

Report of the Scientific Committee

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until

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International Whaling Commission, Anchorage 2007

Report of the Scientific Committee

Contents

1-3. INTRODUCTORY ITEMS	3
4. COOPERATION WITH OTHER ORGANISATIONS	4
5. REVISED MANAGEMENT PROCEDURE (RMP) – GENERAL ISSUES (see also Annex D)	8
5.1 Further evaluate proposed ‘threshold’ levels for Guidelines and Requirements for implementation	8
5.2 MSY rates.....	8
5.3 Mechanism for revision of the RMP	8
6. RMP – PREPARATIONS FOR <i>IMPLEMENTATION</i> (See also Annex D).....	9
6.1 Western North Pacific Bryde’s whales.....	9
6.2. North Atlantic Fin whales.....	12
6.3 <i>Implementation Review</i> for western North Pacific common minke whales.....	12
6.4 <i>Implementation Review</i> for central Northeastern Atlantic common minke whales	12
6.5 Workplan.....	13
7. ESTIMATION OF BYCATCH AND OTHER HUMAN-INDUCED MORTALITY (see also Annex J)	13
7.1 Information and methods to estimate bycatch based on fisheries data and observer programmes	13
7.2 Methods to estimate bycatch based on genetic data.....	14
7.3 Information and methods to estimate cetacean mortality caused by vessel strikes.....	15
7.4 Other issues	17
7.5 Work plan.....	17
8. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT PROCEDURE (See also Annex E)	17
8.1 Completion of the <i>Implementation Review</i> for B-C-B bowhead whales.....	17
8.2 Review progress on the Greenlandic Research programme	18
8.3 Progress with the development of management procedures.....	19
8.4 Preparation for an <i>Implementation Review</i> of Eastern Gray Whales.....	19
8.5 Scientific aspects of an Aboriginal Subsistence Whaling Scheme (AWS).....	19
8.6 Workplan.....	20
9. Aboriginal subsistence whaling stock assessments.....	20
9.1 Bering-Chukchi-Beaufort Seas (B-C-B) bowhead whale stock structure (see also Annex F)	20
9.2 Annual review of catch data and management advice for the Bering-Chukchi-Beaufort Seas bowhead whale.....	21
9.3 Annual review of catch data and management advice for the eastern North Pacific gray whale.....	21
9.4 Management advice for common minke and fin whales off west Greenland (see also Annex E)	22
9.5 Humpback whales off St. Vincent and The Grenadines (see also Annex E).....	24
9.6 Request for management advice for other large whales off West Greenland (see also Annex E)	24
10. Whale stocks	25
10.1 Results of the 2006/07 SOWER cruise (see Annex G).....	25
10.2 Southern Hemisphere minke whales (see Annex G)	27
10.2.1 Estimate abundance of Antarctic minke whales	27
10.2.2. Reasons for differences between minke abundance estimates from CPII and CPIII.....	28
10.2.3 Catch-at-age analyses	29
10.2.4. Dwarf minke whale.....	30
10.3 In-depth assessment of Western North Pacific common minke whales with a focus on J-stock (and see Annex G1)	30
10.3.2 Distribution and abundance	31
10.4 Finalisation of the Southern Hemisphere catch data series (and see Annex H).....	32
10.5 In-depth assessment of Southern Hemisphere humpback whales (see also Annex H).....	33
10.6 Progress on the in-depth assessment of Southern Hemisphere blue whales (see also Annex H).....	36
10.7 Western North Pacific stock of gray whales (see also Annex F).....	38
10.8 Eastern Arctic bowhead whales.....	40
10.9 Other small stocks of bowhead, right and gray whales.....	41
10.10 North Pacific sei whales (see also Annex G)	41
10.11 Sperm whales (see also Annex G).....	41
10.12 Future SOWER cruises (see also Annex G).....	42

11. STOCK DEFINITION (see also Annex I)	42
11.1 Review progress on the Testing of Spatial Structure Models (TOSSM) project	42
11.2 Review of statistical and genetic issues relating to population structure	43
11.3 Workplan	44
12. ENVIRONMENTAL CONCERNS (see also Annex K)	44
12.1 Workshop on Infectious and non-infectious diseases of marine mammals and impact on cetaceans	44
12.2 POLLUTION 2000+	44
12.3 Southern Ocean collaboration (SOC)	45
12.4 Planning and coordination of IWC's participation in the CCAMLR/IWC International Polar Year survey in 2008	45
12.5 Progress with respect to the Commission's request on handling and release of entangled cetaceans	45
12.6 Other habitat related issues	46
12.7 Work plan	47
13. ECOSYSTEM MODELLING (and see Annex K1)	47
13.1 Review progress on joint CCAMLR/IWC Workshop on modelling Antarctic krill predators	47
13.2 Review collaboration with FAO	48
13.3 Review of progress in the development of ecosystem models	48
13.4 Review of data relevant to parameter estimation and ecological interactions	49
13.5 Work Plan	50
14. SMALL CETACEANS (See also Annex L)	50
14.1 Review of population structure, systematics and status of killer whales	50
14.2 Infectious and non-infectious diseases of marine mammals and impact on cetaceans	54
14.3 Progress on previous recommendations	54
15. WHALEWATCHING (see also Annex M)	56
15.1 Assessing biological impacts of whalewatching on cetaceans	56
15.2 Data sources from platforms of opportunity of potential value to the Scientific Committee	58
15.3 Other issues	59
15.4 Work plan	62
16. DNA TESTING (see also Annex N)	62
17. SCIENTIFIC PERMITS (See also Annex O)	63
17.1 Review of Results from JARPA	63
17.2 Review of results from existing permits	64
17.3 Review of new or continuing proposals	65
17.4 Improving the Committee's procedures for reviewing scientific permit proposals and research results	65
17.5 Use of any new protocol in the future work of the Committee	66
18. WHALE SANCTUARIES	66
19. REQUEST FROM THE JAPANESE WITH RESPECT TO W. NORTH PACIFIC COMMON MINKE WHALES	66
20. RESEARCH AND WORKSHOP PROPOSALS AND RESULTS	68
21. COMMITTEE PRIORITIES AND INITIAL AGENDA FOR THE 2008 MEETING	69
23. FUNDING REQUIREMENTS FOR 2007/08	71
24. WORKING METHODS OF THE COMMITTEE	75
25. ELECTION OF OFFICERS	76
26. PUBLICATIONS	76
27. OTHER BUSINESS	76
28. ADOPTION OF REPORT	77

The meeting was held at the Captain Cook Hotel, Anchorage, Alaska from 7-18 May, 2007 and was chaired by Arne Bjørge. A list of participants is given as Annex A.

1. INTRODUCTORY ITEMS

1.1 Chair's welcome and opening remarks

Bjørge welcomed the participants to the meeting. He thanked the Government of the USA for hosting the meeting and for providing such excellent facilities in spectacular surroundings. In particular, he thanked the National Oceanic and Atmospheric Administration (NOAA) and the Alaska Eskimo Whaling Commission (AEWC), for their hard work in making the arrangements to ensure a smooth and successful meeting. Doug DeMaster, science director of the Alaska Science and Fisheries Center (ASFC, a division of NOAA), gave a short address to participants to welcome them and to express his pleasure at being involved in the organisation of the meeting. He, along with the local staff, would be more than happy to help with any queries that participants might have.

1.2 Appointment of rapporteurs

Donovan was appointed rapporteur with assistance from Miller and various members of the Committee as appropriate. Chairs of sub-committees and Working Groups appointed rapporteurs for their individual meetings.

1.3 Meeting procedures and time schedule

Grandy summarised the meeting arrangements and information for participants. The Committee agreed to follow the work schedule prepared by the Chair.

1.4 Establishment of sub-committees and Working Groups

Three meetings preceded the start of the Scientific Committee during 6-7 May. Both the sub-committee on the Revised Management Procedure (RMP) and the Aboriginal Whaling Management Procedure (AWMP) Standing Working Group (SWG) met, in which agenda items covered were incorporated into their main agendas and reports (Annexes D and E respectively). A two-day Symposium on Infectious Diseases of Marine Mammals and their Impacts on Cetaceans was held jointly by the SWG on environmental concerns and the standing sub-committee on small cetaceans and its report is given as Annex K, appendix 2.

A number of Sub-Committees and Working Groups were established. Their reports were either made annexes (below) or subsumed into this report. In response to a request from the Japanese Government, an *ad hoc* Steering Group was convened under Hammond to review the scientific aspects relating to a proposed take of Western North Pacific common minke whales. Further details can be found under Item. 19.

Annex D – Sub-Committee on the Revised Management Procedure (RMP);

Annex E – Standing Working Group on an Aboriginal Whaling Management Procedure (AWMP);

Annex F – Sub-Committee on Bowhead, Right and Gray Whales (BRG);

Annex G – Sub-Committee on In-Depth Assessments (IA);

Annex G1 – Working Group on the In-Depth Assessment of Western North Pacific Common Minke Whales, with a Focus on J Stock (IANP);

Annex H – Sub-Committee on Other Southern Hemisphere Whale Stocks (SH);

Annex I – Working Group on Stock Definition (SD);

Annex J – Sub-Committee on Estimation of Bycatch and other Human-induced Mortality (BC);

Annex K – Standing Working Group on Environmental Concerns (E);

Annex K1 – Working Group to Address Multi-species and Ecosystem Modelling Approaches (EM);

Annex L – Standing Sub-Committee on Small Cetaceans (SM);

Annex M – Sub-Committee on Whalewatching (WW);

Annex N – Working Group on DNA (DNA); and

Annex O – Working Group on Scientific Permits (SP).

1.5 Computing arrangements

Allison outlined the computing and printing facilities available for delegate use. Requests for Secretariat computing are addressed according to the priority assigned by the Convenors.

2. ADOPTION OF AGENDA

The adopted Agenda is given as Annex B1. Statements on the Agenda are given as Annex S. The Agenda took into account the priority items agreed last year and approved by the Commission (IWC, 2003a; 2007c, pp.63-66). Annex B2 links the Committee's Agenda with that of the Commission.

3. REVIEW OF AVAILABLE DATA, DOCUMENTS AND REPORTS

3.1 Documents submitted

Donovan noted that the pre-registration procedure, coupled with the availability of electronic papers had again been successful. With such a large number of documents, pre-specifying papers had reduced the amount of photocopying and unnecessary paper dramatically. The list of documents is given as Annex C.

3.2 National Progress Reports on research

Progress Reports presented at the 2002-07 meetings are accessible on the IWC website. Reports from previous years will also become available in this format in the future.

The Committee reaffirmed its view of the importance of national Progress Reports and **recommends** that the Commission continues to urge member nations to submit them following the approved guidelines (IWC, 1993a).

Table 1
List of data and programs received by the IWC Secretariat since the 2006 meeting.

Date	From	IWC ref.	Details
Catch data:			
22-10-06	D. Botkin	E65	Details of the bowhead whale catch data 1847-1918 described in Bockstoce and Botkin (1983) for use in the B-C-B bowhead whale <i>Implementation Review</i> .
13-11-06	D. Tormosov	CD62-63	Scanned copies of <i>Yury Dolgoruky</i> catch passports (individual records) for the 1969/70 season in the Southern Hemisphere
17-03-07	D. Tormosov	CD66	Data on ovaries of pygmy blue whales in the 1969/70 season
25-03-07	Norway: N. Øien	E66	Individual minke catch records from the Norwegian 2006 commercial catch. Access restricted (specified 14-11-00).
5-05-07	Japan: Nakamura	C06, E68	Individual catch records from the Japanese 2006 North Pacific special permit catch (JARPNI) and 2006/07 Antarctic special permit catch (JARPAII).
5-05-07	Iceland: G. Vikingsson	E69	Icelandic special permit and commercial catch data 2006
Sightings data:			
11-03-07 and 8-05-07	P. Ensor	CD64	2006/7 SOWER cruise data including blue whale data (sightings, effort, weather, ice edge inter-stratum etc and photographs)
30-03-07	L. Burt	CD68	DESS Version 3.7
Other data:			
9-11-06	USA: D. Palka	CD67	Data for 2007 B-C-B bowhead whale <i>Implementation Review</i> , submitted under the data availability agreement. The genetics data was superseded by data received 10-2-07.
10-02-07	USA: D. Palka	CD67	Final updates to the genetics data and associated files submitted 9-11-06
13-03-07 and 11-04-07	D. Tormosov	CD65	Tagging mark fire data by the <i>Yury Dolgoruky</i> in 1963/4 (35 records), 1964/5 (19), 1970/1 (32), 1971/2 (34) and 1974/5 (73) and by the <i>Sovietskaya Rossia</i> in 1966/7 (89 records) and 1971/2 (8)
25-04-07	Norway: R.B. Huseby	E67	Revised version of the Catch Limit subroutine from the Norwegian Computing Centre.
7-05-07	D. Palka	CD69	Simulation data sets 2006-7

Non-member nations wishing to submit progress reports are welcome to do so.

A summary of the information included in the reports presented this year is given as Annex Q; the modified report template, taking account of recent updates, will be made available on the IWC website (www.iwcoffice.org). The importance of using the agreed template was emphasised by the Committee.

3.3 Data collection, storage and manipulation

3.3.1 Catch data and other statistical material

Table 1 lists data received by the Secretariat since the 2006 meeting.

3.3.2 Progress of data coding projects and computing tasks

Allison reported that catch data received from the 2005 season has been entered into the IWC individual database and entry of North Atlantic catch data from the early 1900s, which was supplied by Bloch, has been completed. The individual catch data from the *Yury Dolgoruky* for the 1969/70 season, as supplied by Tormosov, has been encoded and is currently being validated.

Work on the summary catch database has continued. This included further checking and the addition of more details for some expeditions.

Data from the 2005/6 SOWER sightings cruise have been validated and incorporated into the DESS database and work on encoding and validation of data from the 2006/7 cruise has begun.

The control program to run the Western North Pacific Bryde's whale *Implementation Simulation Trials* has been developed and used to condition and run the trials specified last year and at the intersessional workshop. The results are discussed under Item 6.1.

The AWMP-lite program for running trials for the Bowhead *Implementation Review* has been validated and the trials specified at the intersessional workshop have been run. The results are discussed under item 8.1.

Allison expressed her great appreciation for the assistance Punt had given her in the completion of the programming tasks.

3.3.4 Archiving of simulated datasets to test abundance estimation methods

Palka will liaise with Allison to ensure that the most recent versions of the datasets are available.

4. COOPERATION WITH OTHER ORGANISATIONS

4.1 Convention on the Conservation of Migratory Species (CMS)

4.1.1 Scientific Council

The CMS Scientific Council met in Bonn, Germany from 15-17 March 2007. The report of the observer at both meetings is given in IWC/59/4D. The Appointed Councillor on Bycatch outlined a programme to assess available information on the bycatch of numerous aquatic species, including marine mammals. A programme of work for Resolution 8.22 addressing human-induced impacts on cetaceans was reviewed. Its mandate is to: (1) review the extents to which CMS and other Intergovernmental organisations (IGOs) are addressing impacts; and (2) identify gaps and overlaps, potential collaborations and synergies and priorities for action. These directives roughly parallel those of the IWC. The following additions to the appendices were endorsed:

- (1) Atlantic humpback dolphin (Appendix I);
- (2) Irrawaddy dolphin (Appendix I);
- (3) clymene dolphin (Appendix II);
- (4) northwest African population of harbour porpoise

(Appendix II); (5) small cetaceans of the Solomon Islands (spinner dolphin, Pan-tropical spotted dolphin, striped dolphin, Fraser's dolphin, melon-headed whale) (Appendix II).

The first meeting of the signatories of The Memorandum of Understanding (MOU) for the Conservation of Cetaceans and their Habitats in the Pacific Islands Region was held in Apia, Samoa on 5 March 2007. The parties agreed *inter alia* to: (1) take steps to conserve all cetaceans and protected species in Appendix I occurring in the region; (2) consider joining other international agreements working to the same end; (3) review, enact and/or update cetacean conservation legislation; (4) implement an action plan addressing issues relating to cetacean conservation; and (5) facilitate exchange of information and expertise.

Following the meeting of signatories, an action plan was developed which addressed, amongst others, the following issues: (1) creating an inventory of cetacean fauna; (2) sustainability of the dolphin drive fishery in the Solomon Islands; (3) depredation by dolphins and small whales on longline fisheries; and (4) potential impacts of Japan's proposed take of humpback whales in the Southern Ocean on small island breeding populations in the South Pacific region.

During 2007, a planning meeting will be held on establishing an MOU for marine mammals (including cetaceans) in west Africa between CMS and involved countries.

The Committee thanked Perrin for attending on its behalf and **agrees** that he should represent the Committee as an observer at the next meeting of the Scientific Council in 2008 and the Conference of Parties (COP) in 2008.

4.1.2 Agreement on Small Cetaceans of the Baltic and North Seas (ASCOBANS)

MEETING OF PARTIES (MOP)

The report of the IWC observers at the 5th MOP to ASCOBANS, held in 2006 from 18-20 September (Egmond aan Zee, Netherlands) and 12 December (The Hague, Netherlands) is given as IWC/59/4H. Of relevance to the IWC Scientific Committee are the Resolutions passed concerning cetacean conservation and management summarised below:

(1) Resolution 1: Conservation Plan for Harbour Porpoises in the North Sea; (2) Resolution 4: Adverse Effects of Sound, Vessels and Other Forms of Disturbance on Small Cetaceans; (3) Resolution 5: Incidental Take of Small Cetaceans; (4) Resolution 6: Activities of the ASCOBANS AC 2007-10; (5) Resolution 6: Research on Habitat Quality, Health and Status of Small Cetaceans in the Agreement Area; (6) Resolution 9: Implementation of the 'Jastania Plan' for the recovery of Baltic Sea harbour porpoises.

ADVISORY COMMITTEE

The report of the IWC observer at the 14th Meeting of the Advisory Committee (AC) to ASCOBANS held in San Sebastian, Spain from 19-21 April 2007 is given as IWC/59/4I. The main topics of relevance to the IWC were:

(1) formulation of the triennium work plan (2007-09); (2) cooperation with international organisations; (3) enlargement of the agreement area.

The triennium work plan prioritised the following activities:

(1) finalisation and implementation of the Conservation Plan for Harbour Porpoises in the North Sea; (2) implementation of the 'Jastania Plan' (recovery plan for Baltic harbour porpoises); (3) bycatch issues - ASCOBANS will approach the European Commission and the International Council for the Exploration of the Seas (ICES) with the aim that ICES will take a coordinating role, which will involve the establishment of a bycatch reporting system.

The AC was informed of IWC activities, including the status of its POLLUTION 2000+ programme and ongoing activities for developing bycatch limits for small cetaceans in the North Sea and European Atlantic. The progress was welcomed and the AC reiterated its wish to continue cooperating with the IWC.

Almost all ASCOBANS range states have ratified the change in the Agreement text on the westward extension of the area and it is expected that this will come into force in 2007/early 2008. The Committee thanked Reijnders for attending on its behalf and **agrees** that he and/or Donovan should represent the Committee as an observer at the next meeting.

4.1.3 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)

Donovan represents the Committee on the ACCOBAMS Scientific Committee. He reported that information on ACCOBAMS activities, including the reports of the Scientific Committee, can be found on www.accobams.org. Co-operation between IWC and ACCOBAMS is going well and there are a number of activities that are of interest to both Committees, including work on ship strikes, fin whales and the basin-wide survey endorsed by this Committee last year. These are dealt with as appropriate under various agenda items of this report. The Committee thanked Donovan and **agrees** that he should continue to represent the Committee on the ACCOBAMS Scientific Committee.

4.2 International Council for the Exploration of the Sea (ICES)

The report of the IWC observer documenting the 2006 activities of ICES is given as IWC/59/4A. During the year, the ICES Working Group on Marine Mammal Ecology (WGMME) met from 30 January-2 February in Copenhagen, Denmark to review new information on population sizes, bycatch and mitigation measures for fisheries that have a significant impact on small cetaceans and other marine mammals. The Working Group also summarised the observations planned by ICES member states to meet EU Regulation 812/2004 (on monitoring and estimating bycatch of marine mammals in certain fisheries).

Information on the diets of marine mammals in the ICES area, along with an overview on the methods for obtaining this information and the associated difficulties, were

reviewed by the Working Group. For 10 defined regions, the 4-6 most important species in terms of biomass and availability of diet information were summarised. Plans to conduct a workshop on environmental quality and marine mammal health were developed. The workshop will: (1) address biological effects at the individual level; (2) explore subsequent impacts at the population and community levels; and (3) elaborate on the relevance to integrated chemical-biological assessment of ecosystem health and implications for management.

During the Annual Science Conference (ASC) held in Maastricht, The Netherlands from 19-23 September 2006, several ICES committees dealt with marine mammal issues. One session was devoted to 'Marine Mammals, Seabirds and Fisheries: Ecosystem Effects and Advice Provision' and covered issues such as distribution, abundance, reproduction, prey consumption and trophic interactions, interactions with fisheries, bycatch and strandings of seals and whales. Preliminary results from the SCANS II survey (Small Cetaceans in the European Atlantic and North Sea) were also presented.

The Committee thanked Haug for the report and **agrees** that he should represent the Committee as an observer at the next ICES meeting.

4.3 Inter-American Tropical Tuna Commission (IATTC)

No observer for the IWC attended the 2006 meeting of IATTC.

4.4 International Commission for the Conservation of Atlantic Tunas (ICCAT)

No observer for the IWC attended the 2006 meeting of ICCAT.

4.5 Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)

The report of the IWC observer at the 25th Meeting of the CCAMLR Scientific Committee (CCAMLR-SC), held in Hobart, Australia from 23-27 October 2006 is given as IWC/59/4B. Results from the 2006 IWC meeting relevant to CCAMLR were presented by Kock. Details of whale catches within the CCAMLR Convention Area were also reported. The main items considered at the CCAMLR meeting of relevance to the IWC included:

(1) status and trends of Antarctic fish stocks, krill, squid and stone crabs; (2) incidental mortality of marine mammals; (3) harvested species (krill, fish and stone crabs and their assessment); (4) ecosystem monitoring and management; (5) management under conditions of uncertainty; (6) possible joint activities with respect to ecosystem modelling in the Southern Ocean; (7) Planned Inter-polar Year (IPY) and IWC cooperation with CCAMLR.

By the time of the CCAMLR meeting, only Peru had confirmed its participation in the CCAMLR-IPY 2008 survey. The CCAMLR-SC noted with regret that several members who had expressed interest during the planning phase had withdrawn their tentative commitments due to

domestic decisions based on the budget or access to the required ship time. It agreed that the limited available resources of participating research vessels precluded the conduct of the 2008 survey and so it would not be possible to obtain a revised estimate of krill biomass in Area 48, as initially planned. CAMMLR will be able to continue with its contribution to the modified acoustic research project. However it agreed that projects associated with the planned CCAMLR-IPY 2008 survey, should be informed that CCAMLY still cannot commit to participating in IPY and projects may need to be modified accordingly. A planning meeting was held in Cambridge, UK from 2-4 May 2007 to formulate a revised plan for the IPY and the deliberations are detailed under Item 12.4.

The CCAMLR-SC endorsed the recommendations of the Steering Committee for a joint CCAMLR-IWC Workshop on Antarctic Marine Ecosystems. Details of the Workshop will be developed during 2007 and will be finalised at the next CCAMLR-SC meeting. Further discussion of the IWC-CCAMLR collaboration appears under Item 13.1 and in Annex K. Reports of the CCAMLR-SC and its Working Groups are available through the CCAMLR secretariat and on its website (www.ccamlr.org).

The Committee thanked Kock for attending on its behalf and **agrees** that he should represent the Committee as an observer at the next meeting of the CCAMLR-SC.

4.6 Southern Ocean GLOBEC (SO-GLOBEC)

Details of SO-GLOBEC activities and collaboration with the IWC are given under Item 12.3 and in Annex K. The Committee thanked Thiele for promoting and coordinating the collaboration and **agrees** that she should continue in this work in conjunction with the intersessional Steering Group (Annex R20¹).

4.7 North Atlantic Marine Mammal Commission (NAMMCO)

Scientific Committee

The report of the IWC observer at the 14th Annual Meeting of the NAMMCO Scientific Committee (NAMMCO-SC) held from 21-23 November 2006 in Reykjavik, Iceland is given as IWC/59/4E. The full report of the meeting will shortly be published in the NAMMCO annual report and is presently available on the NAMMCO website (www.nammco.no).

In March 2006, a joint meeting with IWC was held on the Catch History, Stock Structure and Abundance of North Atlantic Fin Whales, which was reported on to the IWC Scientific Committee in 2006 (IWC, 2007b). Based on the new information, the NAMMCO-SC found no reason to change its 2005 advice that the West Iceland sub-stock would maintain its present abundance under an annual catch of 150 whales.

The NAMMCO-SC reviewed 2005 abundance estimates of North Atlantic humpback whales and concluded that an interim estimated take of 10 animals per annum from West

¹ All intersessional groups are numbered and their terms of reference and membership is given as Annex R.

Greenland waters would not harm the stock in the short or medium term. This estimate may be adjusted when the 2005 abundance estimate is revised and a new estimate from the planned 2007 survey becomes available.

The NAMMCO-SC was informed of a monitoring plan for 2007-11 for wintering white whales and narwhals off West Greenland, as well as summering aggregations of narwhals in Northwest and East Greenland and stock identification studies of all major aggregations of narwhals and white whales in Greenland. This will be conducted by the Greenland Institute of Natural Resources and was welcomed by the NAMMCO-SC.

The 2006/07 narwhal quota for West Greenland has been set at 260, plus 115 in Melville Bay and 10 to be distributed in the spring if necessary. The NAMMCO-SC expressed its concern that this quota has annually increased since its introduction and further that the total removal has remained above the recommended level of 135 for West Greenland. Although there are no specific recommendations for Melville Bay, it remained concerned that the stock may be small and so a quota of 115 might not be sustainable.

The NAMMCO-SC was informed that the white whale quota for 2006/07 has been set at 140 for West Greenland, plus 20 for Qaanaaq. Greenland was commended for its management efforts for white whales in this area and noted the quota has been reduced since its introduction in 2004. However, the NAMMCO-SC remained concerned the total permitted removals are still above the recommended level of 100.

The NAMMCO-SC was pleased to be informed that planning and undertaking of the Trans North Atlantic Sightings Survey (T-NASS) is well underway. It also noted that it was encouraging that Canada, Greenland and the Russian Federation were participating fully, and that the USA was working closely with the T-NASS to coordinate its own surveys with it. Full details of the TNASS planning, methodology and coverage can be found in SC/59/O19 and members of the IWC Scientific Committee have participated in the planning process.

Due to minimal progress in modelling efforts, the NAMMCO-SC could not provide advice on the economic aspects of marine mammal-fisheries interactions for minke whales in the Barents Sea and Iceland. Given the lack of progress, it was recommended that the Working Group should meet in 2008 at the earliest.

The Committee thanked Walløe for attending on its behalf and **agrees** that he should represent the Committee as an observer at the next NAMMCO Scientific Committee meeting.

Council

The 16th Annual Council Meeting of NAMMCO took place in Tromsø, Norway from 27 February-1 March 2007. The report of the IWC observer is given as IWC/59/4C. The NAMMCO international observer scheme will this year focus on whaling in the Faroe Islands. The scheme has been in operation since 1998 and requires an update to take account of technical developments and safety requirements for observers aboard whaling and sealing vessels. An international workshop on the issue of struck and lost

animals during hunting was held during November 2006 and NAMMCO will be organising a workshop on handling, processing and utilisation of marine mammal products that is planned for 2008. NAMMCO also plans to arrange a workshop on the possible health benefits of consuming marine mammal products, such as whale oil.

At the request of Iceland, the NAMMCO-SC reviewed the appropriateness of including the central North Atlantic fin whale in Appendix I (threatened with extinction) of the Convention on the International Trade in Endangered Species (CITES). It concluded that this fin whale population does not meet the biological criteria for listing under this appendix.

The Committee thanked Lunde for attending on its behalf and **agrees** that he should represent the Committee as an observer at the next NAMMCO council meeting.

4.8 World Conservation Union (IUCN)

The IUCN Red List Authority is in the process of updating Red List entries (www.redlist.org) for mammals globally, in conjunction with the Global Mammal Assessment². Draft assignments of species to categories, and the required supporting documentation, were developed for cetaceans at an expert workshop held in January 2007 at the Southwest Fisheries Science Center, La Jolla, CA. These drafts are currently being reviewed by the Cetacean Red List Authority. Resulting changes to the Red List of Threatened Species, and updating of the documentation, are expected to be implemented later in 2007.

Assessments of the status of cetaceans at regional level have also been conducted or are underway, in association with regional bodies. Red List assessments for Mediterranean and Black Sea populations of cetaceans were developed at a workshop held in March 2006³. Species considered to be visitors or vagrants are noted in regional lists, but not assigned to a category of threat.

Following consultation with a variety of stakeholders, IUCN signed an agreement with Sakhalin Energy (now a majority-owned subsidiary of Gazprom), to constitute an independent Western Gray Whale Advisory Panel (WGWAP), which advises on issues relating to the effects of industrial development on the habitat and population of western gray whales (and see Item 10.7). The Panel is independent, and serviced by IUCN. Several members of the Scientific Committee are on the WGWAP. It has had held two meetings, open to observers, in November 2006 and April 2007. The Panel has established three task forces: one on seismic surveying in gray whale habitat; one on oil spill issues; and one on photo-identification research and results. More information is available on the IUCN website (www.iucn.org/themes/marine/sakhalin). The Committee thanked Cooke for his report and **agrees** that he should continue to represent the Committee as an observer to IUCN.

² www.iucn.org/themes/ssc/biodiversity_assessments/gma/indexgma.htm

³ www.accobams.org/2006.php/pages/show/10

4.9 Food and Agriculture Organisation (FAO) related meetings – Committee on Fisheries (COFI)

The report of the IWC observer at the 27th meeting of the FAO-COFI held 5-9 March 2007 in Rome, Italy is given as SC/59/4G. Of interest to the IWC were discussions on:

- (1) identification of vulnerable marine ecosystems (VMEs);
- (2) assessment of the impacts of fisheries on VMEs; (3) marine debris; (4) incidental catches; (5) Marine Protected Areas (MPAs).

The Committee thanked Morishita for his report and **agrees** that he should represent the Committee as an observer at the next FAO related meeting.

4.10 Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)

The 14th meeting of the Conference of the Parties (CoP14) will be held in The Hague, the Netherlands, from 3 to 15 June 2007.

4.11 North Pacific Marine Science Organisation (PICES)

The report of the IWC observer at the 15th annual meeting of PICES held 13-22 October 2006 in Yokohama, Japan is given as IWC/59/4F. One day prior to this period, the Marine Birds and Marine Mammals Advisory Panel (MBM-AP) held A workshop on Responses of Marine Mammals and Seabirds to Large-Scale and Long-term Climate Changes. The material presented was excellent, but the work is still at an early stage and the mechanisms of marine mammal responses are still poorly understood. The MBM-AP plans to hold a session during the next PICES meeting period on climate change, phenology and the effects of top predators.

The MBM-AP recommended that work on the diet of predators in the North Pacific should be recommenced as a number of high quality data sets already exist. The Committee thanked Kato for his report and **agrees** that he should represent the Committee as an observer at the next PICES meeting.

4.12 Eastern Caribbean Cetacean Commission (ECCO)

No information on the activities of ECCO was provided.

4.13 Protocol on Specially Protected Areas and Wildlife (SPA) of the Cartagena Convention for the Wider Caribbean

There were no meetings of SPAW during the intersessional period. Carlson will represent the IWC at their meeting in early 2008.

5. REVISED MANAGEMENT PROCEDURE (RMP) – GENERAL ISSUES (SEE ALSO ANNEX D)

5.1 Further evaluate proposed ‘threshold’ levels for Guidelines and Requirements for implementation

Last year, the Committee noted that some further work would be needed to fully evaluate the values for thresholds defining ‘acceptable’, ‘borderline’ and ‘unacceptable’

performance criteria in the *Implementation Simulation Trials*. At that time, it was agreed that the Committee would reconsider the criteria at this meeting ‘after their properties have been examined in a wider range of contexts’ (IWC, 2007c, p.6). In the absence of guidance on how a fuller evaluation could be conducted, the second intersessional Bryde’s whale workshop (SC/59/Rep2) agreed to follow, with appropriate caution, the procedure agreed by the sub-committee on the RMP in 2006 (IWC, 2007e, p.109). The Committee **recommends** that, as detailed in Annex D, the following note be added to the draft agreed last year:

‘For cases where, for the two conservation statistics examined, there is a difference in the determination of whether performance is ‘acceptable’, ‘borderline’ or ‘unacceptable’ for a particular variant in a particular trial, the circumstances for this difference will be investigated before reaching a final determination of performance category; the reasoning will be documented in the report.

This wording also covers the general problem noted in SC/59/Rep2, i.e. that some consideration should be given to cases where the appropriate definition for the equivalent single stock trial is not obvious. Further details are provided in Annex D, item 2.1.

The Committee **agrees** the ‘Requirements and Guidelines for *Implementations*’ (IWC, 2005b, pp.84-92) should be updated to incorporate the new text, including that proposed last year (IWC, 2007e).

5.2 MSY rates

At last year’s meeting, the Committee agreed that sufficient new information was available to warrant a review of the plausible range of maximum sustainable yield rates (MSYR) for baleen whales used in trials of the RMP. This year, the report of an intersessional steering group under Cooke (SC/59/RMP9) and SC/59/RMP8 both summarised available information and estimates.

SC/59/RMP10 considered the influence of environmental variability on sustainable yield curves using a theoretical model to distinguish between r_{max} , the maximum *per capita* growth rate that a population can achieve in an ideal habitat, and r_o , the average growth rate that a population will achieve at a low level of abundance. Discussion of this will occur during the review process set out below.

The Committee **re-emphasises** the importance of the MSYR review and possible revision of the plausible range for MSYR, both in relation to future *Implementations* or *Implementation Reviews* and in the context of consideration of a proposed revision of the *CLA* (see section 5.3 below). It **endorses** the plan for continued work developed in Annex D, Appendix 3, including the establishment of a steering group under Donovan (R7) and the holding of an intersessional workshop. The latter is essential if there is to be a reasonable chance that the review can be completed during next year’s meeting.

5.3 Mechanism for revision of the RMP

At the 2004 Annual Meeting, Norway had indicated that it may submit a proposal for the revision of the *CLA* and the

base-case and Robustness Trials (IWC, 2006a, pp.79-80). Last year, the Committee discussed a paper considering two aspects of this (related to the length of the simulation period and MSYR (IWC, 2007c, p.6)). This year, the Committee noted the results provided in SC/59/RMP4 for all single stock trials for a proposed alternative *CLA*, as required for consideration of a proposed revision of this nature (IWC, 2007d, p.89). It **agrees** that detailed consideration of the results would best await completion of the process of reconsideration of the plausible range for MSYR (see item 5.2).

During the intersessional period, the choice of the functional form for density-dependence when the population size exceeds carrying capacity (*K*) was examined by an intersessional working group. The Committee **agrees** that the results of trials in which *K* changes are not sensitive to how density dependence is modelled and thus that no changes are needed to the specifications of the common control program. The intersessional working group had not yet reviewed the question of whether additional trials might be required to consider environmental degradation in conjunction with revisions of the *CLA*. The Committee **agrees** that this work need not be conducted until the review of MSYR has been completed; the matter will be added to the agenda of the intersessional group established under Item 5.2 (R7).

6. RMP – PREPARATIONS FOR IMPLEMENTATION (SEE ALSO ANNEX D)

6.1 Western North Pacific Bryde's whales

6.1.1 Complete Implementation of western North Pacific Bryde's whales

6.1.1.1 REVIEW OF INTERSESSIONAL WORKSHOP REPORT (SC/59/REP2)

The primary objective for the Workshop was to review the results of the final trials and develop recommendations for consideration by the full Committee on: management areas; RMP variants (e.g. catch-cascading, catch-capping); associated operational constraints (e.g. temporal restrictions); suggestions for future research (either within or outside whaling operations) to narrow the range of plausible hypotheses/eliminate some hypotheses; and 'less conservative' variants(s) with their associated required research programmes and associated duration. The four RMP variants considered during the Workshop (and their associated *management area* specifications) were:

- (1) variant 1: Sub-areas 1W, 1E and 2 are *Small Areas*;
- (2) variant 2: Sub-area 2 is taken to be a *Small Area* and the complete sub-area 1 is treated as a *Small Area*;
- (3) variant 3: Sub-area 2 is taken as a *Small Area* and sub-area 1 is a *Combination Area*. Sub-areas 1W and 1E are *Small Areas*, with catch-cascading applied; and
- (4) variant 4: Sub-areas 1 and 2 (combined) are a *Combination Area*, and sub-areas 1W, 1E and 2 are *Small Areas*, with catch-cascading applied.

The workshop chair, Donovan, noted that despite the considerable amount of work undertaken intersessionally to develop and check code, complete the conditioning work and then run the trials specified at the 2006 Annual Meeting, much work remained to be completed in Yokohama. He paid tribute to the work of Punt and Allison in enabling the Workshop to complete its agenda successfully.

The 'Requirements and Guidelines for *Implementations*' (IWC, 2005c) provide advice on the appropriate procedure to review the results of *Implementation Simulation Trials* apart from agreed threshold levels for 'acceptable', 'borderline' and 'unacceptable' performance. Pending the Committee's final decision on threshold levels, the Workshop had agreed to follow the draft values developed last year, with an extra degree of care (see Item 5.1).

The Workshop had also considered possible changes to the trial specifications. A full discussion of these issues is included in item 4.1 of its report (SC/59/Rep2). The agreed final list of trials is given as Table 1. The final trial specifications are provided in Annex D, Appendix 4. The Workshop had received a fully revised set of conditioning results and agreed that the diagnostic plots showed the conditioning to be satisfactory.

The Workshop noted that in accordance with the guidelines, variants which performed 'acceptably' for most of the trials but 'borderline' for a small number of 'medium' weighted trials, may be classified as 'acceptable without research' depending on the results of a detailed examination of the results for the trials concerned (and the balance of factors/hypotheses within trials). Following such an examination, variants 1, 3 and 4 were classified as 'acceptable without research' by the Workshop. Variant 2 was considered a potential candidate for 'acceptable with research' and trials to investigate this were established.

The Committee **endorses** the recommendations of the Workshop and therefore **agrees** that variants 1, 3 and 4 all performed acceptably from a conservation perspective and **recommends** that these variants could be implemented without a research programme. The Committee also **endorses** the workshop conclusion that variant 2 was not acceptable but was a possible candidate for the 'with research' option.

The Committee recognised the considerable work that had taken place since the 2006 Annual Meeting and was pleased that the *Implementation* for the western North Pacific Bryde's whales was completed successfully within the two-year timeframe as envisaged in the 'Requirements and Guidelines for *Implementations*' (IWC, 2005c). It thanked Donovan for guiding this *Implementation*, noting that this is the first time that an attempt has been made to apply the 'Requirements and Guidelines' procedure developed in response to the difficulties encountered during the *Implementation* for the western North Pacific minke whales. It also thanked Allison and Punt for their substantial work during the process, without which it would not have been possible to complete the *Implementation* on time.

Table 2

The Implementation Simulation Trials for the western North Pacific Bryde's whales.

Trial No.	Stocks	Sub-stocks	$MSYR_{mat}$	Mixing matrix	Process error	Stochastic mixing in 1W/1E	Catch series	Age-dependent Mixing?	1W / 1E boundary	Comment	Trial Weight
BR01	1	No	1	A	Baseline	No	Best	No	165°E	Stock structure hypothesis 1	M
BR02	1	No	4	A	Baseline	No	Best	No	165°E	Stock structure hypothesis 1	H
BR03	2	No	1	B	Baseline	No	Best	No	165°E	Stock structure hypothesis 2	M
BR04	2	No	4	B	Baseline	No	Best	No	165°E	Stock structure hypothesis 2	H
BR05	2	No	1	C	Baseline	No	Best	No	165°E	Stock structure hypothesis 3 *	M
BR06	2	No	4	C	Baseline	No	Best	No	165°E	Stock structure hypothesis 3 *	H
BR07	2	Yes	1	D	Baseline	No	Best	No	155°E	Stock structure hypothesis 4	M
BR08	2	Yes	4	D	Baseline	No	Best	No	155°E	Stock structure hypothesis 4	M
BR09	2	No	1	B	Baseline	No	Best	Yes	165°E	B + Age-dependent mixing	M
BR10	2	No	4	B	Baseline	No	Best	Yes	165°E	B + Age-dependent mixing	H
BR11	2	Yes	1	D	$\sigma_p = 0.9$	No	Best	No	155°E	D + Additional process error	M
BR12	2	Yes	4	D	$\sigma_p = 0.9$	No	Best	No	155°E	D + Additional process error	M
BR13	2	Yes	1	D	Baseline	Yes	Best	No	155°E	D + Stochastic mixing *	M
BR14	2	Yes	4	D	Baseline	Yes	Best	No	155°E	D + Stochastic mixing *	M
BR15	2	Yes	1	D	Baseline	No	Best	No	160°E	D + Alternative Boundary 1	M
BR16	2	Yes	4	D	Baseline	No	Best	No	160°E	D + Alternative Boundary 1	M
BR17	2	Yes	1	D	Baseline	No	Best	No	165°E	D + Alternative Boundary 2	M
BR18	2	Yes	4	D	Baseline	No	Best	No	165°E	D + Alternative Boundary 2	M
BR19	2	Yes	1	D	Baseline	No	Low	No	155°E	D + Low catch series	M
BR20	2	Yes	4	D	Baseline	No	Low	No	155°E	D + Low catch series	M
BR21	2	Yes	1	D	Baseline	No	High	No	155°E	D + High catch series	M
BR22	2	Yes	4	D	Baseline	No	High	No	155°E	D + High catch series	M
BR23	2	No	1	B	Baseline	No	High	No	165°E	B + High catch series	M
BR24	2	No	4	B	Baseline	No	High	No	165°E	B + High catch series	H
BR25	2	No	1	B	$\sigma_p = 0.9$	No	Best	No	165°E	B + Additional process error	M
BR26	2	No	4	B	$\sigma_p = 0.9$	No	Best	No	165°E	B + Additional process error	H
BR27	2	No	1	B	Baseline	No	High	Yes	165°E	B + Age-dep.mixing+high catch	M
BR28	2	No	4	B	Baseline	No	High	Yes	165°E	B + Age-dep.mixing+high catch	H

* With stochastic mixing

6.1.1.2 CONSIDERATION OF ADDITIONAL TRIALS RELEVANT TO THE VARIANT WITH RESEARCH OPTION

The Committee has previously agreed that a variant can be considered to be 'acceptable with research' if:

- (1) the conservation performance of the use of the variant for ten years, followed, after a five-year phase-in period, by one of the other variants, is 'acceptable without research', and
- (2) a research programme can be developed which, within a ten-year period, could feasibly address the uncertainties for which the variant performed unacceptably.

The Government of Japan had advised Donovan that it would like to pursue the possibility of classifying variant 2 as 'acceptable with research'. Items 6.1.1.2 and 6.1.1.3 below address points (1) and (2) above for variant 2.

SC/59/RMP1 presented the results of trials BR13, BR15 and BR17 for the four variants considered during the second intersessional workshop, along with three additional variants constructed by using variant 2 for the first ten years

of the 100-year projection period, after which management reverts, via a five-year phase-in period, to one of variants 1, 3 or 4. The Committee **agrees** that the performance of these additional variants was adequate because their performance for trials BR13, BR15 and BR17 was very similar to those for variants 1, 3 and 4, which had been agreed to be 'acceptable without research'.

6.1.1.3 CONSIDERATION OF POTENTIAL RESEARCH PROGRAMME TO ACCOMPANY VARIANT WITH RESEARCH

The Committee noted that a research programme associated with an RMP variant that is 'acceptable with research' needs to: (1) be feasible, (2) be agreed by the Committee, (3) address the uncertainties captured in the trials for which the variant performed unacceptably, and (4) include measures to allow progress to be evaluated (IWC, 2005c, pp.84-92). It also noted that it will undertake an annual review of progress and may recommend that catch limits be based on the more conservative variant immediately if: (a) it deems insufficient progress to have been made against the targets; or (b) the results show that it will not be possible to meet the original objectives within the timeframe; or (c) the results show that the 'medium' ranking assigned to the

trials on which the variant performed ‘unacceptably’ should remain ‘medium’ or be a ‘high’. A more extensive review will occur at the first *Implementation Review*.

The *Implementation* process envisages consideration being given to appropriate research programmes at an early stage (at the end of the *pre-implementation* process), but even so, there will be many instances where it is not possible to develop a potentially acceptable proposal at the ‘Second Annual Meeting’, as is the case for the western North Pacific Bryde’s whales. In such circumstances, the Committee will recommend the ‘acceptable’ variants (if there are any) to the Commission and notify the Commission that the proposers have indicated they will be submitting a research proposal. Until a programme is developed and accepted, catches will be set using the more conservative variant. It is possible that such catches may be zero, for example if there is no acceptable variant. If a research programme is accepted at a future Annual Meeting, the catch limits will be recalculated using the ‘variant with research’ at that meeting.

The Committee noted that although the trials on which the performance of variant 2 was ‘unacceptable’ include several hypotheses, the underlying uncertainty to which variant 2 is not robust is the presence of two sub-stocks in sub-area 1. Any research programme should therefore be focused on this issue. SC/59/PFI2 presented the concepts for such a research program related to variant 2.

In discussion of SC/59/PFI2, the Committee re-iterated the importance of using a suite of techniques to examine hypotheses related to stock identity, noting that the research programme also needs to be practical. Additional aspects that could be considered for inclusion into this research programme are identified in Annex D, item 3.1.3.

The Committee **agrees** that the ability to review a research programme associated with the adoption of a variant that is ‘acceptable with research’ will be easier if a standard *pro-forma* for the presentation of such proposals is available. Such a *pro-forma* was developed (see Annex D, Appendix 5) and the Committee **recommends** that it be attached as an adjunct to the ‘Requirements and Guidelines for Implementations’. It also **agrees** that the Committee may, at the request of the proposer, establish an advisory group to provide technical assistance during the development of a proposed programme. Individuals on the group may provide advice on whether the proposal fits within the guidelines.

Pastene introduced a revised version of a conceptual outline for a research programme which could be implemented in conjunction with variant 2, reformatted to follow the *pro-forma*. Discussion of this outline was in the context of the extent to which the information provided needed to be expanded for it to be ready for review at the 2008 Annual Meeting. A number of suggestions were raised in discussion; they are detailed in Annex D, item 3.1.3.

6.1.1.4 ABSOLUTE ABUNDANCE ESTIMATES AND CATCHES FOR USE IN THE CLA

The Committee noted that the report of the intersessional Workshop included a ‘best’ and two alternative catch series. It **recommends** that applications of the CLA be based on the ‘best’ catch series.

The Committee noted that estimates of abundance that are to be used in the CLA need to be obtained using methods that provide estimates of abundance with ‘acceptable bias and precision’ (IWC, 1999, p.252) and guidelines regarding both bias and precision are to be found in the annotations to the RMP (IWC, 1999, p.256). It also noted that in order for an abundance estimate to be adopted for use in the CLA, it is necessary: (a) for the data to be lodged with the Secretariat no later than six months before the meeting at which they are to be used; (b) for the data analysis and results to be provided to the Secretariat and circulated to the Committee no later than three months before the meeting at which they are to be considered; and (c) for the verification of the data to be audited by the Secretariat (IWC, 2005d, p.94). Allison noted that the data were provided to the Secretariat in 2003, but the audit of the verification has not yet been conducted. Given that, and that the data analysis was not provided to the Secretariat by February 2007, the Committee **agrees** that it is not possible for it to make a recommendation regarding the use of the abundance estimates in SC/59/PFI3 at this year’s meeting. It **recommends** that the Secretariat conduct an audit of the verification of the data no later than three months before the next meeting.

The Committee noted that there had been some changes to the procedures specified in the original survey plans (see Annex D, Item 3.1.4). It **agrees** that these differences do not preclude use of these data for estimation purposes. The matter did, however, highlight the need for more detailed documentation of survey plans (as well as for data collection and analysis) and for more rigorous review by the Committee of survey implementation to avoid misunderstandings which could give rise to difficulties in considering whether abundance estimates from surveys can be used for input to the CLA.

The Committee **stresses** that the survey proposal needs to provide a detailed, and explicit and unambiguous description of the intended protocol and the document on which a decision regarding whether abundance estimates can be used in the CLA is to be based should provide an adequate description of the surveys, the data collected and the methods used for data analyses and their results.

The Committee developed a list of the minimum information that it would normally expect to receive when reviewing abundance estimates for use in the CLA (see Annex D, Appendix 7), noting that the amount of documentation would be greater for abundance estimates for which $g(0)$ is estimated and which calculate effective search width and mean school using data pooled over survey blocks and/or years. The Committee **recommends** that the ‘Requirements and Guidelines for Conducting Surveys and Analysing data within the Revised Management Scheme’ be updated to reflect the material in Annex D, Appendix 7.

The Committee also identified that the documentation in SC/59/PFI3 was lacking in some aspects and that several alternative analyses were needed for it to be able to judge whether the abundance estimates in SC/59/PFI3 were suitable for use in the CLA. Specific suggestions in this regard are given in Annex D, Appendix 8.

6.1.2. Recommended action

The Committee **agrees** that if the RMP is implemented variants 1, 3 and 4 can be implemented without an associated research programme. The recommended *Management Areas* for each variant are given in Annex D, Table 3. It further **agrees** that variant 2 cannot be implemented except in conjunction with a research programme that the Committee agrees could feasibly show that the trials on which variant 2 performs ‘unacceptably’ should have been assigned ‘low’ plausibility. The Committee anticipates being provided with such a proposed research programme and reviewing it at the 2008 Annual Meeting.

6.2. North Atlantic fin whales

6.2.1 New information

SC/59/PFI1 described fin whale photo-identification data in the North Atlantic Ocean and the Mediterranean Sea that might be useful when evaluating stock structure hypotheses. The Committee **recommends** that an attempt should be made to match the small holdings in the eastern North Atlantic to catalogues in the northwest Atlantic and the Mediterranean, and the results be made available to the Steering Group (see Item 6.2.3) at least two months before the First Intersessional Workshop.

6.2.2 Completion of the pre-implementation assessment

Last year, the Committee concluded that the only outstanding item to be completed before proceeding towards the *Implementation* was development of a list of catches with ancillary information to allow the development of a best and alternative catch series for use in simulation trials. It also recommended that genetic and other analyses be refined and extended to discriminate among existing stock structure hypotheses and to estimate mixing and dispersal rates before the implementation process starts.

Allison reported that she had yet to compile the catches, but that this would be completed within a few months. Vikingsson stated that additional analyses of genetics data for fin whales are being undertaken. The Committee **recommends** that the catch series and the results of the genetic analyses be made available to the Steering Group at least two months before the First Intersessional Workshop.

6.2.3 Recommended action

Last year, the Committee recommended that the initiation of the *Implementation* for the North Atlantic fin whales be delayed until 2007 due to the Committee’s priorities and workload, in particular the need to complete the North Pacific Bryde’s Whale *Implementation*. Given that the Bryde’s Whale *Implementation* is now complete, and the *pre-implementation assessment* for the North Atlantic fin whales is completed to the extent necessary to be able to specify *Implementation Simulation Trials* at the First Intersessional Workshop, the Committee **recommends** that the Committee start the *Implementation*. This will entail a meeting of a small technical group and the holding of the First Intersessional Workshop in 2007/08. The Committee established a Steering Group under Donovan (R6) to guide the intersessional work; its workplan and required resources are given in Annex D, item 5.

6.3 Implementation Review for western North Pacific common minke whales

The Committee noted that the ‘Requirements and Guidelines for *Implementations*’ had been developed in response to the difficulties encountered during *Implementation* for western North Pacific minke whales. It also noted that there was considerable new information available on stock structure, particularly for the J-stock. Moreover, JARPN is in its 6th year and Japan intends to synthesise the information obtained and then conduct a review of the programme. Given the likely amount of new information that is already available and that will be forthcoming in the next few years, the Committee **agrees** that it would not be feasible to conduct an *Implementation Review* at a single meeting. Rather, an *Implementation Review* that follows the two-year process envisaged under the ‘Requirements and Guidelines for *Implementations*’ is more appropriate. The Committee therefore **agrees** that rather than starting an *Implementation Review* next year, it would be better to discuss and synthesise the new information first (in the spirit of a *pre-implementation assessment*). An intersessional Steering Group was established under Kitakado (R8).

6.4 Implementation Review for Central and Northeastern Atlantic common minke whales

6.4.1. New information

The Committee received reports on: a 2006 survey in the eastern Norwegian Sea including the coastal areas of northern Norway, comprising the Small Area EW (SC/59/RMP5); an overview of available dive time data for minke whales from radio tagging experiments in Norwegian waters (SC/59/RMP6); information on a model for successive dive times for minke whales in the Northeast Atlantic based on VHF radio tagging data (SC/59/RMP3); and a brief overview of plans by Norway to conduct annual partial surveys over the period 2008-2013 to collect data for a new estimate of abundance (SC/59/RMP7). Details are given in Annex D, Item 3.4.1.

Given that last year the Committee recommended that new dive time data should be collected during future surveys (IWC, 2007c, p.12), it welcomed the new information in SC/59/RMP3. As detailed in Annex D, item 3.4.1, more information on dive times is desirable. that the Committee was informed that Norway would continue to attempt to collect additional information on dive times and report it to the upcoming *Implementation Review*.

6.4.2 Consideration of resources and workplan

An *Implementation Review* for the central and northeastern Atlantic minke whale *Implementation* is scheduled for the 2008 Annual Meeting. Advice from Walløe and Vikingsson in this context is detailed in Annex D, item 3.4.2.

The Committee noted that the objective of the *Implementation Review* was to assess whether the new information obtained since the 2003 *Implementation Review* implies that the trials conducted previously do not reflect the current understanding of the dynamics and uncertainties related to the North Atlantic minke whales. It **agrees** that it would be possible to complete the *Implementation Review* at next year’s meeting if it is not

necessary to specify additional *Implementation Simulation Trials*, otherwise the *Implementation Review* might be completed only in 2009. A Steering Group to prepare for the review was established under Cooke (R9).

Last year, a research vessel planning to carry out a sighting survey in the eastern Barents Sea was not given access to the Russian EEZ for the time period in July when the survey was due to take place. The surveys are part of the ongoing work in preparation for the *Implementation Review*, and also provide valuable information about abundance and distribution of other whale species. The transects are designed in accordance with Committee requirements and guidelines and are performed under its oversight. The abundance estimate to be used in the *Implementation Review* next year will be incomplete without sighting coverage in the eastern Barents Sea in 2007. The Committee therefore **recommends** that the Commission request the relevant authorities in Russia to grant permission for Norwegian research vessels to survey its EEZ waters this year.

The Committee **agrees** that it would be best to conduct the *Implementation Review* during a pre-meeting before the 2008 Annual Meeting. This was how the previous *Implementation Review* was undertaken, and the Committee believed that having such a meeting would be optimal.

6.5 Workplan

Issues relating to the workplan are discussed under Item 21; budgetary implications are considered under Item 23.

7. ESTIMATION OF BYCATCH AND OTHER HUMAN-INDUCED MORTALITY (SEE ALSO ANNEX J)

7.1 Information and methods to estimate bycatch based on fisheries data and observer programmes

7.1.1 Collaboration with FAO on collation of relevant fisheries data

Time constraints have limited progress towards integrating IWC bycatch data with the FAO fishery database, but work has begun on consolidating the IWC data from the national progress reports. This is a very time-consuming task. The Secretariat will assist with the compilation and enter new data directly into a database.

7.1.2 Progress on joining FIRMS

The MoU (Memorandum of Understanding) with the FAO has yet to be completed, however a meeting of the FIRMS (Fishery Resource Monitoring Scheme) Partnership is planned for late 2007, and if the existing IWC data have been entered in a final agreed format, the MoU may be concluded at that meeting.

7.1.3 Feedback on European Union (EU) bycatch monitoring schemes

The first national reports under the EU requirements were due in 2006 but have not yet been made public; it is not yet clear whether all EU members have complied. Some reports have been made publicly available through ASCOBANS. The EU Commission will meet in September

2007 to review the reports, following which they will also be reviewed by ICES.

7.1.4 Modelling approaches to determining appropriate levels of observer coverage

No new information was available. EU members were required to report on this topic in June 2007, so the Committee may expect to see results next year.

7.1.5 NOAA workshop on the bases for determining serious injuries in whales

Originally planned to be held in November 2006, the workshop is now scheduled for August 2007.

7.1.6 Other methods of determining survival of previously entangled whales

Data on the fate of individual entangled whales will contribute to estimation of mortality rates due to entanglement. Collection of such data should preferably be undertaken by trained and authorised individuals; photographs and/or genetic samples to allow subsequent identification of entangled whales as resights or stranded carcasses are important (SC/59/BC1). Information from the entanglement should be contributed to regional archives to maximise the value of the information. An entanglement also offers an opportunity for attachment of a telemetry device for tracking to *inter alia* help determine survival.

The Committee welcomed information on a mark-and-recapture programme aimed at estimating survival of entangled humpback whales in the Gulf of Maine noting the difficulties involved (Annex J, item 5.5.2). The Committee looks forward to receiving the results of this study next year.

SC/59/BC2 presented an analysis of the reliability of eyewitness reports of entanglement on the U.S. east coast and in Hawaii. A number of problems were identified and it was concluded that (1) preferential use of eyewitness reports from fishermen and whale experts will reduce, but not eliminate eyewitness error and (2) once areas of concern are identified, the magnitude and extent should be explored by other techniques. The Committee was also informed of recent outreach initiatives to improve the reporting rate of entangled whales on the feeding grounds in Alaska and close co-ordination with researchers in Hawaii.

The Committee received two regional reports of risks and rates of entanglement. SC/59/BC15 described an on-going study of entanglement in ten humpback feeding grounds and four breeding grounds in the North Pacific, part of the SPLASH project

(http://hawaiihumpback.noaa.gov/special_offerings/sp_off/splash). The study was based primarily on photo-ID with observation of peduncle scars. The minimum scarring rate at Southeast Alaska was 50.0%, comparable to that for the US Gulf of Maine. A significantly lower rate of 31.6% was estimated for the Hawaii breeding ground, where Alaskan whales mingle with whales from other feeding grounds. The Committee looks forward to receiving the results and interpretation of the expanded analyses at next year's meeting.

SC/59/BC17 examined records of minke whale entanglement and sightings in Scotland and linked these with fishing effort by vessels using lobster pots (creels); 10% of stranded dead whales where cause of death could be determined were thought to have died due to entanglement. Using data on fishing effort in published records and minke whale sighting rates, an index of overlap was defined and used to identify areas of highest risk of entanglement. These included areas in the Hebrides (west coast of Scotland) and off the southeast coast of Scotland.

The Committee noted that this approach may also be applicable to other areas. It looked forward to receiving a comparison of the spatial predictions of risk with locations of reported entanglements. Similar analyses comparing relative distribution patterns of whales and fishing gear are being undertaken for the Gulf of Maine. The problem of obtaining accurate information on fishing effort was noted; the Gulf of Maine study estimated gear density from aerial survey data.

SC/59/BC17 also highlighted the difficulties of estimating the relative proportions of strandings due to entanglement compared to natural causes. In the majority of cases (85%), cause of death was not identified. Entanglement is likely to be easier to determine than other causes, and in other areas, 20-30% of large whale strandings were attributed to entanglement, suggesting higher entanglement rates than for minke whales off Scotland.

7.1.7 Other information relating to bycatch

The Committee received several reports on other international efforts to collect and collate data on bycatch in fisheries.

SC/59/BC5 described the status of an initiative (Project GloBAL) co-coordinated by Duke University (NC, USA) which is synthesizing existing data, coordinating ongoing research efforts and testing novel approaches to data collection at the regional scale. The objective is to assess the magnitude and impact of bycatch of whales and other large marine vertebrates, particularly in areas where such assessments have not yet been conducted. A number of suggestions for improvements were discussed in Annex H (item 5.6).

The Committee was informed that ACCOBAMS is collaborating with the General Fisheries Council for the Mediterranean (GFCM) to address bycatch issues in the Mediterranean. A questionnaire on cetacean-fishery interactions was circulated last summer. GFCM have agreed to establish a working group on by-catch and to hold a meeting on bycatch in 2008. ACCOBAMS is also coordinating two bycatch projects of its own. The first is investigating the extent of cetacean by-catch and strandings in the Romanian Black Sea and coast. The second project, 'BYCBAMS', aims to compile and verify the workability of a standard methodology for data collection on bycatch and depredation, and to define the status of interactions in Italian and international waters. Details are given in Annex J (item 5.6).

The CMS Strategic Implementation Plan 2006-2011 provides for a series of reviews of the impact of various threats to migratory species and a resolution was passed in

2005 on 'Adverse Human Induced Impacts on Cetaceans'. A draft plan for the assessment of bycatch in global fisheries was circulated at the meeting of the Scientific Council in March 2007 and will be further developed in coming months. Objectives are to carry out a comprehensive review of all global commercial and artisanal fisheries. The report of the investigation will identify priority fisheries, regions and species which will benefit from international action through the CMS.

CMS is also planning to hold a meeting for a plan of action for small cetaceans in West Africa. The Committee **recommends** close coordination between the IWC and the CMS to ensure that their efforts along these lines are complementary.

The Committee **agrees** that the instruction associated with the reporting of bycatch in the IWC national progress reports should be clarified, as discussed in Annex J (item 5.7).

Godinho *et al.* (2007) reported that histological changes associated with acute phase proteins were detected in stranded harbour porpoises that had been identified as having died in fishing operations, but the accompanying acute severe liver congestion usually found in stranded animals that died of other causes was not detected. The differential symptoms could be a promising way to make diagnoses of bycatch. The Committee welcomed this information and **agrees** that it has the potential to help identify bycaught animals. It was suggested that samples from bycaught large cetaceans should be examined in a blind study to determine whether the findings hold true for whales as well as porpoises.

SC/59/BC6 presented a Bayesian approach for estimating demographic rates and impacts of by-catch on cetaceans for which data on the age-structure of strandings and observed bycatch are available. While the example used was for the harbour porpoise, the approach could be used with any species of cetacean for which such data exist. The approach combines mortality risk functions to estimate parameters that describe rates of both natural and by-catch mortality throughout life. The approach allows estimation of potential population growth rate and the rate realised under bycatch mortality. This paper was also discussed within the sub-committee on small cetaceans (see Annex L); the potential for such methods to be applied to large whales was noted.

7.2 Methods to estimate bycatch based on genetic data

7.2.1 Progress on intersessional work related to market sampling

The initial workshop held in 2005 on the use of market sampling to estimate bycatch had concluded that it is a potentially useful method and made recommendations for further work, including the use of simulations (IWC, 2006b). Last year, the Committee had recommended continuation of these studies to investigate the sensitivity of estimates of bycatch based on mark-recapture techniques. SC/59/BC4 reported the results of further simulations and details are given in Annex J (item 6.1). The Committee welcomed this work and **agrees** that it supports the conclusions reached in 2006 that the mark-recapture

method using all recaptures gave consistent but negatively biased estimates of the number of whales entering the market. The Committee recalled that the most precise estimates of bycatch based on market data will be obtained if the work is undertaken in conjunction with DNA registers. In further discussion, it was also noted that tracking individual whales from entering the market to retail level, through the use of market surveys in conjunction with DNA registers, could provide valuable data on market characteristics and structure. Obtaining reliable unbiased estimates of the number of whales entering the market may require more detailed information on markets.

One task identified by the Committee prior to holding a 2nd stage workshop was to collate available temporal and spatial information on bycaught whales destined for markets. Initial work on this was presented relating positions of bycatch with set nets and fish markets in Japan as discussed in Annex J (item 6.1). It was noted that the Government of Japan believes that estimation of bycatch from market sampling is of doubtful validity and that market related issues are a domestic matter; in view of this, it stated that its contribution to these discussions would be limited.

In reviewing the progress on intersessional work, the Committee **agrees** that while the 2nd stage workshop would still be valuable, that more data are required before it can take place. It emphasised that while no DNA-register data had yet been made available, if data from DNA registers were used in any modelling or estimation attempt, then the statistical precision of estimates would be improved considerably.

On the general topic of market sampling, SC/59/BC9 reported on species identification of whale products purchased via the internet from commercial markets in Japan. The authors suggested that of 36 fin whale products purchased from 1993 to 2004, 14 were more likely to have originated from the North Pacific or Antarctic rather than from the North Atlantic (Iceland), similar pattern to that found previously for sei whales. The merits or otherwise of this analysis were discussed in Annex J (item 6.3).

The Committee also noted the recent paper by Baker *et al.* (2007), an earlier version of which had been discussed previously by the Committee; the published version contains updated analyses. Their estimate of the true total takes of minke whales for Korea based on market sampling for the 5-year period of 1999 to 2003 was 827 (CV 0.20), compared to the officially reported bycatch of 458.

The sub-committee on the estimation of bycatch and other human-induced mortality also had considerable discussion on matters related to species labelling, stockpiles of whale meat and the Japanese Ministerial Ordinance relating to disposition of entangled whales (Annex J, item 6.3).

The Committee noted previous discussions of the orders relating to the retention and disposition of live bycaught baleen whales and **agrees** that it wishes to receive authoritative translations of the official Japanese orders and regulations. Morishita noted that the Japanese Government was not able to provide formal translations but in principle it was possible for others to translate the documents. The

Committee requests Japan to provide copies of the original documents to the Secretariat, so that translations may be arranged. The approximate titles in English of the documents in question are:

- (a) Ministerial Order on the License and Regulation of Fisheries under Control of the Minister, No. 92 dated 20 April 2001 (came into effect 1 July 2001).
- (b) Announcement of Minister of Agriculture, Forestry and Fisheries No. 563, dated 20 April 2001
- (c) Notification of Director General of Fisheries Agency, No. 1004, dated 1 July 2001

Copies of any other relevant documents would also be welcomed.

7.3 Information and methods to estimate cetacean mortality caused by vessel strikes

7.3.1 Results from data collected on vessels relevant to ship strikes

SC/59/BC11 presented a test of whether placing dedicated observers on vessels can increase the chance of a whale being detected. Observers were placed aboard a high-speed ferry operating between Boston and Cape Cod, MA. A dedicated observer was the first to sight an animal, significantly more often than any other crew member, and observers saw whales at distances >400m significantly more often than the vessel's captain. The Committee welcomed the paper and **agrees** that such observers are useful.

SC/59/BC14 examined official records, newspaper archives and the results of a questionnaire to review for whale collisions in the waters surrounding the Hawaiian Islands between 1975 and 2006. Examination of a correlation between the observed humpback population growth rate of 7% and the 13-fold increase in the number of collision reports suggested that population increase alone could not explain the increasing number of reports. This implies that the increase in reports reflected more collisions due to greater vessel traffic and increased awareness of whale-vessel interactions.

The issue of collisions of whales and whalewatching vessels was discussed and it was noted that whalewatching vessel crews paid less attention when departing an observation site. The Committee **agrees** that underreporting of collisions is problematic in whalewatching, although over-reporting is also possible, if for example bycatch victims are attributed to vessel strikes.

SC/59/BC16 reviewed reports of whale-vessel collisions (mostly humpback whales) in Alaska since 1978, ($n=62$). The outcome was usually unknown ($n=45$), but there were 11 confirmed deaths, (all involving large vessels such as container ships and cruise ships) and two examples of whales surviving over many years. The frequency of whale-vessel collision reports seems increasing, but additional analysis is required to evaluate possible trends. The author also discussed two propeller strikes and post-trauma survival rates. The Committee **agrees** that work should continue to obtain a long-term view.

7.3.2 Report of the IWC Vessel Strike Data Standardisation Group

The convenor (Van Waerebeek) of the intersessional Vessel Strike Data Standardisation Group summarised its work (given as Appendix 2 of Annex J), on developing a relational database template. Members of the Committee are invited to request a copy of the template to test run. It was agreed that organisational issues, e.g. how the database should be populated with data, its access, overview and funding should be considered by the Ship Strike Working Group (SSWG) of the Commission's Conservation Committee.

The Committee commends the working group for its hard work and strongly **recommends** that the database be further fine-tuned, and also forwarded to the Commission's SSWG/CC for comment.

7.3.3 Summary of activities of the Conservation Committee on ship strikes

Two issues in the Second Progress Report of the Ship Strikes Working Group to the Conservation Committee (IWC/59/CC3) were emphasised. Firstly, the International Maritime Organisation (IMO) reportedly does not archive the detailed vessel traffic data to which access was anticipated, but IMO and in particular their Marine Environment Protection Committee (MEPC) could assist IWC to contact the appropriate entities that may provide such information. Secondly, a global stranding networks listing that is being compiled by the CC to identify gaps in monitoring coverage could be enhanced as a scientific tool through a qualitative and quantitative evaluation of spatial and temporal coverage of coasts.

7.3.4. Progress on 2006 SC recommendations

The Committee received an update of ship-strike events with large whales reported in Italian waters in 2006, including data from stranded animals and photo-identified free-ranging individuals. Analysis of the stranding data is still in progress, but so far no evidence of ship strikes was encountered. Two live animals (fin whales) with clear and evident signs of collision were photographed at sea during 2006; additional data are being pursued for analysis.

The Committee noted again that the time series of reported ship strikes in this region is a particularly valuable data set for evaluating the relative risk posed by high speed vessels and looked forward to an update next year.

No new information on histopathological techniques to explore fat embolism or bubble lesions and exposure to sound/collisions was presented.

SC/59/BC7 described results of research to determine the routes and distance travelled by ferries in the Canary Islands. Where known high cetacean abundance overlapped with ferry traffic concentrations, primary and secondary high-risk areas for ship strikes were identified. A larger part of the fast and high-speed ferry traffic is concentrated around Tenerife and its neighbouring islands where important habitats for cetaceans are also located, some of which have been declared as Special Areas of Conservation (SACs) under the EU Habitat Directive. The author recommended that the authorities and/or the ferry operators:

- (a) install an obligatory reporting system, thereby making use of the database template developed by the IWC Vessel Strike Data Standardisation Group;
- (b) implement shifts of transects away from primary high risk areas and/or impose speed restrictions;
- (c) place on-board observers on ferries operating in primary high risk areas;
- (d) implement research projects assessing the actual number of collision or near collision events, preferably by placing researchers on board of the ferries, and
- (e) develop a general strategy integrating different available mitigation measures.

The Committee **endorses** these recommendations, in particular (a), (c) and (d), which relate to estimating mortality. The approach in SC/59/BC7 is potentially useful for assessing collision risk and perhaps developing a range of estimates of ship-strike mortality that may meet the needs of the RMP. However, for the approach to be useful, better information on the species of whale struck and on the number of strikes is required and that will be difficult to obtain. Recognising these problems, the Committee **encourages** further research to determine the rates and outcomes of ship strikes

The Committee **agrees** that areas could be designated for concentrated research on species- and vessel-specific strike rates and their effects. Ship-strike mortality is a concern for management for two reasons: setting commercial and aboriginal/subsistence whaling catch limits, and evaluating threats to the survival of stocks known to be endangered. Present areas of RMP interest are the central and northeastern Atlantic and the western North Pacific. The list of endangered species and stocks would suggest that areas of concern might also include the northwest Atlantic for right whales, the area from the China Sea north to the Okhotsk Sea for western Pacific gray whales, and the Straits of Gibraltar and Mediterranean for fin whales, sperm whales and possibly other species.

SC/59/BC13 reported that the Spanish Maritime Authorities in cooperation with the IMO in 2006 relocated the Cabo de Gata Traffic Separation Scheme (TSS) in southern Spain from 5 to 20 n.miles off the coast because of a high risk of ship collisions, oil spills, and other hazards in an area of high nature-conservation value and a proposed MPA for cetaceans. Subsequently, the Spanish Ministry of Environment coordinated with the Maritime Authorities to reduce the impact of ship strikes on cetaceans in the Strait of Gibraltar, and a Notice to Mariners was published in January 2007 establishing a security area owing to the presence of cetaceans (and especially sperm whales), in which it is recommended to limit speed to 13 knots and to navigate with particular caution.

The Committee **welcomes** these developments that relate primarily to mitigation. It also suggests that ship strike data before and after the TSS and compared. It noted that this should be possible for sperm, fin and pilot whales.

Ship strikes on large whales were reported in five Progress Reports (see Annex Q). Twenty-six strikes were reported: of 9 humpback, 6 fin, 2 blue, 2 North Atlantic right, 1 Bryde's, one common minke, 2 sperm and 3 unidentified whales.

7.4 Other issues

7.4.1 Methods for estimating additional human-induced mortalities e.g. from acoustic sources and marine debris

No new information was available in the documents. However, noise-related mortality was discussed in the Standing Working Group on Environmental Concerns (see Annex K). Mattila noted that the results of a review of the effects of marine debris may be available for next year's meeting.

7.5 Work plan

The workplan is discussed under Item 21.

8. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT PROCEDURE (SEE ANNEX E)

This item continues to be discussed as a result of Resolution 1994-4 of the Commission (IWC, 1995). The report of the SWG on the development of an aboriginal whaling management procedure (AWMP) is given as Annex E. The Committee's deliberations, as reported below, are largely a summary of that Annex, and the interested reader is referred to it for a more detailed discussion. The primary issues at this year's meeting comprised: (1) completion of the *Implementation Review* for the bowhead whale; (2) all aspects of the management of Greenlandic fisheries for common minke and fin whales; (3) provision of advice on humpback and bowhead whales off Greenland; and (4) management advice for the humpback whale fishery of St. Vincent and The Grenadines. Catch limits for aboriginal subsistence whaling operations are due for renewal at the Commission meeting this year.

8.1 Completion of the *Implementation Review* for B-C-B bowhead whales

The Committee has been working on an extensive *Implementation Review* for bowhead whales since 2005 with a focus on issues relating to stock structure. The accepted *Bowhead SLA* was developed and tested for a single stock. The review process has involved work by both the SWG on the AWMP and the sub-committee on bowhead, right and gray whales. Three intersessional Workshops have been held since the 2005 Annual Meeting. The process has benefited tremendously from the considerable effort that had been extended in field and laboratory work, and in analyses of genetic and other data related to stock structure.

8.1.1 Intersessional work

Two intersessional workshops have been held since last year, the first in Seattle in January 2007 (SC/59/Rep3) and the second in Copenhagen in March 2007 (SC/59/Rep4).

The focus of the Seattle workshop was to finalise the stock structure hypotheses and work towards incorporating these into a final modelling framework. After an extensive review of the information available to it at that time, including the nine hypotheses considered at the 2006 Annual Meeting, the Workshop agreed to four hypotheses. These captured the broad biological hypotheses that were consistent with the major sources of information and differed in ways that might affect the implications of different levels of aboriginal subsistence need (see Annex E, Fig.1 and Appendix 2). These hypotheses can be summarised as:

- (1) Hypothesis A. Single stock – no feeding ground site fidelity.
- (2) Hypothesis B. Single stock with feeding ground site fidelity.
- (3) Hypothesis C. Two stocks - spatial segregation-St Lawrence mixed.
- (4) Hypothesis D. Two stocks – mixed migration.

It considered that these hypotheses were sufficient for the purposes of evaluating whether the *Bowhead SLA* is robust to uncertainty regarding stock structure. It did not consider the relative plausibility of the different hypotheses.

It also agreed that unless there were exceptional circumstances, the above stock structure hypotheses would be used in the *Implementation Review* with the focus of any further genetic analyses being to assist in assessing the plausibility of the hypotheses⁴. Finally, it agreed that it would be valuable to develop guidelines for the use of genetic data in *Implementations* and *Implementation Reviews*, based *inter alia* on the valuable experience gained during the *Bowhead Whale Implementation Review*. This latter point is discussed under Item 11.2.2.

The Copenhagen Workshop was a primarily technical workshop to ensure that AWMP-lite could be successfully used to run an agreed set of trials by the 2007 Annual Meeting. One of the most important tasks of that Workshop was to finalise the catch and relative exposure matrices (i.e. the assignment of past catches to putative stocks or sub-stocks) for the hypotheses agreed at the Seattle Workshop.

The Workshop also agreed: (1) that conditioning had been satisfactorily accomplished subject to final checking of the code; (2) the final trial structure (see Annex E Appendix 2 and Table 1); and (3) the format for examining results at the 2007 Annual Meeting.

8.1.2 Results of trials

At the present meeting, the SWG thanked Donovan and the workshop participants for their intersessional work. It noted that documenting the catch series for the Bering-Chukchi-Beaufort Seas bowheads whales had been a substantial undertaking, and that the summary of catches in Annex D of SC/59/Rep4 would provide the basis for assessments and management advice in the future. It endorsed the recommendations of the January and March workshops, including the hypotheses for consideration in trials and the

⁴ Extensive discussions during the sub-committee on bowhead, right and gray whales at the present meeting confirmed that there were no such exceptional circumstances see Item 9.1.

specification of the final set of trials. The Committee **concurs** with that endorsement. In particular it **agrees** that the trials specified in Table 1 are sufficient to test for uncertainty in the context of the *Implementation Review*.

The results of all of the specified trials, plus two additional low plausibility trials that it was agreed to run for completeness but which would not inform management recommendations (see Annex E, item 2.3) are summarised in Tables 2 and 3 of Annex E. These tables list the values for the performance statistics agreed at the Copenhagen Workshop for all of the trials when the catch is (1) determined using the *Bowhead SLA* and (2) when it is set to need. The full set of results for all of the performance statistics are archived at the IWC Secretariat.

In reviewing the results, attention was focussed on those trials few trials (Annex E Appendix 3) for which the conservation performance of the *Bowhead SLA* could potentially be poorer than desirable, i.e. those in which the final depletion is below 0.6K and a reduction in population size occurs (i.e. a value for the relative increase statistic below 1) over the simulation period. These are trials 9, 12-14 and 16. These trials, all of which are based on the assumption $MSYR_{1+}=1\%$, were chosen based on the results when the catch equals the need, because this scenario leads to the greatest impact on population size (catch=need always leads to lower values for the final depletion and relative increase statistics than when the strike limit is based on the *Bowhead SLA*).

The Committee **agrees** that the results show that the *Bowhead SLA* performs adequately for all of the stock structure hypotheses and all trials. It **agrees** that the *Implementation Review* had been extremely thorough and it **commends** the efforts of all of the scientists involved in the process. It **strongly recommends** that the *Bowhead SLA* continues to be used to provide management advice.

The Chair of the SWG concluded that it was particularly pleasing to have completed the long and complex *Implementation Review* for B-C-B bowhead whales. He paid tribute to the hard work of all the scientists who participated in the review and recognised the tremendous field, laboratory and analytical effort involved, as well as the sterling work undertaken by Allison and Punt with respect to computing. Completion of the *Review* will allow more time to address the important issue of moving from interim management advice to more thorough *SLA*-based advice for other aboriginal subsistence fisheries.

8.2 Review progress on the Greenlandic Research programme

The Committee welcomed the presentation of considerable new data and analyses this year resulting from ongoing efforts under the Greenland Research Programme. These efforts are critically important to enable progress toward development of AWMP *SLAs* and for provision of interim management advice.

8.2.1 Stock structure, range, movement

No new information on common minke or fin whale stock structure was presented at this year's meeting. In 2006, samples from 133 common minke and 6 fin whales were collected. Past work strongly supports the hypothesis that West Greenland minke whales constitute only a portion of a larger stock. There was some discussion of how much effort should be placed on analysing the more recently collected samples for West Greenlandic common minke whales. Given that a decision on whether the sex ratio information is sufficient to provide management advice and to form the basis of an *SLA* should be taken next year (see Item 9.4), it was agreed that the 2008 Annual Meeting will be an appropriate time to consider this issue further, since that particular assessment approach is relatively insensitive to stock structure information.

Table 2
The *Implementation Review* trials for bowhead whales.

The survey frequency is 10 years; all trials are based on a deterministic model; no age data are generated; differences from the base-case are shown in bold. Note that apart from Trial BE49, reference to hypothesis 'B' in the column 'Baseline' is applicable to hypotheses 'B' and 'C'

Trial No.	Description	$MSYR_{1+}$	z	Final need	Historical survey bias	Future survey bias	Survey CV (true, est)	Mixing parameter, γ	Baseline
BE01	Base case	2.5%	1.04	134	1	1	0.25, 0.25	0	A, B, D
BE02	Constant need	2.5%	1.04	67	1	1	0.25, 0.25	0	A, B, D
BE09	$MSYR_{1+} = 1\%$	1%	1.04	134	0.67 → 1	1	0.25, 0.25	0	A, B, D
BE10	$MSYR_{1+} = 4\%$	4%	11.22	134	1	1	0.25, 0.25	0	A, B, D
BE11	Bad data	2.5%	1.04	134	1	1 → 1.5 in yr 25	0.25, 0.10	0	A, B, D
BE12	Difficult 1%	1%	1.04	134	1 → 1.5	1.5	0.25, 0.10	0	A, B, D
BE13	Difficult 1%; constant need	1%	1.04	67	1 → 1.5	1.5	0.25, 0.10	0	A, B, D
BE14	Need increases to 201	2.5%	1.04	201	1	1	0.25, 0.25	0	A, B, D
BE16	$MSYR_{1+} = 1\%$; 201 need	1%	1.04	201	0.67 → 1	1	0.25, 0.25	0	A, B, D
BE20	$MSYR_{1+} = 4\%$; 201 need	4%	11.22	201	1	1	0.25, 0.25	0	A, B, D
BE41	Cape Pe'ek abundance=400	2.5%	1.04	134	1	1	0.25, 0.25	0	B
BE42	Cape Pe'ek abundance=1300	2.5%	1.04	134	1	1	0.25, 0.25	0	B
BE43	Barrow Spring W:E ratio=40:60	2.5%	1.04	134	1	1	0.25, 0.25	0	D
BE44	Barrow Spring W:E ratio=60:40	2.5%	1.04	134	1	1	0.25, 0.25	0	D
BE45	Less different mixing	2.5%	1.04	134	1	1	0.25, 0.25	-0.25	B,D
BE46	More different mixing	2.5%	1.04	134	1	1	0.25, 0.25	0.25	B,D
BE47	Stocks have different $MSYR$	1% (W), 2.5%(E)	1.04	134	1	1	0.25, 0.25	0	B
BE48	Stocks have different $MSYR$	4% (W), 2.5%(E)	1.04	134	1	1	0.25, 0.25	0	B
BE49	Coast hugging stock	2.5%	1.04	134	1	1	0.25, 0.25	0	C

On a related matter, the Committee **encourages** further work on the possibility of obtaining a minimum estimate of abundance of common minke whales off West Greenland using genetic methods along the lines proposed last year (IWC, 2007f): 133-4. An intersessional group under Waples will consider this (R3).

8.2.2 Catch distributions

Discussion in the SWG focussed on the sex ratio data for common minke whales, and in particular whether they are suitable for incorporation into the assessment methods discussed under Item 9.4. The SWG welcomed paper SC/59/AWMP3 that had responded to some of the issues raised at the Copenhagen Workshop (SC/59/Rep4). The SWG undertook further GLM analyses of the available data that revealed that:

- (1) the proportion of females in the SW region (in the observed dataset) has declined as years progress;
- (2) sampling effort (for sexed whales in the dataset) has shifted northward as years progress.

Thus the proportion of females in the SW region has declined over time while, simultaneously, effort has shifted away from the SW. These two trends could offset each other, thereby yielding an apparently flat time series of sex ratios that does not fully reflect underlying demography. Efforts to resolve this in the context of the assessment process are thus accorded high priority and an intersessional group was established under Laidre (R5) to carry out the further analyses specified in Annex E, item 3.1.2.1. The Committee **endorses** this approach.

8.2.3 Abundance and trends

Last year, the Committee had welcomed the new abundance estimates for common minke and fin whales obtained from an aerial survey conducted in 2005. In accepting the estimates it had identified a number of further analyses that could be undertaken, particularly with respect to addressing questions of availability and perception bias. The SWG was pleased to receive SC/59/AWMP 7 and 9 that addressed these issues. Details and discussion are given in Annex E, item 3.1.3.

With respect to West Greenland minke whales, the Committee **agrees** that the bias-corrected cue-counting abundance estimate of 10,800 whales in 2005 (95% confidence interval 3,600-32,400) was acceptable and could be used for assessment purposes. It was noted that the confidence intervals were very wide and that this in part was due to the fact that the estimated perception bias adjustment was based on only four duplicate observations and was thus highly uncertain, as well as the fact that the CV on the cue rates was high. The uncorrected estimate was 4,900 (95% interval 1,900-12,300). SC/59/AWMP7 documented a number of reasons why the estimate might remain negatively biased. The Committee recognised that a better perception bias adjustment should be obtained in future years as more data become available and that this should reduce the CV of the estimate.

For West Greenland fin whales, the Committee **agrees** that the bias-corrected line-transect abundance estimate of 3,200 whales in 2005 (95% confidence interval 1,400-7,200) was acceptable and could be used for assessment purposes. The

uncorrected estimate was 1,700 (95% interval 800-3,400). Similar caveats to those above also apply to this estimate. In particular, the potential negative bias in the agreed estimate was believed to be more substantial than for common minke whales because there was no adjustment for availability bias. The perception bias adjustment was based on only six duplicates and again a better perception bias adjustment should be obtained in future years as more data become available.

The Committee was pleased to note that further aerial and shipboard surveys will be undertaken in the summer and autumn as part of the T-NASS surveys endorsed by the Committee last year (IWC, 2007c).

8.3 Progress with the development of management procedures

No direct progress on this issue was reported, because recent efforts have focussed on obtaining satisfactory assessment methods (see item 4. of Annex E). However, the Committee **re-emphasises** the importance it attaches to developing satisfactory *SLAs* for the Greenlandic fisheries as soon as possible, so that it can provide robust long-term management advice (and see Item 9.4 and 9.6). The multispecies nature of the fishery will form part of any considerations of *SLAs*.

8.4 Preparation for an Implementation Review of Eastern Gray Whales

The *Implementation Review* for eastern Pacific gray whales is scheduled for 2009. The Committee encourages scientists to submit relevant research and data (in accordance with the Data Availability Agreement) in the coming year so that consideration of this issue can begin at the next annual meeting with the intent that work be completed in 2009. Ilyashenko referred to a paper (IWC/59/ASW7) primarily aimed at the Commission's ASW sub-committee. The paper dealt with the issue of 'stinky' whales and the need for (1) a definition of such whales for inclusion in the Schedule and (2) a proposal to be made as to how such inedible whales can be taken into account when setting catch limits where advice is provided by the *Bowhead Whale SLA*. The Committee **agrees** that this matter should be referred to the Commission's ASW sub-committee. It noted that the *SLA* approach provides advice on the 'need' requirements agreed by the Commission. If the question of 'stinky' whales was incorporated in a need statement then this could be dealt with by the *SLA*. It also **agrees** that the Committee (and the Commission) would be interested in receiving a document reviewing the annual occurrence of stinky whales in the catch in recent years.

8.5 Scientific aspects of an Aboriginal Subsistence Whaling Scheme (AWS)

In 2002, the Scientific Committee **strongly recommended** that the Commission adopt the Aboriginal Subsistence Whaling Scheme (IWC, 2003b, pp.22-23). This covers a number of practical issues such as survey intervals, carryover, and guidelines for surveys. The Committee has stated the AWS provisions constitute an important and necessary component of safe management under AWMP

SLAs. It **reiterates its recommendation** of recent years and will keep this item on its agenda.

During discussions of *ad hoc* interim advice for several whale stocks this year, the SWG expressed a general concern, noting the undesirability that such interim advice would replace or slow down the development of AWMP SLAs. The SWG was particularly concerned that interim advice should not be renewed or re-generated over long time periods. The important question of time spans for interim advice will be considered further at next year's annual meeting. **The Committee shares this concern.**

8.5.1 General issues arising out of the B-C-B Bowhead Implementation Review

The undertaking of the extensive *Implementation Review* for B-C-B bowhead whales gave rise to a number of general issues that require further deliberation and consideration. These are discussed further under Item 24.

8.6 Workplan

Issues related to the workplan of the SWG on the AWMP are dealt with under Item 21; budgetary matters are considered under Item 23.

9. ABORIGINAL SUBSISTENCE WHALING STOCK ASSESSMENTS

9.1 Bering-Chukchi-Beaufort Seas (B-C-B) bowhead whale stock structure (see also Annex F)

9.1.1 Stock structure hypotheses

SC/59/BRG3 summarised research conducted over the past three years to investigate the stock structure of the Bering-Chukchi-Beaufort (B-C-B) population of bowhead whales, as requested by the Scientific Committee during its 2004 meeting (IWC, 2005e, p.196). Collectively, these studies have resulted in over 80 research papers (and over 300 papers submitted to the Committee) and have contributed new information on B-C-B stock structure, in particular the genetic structure of the B-C-B bowhead whale population. Although understanding of the biology of B-C-B bowhead whale biology has increased, data are sparse in some areas where there are few whales or little hunting. The Committee **stresses** the importance of continuing efforts to collect new biological information. George confirmed the intention to continue the project and to encourage peer-reviewed publication of information and analyses developed to date. The Committee **appreciates** the willingness of the US to continue to collaborate with scientists from other member nations to advance the understanding of bowhead whale biology, including stock structure across the Arctic.

A large number of highly technical papers on bowhead whale genetics were discussed, presenting results from analysis of mitochondrial DNA (mtDNA) control region sequences, analysis of 33 polymorphic microsatellite loci and a preliminary analysis of a new class of nuclear genetic markers, single nucleotide polymorphisms (SNPs). A full discussion is given in Annex F (Item 4.1.1).

An issue of concern during the extensive discussion of these papers was the discovery one week before the

meeting that a small number of whales caught in 1992 had been mis-scored at several loci. When these whales were removed from the analysis, the results for the 1992 whales fell in line with results from the other years and changed the conclusion of the analysis with respect to homozygosity.

There was considerable discussion of the paper and issues related to data sharing under the Data Availability Agreement (DAA) were raised. The following points were clarified: (1) the scoring errors for the individuals in question were only discovered the week before the meeting, too late for inclusion in any of the shared datasets; (2) results for all the papers presented this year were based on the same data, which included the mis-scored individuals; (3) all parties had made extensive efforts to limit formal consideration to datasets agreed to under the DAA; (4) evaluations of data quality continued after the data were finalised for the DAA, leading to discovery of the new errors; and (5) discovery of these errors was reported as soon as feasible to members of the sub-committee on bowhead, right and gray whales.

An ongoing extensive evaluation of errors in the remainder of the dataset is underway. This process is ongoing. Although discovery of additional errors is possible, the recently discovered errors were associated with a few poor-quality samples and should not be indicative of broader problems in the dataset. However, there appears to be increased evidence of poor amplification at some of the old loci.

The Committee **agrees** that the DAA process had been open and generally effective. It notes that a low level of genotyping errors is inevitable. For example, for the bowhead whale microsatellite data, even an error rate far below typical published rates would still yield a number of errors among the roughly 27,000 scores made. The B-C-B genetic datasets have undergone an unusually intense and public scrutiny. Nevertheless, the demonstration in papers presented here that a few mis-scored genotypes can have an unusually large effect in some genetic analyses emphasises the importance of taking all reasonable steps to minimise the number of such errors. The Committee referred to work being undertaken by the Working Group on Stock Definition to develop guidelines for the use of genetic data (see Item 11.2.2) in future work of the Committee. In conclusion, the Committee **agrees** that errors in the present data do not prevent it from completing its stock structure deliberations at this meeting.

Several papers reported that the B-C-B bowhead whales are out of Hardy-Weinberg equilibrium (HWE). When discussing the concept of 'genetic disequilibrium' it is important to be explicit. Four types of departures from equilibrium were identified: Hardy-Weinberg disequilibrium within a single gene locus; linkage disequilibrium between pairs of loci; drift-mutation disequilibrium; and demographic disequilibrium. Demographic disequilibrium will cause appreciable genetic disequilibrium only if age classes differ substantially in allele frequencies. It was noted that this is not likely to be the case with bowhead whales, because even at the presumed nadir following cessation of commercial whaling the population size was at least several hundred individuals.

Collectively, information presented in several papers about HWE departures can be summarised as follows: (1) some departures can be explained by genotyping errors; (2) after accounting for genotyping errors, some departures from HWE remain, which indicate that B-C-B whales do not satisfy all the assumptions of a randomly mating, closed population with discrete generations - these include heterozygote deficiencies (which can result from population subdivision, among other causes) and heterozygote excesses (which are not produced by population subdivision); and (3) the data exhibit only very modest levels of linkage disequilibrium, which is typically a more sensitive indicator of population subdivision than is HWE.

After the long detailed discussion of the extensive genetic investigations, the Committee **agrees** that there is no convincing evidence to suggest that B-C-B Seas bowhead whales represent more than one stock.

The Committee also reviewed a number of non-genetic papers related to stock structure. SC/59/BRG18 described passive acoustic surveys conducted in support of a comprehensive effort to investigate stock structure in the B-C-B population of bowhead whales. In neither survey were bowhead whale calls detected in areas or at times supportive of any of the putative multiple stock hypotheses.

SC/59/BRG12 reported on a cooperative effort to study bowhead whale movements and behaviour using satellite telemetry. Two whales were tagged near Barrow, one in May 2006 and one in September 2006. The movements of the two whales described were consistent with current understanding of bowhead migratory behaviour. Important new information on swimming speeds, probable feeding areas, precise migratory routes and migration timing were also obtained. There was some discussion about implications of movement to the isolation of B-C-B and Canadian stocks, but the Committee noted that genetic evidence was consistent with some level of gene flow between separate stocks.

SC/59/BRG6 provided a summary of progress on analysing vertical bowhead whale photographs collected at Barrow in spring 2003 and 2004 and autumn 2005 and in the Bering Sea during spring 2005. No evidence was found in recapture rates for the presence of a second stock that did not pass Barrow in the Bering Sea, although power was low. Data are now available to make a mark-recapture estimate of population size using photos from spring 2003 and 2004.

An analysis of 1984-94 photo-ID data from the spring migration past Barrow (SC/59/BRG2) showed that mature bowhead whales identified in more than one year showed no fidelity to particular migration timing as might be expected if they represented more than one stock.

Finally $\delta^{13}\text{C}$ oscillations in baleen from whales caught at St. Lawrence Island (SC/59/BRG13) were similar to those in whales caught at Barrow, suggesting that the St. Lawrence Island whales also migrated to the Beaufort Sea.

The Committee **agrees** that after a very thorough consideration of stock structure in the B-C-B bowhead whales over several years, the available evidence supports a single-stock hypothesis. There is no evidence to suggest that the stock structure hypotheses investigated by the SWG

did not cover the plausible range; in fact they also considered two-stock hypotheses (see Item 8.1.12). The management implications of this are discussed under Item 9.2.2.

9.1.2 Other new scientific information

A number of other papers related to B-C-B bowhead whales were considered covering a wide range of topics including issues related to age (SC/59/AWMP1; SC/59/BRG10); historic lengths of whales (SC/59/BRG5) and the development of a calf index (SC/59/BRG7) and photo-identification studies (SC/59/BRG28). With respect to the latter, the Committee expressed its appreciation of the authors' progress in developing a new modelling framework and **recommends** that the matching of all existing photos be completed in the near future to maximise the potential wealth of information contained in the full photo-ID dataset.

9.2 Annual review of catch data and management advice for the Bering-Chukchi-Beaufort Seas bowhead whale

9.2.1 Catch information

SC/59/BRG4 reported catch information for the 2006 Alaskan subsistence harvest. A total of 39 bowhead whales were struck, resulting in 31 animals landed. The efficiency (ratio of the number landed to the number struck) of the hunt was 79.5%, almost identical to the average efficiency over the past 10 years (79%). Of the 31 whales landed, 21 were males and 10 were females. Of the 10 females, only one was presumed mature ($>13.4\text{m}$ in length). Ice and weather conditions challenged hunters during spring, resulting in the lowest spring harvest ($n=5$) for the past 35 years. This contributed to an overall lower harvest in 2006 when compared to the previous 10 years.

SC/59/ASW5 reported that no catches were taken of bowhead whales off Russia due to adverse ice and weather.

9.2.2 Management advice

After full consideration of the stock structure discussions, the SWG on the AWMP **strongly recommended** that the *Bowhead SLA* remains the best tool for providing management advice on bowhead whaling (Item 8.1.2), noting that was robust to a wide range of stock structure hypotheses. The Committee **concurs** with this strong recommendation. The results from the *SLA* show that the present strike and catch limits are acceptable. The *SLA* has been run assuming 67 strikes per year i.e. 335 strikes for the 5-year block; a strike is always assumed to result in death. Between block and between year carryover is allowed under the proposed AWS (see Item 8.5).

9.3 Annual review of catch data and management advice for the eastern North Pacific gray whale

9.3.1 New scientific information

SC/59/BRG1 reported on the 2006/07 census of the eastern North Pacific stock of gray whales. The Committee **looks forward** to receiving analyses of these census data.

SC/59/BRG26 presented an application of a population dynamics modelling framework that incorporates a hypothesised relationship between an environmental

variable and a life history parameter for a cetacean population. A method was adopted, which integrates an environmental index hypothesised to be related to calf production, into the stock assessment for eastern North Pacific stock of gray whales. Calculation of the ice index used in the analysis followed previous work by Perryman *et al.* (2002). Future work will provide a framework for testing hypotheses regarding the role of alternative indices (including different temporal and spatial resolutions of sea-ice) on population dynamics.

9.3.2 Catch and stranding information

SC/59/BRG40 provided a preliminary review of stranded gray whales from Alaska to Baja California, Mexico. A total of 1,892 dead gray whales were found during the period 1975-2006. The authors make a number of recommendations to enhance the understanding of strandings of gray whales. The most important is the development of a central stranding database to better track the trend in gray whale strandings and to enhance communication and monitor effort.

SC/59/ASW5 summarised information relevant to the Russian aboriginal hunt for gray whales in 2006. The Russian Federation landed a total of 129 gray whales (including 55 males and 74 females) in 2006. A total of five gray whales were struck and lost during the harvest season 2006, yielding a total of 134 struck whales. Only 16 of the 22 whaling villages in Chukotka were able to participate in the hunt due to severe ice and weather conditions, and for technical reasons. Biological samples were taken from 29 harvested whales in 2006. Biological data are considered in Annex F (item 6.1.2). Five whales (known as 'stinky' whales) exhibited a strange smell, an unpleasant taste and are inedible for humans, representing a nutritional loss for the native people (see Item 8.4).

9.3.3 Management advice

At this meeting, the Committee **reaffirms** its advice from last year that the *Bowhead Whale SLA* remains the most appropriate tool for providing management advice for this harvest. The results from the *SLA* show that the present strike and catch limits are acceptable (a total catch of up to 620 for the five year block). An *Implementation Review* is scheduled for 2009.

9.4 Management advice for common minke and fin whales off west Greenland (see also Annex E)

As it has stated on many occasions, the Committee has never been able to provide satisfactory management advice for either the fin or common minke whales off West Greenland. This reflects the lack of information on stock structure and abundance, and the absence of appropriate assessments. It has viewed this matter with great concern and was the primary reason the Committee first called for the Greenland Research Programme in 1998.

The present catch limits set by the Commission are up to 175 common minke whales struck in each year for the period 2003-2007 with a provision that up to 15 strikes may be carried over from one year to the next and a catch of up

to 19 fin whales each year. New catch and strike limits are due this year.

9.4.1 Catch data

SC/59/ProgRep Denmark reported the following catch information for 2006. East Greenland: 2 common minke whales (2 males; 0 females; 1 struck and lost); West Greenland: 175 common minke whales (43 males; 128 females; 4 unidentified sex; 6 struck and lost) and 9 fin whales (2 males; 6 females; 1 struck and lost; 1 unidentified sex).

9.4.2 Assessment of common minke whales off West Greenland

At last year's meeting, the Committee had received two papers that used sex ratio data as the basis for an assessment of common minke whales off West Greenland (IWC, 2007f, pp.136-7). The Committee had welcomed this work but had identified a number of issues that needed to be addressed before such an approach could be considered acceptable. Further work was undertaken and reviewed at the intersessional workshop in Copenhagen and, as a result, two further papers (SC/59/AWMP6 and 8) were considered at this meeting. There was considerable technical discussion of the papers by the SWG and the details can be found in Annex E (item 4.2.1).

In conclusion, the Committee **welcomes** the considerable progress on assessment methods made at the Copenhagen workshop and at the present meeting. However, it **concurs** with the view of the SWG that it is not in a position to accept an assessment for this stock at this meeting, although it recognised that substantial progress had been made in agreeing the statistical basis for using sex ratio data in assessments. This conclusion was based on the complexities of the assessment methods proposed and the questions remaining about aspects of the modelling approaches presented as well as the data themselves. The Committee therefore **strongly recommends** that an intersessional workshop be held to make progress on West Greenland common minke whale assessment with the goal of being in a position to accept a final assessment at the 2008 annual meeting, following the advice given in Annex E.

9.4.3 Assessment of fin whales off West Greenland

SC/59/AWMP4 updated the SC/M07/AWMP4 (Witting, 2007a) assessment paper for fin whales off West Greenland using discrete population dynamics models with exponential, density regulated and inertia dynamics.

The SWG had welcomed this paper which had benefited from discussions at the Copenhagen workshop. After discussion of a number of factors about the approach, particularly with respect to model selection (see Annex E, item 4.2.2), the SWG was pleased to conclude that the analyses presented in SC/59/AWMP4 were acceptable for formulating interim management advice. It noted that this is the first time that an acceptable assessment method has been developed for this stock. The Committee **concurs** with this view.

The Committee **agrees** that the 'D' model of SC/59/AWMP4 was the most appropriate upon which to base such advice. This model uses the 1988 abundance estimate of 1,100 (CV 0.35), the uncorrected recalculated abundance estimate of 1,652 (CV 0.37) for 2005, and a beta distributed abundance bias with mean 0.51 and CV 0.21 as given by the detection probabilities of the 2005 aerial survey. It uses the standard density dependent population model for consistency with previous practice in the Scientific Committee. The population productivity value underlying the Q_1 (see Wade and Givens (1997)) estimate is not based on data for the population itself but is primarily informed by either the pre-specified value for MSYR(1+) or the prior distribution for MSYR(1+).

Table 3 presents the posterior median and 90% intervals for the current depletion (population size relative to the pre-exploitation level) and Q_1 . Since the 1+ abundance is estimated to be above MSYL (the lower 5%-iles for population exceed MSYL), Q_1 represents 90% of the estimated MSY. Results are presented for two assumptions for MSYR(1+): a lognormal prior from the EGI fin whale stock from SC/14/FW23 (Branch and Butterworth, 2006) which reflects a median estimate of about 1.5%, and 1% which is the lower bound of the plausible range used for recent AWMP trials.

Table 3

Q_1 (see text) and depletion median estimates with 90% credibility intervals in parentheses for two assumptions about productivity.

MSYR values	Q_1	depletion
Lognormal prior	26 [14; 55]	0.90 [0.75; 0.97]
1%	19 [13; 30]	0.85 [0.71; 0.93]

The Committee also noted that given that the abundance data available for the population are limited, a number of different models would be consistent with these data. Nevertheless, the degree of safety associated with the Q_1 values can be judged by the fact that 1% of the lower 5%-ile of the best estimate of abundance of 3,220 (1,630 – 6,355) for 2005 is 16 which does not depend on model assumptions.

9.4.4 Management advice for common minke whales off West Greenland

The Committee stresses that it is in a **considerably stronger position** than it has been in recent years in terms of being able to provide management advice for this stock. In particular, it has accepted a new abundance estimate from the 2005 aerial survey. That estimate is 10,800 with 95% confidence interval 3,600-32,400 (see item 8.2.3). In addition, considerable progress has been made at both the Copenhagen workshop (SC/59/Rep4) and the present meeting on developing an assessment method incorporating the available sex ratio data. The Committee noted the SWG plans to hold an intersessional workshop so that at the 2008 Annual Meeting it will be possible to make a final recommendation on whether this method can be used to give management advice in the short (5-year) term and if so, to provide that advice. Should this work prove successful, it would open the door to beginning

development of a full *SLA* approach for providing long-term advice.

The new abundance estimate is not significantly different to the 1993 estimate accepted by the Committee, although the power to detect differences is low. Questions about stock structure remain. Although the survey estimate does not apply to the whole population available (*inter alia* given the consistent strong female bias in the catches), it is not presently possible to determine by how much it is an underestimate. This issue will be addressed should the proposed assessment method prove to be applicable next year. However, despite the great improvement in the situation compared to previous years, the Committee remains **concerned** that it is not in a position to give authoritative advice on safe catch limits this year. Given that, it **agrees** that it is not possible for it to give more than interim *ad hoc* advice for the forthcoming season, noting that it believed that there was a reasonable chance that it would be in a position to provide advice at the 5-year block timescale next year. Therefore, the Committee **recommends** that any quota established by the Commission on the basis of the interim *ad hoc* advice below be limited to one year only.

While the Committee does not feel in a position to **recommend** a single number, it offers the following advice to the Commission, following the approach of last year: under the assumption that (a) $MSYR_{mat}$ is 3%⁵; (b) that the true population has a sex ratio of 1:1; and (c) that the population is underestimated by factors between 2 and 2.7⁶, the estimated annual replacement yield ranges from about 170 to 230 whales if the lower bound of the revised 2005 aerial survey estimate is used.

The Committee **agrees** that **the Commission should exercise caution** when setting catch limits for this stock. It emphasises its **strong recommendation** that safe long-term management of aboriginal whaling is best accomplished under an agreed AWMP *SLA*. It therefore **agrees** that development of an *SLA* for this fishery should begin as soon as practical.

Finally, the SWG noted that new aerial and shipboard surveys will be undertaken this summer and autumn as part of the extensive T-NASS survey endorsed by the Committee last year (IWC, 2007c, p.4) and it expects new abundance estimates to be provided next year.

9.4.5 Management advice for fin whales off west Greenland

The Committee **welcomes** the new agreed abundance estimate for this stock and the new agreed assessment method. This is the first time that it has had an assessment for this stock. The Committee therefore believes that it is able to provide interim management advice for this stock for the 5-year block period. It notes that the assessment results suggest that this fin whale stock is above its

⁵ The Committee has elsewhere suggested that the likely value for common minke whales lies towards the upper end of the range 1-4% (IWC, 2004a), p. 10).

⁶ Although not accepted as appropriate to use to provide management advice at this meeting, the value of 2.7 is broadly compatible with the results of the methods that attempted to use sex ratio information to obtain a lower bound for the total population abundance.

maximum sustainable yield level (MSYL) - perhaps considerably above it.

The Committee **recommends** the following advice to the Commission: for the preferred estimate of productivity, the estimated posterior median for Q_1 is 26 while the lower 5% credibility value is 14; the comparable values for current depletion shows the stock to be at 97% and 75% of its initial size, respectively⁷.

Although the Committee is pleased to be in a position to provide this interim advice, it **emphasises** that safe long-term management of aboriginal whaling is best accomplished under an agreed AWMP *SLA*. It therefore **agrees** that development of an *SLA* for this fishery begins immediately.

9.4.6 Management advice for common minke whales off East Greenland

In recent years, a catch of 12 minke whales off East Greenland has been allowed. No new information on stock structure, abundance or trends was available this year. However, catches off East Greenland are believed to come from the Central stock of minke whales. The Committee notes that the present catch limit represents a very small proportion of the Central stock that numbers well over 60,000 animals (see Annex E, Table 5 for the estimates agreed at the most recent RMP *Implementation Review*). The Committee **agrees** that the present catch limit poses no threat to the stock

9.5 Humpback whales off St. Vincent and The Grenadines (see also Annex E)

The catch in 2007 was reported to be one female; it was not accompanied by a calf and was not lactating.

The Committee was informed that genetic samples for the whales caught in 2005, 2006, and 2007 have been collected and plans for analysis are in place. The fluke photographs for the 2000, 2003, 2005, and 2006 catches had been submitted for comparison to the North Atlantic Humpback catalogue, and no matches were identified. It **welcomes** this information and particularly **commends** the collection of genetic samples and fluke photos. It **strongly encourages** the continued collection of such data from future catches.

The Committee **agrees** that the animals found off St. Vincent and The Grenadines are part of the large West Indies breeding population. The Commission adopted a total block catch limit of 20 for the period 2003-07. The Committee **agrees** that renewal of this catch limit for another 5-year block will not harm the stock.

9.6 Request for management advice for other large whales off West Greenland (see also Annex E)

This item had been included on the agenda in response to a request made at the last Commission meeting by Denmark and the Commission had agreed that this topic could be added to the Committee's workplan.

The Danish Commissioner had stated that:

'Bearing in mind that the absence of scientific knowledge on minke and fin whale stocks could lead to a reduction in quota of large whales, Denmark indicated that on behalf of Greenland, it would like to request the Scientific Committee to evaluate the situation regarding other large whales off West Greenland. In particular, it was seeking advice on the viability of obtaining the missing 220 tons of meat from catches of other species of large whale such as bowheads and humpbacks. It was noted that these two species have been caught by Greenland in the past and that there are signs that the West Greenland stocks are increasing and that they could sustain a small and well-regulated catch.' (IWC, 2007a).

The Committee wishes to **draw the Commission's attention** to the following concerns.

The Committee has done its best to provide this advice in the time available. However, in doing so it wishes to **emphasise** the difficulties surrounding the provision of *ad hoc* interim advice on catch limits. This is particularly true for new populations for which there has been relatively short notice that advice would be required and for which the Committee has not recently assessed their status. It draws the Commission's attention to its view that it is inappropriate to provide *ad hoc* interim advice for long time periods. The appropriate way to provide long-term advice is through the development of *SLAs* that have been thoroughly tested for robustness to uncertainty and for which it has been agreed that they can meet the Commission's stated long-term management objectives. Any *ad hoc* interim advice must not be seen as a replacement for AWMP *SLAs* and its provision should not slow down their development. Given these concerns, it **reiterates** that the important question of time spans and *ad hoc* interim advice will be considered further at next year's annual meeting.

9.6.1 Humpback whales STOCK STRUCTURE

On the basis of past evidence considered by the Committee over many years, and in particular the in-depth assessment completed in IWC (2002b; 2003c) the Committee **agrees** that the humpback whales found off West Greenland belong to a separate feeding aggregation whose members mix on the breeding grounds in the West Indies with individuals from other similar feeding aggregations. It further **agrees** that this West Greenland feeding aggregation was the appropriate management unit to consider when formulating management advice.

ABUNDANCE AND TRENDS

SC/59/AWMP7 presented the results of an aerial survey of large whales off West Greenland conducted in August and September 2005. Information on fin and common minke whales was considered under Item 8.2.3. The survey covered the area between Cape Farewell and Disko Island on the West Greenland coast out to the 200m depth contour and there were 21 sightings of humpback whales. Humpback whales were found both in offshore and coastal areas of West Greenland with the exception of Store Hellefiske Bank and the Cape Farewell offshore area. The line transect abundance estimate of humpback whales is 1,218 (CV=0.56; 95%CI 423; 3,508), uncorrected for availability and perception bias.

There was considerable discussion of this estimate (Annex E, item 5.1.1.2). Some questions were raised as to whether the standard line transect methods were the best way to

⁷ There is an estimated 50% probability that posterior median value is too high and the same that it is too low. There is a 5% estimated probability that the lower credibility bound is too high.

analyse data for animals exhibiting such a high degree of spatial clustering and with several incidences of very large (e.g. in one case, 95) estimated school sizes. In conclusion, the Committee **agrees** that the estimate in SC/59/AWMP7 is an underestimate in so far as it does not correct for perception or availability bias. It was unclear whether investigations to develop methods better suited to highly clumped, large school size animals might result in suggesting positive or negative bias in the present estimate. Whilst welcoming this estimate, some of the concerns expressed about the analysis methods prevented the Committee from endorsing it for use in assessment or providing management advice at this meeting. Noting the substantial negative biases as a result of not incorporating perception or availability bias, however, the Committee **agrees** that the new data suggest that West Greenland humpback whale abundance is probably higher than previously believed. The Committee also noted that there would be shipboard and aerial surveys off West Greenland this summer and looked forward to receiving abundance estimates for humpback whales next year. Some members suggested that there was value in considering further photo-identification work with a view to updating the existing mark-recapture estimates.

The Committee also briefly reviewed past abundance estimates for West Greenland humpbacks, particularly in the context of the assessment of SC/59/AWMP5 (see Annex E item 5.1.1.3), which used several of these estimates and omitted several others. An intersessional correspondence group under Hammond (convenor) was established to determine the best collection of abundance estimates to use for future assessments (R4). This group will report to the planned intersessional workshop on Greenlandic assessments (see Item 20).

ASSESSMENT

SC/59/AWMP5 updated the SC/M07/AWMP5 (Witting, 2007b) assessment paper for humpback whales off West Greenland using discrete population dynamics models with exponential, density regulated, and inertia dynamics. To account for uncertainty in the catch history, separate trajectories were made with 0, 5 and 10% of the West Indies catches allocated to the West Greenland summer aggregation.

There was considerable discussion of this approach in the SWG (Annex E item 5.1.1.3). The SWG concluded that it was not in a position to agree upon an assessment at this meeting. The assessment of these whales is complex and merits more careful consideration than could be given in the time available at this meeting. Furthermore, despite the similarities of the proposed assessment method to the method agreed for West Greenland fin whales, the situation is rather different because current depletion is sensitive to assumptions regarding historical catches in the West Indies (posterior median 29-97%) for a range from 0-10% catch allocation (table 4 of SC/59/AWMP5). Therefore, greater confidence in the assessment is required before using it to formulate management advice. The SWG referred West Greenland humpback assessment methodological development to the proposed intersessional workshop. Two specific questions addressed by this workshop should be the selection of abundance estimates to use in assessment and the appropriateness or otherwise of conducting an

assessment on the West Greenland feeding aggregation on its own. The Committee **concurs** with this view.

MANAGEMENT ADVICE

The Committee **agrees** that it is unable to respond to the request for management advice at this time. The large abundance estimate discussed - but not fully endorsed - above was a source of both encouragement and concern. Concern over the consistency of this estimate with previous ones is one reason to proceed cautiously. On the other hand, the lower confidence bound for abundance would be one which, if endorsed after future study, might permit formulation of *ad hoc* interim management advice.

The SWG notes that it may receive new abundance estimates at the next annual meeting. It also notes that there will be time for a more detailed examination of assessment methods at the proposed intersessional workshop. It therefore **agrees** that it will be in a better position to provide management advice at the next annual meeting.

The Committee **draws the Commission's attention** to its view on the problems associated with the provision of *ad hoc* interim advice expressed at the beginning of Item 9.7

9.6.2 Bowhead whales

The Committee noted its view that a single shared Eastern Canada-West Greenland stock in the eastern Arctic should be recognised as the working hypothesis (see Item 10.8) and the need for a thorough discussion of stock structure, including comprehensive analyses of genetic data, at the next annual meeting.

It also noted the new agreed abundance estimate of 1,230 bowhead whales (95% CI: 500-2,940; 90% CI: 570-2,550) in the survey area. This estimate does not reflect the total population size of the putative Eastern Canada-West Greenland stock, but only the animals present in West Greenland in the winter.

MANAGEMENT ADVICE

The Committee **emphasises** that no assessment of this putative stock has been undertaken. The new abundance estimate of whales wintering off West Greenland could form the basis of *ad hoc* interim advice since the Committee has in the past provided advice based on 1% of the lower 95% confidence limit of the abundance estimate. For the present estimate that would be 5 whales. However, the Committee **draws the Commission's attention** to its view on the problems associated with the provision of *ad hoc* interim advice expressed at the beginning of Item 9.7. It also noted that there would be a full examination of stock structure at the 2008 annual meeting.

10. WHALE STOCKS

10.1 Results of the 2006/07 SOWER cruise (see also Annex G)

10.1.1 Cruise report

SC/59/IA1 presented the report of the 2006/07 SOWER cruise, the 29th cruise in the series. The research area was the western part of Area III (000°-020°E longitude). *Shonan Maru No.2* departed from Cape Town on 21 December 2006 and returned on 23 February 2007. The primary species were the Antarctic minke whale

(methodological experiments including use of BT (Buckland-Turnock method, (IWC, 1981b)) mode with and without big eye binoculars, school size estimation (SS), angle and distance experiments including use of video), fin whales (survey, photo-identification and biopsy sampling) and blue whales (acoustics, photo-identification and biopsy). Opportunistic photo-identification and biopsy sampling was carried out on other species where possible. Further details and discussion can be found in Annex G item 5.2. The cruise experienced good weather and was very successful both in terms of experiments and in the collection of photo-identification data and biopsy samples.

The Committee **expresses its gratitude** to the Government of Japan for providing the vessel and thanks the officers and crew, the Cruise Leader and the researchers for all their work to ensure a successful cruise.

The Committee **agrees** that any potential opportunistic research studies undertaken on the cruise should be discussed at the planning meeting (Annex G, item 5.3).

10.1.2 Review of experiments

The Committee reviewed the experiments conducted on the 2006/07 survey. Discussion focussed on: (1) their usefulness in providing extra data or information for assisting in analyses or interpretation of results from CPII and CPIII⁸ data; and (2) their practicability for implementation on future SOWER surveys.

SS-III EXPERIMENT: SURVEY IN IO MODE WITH CLOSING WHEN ABEAM

Since data from this experiment are directly useful for some methods of analysis of CPII and CPIII data, and they are also an important diagnostic for all methods, the Committee **recommends** that these data be encoded and validated as **high** priority. There were no practical problems with the experiment. The Committee **agrees** that in principle, the protocols of the experiment can be adapted as a new survey mode to replace Closing mode. However, logistical issues, together with the results of analyses specified above, need to be considered at the planning meeting in September 2007.

SS-II EXPERIMENT: SURVEY IN PASSING MODE WITH CLOSING WHEN ABEAM

This experiment was first conducted on the 1984/85 survey. The Committee **agrees** that a comparison of the new data and those from that experiment should be conducted. If the analyses of the data yields similar results for SS-II and SS-III, then future surveys could operate in IO mode and SS-II mode (with SS-II mode replacing Closing mode). This would allow for the normal scheduled rest periods for the crew, which would not be an option if alternating IO and SS-III modes were used.

BIG-EYE BT MODE: HIGH POWERED BINOCULARS (BIG EYES) ON UPPER BRIDGE AND 7X50 BINOCULARS IN THE BARREL

Potentially, these data could be used to estimate $g(0)$ for 7x50 topmen sightings, therefore providing a comparison with $g(0)$ estimates from the analyses of the CPII and CPIII data. Thus the Committee **recommends** that these data are

validated and analysed. The Committee noted that some practical issues remain, e.g. logistical problems with mounting the Big-Eyes resulted in considerable overlap in search areas between that of the Big-Eye observer and of the topmen in the barrel, searching with 7x50 binoculars. This negates the intended utility of BT mode, thus further Big-Eye BT mode experiments are only potentially useful in the context of analysing and interpreting existing data; this mode is not suitable for general use in future SOWER surveys.

BT OPTION 2: 7X50 BINOCULARS IN THE BARREL; NAKED EYE SEARCHING FROM THE IO PLATFORM

This BT mode option was included as an experiment to test its potential utility in future SOWER surveys. It was easily implemented, although refinements in the data recording systems will enhance the data quality. Further 'experimental' uses of the mode should be considered. The main purpose of any analysis would be to assess search area separation and measurement error issues. The Committee considered these to be of medium priority, depending on the future of the SOWER programme.

SCANS II : SIGHTING TIMES, RANGE AND BEARING DATA RECORDING SYSTEM

A number of practical problems associated with climatic conditions in the Southern Ocean prevented the full implementation of a new recording system. These types of difficulties could be overcome, but with the medium- to long-term future of the SOWER programme currently uncertain, further consideration of this was deferred. In the short-term and recognising the need to evaluate the extent and effect of measurement errors, the Committee **recommends** that the experiment be continued in a reduced form, perhaps using just the video component of the system (which would yield accurate ranges for a proportion of the sightings). Unfortunately, the still camera bearing measurements may be lost due to a hard drive failure. The Committee **recommends** attempting to recover these data so the data could be analysed.

VISUAL DIVE TIME EXPERIMENT

This experiment was very useful for identifying realistic scenarios for incorporation into the simulated data set, and (potentially at least) for designing suitable estimators of abundance. The Committee **agrees** that the results from analyses of data from this experiment (Hedley and Ensor, 2006) should be used to condition the diving behaviour of whales in the simulated data.

PREVIOUS EXPERIMENTS

Trials of BT survey mode were conducted 2005/06 IDCR/SOWER cruise, where the Tracking Platform searched using both Big Eyes and 7x50 binoculars on the Upper Bridge while the Primary observers searched using 7x50 binoculars. The aim was to provide an independent estimate of $g(0)$ that could be compared with those that resulted from the new methods under development. Examination of the sighting angles and radial distances (SC/59/IA5) suggested that there had not been a sufficient separation of search areas between the Tracking platform and the Primary observers, even for big eye sightings. Thus, the Committee **agrees** that the platform configuration and implementation should be reconsidered for future cruises.

⁸ The IDCR/SOWER cruises cover only part of the Antarctic each year; there have been three circumpolar series; CPI, CPII and CPIII.

10.2 Southern Hemisphere minke whales (see Annex G)

10.2.1 Estimate abundance of Antarctic minke whales

10.2.1.1 ESTIMATES FROM IDCR/SOWER CRUISES

This year, the Committee continued to focus on obtaining estimates of minke whale abundance from the IDCR/SOWER surveys. The only new estimates available were from the hazard probability method of Okamura and Kitakado (SC/59/IA14). The other two new methods that have been presented – Cooke's integrated approach and Bravington's spatial model – still require development before they can be reliably applied to the IDCR/SOWER data. The Committee was informed that estimates from these will be available at the 2008 annual meeting.

SC/59/IA14 presented minke whale abundance estimates for the IDCR/SOWER circumpolar surveys, using the updated hazard probability method. The estimated $g(0)$ s by Area and year, integrated over school sizes and strata heterogeneity, were generally between 0.4 and 0.6. The abundance estimates, therefore, were larger than those of Branch (2006) who assumed $g(0)=1$. The difference in the abundance in each Area between CPII and CPIII was generally reduced in comparison with the results from the standard methods, although the $g(0)$ s for CPII were unexpectedly smaller than those for the CPIII survey. In order for the abundance estimates presented in SC/59/IA14 to incorporate additional variance, abundance estimates need to be calculated by 'comparable area'. These calculations will be completed intersessionally.

In discussion, the authors confirmed that, at this stage, the model used in the data analysis had been selected according to performance in the simulation tests not the true data. As shown in SC/59/IA15, the method had performed reasonably well with the simulated datasets. Unlike the model presented in Okamura *et al.* (2005), this model was conditioned on confirmation status in both Passing and Closing modes for estimating mean school size (since the model that included confirmation status performed no better in the simulation tests than the present model). There is a possibility that estimates of school size based only on confirmed sightings could be biased. The reasons are complex, and not easy to check, although SS III data from the 2007 SOWER school size experiment might be useful. The Committee **agrees** to add 'confirmation' (dependent on school size and/or survey mode) to the list of factors possibly to be tested in the simulation trials and to discuss intersessionally further ways of checking bias.

As it was expected that estimates from all three new methods would be produced intersessionally, further consideration was given to identifying suitable diagnostics to facilitate a comparison of estimates from all three models and to evaluate goodness-of-fit. Such diagnostics had been extremely valuable in assessing methods to analyse North Atlantic minke whale data. The Committee **recommends** that diagnostics (including those appropriate for assessing spatial model fits) be developed and applied to the relevant aspects of the three new methods.

The Committee recognised the value of these simulated data sets for evaluating the different analysis methods. It **agrees** that there were other factors that might require simulation tests to fully evaluate the reliability of the new abundance estimates expected next year. Precisely which

factors require simulation tests, and exactly how to do so, will be agreed by an intersessional email group (convened by Palka) in time for the intersessional workshop proposed in Appendix 3 (R17).

Extrapolating to unsurveyed areas, especially when there are variations in density within the survey region, as is probably the case for IDCR/SOWER data, raises difficulties. While this can probably best be addressed using a spatial model, the question of how to quantify uncertainty arises. This issue is also referred to the intersessional group (R17).

CONCLUSIONS AND FURTHER WORK

One of the three new methods under development had reached the stage where preliminary estimates of abundance for the CPII and CPIII surveys were presented. The key new feature of this method is estimation $g(0)$, which resulted in estimates of this quantity which were substantially less than one. This represents an important advance over the past 'standard' method for which the assumption and expectation were that $g(0)$ was essentially one. This results in increases in the abundance estimates for both the CPII and CPIII surveys. In relative terms, the extent of the decrease in estimated abundance from CPII to CPIII is reduced, but some differences still remain (see also below).

Whilst the new estimates presented this year are only preliminary, they did reveal that the appreciable decline in minke whale abundance estimates made using the standard method from CPII to CPIII cannot be explained by differences in $g(0)$ alone (and see Item 10.2.2). This year, the Committee briefly considered other reasons for the difference in estimates, including effects that might pertain only to specific Areas. For example, in the Weddell Sea in Area II, the Ross Sea in Area V (both large embayments) and in Area VI, large and complex differences in sea ice extent occurred. The question of what to do about unsurveyed areas (there was a large unsurveyed polynya south of the ice edge in Area II in CP III) was also considered. The Committee **agrees** that it would therefore be appropriate to develop at least the first two, and perhaps the following three, sets of abundance estimates for next year's Scientific Committee meeting:

- (1) estimates by Area from the surveyed regions;
- (2) estimates by Area from comparable surveyed areas in CPII and CPIII, where appropriate - these are considered to be the best available way to estimate CPII:CPIII ratios; and
- (3) estimates obtained using the most appropriate method for extrapolating northwards to 60°S - the uncertainty in these extrapolated estimates would be less accurately quantified, but this may not matter for some applications.

In addition, the Committee recognises that a number of detailed issues with respect to the new methods and the abundance estimates remain. These include: the analysis of recent data from SOWER experiments; appropriate simulation tests; diagnostic checks including some of those used in evaluating abundance estimates of North Atlantic minke whales; and space/time extrapolation/interpolation. These issues must be resolved before the Committee can

agree on a set of abundance estimates with reasonable confidence. Experience from Committee discussions in recent years has shown that it is impossible to resolve such matters satisfactorily during the main Committee meeting or in intersessional email groups. The in-depth assessment of Southern Hemisphere minke whales has already taken much longer than anticipated, and if the Committee is going to finish this soon, an intersessional workshop will be necessary. After such a workshop (and some associated intersessional email correspondence), the Committee in 2008 should be able to quickly come to an agreement on best available estimates, leaving enough time during the 2008 meeting for discussion of interpretation. Therefore, the Committee **strongly recommends** that such an intersessional workshop takes place.

10.2.1.2 ABUNDANCE AND TRENDS USING JARPA DATA

SC/59/IA11 presented analyses of JARPA minke whale data to address several recommendations offered during the JARPA Review Meeting (SC/59/Rep1). After pooling sighting data, the shape of detection functions, including the 'shoulder', was improved in most of the cases, but the shape of some of the detection functions still need further investigation. Extrapolating density into un-surveyed areas did not change the abundance estimates substantially except in one instance. Other recommendations offered by the JARPA review meeting will be considered in the near future.

SC/59/IA19 found that in Area IV there were trends in the timing of the survey of the ice edge strata, in particular, the last three surveys (from 1999/00 to 2004/05) were different from the previous five. In Area V there was also a trend in the timing of the survey of the strata, with a different sequence occurring during the last three surveys. The fact that the timing of the surveys changed directionally confounds interpretation of trends in abundance of whale species. Given that minke whale density is relatively high in the ice edge strata, these changes may be particularly important to interpretation of trends in minke whale abundance.

In response, it was pointed out that the survey gaps between the northern and southern strata in the Ross Sea in 1990/91 and 1992/93 were not due to changes in the survey design but because of poor weather. As far as survey design, JARPA was planned to be conducted mainly in January and February to cover the feeding migration peak of the minke whales, and most strata in Area IV and V were surveyed in these months.

The Committee noted that there was some search effort conducted in March, especially in the Ross Sea, and that it was clear that the order in which the strata were surveyed had changed over time. This could potentially cause a trend in the estimates because of different ice extent later in the season. In further discussion, it was suggested that an interaction between north/south strata and the temporal dependence be considered, as the impact of migration patterns might differ by latitude, although this effect would probably be small compared to the extent of additional variance. There was no agreement whether the analyses in SC/59/IA11 provided a satisfactory basis for a correction

for this issue because the Committee did not have time to complete its discussion.

The Committee recognised that during the last several years the process of reviewing the JARPA abundance estimates has been drawn out and there has not always been clarity about the complex analyses suggested and results reported. Comments on these issues are given in Annex G Appendix 4. Due to a lack of time, the issues could not be fully discussed. As a way to expedite progress, the Committee **recommends** that an expanded Advisory Group on abundance estimates (appointed during the JARPA review meeting) be reconstituted to work intersessionally.

SC/59/IA12 explored a GAM-based modelling approach for estimating the abundance minke whales using data obtained by the *Kaiyo Maru*-JARPA joint survey in the Ross Sea in austral summer in 2005. The survey was designed as a multi-disciplinary study combining surveys on cetacean, krill and oceanography. Results indicated that the abundance of minke whales could be related to the biomass of Antarctic krill. The authors suggest that a GAM-based model could contribute to interpreting the reasons for the apparent change between CPII and CPIII. They conclude that the continuation of a multi-disciplinary ecological survey such as JARPA II is critically important to relate changes in the abundance of Antarctic minke whales to their environment.

The Committee **agrees** that this type of approach for relating the spatial distributions of whales and krill to features of their environment had potential. Some technical problems with the models presented in SC/59/IA12 were pointed out, and the authors agreed that these issues warranted further investigation before the predictions from the models could be interpreted with confidence.

10.2.2. Reasons for differences between minke abundance estimates from CPII and CPIII

An intersessional working group was established last year to: (1) collaborate with sea ice experts and abundance analysts to obtain abundance estimates by 10° longitudinal slices using the newly developed abundance estimation methods; (2) provide information on sea ice extent so it could be most usefully included as a covariate in abundance estimation; and (3) examine hypotheses that could explain if, and how, a change in sea ice extent might be related to the abundance estimates. It was reported that some, though not all, of these tasks had been achieved and that considerable progress had been made as is reported below.

SC/59/IA7 updated the table listing possible reasons for the decrease in minke whale abundance estimates. The Committee did not discuss this paper because new abundance estimates are expected at next year's meeting.

10.2.2.1 ANIMALS WITHIN THE SEA ICE

The Committee welcomed a report of collaborative studies from SOWER with a Japanese icebreaker (SC/59/IA16) from 2004/2005. The Committee **agrees** that this analysis has confirmed that there were substantial numbers of minke whales within the ice and had demonstrated the need to take these into account when estimating the absolute abundance of minke whales. However, there was concern over the application of standard line transect methodology to this

data since some of the assumptions on which line transect methods are based were violated. It was suggested that it was more appropriate to model the availability of animals within the ice and then model detectability.

The Committee also welcomed reports from German helicopter-based studies (SC/59/IA20 and 21), which provided valuable information on whales within the pack ice. Preliminary findings suggested that there may be a non-negligible proportion of minke whales south of the (IWC-defined) ice edge and in polynyas, in some areas. Further development of suitable analysis methods for obtaining density and abundance estimates from aerial surveys over the pack ice was encouraged (and see Item 10.12).

‘Standard’ line transect estimates by 10° slice were used in SC/59/IA26 to examine the relationship between minke whale abundance and pack ice extent. In discussion, the difficulties in obtaining estimates using design-based methods by 10° slices were noted. The Committee **agrees** that the ‘standard method’ is probably unsuitable for examining the relationship with sea ice extent because it fails to take account of the systematic variation (in density, environmental conditions, etc.) with latitude. It also noted that estimation variance (at least) must be accounted for, so the regression techniques employed in SC/59/IA26 were inappropriate. Recommendations for how the analyses should proceed are presented in Annex G Appendix 7. An intersessional working group was established to investigate these issues further, with Shimada and Palka as co-convenors (R18). A new method for estimating the proportion of whales in the sea ice was also briefly discussed. Noting the conceptual appeal of the approach, the Committee **encourages** its application when the revised estimates of abundance by longitudinal slice were available.

Ainley *et al.* (2007b), Karnovsky *et al.* (2007) and Smith *et al.* (2007b) also provided information on Antarctic minke whales within the ice. Details can be found in Annex G.

The Committee welcomed the presentation of the results from all of these studies. Together they confirm that some minke whales are within the sea ice and polynyas. However, they also document that it is difficult to predict minke whale density within pack ice and in polynyas that have not been surveyed.

The Committee identified future work that would help elucidate any differences in Area-specific estimates, when they are finalised next year. The following topics were considered likely to be important for interpreting these results:

- (1) further examination of the relationship between density/abundance and sea ice extent, including in regions of complex and changing ice extents (such as the Ross Sea in Area V);
- (2) further investigation, including a review of the relevant ecological literature, into the presence and likely abundance of minke whales in polynyas (such as those found in the Weddell Sea in Area II).

Furthermore, the Committee considered that any further insight into the relationship between features of the environment (such as proximity to the Antarctic slope front or krill density) and whale density (such as that presented in

SC/59/IA12 for Area V) might be valuable, particularly if it could be extended to include other Areas.

10.2.3 Catch-at-age analyses

The report of the intersessional working group on VPA analyses related to Antarctic minke whales is given in Annex G, Appendix 5. Four tasks had been identified as of highest priority for work. Progress on two tasks was not accomplished intersessionally, but it is expected to be possible to complete them soon after the present meeting.

10.2.3.1 PRELIMINARY RESULTS

SC/59/IA18 provided a summary of responses from experienced researchers to a questionnaire on minke whale aging and length measuring. Although the sample size was small, the two most important issues: (1) the assessment of the readability of individual earplugs and (2) undercounting of bands in older animals as the result of tight packing of growth layers. The author noted that the consequence of non-migration of whales to and/or from the Antarctic on the formation of growth layers is also a potential source of bias in age estimates. With respect to length measures, the Committee **agrees** that because the possible biases are small and measurement error in lengths can be allowed for in modelling, further investigations along these lines are probably no longer necessary.

SC/59/O8 addressed one of the tasks of the intersessional working group and a recommendation that was made during the JARPA review (SC/59/Rep1). It had been noted that whales aged 5 or younger had longer body lengths on average in the commercial catch than in the JARPA catch, and it was suspected that this might be due in part to coding errors. A cross-check with original ageing notes and biological records for 2,270 whales aged 5 or younger uncovered 45 coding errors. In addition, 474 of the age readings were categorised as ‘biologically unlikely’ on the basis of large body size, recorded ovarian corpora counts or large testes weight. Correcting the coding errors and eliminating the biologically unlikely ages reduced the mean difference considerably.

The Committee welcomed the report and the fact that checking for coding errors and biologically unlikely ages was being extended to older age classes. It also endorsed the plans to train young Japanese scientists to read earplugs and use multiple readers for each earplug.

SC/59/O8 also reported results of an inter-reader ageing calibration using 100 good earplug samples retained from commercial whaling. The mean difference between the two readers was 0.01 ± 0.220 (S.E.) years.

In discussion, it was pointed out that this result indicated that the difference between commercial and JARPA ages in whales of intermediate ages (primarily 15-30 years old) was unlikely to be due to a learning effect. However, both readers were from the same ‘school’, so a bias affecting both readings was still possible. The Committee **recommends** further experiments (Annex G, Appendix 6) to provide additional insight into ageing errors. It was noted that power analyses should be carried out to verify the suggested sample sizes. Using a length-stratified sample would complicate analyses, so the Committee **agrees** that initially a random sample of the left/right earplugs should be read by the Japanese readers. If the

results from this initial experiment suggested that a sample size of 250 was inadequate, then the initial sample could be supplemented with additional earplugs either from a random sample across all length classes or a stratified sample with higher proportions of larger whales.

SC/59/IA4 provides further development of statistical catch-at-age models for Antarctic minke whales. The model is applied to catch, catch-at-length, and age-length keys as well as indices of relative and absolute abundance in order to identify a 'reference case' set of specifications related to vulnerability, examine the sensitivity to using reduced portions of the commercial catch-at-age data for assessment purposes, and to examine an alternative density-dependence function. The results confirm previous results that the data support: a non-uniform vulnerability pattern; a dome-shaped vulnerability for the period of commercial harvest; an increase in minke whale recruitment in Areas III-W, IV, V and VI-W until about the early- to mid-1960s and a decline thereafter; and large changes in carrying capacity and somatic growth rates. However, the model had difficulty in achieving biologically reasonable estimates for stock E and had convergence problems when vulnerabilities were assumed to be age-specific – both of these issues require further analyses.

SC/59/IA13 documented additional modifications to the ADAPT-VPA models for the putative I- and P-stocks of Antarctic minke whales (SC/59/Rep1). The modifications include: (1) inter-annual differences in the distribution of the population between different management Areas; (2) incorporation of a stock-recruitment relationship in the estimator; (3) the effects of possible ageing-error; and (4) the effects of possible change in age-at-sexual maturity over time as indicated by analyses of transition phase data. In further response to requests by the JARPA workshop, performance of the estimator in the complete absence of commercial catch-at-age data was examined for the I-stock, and found to lead to convergence difficulties probably related to the fact that there was insufficient information to estimate early recruitment trends in such circumstances.

The Committee noted that there are few data for the P-stock (Areas V-E and IV-W) with the result that model estimates (e.g. of natural mortality) are more uncertain for the P-stock than for the I-stock. The Committee **agrees** that consideration could be given to (1) estimating common values for some parameters between the models for the P- and I-stocks and accounting for the impacts of partial (age/length dependent) presence of the total population in the area over which age samples were collected when fitting to the JARPA and IDCR-SOWER abundance estimates.

The Committee noted that results of the analyses in SC/59/IA4 and SC/59/IA13 remain preliminary because the Committee has yet to finalise decisions regarding how the data from JARPA and IDCR-SOWER programme should be used to obtain abundance estimates as well as how the catch-at-age data should be included in the analyses. The Committee re-established the intersessional working group on catch-at-age analysis under Polacheck (R16).

The JARPA Review (SC/59/Rep1) noted the apparent contradiction between information from the transition phase

data (that suggest a decline in age-at-maturity from around 11 years in pre-1955 cohorts to 7-8 years in post-1980 cohorts), and the ADAPT-VPA analyses (that suggest that recruitment per mature female was high in the 1950s and 1960s but low post-1980).

The Committee **agrees** the apparent the low recruitment rates after 1970 are inconsistent with the low ages-at-maturity after 1970: i.e. the subsequent increase in age at maturity was much less than might have been expected from the size of these earlier trends, given the large drop in recruitment per adult female suggested by the VPA for the post-1970 period.

The Committee noted that sensitivity tests in SC/59/IA22 also led to model outcomes that differed from those for the 'reference case' considered during the JARPA Review. It is thus desirable to develop diagnostic statistics to quantify the extent to which the recruitment rates from VPA analyses are consistent with the *a priori* expectations based on trends in age-at-maturity. This task is referred to the catch-at-age analysis working group (R16).

10.2.4. Dwarf minke whale

SC/59/IA24 reported sightings of Southern Hemisphere dwarf minke whale (*Balaenoptera acutorostrata*) made during the 33rd (1997) and 43rd (2007) Chilean Scientific Expeditions to the Bransfield and Gerlache Straits in Area II. It also conducted a review of previous records of minke whale in the same region. Based on geographical considerations, it is suggested that whales sighted in summer around the Bransfield and Gerlache Straits could be related to dwarf minke whales previously reported in the Patagonian channels (in the southern tip of South America) and the wintering ground off Brazil. To confirm this link, biopsy samples should be obtained from animals sighted in the Antarctic and their genetic composition should be compared with those in the Patagonian channels and Brazil. This work is part of the research programme on marine mammals of the Marine Biology Group of the CEQUA research centre based in Punta Arenas, Chile.

The Committee welcomed this new information for this region and **encourages** further work to investigate the migratory corridor postulated.

10.3 In-depth assessment of Western North Pacific common minke whales with a focus on J-stock (and see Annex G1)

10.3.1 Stock structure

Last year, the Committee received the results of cooperative research on stock structure between Korea and Japan. Following discussion, several additional analyses were proposed which the Committee hoped would allow clarification among four stock structure hypotheses (IWC, 2007g, p.186).

SC/59/NPM6 reported the results of genetic population structure analyses of common minke whales from Japan (Sub-area 6) and Korea (Sub-area 5 and Sub-area 6), in response to a proposal made last year. The data were divided into two temporal groups: 'early' (April-September) and 'late' (October-March). No significant

heterogeneity was found for the different temporal combination of samples and between Korea and Japan. These results provide no support for the hypothesis of two stocks migrating in these sub-areas in different months or seasons. However, a statistically significant difference was detected in the comparison between the early and late group samples in 1999. The authors concluded that the heterogeneity detected in previous analyses was due to a few individuals taken in that period. These results are consistent with the single stock scenario in these sub-areas.

A full discussion of the paper can be found in Annex G1 (item 6.1). As a result of these discussions a number of recommendations were made with respect to future analyses, including consideration of the hypothesis outlined in Lavery *et al.* (2004).

Despite some concerns over the reliability of the biological information available for bycaught animals, the Committee **agrees** that all available information should be used to explore alternative temporal stratifications. The Committee also **agrees** that it would be valuable to undertake: (1) a sensitivity analysis to examine how results changed with different temporal stratifications; (2) a fuller examination of the data, in which the effects of combining quarters in different ways was explored; and (3) a jackknife analysis to identify any particular individual animals that were causing the heterogeneity. The Committee looked forward to receiving the results of further analyses at next year's meeting. It also looked forward to the results of revised collaborative analyses at next year's meeting, incorporating data from bycaught animals for 2005 and 2006. *Inter alia* these should complete work on item 2 (incorporate sex into analyses) and item 5 (avoiding data standardisation problems) identified last year (IWC, 2007g, p.186).

Regarding item 6 (including samples from possible J-stock animals from the Pacific side of Japan) from last year (IWC, 2007g, p.186), work has thus far concentrated on data from the Sea of Japan. The Committee expects to draw conclusions about stock structure in the Sea of Japan at next year's meeting and then start to consider information on stock structure in waters east of Japan. This is in accord with its remit to conduct an in-depth assessment with a focus on J-stock. Consideration of J-stock animals east of Japan or alternative stock structure hypotheses are applicable to catches as well as allocation by stock. This work will assist in completing the in-depth assessment as well as contributing to the forthcoming *Implementation Review* of western North Pacific common minke whales (see Item 6.3). It was noted that work on stock structure would be facilitated by the new information from the JARPN-II programme. Assignment of animals to stocks will be enhanced by using as much information as possible.

The differences in results from analyses of data from commercial catches in 1982 and analyses of recent data may be a result of inshore/offshore structure (commercial catches were taken offshore but bycatches are primarily inshore). Analysis of both mtDNA and microsatellites should be possible from 1982 samples but material was available from only from 27 animals. Nevertheless, the Committee **recommends** that these analyses should be conducted.

Other non-genetic information on stock structure would also be valuable (for example, photographs to investigate presence/absence of scar of cookie cutter shark bites). Although it is difficult to collect such information from surveys, this will be attempted on forthcoming Japanese surveys. Fishermen are required to take photographs of Japanese bycaught animals but the animals are typically young so there may not be much information to be obtained; nevertheless, this will also be investigated.

There is still a lack of information on stock structure in sub-areas 10 and 11; this is very important to the in-depth assessment. The Committee **strongly recommends** that the Commission requests the Russian Federation to give permission for biopsy samples to be taken during surveys in its waters in these areas as a matter of priority.

10.3.2 Distribution and abundance

The Committee welcomed the information reported on the sightings survey in the northern Sea of Japan conducted in May/ June 2006 (SC/59/NPM3). It was pleased to note that permission to enter the Russian 200 n.miles EEZ had been granted. During about 1,600 n.miles of searching effort, a total of 51 schools (55 animals) of common minke whales was sighted by the primary platform. Common minke whales were distributed widely in the Russian EEZ; a higher density was observed in the northern area between the continent and Sakhalin Island. This suggests that there is a high concentration of common minke whales in the continental side of the Sea. Because permission was received for the first time to survey in Russian waters, the survey focussed first on this part of the survey area; this led to less effort in Japanese waters.

The Committee also welcomed the results of the analyses of these data (SC/59/NPM4). It noted that at the time when the survey was conducted, it was most likely that animals in this area would be from J stock. The authors estimated the abundance of common minke whales in the Russian EEZ as 2,900 (95%CI 1,500 - 5,400) assuming $g(0)=1$, and 3,500 (95%CI 1,900 - 6,500) when correcting for $g(0)$ using the hazard probability method. In the Japanese EEZ, the estimates were 970 (95%CI 300 - 3,150) and 1,200 (95%CI 370 - 3,800), respectively. The area covered by the 2006 survey was about 77% of the total area of sub-area 10; an unsurveyed area remains in the western part of sub-area 10.

More detailed discussion is given in Annex G1 (item 7.2), particularly with respect to the estimation of $g(0)$. Covariates had not been included in the estimation of $g(0)$ because of limited data; this could potentially result in an overestimate of $g(0)$ and hence an underestimate of abundance. The Committee **agrees** that (1) it is important to incorporate covariates in estimation of $g(0)$ in future analyses and (2) in future presentations of the results of $g(0)$ estimation, histograms of the perpendicular distance distribution of duplicates and results of goodness-of-fit tests for duplicates should be presented.

The Committee welcomed the report of a survey conducted in April/May 2006 on the Korean side of sub-area 6 (covering about 8% of that sub-area) during which there were 20 sightings of minke whales (SC/59/NPM1). The authors estimated abundance to be 1,300 (95% CI=700-2,300) assuming that $g(0)=1$, for the inshore block and only

a small part of the offshore block. The Committee **requests** that future presentations show the fitted detection function together with the histograms of perpendicular distribution. It noted that sample sizes were limited and suggested that pooling of data over past surveys to estimate the detection function be investigated.

More generally, the Committee discussed how to move forward with regard to combining the abundance data from all the areas and years together to generate the best available abundance estimates for sub-areas 5, 6 and 10 and trends for some areas if possible. To examine the possibility of obtaining integrated abundance estimates, the information on past sighting surveys for J-stock common minke whales was summarised. Details are given in Annex G1 (Appendix 3). The surveys began in 1994 and a total of 25 cruises had been conducted up to 2006; the most valuable information for abundance estimation was from surveys in April-June since 1999. A total of 17 cruises have generated useful data. The following areas have been surveyed several times: east of sub-area 5, west of sub-area 6, east of sub-areas 6 and 10. The following four areas remain un-surveyed: west of sub-area 5 (Chinese waters), north of sub-area 5 (Chinese and North Korean waters), northwest of sub-area 6 (North Korean waters) and west of sub-area 10 (North Korean waters).

Methods for estimating abundance, including taking additional variance into account, were discussed when combining multiyear surveys for J-stock common minke whales. The migratory behaviour of minke whales in the Sea of Japan means that abundance estimates for each sub-area must take season into account. If abundance in each survey block is assumed to differ between spring (the period up to and including June) and summer, the multiyear model used for western NP Bryde's whales would also be appropriate for J-stock common minke whales. The Committee looked forward to receiving results of estimation work at next year's meeting.

Plans for an IO passing mode sighting survey in the Okhotsk Sea and the Sea of Japan north of Hokkaido from mid May to late June in 2007 were presented. The objective is to obtain information on the distribution and abundance of common minke whales as requested last year (IWC, 2007g, p.187). The Committee **welcomes** this plan and appointed Miyashita to provide Committee oversight on the survey.

SC/59/NPM2 presented the plans for a partial-IO passing mode sightings survey in Korean waters of the Yellow Sea in spring 2008. The objectives of the survey are to obtain information on the distribution and abundance of common minke whales to be used for the in-depth assessment and to collect general information on the distribution and abundance of other cetacean species in the area. The Committee **welcomes** this plan and appointed An to provide Committee oversight on the survey. However, it cautions that analysis of IO data will be problematic with the sample sizes that have typically been obtained from surveys in Korean waters. The Committee looked forward to presentation of the results from these surveys at next year's meeting.

Annex G1 (Appendix 2) provided a summary of an intersessional Workshop held in Ulsan on sighting survey collaborations in the region. Scientists from China, Japan, the Republic of Korea and Russia attended.

The Committee noted a summary of future survey and analysis work required for completion of the in-depth assessment shown in Annex G1 (Appendix 4). In discussion, particular attention was paid to the possibility of surveys in Chinese waters. In order to obtain estimates of abundance in the western part of sub-area 5, the Committee **requests** the Commission to encourage China and the Republic of Korea to collaborate to conduct sightings surveys in this area.

An intersessional group under Miyashita was established to facilitate discussion on planning the allocation of sightings surveys to areas and their designs in the near future (R30).

10.3.3 Other

The results of the estimation of minke whale bycatch entering Korean markets in 1999-2003 were presented (Baker *et al.*, 2007). This is one way of obtaining information on bycatch where it is not fully reported and could be used to construct alternative catch histories in the future. Simulations described in SC/59/BC4 show that the methods used tend to underestimate the amount of bycatch to an extent that depends on assumptions about the markets.

The Committee reiterated its previous **recommendation** that bycatch be reported by O and J stock.

It was reported that additional information related to Korean CPUE may have been lost. Nevertheless, efforts to locate information will continue over the next year. The Committee appreciated and encouraged these efforts because of the importance of this information for the in-depth assessment. If those efforts do not succeed, however, the Committee will consider what inference can be drawn from the existing data.

10.3.4 Work Plan

This is discussed under Item 21; budgetary considerations are dealt with under Item 24.

10.4 Finalisation of the Southern Hemisphere catch data series (and see Annex H)

Last year, the Committee recommended that the IWC catch series be finalised to incorporate revised catch data for the period 1948/49 – 1971/72 (IWC, 2007c, p.2). The Committee was informed that missing data (involving some 3,500 individual catch records) for the 1969/70 season of the factory ship *Yuri Dolgoruky* has been found. These catches have been coded but need to be validated. The Committee was also informed that new data relating to new marking (but not recoveries) of whales have been made available and will be processed shortly. The Committee welcomed the new information received and **recommends** finalisation of the catch series.

10.5 In-depth assessment of Southern Hemisphere humpback whales (see also Annex H)

10.5.1 Issues related to N_{min} and depensation for modelling of humpback whales

Jackson *et al.* (2007) was discussed in response to a previous recommendation for further development of issues relating to minimum abundance (N_{min}) and depensation for modelling of humpback whales (IWC, 2007h, p.200). They reported on a novel genetic approach to estimating N_{min} of a historical population trajectory for a species undergoing a population bottleneck. This parameter is estimated in standard demographic population dynamic models currently being used to assess the status of Southern Hemisphere humpback whales by the Committee. This new genetic approach can be used to provide an additional constraint parameter for future demographic population dynamic models. The results suggested that minimum abundance estimates computed by demographic models are compatible with the genetic estimate of N_{min} when population growth rates are near or lower than 4% per year. These results pointed to the need for better integrating evolutionary processes into population dynamics models, to account for uncertainty in catch records, the influence of maternal fidelity on metapopulation dynamics and the potential for inverse density dependence (an 'Allee effect') in severely depleted populations.

The Committee welcomed the results presented and expressed appreciation for the progress in the development of this method. A working group established to discuss the issue further concluded that while substantial progress was made, the parameterization of the models was not sufficiently resolved to allow the approach to be applied to the present humpback whale assessments (Annex H, item 3). It also indicated that further work should be conducted intersessionally. The Committee **agrees** with this plan.

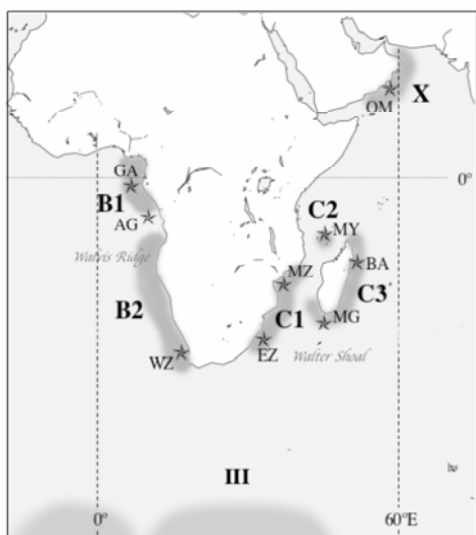


Fig. 1. Map with Breeding Stocks B, C and X, and IWC Area III. Key: GA = Gabon, AG = Angola, WZ = Western South Africa, MG = southern Madagascar, BA = Antongil Bay, Madagascar, MZ = Mozambique, MY = Mayotte and the Comoros, OM = Oman. [Taken from SC/A06/HW38].

10.5.2 Humpback whale distribution at mid latitudes based on historic catches and JSV data

Last year, it had been recommended that the Japanese Scouting Vessels (JSV) and the historic catch data be examined to improve knowledge of humpback whale distributions at mid-latitudes and to assess whether information on the proportion of whales found in these regions could be incorporated into analyses of abundance (IWC, 2007h). This year, the information provided was reviewed, including an earlier analysis of the JSV data (Butterworth and Geromont, 1995). It was concluded that new analyses would be unlikely to alter the outcome of that work, given the bias associated with the non-systematic nature of the JSV data.

10.5.3 In-depth assessment of Southern Hemisphere humpback whales Breeding Stocks B and C

At last year's meeting, the Committee agreed that the assessment of breeding stocks B (western Africa) and C (eastern Africa) were highest priority toward the completion of the assessment of Southern Hemisphere humpback whales (IWC, 2006d, p.205). While information was presented for multiple populations, the Committee focused the discussions on the above mentioned stocks. A priority list of the tasks needed for completion of the assessment of stocks B and C at the 2008 Annual Meeting was developed. Details of these discussions in the sub-committee are found in Item 5 of Annex H.

10.5.3.1 STOCK STRUCTURE IN THE FEEDING GROUNDS

SC/59/SH24 provided estimates of the genetic structure of feeding aggregations of humpback whales in the southern ocean using microsatellite loci and mitochondrial genetic data. This study included samples from the IWC Management Areas I to IV and VI in the Antarctic collected by the IDCR/SOWER program (through the 2005/6 cruise), the SO-GLOBEC program, and the Chilean Antarctic Programme. Genetic structuring was explored for Management Areas and between the Naïve/Core feeding areas associated with each humpback whale breeding stock as previously defined by the Committee - see IWC (2006e) and IWC (1998b, p.191). No significant differentiation between feeding areas corresponding to breeding stocks B and C, and between C and D, were found. This may reflect (1) interchange of whales from different breeding populations in the feeding grounds and (2) poorly understood migratory processes occurring between breeding and feeding stocks across regions. The feeding area associated to breeding stock G was found to be different from all other feeding areas, and the feeding area associated with breeding stock F was different those of stocks B and C.

The Committee welcomed this paper as it addressed some of the work previously recommended. The Committee noted that results obtained from feeding grounds associated with breeding stock A and E should be considered preliminary due to small sample size (≤ 10). Therefore, it **recommends** that increasing efforts be made to sample the feeding areas associated with these two stocks. In this respect, the Committee was informed of the existence of nearly 90 samples from JARPA from Area V, some of which correspond to the feeding grounds associated to stock E.

Evidence for mixing of breeding stocks in high latitude feeding areas was examined with respect to the allocation of boundaries for feeding grounds associated with breeding stocks. The Committee **agrees** that such boundary allocations remain uncertain and that a more complete understanding will probably require better knowledge of humpback whale distribution, movements and habitat (e.g. oceanography, sea-ice extent) in high latitudes. It was noted that work on the development of alternative genetic approaches to describe the proportion of whales from different breeding grounds in the feeding grounds is ongoing and would be presented in the near future.

The Committee welcomed information received on the photographic comparison of individually identified humpback whales from wintering grounds in Brazil (breeding stock A) and feeding grounds in the South Sandwich and the Bouvet Islands. No matches were recorded between Bouvet and Brazil and between Bouvet and the South Sandwich Islands, but four whales seen in the latter were also recorded in Brazil. No comparison with west Africa had been done. The Committee noted that this should occur. The Committee also noted that the IDCR/SOWER cruises were occurring near the Bouvet Islands, both to the south of 60°S (where previous survey effort was concentrated) and also to the north. The potential for using these data in the assessment (e.g. to compute abundance estimates or to understand the proportion of the population found north and south of 60°S) was highlighted.

Potential IWC participation in the upcoming CCAMLR-IPY survey was discussed. A Norwegian project has offered to place two observers on board a research vessel operating in the Bouvet Island area (~50°-60°S, 5°W-5°E) in February 2008. Any data collection in this region could assist in clarifying humpback whale stock structure in the feeding grounds and the Committee **agrees** to accept this offer, provided the collection of biopsy samples is possible.

10.5.3.2 BREEDING STOCK B

10.5.3.2.1 DISTRIBUTION, MOVEMENTS AND STOCK STRUCTURE
Existing evidence suggest that breeding stock B may be sub-structured, but the extent of this is poorly understood (IWC, 2006e). Region B1 (Gulf of Guinea, north of 18°S) is likely a breeding ground, while region B2 (west coast of South Africa) is a summer feeding ground and winter migration corridor. Significant genetic differences between B1 and B2 have been identified for females, suggesting that more than one breeding stock may occur in B (Rosenbaum *et al.*, 2006). Since the degree of current interchange is unknown, it was suggested that any assessment performed at this time should combine information from both sub-stocks B1 and B2.

10.5.3.2.2 ABUNDANCE ESTIMATES

Collins *et al.* (2006) presented preliminary closed population mark-recapture abundance estimates for sub-stock B1. The Chapman's modified Petersen model provided independent estimates from photographic and genetic data. Weighted mean values over the period 2001-2004 resulted in estimates of 5,300 (95% CI = 3,500-8,000) and 3,800 (95% CI = 2,000-7,300) respectively; these are not significantly different. Potential bias in the abundance estimates was discussed. Negative bias due to short survey timing could have occurred because whales present in the

region outside the survey period were missed. However, if multiple stocks (e.g. migrating whales) are present in the area of B1 during sampling, estimates of 4,000-5,500 whales for sub-stock B1 alone might be high. The Committee **recommends** refinement of these estimates before completion of the assessment.

Branch (2007) provided abundance estimates of humpback whales in the Antarctic from the IDCR/SOWER surveys. Some breeding ground estimates are far greater, and others far lower, than the corresponding IDCR/SOWER feeding ground estimates, in a pattern apparently related to the latitudinal position of the Antarctic Polar Front. The sum of the breeding ground estimates in 1999-2005 is approximately 53,000. The most recent (1996/1997) estimate for the feeding grounds associated with breeding stock B (20°W-10°E), was 600 whales (95% CI = 210-1,400). This estimate is biased downwards because the survey did not extend north of 60°S. The ratio of population estimates between breeding and feeding grounds suggest that only 14-28% of whales breeding in sub-stock B1 are found south of 60°S.

10.5.3.2.3 TRENDS IN ABUNDANCE

Branch (2007) estimated an annual increase in abundance of 5.9% (95% CI = -5.9% to 17.6%) between 1979/80 and 1996/7 for the feeding grounds associated with breeding stock B (20°W-10°E) using the IDCR/SOWER data. This trend is not significantly different from zero. The Committee expected that the large uncertainty associated with this estimate would have little influence on population assessment models, but **agrees** that the sensitivity of these models to the trend data should be explored. In addition, the Committee **recommends** that alternative approaches should be investigated to obtain information on growth rate, including the use of information from other populations as priors.

10.5.3.2.4 PRELIMINARY ASSESSMENT

SC/59/SH3 described a preliminary Bayesian stock assessment of Southern Hemisphere humpback whales (breeding sub-stock B1) and indicated that the population is currently within the range of 60-90% of its pre-exploitation size. However, given the concerns identified with the existing abundance estimates for stock B in the breeding grounds (10.5.3.2.2), the Committee **recommends** that an updated abundance estimate for sub-stock B1 be computed before the assessment is completed. In the absence of abundance estimates from B2, the updated estimate for B1 will provide a conservative abundance estimate for the whole stock B.

SC/59/SH3 also explored the influence of variation in the Antarctic catch data allocation on estimated recovery for breeding stock B1. The Committee noted that further options regarding the allocation of catches should be considered and **recommends** that overlap and fringe models of catch allocation be applied in future modelling. The Committee also **recommends** that genetic data from breeding grounds be compared with genetic data from their associated feeding grounds in order to determine the levels of stock mixing on feeding grounds and to assist with allocation of catches.

10.5.3.3 BREEDING STOCK C

10.5.3.3.1 DISTRIBUTION, MOVEMENTS AND STOCK STRUCTURE

Existing data indicate that breeding stock C can be divided into three sub-stocks: C1, C2 and C3 (IWC, 2006e). C1 is a migratory corridor and potential breeding area for humpbacks along the east African coast, while C2 (central Mozambique channel islands, represented by Mayotte) and C3 (Antongil Bay, Madagascar) may overlap as breeding grounds. Previous genetic analyses show no significant differentiation between C2 and C3 but uncertainty regarding the level of differentiation between C1 and C3, and C1 and C2, still exists. A preliminary analysis found one genetic recapture between C1 and C3, but further work is needed to clarify the relationship between these two sub-stocks. The Committee previously noted that large areas within regions C1 and C2 have not been sampled (IWC, 2006e). The Committee **agrees** that a more in-depth comparison between C1 and C3 is required and **strongly recommends** that the degree of sub-stock interchange be investigated by photographic and genetic methods.

10.5.3.3.2 ABUNDANCE ESTIMATES

Cerchio *et al.* (2006) presented mark-recapture abundance estimates of humpback whales from Antongil Bay, Madagascar (sub-stock C3) using closed population models for the period 2001-2004. Given the potential bias of these estimates, it was agreed that they should be considered preliminary. The Committee noted that the geographic area represented in these estimates was unclear. Because of the possible connection of sub-stocks C2 and C3, estimates may correspond to Madagascar and the islands of the Mozambique Channel. New evidence of possible exchange between C3 and C1 suggests that overlapping of all sub-stocks in these regions may occur.

In discussion, the Committee **agrees** that due to extremely low recapture rates and potential bias introduced by temporal trends in sampling, these estimates are subject to similar problems to those noted for breeding stock B (item 10.5.3.2.2 above). Therefore, the Committee **recommends** that a new estimate for sub-stock C3 be computed.

Branch (2007) provided abundance estimates from IDCR/SOWER surveys of the feeding area associated with breeding stock C (10°E-60°E). These were 1,000 (95% CI = 340-3200) for CPI (1979-1980), 900 (95% CI = 320-2,500) for CPII (1987-1988) and 2,400 (95% CI = 1,100-5,200) for CPIII (1992-1993 and 1994-1995).

10.5.3.3.3 TRENDS IN ABUNDANCE

Branch (2007) estimated an annual rate of increase of 66% (95% CI = -3.8% to 16.9%) for the feeding grounds associated with breeding stock C between 1979/80 and 1993/1994. As for stock B, the Committee noted that such associated uncertainty will have a low influence on population assessment models, but **agrees** that sensitivity tests should be undertaken.

10.5.3.3.4 PRELIMINARY ASSESSMENT

SC/59/SH4 reported further stock assessment results for breeding stock C and its component sub-stocks. Two modelling approaches were applied: one treated the stocks independently, and another allowed for mixing on the feeding grounds. Two estimates of absolute abundance were incorporated in the model. Multiple trend/CPUE indices available for sub-stock C1 resulted in relatively good model fits. The authors noted that these preliminary

results suggested that sub-stock C1 may now be over 70% of its pre-exploitation size.

The Committee **agrees** that for a number of reasons conclusions about the level of recovery are premature. There are insufficient data and hence substantial uncertainty regarding the abundance estimates used for C2+3, and an updated abundance estimate should be used in further assessments of this stock. The Committee **agrees** that one of these abundance estimates (C1 or C3) could be used to represent a lower bound for the abundance of stock C (C1+C2+C3). This is based on the conservative assumption that either all whales in sub-stocks C2 and C3 are included in abundance estimates derived from C1, or that all humpback whales migrating past C1 breed in C3. The Committee discussed whether estimates of C1 and C3 could be pooled to provide an upper bound estimate of the size of stock C. It concluded that the interchange between C1 and C3 must be investigated before pooling is considered. Therefore, the Committee **recommends** that photographic and genetic comparisons between these two regions be made.

The inclusion of some past CPUE (catch per unit effort) indices have provide a good fit to the overall population trajectory. Point estimates for the IDCR/SOWER (~7%/year) and Cape Vidal rates of increase (~12%/year, (Findlay and Best, 2006)) differ. The Committee **recommends** that sensitivity analysis be conducted on all existing trend and CPUE data for this stock. The Committee also **recommends** that overlap and fringe models of catch allocation be applied in future modelling to explore catch allocation in the feeding grounds. In this regard, the Committee **recommends** that genetic data from breeding grounds B and C be compared with those from their associated feeding grounds in order to determine levels of stock mixing in high latitudes.

The Committee noted that historic CPUE data had provided helpful insights into evaluation of the results of the assessment for breeding stock C (and previously for stocks D and E) and **recommends** that the availability of such information be investigated for other stocks.

10.5.4 Other issues related to Southern Hemisphere humpback whales

10.5.4.1 OTHER SOUTHERN HEMISPHERE HUMBACK WHALE BREEDING STOCKS

The Committee received a number of papers concerning breeding grounds A, E, F and G. These are discussed in Annex H, item 5.4).

SC/59/SH2 presented a re-analysis of the population models used in the assessment of breeding stock G, in response to a mistake found in the trend data used for the assessments (Johnston and Butterworth, 2005); (IWC, 2007h, p.31 [footnote 8]). The new analysis used the same models and data as the one presented previously, but included the correct trend information. New results are summarised in Annex H (Table 1) and suggest that the current (2006) status of this stock ranges from 28-50% of its pre-exploitation size. The Committee noted that the new estimates provide slightly more pessimistic results, but **agrees** that they do not change overall conclusions for the status of stock G reported in (IWC, 2007h).

SC/59/SH11 presented information on the genetic characterisation of humpback whales breeding in Ecuadorian waters (breeding stock G) and their relationship with the feeding grounds in the Magellan strait and the Antarctic Peninsula. SC/59/SH12 reported on the newly formed Latin American Humpback Whale Photo-identification Network. This is a cooperative effort between countries in South and Central America to improve the knowledge of humpback whale breeding populations A and G.

SC/59/SH14, SC/59/SH15 and SC/59/SH18 presented new information on movements of individually identified humpback whales within the breeding grounds for stocks E and F. No directional trend was apparent and movement between regions did not seem to be sex specific. The low level of interchange between Oceania and Eastern Australia and observed movement across Oceania (including interchange across the boundaries of Areas V and VI) have important implications for understanding the stock structure in this region. These results may explain the inconsistency between the current low abundances of stocks in Oceania (e.g. Gibbs *et al.* (2004); South Pacific Whale Research Consortium *et al.* (2006)) and the high humpback population growth rates observed along the coast of eastern Australia (Noad *et al.*, 2006). SC/59/SH16 reported on the first successful satellite-monitored tracking of a humpback whale from the Cook Islands to the Antarctic. This is the first confirmation of the migratory destination for a whale from breeding stock F, and implies that at least some humpbacks wintering in the Cook Islands feed in the waters of Area VI. The Committee welcomed these papers as they addressed some of the previous recommendations (IWC, 2006e) to improve knowledge of stock structure of breeding stocks E and F.

The report of the 2007 annual meeting of the South Pacific Whale Research Consortium was presented in SC/59/SH19. The Consortium consists of 100 or more scientists and their affiliates in a wide variety of locations ranging from eastern Australia to Oceania and western South America. Some of the more significant results of Consortium activities were reported in SC/59/SH12 as well as in SC/59/SH14-16.

SC/59/SH20 provided anecdotal information to suggest that there may have been Soviet whale catches in Tonga and Fiji. It was also noted that there is no accepted catch series for the local hunting of humpback whales in the Kingdom of Tonga. This hunt is thought to have occurred throughout the 20th century, using open boats and hand-held harpoons, until banned by royal decree in 1979 (IWC, 1981a). The Committee **recommends** that the availability of additional catch data relating to waters around Tonga be further investigated.

The Committee also expressed its appreciation for the papers presented above and encourages further development of the research reported.

10.5.4.2. ANTARCTIC HUMPBAC WHALE CATALOGUE

SC/59/SH17 provided an interim progress report of the Antarctic Humpback Whale Catalogue (AHWC). During the contract period, the AHWC catalogued 418 photo-identification images representing 288 individual humpback whales from Antarctic and Southern Hemisphere waters.

Matches made during the contract period to previously sighted individuals include resightings between Ecuador and the Antarctic Peninsula (3), and within-region resightings in the Antarctic Peninsula (9), Brazil (59), Ecuador (15) and Eastern Australia (1). Analysis of photographs from the IWC SOWER cruises (2001 to 2006) is almost complete and will be made available, according to IWC policy, in the AHWC public access catalogue. The Committee welcomed the information presented and **recommends** that this work continues. The Committee also noted that a number of new publications resulted from the work of the Antarctic Humpback Whale Catalogue, e.g. Rasmussen *et al.* (2007); Rock *et al.* (2006) and Stevick *et al.* (2004; 2006).

10.5.2 Work Plan and Budget requests (Humpback Whales)

The Committee noted that substantial progress has been made towards the In-depth assessment of Southern Hemisphere humpback whales. Recommendations for future work towards the completion of the assessment next year are provided in Annex H, item 9.

Priorities for next year are discussed under Item 21 and budgetary implications are presented under Item 23.

10.6 Progress on the in-depth assessment of Southern Hemisphere blue whales (see also Annex H)

10.6.1 Report of the intersessional email group

The Committee received a report on the intersessional email working group on blue whales with a compilation of a synthesis document, which incorporated new data from papers presented to the present meeting. This document was used as basis to identify blue whale stocks for which assessments could be undertaken.

10.6.2 Distribution, movements and stock structure

The Committee received a number of papers on the distribution, movements, acoustics, biological parameters and genetics of blue whales. These were discussed in detail in Annex H, item 7.

SC/59/SH1 summarised results of a blue whale study off Isla de Chiloé, Chile, in 2007. The Committee was informed that further analyses and surveys are underway to compute abundance estimates, which will be presented in the future. Photographs from aerial surveys could be examined in order to try and determine the sub-specific identity of whales (true versus pygmy blue whale) in these waters.

In discussion of another study from a land-based platform (elevation 77 m) in southern Chile, the Committee questioned the reliability of identifying whales to species level at considerable distances (e.g. 20 miles) and suggested that species determination conducted independently from land and from a boat, should assist with this problem.

SC/59/SH5 and SC/59/SH23 examined the seasonal occurrence of low-frequency whale vocalizations across eastern Antarctica, southern Australia and Possession Island (Crozet Archipelago, Indian Ocean). Antarctic and pygmy blue whales were recorded. Further details of these papers are found in Annex H, item 7.2.

SC/59/SH7 provided information on length and ovarian corpora from 1961–71 Soviet expeditions to the Antarctic and the Indian Ocean. These data allowed estimation of length at sexual maturity for pygmy blue whales, as a whole and also divided into regions. Regional estimates of the length at which 50% of females reach sexual maturity differ little, but were all much shorter than in the Antarctic region. There was some evidence of a small proportion (<1%) of Antarctic blue whales north of 52°S and pygmy blue whales south of 56°S. Branch *et al.* (2007a) examined catch lengths of sexually mature female blue whales to estimate the proportions of pygmy and Antarctic blue whales using a mixture model. Antarctic blue whales dominated catches south of 52°S (99.2%), whereas they were identified in 0–2% of shore-based catches north of 60°S (SW Africa, south Georgia, South Shetlands). Pygmy blue whales dominated (99.9%) catches north of 52°S and in 35°–180°E, while south of 60°S they were only found in 0.7% (95% CI = 0.5–1.0%) of catches. Actual proportions in these areas were probably higher but also maybe biased by rounding, poor length estimation methods and other confounding factors. A good model fit to the Chilean data was only obtained by assuming that these blue whales are a separate subspecies/distinctive population. This finding is consistent with their discrete distribution, and differences in genetics and call types compared to Antarctic and pygmy blue whales.

Branch *et al.* (2007b) reviewed the past and present distribution, densities and movements of blue whales in the Southern Hemisphere and northern Indian Ocean, including new data sources (JARPA and Chilean sightings, acoustics data, and pattern comparisons with oceanographic processes). At least four groupings of pygmy blue whales were identified: northern Indian Ocean, from Madagascar southwards to the Sub-Antarctic, Indonesia to western and southern Australia, and from New Zealand northwards to the equator. Southeast Pacific blue whales were distinctive in their distribution, acoustics, length frequencies and genetics, and should be managed separately from Antarctic and pygmy blue whales.

LeDuc *et al.* (2007) summarised analyses of genetic variation in Southern Hemisphere blue whales to investigate population differentiation between ocean basins: Southern Ocean, the Indian Ocean and the southeast Pacific. Results indicated that samples from each ocean basin were highly differentiated. The Committee was informed that this analysis did not clarify the taxonomic status of Chilean blue whales because samples grouped under the eastern South Pacific not only included samples from Chile, but also from Peru and Ecuador. Therefore, the northernmost sampling area (Ecuador) could conceivably have included incursions by animals from the North Pacific.

The Committee noted that at present no comparison between Southern and Northern Hemispheres has been performed for blue whales. In this respect, the Committee was informed of a proposed international collaboration including scientists from Australia, Chile, and the United States to conduct a global genetic study of blue whales.

In summary, the Committee **agrees** that whales off Chile are distinctive in their distribution, acoustics and length frequencies and therefore should be managed separately

from Antarctic and pygmy blue whales. The Committee also **agrees** that further genetic studies are needed to possibly elucidate the taxonomic status of whales inhabiting the coast of Chile.

10.6.3 Abundance estimates

SC/59/SH8 presented a line transect estimate of blue whale abundance west of Chile from the 1997/98 IDCR/SOWER cruise (452, 95% CI 160–1300). Inshore regions (Chilean territorial waters) and offshore regions west of the study area were not surveyed. SC/59/SH10 summarised distribution and abundance estimates of pygmy blue whales off the southern coast of Australia from a joint Japanese/IWC cruise. Abundance was also computed from a joint Japanese/Australian project in 1993 for waters between 35–45°S and 115–125°E. In view of concerns regarding survey design and analysis, the Committee notes that these abundance estimates are being reviewed.

SC/59/SH9 provided an update of blue whale abundance estimates south of 60°S from the IDCR/SOWER circumpolar (CP) surveys. Abundance estimates were 450 (95% CI = 210–960), 560 (95% CI = 230–1,340) and 2,300 (95% CI = 1,150–4,500) with approximate mid-years of 1980/81, 1987/88 and 1997/98. The latest estimate (from CPIII) is the most complete for Antarctic blue whales. These estimates are negatively biased because they exclude blue whales north of 60°S and because some blue whales on the trackline may have been missed. Although these estimates are assumed to apply to Antarctic blue whales, a small proportion, no more than 1%, may have been pygmy blue whales. The Committee agrees these estimates.

10.6.4 Trends in abundance

SC/59/SH9 provided an estimate of the trend in abundance of blue whales in the Antarctic, which used abundance estimates from IDCR/SOWER to provide a population growth rate of 8.2% (95% CI 3.8–12.5%) per year between 1978/79 and 2003/04. The analysis used data from the complete third circumpolar cruise (CPIII). The estimate, as well as those for abundance, as above, was a further update to that previously discussed in (IWC, 2004a, p.23), see also Annex H), which had used data only to 2000/01. The Committee **agrees** to accept these estimates and this trend.

10.6.5 Preliminary assessments

SC/59/SH8 provided a preliminary assessment of the status of the southeastern Pacific (Chilean) blue whale population. Different growth rate and catch allocation scenarios indicated that this population was at a minimum of 7–23% of pre-exploitation levels in 1997, suggesting that blue whales found in Chilean waters are less depleted than those found in Antarctic waters. It was noted that log books from whaling in this area are available and may contain information on blue whale catches. The Committee **recommends** that further work be conducted to examine the history of catches and biological data from Chilean whaling operations.

The Committee noted that the historical CPUE data were useful to provide insights into evaluation of the assessment models for humpback whales (Item 10.5.3.3.4 above) and **recommends** that availability of similar data be

investigated to perhaps allow similar analysis to be conducted in assessing blue whale populations

10.6.6 Other

SC/59/SH21 described three types of skin lesions observed in photographs of blue whales found off the northwestern coast of Chiloé Island. Details are found in Annex H, item 7.6. The Committee welcomed this work and **agrees** that populations of large whales should be monitored in order to better understand the implications of these lesions to large whale populations. It noted that this issue is of relevance to the workshop proposed under Item 12.1.

SC/59/IA10 described the archiving and analysis of blue whale photographs collected from 18 IDCR/SOWER cruises. Photographs from IWC management Area IIIW have been cross-referenced and yield multiple within-year re-sightings. Re-sightings were between 4-15 days apart and occurred 58-134nm distant of the original sighting. No between-year re-sights have yet been observed. The Committee welcomed the work presented and **recommends** its continuation in the future.

The Committee was notified that a workshop on blue whale research will be held prior to the Society for Marine Mammal Biennial Conference in Cape Town, South Africa, in late November 2007. Presentations will focus on ongoing research on blue whales in several regions in the Southern Hemisphere (Antarctica, Australia, eastern South America), but studies in the Northern Hemisphere may also be considered. The Committee welcomed this information and noted that the results will complement the Committee's ongoing assessment of blue whales.

10.6.7 Work Plan and Budget requests (blue whales)

Substantial progress has been made towards the in-depth assessment of Southern Hemisphere blue whales. Recommendations for research required to advance the assessment are provided in Annex H, item 9.

Priorities for next year are discussed under Item 21 and budgetary implications are presented under Item 23.

10.7 Western North Pacific stock of gray whales (see also Annex F)

10.7.1 New scientific information

SC/59/BRG19 presented research on the western gray whale population summering off northeastern Sakhalin Island, Russia. This collaborative Russia-U.S. research programme has been ongoing since 1995 and has produced important new information on the conservation status of this critically endangered population. Photo-identification research conducted off Sakhalin Island in 2006 resulted in the identification of 79 whales, including four calves and three previously unidentified non-calves. When combined with data from 1994-2005, a catalogue of 158 photo-identified individuals has been compiled, although not all of these whales are assumed to be alive today. Some 5.1% of the 79 whales identified in 2006 were observed to be 'skinny' (i.e. poor body condition).

SC/59/BRG22 presented a preliminary report of seasonal and annual variation in body condition of western gray

whales off north-eastern Sakhalin Island, Russia. Over the short-term, western gray whales appear to recover from periods of compromised body condition. SC/59/BRG37 provided a report on anthropogenic scarring of western gray whales and was an update of a preliminary report made last year. Out of 150 identified whales considered, 28 male and female western gray whales were found to have been entangled in fishing gear at least once and three to have survived at least one vessel collision. These estimates are likely to be conservative given the nature of the photo-identification ID dataset.

SC/59/BRG41 presented an updated population assessment of the western gray whale using the Russia-US programme photo-identification data from 1994 to 2006. An individually-based population model was fitted to the data to obtain estimates of population size, population parameters, and probabilistic projections of the population. New median estimates of key population parameters were presented. Forward projections of the population model to 2050, assuming no additional mortality or disturbance to reproduction, indicate a high probability of population increase. Four whales (all female) have been trapped and killed in trap nets on the Pacific coast of Japan during the past 24 months. Projections of the female population incorporating this level of extra mortality indicate a high probability of population decline and a substantial risk of extinction by 2050. It is important to avoid any further human-caused deaths in this depleted population.

SC/59/O18 reports on the status of conservation and research on western gray whales in Japan. No sightings of western gray whales were made during either systematic or platform of opportunity surveys around Japan, during June 2006 to April 2007. However, unfortunately a juvenile female gray whale was incidentally entangled by a set net located off Snariku-cho, Ohfunato city, Iwate prefecture, on the morning of 18th January, 2007. The animal was a female which measured 9.19m in body length. Currently, the Fisheries Agency of Japan is exploring alternative actions in to try order to eliminate anthropogenic mortality.

SC/59/BRG/38 reviewed various human related threats to western gray whales, especially bycatch, and made a number of recommendations to promote the release whales from fishing gear. It was also noted that a programme for the release of live dugongs in Okinawa has been established by the Ministry of the Environment.

The Committee was informed of the special status of set net fisheries in Japan, including the fact that Japanese regulations of coastal fisheries have a different system from whaling management and this issue affects various coastal fisheries. In addition, Kato explained that the government is considering starting a programme for improving the release of whales from set nets.

Given the four western gray whales entrapped since 2005, and the finding that this level of mortality is unsustainable (SC/59/BRG41), the Committee again **stresses** the urgency of reducing anthropogenic mortality in this population to zero.

The Committee noted that trap nets are found throughout Japan, and that it is not yet clear whether the risk is restricted to one region. Two of the three fatal trapping

events during 2005-07, involving three animals, were on the northeast coast of Honshu in Iwate and Miyagi prefectures, while the circumstances surrounding the animal killed in Tokyo Bay in May 2005 may have been untypical. Although animals have been trapped elsewhere in previous years, (SC/59/O18), at least the northeast of Honshu should provisionally be considered a high-risk area.

The Committee **agrees** that mitigation should focus initially on ensuring that trapped animals are released alive. Experience in live release of large whales gained in southern Japan and in other parts of the world, such as the NW Atlantic, should be used. The emphasis should be on providing fishermen with the knowledge and incentive to release trapped whales immediately on discovery. In addition, qualified personnel should be trained to assist with releases where possible given logistical constraints.

The Committee considered that an effective mitigation strategy would need to contain several elements, for example:

(1) *Education and training*

- (a) Educating trap net fishermen about the importance of releasing trapped whales, methods of doing so, and opportunities for compensation of costs; production and distribution of suitable AV material;
- (b) Educating relevant prefectural and local officials on the issue of large whale entrapment and release;
- (c) Training of qualified personnel in:
 - (i) assessing the status of an entrapment and releasing the whale(s);
 - (ii) providing general education to fishermen on whale entrapment, and real-time advice in the event of an entrapment.

(2) *Legal and administration*

- (a) Regulations to ensure that there is no commercial incentive to trap or kill trapped animals of endangered populations such as western gray whales;
- (b) Arrangements for compensation for costs associated with release, including cutting of gear and accidental release of fish, to enhance the incentive to help maximise the chances of release.

(3) *Organisational*

- (a) Establishment of a contact point (hotline) for large whale entanglement and entrapment events and appointment of an entrapment response team, which shall be able to provide real-time advice by cell phone to fishermen during an entrapment event and where possible to travel rapidly to the entrapment location to assist with the release.

Morishita explained that the Government of Japan shares the concerns of the Committee about anthropogenic mortality of western gray whales and is committed to implement mitigation measures. He noted the above considerations, but stated that it was not possible to consider them in detail at this meeting because they were

raised late in the meeting, and furthermore he was not authorised to agree to recommendations relating to the trap net fishery, which is not subject to whaling regulations. He stated that Japan will study the proposals and incorporate the ideas, to the extent feasible and practical, into its domestic mitigation methods.

The Committee noted with appreciation the intentions of the Japanese authorities to address the issue of western gray whale bycatch. The Committee **agrees** that western gray whales will be a priority stock at next year's meeting, when it will return to the issue of western gray whale bycatch in more depth. The Committee **requests** that a person qualified to discuss issues relating to the trap net fishery be present to participate in this discussion.

The Committee also repeats its **recommendation** of the last two years (IWC, 2007c, p.36); (IWC, 2006c, p.30) that (1) every effort be made to ascertain whether all these entrapped western gray whales that died in 2005 were previously identified animals from Sakhalin feeding ground; and (2) that arrangements be made for samples and photographs from these whales be sent to the archives of the joint Russia-US programme (i.e. the SWFSC) in La Jolla, California. The Committee also noted with concern that further seismic surveys are scheduled near the Sakhalin feeding ground in 2008 (see section 12.6.3).

10.7.3 Telemetry studies

Last year, the issue of using telemetry data to provide information on migratory routes and breeding grounds of western gray whales in the context of developing measures to mitigate anthropogenic risks throughout their range was discussed (this includes the waters of China, Republic of Korea, People's Republic of Korea, Japan and the Russian Federation). The Committee had recommended that such work be initiated but given concerns over the status of the population had also strongly recommended that:

(1) the work is only carried out using experienced investigators (e.g. Mate) using proven technologies;

(2) tags are only applied to known males (these can be identified in the field by experienced scientists based on their appearance and the results from the joint Russia-US programme).

The Committee **repeats** these recommendations. To encourage progress, the Committee **recommends** that the IWC acts as a co-ordinator for a telemetry project *inter alia* to ensure that it is carried out in as risk averse manner as possible.

It also noted that this issue has been and is being considered by the IUCN Western Gray Whale Advisory Panel (WGWAP) which includes several members of this Committee. It **agrees** to establish a co-ordination group comprising Reeves, Weller, Donovan, Brownell and Gales to oversee the process. It is particularly important that all relevant recommendations of both the Scientific Committee and the IUCN WGWAP are fully taken into account. In this regard, the Committee further **recommends** that the information from the tags, once they are deployed on western gray whales, should be made available in an appropriate form on the web in near real-time.

To be successful, the project will involve the participation of several research groups (for whale identification, tagging, and follow-up re-location efforts) in a remote area with difficult logistics. It will certainly take more than one year before any field work can commence. Although detailed costings can not be made at this time, it is clear that the total budget may exceed US\$1M. Therefore, the Committee **agrees** that this project be included in the Committee's budget but with a token funding request and a recommendation that individual governments or others consider making voluntary contributions to the IWC research fund specified for this purpose. The co-ordination group will also work to encourage the participation of scientists from range states in the process. The Committee looks forward to a progress report from the co-ordination group at next year's meeting, at which a review of progress against IWC and IUCN GWAP recommendations will occur. That report should also take into account relevant information from the forthcoming meeting of the GWAP and consideration of the Marine Mammal Commission Workshop Report referred to below.

Last year, the Committee had also agreed that the general issue of the use of telemetry and potential effects on whales should be considered at next year's meeting where *inter alia* it had been expected that the report of the Marine Mammal Commission (MMC) workshop would be available. This year, the Committee was informed that the MMC report was not yet available but noted that it should be available next year. The Committee looks forward to receiving this report. At the 2008 Annual Meeting it will undertake a review of the information available on general issue of the use of telemetry and potential effects on whales, with an emphasis on the use of such techniques on endangered populations. Part of this review will include consideration of the need to hold an IWC Workshop on the subject in the future.

10.8 Eastern Arctic bowhead whales

10.8.1 Stock structure

The study reported in SC/59/BRG36 augments the existing data on the movement patterns of bowhead whales (*Balaena mysticetus*) in waters between West Greenland and eastern Canada and provides further data supporting a single stock hypothesis. Recent results of satellite tracking of whales from West Greenland in 2005 and 2006 supplement the previous data supporting the hypothesis demonstrating that the bowhead whales inhabiting Foxe Basin, Hudson Bay, Hudson Strait, Eastern Baffin Island, Lancaster Sound with tributaries and West Greenland belong to one highly segregated population. For the authors, the most important problems with the two-stock hypothesis are that: (1) too few calves have been found in the putative Baffin Bay stock to maintain a viable population; and (2) too few adults have been found in the putative Hudson Bay stock to produce the calves and sub-adults that have been seen there. Satellite tracking data have shown that there is no geographical separation between the two putative stocks. The simplest explanation for these findings is that bowhead whales summering in the eastern Canadian Arctic, and wintering in the Hudson Strait and off

the west coast of Greenland belong to a single population. Those animals found in occupying Baffin Bay are mainly adult males and resting females and those occupying in Prince Regent Inlet, Gulf of Boothia, Foxe Basin and north-western Hudson Bay are mainly nursing females, calves and sub-adults. The original stock delineation of two putative stocks was based on the assumption that bowhead whales do not migrate through Fury and Hecla Strait. Satellite tracking in both West Greenland and Canada has demonstrated this assumption is not correct.

Geographic boundaries previously proposed to separate the two putative stocks have been demonstrated not to constitute barriers for whales. Given the data and analyses presented by Greenlandic and Canadian scientists at this and previous meetings, the Committee **agrees** that a single shared Eastern Canada-West Greenland stock in the eastern Arctic should be recognised as the working hypothesis. It **recommends** that a thorough discussion of stock structure occurs at the 2005 Annual Meeting, including comprehensive analyses of genetic data, in order to clarify the stock structure of these whales.

10.8.2 Abundance

SC/59/BRG23 presented the results of a dedicated survey for bowhead whales conducted in April 2006 on the former whaling ground in West Greenland. The estimated abundance of bowhead whale groups corrected for perception bias was 267 (CV=0.47; 95% CI=111-641) and the corresponding total abundance of individuals was estimated to be 295 (CV=0.47; 95% CI=129-708). Applying data from instrumented animals to correct for availability bias and correcting for sightings missed by observers resulted in a fully corrected abundance estimate of 1,229 (95% CI=495-2,939) bowhead whales.

After discussion the Committee concluded that this survey was properly conducted. The Committee **accepts** these abundance estimates. While the abundance estimate does not reflect a total population size, it is representative of the number of animals in West Greenland in winter.

10.8.3 Other new scientific information

SC/59/BRG21 reported that a re-examination of abundance estimates for bowhead whales of the eastern Canadian Arctic, based on surveys conducted in 2002-04 is currently underway, but has not been completed. A satellite-linked telemetry project was conducted in 2006. Details are discussed in Annex F. Whales migrated to summering areas in Prince Regent Inlet and Gulf of Boothia, using both northern and southern routes around Baffin Island. Autumn migration routes to wintering areas also included both northern and southern routes as well. Wintering sites included the mouth of Cumberland Sound, Hudson Strait, and northeast Hudson Bay. Genetic analyses of the complete Canadian dataset are underway. In the eastern Canadian Arctic, one bowhead was observed entangled in a net and another dead beached whale was observed. In the western Arctic, two dead beached bowhead whales were reported. Canadian authorities have decided to treat bowhead whales in the eastern Arctic as a single population.

10.9 Other small stocks of bowhead, right and gray whales

10.9.1 *Small stocks of bowhead whales*

SC/59/ProgRep Norway reports on observations of bowhead whales made in a relatively small area in the Fram Strait between Svalbard and Greenland during the second half of April 2006 (8 sightings; 17-20 animals). The Committee **recommends** the continuation of these surveys in order to increase the limited amount of information available for these whales.

10.9.2 *North Atlantic right whales*

The Committee was pleased to receive information on this species in SC/59/ProgRep USA, including information on survey and photo-identification effort. Two fatal ship strikes were reported for 2004, one off Virginia, the other off North Carolina. An additional animal was recorded as bycatch in Roseway Basin, Nova Scotia.

The Committee repeats its previous **recommendations** on this population that it is a **matter of absolute urgency** that every effort be made to reduce anthropogenic mortality to zero.

10.9.3 *Southern Hemisphere right whales*

New information on southern right whales is presented in Annex F, item 5.3. A brief summary is given below. Based on data from the annual aerial survey along the southern Australian coast, the calculated increase rate for cow/calf pairs, 1993-2006, is 7.56% (95% CI= 4.61, 10.51). Current abundance for the survey area is estimated as 2,100, and for the 'Australian' population (including animals visiting the southeast coast) as *ca* 2,400.

A total of 208 right whales including 34 cow/calf pairs, were recorded during a three week survey at the New Zealand sub-Antarctic Auckland Islands during winter 2006. A similar count in 1997 yielded 146 animals including 18 cow/calf pairs.

SC/59/SH10 reports on the distribution and abundance of southern right whales off the southern coast of Australia using data obtained during the 1995/96 Japan/IWC blue whale survey cruise. Abundance was estimated to be 2,100 (95% CI= 550-8,100) for the area between 38°S and 45°S, and 115°E and 124°E. Whilst the point estimate might be higher than expected, the confidence interval is wide.

The Committee was pleased to receive information on aerial surveys and photo-identification studies off southern Brazil in 2006 (SC/59/ProgRep Brazil).

The status of southern right whales off Chile and Peru was briefly considered. Little information is available for the South East Pacific, although thousands of animals were taken in the 19th century. During the austral winter and spring, these whales are found in the coastal waters off southern Chile north to central Peru, and in southernmost Chile during the summer and autumn. Since there were no known major catches by coastal whalers off Chile and Peru during the 20th century, it is surprising that no increase has been observed in this population. Between 1964 and 1991, only 16 female-calf pairs have been recorded from south-central to northern Chile, and until today only 3 from Peru. More effective conservation measures and additional efforts

are needed to better document all sightings in Chile and Peru and to improve our understanding of this critically endangered population. This will be considered at the 2008 Annual Meeting.

The annual photo-ID studies of southern right whales in the winter breeding area off Pensinsula Valdéz, Argentina, that began in 1971, continued in 2006. An analysis of calving success showed that calving rates are correlated with water temperature around South Georgia, a known feeding ground, and with the breeding success of other krill predators at South Georgia.

The Committee **agrees** that these findings illustrate the importance of continuing long-term photo-ID studies of southern right whales off the New Zealand sub-Antarctic Auckland Islands, Australia, South Africa and Argentina. Only with such long time series is it possible to identify the environmental factors that determine breeding success and hence population dynamics. The Committee repeats previous recommendations that the Commission requests relevant member states to continue to provide funding for long-term monitoring programmes.

10.9.4 *Other small stocks of right whales*

In the offshore component of a western North Pacific JARPN II cruise in August 2006, 14 right whales were recorded at 48°N, 165°E and a number of photo-identification photographs were obtained.

There has been limited U.S. funding to survey for North Pacific right whales in recent years. However, due to the recent opening of oil leases for sale in the southeastern Bering Sea, funding is currently forthcoming and surveys are being planned for the immediate areas during the summer of 2007.

10.10 North Pacific sei whales (see also Annex G)

10.10.1 *Consider beginning a North Pacific sei whale in-depth assessment*

SC/59/IA17 identified potential sources of information that would facilitate a comprehensive assessment of North Pacific sei whales. Additionally, preparatory suggestions of how to proceed with work to be undertaken prior to such an assessment were made (Annex G, Appendix 8).

The Committee **agrees** to the suggestions made as an initial way forward. An intersessional Working Group convened by Cooke, was established to facilitate the work outlined (R14). The Committee **agrees** that the Working Group initially concentrate on the suggestions made in Annex G, Appendix 8 which do not relate to JARPN II data, and follow up on those that do require these data after the 6-year review of that programme.

10.11 Sperm whales (see also Annex G)

10.11.1 *Consider beginning a sperm whale in-depth assessment*

SC/59/IA23 provides a progress report on work undertaken towards a sperm whale assessment with respect to population structure, historical catches, and survey methods. Substantial information is being accumulated on abundance and distribution and on the potential effects of acoustic activity but work is still needed on population

structure, catches, female survival rates and population modelling.

The Committee noted that recently published sperm whale population assessments had not incorporated the fact that there is a prevalence of schools of female and juvenile animals in lower latitudes, while single males and bachelor schools occur in higher latitudes especially in summer. A reconstruction of the population and catch history will need to take these features into account, at least in broad terms.

Misreporting of length and sex has led to problems of interpretation of the historical catch data. Before a population assessment can be made, it will be necessary to attempt to place approximate bounds on the size and composition of the catches. On this basis it may be possible to construct 'low', 'best' and 'high' catch series for female sperm whales, as has been done by the Committee in some other assessments.

Previously, the Committee had indicated that its work programme would not permit progress on a sperm whale assessment until 2008. In the light of current commitments, the Committee could not recommend including a sperm whale assessment in the immediate future, but **agrees** that it would encourage work to be undertaken in parallel along the lines indicated in Annex G, Appendix 9.

10.12 Future SOWER cruises (see also Annex G)

10.12.1 Recommendations for the 2007/08 cruise

SC/59/IA2 presented plans for an aerial survey by Australia in December 2007-January 2008 for minke whales off Eastern Antarctica using Casey Station (66° 17S, 110° 32E) as the operational base. The survey would be conducted by two fixed-wing CASA-212 aircraft, primarily to investigate the feasibility of using aerial surveys for minke whales in the pack ice, but also to attempt to estimate their relative and/or absolute abundance. Integrating the proposed survey with the 2007/08 IWC/SOWER survey should provide directly comparable estimates of minke whale densities within the pack ice and in open water and allow a check on whether the distribution of whales in open water was comparable to most SOWER surveys. It was noted that the final availability of these aircraft and some other logistics could not be confirmed until closer to the proposed survey dates.

The Committee welcomed this proposal and **agrees** that concurrent surveying of the open water by the SOWER vessel would provide valuable information. A plan for a joint survey in 2007/08 between the SOWER Cruise and the above minke whale aerial survey is given in Annex G, Appendix 2. The aircraft is expected to be available for the first two weeks of January, 2008, although the precise logistics have yet to be finalised. They will operate from the Australian Antarctic Station Casey, at ca 110°E. The Government of Japan has offered the research vessel *Shonan Maru No 2*. Given a cruise duration of 60 days, 40 days will be available for research, to allow for transit to and from the home port in Australia (Fremantle). The target species and order of priority will be as in previous years (see Annex G, Appendix 2, Item 5.5), as will the priority items for research. A systematic sighting survey will be undertaken, using standard protocols. Detailed

recommendations, the budget and an outline contingency plan should the aircraft not be available are in Annex G, Appendix 2.

Four researchers, including the Cruise Leader (Ensor), will be required. The Committee **recommends** that final plans, including a contingency plan in the event that the aerial survey does not go ahead, should be formulated at the Planning Meeting in Tokyo during 29 September-2 October 2007. Members are encouraged to submit proposals for the contingency plan research to the Convenor, Kato, by 21 September, for consideration by the SOWER Steering Group (Kato, Bannister, Best, Bravington, Brownell, Clark, Donovan, Ensor, Gales, Hedley and Palka).

10.12.2 Recommendations for the long term

SC/59/IA3 introduced a new methodology to examine the precision that might be obtained from line transect surveys when covariate-based spatial models are used to analyse the data and there was only one survey vessel. Preliminary results suggested that an optimal survey design would continue to allocate more effort to the southernmost region of the survey area, and that a reduction in the proportion of Closing mode effort would improve precision in the abundance estimate. Tentatively, the authors considered that with an appropriate survey design and a spatial analysis, reasonably precise estimates of minke whale abundance could be achieved from SOWER surveys using only one vessel.

These results were encouraging. The Committee **recommends** this investigation continue, specifically, a spatial component for variance in mean school size could be incorporated to facilitate the use of the methods in SC/59/IA3 in planning future SOWER abundance surveys. The Committee also **recommends** that the Tokyo Planning Meeting discuss recommendations for the long term, taking into account the most recent information about the availability or otherwise of vessels in the long-term.

11. STOCK DEFINITION (SEE ALSO ANNEX I)

11.1 Review progress on the Testing of Spatial Structure Models (TOSSM) project

The TOSSM project was initiated in 2003 (IWC, 2004a, pp.27-28; 2004c). The main aim is to develop simulation tools that can be used to examine the performance of current and future genetic population structure techniques, akin to the simulation-testing approach in RMP and AWMP. The focus of TOSSM is on management implications, in that the genetic techniques are used to suggest management boundaries, which in turn are used to set or subdivide catch limits according to some rule; the performance of different genetic methods is ultimately to be assessed in terms of how well a simulated management regime performs if the suggested boundaries are used. There is very little tradition in population genetics of such management testing. Further, there is often a considerable gap between the parameters population genetics methods are designed to estimate and those required for management. TOSSM aims to bridge that gap both for simulation testing and for specific management cases.

This year, results were presented for two commonly-used population genetics methods (STRUCTURE and BayesAss), which were applied to simulated datasets of a total population of 7,500 animals, either as one panmictic population or two sub-populations linked by various rates of migration (see SC/59/SD3 and SC/59/SD6 for further details of life history, exploitation, and genetics in the scenarios). In the (difficult) scenarios tested, neither method performed well in terms of estimating the quantities they were designed to estimate. STRUCTURE frequently misidentified the number of sub-populations, and its assignment of individuals to particular populations was no better than chance, even when the reported assignment probabilities were close to 0 or 1. BayesAss's estimates of migration rate were both inaccurate and inconsistent. Consequently, both methods also performed poorly in management terms, producing a suboptimal description of management units, at least for the boundary setting options chosen.

Some suggestions were made for how STRUCTURE and BayesAss are used in TOSSM, that may improve performance in scenarios relevant to the IWC. It was noted that the scenarios examined in SC/59/SD3 and SD6, while 'difficult' for population genetics, nevertheless do cover parameter ranges that are plausible for baleen whale populations.

With respect to overall performance, many population genetic methods will perform worse with increasing population size (for any given *per capita* migration rate), because the larger absolute number of migrants per generation will erode the difference between the subpopulations. BayesAss, for example, can thus be expected to work well for large populations when there has only been recent contact; a longer period of contact will still leave a signal if the population sizes are small, but this may limit its utility for whaling management.

A number of widely-used population genetics methods rely on MCMC⁹ to produce their results. The time needed for this may not be a problem in specific applications when the methods are only being used once or twice, but can be a serious impediment to simulation-testing when hundreds of runs are required. The Committee noted that there might be value in exploring faster more approximate modifications of some methods, in order to facilitate testing.

Together with last year's work, the Committee has now seen five population genetics methods undergo exploratory testing under TOSSM (Geneland, Structure, BayesAss, Mixprop, Sequential hypothesis testing; see also (IWC, 2007c, pp.489-98). The broad plan is to move forward on three tasks. The first task is to increase the suite of methods tested. This entails identifying a 'champion' for each method who will take the lead in turning the method into a BSA (boundary setting algorithm); see Annex I for the current list.

The second task is to take TOSSM beyond the exploratory-dataset phase into development of an initial set of performance trials, representing a common set of tests that any population genetic method being tested in TOSSM

should undergo. Specific suggestions for the performance trials are given in Annex I Appendix 3.

The third task is to further develop the control program used to simulation-test a BSA. This program is now available as an 'R package'¹⁰ which anyone can use to simulation-test a BSA that they develop (SC/59/SD4). The Committee identified a number of features requiring further development. In particular, further clarification of the documentation, including worked examples of BSA, is important to ensure the continued and expanded involvement of the non-IWC population genetics community.

11.2 Review of statistical and genetic issues relating to population structure

11.2.1 Scoring errors and mutation rates

SC/53/SD2 presented a new statistical method for estimating genotyping error rates based on mother-foetus pairs, with some results from the Norwegian minke whale DNA-register. The Committee noted the value of these data in providing independent estimates of scoring error. Further, when re-typing of apparently discrepant samples is used to eliminate the possibility of scoring errors, mother-foetus pairs can provide a direct estimate of mutation rates for both nuclear and mitochondrial DNA. These mutation rates are important parameters for population genetics which can normally only be inferred indirectly and imprecisely. The Committee **encourages** further application of this method for a variety of species, noting that by-caught and stranded animals may be a potential source of data.

11.2.2 DNA data quality

At the start of the present meeting, the Chair of the SWG on the AWMP approached the SDWG with a request for advice. Although the general issue of data quality has been on the SDWG agenda for a number of years, discussions surrounding the genetic data used in the analyses providing input to the delineation of stock structure hypotheses for the bowhead whale *Implementation Review* have re-emphasised the importance of developing a suitable protocol for genetic data used in providing management advice. In SC/59/Rep3 the AWMP SWG *'agreed that after the Annual Meeting, it will be valuable to develop guidelines for the use of genetic data in Implementations and Implementation Reviews, based inter alia on the valuable experience gained during this review'*. There are related Data Availability Agreement issues involved and these would be greatly aided by the development of an initial protocol for the use of genetic data that included both guidelines and suggestions for minimum standards.

A working group made a good start during the present meeting but it did not have time to finalise its deliberations; for example, there was not enough time to properly review the extensive literature on numerical standards for benchmarks. It discussed the following issues:

⁹ Markov Chain Monte Carlo – a computational technique that often requires lengthy computer runs.

¹⁰ Library of code for the R programming language: see R Development Core Team. 2006: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria, ISBN 3-900051-07-0.

- (1) experimental design (quality control for samples, data, analysis);
- (2) procedural implementation of data quality checks;
- (3) presentation of data and associated errors; and
- (4) assessment of error rates.

Its report is given in Annex I, Appendix 2.

The Committee **agrees** that the suggestions in Annex I, Appendix 2 make a useful contribution to its work, and noted that there were some other technical issues that might be usefully examined. The work will continue intersessionally and a paper will be presented to the 2008 meeting. That paper will contain, *inter alia*, suggestions for numerical benchmarks in relative and absolute terms, and a suggested list of specific analyses expanding on Item V of Annex I, Appendix 2.

11.3 Workplan

Issues relating to the workplan are discussed under Item 21; budgetary implications are discussed under Item 23.

12. ENVIRONMENTAL CONCERNS (SEE ALSO ANNEX K)

12.1 Workshop on Infectious and non-infectious diseases of marine mammals and impact on cetaceans

The Workshop (jointly hosted by the SWG on environmental concerns and the sub-committee on small cetaceans) was held 5-6 May 2007 in Anchorage, Alaska. The objectives of the workshop were to:

- (1) review case studies where infectious and non-infectious diseases are impacting wild populations;
- (2) review the modelling and risk assessment approaches for incorporating disease data;
- (3) determine the types of data needed for assessments;
- (4) standardise the collection of samples and data; and
- (5) enhance collaboration between the various disciplines.

The Workshop focussed on three major topics: harmful algal blooms (HABs) and their associated biotoxins; infectious diseases in marine mammals; and modelling and risk assessment approaches for understanding the impacts of these organisms, toxins or diseases on cetacean populations.

In reviewing the global distribution of HABs, attention was paid to factors which may contribute to their global increase; including eutrophication, coastal development and agriculture and aquaculture. Emphasis was placed on HABs that produce toxins known to be associated with cetacean mortalities (brevetoxin, domoic acid and saxitoxin). It was noted with concern that some mitigation methods may have detrimental effects on marine ecosystems or cetacean habitats. Several international and national organisations are examining the issue of HABs and their associated biotoxins and impacts on ecosystems; IWC collaboration with such groups is encouraged.

The ecology of infectious diseases was also reviewed, with emphasis on factors that may affect individual or population susceptibility to infectious diseases and the geographic distribution and types of diseases found in cetaceans. Of particular note was the increasing incidence of reports of new infectious diseases in cetaceans and skin lesions noted in small cetaceans and large whales in several areas, particularly South America (and see Item 23). Given the known influence of environmental factors on diseases in wildlife, climate change was also discussed in the context of its potential to affect the incidence of diseases in cetacean populations and the severity of their effects. Finally, the Workshop reviewed population and risk assessment modelling approaches. For each of the discussion areas, the Workshop outlined specific data gaps, sampling strategies and research needs and made recommendations for further work.

Based on the findings presented and discussed (Annex K, Appendix 2), the Committee **recognises** that increases in the frequency, type and duration of HABs and increases in biotoxin and pathogen related disease reports in cetaceans are now common throughout the world. Furthermore, it **recognises** the need for increased research and standardised reporting in a wide number of disciplines dealing with cetacean health. These disciplines range from global coverage of field monitoring, climate change, zoonotics (public health) and contaminants to modelling and tool development. There is a need for a better understanding of the epidemiology and clinical aspects of infectious and non-infectious diseases that may affect cetacean population status, especially those diseases that may be related to anthropogenic factors. Finally, the Committee noted that, for most cetacean species, there are currently insufficient disease-specific data to allow modelling exercises to be informative.

To better address those aspects of current and emerging diseases that are relevant to the IWC, the Committee **recommends** the establishment of a Cetacean Emerging and Resurging Diseases (CERD) Working Group (R-). The CERD working group will provide a report to the 2008 annual meeting. Its immediate specific tasks are to: (1) summarise available information on cetacean pathogens, biotoxins and diseases so that disease agents, data gaps and geographic hotspots can be identified; and (2) organise a review of cetacean skin diseases with specific emphasis on the issues in South America.

12.2 POLLUTION 2000+

The report of the recent workshop reviewing the POLLUTION 2000+ project and making recommendations with respect to a second phase can be found in SC/59/Rep6. The Committee **recommends** that Phase II of the programme begins as outlined in that report and in Appendix 3 of Annex K. In summary, the initial work will concentrate on developing:

- (1) an integrated modelling framework for examining the effects of pollutants on cetacean populations;
- (2) a protocol for validating the use biopsy samples in pollution related studies.

An important component of this work will be to identify suitable focal populations for future work. The work will be expedited by the holding of a multidisciplinary workshop to address both items and to evaluate candidate populations. A new Steering Group under O'Hara and Aguilar was established (R22) that intersessionally will consider validation and critical assessment of biopsy techniques with application to large whale species as selected for study during Phase II. A primary component of that work will be the scoping meeting **recommended** under Item 23.

12.3 Southern Ocean collaboration (SOC)

The IWC-SOC WG was developed in direct response to recommendations from the Scientific Committee and directives from the Commission to investigate the effects of climate change on cetaceans. Last year the SOC WG received funding towards:

- (1) the completion of data entry and data validation for the IWC Southern Ocean Cetacean Database (SOCDB); and
- (2) high priority analyses projects and representation and collaboration with ICED Science Planning for the development of cetacean research as an integral component of this new Antarctic research program.

Sea ice, cruise track data and maps are currently being integrated into the database format and the full database will be lodged with the IWC Secretariat in June 2007. It is anticipated that all high priority analyses will be completed in the next 6 months, with results published or in press in scientific journals prior to IWC 2008. The main body of analytical work will be presented at the 2008 annual meeting.

12.4 Planning and coordination of IWC's participation in the CCAMLR/IWC International Polar Year survey in 2008

The Committee was provided with an overview of efforts to plan and coordinate IWC's participation in the CCAMLR International Polar Year (IPY) survey in 2008. Although the IWC was invited to cooperate with the planned survey, at the 2006 meeting of the CCAMLR SC it became clear that there was insufficient commitment in terms of vessel resources to be able to plan such a large-scale effort. Instead, a revised plan for IPY was formulated, based on a series of local krill surveys in various regions of the Antarctic. A survey Planning Meeting for the revised plan was held in Cambridge, UK, from 2-4 May 2007, during which potential IWC collaboration with regional surveys was discussed. It was clear from those discussions that opportunities for cetacean related research would be limited. Those aspects of collaboration that may be of value to the work of the Southern Hemisphere humpback whale in depth assessment are discussed under Item 10.5.

12.5 Progress with respect to the Commission's request on handling and release of entangled cetaceans

Five points for discussion were listed in last year's report on this topic and the Committee's response to these is summarised below. More detail can be found in Annexes J and K. The Committee welcomed the general review of scientific information that can be gathered during the

process of releasing (or disentangling) large whales from entanglements in manmade materials (SC/59/BC1).

(1) The use of data gathered by release programmes in improving estimates of the magnitude, rate and geographic extent of entanglements.

The Committee referred to discussions on this topic in the report of the sub-committee on bycatch and other human-induced mortality (Annex J, item 5.5 and Item 7 of this report). Several aspects of the review in SC/59/BC1 were relevant to estimating mortality due to entanglement. Information must be carefully collected, preferably by trained personnel and should include images and/or genetic material that will allow later identification of the released individual in order to determine its fate. This may be useful in the short-term (if the animal dies) or the long-term if the animal survives. Additional documentation (e.g. of scars and visual health characteristics) may help to inform studies that attempt to estimate rates of entanglement and survival based on these indices. The Committee also considered reports on the accuracy of entanglement reports and analysis of displacement made by entangled whales (SC/59/BC2) and efforts to estimate humpback whale entanglement rates across the North Pacific Ocean using scar analysis (SC/59/BC15).

(2) The impact of entanglements on whales, focusing on the potential, through available case studies and/or modelling, to estimate mortality rates and other non-lethal impacts, including both individual and population level affects.

Available techniques were reviewed to determine the fate of whales after disentanglement, including: (1) reliance on carcass recovery after death; (2) telemetry; and (3) mark-recapture statistical approaches. Regardless of the approach used, the data required to estimate fate accumulate slowly, even where disentanglement programmes are well established.

(3) Methods of safely collecting appropriate data while releasing different species, practical experiences of disentanglement techniques and relative success rates.

The Committee **emphasises** the potential danger in attempting to release large whales from entanglements, noting the recent death of a rescuer in New Zealand. It was reported that in the US, initial disentanglement training now routinely takes two days with classroom discussions and practical use of the tools in simulated exercises. The Committee **recommends** that those who wish to establish disentanglement teams in their countries should work with the appropriate local governmental authorities (for any necessary authorisation) and seek training from professionals with a track record of safety and success.

(4) Types of data which can be collected from entangled/entrapped whales

The Committee reviewed the types and applications of data that can be obtained during disentanglement, but emphasised that data collection plans must not compromise the safety of the crew or the success of the release. High quality photographic documentation is critical to understanding the types and magnitudes of external injuries that can result from entanglement. Such photographic data

is now being used to identify and study the incidence of exposure to entanglement in the free-ranging population. Biopsy samples taken from entangled animals can be used to re-identify the animal using genetic techniques and can also be used in an increasing array of analyses relevant to animal status and health. Respiration and behavioural data obtained from compromised animals can be helpful in assessing responses to disentanglement. In addition, the process of disentanglement can provide opportunities to attach telemetry devices (with careful consideration to the potential impact on the animal) to the released whales in order to determine survival. Finally, gear retrieval is critical to successful determination of the types of gear involved in entanglement and areas where entanglements occur.

(5) Uses of similar or related data that can complement data collected from entangled/released whales (e.g. stranding and scarring data).

Studies on stranded animals can provide additional insight into the nature and severity of entanglement injuries. The Committee noted that it was important for disentanglement teams to work in close cooperation with stranding networks in order to maximise this type of cross-referencing.

In conclusion, the Committee **emphasises** that the most valuable use of disentanglement data is for developing new fishing gear and practices that prevent lethal entanglements of large whales. This is especially important in situations where entanglement is inhibiting the recovery of extremely endangered species or populations. The Committee **agrees** that a workshop on handling and release of entangled cetaceans is not needed, but that interested parties should obtain background information and request detailed information and training from the existing disentanglement teams.

12.6 Other habitat related issues

12.6.1 Progress on planning for a possible climate change workshop

A number of papers were presented dealing with topics related to climate change (e.g. predictions and available evidence for the impacts of climate change on marine mammals, climate changes in the Arctic and infectious diseases in biota). A draft plan for an intersessional Workshop on climate change was presented (Annex K, Appendix 4) and two key issues were discussed: (1) identifying experts who can provide concise reviews of climate change impacts on cetacean habitats, and (2) identifying scientists with long-term datasets that can be analysed for effects of the anticipated changes. The Committee **supports** the workshop proposal and looks forward to receiving a progress report at the 2008 Annual Meeting. An intersessional steering Group was established under Simmonds (R19). The Committee **recommends** that the proposed scoping workshop takes place (see Item 23).

12.6.2 State of the Cetacean Environment Report (SOCER)

The 2007 State of the Cetacean Environment Report (SOCER) is intended to provide a 'snapshot' of environmental developments potentially relevant to cetaceans for scientists and non-scientists alike. This year's regional focus was on the Mediterranean and Black Seas

and the authors commented that in these seas (as many others), most key threats to cetaceans are present and some may be getting worse. The literature analysis of all cetacean-related publications in 2006 revealed that almost half dealt primarily with environment- or conservation-related issues. The full report can be found in Annex K, Appendix 5. The Committee recorded its thanks to Stachowitsch, Parsons and Rose for their hard work in compiling the SOCER.

12.6.3 Progress in acoustics

In previous years, the Committee has emphasised the importance of monitoring impending military exercises and other acoustic events that could have injurious or lethal effects on cetaceans.

The Committee's attention was drawn to an extensive naval training exercise, Talisman Sabre 2007, scheduled to be carried out between late May and early July 2007 by the Australian and US Defence Forces. The Australian Public Environment Report notes that this exercise will include the use of mid-frequency sonar (MFS). The Committee has previously raised concerns about the use of MFS in areas inhabited by beaked whales because of associated mass stranding events. The Committee **urges** that best practice mitigation measures be taken. Guidelines exist that limit military sonar levels to <230dB and include rules about searching for cetaceans prior to start-up. Arrangements should be made to monitor beaches in regions where MFS operations occur and to have a response team standing by in case of strandings. It was noted that there is a well-organised strandings programme in place along the Queensland coast, with a wide reporting network for dugongs, turtles, dolphins and whales.

The Committee **reiterates its previous recommendations** from 2004 (IWC, 2005a, pp. 36-38) and **requests** that the Commission **urges** that these are followed by Australia in planning for the 2007 Talisman Saber exercise.

The Committee was informed that US vessels guarding the G-8 summit being held on the Baltic Sea coast in Germany have the capacity to use MFS, which could affect the endangered Baltic Sea population of harbour porpoises. It requests that the Commission **urges** the relevant authorities to ensure that appropriate mitigation measures are employed.

SC/59/E5 provided an overview of seismic surveys conducted in offshore waters of northern Alaska and the western Canadian Arctic in 2006 and a preview of plans for 2007. Three companies (Shell, ConocoPhillips and GX Technology) conducted seismic surveys in the Chukchi Sea and one company surveyed in the Canadian Beaufort Sea in 2006. A variety of mitigation measures were implemented. The potential effects of noise from seismic surveys on bowhead whales and on the Alaska Native subsistence hunt remain the focus of study and concern in the US and Canada. Although SC/59/E5 focused on seismic surveys, other activities associated with oil and gas development contribute to the acoustic environment (e.g. tugs, barges and drilling). The Committee **recommends** that, as a way of beginning to assess the potential for disturbance (as well as the risk of collision mortality), a mechanism be

established to record locations and activities of all vessels and that a system be created to consolidate and make this information available on an annual basis.

The effects of seismic surveys on cetaceans remain poorly understood. In this regard, a newly published paper by Stone and Tasker (2006) provided evidence of short-term effects on the occurrence and orientation of some cetacean species. Last year, the Committee strongly recommended that baseline information should be collected against which potential effects can be measured (IWC, 2007c, pp.41-43). It repeats that recommendation. Archival acoustic recorders currently deployed in the region should provide some useful baseline data. The Committee was informed that the concept of collecting and analysing pre-, during- and post-disturbance data is gradually becoming better understood and more widely adopted in the industry; new instrumentation and approaches are being developed under the Joint Industry Research Program.

SC/59/E9 raised concerns in regard to oil and gas development in the North Aleutian Basin Planning Area. This area is well-known for its high seasonal biological productivity and includes much of the known critical feeding habitat of endangered North Pacific right whales. Current plans could allow lease sales in Bristol Bay as early as 2011. The Committee **expresses concern** about offshore development in this region primarily because of the potential effects, including cumulative effects, on the highly endangered eastern North Pacific right whale population. The Committee was also informed that a 4D seismic survey is expected to be conducted in summer 2008 near the feeding ground of endangered western gray whales off Sakhalin Island, Russia. There are indications that another seismic survey is being planned directly on the nearshore feeding ground, also in 2008.

The Committee **again expresses its concerns** about the potential impacts from seismic exploration activities on cetaceans. It **recommends** that industry, government and other users of seismic technologies give special consideration to protecting known or predicted areas of biological significance, especially relating to B-C-B bowhead whales and the critically endangered western gray and North Pacific right whales. Seismic surveys should be planned to avoid areas/times where/when these whales aggregate for feeding, breeding, calving or migration. The development of new mitigation technologies might help reduce or avoid disturbance in such areas; the Committee **recommends** that the oil and gas industry continue to work with national resource agencies and other stakeholders to identify the most appropriate mitigation measures.

Wang and Yang (2006) reported on unusual strandings in Taiwan, some of which coincided with offshore military exercises. Additional laboratory analyses related to unusual stranding events in Taiwan, led by Fernández, are underway and will be presented at next year's meeting.

12.6.4 Sea ice: Arctic and Antarctic

SC/59/E4 synthesised information relevant to Arctic issues and sea ice and comprised three sections: (1) a short list of cetacean-related research associated with the IPY; (2) ongoing Arctic research programmes of potential interest to cetacean researchers, and (3) a sampling of recent

publications pertaining to cetacean habitat and health. With reference to (1), the Canadian Flaw Lead (CFL) study, the Pan-Arctic Tracking of Belugas (PATOB) and the Trans North Atlantic Sightings Survey (TNASS) were noted as potentially relevant to the work of the IWC. Details and points of contact for these multidisciplinary research plans can be found on the IPY web site (www.ipy.org).

The recently released 4th Assessment Report of the International Panel on Climate Change (IPCC; www.ipcc.ch) stated that it is highly likely that humans are implicated in increasing global temperatures beyond the previous range of natural variability. Increased marine transport and access to resources across the Arctic that will likely accompany reduction in sea ice associated with climate warming is the focus of an assessment planned by the Protection of the Arctic Marine Environment (PAME; <http://www.pame/is>) working group of the Arctic Council.

SC/59/E8 provided a review of how climate-related changes in the Antarctic sea ice ecosystem may impact populations of baleen whales through effects on krill, their primary prey. It summarised information on: (1) the current state of knowledge of sea ice physics; (2) the link between sea ice and productivity, especially with respect to krill; (3) the current state of knowledge of Antarctic cetaceans with a view to relating distribution and abundance to key aspects the physics and biology of sea ice ecosystem; and (4) the long-term change in biological elements of Antarctica in the context of harvesting and regional and global change.

12.7 Work plan

This is discussed under Item 21. Budgetary implications are dealt with under Item 23.

13. ECOSYSTEM MODELLING (ALSO SEE ANNEX K1)

13.1 Review progress on joint CCAMLR/IWC Workshop on modelling Antarctic krill predators

The Scientific Committees of the Commission for the Conservation of Antarctic Marine Living Resources (SC-CCAMLR) and the IWC Scientific Committee have agreed to hold a joint Workshop to review input data required for ecosystem models being developed to provide management and conservation advice on krill predators in the Antarctic marine environment (IWC, 2007i). A Joint Steering Group (JSG), made up of representatives from both organisations and co-convened by Gales and Constable was established in 2006 to plan for the Workshop following these Terms of Reference (TOR):

- (1) for models on the Antarctic marine ecosystem, and in particular predator-prey relationships, that could be developed for providing management and conservation advice relevant to CCAMLR and IWC, consider the types, relative importance and uncertainties associated with input data for those models, in order to understand what is needed to reduce uncertainties and errors in their use;
- (2) review the available input data from published and unpublished sources that are currently available for such models;
- (3) summarise the nature of input data (e.g. abundance estimates, trend estimates, foraging scales, seasonal diet

etc), based on metadata (see definition below), by describing methodology, broad levels of uncertainty, time series, spatial extent and determine the appropriate scale at which those input data are relevant to these modelling efforts; and

(4) identify and prioritise the gaps in knowledge and types of analyses and field research programs needed to reduce important uncertainties in ecosystem models being developed for CCAMLR and IWC and how scientists from the two Commissions can best collaborate and share data to maximise the rate of development and scientific quality of modelling efforts and input data.

SC/59/EM1 was developed by the JSG and outlined the background to the Workshop, identified issues associated with model requirements and metadata, noted the preparations required for the workshop and proposed a budget. The JSG recommended that expert groups be identified to:

- (1) help compile metadata of the input data for their area of expertise;
- (2) to review the input data and their inherent levels of uncertainty as they might affect model results.

Seven physical and ecological parameters were identified for input from the expert groups (including cetaceans, seals, etc.). Each group will prepare a written review which will provide the foundation for discussion at the workshop. The Australian Antarctic Division has offered to host and manage the metadata records through its Data Centre as well as provide some secretariat support.

Preparations for the workshop have so far been organised by the JSG and the Committee **agrees** that this group should continue to prepare for the 2008 Workshop. With respect to pre-documentation, the Committee **agrees** that a list of potential names for expert groups should be developed by the JSG. In the event that researchers are funded for the preparation of pre-documentation for this Workshop, the Committee **agrees** that it would be useful to set contract deadlines to ensure that products would be delivered on time.

The timing for the Workshop was discussed in relation to allowing sufficient time for these preparations as well as minimising the budget implications by affiliating the meeting to an existing meeting where some participants were already likely to attend. On consideration of the available options, the Committee **agrees** that the preferred option would be to affiliate the workshop with the CCAMLR EMM meeting that will probably occur in July 2008. This option requires the consideration and support from SC-CCAMLR. The Steering Group will report back to the Committee at the 2008 Annual Meeting.

13.2 Review collaboration with FAO

FAO is holding an Expert Consultation on 'modelling ecosystem interactions for informing an ecosystem approach to fisheries' scheduled for July, 2007. Several Committee participants have been invited to attend this consultation. Given the obvious relevance of the consultation to the work of the Committee, those invited were requested to report back to the Committee at the 2008 Annual Meeting.

13.3 Review of progress in the development of ecosystem models

The Committee discussed four papers dealing with different ecosystem modelling approaches developed as part of JARPN II (SC/59/O11, SC/59/O12, SC/59/O13 and SC/59/O14). SC/59/O11 explained that three modelling approaches were in progress in JARPN II: *Ecopath-with-Ecosim*, Multspec-type model and Bayesian assessment.

SC/59/O12 described the Multspec-type model under construction for the offshore survey area of JARPN II. The model took into account the prey-predator relationships between anchovy/saury and minke/sei/Bryde's whales. Modelling is at an early stage and the work plan was presented to the Committee for review. SC/59/O13 described how *Ecopath-with-Ecosim* software was used to evaluate the possible impact of minke whales migrating to the JARPN II offshore survey area on Japanese commercially important fisheries resources. Again the work is at an early stage - for one model run, increases in minke whale biomass caused Pacific saury to decline, but there was very little effect on other species considered in the model. The model suggested that the largest impact on the ecosystem appeared to come from commercial fishing and whaling. Further work for the model was planned.

The inshore component of JARPN II was modelled with a Bayesian assessment model to investigate the effects of consumption by marine mammals on sandlances in the northwestern Pacific coastal region of Japan (SC/59/O14). For modelling purposes, the authors used fur seals as the main predator with the main prey being sandlance. However, the authors noted that at this early stage the paucity of information on fur seals prevented robust parameter estimation. The authors expected that they would be able to submit the quantitative results of this model to the next SC meeting and that the model could be extended to incorporate the minke whale using parameters collected by JARPN II.

The Committee thanked the authors of the JARPN II modelling papers and encouraged further model development work.

In the context of discussions on the development of ecosystem models, the Committee considered the concept of competition and noted some confusion over the use of the term. In the mathematical sense, competition (as a competitive interaction term in equations) is regarded as always occurring when predators share a common diet item, but that relationship can scale down to very small levels, or even zero under some circumstances. From an ecological context, prey overlap and competition are two different concepts and the latter may or may not occur with the former. In the ecological literature, the term 'competition' can be defined as 'the negative effects which one organism has upon another by consuming, or controlling access to, a resource that is limited in availability'. The Committee **agrees** that in future discussions and reports, members should be clear about the distinction of trophic overlap and competition in its ecological sense. It was further suggested that findings make clear that in circumstances where one or more predators exhibit trophic overlap, inverse inter- or intra-specific correlations alone establish only that data are consistent with a competition hypothesis and do not

necessarily exclude other hypotheses with different implications.

The Committee reviewed three papers that described ecological interactions in the Ross Sea, Antarctica (Ainley *et al.*, 2006; CCAMLR, 2003; 2007). The papers highlighted the value of long-term uninterrupted ecological data sets in this region and reviewed examples of how this research has revealed the interaction of top-down and bottom-up processes, as well as pelagic-benthic coupling, in the Ross Sea. The papers also described the trophic overlap in the Ross Sea of the major top-trophic predators: silverfish, toothfish, killer whales, minke whales, Weddell seals, and Emperor and Adélie penguins. The Committee discussed a range of views about the relative influence of top-down structuring with bottom-up forcing (Ainley *et al.*, 2007a), (Nicol *et al.*, 2007) and **agrees** that the best approach to advancing the study of ecosystem form and function in the Southern Ocean is to develop integrated studies planned around well structured hypotheses that incorporate both the physical and biological drivers of ecosystem processes.

Ecological interactions in the North Pacific in the form of sequential megafaunal collapses and prey switching hypotheses were discussed by the Committee (Wade *et al.*, 2007); (Springer *et al.*, 2003). The latter paper contended that sequential declines occurred in North Pacific populations of harbour and northern fur seals, Steller sea lions, and sea otters and that these declines were due to increased predation by killer whales, when industrial whaling's removal of large whales as a supposed primary food source precipitated a prey switch. Using a regional approach, Wade *et al.* (2007) re-examined whale catch data, killer whale predation observations, and the current biomass and trends of potential prey and found little support for the prey-switching hypothesis. The Committee noted that analyses of historical data provided valuable insights into complex multi-species interactions and provide valuable time series for testing some multi-species, ecosystem models.

13.4 Review of data relevant to parameter estimation and ecological interactions

The Committee reviewed two papers that arose from recommendations in the JARPA review (SC/59/Rep1) for further analyses of JARPA data sets that are relevant to parameter estimation in ecological models (SC/59/O9, SC/59/O10). The first of these presented additional analysis of annual trend in stomach contents weight per capita in the Antarctic minke whale using data from all 18 JARPA surveys. Stepwise multiple linear regression analyses, incorporating a large number of covariates, were conducted to investigate the trend of stomach content weight *per capita*. On the basis of this analysis, the authors suggest that stomach contents weight has decreased over an 11 year period and contended that competition among krill feeders and/or the decrease of krill resources must be a potential hypotheses to explain the decline.

There was considerable discussion of this paper. It was suggested that covariates such as distance from the ice edge and distance from the shelf break would probably have some explanatory power. The difficulties of determining ice

edge precisely were discussed, but the Committee **agrees** that such an analysis would be instructive. Further analyses **recommended** included the consideration of some non-linear functional forms as well as a GLM and or GAM modelling approach. The inclusion of AIC values and details of results from non explanatory variables should also noted to be presented in similar papers in future. Some of these issues were partially addressed with a re-analysis of SC/59/O9 during the meeting which took into account non-linearity of some effects specified in a GLM as categorical variables, with the issue of distance from ice-edge approximated as a latitude-month interaction. The Committee thanked the authors for their prompt work and encouraged them to continue with their analysis.

Further discussion on the estimates of mean daily prey consumption by Antarctic minke whales in the Southern Ocean (SC/59/IA8; Tamura and Konishi (2006)) highlighted that estimates are particularly sensitive to assumptions about digestion rates for which data are not available. This, and other uncertainties associated with diurnal feeding behaviour resulted in feeding rates derived from the very large JARPA data set falling in a wide range which covers what might be considered the plausible range of values from other sources, including allometric comparisons of energy requirements. The Committee summarised the three issues that would need to be resolved before progress can be made: (1) the length of feeding season; (2) to what extent consumption rate is sensitive to digestion rate (which is largely unknown); and (3) the extent of feeding at night. The Committee **agrees** that while these questions are being investigated it would be difficult to move beyond only broad estimates and that although it is important to look at temporal trends, there is still further work needed to determine whether the current trends suggested in the data are real, or an artefact of sampling or analysis.

In SC/59/O10, the authors further explored trends in energy storage in minke whales. The annual trend in energy storage in the Antarctic minke whale was examined using stepwise multiple linear regression analyses which showed that blubber thickness at two positions and fat weight of minke whales had been decreasing for nearly two decades. The decrease in blubber thickness was estimated at approximately 0.02 cm per year at a mid-lateral position, which corresponded to a decrease of 9% over the JARPA years (1987/88 to 2004/05). The authors contended this decline in energy storage was best explained by competition among krill feeders combined with the resulting krill population change.

Substantial discussion ensued on this paper, including the presentation of SC/59/O19. The discussion focused on issues of lack of independence between variables, the non-energy related functions of blubber (structure, thermoregulation), the variability of energy content of blubber (lipid analysis) and the non-linearity of blubber thickness variation over a changing core (including issues of foetal growth in pregnancy). More specifically the authors of SC/59/O19 recommended that, together with blubber thickness, other morphometric and biochemical variables should be incorporated into an integrated energetic model. Some further analyses following this

discussion were presented to the Committee which showed a strong correlation between girth and blubber thickness.

The Committee noted that the analysis of the trend data in energy stores of minke whales was of great importance as it applied to the interpretation of multispecies and ecosystem interactions in the Southern Ocean. An intersessional email correspondence group under Walløe was established (R34).

In relation to the analysis of long term trend data from JARPA data, the Committee discussed SC/59/IA19 which reviewed the JARPA surveys for the adequacy of coverage of strata, the sequence that strata were surveyed, the extent of sea ice during the surveys, and other related information. The authors of this paper concluded that there were substantial differences in all these categories in the last three surveys (from 1999/00 to 2004/05) compared to the previous five surveys (from 1989/90 to 1998/99). Opposing views to this interpretation were expressed during the discussion of SC/59/IA19 and these can be found in Annex G (IA). These changes may affect interpretation of data collected during JARPA and further analyses should attempt to account for these temporal and spatial differences. However, it is not clear that complex analysis methods and modelling can satisfactorily correct for fundamental changes in the sampling design through time.

13.5 Work Plan

The workplan is discussed under Item 23, and the budgetary implications are considered under Item 23.

14. SMALL CETACEANS (SEE ALSO ANNEX L)

14.1 Review of population structure, systematics and status of killer whales

The Committee last reviewed the status of killer whales in 1981 (IWC, 1982) and since that time a great deal of new information has become available on all aspects of their biology and status. Killer whales in the North Pacific have been assigned to different ecotypes based on their foraging ecology, with three main ecotypes identified – residents (fish-eating), transients (marine mammal-eating) and offshores (prey type not known, but could include elasmobranchs). In the Antarctic, three ecotypes have also been described based on morphometric characteristics from photographs and field observations. The ecotypes in this region were designated type A (feeding mainly on Antarctic minke whales), B (pinniped specialists) and C (mostly piscivorous) and this terminology is used below. Type C is reportedly smaller than the other two forms and it has previously been hypothesised that multiple species of killer whale occur in the Southern Ocean.

14.1.1 Distribution and abundance

The killer whale has the most extensive global distribution of any cetacean and occurs, or occurred historically, in all oceans and appended seas. The present observed patterns of worldwide distribution are in general agreement with previous distributions; killer whales are more common at higher latitudes and in coastal waters. This distribution

pattern appears to be related to higher productivity in coastal and high latitude areas (Forney and Wade, 2006). High latitude and productivity may also define the presence of the fish-eating form whereas in lower latitudes it is hypothesised that killer whales tend to be generalists rather than specialists. A minimum worldwide abundance estimate of about 50,000 killer whales has been suggested (Forney and Wade, 2006) but the true number is likely to be higher, given the lack of survey effort in many parts of the world's oceans, including high latitude areas of the Northern Hemisphere and most tropical waters.

Abundance estimates have been derived in a number of small geographic areas using photo-identification mark-recapture approaches, dedicated line transect methodology and combinations thereof. A number of papers were available to the Committee on distribution and abundance. In the North Pacific, where most of the research has focussed, information was received from Avacha Gulf, eastern Kamchatka (SC/59/SM4), Gulf of Alaska and Aleutian islands (Zerbini *et al.*, 2007), eastern tropical Pacific or ETP (SC/59/SM27), Gulf of California (SC/59/SM15) and Taiwan (SC/59/SM1). In all regions except the ETP, resident and transient types have been identified.

In the South Pacific, papers were presented on abundance and distribution of killer whales in New Zealand (SC/59/SM19), Papua New Guinea (SC/59/SM20) and the Pacific Islands region. Information on killer whales in the South Pacific is very patchy, except for New Zealand. In the Southern Ocean, at least three ecotypes are recognised (types A, B and C) and based on external colouration patterns and size, it has been recently suggested that a fourth ecotype may be present in this region. Branch and Butterworth (2001) estimated that there were 25,000 killer whales in the Southern Ocean south of 60°S in the 1990s from SOWER cruise data and at the meeting a number of papers were presented which used photo-identification and line-transect methodology on a smaller scale to examine distribution and abundance by ecotype. Information was provided for Macquarie island (SC/59/SM7), Possession Island (Crozet archipelago) (SC/59/SM23), Terra Nova Bay in the Ross Sea (SC/59/SM8), the Antarctic Peninsula (SC/59/SM10) and on a wider scale using ships of opportunity (SC/59/SM21). Site fidelity was noted at the Crozet islands, although long distance travel (1,300km) was also observed (SC/59/SM23). Type C was the predominant ecotype in the Ross Sea study (SC/59/SM8), whereas Types A and C were observed at the Antarctic Peninsula (SC/59/SM23). Matches between catalogues have also been made and both Type B and C Antarctic killer whales have been recorded in New Zealand (SC/59/SM19). It was also noted, as elsewhere, that killer whale distribution is patchy, but the factors responsible for this spatial variation in distribution are not understood. Given the paucity of information on the distribution and abundance of specific killer whale ecotypes in the Antarctic, the Committee welcomed these results and **encourages** future dedicated surveys in this region. It also noted that fisheries observers on longline vessels represent a potential source of data on killer whales in sub-Antarctic waters and **recommends** that the Secretariat contacts CCAMLR and requests a compilation of data on killer whale occurrence and fisheries

interactions from their observer reports and supply those for consideration to the IWC.

In the Atlantic, new information on distribution and abundance was received from Brazil (SC/59/SM11), the northeastern Atlantic (SC/59/SM5), Norwegian (SC/59/SM13) and Spanish SC/59/SM25) coastal waters. In Brazil, most of the sightings are from the south and southeastern regions, with some indication of seasonal occurrence in the latter. Dedicated studies are required for this region to determine the ecotype identity of killer whales while broad surveys are required to estimate abundance. A sightings dataset ($n=3,787$) from across the northeastern Atlantic (1970 – 2007) was compared with locations of 1,413 killer whale catches (1938 – 1967). Information suggests that killer whales are relatively evenly distributed across the northeastern Atlantic in the summer months. Estimates of killer whale abundance from the NASS surveys in different years ranged from 4,413 – 26,774 (SC/59/SM5).

In the coastal waters of northern Norway, killer whales have, for the last 20 years, been concentrating in fjords during October – January where their main prey, Norwegian spring spawning herring over winters (SC/59/SM13). Based on photo-identification mark-recapture techniques, a preliminary total estimate of abundance (in 2003) of killer whales was calculated to be 606 individuals (95% CI 460 – 800). These whales were likely part of a larger population that was targeted by Norwegian whaling from 1938 – 1981. In contrast, a population of 32 killer whales in three or four social groups is consistently present in the Strait of Gibraltar from March – October, with some sightings during winter (SC/59/SM25). Killer whales have also been recorded in the Gulf of Biscay.

The Committee welcomed these new analyses, **encourages** completion of all these studies and recognised the value of long-term studies including photo-identification catalogues, in studying this relatively long-lived odontocete.

14.1.2 Stock structure

In the North Pacific, killer whales have been assigned putative populations based on their seasonal distribution (primarily summer) and foraging ecology. SC/59/SM6 presented the results of mtDNA and microsatellite genetic analysis of seven putative populations in the North Pacific. The authors concluded that locally differentiated populations can be defined by both geographic distribution and ecotype, consistent with current strategy. Detailed discussion can be found in Annex L (Item 5.2). Results from genetic analysis of a mass stranding of killer whales entrapped in sea ice off northern Japan (SC/59/SM12) showed that all animals shared one mtDNA sequence, which is clustered with the transient ecotype of the North Pacific. The Committee welcomed these new results and **agrees** that at least eight stocks occur in the North Pacific, with more stocks likely to be determined.

Information from elsewhere is limited. In the Atlantic, some work is on-going in relation to stock structure of killer whales around Iceland, UK and Norway. Multiple haplotypes have been identified off Iceland (SC/59/SM6), Norway and UK, but analysis of nuclear markers (such as

microsatellites) will be required to define genetic stock structure. The Committee welcomed these results and **encourages** more work on stock structure in this region.

Given the presence of at least three ecotypes in the Antarctic region, and the unresolved questions over the systematics of killer whales in this region, the Committee **recommends** that additional morphological and genetic studies be carried out on samples from this large area.

14.1.3 Life history

A new non-lethal method for estimating ages of killer whales from measurements of specific fatty acids present in their outer blubber layer was presented (SC/59/SM3). A simple multi-linear equation model derived from the combination of two specific fatty acid ratios enabled the ages of known aged individual killer whales to be predicted with good precision (± 3.8 years). This simple killer whale age/fatty acid ratio model appeared to be independent of individual diet and was therefore applicable to eastern North Pacific killer whale populations regardless of sex or ecotype. The model was also applied to other less well studied resident and transient killer whale populations and to other well known groups, such as the west coast southern residents. Results suggest that adult male transient killer whales may have a lower life expectancy than their resident counterparts.

The Committee concluded that this method has important implications for cetacean research and **recommends** that further effort be made to develop, test and, if appropriate, apply it in demographic studies to other cetacean species, including of large whales.

Elsewhere in the Pacific, information was provided on age distribution of a group of killer whales from northern Japan that died as a result of ice entrapment (SC/59/SM4) and individual sightings records from New Zealand. In the Japanese sample, the oldest female (59 years) had only eight corpora suggesting that ovulation rate may decline with age.

In the North Atlantic, preliminary analysis of data from Norway suggest that adult male and adult female survival is estimated to be 0.958 (SE = 0.0096, 95% CI = 0.935-0.973) and 0.959 (SE = 0.0142, 95% CI = 0.929-0.980), respectively. Lowest survival was estimated for calves, 0.816 (SE = 0.167, 95% CI = 0.335-0.975). Calving intervals based on photo-identification data collected over a 14-year period (1989-2002) ranged from 3-14 years (mean = 5.93, SE = 3.087). The Committee welcomed these preliminary results from the long-term photo-identification study of killer whales in Norway. It is the first time that demographic information has been available from outside the northeastern Pacific. Although provisional, these survival life history parameters values for adults appear similar to those for northeastern Pacific populations that have been studied over long timescales.

In general, little is known about the life history of killer whales and the Committee **encourages** the continuation, *inter alia*, of photo-identification programmes to obtain better demographic information from all regions.

14.1.4 Ecology

Information on feeding ecology has shown that killer whales forage on a wide variety of prey items throughout their range. Most information comes from direct observations of feeding activity, with less information from stranded or bycatch animals. More recently, information obtained from stable isotope and fatty acid analysis has led to an increase in our understanding of feeding strategies. Most of the published information comes from the North East Pacific and at this meeting the Committee reviewed a large number of papers containing information on diet and feeding ecology. For example, resident-type killer whales off Kamchatka have been observed feeding on Atka mackerel, various salmon species and cod (SC/59/SM4). There are also reports of killer whales hunting large seals in the northern part of Avacha Gulf and northern fur seals on Medny Island (SC/59/SM4). Two species of seals and a large number of cephalopod species were recovered from stomach contents in stranded killer whales from Japan (SC/59/SM4). In the Aleutian islands, gray whales, northern fur seals and minke whales were frequently observed being taken by killer whales in that region, whereas a long term data set from 1970 – 2000 of the west coast transient killer whales from British Columbia and southeastern Alaska (SC/59/SM24) showed that 208 observed kills involved seven species of marine mammal and five species of bird. It was concluded from this study that the more times an individual was observed making a successful kill, the greater the cumulative number of different prey species that individual was known to have taken, leading the authors to conclude (provisionally) that most of these transient killer whales are not prey specialists. Results from stable isotope work in the Aleutians is consistent with what is inferred from observational studies. In the Gulf of California, predation has been observed on cetaceans (including humpback whales), pinnipeds, sea turtles and fish (SC/59/SM14) whereas in contrast, in New Zealand, to date pinnipeds have not been identified as prey (SC/59/SM19).

Information from chemical tracers can be used to help establish trophic patterns levels and point to areas where killer whales have been feeding (e.g. Herman *et al.* (2005), Krahn *et al.* (2007)). For example, fatty acid, stable isotope and organochlorine analyses of blubber biopsies showed good concordance in assignment to the three recognised ecotypes of killer whales in the eastern North Pacific – residents, transients and offshores. The ecotype profiles exhibited broad similarity across geographical regions, suggesting that the dietary specialization reported for resident and transient whales in the well-studied eastern North Pacific populations also extend to the less-studied whales in the western Gulf of Alaska and Aleutian Islands.

Similarly in the Southern Ocean, in the different areas studied, differences were observed between the prey species and foraging strategies of the observed ecotypes (SC/59/SM8, SM20, SM7). For example, in the Antarctic Peninsula, both Type A and B killer whales were observed harassing humpback whales and minke whales, and killing pinnipeds and Type B were also observed killing gentoo penguins.

In the North Atlantic, prey items include herring (SC/59/SM13), mackerel (SC/59/SM5) and bluefin tuna (Guinet *et al.*, In press). It has been suggested that in Norway there is a smaller, fish-eating ecotype that frequents nearshore waters, and a larger, mammal-eating form that occurs offshore (Pitman *et al.*, 2007). Recent contaminant analysis and stable isotope analysis of animals from the UK and Ireland also suggest the presence of a mammal eating form in Shetland (McHugh *et al.*, 2007). In the South Atlantic, a variety of prey items have been recorded, mostly from analysis of stomach contents, including bony fishes, stingrays, cetaceans, cephalopods and salps (SC/59/SM11). Depredation by killer whales on longline caught tuna and swordfish has also been reported from this area (Dalla Rosa and Secchi, 2007).

It is clear that foraging strategies and prey choice are very varied throughout the known range of killer whales and that this complexity and diversity in foraging should be noted when incorporating prey into ecosystem models.

14.1.5 Habitat

Habitat degradation or exclusion was viewed as the most important threat to killer whales around New Zealand (SC/59/SM19) and Papua New Guinea (SC/59/SM20) by the authors. Concern was expressed about the proposed development of 200 turbines in a narrow harbour entrance in 30m of water, frequently used by killer whales in New Zealand.

14.1.6 Directed takes and incidental mortality

Live-captures for a dolphinarium in the Black Sea were attempted in the Russian Far East off Sakhalin Island and Kamchatka beginning in 2002 (SC/59/SM4). It is uncertain whether any whales were killed during capture efforts that year but in September 2003, a group of 32-37 resident-type whales was encircled by seine nets in Zhirrovaya Bay, Avacha Gulf, eastern Kamchatka. At least one of two whales that became entangled in the netting died, and a third young female was transported to the Black Sea dolphinarium where she died after 3 weeks in captivity. An annual quota of 6-8 live-captured killer whales had been established by the Russian Federation over the last several years but the uptake on the quota is unknown. No population assessment has been made to justify the removal quotas and therefore the Committee **recommends** that a scientifically valid assessment be conducted before further captures off Kamchatka are authorised. The social implications of removals on the social behaviour of killer whales must be taken into account in any such assessment.

Depredation by killer whales on longlines in the Sea of Okhotsk and elsewhere is an increasingly serious problem. There is concern about retaliatory efforts by fishermen, depletion of prey resources and the potential for incidental hooking or entanglement or hooking of the killer whales. As mentioned previously, during the summer months, killer whales in the Strait of Gibraltar also interact with the longline fishery for tuna that began in the strait in 1995. Two killer whales were killed in Morocco in 2004 and six more in September 2006, but this information has not been confirmed. It has been suggested that these mortalities may have been the result of fisheries interactions.

Between 2000 and 2005, the annual reported take of killer whales in West Greenland ranged from 15 – 34 individuals (Anon., 2006). Further information is required on the population structure and abundance estimation of killer whales in this region.

14.1.7 Other

There were a number of papers presented to the Committee on other aspects of killer whale biology and ecology, including the prevalence of diseases (SC/59/SM18) and parasitic infections (SC/59/SM12), skin lesions and damage (SC/59/SM1), potential impacts of repeated whalewatching on foraging (Bain *et al.*, 2007a), and mass strandings (SC/59/SM22). In general, strandings of killer whales (58 killer whales per annum - SC/59/SM18) and mass strandings of killer whales (defined here as strandings of three or more animals) are quite rare. To facilitate better use of opportunities to sample carcasses of stranded killer whales, a standardised killer whale necropsy and disease testing protocol has been developed (SC/59/SM18) and may be modified to include procedures when full post-mortem examination is not feasible.

14.1.8 Consideration of status

The Committee noted that the population structure of killer whales was complex and, except for a few areas of the North Pacific, poorly understood. Furthermore, in many areas (such as most of the tropical oceans) there is very little information available on any aspect of killer whale biology. Such limitations hinder any assessment of the status of killer whales.

Several ecotypes of killer whales exist, sometimes in sympatry. These ecotypes vary in their patterns of social behaviour and foraging specialisations. Population structure exists within ecotypes, although the amount of gene flow between populations and ecotypes is poorly understood. Nevertheless, it is clear that some populations of killer whales are small, demographically closed and thus vulnerable to anthropogenic perturbation. Adverse human influences can impact these demographically independent populations in many ways, including direct removals, prey depletion, environmental contaminants, habitat degradation, disturbance and other factors.

Due to limitations of time and the absence from the meeting of a number of experts, the Committee was unable to fully review the status of all stocks of killer whales for which information exists. Nevertheless, the Committee drew attention to several stocks of killer whales for which there is clear reason for concern regarding status, including: (1) the southern resident killer whale population from the coasts of Washington State and British Columbia; (2) killer whales in Greenland; (3) killer whales found near the Strait of Gibraltar; and (4) killer whales of the Oyashio Current ecosystem.

The southern residents comprise a small, demographically closed population of piscivorous whales that inhabit the inshore trans-boundary waters of Washington State and British Columbia. These killer whales have been studied continuously since 1974 and there is a rich body of information on the abundance and demography of this population. Between 48 and 58 animals were taken for

public display from the southern resident population between 1962 and 1973; since then abundance has fluctuated between 71 and 97 individuals. Southern resident killer whales feed primarily on Chinook salmon during the spring and summer months and on chum salmon during autumn. Current potential threats to the population include: declines in prey availability; high levels of contaminants; disease; and impacts of vessel traffic, particularly whale watching boats. It is listed as *endangered* under the legislation of both the USA and Canada.

Preliminary results of models that examined temporal variation in crude survival rates for the population as a whole and survival of the three component pods were presented to the Committee. It appears that the survival of southern resident killer whales has fluctuated dramatically through time and these fluctuations appear to be driven primarily by the abundance of their salmonid prey. The declines in salmon abundance may have made killer whales in this population more vulnerable and less resilient to normal variation in prey abundance. Contaminants may affect the health and survival of killer whales if individuals mobilise energy reserves (and contaminants) during periods of nutritional stress. The Committee welcomed this new modelling approach and these preliminary results and **encourages** Wade to complete this analysis.

The Committee also noted the reported takes of killer whales from West Greenland, including a recent take of 15 animals in 2005 (Anon., 2006). Further information is required on the population structure and abundance estimation of killer whales in this region. The Committee **recommends** that every effort is made to obtain information and samples from killer whales hunted in Greenland.

The Committee drew attention to the status of killer whales near the Straits of Gibraltar, where approximately 30 animals feed on bluefin tuna. As noted in SC/59/SM25, these killer whales are threatened by depletion of their primary prey source, and from harassment and culling attempts by tuna fishermen in Morocco. Further information is required on the population structure of these killer whales, particularly to determine whether or not this is a demographically closed population. Nevertheless, there is reason for concern regarding the direct and indirect effects of fisheries activities on these animals. The Committee **expresses concern** about the status of the killer whales in the Strait of Gibraltar and **urges** that the relevant local and national agencies in Spain and Morocco cooperate to monitor their status and assess the need for conservation action. It further **recommends** that population structure be investigated on an urgent basis to determine this small group of whales' degree of isolation.

The Committee considered the potential effects of the past harvest of killer whales in the coastal waters of Japan, where more than 1,500 individuals have been removed since 1948 (Ohsumi, 1975). Removals of this number of killer whales would have caused major depletions and could have caused local or regional extirpation of killer whales in this ecosystem. There are relatively low densities of killer whales in the Oyashio Current ecosystem,

compared to the number in other productive, cold-water ecosystems, such as the Gulf of Alaska and California Current (Forney and Wade, 2006). The Committee **recommends** that surveys and population assessments should be conducted to better understand the present status of killer whales in this region.

14.2 Infectious and non-infectious diseases of marine mammals and impact on cetaceans

A pre-meeting workshop was held jointly with the Standing Working Group on Environmental Concerns on the topic of infectious and non-infectious diseases of marine mammals. The full report from the workshop, including the recommendations is presented as Appendix 2 of Annex K. The issue is discussed further under Item 21.

14.3 Progress on previous recommendations

IWC Resolution 2001-13 (IWC, 2002a, p.60) directs the Scientific Committee to review progress on previous recommendations relating to critically endangered stocks of small cetaceans on a regular basis.

14.3.1 Baiji

In recent years, the Committee has expressed repeated concern over the critical conservation status of the baiji; The Committee received results (Turvey *et al.*, Submitted) of a systematic visual and acoustic survey conducted for baiji between 6 November and 13 December 2006. There were no baiji sightings or acoustic recordings. The Committee endorsed the methods used in this survey and **agrees** fully with the conclusions of the scientists who conducted the survey that the baiji is probably extinct.

The Committee expressed its great concern that, despite extensive scientific discourse for more than two decades, little effort was made to implement any real conservation measures for this species. In hindsight, the extinction of this species is not surprising; species cannot be expected to save themselves. The extinction of this species (the first human-caused cetacean extinction) also underscores the risk to other endangered species of small cetaceans and particularly to the vaquita (see below). Such highly endangered species require swift and decisive human intervention before they are lost forever.

14.3.2 Vaquita

The Committee reviewed the current status of the highly endangered vaquita, noting the comprehensive review of Rojas-Bracho *et al.* (2006). The likely rate of decline for the vaquita was estimated by assuming that the rate of animals killed in entangling nets has remained constant since the documentation of D'Agrosa *et al.* (2000) in the mid-1990s. The best estimate of the number of vaquitas killed (78) divided by the best estimate of vaquita abundance (567) in that same time period results in an annual removal rate of 13.8% per year. Assuming that the vaquita population is growing at its maximal annual rate of 4% (see Rojas-Bracho *et al.* (2006)), the population is declining at an annual rate of 9.8%. Using this rate, and assuming no density depensation, the current population size of the vaquita is estimated as 213 animals. This

exercise also suggests that the time remaining to a critical threshold, below which the most extreme conservation actions would be necessary, is approximately 8 years.

The results of an updated analysis of the statistical power required to detect a 10% per annum decline reinforces the conclusions of Taylor and Gerrodette (1993), who estimated that by the time any decline in abundance could be detected, the vaquita could well be extinct. In addition, survey costs are high and would significantly reduce funds needed for direct conservation action.

The Committee reiterates its **extreme concern** for this species. The current number of vaquitas is likely in the low hundreds and that there is very little time remaining until the population becomes so small that it is vulnerable to depensation and ecological, genetic and demographic stochasticity. The Committee emphasises that the conservation measures typically applied to other very small populations, such as captive breeding, are *not* a viable option for this species. It further concludes that another survey cannot provide any information needed for the conservation of this critically endangered species¹¹. More science is not required to conserve this species. Instead, the Committee **strongly recommends** that resources must be found to design and implement a comprehensive programme to eliminate entangling nets from the range of the vaquita through a buy-out programme or other system of compensation to affected fishing communities. Such a programme should include appropriate enforcement and control measures.

The extinction of the baiji serves as an urgent warning regarding the vulnerability of extremely small populations of cetaceans. The baiji was the first cetacean species driven to extinction by humans. Without prompt, decisive action, the vaquita, which was only described fifty years ago, will soon become extinct.

14.3.3 Harbour Porpoise

The Committee reviewed the status of harbour porpoises in the North Atlantic in 1995 and agreed that reported bycatch levels justified concern about sustainability. This year, a number of papers were received in relation to estimating growth rate, estimating demographic rates and impacts of bycatch on a population and use of pingers to reduce bycatch.

A framework for estimating the growth rate of harbour porpoise populations in the North Sea and European Atlantic using a population model was presented (SC/59/SM26). The model was simultaneously fit to data on abundance, life history and bycatch rate (per unit fishing effort) with data on total fishing effort as input. The model allowed explicit consideration of uncertainty. It also provided a useful method for assessing the consistency of information from different datasets. The framework will be further developed to consider population structure of harbour porpoises in the North Sea and data on bycatch and life history from other countries in the region. A Bayesian approach to estimate demographic rates and impacts of bycatch on the population of harbour porpoises in the Gulf of

¹¹ As classified under IUCN criteria.

Maine and Bay of Fundy was also presented (SC/59/BC6). This approach combines mortality risk functions to estimate parameters that describe rates of both natural and by-catch mortality throughout life. Further refinements of both models are planned in the near future.

Results of a trial using acoustic alarms (pingers) conducted in the Danish North Sea hake gill net fishery in July-September 2006 were presented (SC/59/SM2). The goal of the trial was to determine whether the spacing of the Aquatec AQUAmark 100 pinger could be increased without reducing its effectiveness in reducing harbour porpoise by-catch. The results of this experiment showed that pinger spacing can be increased considerably in this fishery (at least to 455m), relative to current guidelines and regulation, without any loss of efficacy. The paper discussed factors influencing the general applicability of these results and recommended that further trials of pinger spacing be conducted in other gill net fisheries and with other pingers. The Committee welcomed the results of this experiment and looked forward to receiving updates of future work in this area. In contrast, results presented on trials to determine the efficacy of a new type of pinger in reducing harbour porpoise by-catch were not promising. It has been hypothesised that alerting sounds might stimulate porpoises to echolocate, which would enhance detection of the net. This concept was tested by deploying custom made alarms, called PAS (Porpoise Alerting Sound) pingers, in the Danish hake gill net fishery during July-August 2006. Results indicate that the alerting sounds emitted by the PAS pingers do not reduce the by-catch of harbour porpoises. The Committee noted that the causes of entanglement of harbour porpoises (and other small odontocetes) are still poorly understood.

At its meeting in 2003, the Committee highlighted the endangered status of the population of Baltic harbour porpoises, especially in the 'Baltic proper' and the urgent need for immediate actions to prevent further anthropogenic mortality in this region. In addition, the Committee reiterated its strong endorsement of the measures outlined in the ASCOBANS recovery plan for porpoises in the Baltic (the 'Jastarnia Plan'). There was some new information from the Baltic presented this year. SC/59/ProgRepGermany referred to the deployment of porpoise detectors in the German sector from Kiel Bight to the Pomeranian Bay in 2006 (ongoing since 2003 *vide* Dinter) as part of the implementation of the Jastarnia Plan. SC/59/ProgRep Sweden reported that detectors were also deployed along the Swedish Baltic coast, with expected future expansion to Finland. The Committee was informed about an European Union Regulation on Fisheries (EU Regulation 812/2004) requiring the use of pingers on gillnets set by vessels 12m and longer and a ban on drift nets that will be effective in 2008. The Committee welcomed this new information and **requests** that it be informed at its next annual meeting of any other progress made towards implementation of the EU Regulation 812/2004 and the Jastarnia Plan, especially in regard to animals in the Baltic proper. The Committee also requests that ASCOBANS provides a written report describing what has (and has not) been accomplished in terms of plan implementation.

14.3.4 *Sotalia*

SC/59/SM29 provided updates on the status of *Sotalia guianensis*¹² in Venezuela. Throughout its range the main threats to this species are bycatch and habitat degradation. This is also true in Venezuela, where populations may be impacted by petroleum extraction activities, shipping traffic and fisheries by-catch. By-caught animals in Venezuela may be subject to some level of consumptive use. Recent efforts have focused on designing and implementing a plan to evaluate the status of this and other cetaceans in the Maracaibo system, including examination of the causes of stranding events (including bycatch). The Committee welcomed this news and **encourages** further research assessing the level and impact of by-catch of this species, in particular in the Maracaibo system and the Orinoco.

14.3.5 Other

The Committee was informed of catches of small cetaceans in Greenland. As reported in IWC/59/4 Appendix E, the NAMMCO-SC met in November 2006 and reviewed recent research, together with catches and management of narwhals and belugas in Greenland. Aerial surveys and studies of stock structure are underway for both species in Greenland. The NAMMCO Scientific Committee expressed concern about the narwhal quotas set for West Greenland (260 animals in 2006/7) and Melville Bay (115 animals in 2006/7). The West Greenland quota exceeds the recommended level of 135 and the quota for Melville Bay 'might not be sustainable.' White whale quotas have been reduced since their introduction in 2004 (140 animals for West Greenland and 20 for Qaanaaq in 2006/7), but the NAMMCO-SC 'remained concerned that the total removals for West Greenland were still above the recommended level of 100.' The Committee **shares the concerns** of the NAMMCO-SC and reiterates its earlier **recommendations** that stocks of narwhals and white whales in West Greenland should remain the focus of major conservation efforts.

The Committee also noted the magnitude of reported harvests of other small cetaceans in Greenland for which there are no quotas. In 2005, the Greenland hunting statistics (Anon., 2006) reported harvests of 2,568 harbour porpoises, 15 killer whales (noted above) and 91 long-finned pilot whales (*Globicephala melas*). The Committee **expresses concern** regarding these harvests, particularly of the large numbers of harbour porpoises reportedly taken, because no assessment has been made of their sustainability. It **recommends** that formal assessments be made of these stocks.

The Committee received information from da Silva (INPA, Manaus, Brazil) on the large and growing illegal catch of botos for use as bait in the central Brazilian Amazon (IWC, 2007c, p.317). Botos are captured by harpoon after tributaries or small lakes are blocked by nets. This illegal killing continues at levels that are very likely to be unsustainable. The effects of the hunt are shown by declining densities of botos in standardised visual surveys and the disappearance of marked individuals from the population. This practice probably originated elsewhere in

¹² See Item 27.1 for a discussion of taxonomy.

the Amazon Basin (e.g. Columbia) and may continue in these areas today. The Committee **expresses great concern** regarding these illegal takes and **recommends** that the Government of Brazil make every effort to determine the number of individuals killed and the geographic extent of the hunt, and conduct an assessment of the impact of these removals on the dolphin population.

The hand-harpoon hunt for Dall's porpoise populations in the western North Pacific near Japan targets a population of *truei*-type porpoises as well as a population of *dalli*-type porpoise found in the Sea of Japan and the southern Okhotsk Sea. The Committee has previously expressed concern for the status of these populations (IWC, 1992; 1993b; 2002d). A summary of information about the hunt available on the website of the National Research Institute of Far Seas Fisheries (Iwasaki, 2006), <http://kokushi.job.affrc.go.jp>, stated that 'in order to promote further rational and scientific resource management it may be possible to apply the idea of PBR from Wade (1998)'. The Committee **encourages** the consideration of alternative methods to evaluate catch levels of these Dall's porpoise stocks. Applying a variety of approaches for determining catches for the southern Okhotsk Sea population (*dalli*-type), catch limits would vary from 596 to 4,520. While for the *truei*-type population, catch limits would range from 539 to 4,340. The current quota is set at 4% of the abundance estimation and for 2001-2005 catches averaged 7,169 for *dalli*-type porpoises and 8,226 for *truei*-type porpoises (<http://kokushi.job.affrc.go.jp>). This catch level was above the highest alternative threshold by nearly a factor of 2, and some of the other alternative thresholds by a factor of 4 or more. If the maximum annual population growth rate of Dall's porpoise is 4%, under the assumptions of a density-dependent model, a catch of 4% will cause the population to decline to levels approaching zero, and will prevent future recovery.

The Committee **reiterates** its extreme concern for these stocks and **repeats** its previous recommendation that catches be reduced as soon as possible to sustainable levels. Given that the existing abundance estimates for these stocks are now 17 years old, the Committee strongly **recommends** that new abundance estimates be generated for Dall's porpoise stocks in the region; it **encourages** adjacent member states to facilitate such a survey. Such estimates should address potential biases from vessel avoidance or vessel attraction. It also repeats its **recommendation** for research on quantification of bycatches, investigation into the accuracy of estimates of catch, and research into population structure of Dall's porpoise in the Okhotsk Sea, further details of which can be found in IWC (2002c). Finally, the Committee noted that a full assessment of the status of these stocks, as recommended in 2002, has not been undertaken, and it **repeats** its recommendation that a full assessment of the status of each population be conducted as soon as possible.

14.4. Takes of small cetaceans

The Committee reviewed a table of incidental captures of small cetaceans (Appendix 1) and thanked the Secretariat for compiling these records. The Committee welcomed the

information submitted by some member countries and **encourages** others to contribute these data.

Several members of the Committee noted that live captures were planned in several parts of the world (e.g. Panama, Turkey and the Solomon Islands) for a variety of small cetaceans (killer whales, bottlenose dolphins, etc.) for display purposes. The Committee reiterates its long-standing **recommendation** that no removals (live capture or directed harvest) should be authorised until a full and complete assessment had been made of their sustainability.

14.5 Other

The Committee noted two papers that reported on by-catch mitigation research in the Mediterranean (SC/59/BC 8 and 10). Both papers were preliminary in nature and the Committee looked forward to receiving full reports of this research at next year's meeting.

The Committee briefly reviewed a paper in relation to interactions between cetaceans and fishing operations in the Azores (SC/59/BC3). Overall, results suggested a low level of interaction between cetaceans and fisheries in the Azores and that the economic impact of cetacean interference was probably small.

14.6 Work plan

The workplan for next year is discussed under Item 21. The Committee reviewed its schedule of priority topics. Those currently held by the Committee (IWC, 2007c, p.37) are as follows:

- (1) Systematics and population structure of *Tursiops*;
- (2) Status of ziphiids in the Southern Ocean;
- (3) Status of common dolphin (*Delphinus* spp.);
- (4) Status of small cetaceans of the eastern tropical Atlantic; and
- (5) Fishery depredation by small cetaceans.

15. WHALEWATCHING (SEE ALSO ANNEX M)

15.1 Assessing biological impacts of whalewatching on cetaceans

15.1.1 Quantifying baselines

SC/59/WW2 presents a framework for literal and standardised use of terminology and an empirical technique for discerning among explanatory mechanisms to detect true habituation and sensitisation responses. The paper urges that classification of wildlife response as habituation or sensitisation should not be done without considerable scrutiny. This paper demonstrates that most cases of presumed habituation or sensitisation actually represent differences in the *tolerance levels* of wildlife to anthropogenic activity (Annex M, item 5.1, fig. 1). The Committee welcomed the paper and emphasised that absence of response does not necessarily mean absence of impacts; i.e., there may be unseen population level impacts due to stress.

SC/59/WW4 considered the theoretical and empirical contexts informing our current understanding of the impacts of boat-based tourist interactions with cetaceans. The proposed conceptual framework, incorporating the conceptual 'Levels of Acceptable Change' (LAC) approach developed by Duffus and Dearden (1990), was discussed in terms of the integration of four key stakeholder groups; the commercial tourism operator, the research community (both natural and social scientists), policy-makers and management agencies. In discussing this framework it was concluded that given the critical contribution of science to sustainability, rigorous research and comprehensive monitoring must become an integral part of sustainable management.

15.1.2 Methods

Smith *et al.* (2007a) assessed factors influencing tourist satisfaction and long-finned pilot whale reactions to boat interactions in Cape Breton Island, Canada. The authors suggested using results from both dimensions of this whalewatching system to define an optimal trade-off in how long encounters should last, minimising the reaction of the whales and maximising the satisfaction of tourists. If the optimal trade-offs are not sustainable, the LAC then becomes crucial in determining best practice (Annex M, item 5.1, fig. 2). This approach should allow the defining and quantification of sustainable solutions, along with their resilience to ecological and socio-economical changes.

In discussion, the value of a model-selection based (as opposed to hypothesis-testing) approach to data analysis was noted. It was also noted that the paper suggested that reducing interaction time might reduce impacts and several other studies on regulatory compliance show better adherence to delimited interaction durations. The Committee **encourages** further modelling work of this kind.

SC/59/WW18 reported on a spatial analysis of 'Southern Resident' killer whale habitat use. Vessel traffic is one of several factors implicated in the decline of this population. Reserves present an obvious impact mitigation option, but should not be arbitrarily placed. Minor adjustments to the boundaries of existing vessel exclusion zones would encompass habitat that killer whales use preferentially for feeding. The authors hope to expand their analyses using existing longer-term datasets to assess whether there is stability in the locations of preferred feeding areas over time. The Committee welcomed the approach and **encourages** them to report on results of future studies.

SC/59/WW20 summarised a study on the impact of tour boats on the behaviour and energetics of bottlenose dolphins off Choros Island (Chile). The energetic costs to dolphins of swimming at different speeds was estimated from captive animal studies. A discussion of the results of the paper is given under item 15.1.4. The Committee **encourages** studies that took into account energetic costs to animals of vessel responses, as an important method for determining the potential for long-term effects from short-term responses.

SC/59/WW24 examined the effect of whalewatching on humpback whales in Witless Bay, Newfoundland. The project used three different methods to study whale

reactions: a one-month cliff-top study, where respiratory variables, whale behaviour, and boat presence were recorded; examination of whale behaviour from aboard whalewatching boats, using laser-range finder binoculars to determine vessel approach distances to whales simultaneously with the behaviour of the whales; and time-depth recorder tags to implement a BACI (before/after, control/impact) study that looked at changes in surface behaviour, respiratory variables and dive profiles. This work represents one of the few cases to date where tag data have been incorporated into such studies and where multiple methodologies were used to determine effects of vessel approaches. Results of this study are presented under Annex M, item 5.4. Further work using multi-faceted approaches is **encouraged**.

15.1.3 Population-level effects

SC/59/WW14 reported on movements of vessels and 'Northern Resident' killer whales in a marine reserve in British Columbia, Canada. Killer whales spent significantly more time near gravel 'rubbing beaches' than anywhere else in the reserve. The authors noted that boats can displace whales from an area that has been designated recently as critical habitat for the population and that all vessel traffic in the area, not only commercial whalewatching boats, contributed to problem.

SC/59/WW23 examined whether whalewatching vessel exposure affected either the calving rates or calf survival to age two in humpback whales on their feeding grounds off southern New England. The results, presented in Annex M, item 5.3, indicated that strong maternal fidelity to specific feeding sites supersedes any effect of displacement for humpback whales, and there was no evidence that whalewatching had negative effects on reproductive parameters. The authors suggest that in large whales, evidence of short-term disturbance may not necessarily be indicative of more biologically meaningful effects on either individuals or populations.

A number of caveats were raised in the discussion given under item 5.3 of Annex M. However, the Committee welcomed the paper and its analytical methods, and suggested that these would be appropriate to use in other areas where such data were available. The Committee **agrees** that long-term studies in areas where whalewatching activities are taking place, especially those studies measuring vital rates over time, are extremely helpful in assessing whether changes in individual fitness and/or population-level effects were caused by whalewatching. The Committee **requests** the Commission to **encourage** Contracting Governments to provide long-term funding for longitudinal studies.

15.1.4 Short-term effects

SC/59/WW1 provided a compilation of whalewatching research studies published over the past year, and summarised recent studies on short-term impacts: Delfour (2007) evaluated the impact of human activities (boat activity, kayak and dolphin-swim activity) on Hawaiian spinner dolphins during three successive summers at one dolphin resting location; Stensland and Berggren (2007) investigated the responses of Indo-Pacific bottlenose

dolphins to whalewatching traffic and do Valle and Cunha Melo (2006) and Santos *et al.*, (2006), described changes in *Sotalia* as the result of exposure to boat traffic, including whalewatching vessels. Results are presented in Annex M, item 5.4. The Committee looks forward to receiving a similar compilation next year.

SC/59/WW9 presented a study to evaluate the appropriateness of distance limit regulations in the Azores. Land-based observations using a theodolite were carried out south of Pico Island during the whalewatching high season. Findings from this study suggest that distances defined in the regulations were appropriate, but particular concern arose due to the high whalewatching traffic observed in the study area.

SC/59/WW24 looked at the impact of whalewatching in Witless Bay, Newfoundland. A cliff-based study found that whale blow intervals increased with the number of whalewatching boats that approached the whales. Aerial behaviour was more common when boats were present than when they were not, and increased with the number of whalewatching boats. Studies on board the boats suggested that while whale behaviour did not vary whether code of conduct violations occurred or not, blow interval significantly increased with an increasing number of infractions per minute. Time-depth recorders were used to determine that whales showed no difference in diving behaviour regardless of whether code violations occurred; however, their index of linearity was lower and their travel speed increased during boat interactions. Whales could be using a two-step horizontal avoidance. In cases of low disturbance, whales responded with increased speed and possibly a more irregular path, allowing them to remain in the same area for feeding. In more intrusive interactions, whales may abandon short-range avoidance mechanisms and start travelling.

In discussion, it was noted that the results show consistency with other studies where responses incorporate changes in swimming speed, indices of linearity and respiratory variables, suggesting that this commonality should be explored further.

SC/59/WW20 examined how the activities and energetics of bottlenose dolphins are affected by boats. Results are presented in Annex M, item 5.4. While the Committee welcomed the approach of combining metabolic rate measurements from captive studies with field observations, it noted that there were substantial flaws in the experimental and analytical design, including pseudo-replication and not accounting for auto correlation in behaviour. New analyses are required.

Bain *et al.* (2007a; 2007b) reported on a study examining the influence of boat traffic on southern resident killer whales. These studies concluded that: vessel interactions led to a reduction in time spent foraging; and number and proximity of vessels increased the distance whales travelled, which could result in increased energy expenditure. The cumulative exposure of those whales to vessels raises the possibility that the short-term behavioural changes reported here can lead to biologically significant consequences.

The Committee **welcomes** this new information, and noted that it illustrated the validity behind the Committee's oft-repeated recommendations that vessel interaction studies begin before whalewatching traffic reaches saturation point. The Committee noted that while these studies provide evidence that habitat degradation is influencing whale behaviour and activity budgets, it is currently unclear whether this effect is driven by acoustics or boat behaviour.

It was noted that many studies have been produced in the past 10 years using similar behavioural proxies (for example, deviation index and respiration rate) to assess short-term effects. A meta-analysis of these studies would help explore the influence of these factors on whalewatching effect size. It was proposed that such a meta-analysis be presented at the next meeting of the Committee. The Committee **agreed** to form an intersessional working group under Lusseau (R33). The terms of reference are presented in Annex M, item 5.4.

15.2 Data sources from platforms of opportunity of potential value to the Scientific Committee

SC/59/WW1 summarised Hauser *et al.* (2006) which investigated data gathered on distribution and pod composition by whalewatching operators in British Columbia (Canada) and Washington State (USA) targeting resident killer whale populations. Results are presented in Annex M, item 6.

SC/59/WW11 relates to the 'Dolphin Space Programme' (DSP), an accreditation scheme for wildlife tour boat operators in the Moray Firth, Scotland. It provided some background to ongoing research collaborations being facilitated by the DSP. It was noted that the DSP team would be pleased to receive advice from the sub-committee on whalewatching and emphasised the potential importance of the Moray Firth in future dedicated studies.

SC/59/WW21 reported on cetacean sightings made during a journey onboard a commercial cruise ship. Ship time provided by cruise operators can constitute a cost-effective way to collect data, which otherwise might be difficult to obtain.

The Committee noted that information about sampling effort and observational procedures be incorporated, to enable use of this type of information for density estimates and/or habitat use over time. Cruise ships may navigate in poorly sampled areas and therefore provide a valuable platform of opportunity to collect information relevant to the Committee. The Committee referred to previously established procedures to implement this type of sampling, such as described in William *et al.* (2006).

Ritter (2007) summarised observations on behavioural responses of rough-toothed dolphins towards a dead newborn calf made during a long-term research programme on cetaceans off La Gomera, Canary Islands, conducted from whalewatching boats. The recorded behaviour underlines the highly social nature of the species and the Committee noted the value of platforms of opportunity in obtaining information on behaviours rarely observed in cetaceans. Joergensen (2007) reported the first photographed observation of a harbour porpoise in Svalbard in July 2006. The observation from a platform of

opportunity is 525n.miles further north than the previous northern-most record in this region.

It was noted in discussion that while not every observation from every vessel can be considered valuable ‘data’, it is often true that vessels conduct repeated cruises along the same track lines across a season. Rigorous standardised protocols may be used in such situations to obtain repeated sightings to measure density, seasonal changes in abundance, and other factors.

The Committee acknowledged the value of the data presented in these studies and the importance of publishing such information. It noted the potential importance of data collected from board platforms of opportunity (e.g., whalewatching boats, cruise ships, ferries and other types of vessels) and **recommends** the documentation of cetacean sightings and behaviours via photography/video whenever possible. It further **recommends** the submission of new information based on such verified documentation of species and behaviours to peer-reviewed journals.

Stockin *et al.* (2001) analysed common minke whale surfacing data in northeast Atlantic waters gathered over a period of three years on board whalewatching boats (1,367 dive sequences in total) from a survey area covering 450km². The study showed significant changes in surfacing rates both throughout the season and during the day. Data collected during this study is the most substantial data set of minke whale surfacing rates in the northeast Atlantic and may have implications for calibrating line transect surveys and minke whale abundance estimates.

The work of the intersessional working group to identify data sources from platforms of opportunity of potential value to the Committee was discussed. The IWC already requests information about opportunistic data collection in Section 2.1.2 of the National Progress Reports (see Annex M, item 6). However, the *ad hoc* nature of these entries is problematic. The Committee therefore **encourages** modifications in the template instructions for opportunistic data reporting in the National Progress Reports, as reported in Annex M, item 6.

The database already compiled will be transferred to the Secretariat next year to facilitate queries by any member of the Committee. The Committee welcomed the work of the intersessional working group and agreed it should continue under Robbins (R27). The terms of reference are presented in Annex M, item 6.

15.3 Other issues

15.3.1 Whalewatching in Alaska

Whalewatching in Alaska is highly seasonal, occurring mostly in the summer months, in coastal areas near major tourist hubs. The main target species are humpback whales and killer whales. A variety of vessel types participate, including large cruise ships. To minimise the potential for harassment and the possibility of collision, regulations were introduced in 2001 that prohibit approaching humpback whales closer than 100 yards in Alaskan waters, prohibit disruption of normal behaviour and prescribe a slow, safe speed near whales. In addition, Glacier Bay National Park requires a minimum humpback whale approach distance of 1/4 mile. Numerous incidents of vessel interactions with

humpback whales have been documented in Alaska, including harassment and fatal and non-fatal collisions. In discussion, it was clarified that the regulations were based on research results and applied only to humpback whales due to their endangered status under U.S. legislation.

A study that has been designed to use ferries to gather survey data and to help assess collision risk, had not been carried out due to lack of funding. The Committee expressed interest in the study design for application in other situations and Straley agreed to submit a paper detailing the design for next year’s meeting.

The Committee **recommends** the collection of basic information about the whalewatching industry worldwide, including the number of companies operating dedicated whalewatching tours, as well as marine cruises that target cetaceans as part of their tours. Other information needed includes the number and type of vessels operating, routes used by the vessels and general socio-economic information about the industry. This information is important to place short-term impacts in context when working to understand their biological relevance.

15.3.2 Discuss and organise a workshop on the strategic planning of large-scale whalewatching research

Last year, the Committee agreed that it was necessary to concentrate research effort on understanding the interactions between whalewatching impacts on cetaceans and other anthropogenic disturbances and ecological factors. To do so, the Committee proposed a dedicated workshop to develop a global scale research design and recommended that such a workshop be held (IWC, 2007j, p.335). SC/59/WW17 proposed a programme for this workshop to design a large-scale study that will be replicated at different sites, and to select such sites. A review of pertinent pre-existing data will be presented to the workshop participants. Appropriate sites will be those for which some relevant information, such as population biology or whalewatching information, already exists. The workshop will also draw attention to studies that have already highlighted interactions between whalewatching impact and other environmental factors (natural or anthropogenic). A robust study design will focus on: whether whalewatching can alter population biology parameters, whether it can act as an evolutionary selective force on targeted individuals and populations, and it will try to detect the mechanisms involved in any impacts. A draft list of candidate species and the specific populations that would make ideal study subjects will be developed to maximise the precision and implications of the results while minimising the number of study sites involved. This list will then be compared with sites highlighted in the review and desirable sites will be selected. The working group proposed to hold this workshop for two days before next year’s IWC meeting. Discussions on the workshop are presented in Annex M, item 7.2.

The Committee **agrees** that the intersessional working group should now be the workshop steering committee and should continue its work under Lusseau (R29) in preparation for a two-day pre-meeting workshop at the 2008 Annual Meeting.

15.3.3 Swim-with-whale operations

SC/59/WW6 provided an update on the development of a questionnaire for swim-with-whale tourism operators and researchers. The questionnaire is an attempt to get more in-depth data on operational procedures when people are placed in the water with large whales. The paper also noted an incident during a swim-with-whale encounter that resulted in serious injuries to three tourists in the Dominican Republic. This incident highlights that swim-with-whale guidelines that discourage active approaches to the animals are not sufficient to safeguard swimmer safety.

SC/59/WW12 reported on swim-with-dolphin activities in the Azores. Regulations and activities are presented in Annex M, item 7.3. The Regional Law in the Azores that regulates whalewatching activity strictly forbids swimming with great whales and specifically states that swimming is only allowed with *Delphinus delphis*, *Stenella frontalis*, *Tursiops truncatus*, *Grampus griseus*, *S. coeruleoalba* and *Steno bredanensis*.

The Committee **agrees** that the intersessional working group on swim-with programmes under Rose should continue its work (R28).

15.3.4 Review of whalewatching guidelines and regulations

Carlson reported that the compendium of whalewatching guidelines and regulations around the world has been updated and is available on the IWC's website.

SC/59/WW1 presented recently published studies investigating compliance with whalewatching regulations: Whitt and Read (2006) studied the level of compliance with dolphin-watching regulations in Clearwater, Florida; and Cunningham-Smith *et al.* (2006) conducted a study in Sarasota, Florida, to evaluate the level of human/dolphin interaction. Results of these studies are presented in Annex M, item 7.4.

SC/59/WW3 presented a series of recent events that collectively represent a paradigmatic shift in the way commercial tourism encounters with cetaceans are managed. These events coalesced around an Australian ministerial decision to reduce the number of commercial dolphin-watch licenses from two to one in Shark Bay as a necessary sacrifice for the long-term sustainability of the area. It represents a socio-political complement to a scientific programme in which a demonstrated negative impact on cetaceans was considered to be unacceptable. The wider significance of this development became apparent at the 2nd National Wildlife Tourism Conference (Fremantle, Western Australia, 2006). The conference represented the intersection of three timely events: (1) the completion and reporting of a five year programme of research (which drew upon over 15 years of data collection) monitoring the impacts of commercial tourism at Shark Bay, Western Australia (Bejder *et al.*, 2006a; 2006b); (2) the subsequent ministerial decision (Minister for the Environment, Western Australia) in response to the research; and (3) a resolution from delegates at the National Wildlife Tourism Conference supporting that ministerial decision. The paper summarised these developments and considers their significance in terms of the sustainable

management of wildlife tourism, both in Australia and elsewhere.

It was noted that an important component behind the Western Australian ministerial decision was the IWC Scientific Committee's (2006) recommendation to the Government of Australia to ensure that appropriate action was taken to restore the abundance and breeding success of individuals in the exposed area in Shark Bay. The Committee **commends** the Australian Government for its decision.

The sub-committee on whalewatching had noted the apparent lack of action by the Government of New Zealand in response to the recommendation of the Committee last year to increase protection for the Doubtful Sound, New Zealand dolphin population as a matter of urgency.

The following discussion occurred after completion of sub-committee business.

Childerhouse stated that the NZ Department of Conservation (DOC) has taken this issue very seriously and has undertaken considerable work over the last year to improve the conservation and protection of this threatened population. Specifically this has been undertaken through the development of stronger relationships with operators and other stakeholders; development of a Code of Practice for commercial operators; numerous education workshops; increased compliance checks and advocating for less traffic in critical habitat areas under the Resource Management Act (RMA). A major focus of management action has been the development of a discussion document to outline various management options, including a marine mammal sanctuary that can be used to mitigate the impact vessels are having on the Doubtful Sound dolphin population.

Some members noted that these steps did not in effect increase the protection of this small and genetically isolated population of bottlenose dolphins of which the viability is currently jeopardised. It was further noted that similar steps by the DOC and the New Zealand Government as described above were taken earlier (2003-2005) but no concrete actions were subsequently taken.

In response, Childerhouse noted that DOC is working towards an approach which will produce long term benefits. While the gains in this regard are not immediate, they are being developed and implemented in a manner it believed were appropriate to this situation, and it is expected that the mechanisms offering increased protection will be sustainable and achievable. With the isolation of Doubtful Sound it is important to gain stakeholder buy-in and this process takes time. With respect to the Australian example, the statutory framework between the two countries is different and, as such, differing protection measures will follow different time frames.

During plenary, Donoghue further explained that a fundamental difficulty in addressing this issue through legislation is that tourist vessels in Doubtful Sound do not specifically target dolphins, nor do they advertise their intention to do so. Consequently, they are only subject to the provisions of the Resource Management Act and not the more specific provisions of the Marine Mammals Protection Regulations promulgated under the Marine

Mammals Protection Act. While the New Zealand Government and the Department of Conservation are aware of the Western Australian Ministerial decision reported above, a similar decision by the New Zealand Minister of Conservation is not possible as Doubtful Sound tourist vessels are not subject to the Marine Mammals Protection Act. As noted, the Department of Conservation is actively engaged in a process of stakeholder consultation and awareness-raising and will report to next years' sub-committee meeting on progress achieved.

The Committee noted that the NZ government had taken some action to address this issue and it **urges** the NZ government to develop management measures to address the issues identified by the Committee. It **recommends** that the Government of New Zealand increases protection for this population and other bottlenose dolphin populations in Fiordland as a matter of urgency.

Groch reported on progress to establish Control Areas in the Right Whale Environmental Protection Area, Santa Catarina, Brazil. During last year's meeting, the Committee reviewed a proposal to improve monitoring of the effects of boat-based whalewatching in the Environmental Protection Area, as well as to improve the design and implementation of management measures to ensure both the species' survival and the sustainability of the whalewatching industry. The Committee's recommendation that the proposal be implemented by relevant authorities was brought forward to the Brazilian authorities and acted upon. The Committee **commends** the Brazilian government for its actions.

SC/59/WW5 was a review of a multi-stakeholder effort in Peru to promote sustainable cetacean watching. Multiple stakeholders, including Peruvian government agencies and the U.S. State Department, have sponsored a project to foster the development of sustainable cetacean watching in coastal communities, as a viable economic alternative to dolphin poaching and an incentive to protect coastal habitat. A national strategy for developing sustainable cetacean watching in Peru and a generic plan for developing sustainable cetacean watching world-wide, have been produced as part of this project. Base-line research on bottlenose dolphins is ongoing and dolphin watching pilot projects will be undertaken in the near future. Cetacean watching guidelines and monitoring programmes will be established as soon as possible.

The Committee welcomed this collaborative initiative and **encourages** such initiatives wherever whalewatching activities occur or are planned. It stresses the importance of the collection of baseline data before an industry had developed to any significant degree.

SC/59/WW22 reported on the use of voluntary approaches (VAs) to achieve conservation goals. In the northeast United States, a VA was established in 1998 by the whalewatching industry in cooperation with government agencies and NGOs. Its intent was to avoid collisions with and harassment of endangered whales by commercial and recreational whalewatching vessels. Whalewatching companies were routinely non-compliant, non-compliance was significantly higher in zones farther from whales, and vessels approached their maximum speeds in all zones. These results indicated that the VA did not achieve the

conservation goal of substantially limiting vessel speed near whales. The failure is troubling because the case study represented near-ideal conditions for success. Discussions on the paper are presented in Annex M, item 7.4.

The Committee **agrees** that it was clear from a growing number of scientific studies testing lack of guideline compliance that voluntary guidelines are often not effective and statutory regulations are preferable. The Committee **recommends** that whalewatching activities should be monitored for compliance and regulations should be actively enforced. However, the Committee also noted the area- and species-specific nature of whalewatching and the importance of using results from appropriately conducted studies and of considering local conditions in developing whalewatching regulations. The Committee **encourages** the enactment of regulations that are science-based, but recognised that in some cases, regulations based on best practice will be most precautionary. In such cases, however, such regulations must remain dynamic and should be amended as research progresses. Further, convenience of enforcement should not be the primary underlying factor in developing regulations in the absence of scientific data.

SC/59/WW24 presented data on compliance with the Code of Conduct in Witless Bay, Newfoundland, Canada. Overall the code was violated on 69% of the trips. This lack of compliance was unexpected as operators voluntarily signed up for the Code of Conduct in the previous year, and some were strong advocates. The author believes that skippers who commit infractions were often unaware that they were violating the code and that the presence of investigators on board would have provided additional incentive to be cautious.

SC/59/WW15 presented recommendations for whalewatching guidelines in the blue whale feeding area of southern Chile. Currently, there is high pressure to develop whalewatching on a regular basis. Any possible negative impacts generated by whalewatching activities may be intensified as the population is already endangered due to past exploitation and therefore more vulnerable to anthropogenic disturbances and changes in ocean conditions. The proposed guidelines are presented in Annex M, item 7.4.

The Committee welcomed this initiative and **endorses** the recommended guidelines. In addition, the Committee **repeats** its previous recommendations that it is extremely important to obtain baseline data from areas where whalewatching has not yet developed but is likely to begin and that such data be collected whenever possible. Further, the Committee **recommends** carefully designed studies to determine the effectiveness of the guidelines in minimizing disturbance responses in the target animals.

SC/59/WW7 presented an updated review of Azorean whalewatching regulations. Azorean whalewatching started in 1993. The regulation process started in 1996 and the first law order was created in 1999. In 2003, another law order appeared with several modifications and, one year later, a governmental law was created to regulate some aspects of the latter one.

15.3.5 Other

SC/59/WV19 introduced the results of a study examining tourist perceptions of the whalewatching industry in northeast Venezuela. Guidelines established in this area allow for the presence of a dedicated observer on tour vessels. Most interviewed tourists did not perceive whalewatching as a potential threat to the conservation of the local dolphin population. These results will be incorporated in the local whalewatching guidelines to increase the awareness of tourists to potential conservation challenges the local dolphin populations are facing.

15.3.6 Review of risk to cetaceans from colliding with whalewatching vessels

This is considered under Item 7.3.

15.4 Work plan

The discussion of the work plan is given under Item 21.

16. DNA TESTING (SEE ALSO ANNEX N)

16.1 Genetic methods for species, stock and individual identification

SC/59/SD1 describes the testing of DNA extraction and PCR amplification methods developed for human forensic analysis for use with degraded, damaged, and highly processed cetacean tissues, and including: (1) a series of purification steps that can purify degraded and chemically treated DNA from 'processed' samples, (2) pre-amplification or 'primerless PCR' which repairs and improves DNA template material prior to PCR amplification, and (3) hemi-nested PCR which uses hierarchical PCR to amplify cetacean DNA with high specificity, even in a background containing degradation products and other inhibitors and DNA from other species. Details and discussion on this document are found in Annex N.

SC/59/SD2 presented preliminary estimates of genotyping error rates in the Norwegian minke whale DNA-register using DNA-profiles from 589 mother-foetus pairs. The analytical aspects of this document were discussed in the Working Group on Stock Definition. The basic idea is that mother and offspring must share at least one allele per locus. It was reported that the laboratory currently used for the DNA-register has a much lower error rate than the laboratory used until 2002. This conclusion is supported by auxiliary data consisting of a repeated scoring of 25 individuals for which the true genotype is believed to be known. The error rates for the period 2002-present are comparable to those found in the published literature. The error rate per allele ranged between 0.0016 and 0.18, depending on the dataset and the assumptions made. Details and discussion on this document are found in Annex N.

SC/59/SD5 described the improved and expanded Witness for the Whales, Vs 4.3 database and accompanying DNA Surveillance web-based program for species identification using DNA sequence data and phylogenetic analysis. The Witness for the Whales Vs3.1 database has been revised by replacing all sequences from specimens of unknown provenance with sequences from known-provenance

individuals. *Witness for the Whales*, database Vs 4.3 is now taxonomically comprehensive, with a total of 399 control region sequences and 264 cyt *b* sequences representing 88 species. Sequences from documented specimens now represent all of the 83 species recognised by Rice (1998), with two exceptions: the Atlantic humpback dolphin, *Sousa teuszii* and the Indian humpback dolphin *S. plumbea* (the latter species has not been accepted by IWC). Vs 4.3 also includes seven species proposed in recent publications and three subspecies of baleen whales. A total of 47 new control region sequences have been submitted to GenBank, and all sequences in the cytochrome *b* dataset are already available there. Details on this document are found in Annex N.

Last year, the Committee agreed on several tasks to be conducted intersessionally to continue with the development of plans for sequence validation (IWC, 2007c, p.57).

In response it was noted that a search in GenBank revealed that by April 2007 a total of 1,323 mtDNA control region sequences of baleen whales had been deposited in this sequence depository. There has been considerable variation in the number of sequences deposited per year. The Committee **agrees** to start with the first round of validation using DNA Surveillance (Ross *et al.*, 2003) (Ross and Murugan, 2006) in the intersessional period 2007/08 for the sequences deposited prior to 2007 ($n=922$), and details are given in Annex N, Appendix 2.

As agreed by the Committee last year, any anomaly detected in the validation process would be shared with members of the Committee. The original submitter would be notified of the inconsistency and a suggestion would be made that an amendment be made to the entry, followed with an offer to help after GenBank has been notified directly of the permission to amend. It was noted that a member of the Committee should be identified to carry out this work after the report of the first round of validation is received next year.

The possibility of future annual validation to be made under contract will be discussed after the experience of the first round of validation has been evaluated by the Committee in 2008.

16.2 Collection and archiving of tissue samples from catches and bycatches

The collection of tissue samples in Norway is from the commercial catches of North Atlantic common minke whales from 1997 to 2006. A total of 538 whales were landed in 2006 and two missing samples were reported. It was noted that there was an unusually high number of duplicate samples (7) from 2004, which coincided with the end of the use of government inspectors for handling samples (see Annex N, Appendix 3).

The collection of tissue samples in Japan is from scientific permit whaling in the Antarctic (JARPA-JARPA II) and North Pacific (JARP-N-JARP-N II), bycatches and strandings. The collection includes complete coverage for 2006 through the 2006/2007 Antarctic season. The Committee was informed that a total of 505 genetic samples of the Antarctic minke whale and three of the fin whale

were collected from the 2006/07 austral summer survey of JARPA II. From JARPN II in the western North Pacific (NP) samples stored in 2006 were: NP common minke whale, $n=195$; NP Bryde's whale, $n=50$; NP sei whale, $n=100$ and NP sperm whale, $n=6$. The samples from bycatch stored in 2006 were: NP common minke whale: 147; NP humpback whale, $n=3$ and NP sperm whale, $n=1$. Genetic samples were stored for the following stranded whales in 2006: NP common minke whale, $n=8$; NP Bryde's whale, $n=3$; NP humpback whale, $n=1$; NP right whale, $n=1$ and NP sperm whale, $n=1$ (see Annex N, Appendix 4).

Regarding the collection of samples in Iceland, for scientific whaling, tissue samples stored in 2006 were: North Atlantic common minke whale, $n=58$. For commercial whaling, samples stored in 2006 were: North Atlantic common minke whale, $n=1$, North Atlantic fin whale, $n=7$ (see Annex N, Appendix 5).

16.3 Reference databases and standards for diagnostic DNA registries

For the Norwegian register, genetic analyses have been completed and data on mtDNA, STRs and sex entered for the years up to 2004. Genetic analysis of samples collected in 2005 and 2006 is in progress (see Annex N, Appendix 3).

For the Japanese register all genetic analyses have been completed for NP common minke, NP Bryde's and NP sei whales through 2006, mtDNA for NP sperm whales up to 2006 and sex for all samples from all species. The genetic samples of Antarctic minke whales and southern fin whales have not yet been analysed. For bycatch and stranding samples, mtDNA analysis has been completed up to 2006 (see Annex N, Appendix 4).

For the Icelandic register all genetic analyses have been conducted for fin whales caught in 2006. Genetic analysis of the minke whale samples is in progress (see Annex N, Appendix 5).

The Committee **agrees** that reports of updates of registers should include a list of references with relevant documents on register documentation and specifications. The Committee also **agrees** that any substantial new technical improvement in the registers should be presented to the Committee as separate documents.

16.4 Work plan

This is discussed under Item 21 and in Annex M.

17. SCIENTIFIC PERMITS (SEE ALSO ANNEX O)

17.1 Review of Results from JARPA

17.1.1 Report of the JARPA Review Workshop (SC/59/Rep1)

An intersessional meeting to review the results from the JARPA research program was convened in Tokyo in December 2006. The Committee noted its appreciation to Bannister, the Steering Committee for the Workshop, the rapporteurs and the Head of Science for their efforts in organising, convening and preparing the workshop report.

Annex D of SC/59/Rep1 indicates that considerable data have been collected by the JARPA programme by both lethal and non-lethal methods, although there was disagreement regarding the analysis and interpretation of some of these data. Item 8 of the workshop report provided an overview of results in the context of the stated objectives of the JARPA programme and of stock management. The Committee reviewed the Workshop report and **endorses** its conclusions and recommendations. For convenience, a short summary of the conclusions on the main topics covered in the JARPA review is given below. However, this is not intended to subsume SC/59/Rep1. A number of these scientific issues were considered further in the reports of relevant sub-committees at this meeting.

1. ABUNDANCE AND TRENDS

Estimates of population trend arising from JARPA are summarised in table 2 of SC/59/Rep1. Current confidence intervals for the estimates of trend are relatively wide. These results are, therefore, consistent with a substantial decline, a substantial increase, or approximate stability in Antarctic minke whale abundance in these geographic areas over the period of JARPA (SC/59/Rep1, p.11).

Considerable progress has been made in addressing the issues related to Antarctic minke whale abundance and trends and provided the recommendations given under item 2 of SC/59/Rep1 are followed, the Committee may be able to agree estimates. This issue was discussed in detail in at this meeting (see Item 10.2.1.2) and a summary in Annex G, item 6.

The abundance estimates provided in Matsuoka *et al.* (2005) for humpback whales represented useful steps forward in working towards acceptable estimates of abundance. Further discussion of this issue is reported in Annex H.

2. POPULATION STRUCTURE

A very considerable amount of work has been undertaken since the mid-term review and the progress that has and can be made given the data collected. Based on the analyses of the genetic and morphometric data presented, it was agreed that there are at least two stocks of Antarctic minke whales present in the JARPA research area. The data do not support the current IWC management Areas for Antarctic minke whales. The data also suggest an area of transition in the region around 150°-165°E across which there is an as yet undetermined level and range of mixing. Samples from the breeding areas would greatly facilitate these analyses, and are likely to be required to resolve issues relevant to stock structure and mixing within the JARPA research area (SC/59/Rep1, p.16).

3. ESTIMATION OF NATURAL MORTALITY RATE

The estimation of this parameter was the main objective of JARPA when the programme was initiated. The natural mortality rate estimates from JARPA data alone (Tanaka *et al.*, 2006) (SC/D06/J13), were, at around 0.04, within the plausible range, but the confidence limits (from below zero to above 0.10) spanned such a wide range that the parameter is still effectively unknown.

The ADAPT-VPA provided estimates of natural mortality rates with a CV of about 0.15 but these depend on the use of commercial catch-at-age data, about which, as discussed

in SC/59/Rep1, there are some problems (and see Item 10.2.3).

4. OTHER BIOLOGICAL PARAMETERS

Estimates of several biological parameters according to one stock hypothesis presented at the Workshop are summarised in table 3 (SC/59/Rep1, p.20). These parameters are length at sexual maturity, age at sexual maturity, length at physical maturity, age at physical maturity, size at age (i.e., generation of a growth curve), percentage of matured females pregnant, foetal sex ratio (male%) and mean litter size. In general, it was agreed that the results confirmed the high pregnancy rates found in this species in the previous commercial data, and corresponds essentially to a 1-year reproductive cycle (SC/59/Rep1, p.21).

Differing views were expressed about the level of reliability that could be assigned to the estimates of historical trends in biological and population parameters of minke whales prior to the JARPA period.

For the JARPA period, no marked trends in biological parameters were found. The growth rates were apparently constant, while the pregnancy rate remained high with some annual fluctuation. The transition phase data suggested a possible small increase in the mean age at maturity over the JARPA period, but the age at first ovulation showed a decrease, at least for the putative 'P' stock (SC/59/Rep1, p.23).

5. ROLE OF ANTARCTIC MINKE WHALES IN THE ECOSYSTEM

A total of ten prey species, including one amphipod, four euphausiids and five fish species were identified based on analysis of stomach contents. Antarctic krill (*Euphausia superba*) was the most important prey species throughout the survey period. The estimates of daily consumption reported ranged from 2.6% to 5.0% of body weight per day (SC/59/Rep1, p.24). Daily prey consumption estimates were similar to those from North Atlantic common minke whales (Haug *et al.*, 1995) and to those predicted by Lockyer (1981) (SC/59/Rep1, p.24).

It was further noted that the Committee welcomed the oceanographic and krill-related work undertaken since the 1997 Workshop. The Committee also agreed that considerable relevant data had been collected by the JARPA programme on matters related to body condition and feeding. However, it is clear from the discussion under Item 5 of the JARPA review that the simple nature of several of the analyses present at the JARPA review means that relatively little progress has been made in addressing this objective, even allowing for the complexities of the subject. However, it was also noted that a number of more refined analyses were presented and discussed at this meeting (Annex K1, item 1.5). This work is ongoing (see item 13.4).

6. POLLUTANTS

Levels of toxic metals and organochlorines were low compared with whales in the Northern Hemisphere, with some indication of a decrease over time. There was speculation as to the cause of this.

7. OTHER RESULTS

The important contribution of the genetic analyses of dwarf minke whale samples from JARPA to the understanding of the phylogenetic relationships among minke whales from different ocean basins was recognised. Genetic results had contributed to the taxonomic review of minke whales conducted by Rice (1998) that confirmed the existence of two species of minke whales, the Antarctic minke whale and the common minke whale (SC/59/Rep1, p.30). Additional work on genetic diversity and spatial pattern of genetic variation in southern humpback whales was reported.

8. MANAGEMENT

The Committee **concurs** with the view reported in SC/59/Rep1 that 'The results of the JARPA programme, while not required for management under the RMP, have the potential to improve management of minke whales in the Southern Hemisphere' (SC/59/Rep1, p.31) in a number of ways. The Committee **agrees** that the following statement, taken from the mid-term review, still applies:

The results from the JARPA programme, while not required for management under the RMP, have the potential to improve management of minke whales in the Southern Hemisphere in the following ways: (1) reductions in the current set of plausible scenarios considered in *Implementation Simulation Trials*; and (2) identification of new scenarios to which future *Implementation Simulation Trials* will have to be developed (e.g. the temporal component of stock structure). The results of analyses of JARPA data could be used in this way perhaps to increase the allowed catch of minke whales in the Southern Hemisphere, without increasing depletion risk above the level indicated by the existing *Implementation Simulation Trials* of the RMP for these minke whales. (IWC, 1998a)

17.1.2 Additional Committee discussion

The Committee **concurs** with the summary reported in Appendix 3 (Annex O) of major findings of the JARPA research program in the context of IWC resolutions. Whilst workshop participants had agreed that a discussion of the respective merits of lethal and non-lethal methodology was important, there had been insufficient time to do so and it had been suggested that this topic should be discussed at the Annual Meeting. The report of this discussion is presented in Annex O. As has been the case in past Committee discussions on this topic, it was not possible to reach consensus amongst the participants.

It was inevitable that the discussions at the Workshop would give rise to suggestions for further and/or refined analyses. The Committee noted the Table of recommendations and the current state of their implementation provided in Appendix 4 of Annex O.

17.2 Review of results from existing permits

17.2.1 JARPA II

A summary of findings from the JARPA II research programme was reported in SC/59/O3 and O4. Discussion regarding this research report focused on the representativeness of samples, as well as the impact on the research of having to terminate the field season prematurely. A more detailed discussion is reported in Annex O.

17.2.2 JARPN II

A summary of findings from the JARPN II SC/59/O5 research programme is reported in SC/59/O5, 6 and 7. A detailed discussion is reported in Annex O.

17.2.3 Iceland

A summary of the Icelandic research programme on common minke whales in Icelandic waters was reported in SC/59/O16. The main objective of the project concerns feeding ecology, energetics and multispecies modelling, but several additional subprojects are included in the programme involving scientists from various research institutions and universities in addition to the Marine Research Institute. A detailed discussion is reported in Annex O.

17.3 Review of new or continuing proposals

The Committee did not have time to consider continuing research proposals of Japan (JARPA II and JARPN II) and Iceland. However, it was noted that there were no substantial changes in these proposals since the previous reviews by the Scientific Committee. The Committee therefore refers to its comments and those of the Scientific Committee in previous years, e.g. (IWC, 2007c, pp.58-63).

17.4 Improving the Committee's procedures for reviewing scientific permit proposals and research results

At last year's meeting, Committee agreed that: (1) the process for reviewing the special permits is less than satisfactory; and (2) the approach reported in Annex P of last year's report, hereafter referred to as DeMaster *et al.* (2007, pp.350-52) would serve as a starting point for discussions at this year's meeting. It was further agreed that the following points will be discussed as a priority:

- (1) the level to which the suggested process will lead to an improvement to the existing process, if at all,
- (2) if a specialist review group is set up and an intersessional workshop held: (a) what would the composition of participants be and how would they be selected; (b) what should the Terms of Reference (TOR) be; (c) how would the process be funded; and (d) what is the role of proponents at the Workshop and what is their role at the Annual Meeting of the Committee?

Further, at last year's meeting it was agreed that the primary elements of an improved process should *inter alia* include: (1) proposals would be submitted to the Chair of the Scientific Committee at least six months prior to the Annual Meeting following a *pro forma* supplied by the Secretariat; (2) a review process would be followed, where the initial review of the proposal would take place at a small specialist workshop that would take place at least 100 days before the Annual Meeting; the composition of the invited experts would be determined by the Chair, Vice-Chair and Head of Science in conjunction with Convenors for that year; (3) the terms of reference for the workshop would primarily be to review the proposal in light of the stated objectives; (4) the report of the workshop would be completed 80 days prior to the Annual Meeting; (5) the original special permit proposal, the report of the specialist

workshop, opinions of the proponents of the proposal, and any revised permit proposal from the Contracting Government would be submitted to the Scientific Committee no later than 40 days before the Annual Meeting; and (6) in principle, a similar approach would be used for the review of periodic or final research results from Scientific Research programmes. In addition, it was agreed that at the Scientific Committee meeting the report of the specialist workshop would be discussed, but not amended. The comments of the Scientific Committee would be included in the Scientific Committee report and provided to the Commission.

This year, the Committee **agrees** that the suggested way forward is an improvement to the existing process and **concurs** that in principle the process reported in DeMaster *et al.* (2007) is an improvement and should be implemented, taking into account the discussions below.

Composition of workshop participants

Various potential options to determine the composition of the workshop participants were identified including: the Convenors of the Scientific Committee; the Heads of Delegations to the Scientific Committee; a standing steering group; or deferring this decision to the Commission. After discussion, the Committee **agrees** that a Standing Steering Group (SSG) established by the Chair of the Scientific Committee would develop an initial list of potential candidates to serve as independent experts at the workshop. The final list would be agreed by the Chair, Vice-Chair, and Head of Science.

With respect to the primary questions posed last year, the following items were discussed.

Terms of Reference (TOR) for the workshop

After some discussion, the Committee **agrees** that the TOR for the specialist workshop should be developed by the SSG and submitted to the Scientific Committee at the annual meeting prior to the workshop. These TOR will include at least the five objectives reported in Annex O, pages 12-13.

Source of funding

The Committee **agrees** that funding to provide for travel of invited participants to workshops associated with the review of new proposals or existing research programmes should be budgeted as part of the annual expenses of the Scientific Committee.

Role of scientists from the Government proposing the Special Permit or carrying out scientific whaling

After discussion, the Committee **agrees** that scientists selected to be proponents of a proposal for a special permit (or the periodic review of results of research authorised under such a permit) should participate in the specialist workshop, but that the findings and recommendations in the workshop report will only reflect the opinions of the independent experts. The Committee **agrees** that: 'The Chair is responsible for the level and nature of participation of the scientists involved in the proposal, which should be limited to (1) providing information to the invited experts in addition to that contained in the proposal or research results

and (2) answering questions posed by the invited experts.’ The Committee **agrees** that there is a desire to ensure that the process of reviewing new proposals and that for the review of existing proposals should be effectively the same and should encompass the process of scientific transparency and independence outlined last year (DeMaster *et al.*, 2007). The Committee **recommends** the adoption of the revised process detailed in Annex P as it applies to new proposals and in principle to periodic and final reviews. It was recognised that additional work was needed to implement this new process for the review of research results associated with Special Permits (i.e., periodic and final reviews). The Committee anticipated that this work would result in formal revisions to Annex P. An intersessional working group (R13) was established to *inter alia* provide suggestions on the following issues with respect to periodic and final reviews in particular, but also the overall process (e.g., identification of members of the SSG):

- (1) timing of such reviews;
- (2) the criteria for selecting and the role of invited experts;
- (3) the application of the Data Availability Agreement with respect to data sets and associated reports;
- (4) the need for a *pro forma* or minimum required list of documents;
- (5) the establishment of a process to develop detailed TOR for specific reviews;
- (6) the need for a *pro forma* for the report of specialist workshops;
- (7) the role of the Scientific Committee in evaluating periodic or final reviews;
- (8) the role of scientists directly involved in research associated with Special Permits, and as noted above,
- (9) the process by which members of the SSG would be identified (including the question of whether it can include proponents).

17.5 Use of any new protocol in the future work of the Committee

It is anticipated that recommendations from the intersessional working group will be reviewed and a final protocol adopted at the 2008 Annual Meeting. This should allow for the orderly review of research results from JARPN II and the research programme of Iceland. The former programme will have completed six years of data collection and has proposed periodic reviews for each six year period of research; thus the intersessional review of the JARPN II research results would take place between 2008 and 2009. It is further anticipated that pending the completion of data analysis and report generation, a review of the research results of the Icelandic research programme would be undertaken following this protocol. The Committee was informed that no new Special Permit research proposals are anticipated in the foreseeable future.

18. WHALE SANCTUARIES

No new proposals for sanctuaries were received. The Committee was informed that Brazil’s proposal for the establishment of a South Atlantic Whale Sanctuary was unchanged and discussion of this issue will occur during the Conservation Committee and Commission Plenary Meetings.

19. REQUEST FROM THE JAPANESE GOVERNMENT WITH RESPECT TO WESTERN NORTH PACIFIC COMMON MINKE WHALES

The Committee had received a request from the Government of Japan to review the scientific aspects of its proposal to the Commission regarding small-type whaling in its coastal waters. The proposal itself did not indicate a specific value for a proposed catch, although it noted that if the Commission should grant a catch, that catch would be subtracted from the present Special Permit catch granted by Japan.

The Chair introduced the item after consultation with the convenors. He first noted that there have been a number of precedents for the Committee to receive requests for advice from individual Commissioners intersessionally (e.g. IWC (1978)). In the past, the Committee had agreed that its priorities lay in completing the work laid out in the initial agenda presented to the Commission. However, it has also agreed that where possible it will try to accommodate Commissioner’s requests to the extent feasible, by allocating a strictly limited short time period to addressing such requests. He also noted that at last year’s Commission meeting, a number of Commissioners when commenting on a similar proposal by Japan, indicated that the scientific aspects should have been considered first by the Scientific Committee. In agreeing to follow past precedent by allowing limited time to discuss this request, the Committee **draws the Commission’s attention** to its already heavy workload and **requests advice** on how it should deal with individual requests from Commissioners in the future.

With that background an *ad hoc* Working Group of the Plenary was established under Hammond with terms of reference:

To examine the scientific content of SC/59/NPM5 and indicate whether it reflects our present knowledge and uncertainty over the key issues, primarily those of stock structure, abundance and trends, anthropogenic removals (primarily direct and incidental catches) and productivity.

The deliberations of the Working Group are incorporated below as Committee report.

Before considering the scientific content of SC/59/NPM5, the Committee returned to the process by which it provided advice on the effect of catches on whale stocks. Some members stated that the request was inconsistent with the rules of procedure of the Scientific Committee and the Commission noting, in particular, that a previous Commission Resolution instructed the Committee not to calculate any quotas for any stock unless instructed to do so by the Commission. While the request was not directly

seeking advice on the setting of a quota, it does request comment on issues that might directly lead to this. They believed that the Committee should request advice from the Commission as to the appropriateness of the Committee discussing this issue. In response, Morishita stated that it was the intention of the Government of Japan that the Scientific Committee should discuss only the contents of the Appendices in SC/59NPM5.

The Committee believed that the most appropriate way for it to provide advice on the effects of catches on stocks of whales not subject to aboriginal subsistence whaling was within the framework of the RMP. Although this framework is for assessing the impact of commercial whaling, it also considers incidental catches and is appropriate to use more generally. Only under such a framework can the necessary uncertainties and complexities, particularly with regard to stock structure, be explored and taken into account. The Committee noted that the context of the request from the Government of Japan was different from that of providing advice under the RMP. It therefore **requests** advice from the Commission on how to deal with any possible future request along similar lines either by the Commission itself or an individual government.

Hatanaka noted that the Committee had been unable to come to agreement on the plausibility of the various stock structure hypotheses for North Pacific common minke whales, and that the intention of SC/59/NPM5 was to use additional information obtained since the *Implementation* was completed to explore further this and other issues. Whilst agreeing that the framework of the RMP was the best way forward for providing advice some members believed that it was appropriate for the Committee to provide advice in the interim before an *Implementation Review*.

In providing a review of the scientific aspects of the proposal, the Committee noted that it is at present undertaking an in-depth assessment of the western North Pacific common minke whale with focus on J-stock (see Annex G1). It also referred to its discussions on an *Implementation Review* for common minke whales in this region given under Item 6.3.

The Committee noted that data had not been provided under the Data Availability Agreement (DAA) because this was not believed to be necessary by the presenters of SC/59/NPM5. The Committee **agrees** that the issue of the DAA and the provision of interim advice should be covered in the review discussed under Item 24.

Stock structure

Information on stock structure was detailed in Appendices I, III and IV of SC/59/NPM5.

Appendix I described the genetic basis for limiting whaling operations on O stock common minke whales to waters 10 n.miles or more from the Japanese Pacific Coast. It investigated the mixing proportion of J and O stocks using mtDNA data from various sources and calculated using methods employed during *Implementation Simulation Trials (ISTs)* for western North Pacific common minke whales. Mixing proportions were presented for animals up

to different distances from the Japanese Pacific coast in sub-area 7. The results (Appendix I, Table 2) showed that the mixing proportion of J-stock declined with distance from the coast. The authors concluded that the impact of community-based whaling on J-stock can be minimised by restricting catches to 10 n.miles or more from the coast.

Appendix III described the results of mtDNA analyses using samples from JARPN and JARPN-II 1994-2006, including data from previously unanalysed samples from 2003-2006, to examine the plausibility of the four stock structure scenarios used in the *Implementation Simulation Trials* for western North Pacific common minke whales. The authors concluded that the results of the updated analysis supported Scenario B (two stocks, J and O, with no W stock), but did not support Scenarios A, C and D.

Appendix IV made use of CPUE data previously unused during *Implementation Simulation Trials (ISTs)* to investigate the plausibility of the different stock structure scenarios considered for western North Pacific common minke whales in the *ISTs*. A simple Bayesian population dynamics model was used to estimate depletion levels, which were compared to those generated for stock structure Scenarios A, C and D in the *ISTs*. Results showed that the 90% CI of depletion under scenario A was within the 90% CI of depletion estimated by the model. Conversely, the 90% CIs of depletion under scenarios C and D was not included in the 90% CI of depletion estimated by the model. Sensitivity analyses did not appreciably modify these results. The authors concluded that the plausibility of stock structure scenarios C and D is much lower than that of scenario A and, inference, B.

In discussion, several members expressed the view that without detailed consideration of the data it was not possible to assess the conclusions drawn from the analyses presented. The situation with regard to stock structure was uncertain and the process to evaluate different stock structure hypotheses was complex. Attention was drawn to the recent work of the Committee to assess bowhead whales of the B-C-B stock, where very detailed analyses had been conducted on comprehensive data made available under the DAA. Without all the data being available to conduct a much fuller analysis, advice could not be given. Baker pointed out that the proportion of J and O stock animals in coastal bycatch around Japan was 85:15 for the years 2002 to 2006 (Appendix 2, Table 1 and Appendix 6, Table 1 of SC/59/NPM5). This was higher than for some of the trials in the 2003 *Implementation*. This should be considered in the wider context of stock structure in coastal waters east of Japan, which was far from clear and needed detailed examination. He believed that minke whales in this area may be part of a stock intermediate between O and J stock rather than a mixture of J and O stock animals.

In response, the presenters of SC/59/NPM5 pointed out that the analytical methods used were the same as or very similar to those previously used by the Committee and that the same stock structure hypotheses were being evaluated. The Committee should, therefore, be able to provide advice. They reminded the Committee that age/sex segregation is well-established in North Pacific common minke whales. The bycatches of small J-stock minke whales very close to the east coast of Japan is consistent with young animals

from this stock moving into the Pacific through the Tsugaru Strait. The increase in the proportion of J-stock animals identified in the JARPN-II catch compared to animals taken during commercial whaling in 1983-87 indicated that this could be happening more often now than in the past. Hypothesis C includes an intermediate stock in sub-area 7 but the authors of SC/59/NPM5 concluded that the evidence presented therein did not support this hypothesis.

In conclusion, the Committee was **unable to agree** on whether or not the information on stock structure presented in SC/59/NPM5 reflected present knowledge and uncertainty.

Catches, abundance and trends, and productivity

Information on direct and incidental catches used to examine the effects of future catches on O-stock and J-stock common minke whales, respectively, was presented in Appendices II and VI of SC/59/NPM5.

Previously specified past commercial and research catch series were used. Mixing rates between J and O-stocks estimated in Appendix I were used to assign past and future catches to J and O-stocks. Future annual catches of 220 were assumed in sub-areas 7, 8 and 9 (Appendix II), of which 18 were estimated to be from J-stock (Appendix VI). Incidental catch data from Japan were from option J(ii) from previous *Implementation Simulation Trials* for years up to and including 2000 and from Japanese Progress Reports for 2001-2006. Future annual incidental catches from Japan were assumed to be the average of those in 2001-2006. Mixing rates between J and O stocks in past and future incidental catches were assumed to be the average over 2001-2005, estimated using previously applied methods. Data used from Korea were from *ISTs* in 1995-2001 and Korean Progress Reports in 2002-2005.

Some specific points were raised concerning the analyses used to examine the effects of future catches on the stocks of minke whales. Catches in excess of MSY appeared to be sustainable in the projections only because the assumption was made that >70% of catches would be males. This assumption was based on data from recent years; in earlier years an excess of females was found. It was noted that results would be rather sensitive to this assumption, the reasonableness of which was therefore questioned. For example, examination of the CPUE series stratified by sex would show a decline in numbers of females, which would cast doubt on the conclusion in SC/59/NPM5 that the CPUE trend did not support certain stock structure hypotheses. The point was also made that results would be sensitive to assumptions about numbers of O and J stock animals in future catches. The Committee has previously agreed that CPUE data only be used to determine trends in abundance when the nature of the whaling operation is fully described and well understood (IWC, 1989) – more

information would be needed to assess the results presented.

Hakamada responded that recent data on sex composition from research takes had been used to examine the effect on future catches and that these included the higher percentage of females in the catch in the coastal area. He believed, therefore, that the assumption in the analysis was appropriate.

No comments were made on the information presented on abundance and trends (Appendix V) or productivity (Appendix II).

Summary response from Committee

The Committee **agrees** that the most appropriate way for it to provide advice on the effects of catches on stocks of whales not subject to aboriginal subsistence whaling is within the framework of the RMP. The Committee noted that the context of the request from the Government of Japan was different from that of providing advice under the RMP. It therefore **requests advice from the Commission** on how to deal with any possible future request along similar lines either by the Commission itself or an individual government.

The Committee could not agree on whether it was appropriate to provide short term interim advice at intervening times between *Implementations* and *Implementation Reviews*. The Committee recalled the uncertainty concerning stock structure in North Pacific common minke whales that remained following completion of the *Implementation* in 2003 (IWC, 2004b). Some members believed that the new information presented in SC/59/NPM5 had reduced this uncertainty and clarified understanding of stock structure. Other members believed that progress on addressing uncertainty in stock structure could only be made by consideration of all relevant data within the framework of an *Implementation Review* under the RMP. The Committee refers to its discussions on an *Implementation Review* under Item 6.3.

20. RESEARCH AND WORKSHOP PROPOSALS AND RESULTS

Table 4 lists the proposed intersessional meetings and workshops. Financial implications are dealt with under Item 23.

20.1 Review results from previously funded research proposals

Results from IWC funded projects are dealt with under the relevant Agenda Items.

20.2 Review proposals for 2007/08

No unsolicited research proposals were received.

Table 4
Workshops and intersessional meetings planned for 2007/08.

Subject	Agenda item	Venue	Dates	Steering Group
SOWER cruise: planning meeting and future SOWER abundance estimates Workshop	Annex G, App. 2	Tokyo	Sep 2007	R15
IWC/CCAMLR Workshop on ecosystem modelling	Annex G, App. 3	TBA	Dec 2007/Jan 2008	R17
Pollution 2000+ Phase II scoping group meeting	Annex K1, item 1.2	TBA	July 2008	R24
Workshop to review skin diseases in cetaceans of South America	Annex K, App. 3	Mexico?	Likely March 2008	R22
Climate Change scoping group meeting	Annex K, item 6	Chile	2 day pre-meeting	R34
Workshop on Greenland fisheries	Annex K, App. 4	TBA	Prior to 2008 meeting	R19
North Atlantic fin whale <i>Implementation</i> technical Workshop	Annex E, items 3-5	Copenhagen?	Spring 2008	R3, R4, R5
First intersessional Workshop for the North Atlantic fin whale <i>Implementation</i>	Annex D, item 5.1	TBA	Late 2007	R6
Intersessional workshop to review MSY rates	Annex D, item 5.1.2	Reykjavik	Spring 2008	R6
Workshop for strategic planning of large-scale whalewatching	Annex D, App 3	Chile	2 day pre-meeting	R33
Pre-meeting RMP (early start)	Annex M, item 7.2	Chile	2 day pre-meeting	R9
Pre-meeting AWMP (early start) – <i>Implementation Review</i> for common minke whales in the North Atlantic	Annex D, item 3.4	Chile	2 day pre-meeting	R2
MSYR review workshop	Annex E, item 9	Chile	2 day pre-meeting	R2
	Annex D, App 3	TBA	Prior to 2008	R7

21. COMMITTEE PRIORITIES AND INITIAL AGENDA FOR THE 2008 MEETING

At this year's Scientific Committee meeting, 14 sub-committees (including SWGs and *ad hoc* Working Groups) were established. The number of sessions for sub-committee deliberations was 90 over a six-day period, based on three concurrent sub-committee meetings for each of five work sessions per day, starting at approximately 08:30 and ending typically at 21:30. In addition, a further five sessions were scheduled 17:30-19:00 (when no other sub-committee meetings took place) by the SWG on scientific permits, due to wide Scientific Committee interest. At this year's meeting, because of the inability to schedule certain sub-committees opposite other sub-committees, only 85 of the possible 90 sessions could be scheduled, plus the additional five special permits sessions.

21.1 Committee priorities for 2008

As in recent years and with the Committee's agreement, the Convenors met after the close of the Committee meeting and drew up the following basis of an initial agenda for the 2008 meeting. The same criteria as previous years were taken into account (e.g. IWC, 2004a, p.51). The Committee recognises that priorities may have to be reviewed in light of decisions made by the Commission.

As last year, with only six days for sub-committee meetings there will be a maximum of 90 sessions available. Items of lower priority on sub-committee agendas will only be discussed if time allows. The Convenors noted the current heavy workload of the Committee and **requests** the Commission allow the Scientific Committee to meet for one extra day. This would allow an extra 15 sessions for sub-committee deliberations.

The Committee stresses that papers considering anything other than priority topics will probably not be addressed at next year's meeting. It agrees that this information should be included on the website when the information about document submission is published next year. There will

again be an *ad hoc* Working Group established to consider North Pacific common minke whales and an *ad hoc* Working Group to handle discussions related to ecosystem modelling issues. In addition, it agrees that two pre-meeting meetings will probably be required, depending on intersessional progress; the proposal is that AWMP and RMP will share two days. The Committee stresses that these pre-meetings are part of the main sub-committee or SWG agendas; discussion will not be re-opened during the main sub-committee week and the agenda items to be discussed may vary from those expected, depending on progress.

The Revised Management Procedure (RMP)

The following issues are high priority topics:

- (1) complete audit of the survey data and agree abundance estimates for Western North Pacific Bryde's whales;
- (2) start the *Implementation* process for North Atlantic fin whales (including holding an intersessional workshop);
- (3) review MSY rates and if appropriate suggest changes to the plausible range (in an RMP context (including holding an intersessional workshop).
- (4) complete the *Implementation review* for North Atlantic common minke whales;
- (5) develop an inventory of the new data available and review progress (in the spirit of a *pre-Implementation assessment*) for West Pacific common minke whales.

Aboriginal Whaling Management Procedure (AWMP)

The following issues are high priority topics:

- (1) work on developing appropriate long-term management advice for the Greenlandic fisheries (including an intersessional Workshop) with the primary focus of:
 - (a) completing work on a sex-ratio based assessment of common minke whales off West Greenland;

- (b) further consideration of the assessment of humpback whales off West Greenland;
- (c) beginning work on developing *SLAs* for Greenlandic fisheries with an initial focus on fin whales and noting the multispecies nature of Greenlandic fisheries;
- (2) further consider issues arising out of the *Implementation Review* with special reference to the Data Availability Agreement and the AWS;
- (3) further consider issues related to the provision of *ad hoc* interim advice, particularly with respect to timeframes; and
- (4) validate and amend computer programmes associated with *Implementations* and assessments.

Bowhead right and gray whales (BRG)

The following issues are high priority topics:

- (1) review new information on Western North Pacific gray whales;
- (2) prepare for the *Implementation Review* of Eastern North Pacific gray whales in 2009;
- (3) review stock structure and abundance for Eastern Arctic bowhead whales; and
- (4) review new information on right whales;

Only if the Commission requests will the following considered a priority item:

- (5) perform the annual review of catch information for the B-C-B bowhead and Eastern North Pacific gray whales;

In-depth assessment (IA)

The following issues are high priority topics:

- (1) produce agreed abundance estimates of Antarctic minke whales using SOWER¹³ data;
- (2) review reasons for (possibly area specific differences) between Antarctic minke whale abundance estimates from CPII and CPIII;
- (3) develop recommendations for future SOWER cruises, both for the short- and long-term;

The following will be discussed only if there is time and documentation available:

- (1) review catch-at-age analyses of the Antarctic minke whales.

In-depth assessment of western North Pacific common minke whales with a focus on J-stock (NPM)

The following issues are high priority topics:

- (1) stock structure in Sea of Japan;
 - (a) increase data available and update knowledge on stock structure;

- (b) investigate plausible hypotheses on stock structure for J Stock;

- (2) continue work on distribution and abundance;

- (a) explore the possibility of surveys in unsurveyed areas;
- (b) integrate abundance estimates with the assumption of $g(0)=1$ in surveyed areas; and
- (c) update $g(0)$ estimates by taking covariates into account.

The following will be discussed only if there is time and documentation available:

- (1) work towards developing a standard CPUE series for population assessments.

Bycatch and other anthropogenic removals (BC)

The following issues are high priority topics:

- (1) estimating mortality from:
 - (a) bycatch; (b) entanglement; (c) ship strikes;
 - (d) marine debris; (e) acoustic noise
- (2) data collection, collation and sharing (IWC and IGOs).

The following will be discussed only if there is time and documentation available:

- (1) bycatch in longline fisheries; and
- (2) progress towards second Workshop on estimating bycatch through genetic market sampling.

Southern Hemisphere whales other than Antarctic minke whales (SH)

The following issues are high priority topics:

- (1) assessment of Southern Hemisphere humpback whales, Breeding Stocks B and C:
 - (a) abundance from populations B1 and C3 using photographic and genetic data;
 - (b) relationship between areas B1 and B2 and C1 and C3;
 - (c) estimate proportional representation of B and C stocks on the feeding grounds; and
 - (d) population assessment modelling.

The following will be discussed only if there is time and documentation available:

- (1) continue assessment of Antarctic blue whales;
 - (a) results from contract study.

Environmental concerns (E)

High priority will be given to the following:

- (1) plans for climate change workshop (including review report from scoping group);
- (2) plans for Phase II of POLLUTION 2000+ (including review report from scoping group);

¹³ JARPA data will be considered in 2009;

(3) report from CERD (cetacean emerging and resurging diseases) working group (including ;

(4) SOCER report;

The following will be discussed only if there is time and documentation available:

(1) anthropogenic noise and cetaceans; and

(2) marine renewable energy and cetaceans.

Ecosystem modelling (EM)

High priority will be given to the following:

(1) planning for the Joint IWC/CCAMLR workshop on modelling Antarctic krill predators.

The following will be discussed only if there is time and documentation available:

(1) review and update relevant models; and

(2) review and update model parameters.

Stock definition (SD)

High priority will be given to the following:

(1) statistical and genetic issues relating to stock definition; including further discussion of DNA data quality; and

(2) progress on TOSSM;

The following will be discussed only if there is time and documentation available:

(1) criteria for unit-to- conserve.

Whalewatching (WW)

High priority will be given to the following:

(1) review the report of the workshop on strategic planning of large-scale whalewatching research;

(2) develop methodology of and assessing the biological impacts of whalewatching on cetaceans;

(3) review whalewatching in South America;

(4) review reports of intersessional Working Groups.

The following will be discussed only if there is time and documentation available:

(1) consider information from platforms of opportunity of potential value to the Scientific Committee;

(2) review whalewatching guidelines and regulations; and

(3) review risks to cetaceans from collisions with whalewatching vessels.

Small cetaceans (SM)

High priority will be given to the following:

(1) review conservation issues regarding small cetaceans in the SE Pacific;

(2) review progress on previous recommendations; and

(3) review takes of small cetaceans.

DNA (DNA)

High priority will be given to the following:

(1) review genetic methods for species, stock and individual identification;

(2) conduct the first round of sequence validation and continue discussion of plans for sequence validation;

(3) collection and archiving of tissue samples from catches and bycatches; and

(4) reference databases and standard for diagnostic DNA registries.

22. DATA PROCESSING AND COMPUTING NEEDS FOR 2007/08

The Committee identified and agreed the requests for intersessional work by the Secretariat given in Table 5. Noting the research funding proposal for RMP computing support this year (Item 23) and the growing computing workload for the Secretariat, the Committee will review the need for computing support within and outside the Secretariat and the nature of its funding at next year's meeting.

23. FUNDING REQUIREMENTS FOR 2007/08

Table 6 summarises the complete list of recommendations for funding made by the Committee. The total required to meet its preferred budget is £331,050. The Committee **recommends** all of these proposed expenditures to the Commission.

However, it understands that the projected amount available for funding is about £290,000. It therefore carefully reviewed the full list, taking into account its work plan, priorities and the possibility that some of the work requiring funding could be postponed to a future year or years. Such

Table 5

Computing tasks/needs for 2007/8.

RMP – preparations for Implementation

- (1) Preparation of a comprehensive list of North Atlantic fin whale catches including notations on data quality and ancillary information (in collaboration with Bloch and Gunnlaugsson)
- (2) Development of a control program for running North Atlantic fin whale trials as specified at the forthcoming Technical and Intersessional Workshops
- (3) Conduct an audit of the survey data for western north Pacific Bryde's whales (Annex D item 5)

AWMP

- (1) Amend the *Bowhead SLA* to enable it to be used as a stand-alone program
- (2) Validation of computer programs associated with *Implementations* and assessments (Annex E item 10)
- (3) Begin work on a control program for testing potential Greenlandic *SLAs*, if specified at the intersessional workshop

In-depth assessment

- (1) Validation of the 2006/07 SOWER cruise data and incorporation into the sightings database

Southern Hemisphere whale stocks

- (1) Preparation of a 'final' revised Southern Hemisphere catch data series including validation of new individual data

By-catch

- (1) Work with Northridge to input by-catch data into database (see Annex J Item 5)

considerations are difficult and the Committee **stresses** that projects for which it has had to suggest reduced or no funding are still considered important and valuable. Should the Commission be unable to fund the full list of items in Table 6, the Committee **agrees** that the final column given in the table represents a budget that will allow progress to be made by its sub-committees and Working Groups in its priority topics. Progress will not be possible in some important areas, as outlined below and the Committee **requests** that the Commission or individual member governments provide additional funding in these areas. The Committee **strongly recommends** that the Commission accepts its reduced budget of £293,350.

A summary of each of the items is given below, by sub-committee or standing Working Group. Full details can be found under the relevant Agenda Items and Annexes as given in the table.

Revised Management Procedure

(1) NORTH PACIFIC BRYDE'S WHALE – AUDIT SURVEY DATA

The Commission has endorsed the Committee's

'Requirements and Guidelines for Surveys' for use in the RMP. As part of the process, the survey data must be audited. This funding is to allow this process to happen via contract.

(2) - (4) TECHNICAL AND FIRST INTERSESSIONAL WORKSHOP FOR THE NA FIN WHALE IMPLEMENTATION

The Commission has endorsed the process recommended three years ago by the Committee with respect to the time schedule if an *Implementation* begins (IWC, 2005c, pp.84-92). Last year, the Commission agreed with the Committee's proposal to begin the North Atlantic fin whale *Implementation* after completion of the North Pacific Bryde's whale *Implementation*. As discussed in Annex D, Appendix 9, Items (2) and (3) are to cover the cost a technical preparatory meeting before the first workshop and to ensure appropriate programming assistance is available. This is especially important because it is unreasonable to expect the invaluable free intersessional work that Punt has done over a decade to have continued. Workshop funding is required for invited participant costs; Iceland has kindly offered to host the Workshop which will probably take place in Reykjavik in Spring 2008.

Table 6

Plenary Item first	Short title	Requested	Reduced
RMP			
1 Item 6.1; Annex D, App. 6	Audit western NP Bryde's whale survey data	5,000	2,000
2 Item 6; Annex D, App. 9	Computing support for <i>Implementations</i>	20,000	20,000
3 Item 6.2; Annex D, Item 5.1	NA Fin Whale <i>Implementation</i> - technical meeting	5,000	5,000
4 Item 6.2; Annex D, Item 5.1.2	1st Intersessional Workshop for the NA Fin Whale <i>Implementation</i>	10,000	10,000
5 Item; 5.2; Annex D, Item 5.5	Workshop to review MSY rates	6,000	6,000
AWMP			
6 Items 8, 9.4, 9.6; Annex E	Assistance for <i>SLA</i> developers	10,000	10,000
7 Items 8, 9.4, 9.6; Annex E, Items 3-5	Workshop on Greenland fisheries.	10,000	10,000
BRG			
8 Item 10.7; Annex F, Item 6.2	W. North Pacific gray whale telemetry, contingent on meeting the requirements in Annex F.	2,000	2,000
IA			
9 Item 10.2, 10.11; Annex G; App. 2	SOWER 2007/08 cruise and planning meeting	66,750	66,750
10 Item 10.2.1; Annex G, App. 3	SOWER abundance estimate workshop	4,000	4,000
11 Item 10.2.3; Annex G, App. 6	Travel for earplug ageing expert in calibration experiment	2,000	2,000
12 Item 10.2, 10.11 Annex G, Item 6.2	Analysis of the BT mode data and importation of 2006/07 SOWER data into DESS	10,000	10,000
13 Item 10.2.3; Annex G, Item 7.4	Continue development of statistical catch-at-age estimators for Antarctic minke whales	6,000	6,000
SH			
14 Item 10.5; Annex H, App. 3	Finalise assessment of humpback whale Breeding Stocks C and D.	37,000	23,000
15 Item 10.5; Annex H, Item 6	Antarctic humpback whale photo-identification catalogue maintenance	6,600	6,600
16 Item 10.6; Annex H, App. 4	Initiate assessment of Antarctic blue whales	3,300	3,300
SD			
17 Item 11.2; Annex I, App. 4	TOSSM development – programming assistance	9,000	9,000
E			
18 Item 12.2; Annex K, App. 3	Scoping meeting for POLLUTION 2000+ Workshop	5,000	5,000
19 Item 12.6.1; Annex K, App. 4	Scoping meeting for Climate Change Workshop	6,000	6,000
20 Item 12.1; Annex K, Item 6	Workshop to review of skin diseases in cetaceans of S. America.	7,700	2,000
EM			
21 Item 13.1; Annex K1, Item 1.2	CCAMLR/IWC Workshop in July 2008	36,000	36,000
WW			
22 Item 15.3.2; Annex M, Item 7.2	Workshop for strategic planning of large-scale whalewatching research.	21,000	6,000
DNA			
23 Item 16.1; Annex N, App. 2	Validate mtDNA control-region sequences in GenBank for large baleen whales	2,700	2,700
24 ALL	Invited Participants to the 2008 Annual Meeting	40,000	40,000
TOTAL		331,050	293,350

(5) WORKSHOP TO REVIEW MSY RATES

The workshop is to enable sufficient progress to be made to be able to have a thorough review of and perhaps to revise the range of plausible MSY rates (currently $MSY_{(mat)} = 1\%$ to 7%) for use in RMP trials by the 2008 meeting

*Aboriginal Whaling Management Procedure***(6) AWMP DEVELOPERS FUND**

The developers fund has been invaluable in the work of SLA development and other essential tasks of the Standing Working Group. It has been agreed as a standing fund by the Commission. The primary development tasks facing the SWG are for the Greenlandic fisheries. These tasks are of high priority to the Committee which has frequently expressed its great concern at its inability to provide management advice on safe catch limits (see Items 8.1 and 9.4). The fund is essential to allow progress to be made.

(7) WORKSHOP ON MANAGEMENT OF GREENLANDIC FISHERIES

The Committee remains unable to provide satisfactory management advice on the effects of aboriginal subsistence whaling on the common minke whale stocks off West Greenland, despite major advances in recent years. There has been a fundamental difficulty in the AWMP discussions as to whether sex ratio data alone are a sufficient basis for management advice and for the development of an SLA for common minke whales. It is essential that this issue be resolved. The success of developing an assessment method for fin whales this year means that work can begin immediately on developing an SLA for this stock. There are also a number of questions remaining with respect to assessing humpback whales. An intersessional Workshop is essential to maintain momentum.

*Bowhead, right and gray whales***(8) TELEMETRY STUDIES ON THE WESTERN GRAY WHALE**

The western gray whale is one of the most critically endangered populations of great whales. It is vulnerable throughout its range to bycatch and/or ship strikes and vulnerable in its feeding grounds to oil and gas development activities. Telemetry data can provide information on its poorly known migratory routes and breeding grounds to aid in developing measures to mitigate anthropogenic risks throughout the range of the animals (which includes the waters of China, Republic of Korea, People's Republic of Korea, Japan and the Russian Federation). The Committee has recommended that the IWC acts as a co-ordinator for a telemetry project *inter alia* to ensure that it is carried out in as risk averse manner as possible and a number of safeguards and provisos have been developed. Although detailed costings can not be made at this time, it is clear that the total budget may exceed US\$1M. Therefore, the Committee agreed that this project be included in the Committee's budget but with a token funding request and a recommendation that individual governments or others consider making voluntary contributions to the IWC research fund, specified for this purpose.

*In-depth assessments***(9) SOWER CIRCUMPOLAR CRUISE**

The Committee and the Commission have both given high priority to obtaining agreed abundance estimates for

Antarctic minke whales and for explaining the differences between CPII and CPIII. The high priority plans for this year's survey are directed at experiments to address these problems including a co-operative study with an Australian aerial survey over the ice. In addition there will be continued work related to: (1) improving estimates of distance/angle estimation; (2) research on blue whales and humpback whales which are the subject of a comprehensive assessment. The funding is for planning, equipment and participation by international scientists. The vessel is generously provided by the Government of Japan.

(10) ANTARCTIC MINKE WHALE ABUNDANCE ESTIMATION WORKSHOP

The Committee and the Commission have both given high priority to obtaining agreed abundance estimates for Antarctic minke whales and for explaining the differences between CPII and CPIII. The in-depth assessment of Southern Hemisphere minke whales has already taken much longer than anticipated, and if the Committee is going to finish this soon, then an intersessional technical workshop to develop abundance estimates using the three proposed methods is essential. After such a workshop (and some associated intersessional email correspondence), the Committee in 2008 should be able to quickly come to an agreement on best available estimates, leaving enough time during the 2008 meeting for discussion of interpretation.

(11) TRAVEL FOR EARPLUG AGEING EXPERT IN CALIBRATION EXPERIMENT

The Committee has encountered a number of difficulties arising from differences in age distributions between commercial and scientific catches. It is important to determine how much, if any, can be explained by ageing errors. The Committee has agreed a process to investigate this, of which one aspect requires funding: the travel and subsistence cost for an independent expert to visit Tokyo.

(12) ANALYSIS OF THE BT MODE DATA AND IMPORTATION OF 2006/07 SOWER DATA INTO DESS

Last year, a considerable amount of new experimental data was collected. Collection of BT mode data as part of a feasibility study was given high priority, since it can potentially incorporate estimates of $g(0)$ and incorporate reactive movement (if there is any) into abundance estimates of Antarctic minke whales. It is essential that this is incorporated promptly into the IWC-DESS database so that appropriate analyses can be carried out, preferably before the Planning Meeting in Tokyo at the end of September. This work will be undertaken by the IWC Secretariat in conjunction with Burt.

(13) VPA ANALYSIS AND CATCH-AT-AGE ANALYSIS

This work has been recommended by the Committee in the past and is essential in furthering the work on exploring the reasons for differences in Antarctic minke whale abundance from CPII and CPIII and working towards an in depth assessment. The data have been generously made available by the Institute of Cetacean Research (Tokyo) under the Data Availability Agreement.

*Southern Hemisphere humpback and blue whales***(14) FINALISE ASSESSMENT OF HUMPBACK WHALE BREEDING STOCKS B AND C.**

The Committee has placed high priority on completing the Comprehensive Assessment of Southern Hemisphere humpback whales. This work should allow for completion

of assessments for Breeding Stocks B and C or at least further the work considerably. The money will fund photo-identification, genetic and modelling work. The former are related to both answering questions about stock structure and providing reliable estimates of abundance. The reduced funding will still allow progress to be made and priorities for the work are being set.

(15) ANTARCTIC HUMPBACK WHALE CATALOGUE

The Committee is already committed to funding this project, which represents only a partial cost of running the catalogue and is of great benefit to its in-depth assessment of Southern Hemisphere humpback whales. The work required to *inter alia* make the IWC/SOWER photographs more accessible is being carried out. The funds are mainly required for database management.

(16) INITIATE ASSESSMENT OF ANTARCTIC BLUE WHALES

The Committee has agreed to begin an in-depth assessment of Southern Hemisphere blue whales. There is also considerable interest within the Commission with respect to the status of this species. The work will involve: (1) updating the catch series for this subspecies by splitting the historical catches between Antarctic and pygmy blue whales; (2) updating a biological informative prior for the maximum rate of increase based on new data for biological parameters for blue whales; and (3) conducting an assessment of the population incorporating the revised IDCR/SOWER, JARPA and JSV data.

Stock definition

(17) TOSSM DEVELOPMENT: SPECIALIST PROGRAMMER

Great progress that has been made with TOSSM over the past year; the results are starting to make an impact the Committee's work. Apart from the generic insights into tools such as STRUCTURE, the programming of TOSSM greatly facilitated the development of the individual-based simulations used in case-specific B-C-B bowhead whale discussions this year. The substantial tasks identified in Annex I need to be implemented intersessionally. This year's progress has been made possible by the employment of a full-time TOSSM technical assistant (part-funded by IWC). This funding request will cover the gap between March 2008 and May 2008; other sources for funding beyond that date are being sought. Continuity in the technical assistant position is crucial to making efficient progress with TOSSM and bringing forward the results into the Committee's work.

Environment

(18) SCOPING MEETING FOR POLLUTION 2000+ WORKSHOP

The Committee has agreed that it will be valuable to begin Phase II of POLLUTION 2000+. The initial work will concentrate on developing: (1) an integrated modelling framework for examining the effects of pollutants on cetacean populations; and (2) a protocol for validating the use biopsy samples in pollution related studies. An important component of this work will be to identify suitable focal populations for future work. The work will be expedited by the holding of a multidisciplinary workshop to address both items and to evaluate candidate populations. However, such a multidisciplinary workshop is very ambitious in scope and it is essential that thorough planning

occurs, including the holding of a scoping meeting. It is particularly important to ensure that preparatory analyses and key papers are produced in good time. It is assumed that the full Workshop will occur after the 2008 meeting and will be funded in next year's budget.

(19) SCOPING MEETING FOR POLLUTION 2000+ WORKSHOP

The IWC last convened a workshop focused on impacts of climate change on cetaceans in 1995 (IWC, 1996). Since then, much has been learnt about both how climate change is manifesting its impacts in the oceans and how to extrapolate those impacts at temporal and spatial scales relevant to cetaceans. With the release of the latest IPCC report in March 2007 and growing evidence of changes to cetacean habitats, particularly at high latitudes, it is now timely to revisit and review this important matter. However, such a multidisciplinary workshop is very ambitious in scope and it is essential that thorough planning occurs, including the holding of a scoping meeting. It is particularly important to ensure that preparatory analyses and key papers are produced in good time. It is assumed that the full Workshop will occur after the 2008 meeting and will be funded in next year's budget.

(20) WORKSHOP TO REVIEW OF SKIN DISEASES IN CETACEANS OF SOUTH AMERICA

This will provide seed funding for a workshop on skin diseases with an emphasis on South America. Many of these diseases are of unknown aetiology, have been reported in cetaceans from scattered locations worldwide and, so far, have been predominantly encountered in cetaceans occupying or transiting coastal habitat, suggesting anthropogenic causes or contributing factors. The review will take into account: visual assessments of skin disease using high-definition digital imaging in addition to traditional assessments from necropsy; and utilisation of existing archives of photo-identification images world-wide, many of which may allow a long-term retrospective trends analysis. In addition to the participation of local scientists, other international experts will be identified and included as Invited Participants to assess and review the information presented to help focus further investigations.

(21) JOINT IWC-CCAMLR WORKSHOP ON MODELLING ANTARCTIC KRILL PREDATORS IN JULY 2008

Ecosystem modelling is becoming more important to the Committee's work, particularly in attempting to understand what may have happened in the Antarctic as a result of intensive exploitation of whales and other marine mammals. The Committee agreed that a collaborative effort with CCAMLR would make an important contribution to its work. The funds are requested as the IWC contribution to the Workshop that will be held in Hobart, Tasmania, probably in July 2008.

(22) WORKSHOP FOR STRATEGIC PLANNING OF LARGE-SCALE WHALEWATCHING RESEARCH

Last year, the Committee agreed that it was necessary to concentrate research effort on understanding the interactions between whalewatching impacts on cetaceans and other anthropogenic disturbances and ecological factors. To do so, the Committee proposed the holding of a dedicated workshop to develop a global scale research design. Detailed planning has taken place for a two-day pre-meeting workshop at the 2008 Annual Meeting.

(23) VALIDATE MTDNA CONTROL-REGION SEQUENCES IN GENBANK FOR LARGE BALEEN WHALES

Last year, the Committee agreed to continue with the development of plans for sequence validation in GenBank. This funding is for the first year of the project and will provide a contract to Dr Ross of New Zealand. Validation will take the form of a report with the following provisions: (1) List the *GenBank* accession number and species identity of each mysticete control region sequence with the species identity as determined using the most recent version of the Witness for the Whale reference sequence alignments (see SC/59/SD5) and the DNA Surveillance software engine; (2) The above list to be supported by phylogenetic trees, one per sequence, showing the placement of the *GenBank* sequence in relation to the reference sequence; (3) an

24. WORKING METHODS OF THE COMMITTEE

24.1 Working papers

At last year's Commission meeting, the Commissioner for Brazil requested the Committee to review its policy on working papers. The Committee reviewed and summarised its present policy which has evolved over a number of years:

(1) The primary purpose of working papers is to facilitate discussion in the sub-committees, working groups and the Committee. They take a number of forms including:

- (a) presentation of analyses and results produced at the request of the relevant group;
- (b) presentation of analyses and results that an individual or group of individuals believes will facilitate discussions;
- (c) reports of *ad hoc* groups established to examine particular issues at the request of Chairs;
- (d) discussion documents relevant to specific agenda items produced to aid discussion – these often serve to assist scientist for whom English is not their first language when complex issues are raised – they may be produced on the initiative of individuals or groups of individuals or at the request of the Chair.

(2) Working papers can only be distributed when approved by the Chair – whilst this is almost always the case, this condition:

- (a) helps Chairs in planning the day's business;
- (b) avoids unnecessary conflict in discussions.

(3) There are three possible 'fates' for working papers, they:

- (a) are appended to the report or subsumed into the text of the report – this decision is taken by the relevant Chair and sub-committee when writing and reviewing the report;
- (b) are upgraded to the status of a full paper, given a document number and become available as part of the meeting record – this decision is taken by the Head of Science in conjunction with the relevant Chair;

evaluation of the types of inconsistencies/errors (quality of submitted sequences, accuracy of species identification and accuracy of geographical location).

(24) INVITED PARTICIPANTS FUND

The Committee **draws attention** to the essential contribution made to its work by the funded IPs. The IWC-funded IPs play an essential role in the Committee's work including the critically important roles of chairs and rapporteurs. They represent excellent value as they receive only travel and subsistence costs and thus donate their time, which is considerable. As was the case for previous meetings, where possible, effort will be made to accommodate scientists from developing countries.

(c) disappear – this decision is taken by the relevant Chair and sub-committee – within this option is the possibility that the author(s) are requested to develop a full paper for the following year's meeting.

The rationale for this option is that working papers are developed to facilitate discussion and debate – they are often produced in a hurry and there are a number of reasons why a particular author may not wish them to survive (e.g. they may contain errors, be produced in 'devil's advocate' fashion to stimulate debate etc). The retaining of this option has been seen as important by the Committee in the past as without it members may be reluctant to write them and this can only be to the detriment of the work of the Committee.

After this review, the Committee **agrees** that the present policy is flexible enough to ensure that it best facilitates the work of the Committee. It **recommends** that there be no changes to the current policy.

24.2 DAA issues

The data availability agreement (DAA) was developed some years ago and has succeeded in providing a stable framework for ensuring transparency and preserving the rights of data owners. Finding this balance was a difficult task and it remains a tribute to the Committee that it was adopted by consensus; there is no doubt that it represents a major advance in the Committee's working methods. However, the Committee recognises that any such document can benefit from periodic review in the light of experience gained since its inception. This year, for example has seen the first *Implementation* completed under the new 'Requirements and Guidelines for RMP *Implementations* and *Implementation Reviews*' as well as the first *AWMP Implementation*. As a result of this, the Committee **agrees** that it seems timely to review the DAA and consider if, and if so where, it can benefit from clarifications or modifications whilst preserving its original philosophy. The review should also take into account practical considerations in terms of improving efficiency and ensuring that mistakes or misunderstandings do not occur. A number of these issues are referred to in Annex E. They include:

- (1) clarification of how to handle DAA deadlines when a multi-year, multi-workshop process occurs;

- (2) clarification of how to apply the DAA to data from either non-member countries or non-governmental sources;
- (3) clarification of the DAA with respect to the provision of interim advice rather than advice within the *SLA* framework;
- (4) balancing the need to meet DAA deadlines with the provision of the best scientific advice, including direct requests from workshops for data/analyses that could be provided in time to provide advice but strictly fall outside the DAA deadlines;
- (5) consideration of corrections to datasets against the deadlines;
- (6) streamlining and improving communications regarding DAA issues.
- (7) protocol for genetic data submission and error reporting.

The Committee **agrees** that these general issues (including that raised under Item 19 with respect to *ad hoc* interim advice) should be drawn the attention of the DAG for consideration intersessionally and at the next meeting. It also **agrees** to the establishment of a small group under Donovan to examine specific issues relevant to the AWMP and to consider of whether there might be value in incorporating them into the Aboriginal Subsistence Whaling Scheme.

25. ELECTION OF OFFICERS

The Committee agreed that there was no need for elections this year. Bjørge reminded the Committee of the change in procedure in 2004, in which the vice-Chair automatically succeeds the current Chair. Thus no new elections are expected until 2008.

26. PUBLICATIONS

Donovan reported that the Journal continues to thrive. The RMP special issue should be completed within the next year, and the special issue on the Southern Hemisphere will be available by the 2008 Annual meeting if progress continues at its current rate. Donovan thanked the Secretariat staff involved in production of the Journal, along with all the reviewers and the editorial board. He stressed the importance to delegates to encourage their institutions to subscribe to the Journal, and to continue to submit high quality papers to the Journal.

27. OTHER BUSINESS

27.1 Review updates to the list of recognised species of cetaceans

The Committee reviewed proposals to add three species of small cetaceans to the Scientific Committee's List of Recognised Species of Cetaceans. SC/59/O15 proposed that Omura's whale, *Balaenoptera omurai*, be added to the List of Recognised Species of Cetaceans. The species had been described in 2003, but in 2004, the Committee decided

against adding the species to the List at that time, because of data limitations and uncertainty about the genetic identity of the holotype specimen of *B. edeni* (IWC, 2005a, p.5). New analyses (Sasaki *et al.*, 2006) have confirmed the species' status. The case is compelling and the Committee **recommends** that the species now be added to the List.

As detailed in Annex D, Item 4, the identity and number of species in the Bryde's whale complex (apart from *B. omurai*) are still uncertain. Pending further analyses based on broader global coverage, the Committee **recommends** that the 'ordinary' Bryde's and small-form Bryde's be provisionally be considered a single species and continue to be listed as *B. edeni*. Pending more extensive analyses of the genetics of small-form Bryde's whales globally, continued use of the common names 'ordinary Bryde's whale' and 'small-form Bryde's whale' is recommended.

Although there is still nomenclatural uncertainty about exactly what name should be applied to Omura's whale, the name *B. omurai* has gained currency in the technical literature, and the Committee **recommends** that it be used provisionally. The uncertainty relates to the continued unknown genetic identity of the holotype specimen of *B. edeni*, and the committee **recommends** that the Commission request the Government of India to facilitate the genetic determination of the specimen, which resides in a museum in Calcutta.

Since the range of *B. omurai* may be larger than known at present, the Committee **recommends** that any whale thought to possibly belong to this species be identified as such only after its mtDNA has been sequenced and found to support the identification.

Beasley *et al.* (2005) documented morphological and genetic discontinuities between the form of the Irrawaddy dolphin (*Orcaella brevirostris*) in the coastal waters of New Guinea and Australia and animals in the remainder of the species' range. The two forms differ significantly in several morphological features and are separated by 17 diagnostic sites in a 403 base-pair region of the mtDNA control region. This latter distinction is greater than the genetic distance between other pairs of recognised species, such as *Stenella coeruleoalba* and *Delphinus delphis*. Beasley *et al.* (2005) described the new Australasian form as the snubfin dolphin *Orcaella heinsohni*. The Committee endorsed this description and **recommended** that the Australian snubfin dolphin *Orcaella heinsohni* be added to the Scientific Committee's List of Recognised Species of Cetaceans.

The status of the nominal species in *Sotalia* has been debated for some time. In particular, there has been disagreement as to whether the marine and riverine forms are distinct at the species or sub-species level. Recent papers by Monteiro-Filho *et al.* (2002), Cunha *et al.* (2005) and Caballero *et al.* (2007) have recommended the separation of these two forms into discrete species: the riverine *Sotalia fluviatilis* and the coastal *Sotalia guianensis*. The two forms differ in morphological characters, and mtDNA and nuclear sequences. The Committee endorsed this classification and **recommends** that *Sotalia guianensis* be added to the Scientific

Committee's List of Recognised Species of Cetaceans. The Committee further **recommends** that the common name not be assigned to this species until scientists in South America have reached a consensus.

28. ADOPTION OF REPORT

Following the end of the Scientific Committee meeting, Rojas-Bracho stepped down as the Convenor for the SWG on Environmental concerns. Bjørge acknowledged his hard work in managing the SWG, which has a particularly wide-ranging agenda. Moore was appointed as the new Convenor for the SWG and Bjørge wished her well in her new role.

Bjørge thanked Donovan and Miller for all their help interessionally and particularly Donovan for his excellent advice throughout the meeting. On behalf of the Scientific Committee, Bjørge expressed his gratitude to Suydam, for organising the Scientific Committee football match. He also thanked the US government for hosting the meeting and the Secretariat who work very hard behind the scenes to ensure Scientific Committee meetings run smoothly. Finally he thanked the Scientific Committee for all their excellent work and for producing such excellent reports.

The Scientific Committee thanked Bjørge for Chairing the meeting efficiently and with good humour.

The report was adopted at 16:36hrs on 18th May 2007. As usual, final editing was carried out by the Convenors after the meeting.

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Annex A

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Annex B1

Agenda

1. Introductory Items
 - 1.1 Chair's welcome and opening remarks
 - 1.2 Appointment of rapporteurs
 - 1.3 Meeting procedures and time schedule
 - 1.4 Establishment of sub-committees and Working Groups
 - 1.5 Computing arrangements
2. Adoption of Agenda
3. Review of available data, documents and reports
 - 3.1 Documents submitted
 - 3.2 National Progress Reports on research
 - 3.3 Data collection, storage and manipulation
 - 3.3.1 Catch data and other statistical material
 - 3.3.2 Progress of data coding projects and computing tasks
 - 3.3.4 Archiving of simulated datasets to test abundance estimation methods
4. Cooperation with other organisations
 - 4.1 Convention on the Conservation of Migratory Species (CMS)
 - 4.1.1 Scientific Council
 - 4.1.2 Agreement on Small Cetaceans of the Baltic and North Seas (ASCOBANS)
 - 4.1.3 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)
 - 4.2 International Council for the Exploration of the Sea (ICES)
 - 4.3 Inter-American Tropical Tuna Commission (IATTC)
 - 4.4 International Commission for the Conservation of Atlantic Tunas (ICCAT)
 - 4.5 Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)
 - 4.6 Southern Ocean GLOBEC (SO-GLOBEC)
 - 4.7 North Atlantic Marine Mammal Commission (NAMMCO)
 - Scientific Committee
 - Council
 - 4.8 World Conservation Union (IUCN)
 - 4.9 Food and Agriculture Organisation (FAO) related meetings – Committee on Fisheries (COFI)
 - 4.10 Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)
 - 4.11 North Pacific Marine Science Organisation (PICES)
 - 4.12 Eastern Caribbean Cetacean Commission (ECCO)
 - 4.13 Protocol on Specially Protected Areas and Wildlife (SPA) of the Cartagena Convention for the Wider Caribbean
5. Revised Management Procedure (RMP) – general issues (Annex D)
 - 5.1 Further evaluate proposed 'threshold' levels for Guidelines and Requirements for implementation
 - 5.2 MSY rates
 - 5.3 Mechanism for revision of the RMP
6. RMP – Preparations for *Implementation* (Annex D)
 - 6.1 Western North Pacific Bryde's whales
 - 6.1.1 Complete Implementation of western North Pacific Bryde's whales
 - 6.1.2. Recommended action
 - 6.2. North Atlantic fin whales
 - 6.2.1 New information
 - 6.2.2 Completion of the pre-implementation assessment
 - 6.2.3 Recommended action
 - 6.3 *Implementation Review* for western North Pacific common minke whales
 - 6.4 *Implementation Review* for Central and Northeastern Atlantic common minke whales
 - 6.4.1. New information
 - 6.4.2 Consideration of resources and workplan
 - 6.5 Work plan
7. Estimation of bycatch (Annex J)
 - 7.1 Information and methods to estimate bycatch based on fisheries data and observer programmes
 - 7.1.1 Collaboration with FAO on collation of relevant fisheries data
 - 7.1.2 Progress on joining FIRMS
 - 7.1.3 Feedback on European Union (EU) bycatch monitoring schemes
 - 7.1.4 Modelling approaches to determining appropriate levels of observer coverage
 - 7.1.5 NOAA workshop on the bases for determining serious injuries in whales
 - 7.1.6 Other methods of determining survival of previously entangled whales
 - 7.1.7 Other information relating to bycatch
 - 7.2 Methods to estimate bycatch based on genetic data
 - 7.2.1 Progress on intersessional work related to market sampling
 - 7.3 Information and methods to estimate cetacean mortality caused by vessel strikes
 - 7.3.1 Results from data collected on vessels relevant to ship strikes
 - 7.3.2 Report of the IWC Vessel Strike Data Standardisation Group
 - 7.3.3 Summary of activities of the Conservation Committee on ship strikes
 - 7.3.4. Progress on 2006 SC recommendations
 - 7.4 Other issues
 - 7.4.1 Methods for estimating additional human-induced mortalities e.g. from acoustic sources and marine debris
 - 7.5 Work plan
8. Aboriginal Subsistence Whaling Management Procedure (Annex E)
 - 8.1 Completion of the *Implementation Review* for B-C-B bowhead whales
 - 8.1.1 Intersessional work
 - 8.1.2 Results of trials
 - 8.2 Review progress on the Greenlandic Research programme
 - 8.2.1 Stock structure, range, movement
 - 8.2.2 Catch distributions
 - 8.2.3 Abundance and trends
 - 8.3 Progress with the development of management procedures
 - 8.4 Preparation for an *Implementation Review* of Eastern Gray Whales

- 8.5 Scientific aspects of an Aboriginal Subsistence Whaling Scheme (AWS)
 - 8.5.1 General issues arising out of the B-C-B Bowhead Implementation Review
- 8.6 Work plan
- 9. Aboriginal subsistence whaling stock assessments
 - 9.1 Bering-Chukchi-Beaufort Seas (B-C-B) bowhead whale stock structure (Annex F)
 - 9.1.1 Stock structure hypotheses
 - 9.1.2 Other new scientific information
 - 9.2 Annual review of catch data and management advice for the Bering-Chukchi-Beaufort Seas bowhead whale
 - 9.2.1 Catch information
 - 9.2.2 Management advice
 - 9.3 Annual review of catch data and management advice for the eastern North Pacific gray whale
 - 9.3.1 New scientific information
 - 9.3.2 Catch and stranding information
 - 9.3.3 Management advice
 - 9.4 Management advice for common minke and fin whales off west Greenland
 - 9.4.1 Catch data
 - 9.4.2 Assessment of common minke whales off West Greenland
 - 9.4.3 Assessment of fin whales off West Greenland
 - 9.4.4 Management advice for common minke whales off West Greenland
 - 9.4.5 Management advice for fin whales off west Greenland
 - 9.4.6 Management advice for common minke whales off East Greenland
 - 9.5 Humpback whales off St. Vincent and The Grenadines (Annex E)
 - 9.6 Request for management advice for other large whales off West Greenland
 - 9.6.1 Humpback whales
 - 9.6.2 Bowhead whales
- 10. Whale stocks
 - 10.1 Results of the 2006/07 SOWER cruise (Annex G)
 - 10.1.1 Cruise report
 - 10.1.2 Review of experiments
 - 10.2 Southern Hemisphere minke whales
 - 10.2.1 Estimate abundance of Antarctic minke whales
 - 10.2.2. Reasons for differences between minke abundance estimates from CPII and CPIII
 - 10.2.3 Catch-at-age analyses
 - 10.2.4 Dwarf minke whale
 - 10.3 In-depth assessment of Western North Pacific common minke whales with a focus on J-stock (Annex G1)
 - 10.3.1 Stock structure
 - 10.3.2 Distribution and abundance
 - 10.3.3 Other
 - 10.3.4 Work Plan
 - 10.4 Finalisation of the Southern Hemisphere catch data series (Annex H)
 - 10.5 In-depth assessment of Southern Hemisphere humpback whales
 - 10.5.1 Issues related to N_{min} and depensation for modelling of humpback whales
 - 10.5.2 Humpback whale distribution at mid latitudes based on historic catches and JSV data
 - 10.5.3 In-depth assessment of Southern Hemisphere humpback whales Breeding Stocks B and C
 - 10.5.4 Other issues related to Southern Hemisphere humpback whales
 - 10.5.2 Work Plan and Budget requests (Humpback Whales)
- 10.6 Progress on the in-depth assessment of Southern Hemisphere blue whales
 - 10.6.1 Report of the intersessional email group
 - 10.6.2 Distribution, movements and stock structure
 - 10.6.3 Abundance estimates
 - 10.6.4 Trends in abundance
 - 10.6.5 Preliminary assessments
 - 10.6.6 Other
 - 10.6.7 Work Plan and Budget requests (blue whales)
- 10.7 Western North Pacific stock of gray whales (Annex F)
 - 10.7.1 New scientific information
 - 10.7.3 Telemetry studies
- 10.8 Eastern Arctic bowhead whales
 - 10.8.1 Stock structure
 - 10.8.2 Abundance
 - 10.8.3 Other new scientific information
- 10.9 Other small stocks of bowhead, right and gray whales
 - 10.9.1 Small stocks of bowhead whales
 - 10.9.2 North Atlantic right whales
 - 10.9.3 Southern Hemisphere right whales
 - 10.9.4 Other small stocks of right whales
- 10.10 North Pacific sei whales (Annex G)
 - 10.10.1 Consider beginning a North Pacific sei whale in-depth assessment
- 10.11 Sperm whales (Annex G)
 - 10.11.1 Consider beginning a sperm whale in-depth assessment
- 10.12 Future SOWER cruises (Annex G)
 - 10.12.1 Recommendations for the 2007/08 cruise
 - 10.12.2 Recommendations for the long term
- 11. Stock definition (Annex I)
 - 11.1 Review progress on the Testing of Spatial Structure Models (TOSSM) project
 - 11.2 Review of statistical and genetic issues relating to population structure
 - 11.2.1 Scoring errors and mutation rates
 - 11.2.2 DNA data quality
 - 11.3 Workplan
- 12. Environmental concerns (Annex K)
 - 12.1 Workshop on Infectious and non-infectious diseases of marine mammals and impact on cetaceans
 - 12.2 POLLUTION 2000+
 - 12.3 Southern Ocean collaboration (SOC)
 - 12.4 Planning and coordination of IWC's participation in the CCAMLR/IWC International Polar Year survey in 2008
 - 12.5 Progress with respect to the Commission's request on handling and release of entangled cetaceans
 - 12.6 Other habitat related issues
 - 12.6.1 Progress on planning for a possible climate change workshop
 - 12.6.2 State of the Cetacean Environment Report (SOCER)
 - 12.6.3 Progress in acoustics
 - 12.6.4 Sea ice: Arctic and Antarctic
 - 12.7 Work plan
- 13. Ecosystem modelling (Annex K1)
 - 13.1 Review progress on joint CCAMLR/IWC Workshop on modelling Antarctic krill predators
 - 13.2 Review collaboration with FAO
 - 13.3 Review of progress in the development of ecosystem models
 - 13.4 Review of data relevant to parameter estimation and ecological interactions
 - 13.5 Work Plan
- 14. Small cetaceans (Annex L)

- 14.1 Review of population structure, systematics and status of killer whales
 - 14.1.1 Distribution and abundance
 - 14.1.2 Stock structure
 - 14.1.3 Life history
 - 14.1.4 Ecology
 - 14.1.5 Habitat
 - 14.1.6 Directed takes and incidental mortality
 - 14.1.7 Other
 - 14.1.8 Consideration of status
- 14.2 Infectious and non-infectious diseases of marine mammals and impact on cetaceans
- 14.3 Progress on previous recommendations
 - 14.3.1 Baiji
 - 14.3.2 Vaquita
 - 14.3.3 Harbour Porpoise
 - 14.3.4 Sotalia
 - 14.3.5 Other
- 14.4. Takes of small cetaceans
- 14.5 Other
- 14.6 Work plan
- 15. Whalewatching (Annex M)
 - 15.1 Assessing biological impacts of whalewatching on cetaceans
 - 15.1.1 Quantifying baselines
 - 15.1.2 Methods
 - 15.1.3 Population-level effects
 - 15.1.4 Short-term effects
 - 15.2 Data sources from platforms of opportunity of potential value to the Scientific Committee
 - 15.3 Other issues
 - 15.3.1 Whalewatching in Alaska
 - 15.3.2 Discuss and organise a workshop on the strategic planning of large-scale whalewatching research
 - 15.3.3 Swim-with-whale operations
 - 15.3.4 Review of whalewatching guidelines and regulations
 - 15.3.5 Other
 - 15.3.6 Review of risk to cetaceans from colliding with whalewatching vessels
 - 15.4 Work plan
- 16. DNA testing (Annex N)
 - 16.1 Genetic methods for species, stock and individual identification
 - 16.2 Collection and archiving of tissue samples from catches and bycatches
 - 16.3 Reference databases and standards for diagnostic DNA registries
- 16.4 Work plan
- 17. Scientific permits (Annex O)
 - 17.1 Review of Results from JARPA
 - 17.1.1 Report of the JARPA Review Workshop (SC/59/Rep1)
 - 17.1.2 Additional Committee discussion
 - 17.2 Review of results from existing permits
 - 17.2.1 JARPA II
 - 17.2.2 JARPN II
 - 17.2.3 Iceland
 - 17.3 Review of new or continuing proposals
 - 17.4 Improving the Committee's procedures for reviewing scientific permit proposals and research results
 - 17.5 Use of any new protocol in the future work of the Committee
- 18. Whale sanctuaries
- 19. Request from the Japanese Government with respect to Western North Pacific common minke whales
- 20. Research and workshop proposals and results
 - 20.1 Review results from previously funded research proposals
 - 20.2 Review proposals for 2007/08
- 21. Committee priorities and initial Agenda for the 2008 meeting
 - 21.1 Committee priorities for 2008
- 22. Data processing and computing needs for 2007/08
- 23. Funding requirements for 2007/08
- 24. working methods of the committee
 - 24.1 Working papers
 - 24.2 DAA issues
- 25. Election of officers
- 26. Publications
- 27. Other business
 - 27.1 Review updates to the list of recognised species of cetaceans
- 28. Adoption of report

Annex B2

Relationship Between Commission and Scientific Committee Agendas

This table is intended to assist readers in finding information relative to the Commission agenda (IWC/59) in the Scientific Committee Report (SC/59) and the Chair's Report of 58th Annual Meeting (2006). Commission agenda items not in this summary were not addressed at the Scientific Committee meeting.

No.	Commission Agenda	Scientific Committee Agenda Item and Annex	Chair's Report (2006: Agenda Item)
3.	WHALE STOCKS		5
3.1	Antarctic minke whales		5.1
3.1.1	Report of the Scientific Committee	10.2; Annex G	
2.2	Western North Pacific common minke whales		5.2
3.2.1	Report of the Scientific Committee	10.3; Annex G1	
3.3	Southern Hemisphere humpback whales		5.3
3.3.1	Report of the Scientific Committee	10.5; Annex H	
3.4	Southern Hemisphere blue whales		5.4
3.4.1	Report of the Scientific Committee	10.6; Annex H	
3.5	Western North Pacific gray whales		5.5
3.5.1	Report of the Scientific Committee	10.7; Annex F	
3.6	Other small stocks- bowhead, right and gray whales		5.5
3.6.1	Report of the Scientific Committee	10.8, 10.9; Annex F	
3.7	North Pacific sei whales		
3.7.1	Report of the Scientific Committee	10.10; Annex G	
5.	ABORIGINAL SUBSISTENCE WHALING		7
5.1	Aboriginal Subsistence Whaling Management Procedure	8; Annex E	7.1
5.2	Advice on other Greenlandic stocks	9.7; Annex E	
5.3	Aboriginal Whaling Scheme		7.2
5.4	Aboriginal subsistence whaling catch limits	9; Annexes E,F	7.3
6.	REVISED MANAGEMENT SCHEME (RMS)		8
6.1	Revised Management Procedure (RMP)		8.1
6.1.1	Report of the Scientific Committee	5, 6; Annex D	
	• General issues	5; Annex D	
	• Implementation process (western North Pacific Bryde's whale, North Atlantic fin whales)	6; Annex D	
	• Bycatch		
6.2	Revised Management Scheme	8.5; Annex J	8
7	SANCTUARIES		8.1
7.1	Issues raised in the Scientific Committee		9
7.1.1	Report of the Scientific Committee	18	
9.	SCIENTIFIC PERMITS		11
9.1	Report of the Scientific Committee	17; Annex O	11.1
9.1.1	Improving procedures for reviewing scientific permit proposals	17.4; Annex O	
9.1.2	Review results of existing permits (incl. JARPA review workshop)	17.1, 17.2; Annex O	
9.1.3	Review of continuing proposals	17.3; Annex O	
10.	ENVIRONMENTAL AND HEALTH ISSUES		12
10.1	Diseases of marine mammals and impacts on cetaceans		
10.1.1	Report of the Scientific Committee	12.1; Annex K	12.1
10.2	Ecosystem Modelling		
11.2.1	Report of the Scientific Committee	13; Annex K1	
10.3	Other habitat-related issues		
10.3.1	Report of the Scientific Committee		12.1
	• POLLUTION 2000+	12.2; Annex K	
	• Southern Ocean Collaboration (incl. CCAMLR International Polar Year survey)	12.3; Annex K	
	• Handling and release of entangled cetaceans	12.5; Annex K	
	• Climate change workshop preparations	12.6.1; Annex K	
	• State of the Cetacean Environment (SOCER)	12.6.2; Annex K	
	• Other	12.6; Annex K	
11.	WHALEWATCHING		13
11.1	Report of the Scientific Committee	15; Annex M	
12.	COOPERATION WITH OTHER ORGANISATIONS		14
12.1	Report of the Scientific Committee	4	14.1
13.	OTHER SCIENTIFIC COMMITTEE ACTIVITIES, ITS FUTURE WORK PLAN AND ADOPTION OF SCIENTIFIC COMMITTEE REPORT		15
13.1	Small cetaceans		15.1
13.1.1	Report of the Scientific Committee	14; Annex L	
13.2	Other activities		15.2
13.2.1	Report of the Scientific Committee	11, 16, 19, 20, 22, 24-27,	
13.3	Scientific Committee future work plan		15.3
13.3.1	Report of the Scientific Committee	21	
21.	FINANCIAL STATEMENTS AND BUDGETS		22
21.2	Consideration of estimated budgets, 2007/08 and 2008/09	23	22.5

Annex C

List of Documents

SC/59/AWMP

1. Morita, J.G. and George, J.C. Age classification of bowhead whales using recursive partitioning. 14pp.
2. Simon, M., Kingsley, M. and Witting, L. Seasonal and spatial distribution and sex ratio of fin whale catches off West Greenland, 1987-2006. 10pp.
3. Simon, M., Kingsley, M. and Witting, L. Biological parameters and the seasonal and spatial distribution of minke whale catch off West Greenland, 1987-2006. 17pp.
4. Witting, L. Population dynamics of fin whales off West Greenland. 34pp. [Plus addendum. 4pp.]
5. Witting, L. Population dynamics of humpback whales off West Greenland. 34pp.
6. Witting, L. and Schweder, T. Sex ratio based assessment for minke whales off West Greenland. 20pp. [Plus revised figure. 1pp.]
7. Heide-Jørgensen, M.P., Borchers, D.L., Witting, L., Simon, M.J., Laidre, K.L., Rosing-Asvid, A. and Pike, D.G. Final estimates of large whale abundance in West Greenland waters from an aerial survey in 2005. 28pp.
8. Brandão, A and Butterworth, D.S. Further results from a AWMP-like assessment of the West Greenland minke whale population. 21pp.

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1. Punt, A.E. and Allison, C. Results of additional Bryde's whale *Implementation Simulation Trials*. 20pp.
2. Punt, A.E. and Brewick, J.M. The implications of different tunings of the CLA for single stock and NE Atlantic minke trials. 8pp.
3. Schweder, T. and Øien, N. On the surfacing rate in minke whales in the northeastern Atlantic. 11pp.
4. Aldrin, M. and Huseby, R.B. Simulation trials 2007 for a re-tuned Catch Limit Algorithm. 24pp.
5. Øien, N. Report of the Norwegian 2006 survey for minke whales in the *Small Management Area EW* in the Northeast Atlantic. 4pp.
6. Øien, N., Bothun, G. and Kleivane, L. Update on available data on surfacing rates of Northeastern Atlantic minke whales. 10pp.
7. Øien, N. Planning of annual partial sighting surveys over the six-year period 2008-2013 to estimate abundance of minke whales in the Northeastern Atlantic. 2pp.
8. Butterworth, D.S., Punt, A.E. and Cunningham, C.L. MSYR – should the information which has become available since selections were made for RMP development in 1987 have changed perceptions on the likely range and relative plausibilities of values for this parameter for baleen whales? 32pp.
9. Cooke, J.G., Best, P.B., Butterworth, D.S., Gunnlaugsson, Th., Hatanaka, H., Polacheck, T., Punt, A.E., Schweder, T., Tanaka, E. and Wade, P.R. Provisional compilation of information for the MSY review. 24pp.
10. Cooke, J.G. The influence of environmental variability on baleen whale sustainable yield curves. 15pp.
11. Cooke, J.G. A note on the long-term behaviour of the RMP Catch Limit Algorithm. 6pp.

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1. Robbins, J., Dendanto, D., Giard, J., Panigada, S., Sears, R. and Zanardelli, M. Photo-ID studies of fin whales in the North Atlantic Ocean and the Mediterranean Sea fin whales. 4pp.
2. Pastene, L.A., Kawahara, S. and Hatanaka, H. Concepts for a research programme on North Pacific Bryde's whale – RMP Variant 2 with research. 5pp.
3. Shimada, H., Kitakado, T., Okamura, H. and Miyashita, T. Abundance of the western North Pacific Bryde's whales for CLA of RMP. 17pp.

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1. Ensor, P., Komiya, H., Beasley, I., Fukutome, K., Olson, P. and Tsuda, Y. 2006-2007 International Whaling Commission-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) cruise. 58pp.
2. Hedley, S., Bravington, M., Gales, N., Kelly, N. and Peel, D. Aerial survey for minke whales off Eastern Antarctica. 47pp.
3. Hedley, S., Bravington, M. and Peel, D. Design of future SOWER cruises. 11pp.
4. Punt, A.E. and Polacheck, T. Further development of statistical catch-at-age models for Southern Hemisphere minke whales. 42pp.
5. Burt, M.L. and Hughes, M.S. Analysis of the BT mode experiments from the IWC-SOWER 2005/2006 cruise. 13pp.

6. Burt, M.L. Abundance estimates of minke whales by 10° longitudinal sectors from IDCR-SOWER surveys. 10pp.
7. Branch, T.A. Possible reasons for the appreciable decrease in abundance estimates for Antarctic minke whales from the IDCR/SOWER surveys between the second and third circumpolar sets of cruises. 9pp.
8. Leaper, R. A note on stomach contents analysis from JARPA. 4pp.
9. Olson, P.A. Report of blue whale photo-identification from IWC-SOWER 2006/2007, Area IIIW. 4pp.
10. Olson, P.A. Status of the archival and analysis of blue whale photographs from IWC IDCR/SOWER cruises. 5pp.
11. Hakamada, T., Matsuoka, K. and Nishiwaki, S. Improvements of the JARPA abundance estimation of Antarctic minke whales based on JARPA Review Meeting recommendations. 24pp.
12. Murase, H., Kitakado, T., Matsuoka, K., Nishiwaki, S. and Naganobu, M. Exploration of GAM based abundance estimation method of Antarctic minke whales to take into account environmental effects: A case study in the Ross Sea. 13pp.
13. Mori, M., Butterworth, D. and Kitakado, T. Further progress on application of ADAPT-VPA to Antarctic minke whales. 32pp.
14. Okamura, H. and Kitakado, T. Abundance estimates of Southern Hemisphere minke whales from the IDCR-SOWER surveys using a hazard probability model. 29pp.
15. Okamura, H. and Kitakado, T. Results of simulation tests of Southern Hemisphere minke whale abundance surveys using a hazard probability model. 12pp.
16. Shimada, H and Kato, A. Population assessment of the Antarctic minke whale within and out ice field using a sighting data by the Ice Breaker and the IWC SOWER vessels in 2004/2005. 13pp.
17. Cooke, J.G., Baker, C.S., Butterworth, D.S., Kato, H., Pastene, L., Walloe, L. and Brownell, R.L., Sources of information for a Comprehensive Assessment of North Pacific sei whales. 5pp.
18. Polacheck, T. Summary of responses to a length-measurement and age-reading questionnaire on Southern Hemisphere minke whales. 8pp.
19. Wade, P.R. A review of the coverage of strata and the sequence of surveys relative to the ice edge during JARPA. 6pp.
20. Scheidat, M., Kock, K-H., Friedlaender, A., Lehnert, L. and Williams, R. Using helicopters to survey Antarctic minke whale abundance in the ice. 10pp.
21. Scheidat, M., Kock, K-H., Friedlaender, A., Lehnert, L. and Williams, R. Preliminary results of aerial surveys around Elephant Island and the South Shetland islands. 7pp.
22. Butterworth, D S and Mori, M. On the compatibility of results from ADAPT-VPA and transition-phase-based trends in age-at-maturity for the I-stock of Antarctic minke whales. 5pp.
23. Smith, T.D. Progress toward an in-depth assessment of sperm whales. 5pp.
24. Acevedo, J., Olavarria, C., Plana, J., Cortes., D., Aguayo-Lobo, A. and Pastene, L.A. Dwarf minke whale (*Balaenoptera acutorostrata*) in Antarctic Areas I and II. 8pp.
25. Leaper, R. Results from use of video camera to measure distances to sightings on SOWER cruise 2006/07. 1pp.
26. Shimada, H. and Burt, A.M. Relationship between minke whale abundance and pack ice extent examined by 10° longitudinal slices. 5pp.

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1. Park, K.J., An, Y.R., Choi, S.-G. and Kim, Z.G. Abundance estimation of northwest Pacific minke whales using the Korean sighting survey in 2006. 6pp.
2. Park, K.J., An, Y.-R., Kim, Z.G. and Choi, S.G. Plan for the Korean sighting surveys in the Yellow Sea, 2008. 3pp.
3. Miyashita, T. Cruise report of the IO sighting survey in the northern Sea of Japan in 2006. 7pp.
4. Miyashita, T. and Okamura, H. Abundance estimate of common minke whales in the northern Sea of Japan including the Russian EEZ using IO sighting data in 2006. 10pp.
5. Government of Japan. Proposed Schedule amendment to permit the catching of minke whales from the Okhotsk Sea-West Pacific Stock by small-type coastal whaling vessels. 8pp. [Including Appendices]
6. Goto, M., Park, J.Y., Kanda, N., Sohn, H., Kim, Z.G. and Pastene, L.A. Progress of the genetic analysis of by-caught J-stock minke whales from Japan and Korea: seasonal pattern of migration. 9pp.

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2. Rugh, D., Koski, W.R. and George, J.C. Interyear re-identifications of bowhead whales during their spring migration past Barrow, Alaska, 1984-1994. 9pp.
3. George, J.C., Moore, S.E. and Suydam, R. Summary of stock structure research on the Bering-Chukchi-Beaufort Seas stock of bowhead whales 2003-2007. 15pp.

4. Suydam, R., George, J.C., Rosa, C., Person, B., Hanns, C., Sheffield, G. and Bacon, J. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2006. 7pp.
5. George, J.C., Bockstoce, J.R., Punt, A.E. and Botkin, D.B. Preliminary estimates of bowhead whale body mass and length from Yankee commercial oil yield records. 11pp.
6. Koski, W.R., Rugh, D.J., Zeh, J., George, J.C., Suydam, R., Davis, A.R., Mocklin, J. and Trask, K.. Review of bowhead whale aerial photographic studies in 2003-06. 5pp.
7. Koski, W.R., George, J.C. and Zeh, J. A calf index for monitoring reproductive success in the Bering-Chukchi-Beaufort Seas bowhead whale (*Balaena mysticetus*) population. 6pp.
8. Morin, P.A., Hancock, B.L. and George, J.C. Development and application of single nucleotide polymorphisms (SNPs) for bowhead whale population structure analysis. 7pp.
9. LeDuc, R.G., Martien, K.K., Morin, P.A., Hedrick, N., Robertson, K.M., Taylor, B.L. Mugué, N.S., Borodin, R.G., Zelenina, D.A. and George, J.C. Mitochondrial genetic variation in bowhead whales in the western Arctic. 11pp.
10. Punt, A.E. and Breiwick, J. Revised age-compositions for the B-C-B bowhead whales. 7pp.
11. Givens, G., Williams, M., Morin, P.A., Hancock, B. and George, J.C. A brief and preliminary look at SNPs data for some Bering-Chukchi-Beaufort Seas bowhead whales. 5pp.
12. Quakenbush, L. Preliminary satellite telemetry results for Bering-Chukchi-Beaufort bowhead whales. 2pp.
13. Knoche, M., Suydam, R.S. George, J.C. and Morita, J. Using stable isotopes in baleen to examine migratory behaviour of Bering-Chukchi-Beaufort Sea bowhead whales (*Balaena mysticetus*): A pilot study. 12pp.
14. Givens, G.H., Huebinger, R.M., Bickham, J.W., George, J.C. and Suydam, R. Patterns of genetic differentiation in bowhead whales (*Balaena mysticetus*) from the western Arctic. 28pp.
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16. Martien, K.K., Archer, E., Ripley, B.J. and Taylor, B.L. The genetic consequences of non-equilibrium dynamics in bowhead whales. 12pp.
17. Archer, E., Martien, K.K., Taylor, B.L., LeDuc, R.G., Givens, G.H. and George, J.C. Use of an individual-based simulation of BCB bowhead whale population dynamics to examine empirical genetic data. 28pp.
18. Moore, S.E., Stafford, K.M. and Munger, L. Passive acoustic surveys for BCB bowhead whales in the Beaufort Sea, 2003-2005. 7pp.
19. Weller, D.W., Bradford, A.L., Lang, A.R., Kim, H.W., Krukova, N., Tsidulko, G.A., Burdin, A.M. and Brownell, R.L. Status of western gray whales off northeastern Sakhalin Island, Russia, in 2006. 11pp.
20. Skaug, H.J. and Givens, G.H. Relatedness among individuals in BCB bowhead microsatellite samples. 5pp.
21. Postma, L., Dueck, L. and Higdon, J. Update on bowhead whale (*Balaena mysticetus*) research and events in Canada. 4pp.
22. Bradford, A.L., Weller, D.W., Ivashchenko, Y.V., Burdin, A.M. and Brownell, R.L. Seasonal and annual variation in body condition of western gray whales off northeastern Sakhalin Island, Russia: a preliminary report. 18pp.
23. Heide-Jørgensen, M.P., Laidre, K., Borchers, D. and Samarra, F. Surprising recovery of bowhead whales. 8pp.
24. [No paper]
25. Laidre, K.L., Heide-Jørgensen, M.P. and Nielsen, T.G. The role of the bowhead whale as a predator in West Greenland. 27pp.
26. Brandon, J.R., Punt, A.E., Wade, P.R., Perryman, W.L., Methot, R.D. and Maunder, M.N. Incorporating environmental time series into a population dynamics model for eastern North Pacific gray whales. 16pp.
27. Jorde, P.E. and Schweder, T. Further analysis of stock structure for BCB bowhead whales using genetic data. 15pp.
28. Schweder, T. and Sadykova, D. Event history models for capture-recapture surveys with passively marked individuals. 14pp.
29. Pastene, L.A., Kitakado, T., Goto, M. and Kanda, N. Update of mitochondrial DNA analyses on stock structure in the B-C-B stock of bowhead whale. 12pp.
30. Kitakado, T., Pastene, L.A., Goto, M. and Kanda, N. Updates of stock structure analyses of B-C-B stock of bowhead whales using microsatellites. 13pp.
31. [No paper]
32. Givens, G.H. A note on interannual variation of Fis for bowhead whales sampled at Barrow. 6pp.
33. LeDuc, R.G., Martien, K.K., Morin, P.A., Hedrick, N., Robertson, K.M., Taylor, B.L., Mugué, N.S., Borodin, R.G., Zelenina, D.A. and George, J.C. Sequence variation in bowhead whales; a response to BRG29 and a re-examination of the analyses. 24pp.
34. Martien, K., Givens, G. and Archer, E. A note on the ability of STRUCTURE to correctly infer the number of populations for Bering-Chukchi-Beaufort Sea bowhead whales. 8pp.
35. Taylor, B.L., LeDuc, R., George, C., Suydam, R., Moore, S. and Rugh, D. Synthesis of lines of evidence for population structure for bowhead whales in the Bering-Chukchi-Beaufort region. 12pp.

36. Heide-Jørgensen, M.P. and Laidre, K.L. Further evidence for a single stock of bowhead whales between Canada and West Greenland. 6pp.
37. Bradford, A.L., Weller, D.W., Ivashchenko, Y.V., Burdin, A.M., and Brownell, R.L., Jr. Anthropogenic scarring of western gray whales (*Eschrichtius robustus*). 15pp.
38. Brownell, R.L. Jr., Kasuya, T. and Weller, D.W. Entrapment of western gray whales in Japanese fishing gear; population threats. 9pp.
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SC/59/EM

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SC/59/SD

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SC/59/SH

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SC/59/WW

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