

11.2 Options for unit-to-serve, including management implications

The point of this agenda item is to allow consideration of various possible definitions of unit-to-serve, and their corresponding implications for management; see IWC (2002f, p.49). No papers were received this year. However, the Committee noted that the TOSSM project is deliberately structured to allow investigation of how different units-to-serve would respond to management, and that results from the first phase of TOSSM should help to inform discussions of unit-to-serve in future.

11.3 Application of genetic and non-genetic data to stock identification

In its discussions about bowhead whales this year, the Committee identified a number of issues related to quality of microsatellite data and caveats about its interpretation. Genetic data are discrete, with reasonably well-understood mechanisms of variation. However, there is some degree of noise and inaccuracy which can compromise and even bias results. Some of the problems are: database errors in linking samples to specific whales, compromised DNA from inadequate sample handling, inappropriate markers, null alleles, allelic dropout, stutter bands, and anomalous/intermediate allele sizes. There was not enough time to discuss genetic data quality in detail this year, but the Committee **agrees** that it should be considered next year (Item 19). It **encourages** the presentation of collaborative review papers.

A number of statistical issues were discussed relating to new and existing boundary setting methods, as given in Annex J (papers SC/56/SD2, SD8, SD9). SC/56/SD9 presented simulation results relating to the performance of Boundary Rank when sampling is spatially unbalanced along a cline, and it is planned to explore this scenario further in TOSSM.

SC/56/SD6 addressed the issue of how variation in vocalisation patterns is related to variations in genetics. The paper's goal was to identify particular acoustic features concordant with patterns of gene flow mediated by male fin whales, female fin whales, or both, in the North Pacific. Microsatellites, mtDNA and Y chromosome markers were compared to directly estimate male- and female-mediated gene flow. In fact, genetic distance showed significant *negative* correlation with acoustic distance when the influence of geographic distance was removed. Nevertheless, the ability to discriminate between the songs of different fin whale populations was high in many instances. The Committee recalled its previous discussions on using data other than genetics and tagging for identifying population structure (IWC, 2002f, pp.269-272); in particular, such data are most likely to be valuable when used in combination. Specifically with respect to vocalisations, it was noted that populations which have separated recently (in evolutionary terms) may sometimes be distinguishable acoustically long before there is the opportunity for detectable genetic differences to accrue; on the other hand, if migrant animals can learn songs

rapidly, regional acoustic differences may not be indicative of genuine population structure. At a minimum, acoustic differentiation may prove useful in designing sampling or tagging schemes to further elucidate population structure.

Several papers described progress in the development of close-kin methods for studying population structure, which make use of pairs of individuals that can be genetically identified as close relatives. Examples were given for Gulf of Maine humpback whales, and for mother-foetus pairs in the Norwegian minke whale DNA register which can be used to infer paternity. Although issues such as sample sizes may be problematic in some populations, close-kin approaches have the potential to be particularly informative about dispersal rates on management timescales, especially when traditional frequency analyses have low power. The TOSSM project will allow testing of boundary setting methods using close-kin, as well as frequency-based methods. The Committee **encourages** further updates on close-kin methods.

The Committee also noted recent significant advances in telemetry that are of value for studying population structure, in particular with satellite tags and pop-up archival tags (PATs). The logistics of attachment still need to be resolved for some species of interest to the Commission (e.g. minke whale); when attachment is feasible, though, satellite tags and PATs can provide data from the whole range of a population without the need to actively collect samples everywhere. Telemetry information describes movements over timescales of just a few years, and is potentially very relevant to management. One problem with genetic frequency data is the statistical power when considering the 'null' hypothesis of a single stock. Since it is generally not safe to interpret 'no significant difference' as meaning 'no population structure' based on genetic data alone, it is sometimes not obvious when it is safe to stop the process of progressively finer management subdivisions. If it is apparent from telemetry data that animals are mixing on the harvest grounds over a spatial scale of hundreds of kilometres, then there is no reason to expect that differential depletion is possible on smaller scales.

The Committee **encourages** further work on using tagging data to study population structure, both with and without additional genetic data; several relevant telemetry studies are in progress or imminent and it looks forward to the submission of more papers on this topic next year.

11.4 Work plan

The Working Group's discussions of its work plan are given in Annex I. The Committee's deliberations are given under Item 19.

12. ENVIRONMENTAL CONCERNS (ANNEX K)

12.1 Integration of E work plan with priority topics of other sub-committees

SC/56/E27 presented suggestions on ways to advance collaboration between the SWG and the assessment-

related sub-committees and working groups. The high-priority long-term goal was that the quantitatively based population level management advice provided to the Commission should include information on the environment, both directly and via its influence on the visual sightings methods that form the core of the assessment tools.

The Committee recognises the need to maintain a balance between the independent aspect of the SWG's work (i.e. investigating environmental impacts on cetaceans) and the need to provide appropriate advice to other sub-committees and working groups, particularly given the existing SWG workload. The Committee noted the considerable progress being made by the SWG in terms of beginning to put some difficult issues into quantitative frameworks. This may have implications for several other sub-committees. For example, the SWG as possible should provide relevant sub-committees with information on anthropogenic removals not considered by other sub-committees (e.g. the number of large whales killed annually as a result of anthropogenic noise on a stock specific basis). In conclusion, the Committee **endorses** the general approach outlined in SC/56/E27 and **recommends** that this approach be discussed with other sub-committees both at this meeting and intersessionally.

In this regard the Committee noted that the issue of sea ice and whale habitat was extremely important for several sub-committees, and **agrees** that this would be a good topic for a joint special session in 2005 (Annex K Appendix 8) as discussed under Item 21. Given the wide relevance of the issue of the impacts of noise on cetaceans to the Committee (see Item 12.2.5), it **agrees** to maintain this as a standing priority item on the agenda, along with chemical pollution and habitat-related issues.

12.2 Habitat related issues

12.2.1 Pollution related matters

12.2.1.1 STEERING GROUP REPORT ON POLLUTION 2000+ SC/56/E35 summarised the recent (2003/2004) progress of the IWC POLLUTION 2000+ programme (Reijnders *et al.*, 1999), which was initiated to investigate pollutant cause-effect relationships in cetaceans. The status of the two subprojects: bottlenose dolphins and harbour porpoise post-mortem calibration was described (see SC/56/E5, E15, E17 and E19). Details are given in Annex K. The work plan to complete Phase I is given as Annex K, Appendix 6. The Committee continues to **strongly endorse** the continuation of POLLUTION 2000+ programme, noting that it is already showing valuable results from Phase 1.

12.2.1.2 OTHER POLLUTION STUDIES

The SWG also considered a number of papers related to pollution studies. Details are given in Annex K. These included: SC/56/E7 and SC/56/E8, that concerned potential risks to Mediterranean cetaceans from organochlorines with endocrine disrupting capacity; SC/56/E1 that reviewed the completion of two major efforts to address OCs, heavy metals and radionuclides in bowheads; and SC/56/E12 that reported preliminary data of an evaluation of the risk of chronic exposure to

oil-born aromatic hydrocarbons (PAHs) for the humpback whale population wintering off the coast of Gabon, an area of intensive oil exploitation.

As a result of *inter alia* discussion of SC/56/E20 (a risk assessment for bottlenose dolphins, the most commonly stranded cetacean in the USA), the Committee **endorses** an integrated approach to determining risk and the need to obtain baseline information that can (1) allow the investigation of temporal and spatial trends in both health and contaminants load and (2) provide the means for correlating health data and environmental variables. It **recognises** the need for the coordination and development of specimen banks and it **recommends** the establishment of an association of cetacean specimen banks.

12.2.2 Progress report on SO-GLOBEC/CCAMLR

The IWC has expanded its collaborative research in the Antarctic and now includes collaboration with the Convention on Antarctic Marine Living Resources (CCAMLR), the Southern Ocean Global Ecosystem Dynamics Program (SO-GLOBEC), the US National Science Foundation (NSF) and the Australian Southern Ocean Cetacean Ecosystem Program (SOCEP). The Committee **endorses** the change of name from the 'SO GLOBEC Working Group' to the 'SO Collaboration Working Group'.

SC/56/E21 reported on progress of this working group. Five research cruises were carried out during the 2003/04 season. IWC-supported observers participated on cruises in the Ross Sea and Weddell Sea. In addition, IWC took part in planning meetings (Seattle) and multidisciplinary pre-analysis collaboration meetings (OSM:Portland) and reported progress in the GLOBEC International Newsletter. The 2003/2004 cruise reports from the SO collaboration were reported in SC/56/E24.

The Committee recognised the value of this work to its deliberations (e.g. the provision of new data on sea ice, the developing role of passive acoustic detection). It also noted the great benefit it receives from a relatively small contribution to these multidisciplinary research cruises. It therefore **strongly endorses** the continued collaboration summarised in Annex K, Appendix 7. In particular, it **recommends** IWC support for the analysis, integration and reporting of data, in addition to field survey work. The Committee thanked Thiele for her role in coordinating IWC participation. The intersessional steering group coordinated by Thiele is given in Annex U.

12.2.3 State of Cetacean Environment Report

The Editors summarised SC/56/E29, which followed last year's agreed upon procedures and provided a review of the Pacific Ocean. The SOCER highlighted issues concerning marine debris, habitat degradation in the Great Barrier Reef, increasing concerns over the impact of pathogens on cetaceans, and 'new' contaminants such as perfluorinated organochemicals (PFOs). SOCER also highlighted the ongoing over-exploitation of many fish stocks that support cetacean populations. The Committee **agrees** that the Arctic and

Antarctic should be the priority regions for next year's SOCER. It also **agrees** that the report should not contain an editorial assessment of whether changes reported are 'positive' or 'negative'. Further, it was agreed that this document should not contain entries related to human health.

As agreed by the Committee, last year's SOCER was appended to the SWGEC report presented to the Commission. However, during the preparation of the Scientific Committee report for publication, the Convenors decided not to include SOCER along with other sections of the full report due to financial constraints. The rationale behind this was that the target audience of the report is the Commission and non-specialists. In addition, they believed that by appending it to the Committee's report to the Commission and having a dedicated page on the IWC website for this and all future SOCER reports, it would better reach its target audience. The *Journal* notes that the report is available on the IWC website. This year the Committee **agrees** that the SOCER be appended to its report (see Annex K, Appendix 5), so that it is made available to the Commission at their meeting. It also **recommends** that it be published in the supplement as well as being given a dedicated page on the IWC website, whilst recognising that the Convenors require some discretion in balancing the demands from all Committee groups to append items to their reports. It was agreed that individual Convenors should give greater consideration during sub-group meetings to assess priorities for inclusion of appendices in the supplement should space be limited.

12.2.4 Arctic issues

The IWC has identified the Arctic as an area of concern for cetaceans and the SWG has discussed in previous years the potential for future work, in particular for collaboration with large-scale oceanographic programmes. SC/56/E9 is an update of a listing of planned or ongoing Arctic research programmes and SC/56/E10 explores in more detail the existing and potential for collaborations in two NSF programmes: the Western Arctic Shelf-Basin Interaction (SBI) and the Study of the Northern Alaska Coastal System (SNACS).

The Committee recognised the value of the information in these papers and **requests** Moore to continue to provide such information. It also **recommends** that relevant published information be submitted to the next SOCER, which has a focus on Arctic and Antarctic issues.

12.2.5 Anthropogenic noise

12.2.5.1 MINI SYMPOSIUM

Last year, the Committee noted the emergent threat of anthropogenic sound on cetaceans and other elements of marine ecosystems and also the potential for the Committee to assist in the development and interpretation of studies aimed at elucidating the potential impacts of anthropogenic noise on cetaceans. Several scientists with expertise in the fields of acoustics or marine mammal acoustics gave

presentations. Clark chaired the mini-symposium as part of the SWG's sessions. Details are given in Annex K (item 6).

Presentations were given on the following topics: (a) the effects of anthropogenic noise on marine animals and the possible synergistic effects between ambient ocean noise levels and other environmental stressors; (b) physical acoustics and ambient noise in the ocean; (c) audition and the physiology of hearing in cetaceans and the effects of intense sounds on cetacean hearing; and (d) whale communication behaviour.

Potential impacts, including chronic and acute exposures, are increasing as a result of increased use of powerful sound sources (e.g. seismic airgun arrays, military sonars) and increasing levels of ambient noise from vessels (e.g. commercial shipping, fishing, recreational traffic). In some cases, sound sources radiate low-frequency sound over very large areas thereby exposing populations to low sound levels (< 120 dB re 1 μ Pa) over relatively long periods of time (chronic). In other cases, sound sources radiate mid- to high-frequency sound over relatively small areas and individual animals are exposed to high levels of sound (> 160 dB re 1 μ Pa) over relatively short periods of time (acute).

During the mini-symposium, examples and evidence were presented to illustrate that impacts from anthropogenic sound sources can operate over spatial and temporal scales that differ by several orders of magnitude. Two examples are: (a) low-frequency (< 1000 Hz) ambient noise levels that have increased in the northern hemisphere by two orders of magnitude over the last 60 years (3dB/decade) thereby reducing the potential for long-range communication in mysticetes; and (b) sound exposures from mid-frequency sonars that coincide with mass strandings of beaked whales since sonar introductions in the 1960's. In addition, SC/56/E37 reviewed all 111 records of Cuvier's beaked whale strandings around Japan from the late 1980s to May 2004. During this period there were ten mass strandings consisting of 47 whales, plus an additional mass stranding of Baird's beaked whales. All these mass strandings occurred inshore from where the US Navy conducts testing activities off Japan, and where Cuvier's beaked whales were hunted historically. Therefore mid-frequency sonars were implicated as the probable cause for these 11 mass strandings (see Annex K, table 1).

The Committee received two papers demonstrating impacts from seismic airgun surveys on mysticetes, including western gray whale displacement from its critical feeding habitat off Sakhalin Island, Russia (SC/56/BRG39) and humpback whale mortalities in a breeding habitat of humpbacks off Brazil (SC/56/E28). The Committee **commends** the Brazilian Government for working to protect critical marine mammal habitats from noise exposure; in one unique case and opportunity, it has undertaken ongoing consultation to define the Abrolhos Banks as a critical habitat for marine mammals. The Committee views with great **concern** the impacts on large whales in critical habitats

from exposures to seismic sounds impulses, particularly with respect to severely threatened populations such as the western gray whale.

In conclusion, the Committee **agrees** that there is now compelling evidence implicating military sonar as a direct impact on beaked whales in particular. The Committee also **agrees** that evidence of increased sounds from other sources, including ships and seismic activities, were cause for serious concern. The potential for cumulative or synergistic effects of sounds, as found in other taxa, with non-acoustic anthropogenic stressor was noted.

Whilst noting that there is considerably more scientific work needed, the Committee emphasises that measures to protect species and habitats cannot always wait for scientific certainty, as encoded in the precautionary principle. This is especially true for cases involving the exclusion of an endangered population from its habitat.

As a result, the Committee **agrees** that noise should remain a standing priority item on its agenda.

12.2.5.2 RECOMMENDATIONS

The SWG made a number of research recommendations with respect to beaked whales and the use of military sonar. These are detailed in Annex K (item 6.4) and summarised below. The Committee **endorses** these recommendations concerning:

- (1) a full review of typical and atypical strandings,¹⁶ including beaked whales and other species that stranded at the same time;
- (2) a full analysis of stranding data relative to military activities;
- (3) thorough, standardised *post mortems* of entire animals at mass strandings;
- (4) standardised responses and protocols for documenting and understanding mass stranding events;
- (5) An investigation of the correlation of natural sounds (e.g. earthquakes, typhoons) with the mass strandings of beaked whales;
- (6) surveys for Cuvier's beaked whales off the Pacific coast of Japan where these whales were hunted and have mass stranded.

The Committee also **endorses** the following, in the context of mitigation and monitoring protocols given its concern over seismic operations:

- (1) effort be expended on the global identification and monitoring of critical habitats¹⁷ for cetaceans;
- (2) access be given to information on timing, distribution, extent (nautical miles or kilometres for 2D

surveys, or square nautical miles or square kilometres for 3D surveys), sound source, and sound source characteristics for past and planned seismic surveys carried out within the range of critical habitats or potential critical habitats.

- (3) descriptions and results of any marine mammal observer programmes or other faunal observation programs carried out in conjunction with previous seismic surveys are provided;
- (4) the continuous acoustic monitoring of critical habitats on sufficient temporal and spatial scales in relation to pre- and post-seismic activity;
- (5) the independent monitoring of critical habitats (from survey vessel and independent platforms) to evaluate displacement from critical habitat and/or disruption of important cetacean behaviours in the critical habitat;
- (6) increased effort to monitor strandings that occur at times and in places where seismic activity is conducted.
- (7) that seismic operators seek ways to mitigate their potential impacts (e.g. to reduce the power of their sources).

The Committee **commends** these recommendations to IWC member governments, and **requests** that they be transmitted to representatives of geophysical exploration and petroleum industries, and various committees and agencies (e.g. ASCOBANS, ACCOBAMS, JNCC, MMCC, NOAA-NMFS, NRC, IUCN, ICES, OSPAR¹⁸) and also to relevant forthcoming workshops (e.g. MMC and JNCC on impacts of noise on marine mammals, September 2004). Clark and Rojas-Bracho will provide the Secretariat with the necessary information on recipients.

Furthermore, the Committee **strongly recommends** that:

- (1) the current protection afforded to the Abrolhos Bank, Brazil should be made permanent, due to its vital importance as a breeding ground for humpback whales in the western South Atlantic Ocean;
- (2) all seismic surveys in areas that could have significant adverse demographic consequences for large whales should be planned so as to be out of phase with the presence of whales;
- (3) in cases when seismic surveys do occur in a critical habitat (e.g. western gray whale feeding area off Sakhalin Island), additional guidelines for seismic surveys and independent scientific monitoring should be developed, and a strict monitoring and mitigation programme should be implemented - this should include independent and highly experienced shipboard marine observers and a monitoring system and platform that are independent of the seismic source vessel and seismic support vessels;

¹⁶ For this purpose, a mass stranding is an event when two or more animals but not a female-calf pair strand simultaneously in the same location. When whales mass strand at approximately the same time but not in the same location, these strandings are considered atypical. In the case of Cuvier's beaked whales no typical or atypical mass strandings are recorded before the introduction of mid-frequency sonars in the early 1960s.

¹⁷ For example, important areas for breeding, calving and feeding.

¹⁸ JNCC (Joint Nature Conservation Comm), MMCC (US Marine Mammal Commission), NOAA-NMFS, NRC (Nat'l. Res. Council), IUCN, ICES (Int'l. Council for the Exploration of the Sea), OSPAR (Convention for the Protection of the Marine Environment in the Northeast Atlantic)

(4) in situations when displacement of whales could have significant demographic consequences, seismic surveys should be stopped.

On the general topic of anthropogenic noise impacts on cetaceans, the Committee **recommends**:

- (1) the convening of a workshop on the impacts of seismic exploration (including both industrial and academic activities) at its 2006 meeting;
- (2) the integration and coordination of international research projects to study and describe acoustic ecologies;
- (3) the establishment of a working group to derive a series of hypotheses to test for synergistic impacts on cetaceans;
- (4) the inclusion of anthropogenic noise assessments and noise exposure standards within the framework of national and international ocean conservation plans (e.g. consideration during designation of critical habitats, marine protected areas and ocean zoning);
- (5) support for multinational programmes to monitor ocean noise (e.g. IOOS) and the development of basin-scale, regional and local-scale underwater noise budgets.

12.2.6 Review progress on the intersessional workshop on habitat degradation

A revised proposal and agenda for this workshop was agreed by the Scientific Committee (Simmonds *et al.*, 2002). The Committee was pleased to hear from Simmonds, the convenor, that the Workshop will take place from November 12-15, 2004 at the University of Siena, Italy.

12.2.6.1 OTHER HABITAT ISSUES

Three papers were considered under this item, two dealing with killer whales (SC/56/E14 and SC/56/E32) and one with recent developments on research on ozone depletion and its interactions with climate change (SC/56/E11). Details are given in Annex K. The Committee **agrees** that ozone depletion may potentially have some effect on cetaceans and that this warrants further investigation, such as modelling ultraviolet and other environmental parameters in the Antarctic.

12.3 Work plan

The sub-committee's discussions of its work plan are given in Annex K. The Committee's deliberations are given under Item 19.

13. SMALL CETACEANS (ANNEX L)

13.1 Review status of franciscana

In recent years there has been growing concern regarding the sustainability of bycatches of franciscana *Pontoporia blainvillei* (Secchi, 2002). As a result, this year the Scientific Committee conducted a review of the status of this species.

13.1.1 Distribution and stock structure

The franciscana is found along the Atlantic coasts of Brazil, Uruguay and Argentina, from approximately 18° to 42° S. The Committee concluded that at least three genetically distinguishable populations of franciscanas exist, with the possibility of a fourth in the southern part of the range. As a result, the Committee **agrees** with the delineation of four Franciscana Management Areas (FMAs) by Secchi *et al.* (2003), as depicted in Fig. 1 of Annex L. However, it recognised that boundaries between some of these FMAs are approximate and should be re-considered as new information becomes available. In particular, the Committee **recommends** that population structure be examined within FMAs III and IV. Given the strong population structure observed in part of its range, the Committee also **recommends** an assessment of the possible existence of franciscana sub-species.

13.1.2 Abundance

The Committee reviewed the results of three line-transect surveys of franciscana, all conducted in FMAs III and IV; no estimates of abundance are available for FMAs I or II. The Committee identified several concerns regarding the calculation of density and its subsequent scaling to obtain population size and concluded that these estimates of abundance could be either positively or negatively biased. The Committee concluded, therefore, that it was *not* appropriate to consider the results of these surveys as minimum estimates of abundance. The Committee suggested several ways in which these estimates could be improved and **recommends** that abundance surveys be conducted in FMAs I and II.

13.1.3 Life history

Information on the life history of franciscana has been derived from examination of stranded and bycaught animals. Most information has been obtained from FMA III. Life history parameters and reproductive seasonality appear to vary among areas. The results of preliminary modelling exercises (SC/56/SM20) suggest that the potential for population growth in this species may be insufficient to compensate for current levels of bycatch mortality, at least in FMA III. The Committee **recommends** that data be collected to allow estimation of life history parameters in other areas and that analytical methods be standardised to allow for more rigorous inter-population comparisons.

13.1.4 Ecology and habitat

The franciscana is found primarily in coastal waters, but the offshore limit of their distribution remains unknown. To date, there is no evidence of large-scale migratory movements, although some seasonal movements have been recorded (Bordino *et al.*, 1999). The Committee received no new information on threats to the franciscana, other than incidental takes in fisheries. It recognised, however, that a variety of anthropogenic activities could impact this coastal species.