

Annex J

Report of the Sub-Committee on Estimation of Bycatch and Other Human-Induced Mortality

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1. CONVENER'S OPENING REMARKS AND TERMS OF REFERENCE

Berggren welcomed the members of the sub-committee and referred to 52nd meeting of the Commission when the Scientific Committee was instructed that catch limits calculated under the Revised Management Procedure (RMP) shall be adjusted downwards to account for human-induced mortalities caused by aboriginal subsistence whaling, scientific whaling, whaling outside the IWC, bycatches and ship strikes. The Commission stated that each such adjustment shall be based on an estimate provided by the Scientific Committee of the size of adjustment required to ensure that total removals over time from each population and area do not be exceed the limits set by the RMP. In order to address this task the Terms of Reference given in Appendix 1 were developed for the sub-committee by the Scientific Committee convener group. Further, the task primarily applies to areas where the RMP is likely to be implemented, the northeast Atlantic and the western North Pacific.

2. ELECTION OF CHAIR AND APPOINTMENT OF RAPORTEURS

Berggren was elected chair. Leaper and Northridge agreed to act as rapporteurs.

3. ADOPTION OF AGENDA

The adopted Agenda is given as Appendix 2.

4. REVIEW OF DOCUMENTS

The following documents were relevant to the sub-committee: SC/56/BC2-11, SC/56/BRG41, SC/56/NPM1, SC/56/SD1, SC/56/IA7.

5. ESTIMATION OF BYCATCH BASED ON FISHERIES DATA AND OBSERVER PROGRAMMES

5.1 Collation of information from fisheries.

5.1.1. *Collaboration with FAO on fishing fleet data.*

Northridge reported on an inter-sessional visit to FAO in Rome to determine the availability of relevant fishing fleet data and to try to develop links with FAO on the issue of whale bycatch, as requested at SC55. FAO is the custodian of at least three datasets that might be useful to the sub-committee in its attempts to develop means to quantify the incidental capture of whales in fishing gear. The first dataset is the Global

Fishing Fleet database. This is the result of annual requests to member states for information on national fishing fleets. The database can be queried over the Internet through the FAO's FIGIS system. Some major shortcomings of this database are well known, in that many member states do not provide the information requested, while others provide information that is aggregated at too coarse a level to be useful to the sub-committee. A second database is the Global Discard Study database, which has been collated by the Fishing Technology Service (FIIT) of FAO in order to collate information on fishery discards. This database was established by searching through existing accounts of the world's fisheries, and holds information on about 2000 fisheries. However, the information held primarily relates to discard issues, and the database has not been established with the intention of updating it; rather it was intended as a snapshot of existing fisheries with the intention of describing current discard rates. There are evidently relatively few records of cetacean bycatch in this database, as these have not been collated systematically, with the focus being on finfish and shellfish. The third database is that being developed under the Inventory of Fisheries project, co-ordinated by the Fishery Information, Data and Statistics Unit (FIDI). This database was conceived as a part of the FAO's Strategy for Improving Information on Status and Trends of Capture Fisheries. Recognising that much information on global fisheries is incomplete, the strategy calls for the development of a global inventory to contain information on the status and trends in fisheries; it is intended that the inventory should be detailed and also that it should be periodically updated. There are fields available for incidental catches, but very few references to cetacean bycatch have been entered so far.

The Inventory on Fisheries appears to be the most useful vehicle for the sub-committee to explore how to quantify whale bycatch. At present, however, it is only partially completed, though for several areas of the world it is well advanced. FAO staff have indicated their willingness to collaborate in an attempt to use the Inventory to determine how easily some measure of fishing activity or effort by gear category can be extracted from the database, while also determining how easily the inventory might be populated with existing information on cetacean bycatch, such as that presented to the Scientific Committee in the form of Annual Progress Reports. To formalize this arrangement, a letter of agreement would need to be exchanged between organizations.

It was also suggested that for the longer term if the Scientific Committee wishes to engage with FAO on the issue of cetacean bycatch, then an appropriate formal mechanism might be through the recently established Fishery Resources Monitoring System (FIRMS). This partnership was established under the Code of Conduct for Responsible Fishing, which calls for increased international collaboration and co-ordination of information gathering, data exchange and fisheries research. The principal objective of FIRMS is to establish a framework between partners involved in fisheries management to enable reporting in an objective way on fisheries status and trends, and to develop, share and maintain services for the collation, management and dissemination of information through the partnership. Existing partners include regional fishery bodies and FAO.

It was noted that the IWC already shares some information with FAO through the Working Party on Fishery Statistics, though these are chiefly confined to statistics on whale catches. The sub-committee **recommended** that the IWC might also consider joining the FIRMS partnership but this would also need to be discussed with the Secretary.

It was noted during discussion that not all states are members of the IWC or UN. Taiwan in particular was mentioned, as there are known to be substantial numbers of cetaceans taken in Taiwanese coastal and far seas fisheries, with at least two recent records of humpback whale entanglements in coastal trap nets, and the occasional occurrence of baleen whale meat in markets. It was suggested that such whale bycatches may be less likely in Taiwanese far seas fisheries that employ longlines and purse seines, though large funnel nets ("Tiger nets") employed by Taiwanese interests in Indonesia may take baleen whales occasionally. The sub-committee asked Northridge to determine whether FAO has access to statistics on Taiwanese fisheries.

The sub-committee **recommended** that continued collaboration with FAO on this subject would be useful, and Northridge agreed to continue his contact with FAO, with a view to collaborating on the further development of the Inventory of Fisheries. The specific aims are to explore how the Inventory of Fisheries might best be used by the sub-committee in its work of developing methods to estimate whale bycatch (for example by extracting synoptic data on levels of fishing effort for gear types known to be involved in cetacean bycatch in particular regions) and to explore how information on cetacean bycatch held by the

IWC might best be represented in the Inventory. The sub-committee **agreed** to request the Secretary to facilitate a letter of agreement between the two organizations for this purpose.

5.1.2. Fishing Gear Descriptions

The sub-committee has previously noted that Progress Reports and other documents submitted to the Committee and relating to whale bycatch, frequently provide scant information on the type of fishing gear involved. It was agreed at SC55 that it would be useful to prepare some guidelines on fishing gear types to ensure some uniformity in the descriptions used. The sub-committee **agreed** that it would be appropriate to adopt the internationally recognized standard descriptions that have been promulgated by FAO for this purpose. The FAO recognizes some 83 gear categories, itemized in Appendix 3, and described in Nedelec and Prado (1990) and also elaborated on the FAO/FIGIS Website. The sub-committee **agreed** that IWC member states should be encouraged to use these gear categories in reporting whale bycatches and entanglements, though more detailed typographies should also be encouraged in addition to these standard categories. It was noted in discussion that the FAO codes do not include reference to shark exclusion nets, and it was **agreed** that in view of the importance of these nets with respect to bycatch, that this additional category should be included in future Progress Reports.

5.2 Extrapolation from fisheries data

SC/56/BC8 presented estimates of large whale bycatch in US fisheries, and used these to extrapolate estimates for whale bycatches in fisheries globally. The estimates for US bycatch were derived from published accounts of large whale bycatches in each of three US regional strata and each of three fishing categories, namely trawls, gillnets and others. On average, around 20 whales per year were recorded as having been killed in US fisheries between 1990 and 1999. Most (63%) came from gillnet fisheries, with a few (4%) from trawls and the remainder from 'other' fisheries. The Global Fishing Fleet database maintained through FIGIS was then used to obtain ratios of the listed US vessel numbers by fishing gear category to those of global vessel numbers by gear category. These ratios were then used to extrapolate to a global estimate of bycatch of around 1800 large whales per year. It was stressed that this was a necessarily crude estimate, but likely to be negatively biased because known bycatches of whales in US fisheries are minimum estimates, and because the Global Fishing Fleet Database probably under-represents the actual numbers of vessels.

During discussion it emerged that the estimates of large whale bycatch did not include whales that had been observed carrying fishing gear, but whose fate was unknown. There was some discussion about entanglement of whales in longlines that is known to occur in several places (Hawaii, the Mediterranean and Southern Ocean were all mentioned), but, again, the fate of such whales usually remains unknown. The issue of trawl bycatches was also raised, and it was suggested that most observations for discards and bycatch in the US would have been made on groundfish or shrimp trawlers, whereas mid-water trawlers might be expected to be more likely to take whales, and there was therefore a need to treat these two trawl categories differently. The fact that in some areas so many whales are scarred in ways that suggest previous encounters with fishing gears lends weight to the assumption that deaths and serious injuries due to fishing gear in US waters are underestimated.

All of the above concerns would suggest that the estimate of 1800 large whales taken globally is likely to be an under-estimate.

On the other hand, the sub-committee also heard that such numbers should be treated with some caution, as US vessels may be larger and more powerful, and more likely to catch whales, than average global vessels. Furthermore, for bycatch to occur there needs to be an overlapping distribution in space and time of whales and fisheries. In the US there are several areas (Gulfs of Alaska and Maine) where there are high densities of both, while some species of whales (humpbacks and grey whales) that feature in the US bycatch statistics are more common in US waters than they are elsewhere globally. Most of the whales taken in 'other' fisheries in the US were in fact taken by entanglement in pot (trap) lines, while such vessels may not be such a significant part of 'other' categories of fishing gear in other parts of the world.

The sub-committee acknowledged that while all of these concerns were quite valid, with nearly 300 whales of all species reported as entanglements or captures in fishing gear (see Table 1) in Progress Reports to the Committee for 2003, a global estimate of 1800 did not seem improbably high.

The sub-committee **agreed** that while the approach was useful in drawing attention to the possible scale of incidental catches of whales in fishing gear, it was unlikely that it could be much improved upon in the short term or without much more detailed information on bycatch rates in other countries and a better understanding of global fishing effort by gear category, preferably with some consideration for the density and lethality of different gear types in different regions. The sub-committee **recommended** that the approach should either be taken forward on a regional basis where a more detailed breakdown of fishing vessel categories might be possible, or by using bycatch data from another country to attempt the same exercise as that in SC/56/BC8.

The sub-committee also **agreed** that while scarring rates might provide some idea of encounter rates with fishing gear, it would be necessary to correlate these directly with bycatch rates before scarring rates alone could be used as indicators of bycatch rates. Such an approach will need to await more detailed data availability from other areas and fisheries, but such studies should be encouraged.

5.3 Observer coverage required to estimate bycatch

SC/56/ForInfo43 (Northridge and Thomas 2003) describes methods used to address monitoring requirements in UK and, more generally, EU fisheries. The approach taken was to determine in advance what level of bycatch is considered a conservation threat (a take limit), and then to calculate how much sampling would be needed for managers to be sure that bycatch rates really were lower than the take limit. For calculations with respect to UK fisheries a binomial distribution of catches for harbour porpoises in gillnet fisheries was assumed, together with a range of possible or plausible bycatch rates for a specific fishery. An observer programme in a fishery where the total number of fishing operations had been pre-determined was simulated, varying both the proportion of operations sampled (H_0) and the total number of porpoises killed (K) in steps. For each combination of H_0 and K the appropriate expected hauls were sampled 1000 times and the 95% one-sided upper confidence limit (UCL) on the resulting 1000 estimates of total bycatch was computed for each H_0 and K value. Confidence limits were calculated using an approximation based on the F-distribution that provided us with a non-negative UCL on the bycatch estimate even when no bycatches are observed.

When 1000 UCLs had been calculated for each combination of H_0 and K the results were presented to show the proportion of these UCLs that exceed the reference level of bycatch, or the level of certainty for the UCL estimates. Given a graph of the results for any specific fishery, it is possible for any proposed value of H_0 to see how sure one can be that the resulting upper confidence limit on the bycatch estimate will exceed the reference bycatch level for the full range of plausible catch rates.

For an example involving porpoises and UK North Sea gillnet fisheries, SC/56/ForInfo43 reported that, for a take limit of 683 animals, if the true bycatch rate in the UK North Sea gillnet fisheries was as high as 2869 then one could be almost certain of obtaining a UCL greater than 683 with observations of fewer than 200 hauls. If, however, the overall true bycatch total was as low as 264 per year, then it would be necessary to monitor somewhere around 2500 hauls to be 95% certain that the UCL would be less than 683.

This approach could be adapted for whale catches in some fisheries. Whale bycatches could also be modeled as a binomial process, and provided some take limit could be specified one could then re-run the simulations for a specified fishery in which a range of possible bycatch rates can be postulated to see what level of observer coverage would provide one with a specified level of certainty that whale bycatches were actually higher, or lower, than the take limit.

The sub-committee acknowledged that this was a promising avenue for further research and **recommended** that this work should be carried forward, and if possible the approach should be applied quickly to any available data, perhaps from the North Atlantic or for certain specific fisheries in the Northwestern Pacific.

5.4 Other

SC/56/BC2 presented information on an initiative being backed by WWF to categorise and describe the major cetacean bycatch issues around the world, with the aim of using such a dossier to raise funds for work on such cases. A working group (drawn from the IUC SSC CSG and WWF's Bycatch Task Force) has been established to assign priorities to known cetacean bycatch where opportunities for successful intervention appear to be good. The group will conduct a survey based on their experience and published

accounts of global bycatch problems, classify and rank those problems according to an agreed set of criteria and provide a clear rationale for each problem that has been assigned a high priority for funding and intervention. The emphasis will be on situations of critical conservation concern, where the application of appropriate resources would result in rapid resolution, situations where bycatch is believed to pose a threat to cetaceans but where a quantitative assessment is needed to verify the risk, and fisheries in which a currently available solution (technical, social or economic) appears feasible. The group will develop criteria for identifying such priority problems, and assumes that generally speaking problems in the US, much of Europe and Australasia will not be included as they are more likely to be addressed by government actions. The key criteria will include the availability of local expertise, a favourable political will to address the problem, and a high likelihood of success. A clear rationale for prioritization will be provided.

The sub-committee endorsed the approach of SC/56/BC2 but noted that IWC members should take the lead in establishing whale bycatch monitoring programmes, particularly for pelagic fisheries, and that contracting parties could lead by example.

SC/56/BC7 addressed right whale and humpback whale entanglements in fishing gears in the USA. Records from a data archive were examined for instances of 31 right and 30 humpback whale entanglements between 1993 and 2002. The records were used to identify the types and parts of fishing gear involved and the parts of the whale's bodies that were affected. The fate of the whale and the point of attachment of the entangling gear were also assessed. SC/56/BC7 concluded that any type and part of fixed gear is capable of entangling a whale, and that any body part can be involved. Pot lines and gillnets appeared to be the most common parts and types of gear (89% of those cases where gear type was identified), although one whale was recovered entangled in towed gear, in this case a Danish (or boat) seine net. Right whales were most commonly entangled by the mouth, while humpbacks were most commonly entangled by the tail or by the mouth. Among parts of gear, vertical lines pose a threat regardless of what they are made of, whereas using negatively buoyant groundlines to link pots together may reduce risk, and the use of this type of line is being encouraged in US pot fisheries. SC/56/BC7 noted that photos of entangled swimming whales had been examined to try to identify the entangling gear type and part, but that this had not been a useful approach.

SC/56/BC10 and SC/56/IA7 reported on sperm whale entanglements in the Mediterranean. SC/56/BC10 presented strandings data for Spain, France and Italy between 1971 and 2003. One or more peaks in strandings were associated with time periods coinciding with high driftnet fishing activity. Concerns were expressed about the completeness of the strandings data presented in SC/56/BC10, but the sub-committee also agreed that a decline in records of stranded sperm whales might be due to one or several causes. Some members believed that a population decline due to bycatch was one of the possibilities.

SC/56/IA7 focused on the South Tyrrhenian Sea in more detail. This area was considered an important area for sperm whales and was also a major swordfish fishing ground where at least 75% of the Italian fleet was concentrated. SC/56/IA7 examined sperm whale presence in the area based on strandings reports published annually from 1986 to 2000. Stranded animals had been assigned one of five categories of post mortem lesion associated with fishing activity or ship strike and a presumed cause of death. In order to assess fishing activity in the area a census of fishing gears was conducted in the 2002/3 season and monthly landing statistics were obtained from port authorities for 1989-1998. Of sixty sperm whale strandings in the study area between 1986 and 2000, 78% had been diagnosed as bycaught animals. Reported sperm whale strandings had declined in the area from 25 in the period 1986-1990 to just 4 in 1996-2000, while strandings of striped dolphins had remained fairly constant. Sightings rates of sperm whales in the area had also declined. Sperm whale strandings had co-occurred seasonally with the operation of the driftnet fishery. All of this suggested high sperm whale bycatch mortality in the study area in the late 1980s and early 1990s, and this fishing practice had probably been a threat to sperm whale populations in this region at the time, as was agreed by the SC in 1992. SC/56/IA7 also noted that there is still a substantial amount of driftnet fishing in this area.

During discussion the sub-committee noted that there had been commercial whaling stations in the far western Mediterranean up until the 1950s but that these had operated mainly in the Atlantic. It was also noted that the officially sanctioned 'ferrettara' nets used in the southern Tyrrhenian Sea referred to in SC/56/IA7 have a maximum length of 2km, a mesh size of 100mm and cannot be used outside the 3nm limit. These do not fall under the EU ban on pelagic driftnetting for large pelagic species. These nets

continue to be used, but target small fish not swordfish. Their impact on sperm whales is not known. The sub-committee **agreed** that bycatch mortalities of sperm whales in the late 1980s and early 1990s were a cause for concern, given that strandings and sightings of sperm whales have declined since that period, raising the possibility that these bycatches could have affected the population.

It was noted that although there have been some sporadic and small scale observer programmes for driftnet and other fisheries in the Mediterranean (SEC 2002), there had yet to be any co-ordinated and adequate monitoring in Mediterranean countries to quantify ongoing bycatch levels in this area. It was also reported to the sub-committee that driftnetting continues both illegally (though at reduced levels) and legally in many Mediterranean countries, and this highlights the problem of trying to estimate bycatch where illegal or unregulated fisheries exist, about which concerns had been raised (WWF 2002).

Furthermore it was pointed out that Progress Reports in general provide no information on the nature or level of any on-board monitoring, so that it is difficult for the Committee to know whether an absence of whale bycatch records in the Progress Reports is due simply to a lack of information or actually reflects some degree of assessment. It was **agreed** that a small sub-group would draft a new table for consideration by the SC to include in future Progress Report templates to try to elicit more detailed information. The result of this group's suggested new template for Progress Reports is presented in Appendix 4.

The sub-committee reviewed information available through the national Progress Reports. The information has been summarised in Tables 1 and 3a-c. There were records of 232 whales entangled in fishing gear in 2003, 214 of these being minke whales, and a further 42 large holes in shark nets that were assumed to have been caused by whales with unknown consequences for the animals involved (SC/55/ProgRep South Africa). A further 15 whales were recorded in Progress Reports as ship struck. Most of the reported minke whale entanglements were from trap nets in Korea and Japan. It was noted that the numbers of minke and other whales reported taken in Japanese trap net fisheries had increased dramatically (roughly 4-fold) after the introduction of domestic legislation to allow bycaught whales to be taken to market. The reasons for this remain unclear, but seem likely to be linked to the change in legislation. The sub-committee also noted that a North Pacific Right whale had been taken in a Japanese trap net, and it was noted that a previous report (IWC 2002) was incorrect. Under domestic Japanese legislation there is no bar to taking bycatches of this species to the market.

SC56/BRG41 reported on 2 North Pacific right whales seen off Sakhalin in August of 2003. Extensive scarring had suggested entanglement in fishing gear. It was recalled that in 1999 a bowhead whale had been recovered from a crab pot fishery, and it was suggested that this or another similar fishery may have been responsible for the scarring observed on these right whales. In view of the possible parallels with right whale entanglement in the Gulf of Maine region, the sub-committee **recommended** that a long-term photo-identification programme is needed to document the occurrence of human induced scars, mainly from fishing gear, on right whales in the Okhotsk Sea. This would best be done under the joint Japanese-Russian sightings survey programme in the Okhotsk Sea. The sub-committee also **recommended** that a release programme for right and grey whales entangled or entrapped alive in fishing gear in the region should be established.

6. ESTIMATION OF BYCATCH BASED ON GENETIC DATA

6.1 Report of Bycatch Workshop Feasibility Steering Group

Berggren presented a draft proposal for the workshop on the use of market sampling to estimate bycatch (Appendix 5). Nakatsuka reiterated Japan's position that it has serious doubt about the usability of market sample data for stock management and that the participation from Japan will be limited. Kim stated that Korea has an efficient bycatch reporting that it continues to improve. The Korean government made efforts to encourage the public to report strandings and bycatches to marine police. The Korean government is reluctant to believe that market sampling can be an efficient method of bycatch estimation. Some members stated that it is still an open question whether market sampling is an appropriate and reliable method to estimate bycatch. A workshop with as broad participation as possible would be the best way to address this issue. The sub-committee **agreed** that the workshop should go forward as described in Appendix 5.

6.2 Data from market surveys

SC/56/BC3 reports on species and stock identification of whale and dolphin products available on commercial markets of Japan and Korea in 2003 and 2004 based on phylogenetic analysis. A total of 82 products from Japanese markets included six species of baleen whale: humpback, fin, Bryde's, sei, North Pacific minke and Antarctic minke whales. In Korea, a total of 56 products included 45 North Pacific minke whales. An improved dataset of world-wide reference sequences of sei whales was also developed. The reference sequences represented the North Atlantic, the North Pacific and the Southern Hemisphere. The sei whale haplotypes fell into three clades concordant with three oceanic basins. The four North Atlantic sei whales formed a clade with strong bootstrap support. The North Pacific and Southern Hemisphere sei whales consistently formed two clades in both parsimony and distance-based reconstructions but lacked bootstrap support. One Southern Hemisphere sei whale was basal to both the North Pacific and Southern Hemisphere clades. The reference dataset allowed greater confidence in estimating the geographic origins of sei whale products including a number of 'exact matches' between reference sequences and market haplotypes. All 13 products purchased between 1998-2002, prior to the release of products from the JARPNII sei whale hunt grouped with either the North Atlantic or Southern Hemisphere reference sequences. Of the 19 products purchased following the release of JARPNII products, all except one grouped with the North Pacific reference sequences. The evidence of market products originating from southern hemisphere sei whales is not consistent with local bycatch or known archives of frozen whale meat products and requires further investigation.

There was some discussion regarding the level of certainty to which whales could be assigned to ocean basins. It was noted that there was a lack of bootstrap support to the assignments in BC3 between the southern hemisphere and the North Pacific. In addition, due to the low numbers of reference samples, the observed clades could potentially break down with more samples. It was suggested that further reference samples from other areas might change the distinctions between ocean basins that are currently apparent. In response, it was thought that additional sampling would be unlikely to alter the results in BC3 unless there is huge genetic variability within sei whales that has not yet been revealed.

It was noted that data on sei whale stock structure from JARPNII would help resolve some of these questions. The data availability procedure developed by the Committee in 2003 was designed to avoid the need for discussions of whether requests for data are appropriate. It was recommended that further analysis of sei whale genetic data, including data from JARPNII, be undertaken to improve the ability to assign sei whales by region. Nakatsuka stated that Japan is prepared to supply information according to the data availability procedure.

In response to whether these results had been independently validated, it was noted that the sequencing used in SC/56/BC3 was very standard. Standard controls were applied to prevent cross-contamination and it was thought that there was minimal risk that the results could have been affected by cross-contamination. These techniques have been subjected to extensive cross-validation including double blind tests that gave identical results between laboratories in New Zealand and the USA. Baker confirmed that he would be willing to send a sub-set of samples to Institute for Cetacean Research, Japan.

Nakatsuka stated that he appreciated the information presented in SC/56/BC3 although the Government of Japan is sceptical of the utility of market surveys and it believes that market research is under the auspices of national governments. Aside from the position of Japan, he recognized the necessity to deal with illegal whaling and asked the authors if they could provide any information regarding the outlet where those samples were from. Baker replied that he was not able to give precise details of the outlet since he is only involved in the scientific aspects and not the purchase of the samples and the discussion was closed since these issues were considered to be beyond the remit of the sub-committee.

SC/56/BC4 described a summary of genetic information from North Pacific minke whale products purchased on commercial markets in the Republic of (South) Korea (n = 282) and Japan (n = 189) from 1999 to 2004. Microsatellite DNA profiling was used to account for potential replicate products, reducing the total sample to a minimum 'census' of 199 individual whales represented on the Korean market and 146 on the Japanese market. mtDNA haplogroups were used to classify these 'market individuals' into J-type and O-type, based on previous analyses (Baker *et al.* 2000). The sex ratios and mtDNA haplogroup frequencies were used to investigate the differences with the reported levels of bycatch and scientific whaling and to investigate potential heterogeneity among market surveys for evidence of multiple coastal

stocks. Comparison of sex ratios and haplogroup frequencies of market individuals showed significant differences from expectations from official reports of scientific hunting in Japan and fisheries bycatch in Korea: (i) Japanese market individuals overall, and when considered by O- or J-type haplogroups separately, had a significantly higher proportion of females than reported in the scientific hunt; and, (ii) Korean market individuals overall had a significantly higher proportion of males than the official reported bycatch for the years 1999- 2002. Differences between markets showed significant heterogeneity indicative of multiple stocks: (i) haplogroup frequencies differed significantly between Japan and Korea for all market individuals, as expected given the directed hunt of O stock by Japan; (ii) haplogroup frequencies differed significantly between Japan and Korean for the subset of J-stock individuals, contrary to the expectation of only a single coastal stock; (iii) sex ratios of J-type individuals differed significantly between Japan and Korea, with a female bias in the former and a male bias in the latter; and, (iv) haplogroup frequencies differed significantly across the five-year surveys in Korea with an increase in O-stock individuals in 2002-2003 surveys.

Some members repeated previous concerns about market sampling due to the lack of data on sampling locality. They believed that data from market sampling should not be used for stock structure analysis.

It was noted that apparent temporal or spatial differences in sex ratios could be the result of segregation by sex within the population. Spatial and temporal information on sampling locations are needed in order to interpret sex ratios in relation to stock structure. Although the market sampling in BC4 was limited to 4 out of the 47 prefectures in Japan in 2003 and 2004, Funahashi commented that almost the whole of Japan had been covered by previous surveys between 1999 and 2002. The analysis of market surveys would be improved if information on the origin of products were available. She noted that the revised regulations require fresh fisheries products to have a label with species name, sea area where it was taken, or landing port or prefecture. However compliance with this regulation by whale meat outlets appeared to be poor and it will be useful if these regulations were better enforced.

Goto also noted that the methods used for differentiation of O and J stock using specific sequences of DNA were not completely established. Whales in the Sea of Japan and Pacific sometimes have exactly the same haplotypes that could be explained by a common ancestor. Although around 92-94% of whales from the Pacific side of Japan would be assigned to O stock by this procedure, uncertainties in assignment of the remaining 6-8% would confuse the statistical analysis. He also believed that the difference from the expected sex ratios was due to bias related to market sampling. The sex ratio of minke whale bycatch in Japan was 53% and 57% females in 2002 and 2003, respectively. When added to the research catches for 2002 and 2003, the overall sex ratio in North Pacific minke whales would be 37% female.

Baker responded that the concern was that the limits of the coastal stock regarded as J stock are not known. J stock may in fact be found widely around Japan and there may in fact be a second or even a third stock. The differences in sex ratios are hard to explain without sex biased migration or multiple stocks. He had not found temporal changes in sex ratios or haplogroup frequencies for Japan following the change in sampling design in 2002. The analysis could be improved if data on haplotypes from the JARPNII were available to enable whales taken under special permit to be excluded.

SC/56/NPM1 estimated genetic diversity of bycaught minke whales in Korean waters based on the mitochondrial control region. The polymerase chain reaction (PCR) was used to amplify a 487 base pair segment of the mitochondrial control region. The haplotype diversity of minke whale bycatch in Korean waters decreased in 2001 and then showed an increasing trend from 2002, however the differences were not significant. Haplotype diversity between the Yellow Sea and East Sea showed no significant differences. The geographic locations of the bycaught animals used in the study were also presented.

In discussion it was noted that the number of samples from the Yellow Sea was small and although it was not clear how representative these samples are, the results did not reveal any differences. It was suggested that the chi-squared tests of a large number of haplotypes resulted in a large number of degrees of freedom and that alternative analyses may have greater statistical power.

6.3 Analytical tests for assignment to stocks and/or areas

Palsbøll presented aspects of SC/56/SD1 and some general observations on the genetic methods of assignment to stocks. SC/56/SD1 considers detection of contemporary population structure when gene-

flow is high from the distribution of close-kin. Case studies were presented for fin whales in the eastern North Pacific and Baja California and humpback whales in the Gulf of Maine. Within the fin whale populations considered, which had previously been hypothesized to be different seasonal aggregations of the same population, it was not possible to obtain an estimate of the number of populations involved using recent iterative assignment approaches. In contrast, by restricting analyses to the most closely related pairs of individuals, it was possible to detect a non-random spatial latitudinal distribution among female humpback whales in the Gulf of Maine. These results demonstrate that by focussing the analysis on close relatives, molecular genetic approaches are capable of detecting structure at time scales relevant to conservation and management, even in high-gene flow populations. In this latter situation, traditional population genetic approaches were shown not to recover any structure. Hence focussing the genetic analysis on close relatives will provide the statistical power and effect size most appropriate for management and conservation. He also noted the importance of fully diagnostic DNA registers for identifying illegal takes and drew attention to a forthcoming publication on assignment tests (TREE 2004).

6.4 Use of capture-recapture methods for estimating bycatches from market data

SC/56/BC11 conducted an analysis of recaptures of individual minke whales sampled on Korean markets during 12 surveys conducted during 1999-2003. It turns out that capture-recapture analyses of market samples are not directly analogous to those for living populations, because individuals do not 'die' suddenly but disappear from the market gradually as they are sold off. A model was developed which enables the simultaneous estimation of the supply of new whales to the market and the average residence time, expressible in terms of the 'half-life' of individuals on the market. Using between-survey recaptures only, the total supply over the period was estimated at 567 whales (SE 136). Using both within- and between-survey recaptures, the total supply was estimated at 545 whales (SE 90). The estimates of half-life were 1.9 months (SE 0.38) and 1.54 months (SE 0.20) respectively. The supply estimates are greater than the officially reported by-catch for this period but not significantly so. The estimates of supply are considered to be negatively biased because all identified sources of potential bias for the estimate using only between-survey recaptures involved negative bias. One potential source of positive bias in estimates using within-season recaptures was identified, but the two estimates are similar. It is concluded that the method can be used to provide an approximate estimate of by-catch and that it may be especially useful in cases where records of by-catch are in doubt or lacking.

The sub-committee welcomed the paper that addressed a request made for this type of analysis in 2003. It was noted that the reported bycatch for Korea was within the lower confidence interval of the estimate in SC/56/BC11 suggesting that bycatch reporting is fairly accurate. Kim stated that he did not believe that market surveys would give better results and that the highly fluctuating levels of bycatch need to be taken into account. Cooke replied that the market was not fully understood and that there were sources of heterogeneity missing from the analysis. This heterogeneity would tend to result in a negative bias in the mark-recapture estimates.

7. ESTIMATION OF CETACEAN MORTALITY FROM SHIP STRIKES

7.1 Simulation models

SC/56/BC6 described simulation modelling of collisions between whales and vessels to assess the potential for vessels to take avoiding action in response to sightings of whales. Modelling combined distribution patterns of vessels and whales to predict the number of potential collisions is one possible method for estimating mortality due to vessel strikes. The main uncertainties regarding such an approach are the responses of whales to vessels and the responses of vessels to whales. The model incorporated three basic components: whale behaviour, the sightings process and vessel manoeuvrability, but it was assumed that whales did not react to the vessel. Simulation runs were conducted for a range of vessels from a 30m fishing vessel to a 340m super tanker across a range of speeds. The whale behavioural parameters and detection probabilities in the model were based on North Atlantic right whales but were believed to be representative for other large baleen whales. Results showed that even under optimum sighting conditions with an alert observer and a fast response time, there is a very limited scope for large ships to avoid whales. For such vessels, model based predictions of interactions between vessels and whales are unlikely to be sensitive to assumptions about vessel response.

The sub-committee welcomed the paper that addressed a request made for simulation modelling of collisions between whales and vessels in 2002. In discussion, it was noted that there were many additional reasons that would result in lower estimates of successful avoidance of whales by vessels. These include vessels navigating largely by radar and vessels unable or unwilling to manoeuvre. It was suggested that the model should be applied to fast ferries and hydrofoils. This could be done but would require further information on the manoeuvrability characteristics of these fast ferries.

7.2 Other

A review of worldwide collisions between cetaceans and fast ferries was presented in SC/56/BC9. Of 24 collisions reported with ferries, 11 were with fast ferries travelling at speeds greater than 30 knots and six were with slower ferries. Speed was not reported in 7 cases. All but two reported collisions were with large whales, nine of which were with fin whales in the Mediterranean. The records are likely to be a notable under-representation of the actual number of collisions that took place. Several areas include highly trafficked ferry routes but with few records of strikes. More detailed information is needed from all areas where whales occur on high speed ferry routes including encouragement of collision reporting and detailed necropsies of beach-cast or floating carcasses. Such data would help illuminate the actual risk to whales from rapidly expanding ferry traffic.

In discussion it was noted that it is important to consider the risks from collisions to depleted stocks in addition to exploited stocks. It was also noted that ACCOBAMS will be holding a workshop on vessel collisions in the Mediterranean in the coming year which would also be relevant to the work of the sub-committee. In addition, ASCOBANS has compiled a database on ferry routes in northern Europe. As in previous years the sub-committee considered a compilation of data on vessel strikes compiled from National Progress Reports (Tables 2 and 3a-c). Another potentially useful source of data identified was a compilation database of ship strikes world-wide (Jensen and Silber, 2003).

There were a number of suggestions to improve data that could lead to a better understanding of vessel strikes. These included: (i) revisiting an idea put forward at the Annual meeting in 2001 to develop accelerometers that might detect the impact of a collision that would otherwise have gone undetected; (ii) controlled data collection on near misses as well as collisions from vessels such as ferries transiting predictable routes (iii) examining sightings survey records for reports of collisions (iv) modelling interactions between whales and ships for a number of geographical areas and comparing these with the proportion of strandings identified as vessel strikes.

Berggren encouraged members of the sub-committee to prepare papers on these topics for consideration at next year's meeting.

8. ESTIMATION OF CETACEAN MORTALITY FROM OTHER HUMAN ACTIVITIES

The sub-committee noted that one of the multiple stranding events reviewed by the standing working group of environmental concerns that was associated with concurrent naval activities also involved two minke whales. SC/56/E28 reports on an apparently unusual stranding of 8 adult humpback whales coincident with seismic surveys in Brazil. The sub-committee **agreed** that considerations of possible mortalities due to acoustic sources should be closely co-ordinated with the work of the standing working group of environmental concerns.

9. WORKPLAN

The sub-committee discussed the priority items for consideration at the next year's meeting and beyond. The following work plan for next year's meeting was agreed:

- (1) Further review of information and methods to estimate bycatch based on fisheries data and observer programmes
 - (a) Continue contacts with FAO to get more information
 - (b) Review modeling to determine observer coverage needed in a fishery to estimate bycatch

- (2) Further review of methods to estimate bycatch based on genetic data
 - (a) Hold workshop on the use of market sampling to estimate bycatch
 - (b) Review report from workshop on the use of market sampling to estimate bycatch
- (3) Further review of information and methods to estimate mortality from ship strikes
 - (a) Review results of data collected on high-speed vessels relevant to ship strikes
 - (b) Review report from planned ACCOBAMS workshop on ship strikes
- (4) Consider methods for estimating additional human induced mortalities
 - (a) Mortalities directly related to acoustic sources

10. ADOPTION OF REPORT

The sub-committee adopted the report at 11:10 AM on 6 July 2004.

REFERENCES

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<http://www.nmfs.noaa.gov/pr/overview/publicat.html>

Nedelec and Prado 1990 (ask Simon Northridge for the reference).

Northridge, S. and Thomas, L. 2003. Monitoring levels required in European Fisheries to assess cetacean bycatch, with particular reference to UK fisheries. Final report DEFRA (EWD) pp37.

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WWF 2002 (ask Simon Northridge for the reference).

TREE 2004 Coming publication on assignment test (ask Per Palsboll for the reference).

Table 1. Large whale entanglements reported in Progress Reports, 2004

(The following national Progress Reports also reported zero non-natural mortality for large cetaceans in 2003

Germany, Ireland, Italy, New Zealand, Oman, Sweden, UK)

Country	Area/ stock	Year	Species	Total	Type of gear
Australia	Area V	2003	Humpback whale	1	Shark nets
Australia	Gold coast	2003	Humpback whale	1	Entanglement (Shark net)
Brazil	Sao Paolo	2003	Southern right whale	1	Entanglement
Iceland	E-Iceland	2003	Humpback whale	1	Gillnet*
Iceland	SE-Iceland	2003	Humpback whale	1	Gillnet*
Iceland	N-Iceland	2003	Humpback whale	1	Gillnet*
Japan	Shizuoka	2003	Bryde's whale	1	Trap net
Japan	Hokkaido	2003	Humpback whale	1	Trap net

Japan	Mie	2003	Humpback whale	1	Trap net
Japan	Wakayama	2003	Humpback whale	1	Trap net
Japan	Hokkaido	2003	Minke whale	16	Trap net
Japan	Aomori	2003	Minke whale	8	Trap net
Japan	Iwate	2003	Minke whale	12	Trap net
Japan	Miyagi	2003	Minke whale	6	Trap net
Japan	Chiba	2003	Minke whale	2	Trap net
Japan	Kanagawa	2003	Minke whale	3	Trap net
Japan	Toyama	2003	Minke whale	11	Trap net
Japan	Niigata	2003	Minke whale	6	Trap net
Japan	Ishikawa	2003	Minke whale	14	Trap net
Japan	Fukui	2003	Minke whale	1	Trap net
Japan	Mie	2003	Minke whale	1	Trap net
Japan	Kyoto	2003	Minke whale	4	Trap net
Japan	Wakayama	2003	Minke whale	3	Trap net
Japan	Shimane	2003	Minke whale	5	Trap net
Japan	Yamaguchi	2003	Minke whale	1	Trap net
Japan	Kochi	2003	Minke whale	7	Trap net
Japan	Nagasaki	2003	Minke whale	20	Trap net
Japan	Kumamoto	2003	Minke whale	2	Trap net
Japan	Miyazaki	2003	Minke whale	1	Trap net
Japan	Kagoshima	2003	Minke whale	2	Trap net
Japan	Wakayama	2003	North Pacific right whale	1	Trap net
Korea	East Sea	2003	Humpback whale	1	Setnet
Korea	East Sea	2003	Minke whale	1	Trawl
Korea	East Sea	2003	Minke whale	11	Setnet
Korea	East Sea	2003	Minke whale	28	Gillnet
Korea	East Sea	2003	Minke whale	28	Trap net
Korea	East Sea	2003	Minke whale	2	Unidentified
Korea	Yellow Sea	2003	Minke whale	2	Trap net
Korea	Yellow Sea	2003	Minke whale	1	Zigging
Korea	Yellow Sea	2003	Minke whale	1	Stow net
Korea	Yellow Sea	2003	Minke whale	4	Unidentified
Korea	South Sea	2003	Minke whale	2	Purse seine
Korea	South Sea	2003	Minke whale	1	Trawl
Korea	South Sea	2003	Minke whale	1	Setnet
Korea	South Sea	2003	Minke whale	1	Gillnet
Korea	South Sea	2003	Minke whale	3	Trap net
Korea	South Sea	2003	Minke whale	1	Unidentified

Peru	Northern Peru	1995-2003	Humpback whale	1	Gillnet
South Africa	KwaZuluNatal	2003	Humpback whale	(8)**	Shark nets
South Africa	KwaZuluNatal	2003	Southern right whale	(6)**	Shark nets
Spain	Balaeric Is.	2002***	Fin whale	1	fishing interaction
Spain	South Spain	2002***	Minke whale	2	fishing interaction
Spain	Andalucia	2003	Fin whale	1	fishing interaction
Spain	Andalucia	2003	Minke whale	2	fishing interaction
USA	Western N. Atlantic	2001	Fin whale	1	entanglement
USA	North Atlantic	2001	Humpback whale	3	entanglement

* Vikingsson pers. com. for gear type

** Released alive

*** Additional data to that reported in 2003

Table 2. Large whale vessel strikes reported in Progress Reports, 2004

Country	Area/ stock	Year	Species	Total
Australia	Area V	2003	Humpback whale	2
Australia	East coast	2003	Minke whale	1
Brazil	Sao Paolo	2003	Bryde's whale	1
Peru	Central Peru	1995-2003	Sperm whale	1
Spain	Canary Is.	2002*	Sperm whale	1
Spain	South Spain	2002*	Sperm whale	3
Spain	Canary Is.	2003	Sperm whale	1
USA	Western N. Atlantic	2001	Fin whale	2
USA	CA/OR/WA	2001	Fin whale	1
USA	North Atlantic	2001	Humpback whale	1
USA	North Atlantic	2001	Humpback whale	2
USA	Eastern USA	2001	North Atlantic right whale	2

- Additional data to that reported in 2003

Table 3a. Total reported mortalities by species in North Pacific

Entanglements	Vessel strikes
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Species	Total
Common minke whale	212
Humpback whale	4
Bryde's whale	1
North Pacific right whale	1

Species	Total
Fin whale	1

Table 3b. Total reported mortalities by species in North Atlantic

Entanglements		Vessel strikes	
Species	Total	Species	Total
Humpback whale	6	Sperm whale	5
Fin whale	3	Humpback whale	3
Common minke whale	2	Fin whale	2
		North Atlantic right whale	2

Table 3c. Total reported mortalities by species in Southern Hemisphere

Entanglements		Vessel strikes	
Species	Total	Species	Total
Humpback whale	2	Humpback whale	2
Southern right whale	1	Bryde's whale	1
		Dwarf minke whale	1
		Sperm whale	1

Appendix 1

TERMS OF REFERENCE OF WORKING GROUP ON ESTIMATION OF BYCATCH AND OTHER HUMAN-INDUCED MORTALITY

At its 52nd meeting, under agenda item 12.1.2, the Commission instructed the Scientific Committee (SC) that catch limits calculated under the Revised Management Procedure (RMP) shall be adjusted downwards to account for human-induced mortalities caused by aboriginal subsistence whaling, scientific whaling, whaling outside IWC, bycatches and ship strikes. The Commission stated that each such adjustment shall be based on an estimate provided by the SC of the size of adjustment required to ensure that total removals over time from each population and area do not exceed the limits set by the RMP. Total removals include commercial catches and the human-induced mortalities listed above to the extent that these are known or can be reasonably estimated.

Terms of reference of the Working Group appointed to this task are:

- (1) Examine methods that have been used to estimate bycatch, and describe acceptable estimators and measures of their precision.
- (2) Consider requirements for sampling to obtain unbiased estimates of specified precision.
- (3) Consider confidence or probability intervals for such estimates that provide reasonable assurance that the Commission's objective regarding total removals over time is met.
- (4) Examine methods for estimating mortalities caused by ship strikes similarly.
- (5) Consider methods for summarising known and estimating unknown mortalities from the types of mortalities listed.
- (6) Consider establishing and maintaining a data base containing the requested information.
- (7) Consider how best to communicate this information to the Commission.

Appendix 2

AGENDA

1. Conveners opening remarks and terms of reference
2. Election of chairperson and appointment of rapporteurs
3. Adoption of agenda
4. Review of documents
5. Estimation of bycatch based on fisheries data and observer programmes
 - 5.1 Collation of information from fisheries
 - 5.1.1 Collaboration with FAO on fishing fleet data
 - 5.1.2 Fishing Gear Descriptions
 - 5.2 Extrapolation from fisheries data
 - 5.3 Observer coverage required to reliably estimate bycatch
 - 5.4 Other
6. Estimation of bycatch based on genetic data
 - 6.1 Report of Bycatch Workshop Feasibility Steering Group
 - 6.2 Data from market surveys
 - 6.3 Analytical tests for assignment to stocks and/or areas
 - 6.4 Use of capture-recapture methods for estimating bycatches from market data
7. Estimation of cetacean mortality from ship strikes
 - 7.1 Simulation models
 - 7.2 Other
8. Estimation of cetacean mortality from other human activities
9. Work plan
10. Adoption of report

Appendix 3
FAO GEAR DESCRIPTION AND CODES

FAO FISHING GEAR CATEGORIES:

SURROUNDING NETS

With purse lines	PS	
One-boat operated purse seines		PS1
Two-boat operated purse seines		PS2
Without purse lines (lampara)		LA
SEINE NETS		
Beach seines		SB
Boat seines		SV
Danish seines		SDN
Scottish seines		SSC
Pair seines		SPR
Seine nets (not specified)	SX	
TRAWLS		
Bottom trawls		TBB
Beam trawls		OTB
Otter trawls (side or stern)	PTB	
Pair trawls		TBN
Nephrops trawls	TBS	
Shrimp trawls (not specified)		TM
Midwater trawls		
Otter trawls (side or stern)	OTM	
Pair trawls		PTM
Shrimp trawls		TMS
Midwater trawls (not specified)		TM
Otter twin trawls	OTT	
Otter trawls (not specified)		OT
Pair trawls (not specified)	PT	
Other trawls (not specified)		TX
DREDGES		
Boat dredges		DRB
Hand dredges		DRH
LIFT NETS		
Portable lift nets	LPN	
Boat-operated lift nets		LNB
Shore operated stationary lift nets	LNS	
Lift nets (not specified)		LN
FALLING GEAR		
Cast nets		FCN
Falling gear (not specified)		FG
GILLNETS AND ENTANGLING GEAR		
Set gillnets (anchored)		GNS
Driftnets	GND	
Encircling gillnets		GNC
Fixed gillnets (on stakes)	GNF	
Trammel nets		GTR
Combined gillnet-trammel nets		GTN
Gillnets and entangling gillnets (not specified)		GEN
Gillnets (not specified)		GN
TRAPS		
Stationary uncovered pounds nets	FPN	
Pots		FPO

Fyke nets		FYK
Stow nets		FSN
Barriers, fences, weirs, etc	FWR	
Aerial traps		FAR
Traps (not specified)		FIX
HOOKS AND LINES		
Handlines and pole-lines (hand operated)	LHP	
Handlines and pole-lines (mechanized)		LHM
Set longlines		LLS
Drifting longlines	LLD	
Longlines (not specified)	LL	
Trolling lines		LTL
Hooks and lines (not specified)		LX
GRAPPLING AND WOUNDING		
Harpoons		HAR
HARVESTING MACHINES		
Pumps		HMP
Mechanised dredges		HMD
Harvesting machines (not specified)		HMX
MISCELLANEOUS GEAR		
RECREATIONAL FISHING GEAR		
GEAR NOT KNOWN OR NOT SPECIFIED		
		NK
ADDITIONAL CATEGORY:		
SHARK CONTROL NETS		NSC

Appendix 4

THE SUB-COMMITTEE REVIEWED THE RESOLUTION BY THE COMMISSION ON REPORTING FISHERY BYCATCH: IWC RESOLUTION 1997-4

Resolution on Cetacean Bycatch Reporting and Bycatch Reduction. The COMMITTEE noted that consistent reporting of bycatch and other human related mortalities to include in total catches over time would be greatly aided by requesting Contacting Governments to include more specific information in the National Reports. In many instances the National Report by Contacting Parties fails to provide useful information, or contains no response.

The sub-committee suggested some modifications be made to Section 6 of the National Report Template.

6.2 Non-natural mortality or injury for the calendar year 19XX, or the season 19XX/XY

Please indicate under comments for each section '0' if there was monitoring and there are no injuries or mortalities to report, or 'NR' if there was nothing to report.

6.2.1 Strandings or dead whales encountered at sea

Please provide the following information if known. If unknown enter 'U.' For location provide Latitude and Longitude if available. In case of a mass stranding enter the number of whales in the 'sex' column and provide the details under comments. Please indicate how cause of death was determined (Det): N = full necropsy, V= visual observation entangled, cuts, etc., U = could not be determined. Provide a contact that can give further details if needed. Example given.

Whale Species	Sex	Date	Location	Cause of Death	Det.	Source or Contact Institution, contact name and telephone and/or e-mail
A. right whale	F	xx/xx	43°37'N 52°15'W	Ship strike	V	Org. Address Contact Tel. xxxxxxxxxxxx E-mail. xxxxxxx@xxxxx.xx.xx
B. sperm whale	U		Beach on Nantucket Is.,	U	U	Same format as above
Comments: 1. Deep cut behind flipper. 2. Found bones and patch of white skin.						

6.2.2 Observed or reported Ship Strikes

If available, please use Latitude and Longitude for location. Please indicate type of vessel, e.g. High-speed Ferry (HSF), Large Cargo, Military, Fishing Vessel (FV), Passenger Carrying Excursion (PC), Other (O). Fate: Indicate if the whale swam away (X), appeared seriously injured (I), killed (D). Example given.

Whale Species	s e x	Date	Location	Vessel Type	Speed	Fate	Source or Contact
Humpback Whale	U	xx/xx	4km off coast Savannah, GA. Pos. Classified	Military	40kts	D	Same format as above
Comments: Cut clean in half.							

6.2.3 Fishery Bycatch

If available, please use Latitude and Longitude for location. Indicate fate (Fate) of whale (R=released alive, D=discarded dead or seriously injured, K=kept for sale or specimen), targeted fish species (*e.g.* tuna, herring, etc.). Use modified FAO Gear Designation: 1 = seine, 3 = trawl, 7 = gill or entangling net, 8 = trap, 9 = hook, logline, troll, 0 = other. Please indicate how observed: M = dedicated marine mammal observer, F = Fishery onboard observer, V = Vessel logbook, A = anecdotal, DA = documented anecdotal, photos, etc. Example given.

Whale Species	S e x	Date	Location	Fate	Targeted Fish species	Gear	Ob?	Source or Contact
NA Minke	U	xx/xx	54° 14'N 29° 43'W	D	Tuna	9	F	Same format as above
Comments: Entangled in gear, cut off and sank..								

Appendix 5

PROPOSAL TO HOLD A WORKSHOP ON THE USE OF MARKET SAMPLING TO ESTIMATE BYCATCH

Berggren, Donovan, Hammond and Zeh *

1. BACKGROUND

The Commission has decided that catch limits calculated under the Revised Management Procedure (RMP) shall be adjusted downwards to account for human-induced mortalities including bycatches and ship strikes. It has also stated that such adjustments shall be based on an estimate provided by the Committee of the size of adjustment required to ensure that total removals over time from each population and area do not exceed the limits set by the RMP. The Sub-Committee on Estimation of Bycatch and Other Human-Induced Mortality (BC) has been working on this issue for three years, giving priority those areas where the RMP is likely to be implemented e.g. the northwestern Pacific and the northeastern Atlantic. Considerable time has been spent discussing the use of genetic methods based on market samples but no agreement has been reached on how reliable such an approach is. The Committee has noted that one key factor in this involves the question of sampling design and that full discussion of this will require the advice of outside experts with detailed knowledge of market sampling issues. An intersessional Steering Group has been investigating the feasibility of holding a workshop to examine whether a market sampling approach would be useful in helping to estimate total anthropogenic removals for use in the RMP. Its report is given in Adjunct 1.

The Committee has agreed (IWC, 2002) that the use of market surveys to improve on minimum estimates of bycatch and provide more realistic unbiased estimates will necessitate an adequate sampling design and include information on: (i) whale bycatches and the fisheries involved; (ii) methods of storage, collection and analysis of genetic samples (including existing registers); (iii) the outlets for whale meat in specified countries and the pathways to those outlets (including direct whaling and bycatches; (iv) the statistical design and analysis of market or other sampling. Some progress has been made on several priority areas for bycatch estimations e.g. development and use of capture-recapture methods for estimating bycatches from market data (SC/56/BC11) and recording of bycatch geographical locations (SC/56/NPM1). Given this progress, it is appropriate to present a more detailed proposal for a methodological workshop.

2. WORKSHOP OBJECTIVES

The objectives of the workshop are:

- (1) to review available methods that have been used to provide estimates of large cetacean bycatches via market samples, including a consideration of their associated confidence intervals in the context of the RMP;
- (2) to provide advice as to whether market-sampling-based methods can be used to reliably estimate bycatch for use in addressing the Commissions objectives regarding total removals over time and, if so, the requirements for such methods.

It should be noted that the proposed workshop is interested in the question of markets only insofar as it involves an evaluation of whether market data can be used to provide reliable estimates of bycatches. Similarly, the aim is to review whether the approach can provide suitable estimates, not to determine if these are cost-effective or more reliable than other methods. That is the work of the Committee.

3. STEERING GROUP AND PLANNING MEETING

A Steering Group (Berggren, Donovan, Hammond, Zeh) will, through the Secretary of the Commission contact potential invitees to participate in a planning meeting to take place during Autumn 2004. At this meeting, the information needs for the Workshop will be reviewed, papers needed to provide background for workshop identified, a list of participants finalised and meeting logistics arranged.

4. PROPOSED LOCATION AND TIMING OF WORKSHOP

In order to reduce costs and simplify logistics, it is proposed that a 3-day Workshop be held immediately prior to the 57th Annual meeting in Ulsan, Korea.

*The development of this proposal would not have been possible without input from the Feasibility Steering Committee (See Appendix 1).

5. DRAFT BUDGET

Based on a 3-day Workshop of approximately 25 people (assuming no cost venue).

Activity	Cost (£ sterling)
Planning meeting (travel and subsistence for 6-8 participants)	5,000
Workshop (travel and subsistence for 8 invited non-IWC participants)	9,500
Total budget	14,500

6. DRAFT AGENDA FOR THE PROPOSED WORKSHOP

1. Convenors opening remarks and terms of reference
2. Election of chairperson and appointment of rapporteurs
3. Adoption of agenda
4. Review of documents
5. Background information
 - 5.1 Summary of the present state of knowledge on the use of genetic methods to identify market products to species and correct for multiple samples from the same individual
 - 5.2 Summary of the present state of knowledge of the ability of analytical tools for allocation to stocks and/or areas
6. Review methods used in previous food market sampling studies designed to elucidate market structure
 - 6.1 Questionnaire and direct interview approaches
 - 6.2 Analysis of official statistics for outlets and available products
 - 6.3 Direct observation of markets
 - 6.4 Other
7. Sampling and analytical methods
 - 6.1 Sampling design considerations (temporal and spatial)
 - 6.2 Analytical techniques (including precision and power)
 - 6.3 Other sampling/analysis methods
7. Conclusion regarding the limitations and advantages of such an approach in an RMP context
8. Recommendations
9. Adoption of report

8. LIST OF POTENTIAL INVITEES

This list includes those people the Steering Group believe would be valuable in allowing a full review of the methodology.

Potential Invited Participants (outside experts)

K. Taya, Tokyo University of Fisheries (seafood market analyst)
S.C. Williams, University of Queensland (seafood market analyst)
G. Luikart, (statistician, capture/recapture expert)
Lebreton, (statistician, capture/recapture expert)
Y.U. Ma, KFEM (expert on outlets for whale products)
(Experts on outlets for whale products, Norway, Iceland, Japan, Korea – to be identified)
I.U.C.N. unregulated use of wildlife specialist (to be identified)
FAO fisheries statistics specialist (to be identified)

Potential Scientific Committee and IP Participants

P. Berggren, convenor, Y.R. An, G. Donovan, P. S. Hammond, J. Zeh, C.S. Baker, A. Bjørge, L. Chou, Taiwan National University, F. Cipriano, J. Cooke, M. Dalebout, N. Funahashi, L. Pastene, M. Goto, P. Hammond, F. Hester, T. Kasuya, Z.Y. Kim, R. Leaper, J. Morishita, D.. Olafsdottir, P. Palsbøll, J.Y. Park, W.F. Perrin, L. Rojas-Bracho, H. Skaug, H. Sohn, P.Wade, J. Wang and J. Zeh.

Adjunct 1

Report of Bycatch Workshop Feasibility Steering Group

Berggren (Chair), Baker, Cipriano, Donovan, Funahashi, Kasuya, Perrin, Rojas-Bracho and Taylor

The Steering Group has previously (SC54 & 55) concluded that it would be feasible to hold a workshop to examine whether a market sampling approach would be useful in helping to estimate total anthropogenic removals for use in the RMP. Initial priority for consideration by the workshop would be assigned to areas with known occurrence of bycatch of large cetaceans for which implementation of the RMP was under consideration (e.g. common minke whales in the North Pacific). Additionally, such information might be useful for estimation of partitioning by stock for use with *in depth assessments*. The Steering Group continued its efforts inter-sessionally to collate information needed to develop a workshop proposal. Additional market sampling specialists have been identified who have conducted research on food product market surveillance and food product distribution in countries where cetacean products are available on commercial markets (e.g. SC/56/BC1). Individuals with knowledge of the different pathways for whale bycatch products who may be able to participate in the workshop have also been identified.

The Steering Group suggests the following approach for developing the workshop:

- (1) A letter explaining the issues and objectives be sent to market sampling and capture/recapture analysis specialists from the Secretary of the Commission, to identify qualified individuals willing to assist in assessing the nature and level of information needed to design a sampling programme to provide estimates of bycatch with a known degree of precision.
- (2) Specialists familiar with each of the following areas (including some current Scientific Committee members and IPs) will be invited to the workshop: food/markets surveillance systems, statistical design and analysis of market sampling, capture/recapture analysis, the outlets for whale meat in specified countries and the pathways to those outlets, whale bycatch and fisheries involved (see list of potential invitees below).
- (3) A planning meeting will be held comprising of a small group (about 10 participants) that will identify the information needed to design a sampling programme that would allow estimation of total bycatch with a suitable precision. Some of the specialists identified in step (1) above will be asked to participate both in the planning meeting and the workshop. The report of the planning meeting will facilitate logistics, working paper solicitations, and assembly of information needed for holding the workshop.
- (4) A draft proposal (see appendix 1) for the workshop, including Terms of Reference, a draft Agenda, a list of participants, dates, venue and budget for the workshop will be finalised during SC56.
- (5) Submit proposal for workshop to the Commission for consideration during the IWC56 annual meeting.

A draft time plan to execute the above may be as follows:

SC56	-develop and submit proposal for the workshop
Summer 2004	-contact and invite potential planning meeting participants
Fall 2004	-continue gathering market structure information -identify individuals with knowledge of market structures -seek funding outside IWC for planning meeting and full workshop -hold planning meeting to discuss information needs and review of market information available, and papers needed to provide background for workshop
Post planning meeting	-invite potential workshop participants
2-3 day before SC57	-Hold workshop