Report of the Scientific Committee

Bled, Slovenia, 24 April-6 May 2018

Annex J

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

**This report is presented as it was at SC/67b.
There may be further editorial changes (e.g. updated references, tables, figures)
made before publication.**

International Whaling Commission

Bled, Slovenia, 2018

Annex J

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

Members: Leaper (Convenor), Al Harthi, Alfaro Shigueto, Andriolo, Aoki, Archer, Atkinson DeMaster, Avila, Bell, Bjørge, Brierley, Brownell, Buss, Caballero, Castro, Cipriano, Collins, Cooke, Cosentino, Cubaynes, Currey (co-Convenor), DeMaster, Di Tullio, Doniol-Valcroze, Double, Ferriss, Fortuna, Frey, Fruet, Gallego, Galletti Vernazzani, Gulland, Haug, Hielscher, Hubbell, Hughes, Iñíguez, Irvine, Jacob, Kato, Kim, E., Kim, H.W., Lang, Langerock, Lauriano, Leaper, Leslie, Lundquist, Mallette, Mangel, Marcondes, Mattila, Mazzariol, Minton, Mwabili, Nelson, Nicol, Northridge, Palka, Panigada, Parsons, Phillips, Pierce, Porter, Reeves, R., Reeves, S., Reyes Reyes, Ridoux, Ritter, Robbins, Rock-An, Rodriguez-Fonseca, Rojas Bracho, Rose, Rowles, Ryeng, Santos, Scheidat, Scordino, Sequeira, Siciliano, Simmonds, Slooten, Slugina, Smith, Stachowitsch, Stack, Stimmelmayr, Svoboda, Tarzia, Taylor, Thomas, Trejos Lasso, Urban, Van Waerebeek, Vikingsson, Wade, Walters, Weinrich, Weller, Williams, Willson, Yaipen-Llanos, Zerbini.

1. INTRODUCTORY ITEMS

1.1 Convenor's opening remarks

Leaper welcomed participants. He noted the establishment of the IWC Bycatch Mitigation Initiative, and the recent appointment within the IWC Secretariat of the Bycatch Coordinator. The Bycatch Mitigation Initiative will provide opportunities for joint action on bycatch, but also challenges for the Committee in relation to how time and limited resources can be used effectively to contribute. Leaper highlighted paper SC/67b/HIM12, outlining the strategic assessment of the Bycatch Mitigation Initiative and for the sub-committee to keep this in mind during the discussion its recommendations, with the highest action being the identification of priority cetacean species/populations or fisheries to focus targeted work for bycatch pilot projects.

1.2 Election of chair and appointment of rapporteurs

Leaper was elected as Chair, Currey as co-Chair. Mattila and Tarzia volunteered to serve as rapporteurs.

1.3 Adoption of Agenda

The Agenda was adopted with an additional item (2.1.4) added on electronic monitoring.

1.4 Available documents

SC/67b/HIM01-12, SC/67b/AWMP08, Temple *et al.* (2017) [SC/67b/ForInfo12], Kiszka *et al.* (2017) [SC/67b/ForInfo13], Anon. (2016) [SC/67b/ForInfo49], Avila *et al.* (2018) [SC/67b/ForInfo25].

2. BYCATCH AND ENTANGLEMENT

2.1 Review new estimates of bycatch and entanglement rates, risks and mortality

2.1.1 Baleen whales

SC/67b/HIM03 provided information on stranded Humpback whales along the south-eastern coast of Brazil during the 2016-17 winter seasons. In addition, information on apparent feeding behaviour of Humpback whales and entanglements off the São Paulo coast was provided. Nine records of stranded or entangled Humpback whales were gathered. Two live stranded whales were towed back to the sea, although long term survival was unclear. Three records of entanglement in gillnets and feeding behaviour were described. In all cases, yearlings were involved in the interactions. These records combine two poorly understood situations of migrating Humpback whales: apparent feeding behaviour in mid-latitude waters and attraction to fishing gear. The study highlighted the need for cetacean awareness campaigns and training of local environmental officers.

It was noted that these entanglements occurred in a small-scale fishery, which is not permanently in operation and which fishes in the very near-shore coastal environment.

SC/67b/HIM09rev1 reviewed ten baleen whale species and subpopulations listed as either Critically Endangered or Endangered by IUCN, or populations with less than 500 individuals remaining, for which bycatch appears to have substantial conservation implications. Six of the ten have an estimated population size of less than 100 individuals, and include the Gulf of Mexico 'Bryde's', eastern North Pacific right whale, Chile-Peru right whale, upper Gulf of Thailand Bryde's, Arabian Sea Humpback, and western gray whale. The remaining four populations have less than 500 individuals including Okhotsk Sea bowhead, Central American Humpback, North Atlantic right, and the western North Pacific right whale. Of these cases where bycatch has been documented, common fishery types are involved and generally include gillnets, pots and traps attached to line, and set nets. Further efforts are needed to assess the extent and rate of fishery interactions, as well as, the population level consequences. These entrapments and entanglements are seasonally dependent on presence of baleen whales that coincide with their migration, feeding or breeding activities. Right whales,

Humpback whales, and gray whales appear to be the species most prone to entanglements in many parts of the world and similarly for bowhead whales in Arctic waters. The authors suggested that more attention must be given to all the populations with fewer than 500 individuals. For those populations with less than 100 individuals immediate action is necessary to address bycatch. In seven of the 10 populations presented with documented bycatch, less than four range states are involved. However, few national and no international programs, exist to address this problem in a systematic way. A review of fishing gear across species is also needed to better understand common problems and gear types attributed to baleen whale bycatch.

In discussion about the necessary follow-up work, the author noted that detailed post-mortems are needed to identify the fishing gears causing bycatch. The sub-committee noted that there were at least two distinct categories for prioritisation presented in the paper; those populations under 100 individuals which require urgent action (including consideration of total fisheries closure); and those populations which number more than 500 individuals, for which there is a little more time available. Furthermore, the cases identified could be further categorised based on the extent of evidence available to indicate that bycatch is the main cause for population declines. For example in the case of the Arabian Sea Humpback whale there is strong evidence that entanglement has been experienced by between 30%-40% of animals within a population of less than 100 animals, emphasising the need for urgent action. Such evidence is less clear for other populations. The authors emphasised their view that the focus should be on the populations which are at immediate risk of extinction, however others noted that focusing on such critically endangered populations might be too late, and that ideally efforts should focus on populations where there is some possibility of success. There is likely to be relevant experience in other countries for mitigation and management of problematic gears for baleen whales that could be useful in assisting countries to tackle the issue for these ten priority species and sub-populations.

SC/67b/AWMP08 contained information on entangled bowhead whales. The author noted that two entangled whales had been harvested in spring 2017 in Barrow, Alaska. During the hunt, one was believed to be a whale that had been recently struck and lost dragging a harpoon line, but upon capture, it was determined to be rope associated with fishing. Further examination suggested that the rope and remaining gear from both whales belonged to the Bering Sea pot fishery (crab/cod). Later, fishers from that industry confirmed the gear was from the pot fishery, however they could not be sure whether the gear was from Russia or the USA. In addition, the wear on the rope suggested that it might be 'ghost' gear. Previously, only one dead beach-cast whale in the region, from 2015, had identifiable gear on it and in that case was from the US Bering Sea crab fleet. Previous work (Citta *et al.* 2013) has suggested that these animals overlap in space, but not time with the crab fishery, suggesting they may predominately encounter lost gear rather than gear that was being actively fished at the time.

In discussion, it was noted that the colour of the rope in both entanglements was tan/green, and that this may ultimately prove to be useful information, given ongoing studies of right whale vision and avoidance of various colours of simulated rope. Also, the author noted that analysis of cortisol in the baleen plates showed at least one order of magnitude spike that began in the winter of 2016, and that these levels were starting to fall, prior to its death in the spring of 2017, as it also appears to have done in dead southern right whale calves showing evidence of kelp gull attacks that have been examined (SC/67b/CMP04).

2.1.2 Inferences from strandings

SC/67b/HIM01 describes preliminary results from largely opportunistic monitoring efforts of beach-cast cetaceans in 11 locations along the Peruvian coast in 2000-17, with a focus on species prevalence and estimation of a minimum human interaction rate (58.8%). A total of 942 specimens (873 identified) covered 8 species: Burmeister's porpoise, dusky dolphin, common dolphins (mostly long-beaked), common bottlenose dolphin, and single specimens of Risso's dolphin, dwarf sperm whale and Peruvian beaked whale. Clear evidence of continued high bycatch rates and some intentional takes, as well as utilisation for food or bait was ubiquitous. Unused bycatch discards were novel. The overwhelming prevalence of Burmeister's porpoises beach-cast nation-wide (66%) and a low 25% of dusky dolphins (central coast) contrast with 1985-90 statistics when dusky dolphins accounted for three quarters of all cetacean captures. The authors reiterated prior concerns (Van Waerebeek 1994) about a persistent long-term trend of a significant decline in prevalence of Peruvian dusky dolphin in catch and stranding records. Regular, dedicated beach surveys with standardised protocols to improve data on human-induced and natural mortality, species/age/sex prevalence, are recommended together with collection of samples for further natural history studies.

In discussion, the author noted that Peru has never had a national strandings network, or a standardised approach to monitoring stranded animals. Those involved in beach monitoring activities in Peru include groups looking at different taxa (e.g. seabirds) and so it is difficult to ensure that standardised protocols are followed for collecting data on stranded cetaceans when this is not their focus. The Peruvian Government has a research vessel that collects cetacean data, which might be useful for determining species abundance, however this has not yet been analysed or processed. The sub-committee noted the situation regarding bycatch in Peru and **recommended** that the IWC Secretariat make contact with the Peruvian government to offer IWC assistance. The observed high mortality levels in Burmeister's porpoise are a serious concern, and action is needed to avoid the same critical situation as with the closely related vaquita. Burmeister's porpoise is already included in a preliminary list for potential Conservation Management Plan development in SC/66a/SM22, and dusky dolphin could potentially also be included. The sub-committee noted possible opportunities to focus on these species through the new IWC Bycatch Mitigation Initiative and **recommended** that these were considered

for potential pilot projects (see 2.5). The sub-committee reiterates the Committee recommendations from 2008 regarding bycatch monitoring programmes and mitigation efforts in these fisheries (JCRM 11(Suppl). p 323).

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.*

SC/67b/HIM05 and SC/67b/HIM08 use stranding data to make inferences about small cetacean mortality. They follow on from previous work published or presented at IWC/SC meetings since 2012. The general long-term aim of this series of studies is to elucidate the different mechanisms that interplay in the stranding process in order to improve the ability to use stranding-based data sets to estimate population parameters.

SC/67b/HIM05 aimed to: (1) identify likely mortality areas at sea of harbour porpoise *Phocoena phocoena* in the Bay of Biscay, English Channel and North Sea; (2) to estimate total number of dead harbour porpoises per year in this large area; with a focus (3) on mortality due to fishery activities on harbour porpoise population in the Bay of Biscay and the English Channel. Harbour porpoise stranding time series from 1990 to 2015 were obtained from stranding schemes established in Denmark, Germany, the Netherlands, Belgium, the United Kingdom and France. In order to link every stranded harbour porpoise stranding to its likely area of death at sea, reverse trajectories were calculated by using the drift prediction model MOTHY (Daniel, 2004; Peltier *et al.*, 2012). Estimated numbers of dead harbour porpoises were estimated by correcting both for drift conditions and proportion of buoyant animals, which was estimated at 17.9% [9.3%; 28.8%] (Peltier *et al.* 2016), under the assumption that harbour porpoise and common dolphin (*Delphinus delphis*) carcasses are similar in this respect. The total number of dead porpoises in the whole study area estimated from the stranding data increased from yearly values under 7500 individuals before 2004 to figures up to 22,000 yearly from 2005 onward, with an unusual peak of 47000 in 2013. Mortality areas were concentrated in the southern North Sea from the mid 2000's onward, which is consistent with the southward shift in the species distribution (Hammond *et al.* 2013). Bycatch related mortality in the Channel and the Bay of Biscay, followed a similar temporal pattern and peaked at 1,500-1,900 individuals in the years 2013 and 2014.

SC/67b/HIM08 investigated the spatial consistency between areas of common dolphin bycatch mortality in the Bay of Biscay, as inferred from strandings by modelling carcass drift, with the distribution of total fishing effort split by gear type and flag. The study focused on the two unusual stranding events recorded in the first week of February 2017 and the first ten days of March 2017. This work, which should be considered as a feasibility study, is related to discussions at SC/67a on whether drift of bycaught carcasses can help identify the fisheries involved. The likely mortality areas at sea of stranded common dolphins diagnosed as bycaught were identified by using the reverse drift modelling methodology (Peltier *et al.*, 2016). Animals categorised as 'fresh' were considered to have <5 days death-to-stranding time, whereas animals classified as 'putrefied' were assumed to have been drifting for 5-15 days (Peltier *et al.*, 2012). Only locations corresponding to each carcass decomposition condition were retained. Fishing effort data were generated on the basis of vessel speeds derived from Vessel Monitoring System positional data and provided by IFREMER (Leblond *et al.*, 2008). Fishing effort during mortality events and carcass drift locations were aggregated in the same 0.4° x 0.4° grid. Generalised Additive Models (GAMs) were used to explore the spatial correlation between the distribution of fishing effort for ten different fisheries and the distribution of common dolphin bycatch mortality. The distributions of fishing effort by French midwater trawlers, Spanish bottom otter trawlers and French Danish-seiners were significantly and positively correlated to the distribution of bycatch mortality corresponding to the two unusual stranding events. Overall, the analysis provided plausible results, highlighting three gear types that would deserve further investigation with respect to interactions with the common dolphin. Future work could expand the temporal frame of the analysis, and split fishing gear categories by main landed fish species, in order to investigate the relationship between mortality areas and fishing effort at the *métier* level.

An intersessional group was established at SC/67a to provide advice on consistent ways to estimate bycatch across both large and small cetaceans, and specifically, review the methods applied in Peltier *et al.* (2016) focused on small cetaceans.

The terms of reference for the intersessional group were:

(1) review the methodology (i.e. modelling the drift of carcasses) and bycatch estimates in Peltier *et al.* (2016) and compare with any comparable results in the area using observer methodology;
(2) review any new data provided by the authors of Peltier *et al.* (2016) that are intended for consideration by the Committee in 2018;

(3) review whether modelling drift of bycaught carcasses can help identify the fisheries involved;
(4) in the light of (3), make recommendations for the design of new or existing observer programmes; and
(5) provide advice to the Committee on general issues (e.g. beyond the specific case of Bay of Biscay) that need to be considered whenever estimates based on strandings are being evaluated.

The intersessional group agreed to focus on the methods applied by Peltier *et al.* (2016), and to identify the uncertainties and assumptions being made with respect to: (i) estimation of total mortalities given the number of animals that strand; (ii) determining cause of death and time since death for those animals that strand; and (iii) attribution of total mortalities to fisheries (specific areas/fleets/target species/gear type). The group made a number of recommendations;

(a) Recommendations to address uncertainties in bycatch estimates derived from strandings

The group recommended further work to address uncertainties in the analysis arising from parameters that either don't appear to have been quantified directly in the analysis to date, or that have been assessed directly but with either very limited sample size or samples obtained in potentially unrepresentative contexts. The group also highlighted uncertainties in the estimation of immersion level, the probability of being buoyant, the probability of stranding, the time of death and potential sensitivity of this approach to application beyond the Bay of Biscay.

(b) Recommendations for how bycatch estimates derived from strandings could be used

The group recommended that any application of this method to derive bycatch estimates from strandings be considered with the following caveats. It was agreed that the method was only able to provide estimates for areas where carcasses are released where prevailing winds and currents result in carcasses stranding with sufficiently high frequency to enable detection. The group further agreed that animal distribution may also reduce or preclude the likelihood of stranding (e.g. taxa with offshore distributions or variable movements). Consequently, the group agreed that the number stranded and scaled estimates derived, assuming the scaling factors are accurate and unbiased, could only ever provide a minimum estimate and one may well be fishery-specific as carcasses released too far offshore may strand with such low frequency as to inhibit detection or estimation (e.g. the Channel bass trawl fishery in which dolphin carcasses were tagged and released but never reported stranded). Finally, the group agreed that correlation of stranding events results in overdispersion of stranding data e.g. because of variable overlap between the fishery and the cetacean distribution. Overdispersion also occurs with observer data but, as it can be directly estimated from observer data, it is more readily addressed, which is not the case with stranding data.

(c) Recommendations to assess if strandings can identify gaps in observer coverage

The group recommended further work to assess if strandings can identify gaps in observer coverage. The group recommended that any such application should involve an initial step to assess if there are in fact gaps in observer coverage by conducting a fishery characterisation to document fleet effort and observer coverage directly. The group recommended back calculation to generate estimates of spatial and temporal uncertainty associated with the at-sea time and location of origin, and therefore the uncertainty in identifying fisheries to which mortalities may be able to be attributed. The group recommended experimental work to achieve this, using carcasses dropped in the sea at a known time and location recovered ashore and then the methodology of Peltier *et al.* (2016) applied to see where the carcasses were determined to have come from. The group also recommended examination of carcasses for net marks to infer mesh size and twine type to aid in attributing mortalities to specific fisheries. This could also be considered in any further experiments with for example net marked carcasses being released at sea. Finally, the group noted the value of observer studies in adjacent areas to aid in assessing the risk of mortality.

The sub-committee endorsed these recommendations and discussed them SC/67b/HIM05 and SC/67b/HIM08 in combination. In response to a question as to the possible causes for the particularly high level of strandings recorded in 2013/14 reported in SC/67b/HIM05, Ridoux noted that it was not clear why the number of dead harbour porpoises in the North Sea had been so much higher than for other years, and that this could have introduced some bias into the analysis. There are no bycatch estimates available for common dolphins in the relevant EU countries. Only one or two countries have tried to produce bycatch estimates, and France has not done this despite an observer programme with thousands at-sea days over the past 10 years. It was further noted that within the European Union, Regulation 812/2004 was put in place to fulfil the requirements under the EU Habitats Directive, which requires all fisheries to be monitored for their impact. Ridoux noted that in France this monitoring has been restricted to vessels over 15m and only to some specific fisheries. Furthermore, in some jurisdictions fishing captains are able to refuse to carry observers on board without sanction, which can complicate the effectiveness of monitoring programmes and the subsequent understanding of bycatch estimates.

The sub-committee noted the value of attempting to correlate the stranding information and modelling of spatial distribution of mortality with fishing vessel tracking data or information on fishing effort. The discussion also included the consideration presented within the paper, and supported by the results of the SCANS surveys, that harbour porpoise have undergone a southwards shift in distribution, moving into areas where there is now a high likelihood of bycaught animals stranding. There are some areas within the North Atlantic, including in the North Sea, where the seasonal wind conditions would result in a very low chance of finding a stranded animal on the coast. Attention was drawn to the conclusion in ICES (2016) that the data collated were indicative of potentially substantial total annual removals of

common dolphins in some European fisheries that may cumulatively exceed safe limits depending on the size of the population from which the bycatch is being taken.

In further consideration of the inferences about bycatch from strandings, considerable information was provided about the Santos Basin Beach Monitoring Project (PMP-BS), required by the Brazilian federal environmental agency for the environmental licensing of the oil and natural gas production and transport by Petrobras. To evaluate the potential impacts of these activities on marine turtles, seabirds and marine mammals, approximately 1,040km of coastline are being systematically monitored, either daily (65% of the area) or weekly (14% of the area), or through calls from local population (21% of the area). The monitoring effort started in August 2015 and is still underway. During these two years of monitoring 2,072 cetaceans (117 mysticetes, 1,926 odontocetes and 29 unidentified cetaceans) were recorded in the area, most during regular monitoring (66.5%). However, stranding rates were very different among species, with 86.5% of all stranded odontocetes being franciscanas, Guiana dolphins or common bottlenose dolphins. Data from the necropsies in fresh and initial decomposition states (stages 2 and 3) indicate that 43% Guiana dolphins and 45% bottlenose dolphins had deaths caused by anthropogenic factors. The number of Guiana and bottlenose dolphins recorded in the first two years of monitoring by the PMP-BS was much higher than what was expected by the researchers involved in the project. Although the 11 organisations that are part of the PMP have been working with marine mammals along this area for many years, the PMP intensive monitoring revealed a greater number of carcasses than those previously recorded by the same institutions, especially for small cetaceans. These results suggest that the turnover of carcasses on the beaches can be quite high and thus beach monitoring with lower frequencies may underestimate stranding rates.

The Brazilian PMP beach monitoring project has also provided information about stranded franciscana. Whenever possible, sex of stranded carcasses was determined, either by external observation or by the macroscopic analysis of gonads, and total length was measured. Classification of developmental stage was done considering total length: calves were animals with less than 90cm; adult males larger than 116cm; adult females larger than 126cm; and juveniles between 90cm and 116cm for males or 126cm for females. Between October 2015 and September 2017, 1,123 franciscana dolphin carcasses were recorded stranded in the area. Most of the carcasses (62%) were found in advanced decomposition stage and thus it was not possible to identify their development stage and sex. For animals where this information could be obtained, juveniles represented the highest number of individuals, and the number of males was slightly higher than females and this pattern was observed in both years. Considering only the animals were sex could be identified, most males were juveniles in both years but for females, the frequency of adults was higher in the second year, while in the first year the highest frequency was for juveniles. Considering the decomposition of the carcasses, 821 could be necropsied and 32.4% had signs of interaction with human activities, being interactions with fishing gear the most common (86.5% of interactions).

The numbers show that the franciscana is continuously under strong pressure in Brazilian waters, despite the regulations for the use of fishing nets established by the government. It was noted that the existing regulation on gillnets, implemented in 2012 is either not being effectively enforced or is not efficient in reducing bycatch. The sub-committee **recommended** the need for this to be investigated further. Barreto noted that urgent actions are needed to reduce bycatch and the risk of extinction of franciscana in Brazilian waters. He also noted that many of the carcasses found had clear signs of bycatch, and that the collected data (which included necropsies to investigate internal trauma, disease) is still being processed, but that when complete, the aim will be to understand potential population level effects rather than just individual causes of death. Many of the animals were found to have died by drowning or asphyxiation, although there was not additional evidence to link that to a fishing gear type, or definitively prove that it was caused by bycatch.

The sub-committee further noted 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. In small scale fisheries observer programmes are particularly complicated, given the small size of vessels, and electronic monitoring may not capture the animals falling from the net during hauling.

In conclusion, the sub-committee **recommended** that the effectiveness of bycatch mitigation measures be evaluated through a combination of monitoring measures. It was noted that this recommendation was particularly relevant to the situation in Brazil as outlined in the previous paragraphs. Such measures could include well-designed and effectively implemented observer, electronic monitoring and stranding programs. The sub-committee **agreed** that using a combination of measures is likely to provide a more robust evaluation of bycatch mitigation measures.

Attention: CG-A

*The Committee **draws attention** to the fact that the franciscana continues to be under strong pressure from human activities, especially bycatch, in Brazilian waters despite the regulations for the use of fishing nets established by the government. The Committee therefore:*

*(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.*

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.*

2.1.3 Spatial dynamics

SC/67b/HIM02 reported on an individual-based model for Maui dolphin. The model was calibrated to ensure dolphin movements match field data on depth preferences, average distance moved per hour, home range sizes and group size. Several recent studies have used individual-based, spatially explicit models to study marine mammal bycatch, including for harbour porpoise in the North Sea (van Beest *et al.* 2017; Nabe-Nielsen *et al.* 2018). These studies map cetacean habitat, with each grid cell having attributes like water depth, number of cetacean and fishing nets. Cetaceans in the model move through the area and interact with gillnets and trawling vessels. An individual-based approach is essential for small populations like Maui dolphins, vaquita and other Critically Endangered populations and is also being used in other contexts for much larger whale populations (e.g. SC/67b/EM07). A spatially explicit approach such as Netlogo (van Beest *et al.* 2017; SC/67b/HIM02) is particularly appropriate for impacts like fishing. Especially where cetacean movements are sufficiently large that they are unlikely to stay inside areas with or without protection.

The sub-committee welcomed this paper, and discussion focused around the potential to use this approach in other contexts. Spatially explicit modelling is increasingly being used and be of particular value when the range of movements are likely to be large enough to include moving between inshore/offshore zones.

2.1.4. Electronic monitoring

Bartholomew *et al.* (2018) summarised the results of a study comparing remote electronic monitoring (REM) systems with onboard observer records of target catch (sharks and rays) and bycatch (marine mammals, sea turtles) by Peruvian small-scale driftnet fishing vessels. The study showed that REM can provide a time- and cost-effective method to monitor target catch in small-scale fisheries and can be used to overcome some of the challenges of observer coverage (e.g. monetary cost, vessel space). With ongoing modifications to the camera specifications, REM performance was expected to improve for all target catch and bycatch species.

The sub-committee commended this work and its focus on electronic monitoring of small scale vessels. The discussion included consideration of whether the electronic system would allow for spatially plotting fishing effort. The author noted that it was not possible to measure the extent of the net with the sampling rate used in the trials (an image captured every 40 seconds), however in the most recent version of the technology this would be possible. It was further noted that a number of researchers have begun to develop algorithms to determine the extent of fishing effort, including the length of net that was set, from electronic data. In relation to the effectiveness of this method for determining the number of animals dropping out of the net during hauling, the author noted that under low-light conditions, or when the recording was not prioritising cetacean bycatch, the system performed less well. The group acknowledged the advantages presented by a portable monitoring/VMS system, particularly as an aid for randomising samples across fleets, and avoiding this bias. The sub-committee further noted that there was a workshop held by ASCOBANS in 2015 on electronic monitoring. Given the increased use of these techniques and the rapid development of camera and associated electronic technology, the sub-committee **recommended** that this should be a focus topic in the work plan for next year.

2.3 Review proposal for global entanglement database

At SC/67a the Committee reviewed the progress on developing a dedicated entanglement database for the use by the teams of trained responders in the Global Whale Entanglement Response Network (GWERN). This included user interface, fields and structure. In October, 2017 a small group met to: (1) finalise the data fields and descriptions; and (2) decide whether to construct it with off the shelf, commercial software, or a bespoke solution developed by the IWC using open-source technologies. Primarily because of the IWC's move to a common database language, for consistency and to avoid obsolescence, the group decided to go with that solution. However, given an estimated cost of £20,000 GBP, it was decided to bring up this topic at the upcoming meeting of the GWERN, 5-7 June, 2018. At which time a similar

database will be demonstrated, and it is hoped that a consensus will be reached in how to proceed with the IWC database (e.g. whether to raise the funds or not).

2.4 Reporting of entanglements and bycatch in national progress reports

As in previous years, reports of large whale bycatch and ship strikes from the National Progress reports were reviewed. These are given as Appendix 2.

Bjørge noted that of the large whales reported entangled in the progress report from Norway, two of the Humpback whales and the minke whale were released alive.

In discussion, the incomplete nature of the bycatch information provided was noted. The sub-committee noted that a similar table of bycatch of small cetaceans is appended to the SM report. The National Progress reports only include an unknown but probably small proportion of recorded bycatch and not estimates of bycatch which would be reviewed by the Committee if papers are submitted. It was further noted that it would be useful for the sub-committee to map out which countries are collecting bycatch data and determine how best to get access to this information.

The sub-committee noted that there was an effort last year to re-focus the national reporting format to improve and streamline it, and that reporting is time consuming. General issues associated with difficulties in submission of National Progress reports will be discussed in the full Committee.

2.5 The IWC Bycatch Mitigation Initiative

SC/67b/HIM12 provides the preliminary outcomes of an assessment on the potential work areas for the new IWC Bycatch Mitigation Initiative, with an evaluation of where the IWC can add the most value in tackling cetacean bycatch. Five different mechanisms were identified as being the most significant for bringing about change in how bycatch is tackled from local to international scale. The mechanisms include identifying high risk areas for future targeted work (pilot studies), testing and demonstrating effective solutions, working directly with fishing communities, and transferring knowledge and developing capacity on bycatch mitigation and management, and collaborative work with regional and international fisheries bodies. The IWC's potential role within each of these mechanisms was then evaluated based on existing gaps, the current or likely strengths of the IWC to work within these areas, and the current challenges and opportunities. Each of the mechanisms was found to be important for bringing about change in how cetacean bycatch is tackled, and the IWC could play a significant role within specific work areas under each. In order to be effective, the Bycatch Mitigation Initiative needs to draw on the expertise of the different parts of the IWC, including the Committee where so much research on this topic has already taken place.

Specific recommendations for the Committee in relation to potential work areas that would help progress the Bycatch Mitigation Initiative, included: (i) identify the priority fisheries/sites/species/populations to be considered for pilot projects based on conservation need and establish bycatch baselines for relevant cetacean populations where mitigation is to be trialled; (ii) lead in communicating the need for increased research on mitigation measures/management approaches for cetaceans to the broader scientific community; (iii) annual review of mitigation measure tables; (iv) provide technical assistance to the coordinator and the expert panel in the development of scientific trials/monitoring programmes to evaluate mitigation measures; and (v) collaborate with researchers identifying fishing effort using vessel monitoring and tracking systems and assess bycatch risk, with a particular focus on small scale fisheries.

The sub-committee thanked Tarzia (the Bycatch Coordinator) and welcomed the comprehensive outline of activities. The sub-committee strongly endorsed the strategic assessment and the recommendations for the Committee work plan and **recommended** that the Bycatch Mitigation Initiative be supported when costed, including ongoing support for the Bycatch coordinator, when brought to IWC/67. It was noted that these recommendations for the Committee were in line with the sub-committee's anticipated work plan, and that the Committee could play a strong role within the initiative, particularly in relation to identifying priorities, driving innovation and reviewing outputs from pilot studies. There was some discussion of 'rapid bycatch and risk assessment' tools and the sub-committee **recommended** that consideration of these also be a focus topic at SC/68a.

Recognising the potential role for the Committee to help raise awareness across the broader scientific community in relation to the current gaps and needs relating to cetacean mitigation research, the sub-committee suggested that its members should assist in promoting this, and the Bycatch Mitigation Initiative through existing networks, at conferences, workshops and with students. It also suggested that some of the approaches taken in relation to ship strikes (e.g. multilingual brochures and annotated Powerpoint presentations) might be useful as a communication aid.

The sub-committee noted that review of tables of mitigation measures was already in the work plan. Also that consideration of vessel monitoring and tracking and remote electronic monitoring systems to assess bycatch would also be considered next year. Discussion focussed on the identification of priorities for pilot projects because this was considered the most urgent in view of presenting a work plan for consideration at IWC/67.

The sub-committee first considered criteria that could be used to identify the priority fisheries/sites/species/populations to be considered for pilot projects. It was noted that Reeves *et al.* (2004) had suggested criteria for determining priorities related to bycatch. Based on these and discussion of the specific role and mandate of the IWC Bycatch Mitigation Initiative, the following five broad criteria were agreed to allow possible pilot projects to be selected. The first stage

would be for the coordinator to compile sources of data to allow projects to be identified. She will then consult with the expert panel to apply the criteria, including contact with any of the governments involved, to select the projects for review by the Standing Working Group.

(1) Urgency of conservation situation driven by bycatch or concern over situations with little or no data on bycatch, but suspected overlap between high risk fishing gears and vulnerable cetacean species. With respect to this the sub-committee agreed that the BMI should be able to select pilot projects where there was information to show a pressing conservation issue, but also where there were indications that a serious problem may exist, but no data to confirm this. In the former case, the pilot project would focus on mitigation, whereas in the latter it would focus on an assessment of bycatch (e.g. a rapid assessment process) as the first step.
(2) Enabling conditions necessary for success. The sub-committee noted that there are useful enabling conditions listed in SC/67b/HIM12 and that these could be further refined with reference to Reeves *et al.* (2004) to make these more specific to assessing the feasibility of pilot projects.
(3) Scope for IWC to contribute (e.g. enhanced international cooperation).
(4) Ability to monitor effectiveness of mitigation actions.
(5) Potential for project to contribute to mitigation of bycatch in other areas.

A number of data sources were also identified to assist in compiling the initial list for evaluation using the criteria. These include papers from SC/67b, (SC/67b/HIM01, SC/67b/HIM07, SC/67b/HIM09, SC/67b/SM06, SC/67b/ForInfo25); previous recommendations under HIM and Small Cetacean sub-committees was also suggested, including species prioritised during the Small Cetacean sub-committee of SC/67b, as was information contained in the SOCER reports and external sources including Reeves *et al.* (2013), the NOAA list of foreign fisheries (2018), Calderan and Leaper (2018 report), Williams *et al.* 2016. Information from CMS, IUCN and ICES are also likely to be useful. The sub-committee discussed potential candidate locations for pilot projects, suggesting that identified fisheries in the Republic of Congo, Peru, Ecuador, Pakistan and India appear to fulfil many of the criteria and are locations where past or present IWC work is being carried out which is relevant to bycatch.

The bycatch coordinator will compile this information and then together with the expert panel apply the criteria and discuss the prioritised list of species/locations with the standing working group and relevant governments.

The IWC's technical advisor for reducing unintended human impacts, reported on relevant activities under the entanglement initiative. Since SC/67a, IWC entanglement trainings have been conducted in Sakhalin (Russia), Arica (Chile), Sortland (Norway) and Bahía Solan (Colombia). The training in Sakhalin was a joint stranding and entanglement response training in cooperation with IFAW, and the Colombia training was the first conducted in Spanish only. This brings the total number of trainees in this initiative to 1,130 from 27 countries. In addition two apprentices were hosted this year, one from Chile and one from Oman. Mattila also presented the IWC's work with entanglement in two workshops at the Society for Marine Mammalogy Biennial conference (2017).

The sub-committee noted the important activity of the GWERN programme, and Mattila was thanked for his leadership and good humour in coordinating the initiative. It was noted that the contacts made could be of particular value to the Bycatch Mitigation Initiative.

The sub-committee also considered SC/67b/ForInfo25 in relation to its potential relevance for identifying priority populations and locations as requested by the Bycatch Mitigation Initiative. Based on a literature review the authors geo-referenced and encoded available information on marine mammal threats in a database, which is available with the paper. Threats affecting 121 marine mammal species between 1991 and 2016 were included. From the database a series of risk maps were developed, linking information about species-specific vulnerabilities to large-scale species distributions, thus providing an assessment of how threat levels for marine mammals vary in space. Risk areas were produced based on binary (presence/absence) range maps using the core habitat. Incidental catch (which included bycatch) affected the most species (112 species), followed by pollution (99 species), direct harvesting (89 species) and traffic-related impacts (86 species). Bycatch, defined as an animal bycaught in active fishing gear for fishing use affected 109 marine mammal species worldwide, mainly odontocetes. High-risk areas were concentrated mainly in coastal waters of North America, India, Australia and the Mediterranean, Baltic and Arabian Seas. In relation to marine cetacean species, 78 species have been documented to be affected between 1991 and 2016 worldwide.

Attention: C-R, SC, CC

The Committee discussed the strategic assessment of the Bycatch Mitigation Initiative and the role of the Committee. The Committee:

(1) ***agrees*** *to incorporate in its workplan the five work areas listed in its report under Item 13.6.1 and also consideration of 'rapid bycatch and risk assessment' tools;*
(2) ***agrees*** *to the criteria listed in its report under Item 13.6.1 when identifying priority fisheries/sites/species/populations; and*
(3) ***recommends*** *to the Commission that the Bycatch Mitigation Initiative continues and is supported, including the provision of ongoing support for the Bycatch coordinator.*

2.6 Collaboration with FAO on bycatch related issues

The IWC's bycatch coordinator gave a brief overview of the FAO's Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations, attended by the coordinator and a number of scientific committee members. The workshop, held in March 2018, produced a report with recommendations to the FAO's Committee on Fisheries (COFI), and a review on mitigation measures with tables indicating proven mitigation measures (by fishing gear type, and cetacean species) and a decision tree providing guidance on choosing a bycatch mitigation pathway. This document will potentially form the ground work for the development of technical guidelines under FAO on marine mammal bycatch. In addition to the workshop the IWC's executive secretary and bycatch coordinator will be attending the COFI meeting in July 2018, and the regional secretariat's network meeting held at the same time. Mattila also represented the IWC at an FAO technical consultation on gear marking 5-9 February, 2018 (Rome), the results of which will be reported at SC/68a.

In discussion the sub-committee welcomed the efforts of the FAO to consider cetacean bycatch, and **recommended** that the IWC secretariat to continue these collaborations with the FAO.

Attention: C-R

*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.*

2.7 New information on cetacean bycatch in the Western, Central and Northern Indian Ocean

Reeves presented SC/67b/HIM07, noting that it was intended as a follow-up to the Committee's recommendation at last year's meeting that, 'in light of the scope and scale of cetacean bycatch in the Western, Central and Northern Indian Ocean and the considerable data gaps associated with intensive and extensive gillnet fisheries,' the topic be included in the work plan for this meeting and the Secretariat establish communications on the issue with the Indian Ocean Tuna Commission (IOTC) (IWC 2018, p.46). Tuna fisheries, both industrial and small-scale, are of major socioeconomic importance throughout the Indian Ocean. Cetacean bycatch rates in this region are thought to be relatively low in pelagic longlines and purse-seines, but the increasing use of drift gillnets, particularly in the northern Indian Ocean, is of concern. The IOTC is the responsible authority for managing fisheries for tuna and tuna-like species. At its annual meeting in September 2017 the Working Party on Ecosystems and Bycatch acknowledged the importance of cetacean bycatch and adopted a work plan that includes this matter as a research priority. While a severe shortage of data remains, the stage is set for collaboration with the IOTC on data collection and ultimately for mitigating bycatch in the region.

The group noted that this issue came up during SC/67a, and that the sub-committee had made two recommendations, that this be included in the 2018 work plan, and that the IWC Secretariat contact the IOTC Secretariat about collaboration/assistance. The IWC's Executive Secretary provided an update on engagement with the IOTC, including a recent teleconference with the IOTC Executive secretary to discuss areas of collaboration. The IOTC is holding some training sessions for on board observer programmes, including those targeting the small scale artisanal sector, and the IWC has been offered the possibility of sending some experts to the training. It was further noted that the IOTC is producing cetacean ID guides to provide to observers and the fishing industry, and that these have been carefully peer-reviewed.

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.*

---

3. SHIP STRIKES

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

DeMaster presented a short summary of a pilot study to better characterise ship strikes in SE Alaska. The work is being coordinated among the Alaska Fisheries Science Center, the University of Alaska SE, and the US Park Service. The focus of the effort is to combine remote electronic monitoring, passive acoustics, and a remote bio-sampling tool to provide information on ship strikes of cetaceans that may be missed by existing methods. The sub-committee encouraged the Principal Investigators to continue this work and to keep the sub-committee informed of their efforts.

3.1.1 Review progress on global database

SC/67b/HIM11 summarised the sixth term of work carried out by the IWC ship strike data coordinators between May 2017 and April 2018. In 2016, the Committee recommended that priority should be given to validation of all the records in the database and thus special attention was given to continuing the data review process while also keeping the database updated with new entries. The process of reviewing all records has been conducted by starting with the most recent records. All the incidents since 31 December 1999 have now been reviewed and assigned a category in consultation with the Data Review Group (DRG). In total, 320 reports were assessed in the last year and are now listed as reviewed cases in the database. Since 1st of May 2017, 21 new reports have been submitted. Some entries were realised by the data co-ordinators, but an increasing number also stemmed from the public, including scientists working in the field. There is still

a need to finalise tools to allow the bulk upload of data to the database. When this option is implemented, it is anticipated that several hundred more reports stemming from different sources will be added. These include records from the USA and it is anticipated that many of the records in the US database hold greater detail on each incident than those that are already in the IWC database. These records will not be reviewed until the full US data has been uploaded. All incidents reported in National Progress Reports are reviewed using the standard procedure, except for those from Australia and the USA, who review reports that come to them with the same (or greater) rigor than the IWC process.

With regard to outreach on the ship strike issue, the IWC PowerPoint presentation, poster and associated briefing materials are available from the Secretariat, and the ship strike brochure is available to download in Arabic, Chinese, English, French, Russian and Spanish on the IWC web site. The data coordinators have also maintained contact regarding ship strikes with ASCOBANS, ACCOBAMS and the Pelagos Sanctuary Executive Secretariat.

The sub-committee commended Panigada and Ritter for their intersessional work, and **recommended** its continuation and the development of the bulk upload tools by the IWC Secretariat. It also urged that the records in the IWC Ship Strike database are reconciled with those in the National Progress Reports. Panigada and Ritter noted that when they made verbal follow up enquires about incidents, these were all documented in writing and placed with each record. Panigada also provided an update on a new project funded by the Pelagos Agreement on ship strikes in the Pelagos Sanctuary. This project will aim to assess ship strikes in the area, together with suggesting mitigation measures to be applied in the Pelagos Sanctuary and in other areas of the Mediterranean Sea.

Attention: C-R
*The Committee **reiterates** the importance of the global ship strikes database to its work. It therefore:*

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

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

SC/67b/HIM04 identified the vessels posing the highest potential risk of ship strikes in the Pelagos Sanctuary area. Passenger and cargo ship traffic together present around 80% of the total traffic at risk. Italian and French vessels accounted for more than 50% of the travelled distance in 2014. Overall, the entire 2014 traffic in Pelagos generated an estimated 3,465 potential collision risk events, among which 3,168 events were related to fin whales and 297 to sperm whales. Collision risk is dominated by a relatively small number of vessels. Seven companies operating vessels that would potentially benefit most from the implementation of the REPCET reporting system were identified. The 96 ships belonging to those companies represent almost half of the traffic risk in the Pelagos sanctuary and one third of the expected collision risk events. Two of these companies are French and the other five are Italian. In France, anti-collision systems, such as REPCET, became mandatory on July 1 2017 for French passenger, cargo vessels and state owned vessels longer than 24m which cross the Pelagos Sanctuary more than 10 times a year. This increase of REPCET equipped vessels led to an increase in reports of cetacean sightings from 492 in 2016 to 927 in 2017.

The sub-committee welcomed the information provided by the authors of SC/67b/HIM04 and commended the Government of France for requiring reporting systems for certain vessel types. It was noted that the information provided in the paper was not sufficiently detailed to allow the estimates of collision risk events to be evaluated. It was also noted that 'Alerting' systems like REPCET require a trained observer and a subsequent avoidance action of some sort by the vessel in order to be a considered as a mitigation tool. With the increased use of REPCET on more vessels an evaluation of its efficacy for ship strike risk reduction is needed. If actions such as diverting or reducing speed were to be required from vessels using REPCET there is concern from the companies operating these vessels about competitiveness if measures are not required for other vessels not fitted with the system. The authors also noted that solutions are currently being investigated for situations such as low visibility or night use to supplement the current visual observation methods used by REPCET.

It was suggested that a Particularly Sensitive Sea Area (PSSA) designation, with associated measures that apply to all large vessels might be fairer and more effective. Reduced speed is a possible measure that has been shown to be effective in other areas. Mandatory speed restrictions implemented off the east coast of the USA to reduce risks to North Atlantic right whales have been evaluated and found to be effective. Voluntary speed restrictions have also been implemented including for Bryde's whales in the Hauraki Gulf and through the 'Blue Skies' initiative in SW California which provides incentives for speed reduction to reduce emissions and also ship strike risk for blue whales. There was some discussion about the scientific aspects of a PSSA proposal which would need to be considered, including the possibility that high use whale habitats with overlapping shipping routes extending outside of the Sanctuary boundaries. If a PSSA were to be proposed, this might stimulate further research to determine the most appropriate boundaries. The basin wide survey planned by ACCOBAMS later in 2018 will cover both inside and beyond the boundaries of the Sanctuary.

The sub-committee **agreed** on the importance of evaluating the efficacy of the REPCET system. The Pelagos Sanctuary has been identified as a potentially high risk area and the sub-committee **recommended** further 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 area.

3.2.2 Consideration of methods to identify 'high risk' areas

Panigada reported on a workshop held in April 2018 at the conference of the European Cetacean Society (ECS), organised jointly by the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force and by the Agreement on Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS). The workshop goal was to take an initial look at overlaying specific anthropogenic threats with recently identified Important Marine Mammal Areas (IMMAs).

Specific threats to cetaceans in the ACCOBAMS area were mapped by overlaying the Mediterranean IMMAs with the available area-explicit information on shipping. Three case study areas containing IMMAs, the Alborán Sea, the Northwest Mediterranean and the Strait of Sicily, were discussed. The overlap between IMMAs and ship traffic appeared to be of particular concern for fin, sperm and Cuvier's beaked whales. The workshop produced a suite of recommendations which will be considered further at the proposed IWC-IUCN Task Force workshop. Panigada noted that the ECS workshop provided a preliminary attempt to overlay threats on IMMAs for potential conservation and management advice. The proposed joint IWC-IUCN TF workshop (see item 4.2) would be a more in depth look to evaluate how the data and process used to identify IMMAs can assist the IWC to identify areas of high risk for ship strikes. The sub-committee **recommended** ongoing IWC engagement with the process to identify IMMAs, including consideration of their utility to address threats.

An intersessional group had been established at SC/67a in order to be able to respond to requests for advice related to ship routeing proposals. However, the Committee did not receive any such requests in the intersessional period following SC67a. There are several scenarios when the Committee's advice may be requested in future. These could include, but are not limited to, when routeing measures are proposed for the first time or alterations are proposed to an existing measure, or when new shipping routes are being established. Advice may also be requested for routes where the primary function of the route is not intended to reduce ship strikes, but ship strike risk may be affected. The IWC Strategic Plan to Mitigate Ship Strikes 2017-20 describes a number of stages in identifying high risk areas and developing the appropriate mitigation measures. The nature of the advice required from the Committee will depend on which stage assistance was required. Table 1 outlines the role the SC could play at each stage. The sub-committee suggested that the table could be placed in the ship strike section of the IWC website to encourage proposals to be brought to the SC in time to allow the best advice to be provided.

Table 1

Potential advice from the Committee in response to requests related to different stages of implementation of mitigation measures identified in the IWC Strategic Plan to Mitigate Ship Strikes.

Stage	Potential advice from the Committee
Stage 1: High risk area of potential concern identified based on overlap of shipping and whale distribution or a high number of reported incidents	The Committee could examine the available information on shipping and whale distribution and extract records for that area from the Ship Strike Database. The Committee could draw attention to other assessments such was those used to identify Important Marine Mammal Areas (IMMAs).
Stage 2: Survey data for whales, AIS data for shipping used to inform risk analysis and local vs international jurisdiction.	The Committee reviews the data available on whale habitat use, and analysis of risk.
Stage 3: Consideration of possible practical options based on risk analysis. Recommendations from IWC Scientific Committee, IWC approaches relevant states to offer information and advice.	The Committee reviews the proposed routing or other risk reduction measures. If the routing measure is associated with a Particularly Sensitive Sea Area (PSSA) the SC may consider reviewing any other Associated Protective Measures (APMs) and their potential impact on whales. In line with 2.2.4 of the Strategic Plan, the Committee could identify any known aids to voyage planning available in the area, or assist in applying such technologies in these areas. If a particular type of vessel traffic appears primarily responsible for ship strikes in the area, the SC could draft guidance for operators of these vessels.
Stage 4: Stakeholder workshops to discuss possible mitigation measures and optimise risk reduction with stakeholder interests.	Especially valuable where new routes are being discussed, the Committee could offer advice on what associated protective measures would fit based on region and known species.
Stage 5: Relevant states consider proposals to IMO assisted by supporting information from IWC.	The IWC could submit supporting information for a routing measure to the relevant IMO Committee meeting based on the Committee evaluation. This submission could be especially important if the proposed routing measure is not primarily concerned with ship strike mitigation.
Stage 6: Measures implemented through IMO.	
Stage 7: Continued Monitoring to evaluate ongoing effectiveness of measures.	The Committee could provide a review of the most recent data on whale distribution along with any known ship strikes since the implementation of the measures. If risk analyses are conducted then further advice to improve risk reduction could be provided.

The group also considered how best to collate information regarding cetaceans in the Western Arctic and Bering Strait migratory routes. Following discussions at the IMO Maritime Safety Committee (related to papers MSC 98/17/2 and MEPC 71/7) on the marine mammal avoidance provision in the Polar Code, IMO invited countries to submit information on populations of marine mammals. Discussion of the matter was referred to the sub-committee on Navigation,

Communication, Search and Rescue (NCSR). NCSR 5 in February 2018 considered two papers related to marine mammal avoidance (FOEI *et al.* 2017a, FOEI *et al.* 2017b). The IMO invited its Member States to share relevant spatial marine mammal information. There could be a role for IWC, possibly in collaboration with Arctic Council and its working group on Protection of the Arctic Marine Environment, in assisting with this.

Proposals by the United States for three recommendatory Areas To Be Avoided (ATBA) encompassing King Island, and Nunivak Island, and St. Lawrence Island in the Bering Sea (United States, 2017) were recommended for adoption by the IMO NCSR with some modifications. The King Island area was identified as biologically important for the gray whale, while the St. Lawrence Island's ATBA was intended to provide protection to bowhead whales, gray whales, and Humpback whales to the north and west of the island, with a high concentration area to the north of Gambell in Anadyr Strait. The United States has created a Waterways Safety Committee for the Western Arctic and IWC participation may be possible.

The sub-committee thanked the intersessional group for its work, and asked it to continue with the task of responding to any intersessional requests for advice related to ship routeing proposals.

At SC/67a the Committee continued discussion of the high risk area for ship strikes to blue whales south of Sri Lanka which had also been identified in the IWC Ship Strike Strategy. The Committee had agreed that the results presented would allow it to provide advice on the relative risks of different routing options and that the available data supported a proposal to IMO to move the shipping lanes off the southern coast of Sri Lanka. In 2017, major shipping organisations represented at IMO also wrote to the Sri Lankan government requesting the routing change to reduce ship strike risks and improve maritime safety. So far there has been no response from Sri Lanka. The sub-committee **recommended** that the Secretariat contact the relevant authorities in Sri Lanka to re-iterate the previous offer of assistance from IWC on this issue.

The Hellenic Trench west of Greece is an identified high risk area for sperm whales. In 2015, the Committee recommended that interested parties (including Greece, ACCOBAMS and the shipping industry) move forward with Greece in order to develop a proposal for routing measures in accordance with the IMO guidelines. In 2016, the Committee had recommended that the Secretariat continue to engage on the issue with the Ministry of Mercantile Marine in Greece. There have been further discussions on this within Greece and the sub-committee **recommended** the Secretariat follow up on previous correspondence.

At SC67a the Committee recommended that the Secretariat and HIM Convenor explore possibilities for developing a memorandum of understanding between IWC and an AIS data provider. IWC could then pass on data requests in a standardised format which would minimise the work for the data provider. The first company approached was Marine Traffic who have generously donated data for previous papers that have been discussed by the Committee. The response from Marine Traffic was enthusiastic and it is hoped to develop an MOU to enable data to be provided for studies coming forward to the Committee.

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 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.*

3.3 Co-operation with IMO Secretariat and relevant IMO committees

Cooperation with IMO is described under item 4.11. The Secretariat had maintained a dialogue with the IMO Secretariat on ship strike issues, including meetings during IMO MEPC 72. The sub-committee **recommended** that this dialogue continue.

Attention: C-R, S

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

(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.*

---

4. WORKPLAN AND BUDGET 2019-20

4.1 Workplan for 2019-20

Table 2

Workplan.

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Bycatch and entanglement				
Bycatch Mitigation Initiative		Review aspects relevant to Committee and respond to requests for advice		Review aspects relevant to Committee and respond to requests for advice
Rates and risks		Review new estimates of entanglement rates, risks and mortality		Review new estimates of entanglement rates, risks and mortality
Mitigation		Review new information on mitigation		
Rapid risk assessment		Consideration of 'rapid risk assessment' tools and outputs		
Electronic monitoring		Consideration of remote electronic monitoring and vessel tracking		
Mitigation measures tables		Develop table of mitigation measures for small cetaceans and update table for large whales from 2017 if needed.		
Global disentanglement database	Mattila to discuss the development of a global database from disentanglement activities conducted by members of the IWC network at GWERN meeting	Review Progress	Advance database development if considered feasible	Review Progress
Collaboration with FAO	Secretariat attend COFI meeting	Review FAO outputs on bycatch	Continue collaboration	Continue to review
Encouraging innovative research on mitigation	Promoting the Bycatch Mitigation Initiative through existing networks, at conferences, workshops and with students – all members of Committee with relevant expertise	Review progress		
Ship strikes				
Rates and risks		Review estimates of rates of ship strikes, risk of ship strikes and mortality		Review estimates of rates of ship strikes, risk of ship strikes and mortality
Mitigation		Review new information on mitigation		
Advice on routeing measures related to ship strike risk	Provide advice as required (Ship routeing group)	Review advice	Provide advice as required (Ship routeing group)	Review advice
Follow up on previous contacts offering IWC assistance regarding high risk areas	Secretariat to contact 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 time line	Continue ongoing data entry into Ship Strike Database and validation of records	Review progress against specific deliverables and time line
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		
Use of IMMAs to identify high risk areas for ship strikes	Hold 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.	Review workshop report		

4.2 Budget requests for 2019-20

The sub-committee received two requests for funding, both related to ship strikes.

Mattila outlined the funding proposal for a workshop looking at Important Marine Mammal Areas and the applicability of this approach for identifying high risk areas for ship strikes. A joint IWC-UNEP ship strike workshop held in Panama in 2014 reviewed the IUCN's Marine Mammal Protected Areas Task Force initiative to identify Important Marine

Mammal Areas (IMMAs) around the World, and recognised that it might be helpful to the process of identifying areas for high risk of ship strike. Subsequently, both the Scientific Committee and the Ship Strike Standing Working Group have encouraged cooperation on this idea between the IUCN TF and the IWC. In 2013 the IUCN task force on marine mammal protected areas thought that the IMMA approach might be a good approach for identifying areas for high risk with ship strikes. This could be a more systematic attempt at identifying high risk areas. The objective of the workshop is to identify if this is feasible and how it could best be achieved. The sub-committee noted the utility of the workshop and **recommended** that it should be funded. In particular, IMMAs are of specific interest to some governments at the moment.

The other proposal with budget implications is the ongoing work of the ship strike data coordinators. The sub-committee **recommended** that this should be funded over the two year budget period and given the highest priority of the funding requests put forward by the sub-committee. The sub-committee noted that other organisations look towards IWC for ship strike data and providing this will not be possible without the work of the ship strike coordinators. Until the review process is complete the IWC is not in a position to make the database available for use. However, there have been some concerns in relation to the internal prioritisation of the ship strike coordinators in relation to how much time is spent on the data entry and outreach activities. Some form of performance assessment is needed so that the coordinators have guidance in relation to priorities. The IWC Secretariat could address some of the communication and outreach aspects. Furthermore, the project should identify clear timelines and associated outputs so that these can be followed up closely and the progress assessed.

Table 3

Summary of the 2-year budget request for HIM.

RP no.	Title	2019 (£)	2020 (£)
Meetings/Workshop			
		10,000	
Modelling/Computing			
Research			
Database/Catalogues			
		10,000	10,000
Total request		**20,000**	**10,000**

5. ADOPTION OF REPORT

The report was adopted at 11:45 on 2 May 2018.

REFERENCES

Avila, I.C., Kaschner, K. and Dormann, C.F. 2018. Current global risk to marine mammals: taking stock of the threats. Biological Conservation 221: 44-58.

Bartholomew *et al.* 2018. SC/67b/INFO/14

Brownell, J., R.L. and Mallette, S.D. Global baleen whale bycatch: the most threatened population. 12pp. SC/67b/HIM09Rev1

Calderan, S. and Leaper, R. Investigations of countries exporting seafood to the US which may be subject to regulation under the MMPA bycatch rule with respect to cetaceans. http://d2ouvy59p0dg6k.cloudfront.net/downloads/investigations_of_countries_exporting_seafood_to_the_us_which_may_be_subject_to_regulati_1.pdf.

Citta, J., J. Burns, L. Quakenbush, V. Vanek, J. George, R. Small, H. Heide-Jorgensen and H. Brower (2013). Potential for bowhead whale entanglement in cod and crab pot gear in the Bering Sea Marine Mammal Science 30(2): 445-459.

Daniel, P., 2004. MOTHY Modèle Océanique De Transport d'HYdrocarbures Documentation Technique .

Hammond, P. S., K. Macleod, P. Berggren, D. L. Borchers, M. L. Burt, A. Cañadas, G. Desportes, G. P. Donovan, A. Gilles, D. Gillespie, J. Gordon, S. Hedley, L. Hiby, I. Kuklik, R. Leaper, K. Lehnert, M. Leopold, P. Lovell, N. Øien, C. G. M. Paxton, V. Ridoux, E. Rogan, F. Samarra, M. Scheidat, M. Sequiera, U. Sibert, H. Skov, R. Swift, M. L. Tasker, J. Teilman, O. van Canneyt and J. A. Vázquez (2013). Distribution and abundance of harbour porpoise and other cetaceans in European Atlantic shelf waters: implications for conservation and management. Biological Conservation 164: 107-122.

ICES (2016). Working Group on Bycatch of Protected Species (WGBYC), 1–5 February 2016. Copenhagen, Denmark, ICES HQ**:** 82pp.

Kiszka, J.J., Berggren, P., Braulik, G., Collins, T., Minton, G. and Reeves, R. 2017. Cetacean bycatch in the western Indian Ocean: a review of available information on coastal gillnet, tuna purse seine and pelagic longline fisheries. Document IOTC-2017-WPEB13-40 Rev_1 intended for IOTC-WPEB 2017 use only. 12pp. SC/67b/ForInfo13

Kiszka, J.J., Talwar, B., Minton, G., Collins, T. and Reeves, R.R. Cetacean bycatch in Indian Ocean tuna fisheries: recent updates and perspectives from the 13th Meeting of the Working Party on Ecosystems and Bycatch of the Indian Ocean Tuna Commission. 11pp. SC/67b/HIM07

Leblond, E., Daures, F., Berthou, P. and Dintheer, C., 2008: The Fisheries Information System of Ifremer: a multidisciplinary monitoring network and an integrated approach for the assessment of French fisheries, including small-scale fisheries. ICES Annual Science Conference 2008, 22-26 September, Halifax (Canada). ICES CM 2008/K:11

Nabe-Nielsen, J. *et al.* 2018. Predicting the impacts of anthropogenic disturbances on marine populations. Conservation Letters, In Press.

NOAA list of foreign fisheries https://www.fisheries.noaa.gov/foreign/international-affairs/list-foreign-fisheries

Peltier, H., Dabin, W., Daniel, P., Van Canneyt, O., Dorémus, G., Huon, M., Ridoux, V., 2012. The significance of stranding data as indicators of cetacean populations at sea: modelling the drift of cetacean carcasses. Ecol. Indic. 18, 278–290.

Peltier, H., M. Authier, R. Deaville, W. Dabin, P. D. Jepson, O. Van Canneyt, P. Daniel and V. Ridoux (2016). Small cetacean bycatch as estimated from stranding schemes: the common dolphin case in the northeast Atlantic. Environmental Science and Policy 63(2016): 7-18.

Reeves, R. R., P. Berggren, E. A. Crespo, N. Gales, S. P. Northridge, G. Notarbartolo di Sciara, W. F. Perrin, A. J. Read, E. Rogan, B. D. Smith and K. Van Waerebeek (2004). Global priorities for reduction of cetacean bycatch

Reeves, R. R., K. McClellan and T. B. Werner (2013). Marine mammal bycatch in gillnet and other entangling net fisheries, 1990 to 2011. Endangered Species Research 20.

van Beest, F. M., L. Kindt-Larsen, F. Bastardie, V. Bartolino, and J. Nabe-Nielsen. 2017. Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures. Ecosphere 8(4):e01785. 10.1002/ecs2.1785

Van Waerebeek, K. 1994. A note on the status of the dusky dolphin in Peru. Reports of the International Whaling Commission (Special Issue 15): 525-528.

Van Waerebeek, K., Apaza, M., Reyes, J.C., Alfaro-Shigueto, J., L., S., Barreda, E., Altamirano-Sierra, A., Astohuaman- Uribe, J., Ortiz-Alvarez, C. and Mangel, J. Beach-cast small cetaceans bear evidence of continued catches and utilisation in coastal Peru, 2000-2017. 15pp. SC/67b/HIM01

Williams, R., M. G. Burgess, E. Ashe, S. D. Gaines and R. R. Reeves (2016). U.S. seafood import restriction presents opportunity and risk. Science 354(6318): 1372-1374.

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 Review new estimates of bycatch and entanglement rates, risks and mortality
     - 2.1.1 Baleen whales
     - 2.1.2 Inferences from strandings
     - 2.1.3 Spatial dynamics
   - 2.2 Consider scientific aspects of bycatch and entanglement mitigation measures and prevention
     - 2.2.1 Summary table on measures to mitigate bycatch of small cetaceans
   - 2.3 Review proposal for global entanglement database
   - 2.4 Reporting of entanglements and bycatch in national progress reports
   - 2.5 The IWC Bycatch Mitigation Initiative
   - 2.6 Collaboration with FAO on bycatch related issues
   - 2.7 New information on cetacean bycatch in the Western, Central and Northern Indian Ocean
3. SHIP STRIKES
   - 3.1 Review 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
   - 3.3 Co-operation with IMO Secretariat and relevant IMO committees
4. WORKPLAN AND BUDGET 2019-20
   - 4.1 Workplan for 2019-20
   - 4.2 Budget requests for 2019-20
5. ADOPTION OF REPORT

Appendix 2

BYCATCH AND VESSEL STRIKES OF LARGE WHALES ENTERED INTO THE 2018 PROGRESS REPORTS

Prepared by Marion Hughes

Table 1

Reports of bycatch entered into the 2018 Progress Reports.

Argentina

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Atlantic Ocean - Argentine Sea	63°32.3S/ 61°00.6W	Humpback whale (Megaptera novaeangliae)	2015	1	N/A	[NK] GEAR NOT KNOWN OR NOT SPECIFIED
Atlantic Ocean - North	Coastal Buenos Aires province	Common minke whale (Balaenoptera acutorostrata)	2018	1		

Australia

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Pacific Ocean - Coral Sea	-	Unidentified large whale	2016	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean - Coral Sea	-	Unidentified large whale	2016	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean - Tasman Sea	-	Unidentified large whale	2016	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Southern Ocean	Gulf St Vincent	Unidentified large whale	2017	1	Unknown	[NK] GEAR NOT KNOWN OR NOT SPECIFIED,
Pacific Ocean – South	Queensland	Humpback whale (Megaptera novaeangliae)	2017	8	White, tiger, bull sharks	[NSC] SHARK CONTROL NETS,
Pacific Ocean - South	-	Humpback whale (Megaptera novaeangliae)	2017	2	-	LHM] HOOKS AND LINES - Handlines and pole-lines (mechanised)
Southern Ocean - Bass Strait	Low Rocky Point - SW Tasmania	Humpback whale (Megaptera novaeangliae)	2017	1	Rock Lobster	FPO] TRAPS - Pots
Southern Ocean	Tasman Peninsula	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	[LNB] LIFT NETS - Boat-operated lift nets
Southern Ocean	Port Davey Region, SW Tasmania	Humpback whale (Megaptera novaeangliae)	2017	1	Rock Lobster	[FPO] TRAPS - Pots
Southern Ocean	Tasman Peninsula	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	[LL] HOOKS AND LINES - Longlines (not specified)
Pacific Ocean - South	Wyrrabalong National Park	Humpback whale (Megaptera novaeangliae)	2017	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Indian Ocean	Western Australia, Broome.	Humpback whale (Megaptera novaeangliae)	2017	1	-	[MIS] MISCELLANEOUS GEAR
Indian Ocean	Western Australia, Cervantes	Humpback whale (Megaptera novaeangliae)	2017	1	Western Rock Lobster	[FPO] TRAPS - Pots
Indian Ocean	Western Australia, Exmouth	Humpback whale (Megaptera novaeangliae)	2017	2	Unknown	[MIS] MISCELLANEOUS GEAR
Indian Ocean	Western Australia, Fremantle	Humpback whale (Megaptera novaeangliae)	2017	1	Western Rock Lobster	[FPO] TRAPS - Pots
Indian Ocean	Western Australia, Garden Island	Humpback whale (Megaptera novaeangliae)	2017	1	Octopus	[LL] HOOKS AND LINES - Longlines (not specified)
Indian Ocean	Western Australia, Kalbarri.	Humpback whale (Megaptera novaeangliae)	2017	1	Western Rock Lobster	[FPO] TRAPS - Pots
Indian Ocean	Western Australia, Mandurah.	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	[MIS] MISCELLANEOUS GEAR
Indian Ocean	Western Australia, Rottnest Island.	Humpback whale (Megaptera novaeangliae)	2017	4	Western Rock Lobster	[FPO] TRAPS - Pots

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Indian Ocean	Western Australia, Rottnest Island.	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	[MIS] MISCELLANEOUS GEAR
Indian Ocean	Western Australia, Two Rocks.	Humpback whale (Megaptera novaeangliae)	2017	1	Octopus	[LL] HOOKS AND LINES - Longlines (not specified)
Pacific Ocean – South	-	False killer whale (Pseudorca crassidens	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Long-finned pilot whale (Globicephala melas)	2017	2	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean - South	-	Long-finned pilot whale (Globicephala melas)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Long-finned pilot whale (Globicephala melas)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Melon-headed whale (Peponocephala electra)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean - South	-	Melon-headed whale (Peponocephala electra)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Melon-headed whale (Peponocephala electra)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Melon-headed whale (Peponocephala electra)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Antarctic minke whale (Balaenoptera bonaerensis)	2017	1	-	[LLS] HOOKS AND LINES - Set longlines
Pacific Ocean – South	-	Short-finned pilot whale (Globicephala macrorhynchus)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Short-finned pilot whale (Globicephala macrorhynchus)	2017	2	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Short-finned pilot whale (Globicephala macrorhynchus)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Short-finned pilot whale (Globicephala macrorhynchus)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Short-finned pilot whale (Globicephala macrorhynchus)	2017	2	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Short-finned pilot whale (Globicephala macrorhynchus)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Humpback whale (Megaptera novaeangliae)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Unidentified large whale	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Unidentified small whale	2017	2	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Southern right whale (Eubalaena australis)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Long- or short-finned pilot whale (Globicephala sp.)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	-	Long- or short-finned pilot whale (Globicephala sp.)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean - South	-	Antarctic minke whale (Balaenoptera bonaerensis)	2017	1	-	[LLD] HOOKS AND LINES - Drifting longlines
Pacific Ocean – South	Diamond Head, Crowdy Bay, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Coalcliff, Wollongong, NSW, AUS	Southern right whale (Eubalaena australis)	2017	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean – South	Ulladulla, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Terrigal, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Sapphire Beach, Coffs Harbour	Humpback whale (Megaptera novaeangliae)	2017	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean – South	Cape Byron, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Myall Lakes National Park, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean – South	Hat Head, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Newcastle, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)
Pacific Ocean - South	Arrawarra, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	FIX] TRAPS - Traps (not specified)

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Pacific Ocean – South	North Solitary Island, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	South West Rocks, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Woolgoolga Headland, Coffs Coast, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	Brooms Head, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FIX] TRAPS - Traps (not specified)
Pacific Ocean – South	South Solitary Island, Coffs Harbour, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean – South	Crowdy Head, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FPO] TRAPS - Pots
Pacific Ocean - South	Ku-ring-gai Chase National Park	Humpback whale (Megaptera novaeangliae)	2017	1	-	[LX] HOOKS AND LINES - Hooks and lines (not specified)

Denmark

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Arctic Ocean - Baffin Bay	Qeqertarsuaq	Bowhead whale (Balaena mysticetus)	2017	1	Crab	[FPO] TRAPS - Pots
Arctic Ocean - Baffin Bay	Sarfannguit near Sisimiut	Humpback whale (Megaptera novaeangliae)	2017	1	Cod	[FPN] TRAPS - Stationary uncovered pounds nets
Arctic Ocean - Davis Strait	Napasoq near Maniitsoq	Humpback whale (Megaptera novaeangliae)	2017	1	Cod	[FPN] TRAPS - Stationary uncovered pounds nets
Arctic Ocean - Davis Strait	Maniitsoq	Humpback whale (Megaptera novaeangliae)	2017	1	Cod	[FPN] TRAPS - Stationary uncovered pounds nets
Arctic Ocean - Davis Strait	Maniitsoq	Humpback whale (Megaptera novaeangliae)	2017	1	-	
Arctic Ocean - Denmark Strait	East Greenland	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[TM] MIDWATER TRAWLS - Midwater trawls (not specified)
Arctic Ocean - Baffin Bay	Ilulissat	Humpback whale (Megaptera novaeangliae)	2017	1	-	-
Atlantic Ocean - North Sea	Skagen	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED

Iceland

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Atlantic Ocean - North	Iceland	Humpback whale (Megaptera novaeangliae)	2017	1	-	[GN] GILLNETS AND ENTANGLING GEAR - Gillnets (not specified),

Japan

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Pacific Ocean – North	Hokkaido prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	10	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Fukuoka prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Iwate prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	20	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Miyagi prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	10	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Akita prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Chiba prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	6	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Kanagawa prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Niigata prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Toyama prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	11	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Ishikawa prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	27	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Nagasaki prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	16	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Miyazaki prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Kagoshima prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	2	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Miyagi prefecture	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Pacific Ocean – North	Kanagawa prefecture	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Kochi prefecture	Humpback whale (Megaptera novaeangliae)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Aomori prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	8	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Fukui prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	7	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Shizuoka prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	4	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Mie prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	3	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Kyoto prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	10	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Wakayama prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	3	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Shimane prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	4	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean - North	Yamaguchi prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	3	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean – North	Tokushima prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	1	-	[FPN] TRAPS - Stationary uncovered pounds nets,
Pacific Ocean - North	Kochi prefecture	Common minke whale (Balaenoptera acutorostrata)	2017	14	-	[FPN] TRAPS - Stationary uncovered pounds nets,

Korea

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Pacific Ocean - Yellow Sea	-	Common minke whale (Balaenoptera acutorostrata)	2017	20	-	[FPO] TRAPS - Pots, [FSN] TRAPS - Stow nets, [FIX] TRAPS - Traps (not specified), [TM] MIDWATER TRAWLS - Midwater trawls (not specified), [GN] GILLNETS AND ENTANGLING GEAR - Gillnets (not specified)
Pacific Ocean - Sea of Japan/East Sea	-	Common minke whale (Balaenoptera acutorostrata)	2017	50	-	[GN] GILLNETS AND ENTANGLING GEAR - Gillnets (not specified), [FPO] TRAPS - Pots, [FIX] TRAPS - Traps (not specified), [TM] MIDWATER TRAWLS - Midwater trawls (not specified)

New Zealand

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Pacific Ocean - New Zealand	Kaikoura	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	[LX] HOOKS AND LINES - Hooks and lines (not specified)
Pacific Ocean - New Zealand	French Pass	Unidentified large baleen whale	2017	1	Crayfish - rock lobster	[FPO] TRAPS - Pots
Pacific Ocean - New Zealand	Stewart Island	Pygmy right whale (Caperea marginata)	2017	1	-	[FPO] TRAPS - Pots

Norway

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Atlantic Ocean – North	Kaldfjorden	Humpback whale (Megaptera novaeangliae)	2017	3	Herring	[PS1] SURROUNDING NETS - One-boat operated purse seines
Atlantic Ocean - North	Lofoten	Common minke whale (Balaenoptera acutorostrata)	2017	1	Cod fishery	[GN] GILLNETS AND ENTANGLING GEAR - Gillnets (not specified)

Spain

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Atlantic Ocean - North	Mar de Arousa	Fin whale (Balaenoptera physalus)	2017	0	-	-

USA

Large Area	Local Area	Species	Year	Indivi-duals*	Targeted species	Gear Type
Atlantic Ocean – North	-	Fin whale (Balaenoptera physalus)	2015	1	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED,
Atlantic Ocean – North	-	Humpback whale (Megaptera novaeangliae)	2015	26	-	-
Pacific Ocean - North	CA	Blue whale (Balaenoptera musculus)	2016	4	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED,
Pacific Ocean – North	Orange, CA	Gray whale (Eschrichtius robustus)	2016	3	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED,
Pacific Ocean – North	-	Humpback whale (Megaptera novaeangliae)	2016	26	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED, [FPO] TRAPS - Pots,
Pacific Ocean - North	CA	Humpback whale (Megaptera novaeangliae)	2016	2	-	[GN] GILLNETS AND ENTANGLING GEAR - Gillnets (not specified),
Pacific Ocean – North	CA	Humpback whale (Megaptera novaeangliae)	2016	24	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED,
Pacific Ocean - North	CA	Unidentified large whale	2016	5	-	[NK] GEAR NOT KNOWN OR NOT SPECIFIED,

**This column has been aggregated*

Table 2

Vessel Strikes of Large Whales entered into the 2018 Progress Reports.

Australia

Large Area	Local Area	Species	Year	Indivi-duals*	Submitted to IWC or National Ship Strike Database	Source of Information
Pacific Ocean - South	off Tweed Coast, near Casuarina, NSW, AUS	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	NSW Office of the Environment and Heritage
Indian Ocean	Western Australia.	Humpback whale (Megaptera novaeangliae)	2017	1	Unknown	Department of Parks and Wildlife WA
Pacific Ocean – South	Peak Island region	Unidentified large baleen whale	2018	1	No	National Collator
Pacific Ocean – South	Cairns region	Unidentified large whale	2018	1	No	National Collator
Pacific Ocean - South	Offshore of North Stradbroke Island	Humpback whale (Megaptera novaeangliae)	2018	1	No	National Collator
Atlantic Ocean - North	Gloucester Island area	Unidentified large whale	2018	1	No	National Collator
Pacific Ocean – South	Cairns region	Humpback whale (Megaptera novaeangliae)	2018	1	No	National Collator
Pacific Ocean - South	Moreton Bay	Humpback whale (Megaptera novaeangliae)	2018	1	No	National Collator

Brazil

Large Area	Local Area	Species	Year	Indivi-duals*	Submitted to IWC or National Ship Strike Database	Source of Information
Atlantic Ocean – South	Santa Catarina State, Southern Brazil	Southern right whale (Eubalaena australis)	2015	0	No	PBF
Atlantic Ocean - South	Morro de São Paulo	Humpback whale (Megaptera novaeangliae)	2017	1	No	IBJ
Atlantic Ocean - North	Baia de Todos os Santos	Andrews' beaked whale (Mesoplodon bowdoini)	2017	1	Unknown	IBJ

New Zealand

Large Area	Local Area	Species	Year	Indivi-duals*	Submitted to IWC or National Ship Strike Database	Source of Information
Pacific Ocean – South	Hauraki Gulf, seaward of Great Barrier Island	Sei whale (Balaenoptera borealis)	2017	1	Yes	National Collator

Spain

Large Area	Local Area	Species	Year	Indivi-duals*	Submitted to IWC or National Ship Strike Database	Source of Information
Atlantic Ocean – North	Isla de La Palma. Canary Islands. San Andrés y Sauces	Bryde's whale (Balaenoptera edeni)	2017	1	No	TENECON, Tenerife Conservacion Research Society
Atlantic Ocean – North	Tenerife. Los Cristianos	Short-finned pilot whale (Globicephala macrorhynchus)	2017	1	Unknown	TENECON, as above
Atlantic Ocean – North	El Hierro-Canary Islands	Sperm whale (Physeter macrocephalus)	2017	1	Unknown	TENECON, as above
Atlantic Ocean – North	Mar de Arousa	Fin whale (Balaenoptera physalus)	2017	1	Unknown	Servicio de Conservación de la Biodiversidad, Consellería de Medio Ambiente, Territorio e Infra-estruturas, Xunta de Galicia
Atlantic Ocean - North	Mar da Coruña	Common minke whale (Balaenoptera acutorostrata)	2017	1	Unknown	As above
Atlantic Ocean - Mediterranean Sea	Gulf of Valencia	Fin whale (Balaenoptera physalus)	2017	1	Unknown	Instituto Cavanilles de Bio-diversidad y Biologia Evolutiva, Universidad de Valencia
Atlantic Ocean - North	Canary Islands	Bryde's whale (Balaenoptera edeni)	2018	1	Unknown	Instituto Universitario de Sanidad Animal, Universidad de las Palmas de Gran Canaria

UK

Large Area	Local Area	Species	Year	Indivi-duals*	Submitted to IWC or National Ship Strike Database	Source of Information
Atlantic Ocean - North		Fin whale (Balaenoptera physalus)	2017	1	Unknown	UK_CSIP

USA

Large Area	Local Area	Species	Year	Indivi-duals*	Submitted to IWC or National Ship Strike Database	Source of Information
Atlantic Ocean - North		Humpback whale (Megaptera novaeangliae)	2015	7	Unknown	National Collator
Atlantic Ocean – North		Common minke whale (Balaenoptera acutorostrata)	2015	1	Unknown	National Collator
Atlantic Ocean - North		Fin whale (Balaenoptera physalus)	2015	1	Unknown	National Collator
Pacific Ocean – North	San Mateo, CA	Blue whale (Balaenoptera musculus)	2016	1	Unknown	NMFS Southwest Fisheries Science Center
Pacific Ocean – North	San Diego, CA and Oregon	Gray whale (Eschrichtius robustus)	2016	3	Unknown	NMFS Southwest Fisheries Science Center
Pacific Ocean - North	CA-OR-WA	Humpback whale (Megaptera novaeangliae)	2016	6	Unknown	NMFS Southwest Fisheries Science Center

** This column has been aggregated.*