Report of the Scientific Committee

The meeting was held at Centre de Congrès, Les Dunes d'Or, Agadir, Morocco from 30 May-11 June 2010 and was chaired by Debra Palka. A list of participants is given as Annex A.

1. INTRODUCTORY ITEMS

1.1 Chair's welcome and opening remarks
Palka welcomed the participants to the meeting. She thanked the Government of Morocco for hosting the meeting and for providing excellent facilities along with fabulous weather. She also expressed thanks for the beautiful artwork exhibited throughout the meeting venue.

With sadness, the Committee noted that Sidney Brown had passed away since the 2009 meeting. Sidney was a long-standing member of the Committee from the early 1960s to the mid 1980s. He was particularly involved in the Discovery Whale Marking Scheme, for which he was responsible for maintaining records of marks fired and recovered, ordering supplies and ensuring their availability for relevant whaling and scientific operations, and writing up the results. His advice on all things cetacean was much sought and greatly respected. His modest English manner belied a shrewd intellect and wide range of interests in maritime history and exploration. A minute of silence was observed in his memory.

1.2 Appointment of rapporteurs
Donovan was appointed rapporteur with assistance from various members of the Committee as appropriate. The Committee gave particular thanks to Butterworth for rapporteuring Item 20. 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
Two pre-meetings preceded the start of the Scientific Committee. The Working Group on the *pre-Implementation assessment* of Western North Pacific Common Minke Whales (NPM) and the correspondence Working Group on Abundance Analysis Methods for Southern Hemisphere Minke Whales met from 28-29 May, during which agenda items covered were incorporated into their main agendas and reports (Annexes D1 and G respectively).

A number of sub-committees and Working Groups were established. Their reports were either made annexes (see below) or subsumed into this report.

Annex D – Sub-Committee on the Revised Management Procedure (RMP);
Annex D1 – Working Group on the *pre-Implementation assessment* of Western North Pacific common minke whales (NPM);
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 H – Sub-Committee on Other Southern Hemisphere Whale Stocks (SH);
Annex I – Working Group on Stock Definition (SD);
Annex J – Working Group 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); and
Annex N – Working Group on DNA (DNA).

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 U. The Agenda took into account the priority items agreed last year and approved by the Commission (IWC, 2010c). 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. He was pleased to note that this year, the percentage of people opting to receive their primary papers entirely electronically (27%) was almost triple that of last year (10%) and he hoped that this percentage would continue to grow in future years. The list of documents is given as Annex C.

3.2 National Progress Reports on research
National Progress Reports presented at the 2002-10 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, 1993). Non-member nations wishing to submit progress reports are welcome to do so. The Secretariat is looking into the possibility of online submission of the data included in national Progress Reports; a simplified progress report template has also been developed (see Annex P).

A summary of the information included in the reports presented this year is given as Annex O; the report template,

Table 1

List of data and programs received by the IWC Secretariat since the 2009 meeting.

Date	From	IWC ref.	Details
Catch data from the previous season:			
03/05/10	Norway: N. Øien	E84 Cat09	Individual minke catch records from the Norwegian 2009 commercial catch. Access restricted (specified 14-11-00).
31/05/10	Iceland: G. Víkingsson	E87 Cat09	Individual catch records from the Icelandic commercial catch 2009.
31/05/10	Japan: H. Okada	E88 Cat09	Individual catch records from the Japanese 2009 North Pacific special permit catch (JARPN II) and 2009/10 Antarctic special permit catch (JARPA II).
31/05/10	Russia: R.G. Borodin	E89 Cat09	Individual catch records from the aboriginal harvest in the Russian Federation in 2009.
03/06/10	St.Vincent: L. Edwards	E90 Cat10	Individual catch records from St. Vincent and The Grenadines for the 2010 humpback harvest.
Sightings data/programs:			
22/02/10	K. Sekiguchi	E86 CD92a-n	2009/10 SOWER cruise photographs and data including sightings, effort, waypoint, ice edge, weather.
00/04/10	L. Burt	CD93	DESS Version 3.63 2010.
30/05/10	Japan: K. Matsuoka	CD94	ICR blue whale photo-id pictures from JARPA 1987/88-2004/05 submitted under IWC data access Procedure B.

is available on the IWC website (*http://www.iwcoffice.org/sci_com/scprogress/htm*). 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 2009 meeting.

3.3.2 Progress of data coding projects and computing tasks
Allison reported that work has continued on the entry of catch data into both the IWC individual and summary catch databases, including data received from the 2008 season. Work has focused on updating data for eastern North Pacific gray whales (see Item 9.2) and data from the North Atlantic in the period 1897-1930. Version 5.0 of the catch databases will be available shortly. Entry of data into the bycatch database developed by Simon Northridge has continued with data from the 2004 and 2008 seasons being added. Data from the 2008/09 SOWER sightings cruise have been validated and incorporated into the DESS database and work on encoding and validation of data from the 2009/10 cruise has begun. Burt and Hughes began an audit of the Western North Pacific Bryde's whale survey data intersessionally and this work was completed during the course of the meeting.

Programming work during the past year is discussed later under the relevant agenda items.

4. COOPERATION WITH OTHER ORGANISATIONS

4.1 Convention on the Conservation of Migratory Species (CMS)
4.1.1 Scientific Council
There were no meetings of the Scientific Council during the intersessional period. Perrin will represent the IWC at its next meeting.

4.1.2 Conference of Parties (COP)
There were no meetings of the Conference of Parties during the intersessional period. The Secretariat will represent the IWC at the next COP.

4.1.3 Agreement on Small Cetaceans of the Baltic and North Seas (ASCOBANS)
The report of the IWC observer at the 6th Meeting of the Parties to ASCOBANS held in Bonn, Germany from 16-18 September 2009 is given as IWC/62/4D. The main topics of relevance to the IWC are summarised as follows:

(1) a new version of the Recovery Plan for Baltic Harbour Porpoises was adopted;
(2) a new Conservation Plan for the Harbour Porpoise in the North Sea was adopted; and
(3) the meeting agreed on guidelines to address the adverse affects of underwater noise on marine mammals during offshore construction activities for renewable energy production.

The 17th meeting of the Advisory Committee to ASCOBANS had been scheduled to take place from 21-23 April 2010 in Cornwall. This was postponed due to flight restrictions caused by volcanic eruptions in Iceland. It has been rescheduled for 4-6 October 2010 in Bonn, Germany.

The Committee thanked Scheidat for her report and **agrees** that she should represent the Committee as an observer at the next ASCOBANS Advisory Committee meeting and Meeting of Parties. Further information can be found at *http://www.ascobans.org*.

4.1.4 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)
The ACCOBAMS Scientific Committee met in Casablanca from the 11-13 January 2010, primarily to prepare information for the forthcoming Meeting of Parties that will be held from 9-12 November 2010 in Monaco. It was attended by members of the Scientific Committee, representatives from the Sub-Regional Coordination Units, representatives from International Organisations and observers including partners of ACCOBAMS. The report of the IWC observer is given as IWC/62/4M.

Nine recommendations and a Declaration expressing the Committee's concern about the slow and/or limited level of implementation of the Agreement to effectively address the conservation problems affecting cetaceans in the Agreement area were adopted by the Committee during the meeting:

Recommendation	Topic
6.1	ACCOBAMS Survey Initiative
6.2	Programme of work on population structure
6.3	Conservation of Mediterranean common dolphins
6.4	Ship strikes
6.5	Marine Protected Areas
6.6	Anthropogenic noise
6.7	Monitoring, assessment and reducing cetacean bycatch in the Black Sea
6.8	Climate change
6.9	Minimum funding for the Scientific Committee

The next meeting of the Scientific Committee is planned for early 2011. The full report of the Scientific Committee can be found on the ACCOBAMS website *http://www. accobams.org*. The Committee thanked Donovan for his report and **agrees** that he should represent the IWC at the forthcoming Meeting of the Parties and Scientific Committee meetings.

4.1.5 Memorandum of Understanding (MoU) on the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia

There was no report related to the MoU on the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia. Perrin will represent the Committee at future activities.

4.1.6 Memorandum of Understanding (MoU) for the Conservation of Cetaceans and Their Habitats in the Pacific Islands Region (MoU for Pacific Islands Cetaceans)

The report of the IWC observer at the 2nd meeting of the MoU for Pacific Islands Cetaceans held 28-29 July 2009 in Auckland, New Zealand is given as IWC/62/4E. The meeting was attended by most of the signatories (Australia, Cook Islands, Fiji, French Polynesia, New Caledonia, New Zealand, Niue, Papua New Guinea, Samoa and the Solomon Islands). Federated States of Micronesia was unable to attend, and Tonga attended as an observer. The UK, on behalf of the Pitcairn Islands, signed the MoU at the meeting, bringing the total number of signatories to twelve.

The meeting, *inter alia*, reviewed progress in cetacean conservation in the region, endorsed a proposal to develop an Oceania Humpback Whale Recovery Plan and adopted an Action Plan for the MoU. An offer by the Whale and Dolphin Conservation Society (WDCS) to convene a Pacific Cetaceans MoU Technical Advisory Group was gratefully accepted. The meeting also noted with appreciation the continued support by WDCS for the development of the CMS Pacific MoU website: *http://www.pacificcetaceans. org*. The Committee thanked Donohue for his report and **agrees** that he should represent the Committee at the next meeting of the MoU for Pacific Islands. Further information can be found at *http://www.cms.int/species/pacific_cet/ pacific_cet_bkrd.htm*.

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

The report of the IWC observer documenting the 2009 activities of ICES is given as IWC/62/4B. The ICES Working Group on Marine Mammal Ecology (WGMME) met in February 2009. Issues considered included management procedures for estimating bycatch limits for small cetaceans, assessing population and stock structure in small cetaceans, improvements in the procedure for reporting on favourable Conservation Status (FSC) under the EU habitats Directive, and developing a framework for monitoring and surveillance of European marine mammal populations.

A review of the ASCOBANS/HELCOM Working Group (WG) on common dolphin population structure in the Northeast Atlantic was conducted. The WGMME concurred with the recommendation that only one common dolphin population inhabits the Northeast Atlantic, although the distributional range of the population is unknown. A separate Iberian harbour porpoise population has recently been identified using genetic analysis and the WGMME strongly recommended that this population be given a high priority for conservation. The WGMME also strongly recommended immediate action by the Spanish and Portuguese governments in monitoring and conserving the Iberian harbour porpoise population.

New data from the SCANS II and CODA projects were reviewed and the WGMME concurred with the recommendation to use the *Catch Limit Algorithm* approach for estimating bycatch limits for small cetaceans.

The WG noted that the continuation and establishment of national observer bycatch programmes is extremely important in order to obtain current estimates of incidental capture for all marine mammal species. The WG also noted the need for the continuation of surveys such as SCANS II and CODA at least every 5-10 years in order to estimate absolute abundance.

Initial development of a European framework for surveillance and monitoring of marine mammals was undertaken. While it is clear that monitoring of abundance, bycatch and health status may reasonably form the core of surveillance for cetaceans, the importance of other types of information (e.g. life history data) and monitoring of specific threats (e.g. offshore construction) should also be recognised when designing a surveillance strategy. Further, monitoring programme design should take account of new findings on the target stock's structure.

The 2009 ICES Annual Science Conference (ASC) was held in Berlin, Germany, 21-25 September 2009. Some sessions were designed with marine mammals included as an integral part. A number of sessions were of relevance to the Committee, including those describing:

(1) advances in marine ecosystem research;
(2) comparative study of climate impact on coastal and continental shelf ecosystems in the ICES area;
(3) habitat science to support stock assessment;
(4) avoidance of bycatch and discards; and
(5) ecological foodweb and network analysis.

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 2009 meeting of IATTC.

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

The report of the IWC observer to the 21st meeting of ICCAT is given as IWC/62/4J. The critical status of some stocks was highlighted, including the bluefin tuna, and measures adopted to allow the rebuilding of stocks as well as measures to improve the management frameworks and status for swordfish and albacore. The Committee thanked Corrêa for attaneding the meeting on its behalf.

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

The report of the IWC observer at the 28th Meeting of the CCAMLR Scientific Committee (CCAMLR-SC), held in Hobart, Australia from 23-27 October 2009 is given as IWC/61/4A. The main items considered at the CCAMLR meeting of relevance to the IWC included: (1) fishery status and trends of Antarctic fish stocks, krill, squid and stone crabs; (2) incidental mortality of seabirds and marine mammals in fisheries in the CCAMLR Convention Area; (3) harvested species (krill, fish, and stone crabs and their assessment); (4) ecosystem monitoring and management; (5) management under conditions of uncertainty about stock size

and sustainable yield; (6) scientific research exemption; (7) CCAMLR Scheme of International Scientific Observation; (8) new and exploratory fisheries; (9) joint CCAMLR-IWC workshop with respect to ecosystem modelling in the Southern Ocean; and (10) the CCAMLR performance review.

Marine Protected Areas were discussed in detail. The area of the southern South Orkney shelf and the Seasonal Pack-ice Zone and part of the Fast Ice Zone south of the Shelf was the first MPA designated by CCAMLR. The following milestones were previously agreed: (1) by 2010, collate relevant data for as many of the 11 priority regions as possible; (2) by 2010, submit proposals on a representative system of MPAs to the CCAMLR Commission; (3) by early 2011, convene a workshop to review progress, share experience and determine a work programme for the identification of MPAs; and (4) by 2011, submit proposals for areas for protection to the CCAMLR-SC.

Two reports of cetacean-fisheries interactions in the Southern Ocean were received by CCAMLR in 2009: (1) a killer whale hooked on a line was dead when brought to the surface; and (2) a sperm whale hauled up dead after being caught in discarded fishing gear on the seabed.

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

4.6 Southern Ocean GLOBEC (SO-GLOBEC)
The synthesis and analysis process under SO-GLOBEC has continued and has produced a number of papers relating cetacean distribution to prey and other environmental variables. There is no active work with respect to SO-GLOBEC at this time.

4.7 North Atlantic Marine Mammal Commission (NAMMCO)
Scientific Committee
The report of the IWC observer at the 16th meeting of the NAMMCO Scientific Committee held in Reykjavik, Iceland 19-22 April 2009 is given as IWC/62/4L.

The Working Group on Marine Mammals-Fisheries (MMFI WG) considered: (1) new developments in the quantitative description of marine mammal diet by species; (2) new developments in the estimation of energy consumption; and (3) recent developments in multi-species modelling. In light of the report of the WG, the NAMMCO SC agreed that multi-species modelling is a valid approach for understanding ecological relations between species. However, it was noted that ecosystem models have significant data requirements, many of which are currently unavailable. In order to improve the understanding of such modelling, an exercise is planned in which four different modelling approaches are used to describe the same ecosystem.

A successful survey of narwhals was conducted in East Greenland during August 2008. The abundance estimates developed from this are the first for the Scoresby Sound fjord system south to Ammassalik. The abundance estimate for narwhals in Melville Bay, developed from the 2007 survey is the first estimate from this locality. The NAMMCO SC recommended catches be set so that there is at least a 70% probability that management objectives be met for West and East Greenland narwhals, i.e. maximum total removals of 310 and 85 narwhals in West and East Greenland respectively.

At the last NAMMCO SC meeting it was recognised that the preliminary data on abundance of narwhals and white whales show higher estimates and encouraged Greenland to submit fully corrected estimates. These were submitted to and endorsed by the NAMMCO/JCNB Joint Working Group in February 2009.

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

Council
The report of the IWC observer at the 17th Annual Meeting of NAMMCO held in Tromso, Norway in September 2009 is given as IWC/61/4F. The whaling and sealing nations in the North Atlantic confirmed their commitment to ensuring the sustainable utilisation of marine mammals through science-bases management decisions, stressing the vital importance marine mammals have as renewable resources for economies and cultures across the region.

Key conclusions from the meeting relevant to IWC included:

(1) welcoming Greenland's multi-annual catch quotas for white whales and narwhal stocks;
(2) a recommendation from the NAMMCO SC that a quota of 10 humpback whales in West Greenland, including struck and lost animals, would be sustainable;
(3) initiation of an ecosystem modelling programme; and
(4) agreement to convene an expert working group to undertake a review and evaluate the whale killing data submitted to NAMMCO by Japan and to look at data and information on recent and ongoing research on improvements and technical innovations in hunting methods and gears used for the hunting of large whales in NAMMCO countries.

The Committee thanked Goodman for attending on its behalf and **agrees** that he should represent the Committee as an observer at the next NAMMCO Council meeting. Further information on NAMMCO can be found at *http://www.nammco.no*.

4.8 International Union for the Conservation of Nature (IUCN)
Cooke and Larsen, the IWC observers, reported on the considerable cooperation with IUCN that had occurred during the past year and this is given as IWC/62/4K.

Western gray whales (see also Item 10.4)
The IUCN Western Gray Whale Advisory Panel has continued its work (*http://www.iucn.org/wgwap*). The Panel had earlier advised that a seismic survey commissioned by Sakhalin Energy and scheduled for 2009 in the Astokh area be postponed, in view of the anomalous (and possibly disturbance-related) distribution of gray whales off Sakhalin in 2008. Given the apparent return to normal gray whale distribution in the area in 2009, the Panel agreed that carrying out of the survey in 2010 was acceptable, particularly in the light of the jointly developed, improved monitoring and mitigation measures and completion of the survey early in the season before large numbers of whales arrive in the Piltun feeding area.

The Panel was extremely concerned to learn that a further seismic survey is planned for July-September 2010 by the company Rosneft Shelf - Far East, to cover the Lebedenskoie field which underlies the northern part of the prime near-shore feeding ground of western gray whales The IUCN Director General has written to Prime Minister Putin urging the Russian government to order the postponement of the survey at least until 2011 to enable satisfactory mitigation measures to be put in place to minimise the disturbance to

whales[1]. A draft Western Gray Whale Conservation Plan has been developed with the help of the IUCN Marine Programme as part of its Range-Wide Conservation Initiative for western Gray Whales (SC/62/BRG24).

Red List updates
Following the comprehensive updating of the Red List entries for cetaceans in 2008, the Cetacean Specialist Group has completed separate assessments of the two species of *Sotalia*, the freshwater tucuxi and the coastal marine and estuarine Guiana dolphin. Draft assessments of a number of Mediterranean subpopulations (fin whale, sperm whale, long-finned pilot whale, Risso's dolphin, striped dolphin, common bottlenose dolphin and Cuvier's beaked whale) are in review.

Asian freshwater cetaceans (see also Item 14.3)
The Cetacean Specialist Group has undertaken several initiatives in Asia over the past year. These have included, most notably a workshop in Samarinda, East Kalimantan, Indonesia in October 2009 on freshwater protected areas for dolphins; a special meeting in Phnom Penh, Cambodia in November 2009 on the conservation of Irrawaddy dolphins in the Mekong River; and a meeting in Patna, India in February 2010 to assist in the development of a national action plan for the conservation of Ganges river dolphins (*Susus*).

The Committee thanked Cooke and Larsen for their report and **agrees** that they should continue to act as observers to IUCN for the IWC. Further information on IUCN can be found at *http://www.iucn.org*.

4.9 Food and Agriculture Organisation (FAO) related meetings – Committee on Fisheries (COFI)
There was no meeting of COFI in 2010. Further information on FAO can be found at *http://www.fao.org*.

4.10 Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)
The report of the IWC observer at the 15th meeting of the CITES Conference of the Parties held 13-25 March 2010 in, Doha, Qatar is given as IWC/62/4H. There were no proposals for changing the listing of whale stocks from Appendix I to Appendix II (downlisting). There were also no proposals for changing the listing of a dolphin or whale species from Appendix II to Appendix I (uplisting).

The CITES Secretariat reviewed all of the Decisions that were in effect after the 14th meeting of the Conference of the Parties, including a recommendation to delete Decision 14.81 relating to great whales. Decision 14.81 states that 'No periodic review of any great whale, including the fin whale, should occur while the moratorium by the International Whaling Commission is in place'. The CITES Secretariat recommendation also noted that if the substance of this Decision should remain in effect, it should be considered in the context of the draft resolution on the periodic review of the Appendices.

A number of Parties opposed its deletion on the basis that the draft resolution on the periodic review had not been accepted. After a vote, the recommendation to delete the Decision was rejected.

The Committee thanked the US Government for attending on its behalf and **agrees** that it should represent

the Committee as an observer at the next CITES meeting. Information on CITES can be found at *http://www.cites.org*.

4.11 North Pacific Marine Science Organisation (PICES)
The report of the IWC observer at the 18th annual meeting of PICES held 23 October-1 November 2009 in Jeju, Republic of Korea is given as IWC/62/4G. The Marine Birds and Mammals Advisory Group (AP-MBM), cosponsored by ICES held a theme session on 'integrating marine mammal populations and rates of prey consumption in models and forecasts of climate change-ecosystem change in the North Pacific and North Atlantic Oceans'. A diverse range of topics were covered, including population trends, diet, estimates of prey consumption and models of trophic impact. AP-MBM reviewed aspects of the new PICES science programme (FUTURE), specifically: (1) understanding climate change and anthropogenic impacts on marine ecosystems; (2) forecasting future ecosystem change; and (3) better communication with society. The AP reiterated its primary mission to provide advice to the PICES community about the role of marine birds and mammals in marine ecosystems. Based on its role in FUTURE the AP-MBM defined its focal points as: (1) spatial ecology of predators in marine ecosystems; (2) models of prey consumption of top predators; (3) marine birds and mammals as indicators of ecosystem change; (4) marine mammals as autonomous oceanographic sampling devices; and (5) providing advice to the PICES community.

The Committee thanked Kato for attending on its behalf and **agrees** that he should represent the Committee as an observer at the next PICES meeting. Further information on PICES can be found at *http://www.pices.int*.

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 (SPAW) of the Cartagena Convention for the Wider Caribbean
There were no meetings of SPAW during the intersessional period. Carlson will represent the IWC at its next meeting. Further information on SPAW can be found at *http://www.cep.unep.org/cartagena-convention*.

4.14 Indian Ocean Commission (IOC)
No information on the activities of IOC was provided. Further information on the IOC can be found at *http://www.coi-ioc.org*.

4.15 Permanent Commission for the South Pacific (CPPS)
No information on the activities of CPPS was provided. Further information on CPPS can be found at *http://www.cpps-int.org*.

4.16 International Maritime Organisation (IMO)
The report of the IWC observer at the General Assembly of the IMO held 23 November-4 December 2009 is given as IWC/62/4I. The proposed Agreement of Cooperation between IMO and IWC was approved, which means that the IWC now has definitive IMO observer status. While the impetus for closer co-operation between IMO and IWC was in relation to ship strikes on cetaceans, there are a number of other issues of potential mutual relevance including habitat degradation and noise from shipping. Discussions on

collisions with whales and underwater noise from shipping took place within the Marine Environment Protection Committee (MEPC) at its 59th session held in July 2009 and 60th session held in March 2010.

The MEPC has had 'noise from commercial shipping and its adverse impact on marine life' on its work programme since 2008. A correspondence group was established to identify and address ways to minimise the introduction of incidental noise into the marine environment from commercial shipping to reduce the potential adverse impact on marine life and in particular develop voluntary technical guidelines for ship-quieting technologies as well as potential navigation and operational practices. The IWC Secretariat is a member of this group.

The Committee thanked the IWC Secretariat for its report and **agrees** that it should represent the Committee at the next IMO meeting. Further information on IMO can be found at *http://www.imo.org*.

4.17 Other
An update was received on conservation in the Southeast Pacific under the framework of the Lima Convention and is given as IWC/62/4C. In January 2010 the 16th Meeting to the Parties to the Lima Convention was held in Guayaquil, Ecuador. The five member countries (Chile, Colombia, Ecuador, Panama and Chile) reviewed the activities regarding implementation of a Plan of Action for the Conservation of Marine Mammals in the Southeast Pacific (PAMM). The PAMM was formed to help countries to improve their policies on marine mammals' conservation and to develop activities that require regional cooperation.

In 2009 five pilot projects to mitigate the impacts of fishing activities were conducted: (1) implementation of actions for the conservation of the Chilean dolphin in the zone of Constitucion; (2) study to mitigate impact of the incidental entanglement of coastal cetaceans in the Columbia Pacific; (3) preliminary assessment of the interaction of cetaceans with artisanal fisheries in the Machalilla National Park, Ecuador; (4) reduction of the impact of gillnets on cetaceans in coastal waters within the Gulf of Chiriqui; and (5) study to test the use of pingers to reduce the incidental bycatch of small cetaceans in Peru.

As a result of these projects, a document entitled 'Efforts to mitigate the impact of fishing activities on cetaceans in the Southeast Pacific countries' will be published.

The first phase of a biodiversity and MCPA information system (SIBIMAP-PSE) was finalised. This is an online tool for searching and downloading information crucial for management and conservation of cetaceans, sea turtles and MCPA in the Southeast Pacific. The module on cetaceans is now complete.

A workshop on legal aspects of whalewatching was planned for March 2010, but was postponed until late 2010 due to an earthquake in Chile.

The Committee thanked Felix for his report and **agrees** that he should represent the Committee at future activities related to cetacean conservation in the Southeast Pacific under the framework of the Lima Convention.

5. REVISED MANAGEMENT PROCEDURE (RMP) – GENERAL ISSUES

5.1 Review MSY rates
5.1.1 Report of the intersessional workshop
The Committee has been discussing maximum sustainable yield rates (MSYR) for some time in the context of a

general reconsideration of the plausible range to be used in population models used for testing the *Catch Limit Algorithm* (*CLA*) of the RMP (and see Item 5.1.2 below). At present, this range is 1% to 7% when expressed in terms of the mature component of the population. As part of the review process, information on observed population growth rates at low population sizes is being considered because Cooke (2007) noted that in circumstances where variability and/ or temporal autocorrelation in the effects of environmental variability on population growth rates is high, simple use of such observed population growth rates could lead to incorrect inferences being drawn concerning the lower end of the range of plausible values for MSYR.

A Third Workshop was held intersessionally to examine whether the observed levels of variation in baleen whale reproduction and annual survival rate parameters were sufficiently large that biases of the nature identified from population models incorporating environmentally-induced variability might be of concern (SC/62/Rep2; Annex D, item 2.1.1).

At the Workshop, an analytical approach was developed and followed to estimate the coefficient of variation (CV) and temporal autocorrelation for the selected time series of calving proportion indices and calving interval data. This information, modified appropriately, provides input for a method developed to relate variability in calving proportion to variability in the annual growth rate of a population using a population dynamics model (see SC/62/Rep2). The model can take into account environmentally-induced variability in population abundance arising from variation in annual survival rate.

The Workshop identified two further steps needed before results from this model can be used to draw inferences about the plausible ranges for the CV and temporal autocorrelation parameters describing the effects of environmental variability on population dynamics in the model of Cooke (2007). The Committee incorporated these into its work plan under this item (see Annex D, item 2.1.2).

The Workshop received a revised approach for a meta-analysis of population growth rates previously discussed (IWC, 2010b) and suggested some additional work to be completed before the 2010 Annual Meeting. Item 5.1.2 and Annex D, item 2.1.1 describe progress made on three other issues listed in the work plan for completion of the MSYR review at last year's meeting.

5.1.2 Issues arising
The Committee received SC/62/RMP3 in response to the Workshop recommendations to: (1) apply the age-structured model of SC/62/Rep2, Annex D to all of the datasets assembled during the Workshop to estimate the resultant CV and temporal auto-correlation in growth rate; and (2) to conduct further tests of the Bayesian meta-analysis approach. More details are given in Annex D, item 2.1.2.

The Committee **agrees** that this Bayesian approach was an acceptable basis to compute a posterior distribution for r_0, once the inputs needed to apply it become available. It also **agrees** that account will need to be taken that the estimates of lower posterior percentiles from this method are positively biased, before making recommendations regarding appropriate values for MSYR for use in trials.

SC/62/RMP2 and SC/62/RMP4 responded to recommendations to use the environmental variability model of Cooke (2007) to provide CVs and temporal autocorrelation estimates for the growth of the population from one year to the next for the standard set of scenarios and to use this model to determine the predicted relationship

between the length of series and the estimated level of variability in the population rate of increase. More details are given in Annex D, item 2.1.2. The Committee **agrees** that it now has a basis to link variability in demographic processes with the inputs of the Cooke (2007) model.

Efforts to fit models that account for both process and observation error to the data on calving rates and calving intervals had encountered numerical problems intersessionally The Committee **endorses** a work plan to address this (Annex D, Appendix 2) and looks forward to seeing the results of this work next year.

The Committee discussed how to relate variation in net recruitment rate, which depends on variation in both survival and reproduction, to variation in reproductive rates alone. Details are given in Annex D, item 2.1.2. The Committee considered the question of correlations between survival and reproductive rates to be potentially important for the question of estimating typical levels of variation in net recruitment rate for baleen whales, but **agrees** that more analysis is required before any general inference can be drawn. It **requests** in particular:

(1) a literature review with regard to the question of the circumstances under which correlations between survival and reproductive rates would be negative or positive;
(2) more extensive modelling to cover the full range of parameter values deemed to be plausible for baleen whales in order to determine whether general inferences can be drawn, or at least to identify the circumstances where substantial correlations of a specific sign would be expected;
(3) direct estimation of variability in survival rates to the extent that this is possible.

The Committee **agrees** that if results from this work are available at its next meeting, then they should be taken into account in its deliberations with respect to the level of variability in baleen whale demography. However, that lack of results will not preclude the Committee from completing its review of MSY rates next year.

The Committee considered the extent to which genetic data could place bounds on fluctuations in population size for some examples of trajectories arising for the environmental variation model of Cooke (2007). It recognised the potential of genetic methods to inform its deliberations on the plausible range of MSYR values, but **agrees** that these methods could not be used during the current review. However, it **recommends** that the number of haplotypes in whale populations, along with other population and demographic measures should be assembled since this might inform the current review. The Committee **encourages** completion of a compilation already initiated by Brownell.

The Committee also **agrees** that although the use of time-series of abundance estimates for species other than whales to make inferences regarding the extent of variation and the temporal auto-correlation of the rate of growth remained a good idea, the lack of such time-series at present means that this source of information cannot be pursued during the current review.

In conclusion, although considerable progress was made during the current meeting, the Committee was once again not in position to complete the review. It established a work plan (see Annex D, item 2.5) to address the final issues that need to be examined to complete the review at next year's meeting.

It **agrees** that the review will be completed at next year's meeting on the basis of the data and analyses available. It **accepts** that it is not appropriate to keep extending the time available for the review, particularly given its importance to Item 5.2 below.

5.2 Finalise the approach for evaluating proposed amendments to the *CLA*

The Committee noted that it could not complete discussions on amendments to the *CLA* until the range for MSYR values in the RMP was completed. Regarding the Norwegian proposal for amending the *CLA*, it was noted that all of the relevant trials/results had been presented in Aldrin and Huseby (2007), but that evaluation of this proposal could not occur until the review of MSY rates was complete.

5.3 Version of *CLA* to be used in trials

SC/62/RMP10 examined the sensitivity of catch limits to the level of accuracy when computing posterior distributions using the *CLA*. Four versions of programs used to implement the *CLA* were discussed. More details are given in Annex D, item 2.1.2.

The Committee **endorses** the recommendations in SC/62/RMP10 that: (a) only the Norwegian version of the *CLA* should be used when conducting future trials; (b) the Second Intersessional Workshop in an *Implementation* or *Implementation Review* will need to be carefully scheduled to ensure that all trials can be run before it takes place; (c) if special circumstances arise when it becomes necessary to run additional trials during a meeting (e.g. during the Second Intersessional Workshop), the 'intermediate' version of the Cooke implementation that is more accurate than the 'trials' version (but less accurate than the 'accurate' or Norwegian version) be used for this purpose and the results confirmed using the Norwegian 'CatchLimit' program after the meeting; and (d) a full set of revised results from the trials for North Atlantic fin whales, Western North Pacific Bryde's whales; and North Atlantic minke whales should be run using the Norwegian 'CatchLimit' program and the results placed on the IWC website.

5.4 Updates to RMP specification and annotations

In the context of applying the RMP pursuant to Item 20, the Committee identified some issues where updating and clarification of the specifications of the RMP and the accompanying annotations and guidelines was warranted (see Annex D, item 2.4).

(1) The provision for the adjustment for sources of human-caused mortality other than commercial catches, as recommended by the Scientific Committee in 2000 (IWC, 2001f, p.91), should be included in the RMP with the qualification specified by the Commission (IWC, 2001b) that the provision be limited to mortality due to bycatches, ship strikes, non-IWC whaling, scientific permit catches, and indigenous subsistence whaling. A new annotation should be added to provide the Committee with operational guidelines to implement this provision.
(2) The maximum period of validity of catch limit calculations should be extended from five to six years to be consistent with the six-year cycle of surveying specified in section 3.2.2 of the RMP, as currently implemented for minke whales in the North Atlantic.
(3) The rule for rounding of catch limits to a whole number of whales should be clarified.

(4) The guidelines for conducting surveys under the RMP and those for *Implementing* the RMP (IWC, 2005b; 2005c) should be modified to clarify that changes to the guidelines are not retroactive. That is, results from surveys conducted in accordance with earlier version of the guidelines would not become inadmissible for use in the RMP when the guidelines are changed.

Proposed amendments to the RMP and its annotations to address these issues are given in Annex D, Appendix 5, along with some background information. The Committee **recommends** adoption of these amendments to the RMP specification and annotations. The Committee further **requests** the Secretariat to prepare a proposal to next year's meeting to update the guidelines for conducting surveys and for *Implementations* to accommodate point (4) in Annex D, item 2.4.

Several amendments to the RMP specifications and annotations had been adopted since the most recent published version (IWC, 1999e). These are listed in Annex D, Appendix 5. The Committee **agrees** that the consolidated revised version be published in full in the next supplement to *J. Cetacean Res. Manage.*

6. RMP – *IMPLEMENTATIONS* AND *IMPLEMENTATION REVIEWS*

6.1 Western North Pacific Bryde's whales
6.1.1 Complete Implementation
6.1.1.1 RESEARCH PROPOSAL FOR THE 'VARIANT WITH RESEARCH'
The Committee had agreed in 2007 (IWC, 2008b) that three of the four RMP variants (1, 3 and 4) considered during the *Implementation* for western North Pacific Bryde's whales performed acceptably from a conservation perspective and recommended that those variants could be implemented without a research programme. It also agreed that variant 2 was only 'acceptable with research' because conservation performance was 'unacceptable' on three 'medium' plausibility trials incorporating stock structure hypothesis 4 i.e. two stocks of Bryde's whales in the western North Pacific, one of which consists of two sub-stocks (stock structure hypothesis 4).

In 2008, the Committee reviewed a research proposal (Pastene *et al.*, 2008) that aimed to determine whether or not sub-stocks occur in sub-area 1. Based on this review, the Committee had recommended that the *Implementation Simulation Trials* for the western North Pacific Bryde's whales be used to determine whether differences in age-compositions between sub-areas 1W and 1E could be used to resolve whether there are sub-stocks in these sub-areas and that results from previous (and any new) power analyses that assess the use of genetic methods to evaluate stock structure hypothesis 4 be included in the revised proposal.

This year, the Committee received a revised research plan (Annex D, Appendix 6) and welcomed work done to address several of its earlier recommendations. The results of the *Implementation Simulation Trials* showed that recent age structure data would not be able to distinguish between scenarios in which there is or is not age-structuring in sub-areas 1W and 1E.

The Committee **recommends** that the proposal be revised further and, in particular, that the power analyses focus more clearly on the specific hypotheses for the Western North Pacific Bryde's whales. The Committee was informed that a revised proposal will be presented next year that will focus to a greater extent on the use of genetic data.

6.1.2 Recommendations and work plan
The Committee **agrees** that its work plan for the 2011 Annual Meeting would be to review the revised research proposal for the 'variant with research'.

6.2 North Atlantic fin whales
6.2.1 Complete Implementation
Last year, the Committee had agreed that if the RMP is implemented for this species in this Region, variants 1, 3, 4, 5 and 6 (see Table 4 of IWC, 2010d) can be implemented without an associated research programme but that variant 2 (sub-areas WI+EG are a Small Area) was only acceptable with research.

This year, comparison of results from different versions of the *CLA* (see Item 5.2) revealed that variant 3 (sub-areas WI+WG+EI/F are a *Small Area*) does not have 'acceptable' performance for some of the trials and can no longer be considered to be acceptable without research but is rather only 'acceptable with research'.

Last year, the Committee had confirmed that use of variant 2 for ten years followed by variant 1 (sub-area WI is a *Small Area*) led to performance which was 'acceptable' for all trials and consequently that the requirements for stage 1 of the process for implementing a 'variant with research' had been met. The second stage of the process was for Iceland to demonstrate to the satisfaction of the Committee that a research programme has a good chance (within a 10-year period) of being able to confirm or deny that stock structure hypothesis IV is implausible.

The Committee received a research proposal (SC/62/ RMP1) that followed the *pro forma* agreed by the Committee in 2007. Details are given in Annex D, item 3.2.2.

The Committee welcomed the proposal, noting that it was not final and that Iceland was inviting suggestions for how it can be improved. In discussion, it noted that the aim of the proposal should be to assess the probability of hypothesis IV relative to the probabilities for the other stock structure hypotheses. It noted that the *Implementation Simulation Trials* could be used to assess the effect sizes on which the power analyses are based.

In particular, the Committee **recommends** that the lowest rate at which the C sub-stocks mix in sub-areas EC, WG, EG, WI, EI+F, and N and the performance of variant 2 is 'acceptable' for all trials should be calculated and used when conducting power analyses. It further **recommends** that quantitative analyses along the lines of Appendix 3 of SC/62/RMP1 be conducted for each of the stock structure hypotheses.

6.2.2 Recommendations and work plan
The Committee **agrees** that its work plan for the 2011 Annual Meeting would be to review a revised research proposal for the 'variant with research' and to review any abundance estimates for use in the *CLA*.

6.3 North Pacific common minke whales
6.3.1 Initiate pre-Implementation assessment
In 2009, the Commission had agreed that the Scientific Committee should follow the option in its report (IWC, 2010e) that specified completing a full *Implementation Review* as soon as possible, ideally by the 2012 meeting. This timeline will be possible only if the *pre-Implementation assessment* can be completed this year. The Committee was undertaking a *pre-implementation assessment*, rather than immediately commencing an *Implementation Review*, because the 2003 *Implementation* had been conducted

before the existing guidelines for *Implementations* had been developed and had focused primarily on 'O' stock.

Committee guidelines for *Implementations* (IWC, 2005b) state that the main focus of a *pre-Implementation assessment* is:

> 'the establishment of plausible stock hypotheses consistent with the data that are inclusive enough that it is deemed unlikely that the collection of new data during the *Implementation* process will suggest a major novel hypothesis (e.g. a different number of stocks) not already specified in the basic *Implementation Simulation Trial* structure.'

Additional foci are examination of available abundance estimates and information on the geographical and temporal nature of 'likely' whaling operations and future levels of anthropogenic removals other than due to commercial whaling.

The importance of creating a document that lists the various datasets and other information available for the *pre-implementation assessment* was recognised (this is normally provided by national scientists in the case of a new request for a *pre-Implementation assessment)*. This will be a living document, at least until the deadline is established for the consideration of no new data for the *Implementation Review* (this occurs at the First Intersessional Workshop although new *analyses* may be presented at the First Annual Meeting). A table containing this information is given in Annex D1, Appendix 2.

6.3.1.1 STOCK STRUCTURE

The goals for the *pre-Implementation assessment* with respect to stock structure were to agree to a set of inclusive plausible hypotheses consistent with the data, and to ensure that the types of information needed for the *Implementation Review* were available. Assessing the relative plausibility of alternative hypotheses regarding stock structure will be considered at the First Annual Meeting of the *Implementation Review*.

The Committee briefly discussed minimum standards for plausibility. It **agrees**, as it has in the past, that the most reasonable approach is to use best professional judgment and common sense, after considering all relevant information.

The Committee first reviewed past discussions on stock structure for western North Pacific minke whales. Details are given in Annex D1, item 5.1.

The Committee then received a number of papers providing new information relevant to stock structure. Details of these and the considerable discussions that ensued are given in Annex D1, item 5.3. The following summary focuses on issues where the Committee made specific statements.

SC/62/NMP22 provided results of a biopsy skin-sampling survey in July-August 2009 in the Okhotsk Sea. Unfortunately, none of the five biopsy samples taken could be removed from Russian waters because of CITES-related restrictions. This is discussed further under Annex D1, item 7.6. In spite of this, the Committee was pleased that that this research had been conducted within the Russian EEZ, and that it had been possible to collect biopsy samples from minke whales on the feeding grounds. The Committee **encourages** future collaborations and **strongly urges** all concerned to find ways to solve these CITES-related issues.

SC/62/NPM10 estimated the mixing proportion of 'O' and 'J' stocks in the Sea of Okhotsk using cookie-cutter shark scars from 22 animals. Based on previous research in sub-area 11 in 1996 and 1999, the maximum likelihood estimate for the proportion of 'J' stock in sub-area 12 was 0. The Committee welcomed this valuable new information, but **agrees** that the method used to estimate mixing proportions needed some refinement.

SC/62/NPM13 reviewed non-genetic biological information relevant to the stock structure of minke whales in the Yellow Sea, Sea of Japan (East Sea), and western Pacific Ocean. The review was structured to examine four key comparisons between: (1) the Yellow Sea and the Korean coast of the Sea of Japan; (2) the Korean and Japanese coasts in the Sea of Japan; (3) the Sea of Japan and Pacific coasts of Japan; and (4) coastal and offshore areas of the Pacific Ocean. The Committee welcomed this attempt to synthesise diverse types of non-genetic information that potentially can inform discussions of stock structure and found the idea of orienting the analyses around four key questions useful. The authors acknowledged that although they had attempted to be exhaustive, they might have missed some relevant biological information, particularly if it was reported outside the IWC context, and requested that any such information be forwarded to them. The Committee in particular supported the collation of information in table 3 in SC/62/NPM13 and **encourages** members to work together to complete this and provide it to the First Intersessional Meeting of the *Implementation Review*.

The Committee reconsidered Hatanaka and Miyashita (1997) that investigated feeding migration based on length data. It was pointed out that these data are consistent with the generic concept of an 'O' stock, and that the length data might be useful for mature/immature determinations to condition different migration patterns for one or more 'O' stocks. The Committee **agrees** to include these data in Annex D1, Appendix 2.

SC/62/NPM11 had two major objectives: (1) to determine the status of whales that could not be identified reliably to 'O' or 'J' stock based on analyses described in Kanda *et al.* (2009); and (2) to examine stock structure of the 'J' stock in the Sea of Japan and Yellow Sea. The Committee **appreciates** the efforts of the authors to respond to some of the suggestions for additional analyses made last year.

Two papers presented new analyses of mtDNA data. SC/62/NPM21 examined genetic variation at the mtDNA control region to evaluate the plausibility of proposed stock structure scenarios for the 'J' and 'O' stocks. SC/62/NPM20 reported on differences in mtDNA sequences and sex ratios in western North Pacific minke whales by combining information from samples collected in Korean market surveys with three Japanese datasets made available through the IWC Data Availability Agreement. SC/62/NPM27 commented on the analyses conducted in SC/62/NPM20. In discussion, it was clarified that although SC/62/NPM20 and SC/62/NPM27 largely considered the same group of samples, there were two important differences: (1) SC/62/NPM20 used market samples for Korean samples, while SC/62/NPM21 used bycatch; and (2) SC/62/NPM21 used mtDNA data that had been error-corrected subsequently whereas due to time constraints and the agreed deadlines for *pre-Implementation assessment*. SC/62/NPM20 used the original data and grouped haplotypes into haplogroups to minimize influence of the sequencing errors.

In further discussion of standards for establishing/rejecting hypotheses, the Committee **agrees** that it is important but challenging to try to find a balance between two potential errors: (1) interpreting minor differences that might be artefacts or not biologically meaningful as evidence for separate stocks; and (2) failing to recognise true stock structure because power to resolve closely related populations is low.

Discussion of these issues highlighted divergent opinions within the Committee regarding how best to deal with the inability to sample populations on their breeding grounds. In one view, the best way to approach this problem is to use results of the program *STRUCTURE* (Pritchard *et al.*, 2000) which is designed to deal with situations in which there are no reliable *a priori* ways of grouping individuals into putative populations. The other view was that this approach has elements of circularity and can result in a false sense of confidence in model results and that *STRUCTURE* has a documented inability to provide reliable results when dealing with mixtures of closely related populations. These issues have arisen previously regarding earlier versions of the genetic data analyses for North Pacific minke whales (IWC, 2010e).

The Committee **agrees** on the potential value of trying to collect samples in areas where a single stock is believed to occur, but recognises the difficulty in identifying the location of these.

Following presentation and discussion of new information, the Committee reviewed and discussed two independent attempts to generate plausible stock-structure hypotheses that synthesised both genetic and non-genetic information. The summaries of these papers and the ensuing discussion are below.

SC/62/NPM12 examined recent progress in the development of stock structure hypotheses for western North Pacific common minke whale ('O' and 'J' stocks), and conducted a preliminary evaluation of these hypotheses in the context of the available scientific information, mainly genetics, presented and discussed by the Committee in recent years. The aim was to identify stock structure scenarios that are consistent with the data. The authors of SC/62/NPM12 considered that the best available scientific evidence is consistent with the hypothesis that there is a single 'J' stock distributed in the Yellow Sea, Sea of Japan and Pacific side of Japan and a single 'O' stock in sub-areas 7, 8 and 9. They considered this hypothesis the most plausible. It is consistent with the pattern of mixing between 'J' and 'O' stocks along the Japanese coast as proposed by Kanda *et al.* (2009), the migration patterns of adult and juvenile 'J' stock whales as suggested by SC/62/NPM1, and the migration of 'O' stock whales as suggested by Hatanaka and Miyashita (1997). SC/62/NPM12 postulated three less plausible hypotheses which modify the most plausible scenario as follows:

(1) a W-stock sporadically intrudes into sub-area 9;
(2) a different stock (Y-stock) resides in the Yellow Sea and overlaps with 'J' stock in the southern part of sub-area 6; and
(3) a W-stock sporadically intrudes into sub-area 9 and a Y-stock resides in the Yellow Sea, and overlaps with 'J' stock in the southern part of sub-area 6.

These four hypotheses are further described and shown graphically in Annex D1, Appendix 3.

SC/62/NPM15 reviewed genetic and non-genetic data regarding stock structure; the authors summarised their conclusions in the context of addressing four key questions, as follows.

(1) Are whales in the Yellow Sea part of a population that migrates into the Sea of Japan?
SC/62/NPM15 summarised that migration north into the Yellow Sea, the presence of mature whales and cow/calf pairs there, and the fact that Yellow Sea whales have only autumn conception dates (*n*=124), provides evidence that a separate stock exists there. The Korean coast of the Sea of Japan showed some evidence for a mixture of two stocks, and microsatellite DNA showed seasonal differences that might be explained by a Yellow Sea stock moving along the Korean coast only in summer. In summary, the authors consider that the available data suggest that Yellow Sea whales may not be a part of the Sea of Japan stock.

(2) Are whales along the Korean coast part of the same population as whales along the western Japanese coast?
SC/62/NPM15 summarized that there is no obvious hiatus in distribution between the two coasts, and that genetic analyses showed mixed results (haplogroup and *STRUCTURE* found no difference, pair-wise mtDNA and microsatellite DNA found differences). A small sample (*n*=8) from the Sea of Japan showed a bimodal distribution of conception dates and a larger sample (*n*=63) showed two different flipper colour patterns, but these data could be explained by a mixture of whales coming into the northeast Sea of Japan from the Sea of Okhotsk. No sex bias or haplogroup-by-sex differences were found for Japanese Sea of Japan bycatch, suggesting a possible year-round presence of a non-migratory coastal stock. In summary, the authors consider that it is plausible there are different stocks on either side of the Sea of Japan, but the data are somewhat contradictory or are lacking in sufficient resolution or spatial extent to make definitive conclusions. Some genetic evidence suggesting a second stock could be most simply explained by whales from a Yellow Sea stock appearing along the coast of Korea in summer.

(3) Are so-called 'J-type' whales on the east coast of Japan the same population as on the west coast of Japan?
The majority of whales bycaught on the southern Pacific coast of Japan (sub-area 2) are assigned to be J-type and so are either part of a Sea of Japan stock or are a coastal stock separate from a Pacific Ocean ('O') stock. Whales caught in the Pacific Ocean, even from sub-area 7 coastal areas, only have winter conception dates (*n*=68) and a single flipper colour type (*n*=77); if coastal sub-area 7 had a mixture of stocks there should be autumn conception dates and a mixture of flipper colour types. There are differences in microsatellite DNA and mtDNA between the two coasts of Japan when all samples are used. Additionally, the southern Pacific coast bycatch (sub-area 2) is genetically different from bycatch along the northern Pacific coast of Japan (sub-area 7), suggesting a Pacific coastal stock might be distributed only in the Kuroshio current, and does not occur further north in the Oyashio current. In summary, the authors consider that it is plausible that there are different coastal stocks on either coast of Japan, and/or longitudinally along the Pacific coast.

(4) Is there a coastal population in Subarea 7 (east of Hokkaido and northern Honshu) that is different from offshore minke whales in the Pacific Ocean, even after accounting for Sea of Japan whales that might migrate into this area?
One hypothesis is that there is a 'pure' Sea of Japan stock (J-type whales) and Pacific Ocean stock (O-type whales). Under that hypothesis, genetic differences between Pacific coastal waters (sub-area 7W) and other areas have been interpreted to be a mixture of these two stocks. An alternate hypothesis is that this area contains a distinct stock characterised by intermediate haplotype frequencies, as seen in humpback whales, for example. Again, the lack of evidence of autumn conception dates (*n*=68) and a mixture of flipper colour types (*n*=77) in the Pacific Ocean argues

Hypothesis 1: (J/O: mixture of J and O stocks,
O_IM: O stock immature, O_AD: O stock adult)

Hypothesis 2: (J/O: mixture of J and O stocks,
O_IM: O stock immature, O_AD: O stock adult)

Hypothesis 3: (J/O: mixture of J and O stocks,
O_IM: O stock immature, O_AD: O stock adult)

Hypothesis 4: (J/O: mixture of J and O stocks,
O_IM: O stock immature, O_AD: O stock adult)

Hypothesis 5: Five stocks, referred to as Y, Jw, Je, Ow and Oe. There is genetic evidence for heterogeneity to the east
of the Oe stock, presumably representing a sixth stock, referred to previously as W
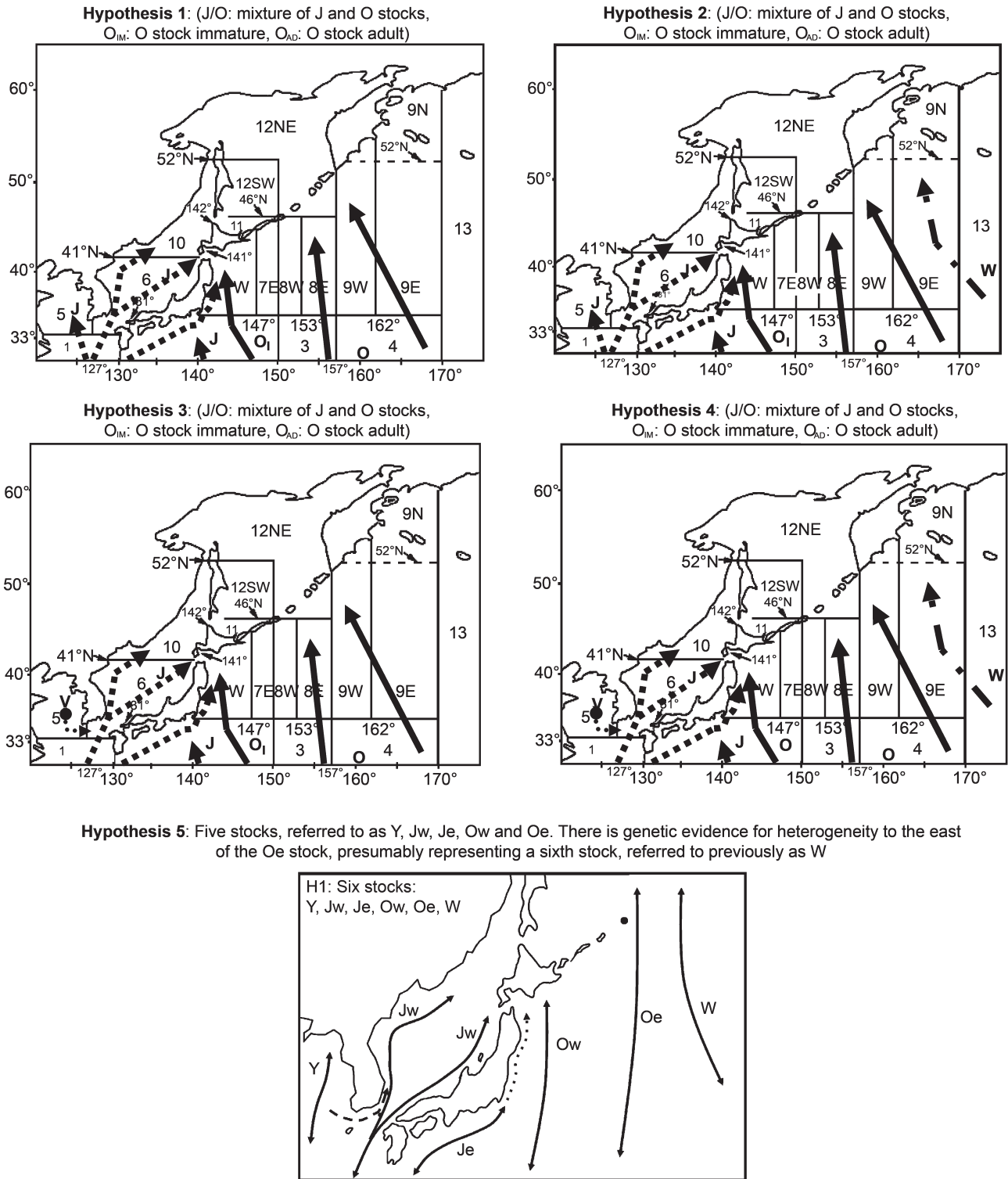
Fig.1. Five plausible stock structure hypotheses for North Pacific minke whales.

against there being a mixture of stocks in coastal Pacific areas. Although it is possible that the haplotype frequencies of sub-area 7W could be explained by a complex seasonal, sex- and age-biased mixing of 2 stocks, e.g. a 'core J' and a 'core O', it is not as parsimonious as the hypothesis of a distinct stock with intermediate haplogroup frequencies. The absence of a strong haplogroup-by-sex interaction in coastal waters is inconsistent with the prediction of a sex-biased mixing of two stocks. SC/62/NPM30 concluded that there was genetic heterogeneity in the Pacific Ocean, with a strong signal in the coastal area east of Hokkaido. In summary, the

authors consider that it is plausible that the unique genetic signals seen in coastal waters of the Pacific coast of Japan are due to the existence of a distinct coastal stock or stocks, rather than a mixture of a 'pure J' and a 'pure O' stock.

An additional stock-structure hypothesis based on consideration of the four questions posed above is that there are six stocks (Y, J_W, J_E, O_W, O_E, and W); this is described and shown graphically in Annex D1, Appendix 4.

In discussion, there was general agreement on answers to two of the key questions posed by SC/62/NPM15: (1) a separate J-like stock (denoted Y-stock) occurs in the Yellow

Sea and in at least some years some Y-stock whales are found in the Sea of Japan; and (2) minke whales on the east coast of Korea and on the west coast of Japan are generally part of a single stock.

In contrast, substantial disagreements remained concerning the other two questions. These disagreements centred on how to interpret results of statistical tests showing heterogeneity of allele frequencies. In one view, the results can be explained by overlapping distributions of 'O' and 'J' stock, which leads to different mixing proportions (and hence different allele and haplotypic frequencies) in different geographic areas. Under this hypothesis, it would not be surprising that comparisons of samples from areas having different fractions of the two stocks often produce statistically significant results. An alternative view to an explanation that requires complex mixing patterns is the hypothesis that the statistically significant differences reflect a distinct stock with intermediate gene frequencies.

In conclusion, in spite of the disagreements noted above, the Committee **agrees** that the set of stock-structure hypotheses based on the four proposed in Annex D1, Appendix 3 and the fifth proposed in Annex D1, Appendix 4 were inclusive and sufficiently plausible at least to take forward to the next step in the *Implementation* process (see Fig. 1).

6.3.1.2 CATCHES
The Committee noted that information was available on commercial catches for those countries that have taken the largest catches of western North Pacific minke whales. There are, however, limited data on catches for the People's Republic of China and no catch data for North Korea (if North Korea has taken western North Pacific minke whales).

The Committee reviewed information regarding incidental catches.

SC/62/NPM4 provided information on incidental catches of common minke whales off Japan and Korea. Some suggestions were made on how plausible estimates of future incidental catches can be made, as well as to how past series, now considered erroneous, can be constructed. The Committee noted that it would be useful if estimates were presented to the Preparatory Meeting for the First Intersessional Meeting of the *Implementation Review* (see Item 6.3.2 and Annex D1, item 11.2).

SC/62/NPM19 provided information on bycatch of minke whales in Korean waters from 1996 to 2008. The authors collected bycatch data from the 14 local branch offices of the Korea Coast Guard which investigates the bycatch of cetaceans. A total of 1,156 minke whales were bycaught of which 83.7% were bycaught in the East Sea; 363 animals were entangled or trapped by set nets, 316 and 303 were entangled by fish pots and gillnets, respectively.

SC/62/NPM26 provided information on incidental catches off Korea based on DNA profiling of market products (discussed under Annex J, item 9.4), which suggested that reported bycatch totals may be underestimated. The Committee was informed that the large majority of the incidental catch off Japan was taken in set nets; 119 common minke whales were bycaught in set nets and one animal in a gill net during 2009 (SC/62/ProgRepJapan).

The Committee **recommends** that available data on incidental catches and the associated effort should be analysed to develop CPUE series for possible use during the *Implementation Review*. The Committee **agrees** that sufficient information is available that alternative hypotheses regarding time-series of historical commercial and incidental catches can be developed during the *Implementation Review*.

The Committee **agrees** that during the *Implementation Review* there is sufficient information to disaggregate the historical commercial and incidental catches to sub-areas and periods during the year.

The Committee received information on likely future whaling operations for minke whales in the western North Pacific. Japan aims to conduct land-based and pelagic whaling. Land-based whaling will be restricted to close to Japan while pelagic whaling will occur mainly in offshore areas. Temporal and spatial restrictions will be imposed on both types of whaling to try to reduce catching J-type animals. Korea intends to conduct land-based whaling to the east and west of Korea from March to November. These whaling plans will need to be elaborated further during the First Intersessional Workshop of the *Implementation Review*.

The work related to catches that needs to be completed prior to the Preparatory Meeting for the First Intersessional Workshop of the *Implementation Review* is:

(1) construction and GLM standardisation of CPUE series using the incidental catches and the associated fishing effort (see also Annex D1, item 8.3);
(2) development of a format for reporting incidental catches by Japanese and Korean scientists to the Secretariat and the provision of these data in the agreed format to the Secretariat; and
(3) development of alternative hypotheses regarding time-series of past and future commercial and incidental catches.

6.3.1.3 ABUNDANCE ESTIMATES
The Committee reviewed information available on abundance surveys and estimates of abundance.

SC/62/NPM2 provided estimates of abundance for the JARPN II survey area (sub-areas 7, 8 and 9, excluding the Russian EEZ) for the early (May and June) and late (July and August) seasons for 2006 and 2007. SC/62/NPM16 analyzed sightings data from recent surveys conducted by Korea in the Yellow Sea (sub-area 5) and the East Sea (sub-area 6) to estimate the abundance of common minke whales. Details are given in Annex D1, item 7.1.

SC/62/NPM24 reported on a sighting survey for minke whales and other cetaceans in the East Sea from 21 April to 30 May, 2009. An provided oversight on behalf of the Scientific Committee and the survey was undertaken in accordance with IWC guidelines. The plan had been presented to the 2008 Annual Meeting (Choi *et al.*, 2008) and was endorsed by the Committee. Details are given in Annex D1, item 7.1. The Committee expressed its appreciation to the Government of Korea for its continued commitment to surveys for minke whales in Korean waters, and to An for his role of oversight on behalf of the Committee. The Committee **agrees** that data from the 2009 survey off Korea are suitable for use in the RMP.

SC/62/NPM7 summarised the sighting surveys for minke whales in the western North Pacific conducted by Japan and Korea since 2000. The survey period for 'J' stock was April-June, and that for 'O' stock July-September. The areas covered were the Korean EEZ in sub-areas 5 and 6, the Japanese EEZ in sub-areas 6 and 10, the Russian EEZ in sub-area 10, the Sea of Okhotsk (sub-areas 11 and 12) and east of the Kurile archipelago and Kamchatka (sub-areas 8, 9 and 12), including the Russian EEZ. A total of 505 minke whale schools (560 animals) were sighted on 27,045 n.miles on primary search effort in 22 cruises.

SC/62/NPM8 updated the integrated abundance estimates for minke whales in sub-areas 5, 6 and 10 using

new information on abundance and $g(0)$. SC/62/NPM14 reviewed the proposed method in SC/62/NPM8 for integrating surveys for use in the *Implementation Simulation Trials*. Details are given in Annex D1, items 7.1 and 7.3.

The Committee **endorses** the method used to combine sightings data over time to estimate the extent of additional variance, but not necessarily the methods proposed for dealing with abundance across spatial areas in this case because of concerns over migration during the survey and extrapolation (see also Annex D1, item 7.3). The Committee did not review the abundance estimates in SC/62/NPM8 *inter alia* because it is unclear whether the sub-areas used for reporting abundance estimates will be used in the *Implementation Simulation Trials* developed during the First Intersessional Meeting. It was noted that although models can be used to interpolate abundance for unsurveyed regions, if a region has never been surveyed, the abundance estimate for that region should be set to zero when calculating catch limits under the RMP.

The Committee discussed possible migration patterns of 'J' stock minke whales in the Sea of Japan, as well as whether some component of the 'J' stock may not migrate to a substantial extent, in relation to how abundance estimates are computed and used in *Implementation Simulation Trials* and when applying the *CLA*. The Committee **agrees** that care needs to be taken to avoid double-counting animals when computing abundance estimates. In relation to animals in the Sea of Japan and the Yellow Sea, the Committee **agrees** that the *Implementation Simulation Trials* will capture hypotheses regarding the migration patterns of western North Pacific minke whales and that the models underlying these trials would be specified accordingly. The abundance estimates used for conditioning will be allocated to the appropriate time periods to avoid double counting.

The Committee **agrees** that there are several abundance estimates available for possible use when conditioning trials. Annex D1, table 1 provides a summary of the sightings surveys for the sub-areas used in the last set of *Implementation Simulation Trials* and those conducted since. The Committee did not discuss the acceptability or otherwise of the use of these surveys for conditioning the *Implementation Simulations Trials*.

The Committee noted that it was not necessary to select the abundance estimates for use in the *CLA* at the present meeting; this will take place during the First Intersessional Meeting of the *Implementation Review*. The selection of abundance estimates for use in *CLA* will need to take account of whether or not the surveys and their analysis followed the Requirements and Guidelines for Conducting Surveys and Analysing Data within the RMP (IWC, 2005c). Some of these surveys (e.g. those from JARPN II) have not been reviewed by the Committee for use in the RMP.

SC/62/NPM9 provided revised estimates of $g(0)$ and abundance for western North Pacific common minke whales. The main changes from the previous analyses were the addition of new data, particularly for the Okhotsk Sea for 2003 and 2005. Details are given in Annex D1, item 7.5. The Committee welcomed this analysis which substantially reduced the previous range for $g(0)$ but there was insufficient time for an in-depth review. The Committee **agrees** to review the method used to estimate $g(0)$ and the resultant estimates further at the First Intersessional Workshop.

The Committee received information on plans for future sighting surveys by Korea and Japan (SC/62/NPM17 and SC/62/NPM4). Japan noted that it was not currently planning to conduct surveys in sub-areas 6 and 10, but may revise that decision in future. It was noted that the results of the *Implementation Simulation Trials* may provide information on which programme of surveys will lead to the best performance of the RMP, and that Japan and Korea may wish to modify their survey plans once the results of initial trials become available.

More specifically, SC/62/NPM25 described plans for a sighting survey in the Yellow Sea in April-May 2011, with the objective to obtain information on the distribution and abundance of minke whales. Details are given in Annex D1, item 7.6. The Committee was pleased to see that distance and angle estimation will be tested and **requests** that the results of analyses of these and previous data be presented to future meetings. It was noted that the survey could be conducted to eliminate the possible implications of migration during the survey. The Committee appointed An to provide oversight on behalf of the Committee.

SC/62/NPM23 described plans for a sighting and biopsy sampling survey for common minke whales in the Okhotsk Sea during summer 2010. The aim of the survey is to collect sightings data for abundance estimation and information on stock identification. To overcome CITES-related issues, genetic analysis using biopsied skin samples will be conducted on the research vessel. The Committee noted the importance of estimating the proportion of 'J' and 'O' stock animals in the survey area. It **recommends** that Japan explore ways that are not constrained by CITES to facilitate extracting relevant information from biopsy samples collected from the EEZ of Russia which could be used to examine stock structure and mixing. Specific suggestions for this are given in Annex D1, item 7.6. The Committee appointed Miyashita to provide oversight on behalf of the Committee.

6.3.1.4 OTHER ISSUES
Regarding information for estimating dispersal rates and mixing proportions, the Committee noted that SC/62/O30 outlined an approach for estimating mixing rates between stocks using microsatellite data.

Values for the biological parameters for use in *Implementation Simulation Trials* for the western North Pacific common minke whales had been assembled for the previous *Implementation* (IWC, 2004).

The previous trials were based on values for MSYR(mat) of 1% and 4%. These values should be used in any new trials unless the current review of MSY rates (Annex D, item 2) leads to a recommendation for a change to this range.

The Committee noted that CPUE data had been assembled and used to compare alternative stock structure hypotheses (Yasunaga *et al.*, 2009, Appendix II). It **recommends** that relevant commercial and incidental catch and effort data, along with the information identified by the 1987 CPUE Workshop (IWC, 1989), should be assembled, GLM standardised where possible, and be available at the First Intersessional Workshop of the *Implementation Review*. Data on flipper colour and conception dates should also be assembled and presented to the Preparatory Meeting of the First Intersessional Workshop of the *Implementation Review*. Initial discussions of future experimental and analytical ways to distinguish among competing hypotheses are given in Annex D1, item 10.

6.3.2 Recommendations
The Committee **agrees** that it has successfully addressed all of the items required for a *pre-Implementation assessment* and therefore **agrees** that the *pre-Implementation assessment* is completed.

The Committee **recognises** that there is a considerable amount of work that needs to be done to complete the *Implementation Review*. Specifically, there is a need: (a) to assemble the data so that they can be used when conditioning the operating models on which the *Implementation Simulation Trials* are based; (b) to specify and code the operating models themselves; and (c) to fit the operating models to the agreed data sets (conditioning).

The Committee **agrees** that it is infeasible to conduct all of the work in a single meeting (the First Intersessional Meeting). Rather, it **agrees** that the probability of completing the work during the first year of the *Implementation Review* will be maximised if two meetings occur. The main objective of the first (the Preparatory Meeting) would be to determine the structure (time-steps, sub-areas and population components) of the operating models so that all relevant data can be assembled at the appropriate spatial and temporal resolutions in time for the First Intersessional Workshop, and to start to specify the operating models and how they will be conditioned. The second step would be to complete work scheduled at the First Intersessional Workshop.

Annex D1, Appendix 9 outlines the work plan in more detail, including tentative dates for deadlines and holding the Preparatory Meeting and the First Intersessional Workshop.

6.4 North Atlantic common minke whales
6.4.1 New information on stock boundaries and abundance estimates
Some of the *Small Areas* boundaries for North Atlantic minke whales were changed during the 2003 *Implementation Review* but not all boundaries were fully specified. The Committee **recommends** that a point at 63°N, 12°W be introduced to fill the 'hole' between the CM and CIP *Small Area*, and that boundaries around the southern tip of Greenland be defined as shown in Annex D, fig. 1. It also **recommends** that the *Small Areas* in Annex D, fig. 1 be adopted for use when the applying the RMP for North Atlantic minke whales.

SC/62/RMP6 presented a method for estimating $g(0)$ from single platform line transect data in which both the forward and perpendicular distances have been recorded. More details are given in Annex D, item 3.3.2. The Committee noted that attempts had been made in the past to estimate $g(0)$ using data from a single platform. It **encourages** efforts to develop methods to achieve this. The Committee **recommends** that the robustness of the method proposed in SC/62/RMP6 to model structure uncertainty, measurement error, and diving pattern be examined.

SC/62/RMP7 summarised a sightings survey conducted in the North Sea area within *Small Area EN* during summer 2009. More details are given in Annex D, item 3.3.2. The Committee **welcomes** this information and noted that these data would be included in a future abundance estimate for the North Atlantic common minke whales.

SC/62/RMP5 presented estimates of abundance for common minke whales in the Central Atlantic from the North Atlantic Sightings Survey conducted by Icelandic and Faroese vessels during June/July 2007. More details are given in Annex D, item 3.3.2.

The Committee **agrees** that the methods in SC/62/RMP5 followed the relevant RMP Guidelines. Annex D, table 1 lists the estimates of abundance in SC/62/RMP5.

The Committee **agrees** to adopt the estimates of abundance for 2007 for the CG and CIP *Small Areas* presented in Annex D, table 1 for use in the RMP.

The Committee **endorses** abundance estimates for the CM *Small Area* and for the Eastern *Medium Area*, by *Small Area*, for use in the RMP given in Annex D, table 2.

6.4.2 Recommendations and work plan
The Committee **recommends** that the boundaries in Annex D, fig. 1 be adopted for use when applying the RMP for North Atlantic minke whales. It also **recommends** that abundance estimates in Annex D, tables 1 and 2 be adopted for use in the RMP. The Committee **agrees** that its work plan for the 2011 Annual Meeting will include the review of any new abundance estimates.

7. ESTIMATION OF BYCATCH AND OTHER HUMAN-INDUCED MORTALITY (BC)
The report of the Working Group on Estimation of Bycatch and Other Human-Induced Mortality is given as Annex J. This subject was introduced onto the Agenda in 2002 (IWC, 2003c) because as part of the Revised Management Procedure, recommended catch limits must take into account estimates of mortality due to *inter alia* bycatch, ship strikes and other human factors in accordance with Commission discussions at the 2000 Annual Meeting (IWC, 2001a), although of course such mortality can be of conservation and management importance to populations of large whales other than those to which the RMP might be applied. Subsequently, the issue of ship strikes has become of interest to the Commission's Conservation Committee (IWC, 2006a).

7.1 Collaboration with FAO on collation of relevant fisheries data
The effort to compile a comprehensive database of entanglement data in the national progress reports, an element of collaboration with FAO, has continued; the IWC Secretariat has now entered data from 2004-09.

7.2 Progress on joining the Fisheries Resource Monitoring System (FIRMS)
The information potentially to be developed in collaboration with FIRMS includes an inventory of fisheries, including gear characteristics and some indicators of fishing effort. The IWC will be eligible to move from observer status to full partnership in FIRMS after completion of the entanglement database (see Item 7.1, above). Details are provided in Annex J.

7.3 Estimation of bycatch mortality of large whales
7.3.1 Mortality in longline fisheries
The Committee received a global review of operational interactions between cetaceans and longline fisheries (SC/62/BC6). It reported deaths of humpback and Bryde's whales. In addition, mortality of southern right whales has been recorded elsewhere (Best *et al.*, 2001). Depredation by some species of cetaceans such as sperm and killer whales (Kock *et al.*, 2008; Kock *et al.*, 2006; Purves *et al.*, 2005) is of economic importance to some fisheries. Research to mitigate depredation and mortality can potentially contribute to estimating both fish and cetacean mortality rates.

7.3.2 Bycatches in Korea and Japan
Genetic analysis of samples of cetacean meat collected in markets in Korea in 2004-05 suggested that 90 common minke whales were represented (SC/62/NPM26). Details of the analyses are given in Annex J. The small number of samples from the same individuals suggests that the whales

pass through the market rapidly. The reported bycatch for Korea for 2004 was 61. The detection of a minimum of 90 whales in the market indicates that the true bycatch was greater than reported. The reported bycatch for 2009 is 54. The results of the 2004-05 market survey analyses suggest that this is likely an underestimate.

The Committee welcomed publication of a recent paper describing incidental entanglement of minke whales in the Republic of Korea (Song *et al.*, 2010). This contained information that had been previously been requested of Korea by the Committee.

The Committee noted the need for time series of bycatch for the *Implementation Simulation Trials* for North Pacific common minke whales (see Item 6.3) for Japan and the Republic of Korea. The Committee reviewed the method presented in SC/62/NPM4 to estimate past incidental catches of minke whales in Japan (details are given in Annex J). Concern was raised regarding the multiplicative factor used to adjust reported catch figures for the period 1979-2000. It was noted that there was considerably more variability in the early reported figures, with CVs for the 1980s and 1990s three to six times higher than since 2001. For this reason, some members suggested that a multiplicative adjustment was not appropriate and that the reports of zero bycatch for some years, (which also resulted in zero estimates) were implausible. Other members considered that estimates in SC/62/NPM4 are an improvement compared to the previous assumption of 100 animals each year over a 100-year period. Butterworth commented that point estimates of zero for some years did not necessarily invalidate the method as a basis for estimating cumulative bycatch mortalities over time, which was the primary input required for *Implementation Simulation Trials*; nevertheless he encouraged refinement of the method presented.

In conclusion, the Committee **recommends** that additional analyses to arrive at time-series of bycatches in the region be undertaken for presentation to the preparatory meeting for the first intersessional workshop. In response to a suggestion from some members that bycatch in fisheries other than set nets warrants further examination, including historical information on past fisheries, e.g. the Japanese squid driftnet fishery of 1978-1992 (Yatsu *et al.*, 1994); it was noted that bycatches occur only rarely in types of gear other than set nets in Japanese waters, as reported in the national progress reports of Japan.

7.4 Estimation of risks and rates of entanglement
7.4.1 Report of intersessional workshop
The Committee noted relevant information on entanglement mortality in an advance copy of the report of the Commission's intersessional Workshop on Welfare Issues Associated with the Entanglement of Large Whales (IWC/62/15). The Workshop concluded that:

(1) all species of large whales are at risk of entanglement to varying degree, but common minke, humpback, right (both North Atlantic and southern) and gray whales are the most frequently reported;
(2) all types of stationary or drifting gear (i.e. not actively towed) pose potential risk to entangle, but pound, set and fyke-type nets, along with gill nets and various pot-type gear were most frequently implicated;
(3) entanglements can occur wherever this type of gear and large whales overlap in distribution, and isnot limited to feeding grounds but also includes breeding grounds as well as migratory pathways;

(4) given the cryptic nature of large whale entanglements in combination with the paucity of experienced observers and lack of formal reporting networks, entangled whales are severely underreported globally; and
(5) regional shifts in fisheries and gear types can produce major differences in the character of entanglements and reporting frequency (e.g. coastal versus offshore gear placement).

Based on these conclusions, the Workshop made the following relevant recommendations:

(1) that coastal nations establish adequate programmes for monitoring entanglement of whales; and
(2) that member countries improve reporting to the IWC through National Progress Reports.

The Committee **endorses** these recommendations. In addition it **recommends** that:

(1) all member countries which have coastal fishing operations be encouraged to more accurately report the occurrence and nature of large whale entanglements and establish entanglement response programmes where applicable;
(2) existing and new programmes communicate with each other to standardise the data collected to maximise their usefulness; and
(3) members be encouraged to facilitate thorough examinations of carcasses, at a minimum to record whether fishing gear is present, or fresh scars which might have resulted in mortality are visible, as well as facilitating necropsies on all large whales whenever possible. Such investigations should be conducted irrespective of population status, since this will be required to better estimate entanglement mortality rates including for species and populations that may be subject to whaling.

Additional details reported concerning the entanglement response networks of various nations are given in Annex J.

7.4.2 Entanglement mortality in Oman
An analysis of scars in the peduncle region indicates that 30-40% of whales observed in the isolated and severely depleted population of humpback whales in the western Arabian Sea (known as Breeding Stock X) were likely to have been involved in entanglements (SC/62/SH20). Of 10 stranded baleen whales, three were entangled in gill nets. Fishing effort, including use of drifting and set gillnets and fish traps, is increasing rapidly in the region. The Committee **welcomes** the establishment of a national stranding committee by the Government of Oman, and **recommends** that all member states that do not have national stranding networks to establish these. The importance of indications of fishing effort was also emphasised. The possibility of this population being considered as a candidate for a conservation management plan is discussed under Item 11.2.2.4.

7.5 Progress on including information in National Progress Reports
The data on entanglements and ship strikes reported in this year's National Progress Reports are summarised in Appendix 2 to Annex J. The Committee last year considered a proposal for developing a mechanism for online submission of the information; progress on issues related to online submission of bycatch and other information is discussed further under Item 3.2 and 25 and in Annex P.

7.6 Review of methods to estimate mortality from ship strikes
7.6.1 New data on ship strikes
The Committee received a report on ship strikes affecting southern right whales in Uruguayan waters (SC/62/BC2); between 2003 and 2007, seven whales were observed with large wounds due to collision and five were stranded dead. The Committee **welcomes** this information, noting that this is the type of information requested to be included in the national progress reports; in combination with data on shipping traffic, it may allow comparative analysis of ship-strike rates along the Atlantic coast of South America.

After consideration of a report of a 'near miss' between a humpback whale and a cruise ship in the Antarctic (see Annex J, item 10.1), it was **agreed** that a study of near-miss data (it is known that ferry operators in Hawaii collected such data) may yield additional insight into the dynamics of ship strikes and provide input for modelling risk (see below).

7.6.2 Progress in modelling risk
A report was received on progress in a series of winter and summer surveys of fin whale distribution and abundance in the Mediterranean Sea especially near the Italian coast and in the Pelagos Sanctuary. These surveys are in part intended to improve evaluation of population level effects of human-induced mortality including ship strikes. Details of the results are in Annex J. Plans to collect data on ship traffic were also detailed. The Committee **encourages** continuation of this effort that makes an important contribution towards the modelling of risk and assessing population level effects.

7.7 Progress in developing global database of ship strikes
This effort has been underway since 2007, with associated activities by IMO and ACCOBAMS. Tasks identified at last year's meeting have been completed or are nearly completed. Progress has relied on informal arrangements among the Secretariat, members of the data review group, and an external contractor. In view of the increasing workload and proposed intersessional tasks, detailed in Annex J, Appendix 3, the Committee **recommends** that consideration be given to the appointment of a dedicated coordinator; this is the practice for other similar successful databases of this scale. Funding requested to support intersessional work including data validation, the creation of a handbook and for work on data entry is discussed under Item 24.

The Committee **endorses** the policy on release of information in the database in response to requests from the public detailed in Annex J, Appendix 3. Information from nine fields in the database will be eligible for release on a down-loadable basis. Only data on confirmed ship strikes will be released. Requests for full access will be dealt with on an individual basis.

The Committee noted that IWC and ACCOBAMS will hold a joint workshop in Monaco from 21-24 September 2010 on reducing risk of ship strike and that some agenda items will be relevant to data gathering and estimating numbers of collisions. The IWC also continues to collaborate with IMO on efforts to minimise the risk of ships strikes and to reduce underwater noise from commercial shipping (Annex K, item 9.4).

7.8 Other issues
7.8.1 Methods for assessing mortality from acoustic sources
There was no new information on this topic. However, the Committee noted development of an improved method for handling and analysis of gas embolisms found in stranded cetaceans (Bernaldo de Quiros *et al.*, 2010); such embolisms may be linked with acoustic sources. A workshop entitled 'Diving marine mammals gas kinetics' was held in Woods Hole, MA, USA in April 2010 and the Committee looks forward to receiving the report at next year's meeting.

7.8.2 Methods for assessing mortality from marine debris
Methods used in a study modelling co-occurrence of debris and cetaceans (SC/62/BC5) have potential value for assessing mortality from debris. The Committee **recommends** that full necropsies be conducted on all stranded large whales, irrespective of population status, to detect incidents of mortality associated with ingested debris (and see the earlier recommendation on entanglement).

7.8.3 Other potential sources of human-induced mortality
The Committee noted that while there have been no confirmed reports of whale mortality due to collisions with marine renewable energy developments, the potential exists for such (SC/62/E7 and E8) and see Carter *et al.* (2008).

7.8.4 Actions arising from intersessional requests from the Commission
The Committee was asked to review Annex {DNA} of IWC/62/7rev. This contains a section on market sampling. Although the proposed scheme has the purpose of acting as a deterrent to illegal activity, the Committee noted that it might also potentially provide information for estimating bycatch. A workshop and simulation studies were conducted in the past by the Committee to assess the possibilities for developing a market sampling system to estimate bycatch (details in Annex J).

8. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT PROCEDURE (AWMP)

This item continues to be discussed as a result of Resolution 1994-4 of the Commission (IWC, 1995a). 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) *Implementation Review* of eastern gray whales; (2) various aspects of providing management advice for Greenlandic hunts; and (3) review of management advice for the humpback whale fishery of St. Vincent and The Grenadines. This represented a significant workload. The Chair of the SWG noted that its work this year had been considerably assisted by the progress made at the intersessional Workshop on Greenland fisheries held in Roskilde, Denmark (SC/62/Rep3).

In addition, he recalled that two years ago (IWC, 2009c), the Committee had tested and agreed a safe method to provide interim advice (i.e. catch limits for up to two 5-year blocks) such that the catch limit is 2% of the lower 5th percentile of the most recent estimate of abundance.

8.1 Sex ratio methods for common minke whales off West Greenland
The Committee has been evaluating assessment methods for common minke whales off West Greenland that rely on the relationship between the observed sex ratio of catches and that inferred from population models parameterised in terms of carrying capacity, productivity and how the distribution of males may have changed relative to that of females. This concept was introduced in 2005 (IWC, 2006b; Witting,

2005). The major factor which suggests that sex-ratio data may be informative about population size is that catches have consistently been female-dominated. 'Best' estimates of population size from sex ratio based methods are infinite, in effect indicating that any level of past catches would not have impacted this population of minke whales. However, it is standard Scientific Committee practice, in accordance with a precautionary approach, to base management advice primarily on lower confidence bounds for such estimates. The Committee has therefore focussed attention on developing the novel assessment approach required to calculate these bounds.

Considerable technical work was undertaken by the SWG during the intersessional period with a view to being able to test the approach with an initial set of robustness trials as described in SC/62/Rep3. However, implementation of the new method is proving extremely difficult. The details of this are complex and can be found in Annex E, item 3.1.3 but in short can be said to be due to the continued difficulties the SWG has faced with the likelihood function that underlies the sex-ratio approach.

Several remedies were considered by the SWG. The most promising of these was to re-parameterise the analysis by replacing K (carrying capacity) with a suitable transformation. This can be thought of as a high-risk/ high-reward option: it could provide an adequate basis for estimation thereby eliminating many of the intricacies that continue to plague the current framework, but it may introduce new difficulties.

The Committee **endorses** the SWG recommendation that this approach receive the highest priority during the next intersessional period. If a transformed analysis could be completed and agreed at the 2011 Scientific Committee meeting, the sex-ratio method could be used as a basis for abundance estimation and submitted to appropriate simulation trials to test performance and robustness. If these trials are passed, the approach could then be used for providing management advice and as a basis for a long-term *SLA* (Item 8.3).

The SWG also considered a number of other options which would not require such a drastic change but which it considered had less chance of being successful, as can be seen in Annex E. An option to try raising the current truncation point was shown not to solve the issue as a result of runs undertaken after the SWG had completed its work.

The SWG had agreed that the continued difficulties in successfully implementing a sex-ratio approach required a re-evaluation of its work plan. The original motivation for this work had been the Committee's inability to provide management advice for this hunt. Thus, reflecting the priorities of the Scientific Committee and the Commission, work on a sex ratio estimation of abundance for West Greenland common minke whales has been the dominant focus of SWG effort for a number of annual meetings and three intersessional workshops. The participants have devoted considerable research effort to this task, the work has been scientifically challenging and methodologically innovative and the potential gain in terms of providing adequate management advice extremely high. However, despite enormous effort, no satisfactory conclusion has been achieved to date. Last year, the Committee had agreed an abundance estimate for common minke whales off West Greenland that, in conjunction with the agreed approach to provide safe interim advice for up to two five-year blocks, meant that the Committee was able to provide satisfactory management advice for the first time.

Therefore, the SWG had concluded that it would no longer prioritise development of the sex ratio approach unless a comprehensive final analysis could be endorsed at the 2011 Scientific Committee meeting. Although it would be regrettable to abandon the sex ratio effort without obtaining an agreed abundance estimate, there are many other urgent issues to which the SWG must turn its focus. The Committee **concurs** with this view.

8.2 Conduct *Implementation Review* of eastern North Pacific gray whales

In 2004, (IWC, 2005d), the Committee presented the Commission with its recommended Gray Whale *Strike Limit Algorithm* (the *Gray Whale SLA*) and this was endorsed by the Commission. The scheduled 2009 *Implementation Review* had been postponed because a number of key analyses would not be ready in time.

The purpose of an *Implementation Review* is to update information on catch history and abundance and to determine whether any other new information that has become available in the intervening (normally) 5-year period indicates that the present situation is outside the region of parameter space tested during *SLA* development. If this is the case, additional trials will need to be developed to test the performance of the *SLA* in this new region. If performance is found to be unacceptable under these new trials, revisions to the *SLA* will be required.

Full details of the parameter space investigated in the development of the *Gray Whale SLA* can be found in IWC (2005d). In practical terms, the most important issues relevant to the present *Implementation Review* relate to the issues of stock structure and updated information on abundance/trends.

8.2.1 The issue of the DAA and the conduct of this Implementation Review

Implementation Reviews are subject to the Committee's Data Availability Agreement incorporating a timetable of events. Although many datasets and analyses were completed within the appropriate timelines, unfortunately, just before adoption of its report, the SWG had realised that the photo-id and genetics data central to its discussions of stock structure and movements had not formally been submitted to the IWC under the DAA (although the papers themselves had met the appropriate deadlines). The same is also true for the telemetry data that, while not central to the conclusions reached, was also discussed under that Agenda Item; in this case the paper also did not meet the appropriate deadline.

The Committee recognised that discussions of these data cannot be considered as part of the *Implementation Review*. Thus although the *Implementation Review* is considered complete with respect to the discussions involving the data properly made available under the DAA, it **recommends** that a new *Implementation Review* takes place at the next Annual Meeting. This is to enable the SWG to take properly into account the important new information received this year that had not met the DAA timeline and that could indicate that the original trial structure was not sufficiently broad (see Item 8.2.7). This issue is referred to, where appropriate, in other parts of this report. A mechanism to ensure that this unfortunate event does not happen again is discussed under Item 8.2.8.

8.2.2 Stock structure

In the development process for the *Gray Whale SLA*, the possibility of a summer feeding aggregation along the Pacific coast between California and southeast Alaska was

noted (e.g. IWC, 2001h) but the Committee had agreed that a single stock scenario was the most appropriate (IWC, 2002d).

Considerable new information has been collected since that time on the animals feeding along the Pacific coast and the SWG received three papers of relevance to stock structure at this meeting (unfortunately, as noted above, these did not meet all of the DAA requirements). Although different names have been used in the past by different authors (e.g. the southern feeding group, the Pacific Coast Feeding aggregation), the Committee **agrees** to refer to the animals that spend the spring, summer and autumn feeding in coastal waters of the Pacific coast of North America from California to southeast Alaska as the Pacific Coast Feeding Group or PCFG.

SC/62/AWMP1 presented an analysis of the genetic differentiation between the PCFG (using samples from Vancouver Island) and the larger population (using samples from Baja California). The authors concluded that their results suggest that the matrilines of the southern feeding group are demographically independent from those of the rest of the population, and therefore require separate management consideration.

SC/62/BRG32 reported the results of an 11-year (1998-2008) photo-id study examining the abundance and the population structure of eastern gray whales that spend the spring, summer and autumn feeding in coastal waters of the Pacific Northwest. With respect to stock structure, it concluded that there is one group of whales that return frequently and account for the majority of the sightings in the Pacific northwest during summer and autumn (i.e. the PCFG) and a second group of whales are apparent 'stragglers' encountered in this region after the main migration.

The discussion was also informed by consideration of telemetry data (SC/62/BRG21) and the details can be found in Annex E, item 2.2.

The Committee thanked the authors for these comprehensive papers. There was considerable discussion of them and their implications for stock structure. Despite some differences in interpretation and recognising that further analyses could be carried out, the Committee **endorses** the SWG's conclusion that the hypothesis of a demographically distinct PCFG was plausible and warranted further investigation. The implications of this for the *Implementation Review* are discussed under Item 8.2.7.

Telemetry data may provide the best estimator of residency times for PCFG gray whales in order to evaluate their relative vulnerability with respect to the spatial and temporal characteristics being considered for the Makah hunt. Analogous data from non-PCFG whales may also help determine if there are differences between PCFG and non-PCFG whales with regard to their migrations (distances from shore, water depths or timing) or other behaviours. Therefore, the Committee **recommends** that the satellite tagging work should continue and that these data be analysed with the goal of providing input (e.g. as required in mixing matrices, etc.) for any future trials of the *Gray Whale SLA*.

8.2.3 Catch data
Allison informed the SWG that the catch series had been updated to incorporate new information. The complete series can be found in Annex E, table 1.

8.2.4 Abundance and trends
Two papers relating to calf counts were considered, one from migration and one from the breeding grounds.

SC/62/BRG1 presented calf counts from shore-based surveys of northbound eastern North Pacific gray whales that have been conducted each spring between 1994 and 2009 in central California. Estimates were highly variable between years, with no sign of a positive or negative trend. Calf production indices, ranged between 1.6 - 8.8% with an overall average of 4.2%. The authors hypothesised that a late retreat of seasonal ice may delay access to the feeding areas for pregnant females and reduce the probability that existing pregnancies will be carried to term.

SC/62/BRG36 reported on changes in the abundance of gray whales inferred from boat surveys at Laguna Ojo de Liebre and Laguna San Ignacio between the late 1970s to the present. There was a decrease in the numbers of cow-calf pairs in both lagoons during 2007 to 2009, similar to the results from shore-based surveys at Piedras Blancas during the northbound migration. The counts of cow-calf pairs in both lagoons in 2010 were the lowest over the last 15 years.

In discussion, it was noted that the calf production indices were particularly low (<3%) during two periods (1999-2001 and 2007-09). During the first period, calf counts were low and high numbers of strandings also occurred. However, although the calf counts were low during 2007-09, there is no evidence for higher numbers of strandings during these years. The Committee noted that the calf production indices are being used in its discussion of MSY rates (see Item 5.1). Although the time-series of calf counts is now 16 years long, this is only just long enough to allow estimation of these parameters.

The Committee therefore **recommends** that these data continue to be collected and are reviewed during future *Implementation Reviews*. The series of cow-calf counts in lagoons, which provide a relative index not absolute estimates, are consistent with the calf counts given in SC/62/BRG1.

The Committee noted that the calf count data had been used during the initial development and *Implementation* for eastern gray whales and **agrees** that the new information did not indicate a need to modify the trials structure.

The Committee had two new papers relating to total abundance estimates. The first, SC/62/BRG8 reported a promising new approach that has recently been adopted for the counts of southbound migrating whales at Granite Canyon, California, which form the basis of abundance estimation for the eastern gray whales. The authors recognised the need for new calibration data to evaluate the different biases of new counting methods and new observers before count data can be reliably rescaled to estimate abundance.

The Committee welcomed this report, noting the importance of ensuring comparability among years in any long-term monitoring effort. It **recommends** that data be collected to re-evaluate pod size bias given the change in survey protocol and that variance estimates for future survey estimates of abundance account for the uncertainty associated with calibration of abundance estimates computed using different survey protocols.

The second paper, Laake *et al.* (2009), re-evaluated the data from all 23 seasons of shore-based counts for the Eastern North Pacific stock of gray whales conducted throughout all or most of the southbound migration near Carmel, California using a common estimation procedure and an improved method for treatment of error in pod size and detection probability estimation.

In addition to these papers, the Committee noted that the telemetric information in SC/62/BRG21 provided the first confirmation of day/night migration rates since the original

Table 2

Time-series of agreed abundance estimates of eastern gray whales for use in the *Gray Whale SLA* (taken from Laake *et al.*, 2009).

Year	Estimate	CV	Year	Estimate	CV
1967/68	13,426	0.094	1979/80	19,763	0.083
1968/69	14,548	0.080	1984/85	23,499	0.089
1969/70	14,553	0.083	1985/86	22,921	0.081
1970/71	12,771	0.081	1987/88	26,916	0.058
1971/72	11,079	0.092	1992/93	15,762	0.067
1972/73	17,365	0.079	1993/94	20,103	0.055
1973/74	17,375	0.082	1995/96	20,944	0.061
1974/75	15,290	0.084	1997/98	21,135	0.068
1975/76	17,564	0.086	2000/01	16,369	0.061
1976/77	18,377	0.080	2001/02	16,033	0.069
1977/78	19,538	0.088	2006/07	19,126	0.071
1978/79	15,384	0.080			

radio tag information that has been used when estimating abundance from the southbound census. The Committee thanked the authors for this comprehensive and careful review of this extremely valuable time-series of absolute abundance estimates. It **recommends** that the estimates of abundance given in Table 2 be **adopted** for use in the *Implementation Review* and for use when applying the *Gray Whale SLA*.

SC/62/BRG32 referred to under Item 8.2.2, also used the photo-id data to estimate the abundance of the PCFG. Abundance estimates for whales present in summer and autumn were estimated using both open and closed population models. Methods were proposed to remove the 'stragglers' from both types of analyses, to estimate abundance only of regularly returning whales. Three methods and four geographic scales revealed the abundance of animals that regularly return to the Pacific Northwest to be at most a few hundred individuals.

The Committee **agrees** that these data will be extremely useful during the proposed 2011 *Implementation Review*, along with telemetry data, to determine the probability that animals from the putative feeding aggregation in the Pacific Northwest are at risk of being caught during hunts in that area (see Annex E, item 2.6). The estimates in SC/62/BRG32 will also be useful to condition any trials developed to examine the performance of *SLA* variants for this feeding aggregation.

8.2.5 Assessment
SC/62/AWMP2 fitted an age- and sex-structured population dynamics model to data on the catches and abundance estimates for the ENP stock of gray whales using Bayesian methods. The prior distributions used for these analyses incorporated the revised the estimates of abundance in Laake *et al.* (2009) and SC/62/BRG1, and account explicitly for the drop in abundance caused by the 1999-2000 mortality event. A series of sensitivity analyses were conducted. The baseline analysis estimated the population to be above MSYL and the 2009 population size (posterior mean of 21,911) to be at 85% of its carrying capacity (posterior mean of 25,808); conclusions were consistent across all the model runs. SC/62/AWMP2 only estimated an extra mortality parameter for 1999-2000 based both on calf and strandings data and the analysis of Brandon and Punt (2009a; 2009b) in which annual parameters were estimated for reproduction and survival.

The Committee thanked the authors of SC/62/AWMP2 for the updated assessment. It **agrees** that the results of the assessment are within the bounds considered during the *Implementation*. Although the base operating model used to estimate the *Gray Whale SLA* did not explicitly include the 1999-2000 event, robustness tests involving catastrophic mortality events were conducted and the *Gray Whale SLA* performed adequately for these tests.

8.2.6 Strandings data
SC/62/BRG25 provided a summary of all gray whale strandings in California, Oregon and Washington between 1 January 2010 and 31 May 2010. The Committee welcomes this information, **agrees** that it showed that stranding levels were now similar to 'normal' years, and **recommends** that these data continue to be collected and presented to the Committee.

8.2.7 Consideration of need for new trials (and, if applicable, results of those)
The Committee refers to its earlier comments on the situation with respect to the DAA and the need for an *Implementation Review*.

Although some of the papers/data available could not be considered in terms of the 2010 *Implementation Review*, the Committee **agrees** that the information provided on the PCFG was such that its existence represents a plausible hypothesis, not considered in the original *Implementation*. In accord with Committee guidelines for this process (IWC, 2005b), this is sufficient to trigger a new *Implementation Review* in 2011. The reason that this hypothesis is important from an AWMP perspective relates to the potential harvesting in this region by the Makah Tribe and thus the need for the SWG to provide advice/develop an *SLA* to fulfil both the 'conservation' and 'user' objectives given by the Commission. It noted that the situation for PCFG is not the same as for the Greenlandic feeding aggregation of humpback whales; the latter case involves a feeding aggregation that does not occur (even in the short-term during migration) with animals from other feeding aggregations in the waters where the hunt takes place. In the case of the proposed area for the Makah hunt, both PCFG and migrating whales from the other feeding areas co-occur at least some of the time. In fact the situation is more similar to that of Gulf of Maine humpback whales.

The Committee therefore **agrees** that the information on stock structure and hunting warranted the development of trials to evaluate the performance of *SLA*s for hunting in the Pacific northwest at the 2011 *Implementation Review*. The Committee also noted that the assessment work discussed above (Item 8.2.5) showed that the population as a whole is in a healthy state. It **agrees** that for the purposes of the 2011 *Implementation Review*, the primary focus should be the PCFG.

That being said, it also **agrees** that over the next few years (i.e. in time for an *Implementation Review* in about 2016), further work should be undertaken to investigate the possibility of structure on the northern feeding grounds, especially in the region of the Chukotkan hunts. It **recommends** that relevant information be collected from the Chukotkan region, in particular, where possible, including genetic samples and photographs from the hunt). In addition, the collation of information on the geographical and temporal distribution of the hunt will be valuable.

Annex E, item 2.6 provides some general guidance for the 2011 *Implementation* Review. The Committee **agrees** that any acceptable future *SLA* for the hunt in the Pacific northwest must include a feedback mechanism. It also requests that the Chair of the SWG discuss its requirements for need envelopes with the hunters and members of the

US delegation. The Committee **agrees** that the following would assist, but are not required for beginning, the trial development process:

(1) Collection/analysis of genetic data that would allow more robust comparison of such data from animals in the northern and southern feeding areas;

(2) Collection/analysis of genetic data from Kodiak Island to California to further examine the probable range of the PCFG;

(3) Collection/analysis of genetic data to compare further animals seen in only one year ('stragglers' in SC/62/BRG32) with animals that are frequently seen within the hunting area;

(4) Collection/analysis of additional information (including telemetry data) on the relative temporal 'availability' of PCFG animals within the hunting area (e.g. by month); and

(5) An updated analysis of any additional data to obtain the most recent abundance estimate for the PCFG at the time of the 2011 *Implementation Review.*

8.2.8 Conclusions and recommendations
In light of the DAA difficulties discussed earlier, the Committee **agrees** that it has completed the *Implementation Review* on the basis of the data that had been made available to it in accord with the DAA. However, given the new information available that did not meet the DAA conditions, it **agrees** that a new *Implementation Review* should occur in 2011 to take into account information provided on the PCFG which was presented outside the DAA as noted under Items 8.2.2 and 8.2.7. The Chair of the SWG **agrees** to ensure that all likely contributors to the review are made aware of the DAA requirements as well as the guidelines for genetic analyses and data. The draft guidelines for *Implementation Reviews* referred to under Item 8.4 will also assist this process. The Committee also **agrees** that preparatory discussions for the 2011 *Implementation Review* take place at the proposed intersessional workshop (see Item 21). Management advice for this population can be found under Item 9.2.2.

8.3 Continue work on developing *SLA*s for the Greenlandic fisheries
In 2009, the Committee agreed an approach for providing safe interim advice on catch limits that is valid for up to two five-year blocks. In doing so, this provides time for the SWG to develop long-term *SLA*s for the Greenlandic fisheries. Work on this has progressed in general terms (e.g. see discussion in SC/62/Rep3 and Annex E, items 3.3 and 4.2). However, particularly given the complexity of the multispecies hunt in Greenland, the Committee **agrees** that this must be given high priority for the future work of the SWG, such that suitable *SLA*s can be developed and tested before the interim advice expires.

Simulation evaluation of *SLA*s requires the development and parameterisation of a set of operating models. Unlike the situation for West Greenland common minke whales, the SWG has an assessment for West Greenland fin whales which means that it is in a better position to develop an *SLA* for fin whales. Last year, it was agreed that the set of RMP trials developed to evaluate variants of the RMP for North Atlantic fin whales would be an appropriate starting point for developing such trials and this year the SWG was presented with a summary of the stock structure hypotheses underlying those trials. These will need to be modified to focus more on the uncertainties pertinent to West Greenland if they are to form the basis for evaluation of *SLA*s for

fin whales. Unfortunately, the SWG did not have time to consider this further at the present meeting.

With respect to common minke whales off West Greenland, the SWG had previously been awaiting the outcome of the evaluation of a sex ratio method approach before addressing the issue of long-term *SLA*s; the decision potentially to cease work on a sex-ratio abundance estimate in 2011 (see Item 8.1) does not affect the need to begin work on an *SLA* as soon as possible. As noted in SC/62/Rep3, consideration of existing RMP trials for North Atlantic common minke whales may again prove a useful starting point for discussions.

In conclusion, the Committee **re-emphasises** the importance of developing *SLA*s for Greenlandic fisheries as soon as possible. It **agrees** that this should form the primary item for discussion at the intersessional workshop.

8.4 Consider lessons learned from the bowhead whale *Implementation Review*
Two main issues arising from the bowhead *Implementation Review* relating to: (1) stock structure and in particular genetic samples; and (2) data availability. In relation to the first of these two issues, the Committee noted that there are now guidelines for DNA data quality (IWC, 2009h).

In relation to the general question of data availability, a number of issues were raised in the SWG (see Annex E, item 8). One reason for the difficulties encountered was the lack of explicit guidelines for conducting *Implementations* and *Implementation Reviews* for the AWMP process, noting how valuable these had proved for the RMP process. The Committee **agrees** that Donovan should develop a draft of such a document for consideration at next year's meeting.

8.5 Aboriginal Whaling Scheme (AWS)
In 2002, the Committee strongly recommended that the Commission adopt the Aboriginal Subsistence Whaling Scheme (IWC, 2003a, pp.22-23). This covers a number of practical issues such as survey intervals, carryover, and guidelines for surveys. The Committee has stated in the past the AWS provisions constitute an important and necessary component of safe management under AWMP *SLAs* and it **reaffirms** this view. It noted that discussions within the Commission of some aspects such as the 'grace period' are not yet complete.

8.6 Other
8.6.1 Conversion factors for edible products for Greenland fisheries
IWC/62/9 is the report of a Small Working Group (Donovan, Palka, George, Hammond, Levermann and Witting) established by the Chair of the Commission to provide advice on conversion factors for the Greenlandic hunt. The report of the group was presented to the intersessional Commission meeting to consider Greenlandic strike limits. In discussion of the report at that meeting, it was agreed that there was no need for the report to be reviewed in detail by the Scientific Committee but that individual scientists should send comments to the authors so that the report could be revised, if necessary, by the Commission meeting in Agadir. That request and the document itself was circulated to the Scientific Committee with a request for comments by 6 June 2010. However, it had been agreed that this issue would be added to the SWG agenda.

A short summary of the report, which has been available on the IWC website since February 2010, is given in Annex E, item 9.1[2].

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[2]The full 52 page report can be found at *http://www.iwcoffice.org/_documents/commission/IWC62docs/62-9.pdf.*

In discussion of IWC/62/9 during the present meeting, one member provided a number of comments on the underlying approach to calculating conversion factors, as well as to the quality of the data used by the authors. Points raised included whether conversion factors should be based only upon what product yield has been achieved in the past, or whether it should consider what could be achieved with significant improvements in processing efficiency. He also commented on the likely inaccuracy and unreliability of the hunter collected data. He suggested that Greenland be asked to come back next year with data of verifiable quality on length and product yield, and/or that the Committee be given details of the new data collection methods, together with information on the process by which the reliability of the product yield data is verified. In response, the authors noted that they had spent considerable time and effort in investigating the original data, recognising that it had not been collected by scientists for the purposes of estimating conversion factors. The large sample size and the consistency with edible product information collected by scientists in the North Pacific, revealed that the data for common minke whales were sufficient to calculate a robust conversion factor (as well as showing the flensing process to be efficient). The limitations of the conversion factors provided for the other species were recognised in the report and considered interim pending the recommended collection of additional data on length correction and edible products. They had offered to assist in appropriate experimental design. They also noted that it would take some time to obtain sufficient sample sizes for some species. They concluded that matters of efficiency were appropriate for discussion by the Commission.

The Committee endorsed the **recommendations** of the report. In particular, it supported the recommendations for further work that data on both 'curved' and 'standard' measurements are obtained during the coming season for common minke whales, fin whales and bowhead whales and that new data on edible products be collected using properly-design protocols, analysed appropriately and reviewed. It also supported the recommendation that the work be undertaken by scientists, hunters and wildlife officers since this would improve the ability of hunters, particularly those in remote areas, to obtain more accurate length and weight measurements. The Committee was informed that Greenland has already begun to implement some of the recommendations of the Small Working Group and they will be implementing all of them in the next season. There is now increased collaboration between hunters, scientists and managers and improved estimates of the three types of edible product should be possible by having each product stored in separate bins and weighed. It was also noted that collaboration between hunters from Alaska and Greenland was underway with the respect to flensing techniques for bowhead whales. Finally, the Committee **requests** Greenland to provide information on its sampling scheme and data validation protocols to next year's meeting.

9. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT ADVICE

9.1 Eastern Canada and West Greenland bowhead whales

9.1.1 Assess stock structure and abundance of Eastern Canada and West Greenland bowhead whales

The Committee has agreed at the previous three Annual Meetings to consider a single stock of bowhead whales in this region as the 'working hypothesis' while acknowledging that there is still some uncertainty about the population structure of bowhead whales in eastern Canada and western Greenland (e.g. IWC, 2009d). Last year, the Committee had expressed some disappointment that the expected genetic analyses had not materialised to take discussions further. It had noted that use of the term 'working' hypothesis implies that alternative hypotheses can still be considered and thus there should be consideration of both one stock and two stock hypotheses. The Committee was therefore pleased to receive this year a number of stock structure papers, some of which include the use of genetic data.

SC/62/BRG26 presented work on genetic differentiation of bowhead whales in Eastern Canada and Western Greenland. The study included sequence data for 346 individuals from Baffin-Bay-Davis-Strait and 197 individuals from Hudson-Bay-Foxe-Basin. There was a slight but significant genetic difference between the two areas in terms of F_{ST} based on haplotype frequencies. However, there was no differentiation between Hudson Bay-Foxe Basin and Cumberland Sound, an area presumed to be within the range of the putative Baffin Bay-Davis-Strait stock. In the context of other biological information available (SC/62/BRG23 and SC/62/ BRG25), the authors consider the observed F_{ST} to be consistent with the one stock hypothesis.

SC/62/BRG25 reported on the re-identification patterns of genetic markers from bowhead whales sampled in Eastern Canada and West Greenland. From the total of 647 identified individuals, 91 were re-identified within the same location and year. Of the remaining 556 individuals (208 males and 348 females), the authors found 16 re-identifications between years. Three of these were between sampling areas and all three had moved from the Hudson Bay-Foxe Basin area to the Baffin Bay-Davis Strait area. In addition, of the 20 new satellite tags put out in 2009 in Disko Bay, four animals had crossed assumed boundaries between putative stocks. The authors concluded that: (i) the low number of re-identifications between years indicates that the population is relatively large; and (ii) the high proportion of re-identifications and movements of satellite tagged animals between areas indicate a high rate of movement between the areas. In the authors' view, these results indicate that there is only one stock of bowhead whales in Eastern Canada and Western Greenland.

SC/62/BRG23 reported on the sexual segregation of bowhead whales sampled in Eastern Canada and West Greenland. Genetic samples (the same as used in the previous two papers) were obtained from one location in West Greenland: Disko Bay (April-June 2000-09) and four locations in Eastern Canada: Pelly Bay (September 2000-02), Cumberland Sound (June-August 1997-2006), Foxe Basin (July-August 1994-2007) and Repulse Bay (September 1995-2005). The sex-ratio was significantly different from 1:1 in Disko Bay (76% females), but this was not the case in the remaining areas. The authors also reviewed available field observations and historical whaling records in the region, which provided further evidence of segregation. They concluded that Baffin Bay is mainly used by adult males and resting/pregnant females, whereas the Prince Regent, Gulf of Boothia, Foxe Basin and northwestern Hudson Bay areas are used by nursing females, calves and sub-adults. The Committee noted that the available information is consistent with some form of structured movement, but that this movement is still not well understood.

There was considerable discussion of these papers and their strengths and weaknesses in their ability to distinguish

among stock structure hypotheses as can be seen in Annex F, item 4.2. Some members of the Committee interpreted the seasonal movements and resighting patterns between the two areas to mean that there is a single stock whilst others believed that these movements and the observed shallow population structure between some areas are still consistent with the two-stock hypothesis. The Committee **agrees** that the degree of population structure requires further work with additional molecular markers (nuclear loci) before a final conclusion can be reached and it also **recognises** the importance of the successful satellite tracking study. It **encourages** the continuation of work on structure in order to allow it to conduct a more in-depth analysis next year.

The Committee also received two papers on abundance (Annex F, item 4.2.2). SC/62/BRG28 reported the results of an aerial survey of the late-summer concentration of bowhead whales in Isabella Bay, Nunavut, Canada in September 2009. The resulting abundance of 1,105 (95% CI: 532-2,294) was corrected for whales that were submerged during the passage of the survey plane, but not for whales missed by the observers because >90% of the sightings were detected by both platforms.

SC/62/BRG34 summarised a preliminary evaluation of the potential to use photographs and capture-recapture analyses to estimate the size of the Eastern Canada-West Greenland stock(s) of bowhead whales. The large and often remote summer range of these animals makes it difficult to obtain an aerial survey estimate of abundance. On the other hand, photographic surveys benefit from mixing among the separate sampling areas and have been successfully used to estimate abundance of the B-C-B stock of bowhead whales. The authors proposed that photographic surveys be directed at areas of known summer aggregations. Photography methods and analyses for the proposed surveys would follow methods used for the 2004 B-C-B bowhead population estimate (Koski *et al.*, 2009), which has been accepted by the IWC. The Committee **welcomes** these papers and looks forward to further analyses at next year's meeting.

9.1.2 Review recent catch information
SC/62/BRG27 reported that two female and one male bowhead whales were taken in April-May 2009 and three females in April-May 2010 for subsistence purposes in Disko Bay, West Greenland (no whales were struck in 2008 and no whales were struck and lost in 2009 and 2010). In light of the uncertainties surrounding eastern Arctic bowhead stock structure and abundance, the Committee **requests** the Secretariat to contact Canada to try to obtain data on Canadian catches.

9.1.3 Management advice
In 2007, the Commission agreed to a quota for 2008 to 2012 of two bowhead whales struck annually off West Greenland but the quota for each year shall only become operative when the Commission has received advice from the Committee that the strikes are unlikely to endanger the stock. In 2008, the Committee was pleased to have developed an agreed approach for determining interim management advice (IWC, 2009c), that is valid for two five-year blocks. The Committee again **agrees** that the current catch limit for Greenland will not harm the stock (noting that this applies whichever stock structure hypothesis prevails)**.** It was also aware that catches from the same stock have been taken by a non-member nation, Canada. It **agrees,** as in previous years, that should Canadian catches continue at a similar level as in recent years, this would not change the Committee's advice with respect to the strike limits agreed for West Greenland.

The Committee reviewed the catch limits in Table 4 of the Report of 'Proposed consensus decision to improve the conservation of whales from the Chair and Vice-Chair of the Commission' (IWC/62/7rev). For Eastern Canada/West Greenland bowhead whales, the Greenland strike limit is 2 per year (plus a carryover provision of two unused strikes from the previous year). The Committee **agrees** that the strike limits for Eastern Canada/West Greenland bowhead whales that are listed in table 4 of IWC/62/7rev are in accord with its advice, recognising that the normal regular review is also intended as part of IWC/62/7rev. However, the Committee notes that Canada may allow for regular catches from this stock. If the size of Canadian catches increases then the Committee's advice may change in that the total number of removals may exceed the safe limit determined by the agreed approach. If the Canadian catch increases, then the Committee wishes to draw attention to the fact that the total number taken from the stock may be greater than what is safe. Given the importance of this issue, the Committee **recommends** that the Secretariat should contact Canada requesting information about catch limits for bowhead whales.

9.2 Eastern North Pacific gray whales
9.2.1 Summary of previous season's catch data
A total of 115 gray whales (58 males, 57 females) was harvested in Chukotkan waters in 2009 and 1 was lost. A total of 6 of the 115 individuals were considered as unfit for consumption in 2009 (samples were taken from all 6). Biological sampling was conducted on 61 gray whales.

9.2.2 Management advice
As noted under Item 8.2, the Committee **agrees** that it has completed the *Implementation Review* but that a new *Implementation Review* should take place next year. In this context, the Committee **agrees** that its position with respect to the provision of management advice was unchanged from last year, i.e. the *Gray Whale SLA* remains the appropriate tool to provide management advice for eastern North Pacific gray whales. This remains the case, at least until the 2011 *Implementation Review* is completed.

In line with the values in table 4 of the proposed consensus decision (IWC/62/7rev), the Secretariat ran the *SLA* using the updated information on catches and abundance agreed at this meeting. This confirmed that an annual strike limit of 145 animals will not harm the stock (note that 145 is the maximum catch that can be taken in any one year; the annual average catch is 129 whales). The additional five whales added to the annual maximum in any one year from that previously considered (140) was intended to account for 'stinky' whales (IWC/62/7rev). In providing its advice, the Committee **draws attention** to the need for a new *Implementation Review* next year with a focus on PCFG whales. It was noted that although the table included strike limits for 10 years, the proposed consensus decision envisages the usual periodic reviews of strike limits for indigenous whaling.

Borodin commented that the annual strike limit should include the actual number of struck-and-lost whales and 'stinky' whales (e.g. in 2009 the numbers were 1 and 6, respectively). If hunting is on large whales then the number of struck-and-lost whales will be higher. Within that context, he noted that the annual strike limit should not exceed 150 whales (the number included in the *Gray Whale SLA* trials for the early period of catches during the development process).

9.3 Bering-Chukchi-Beaufort (B-C-B) Seas stock of bowhead whales

9.3.1 Review catch information and new scientific information

The Committee was pleased to receive two papers dealing with broad-scale aerial surveys from the northeastern Chukchi (SC/62/BRG13) and Alaskan Beaufort (SC/62/BRG14) Seas respectively. Details can be found in Annex F, item 4.1.1.

SC/62/BRG13 presented preliminary analyses of broad-scale aerial surveys for large whales in the northeastern Chukchi Sea that were conducted in 2008 and 2009, and compared these with results from similar surveys conducted in that region from 1982-91. The distribution of bowhead whale sightings during the light ice years of the early period (1982, 1986, 1989 and 1990) was similar to the distribution of bowhead sightings during 2008-09. There did not appear to be any major shifts in cetacean distribution between the early and late surveys although there were unexpectedly no gray whale sightings in the offshore shoal areas during 2008-09. In general, it was noted that analysing cetacean distribution in relation to environmental factors like sea-ice was complicated with this data set because the timing of the surveys was not consistent between years.

SC/62/BRG14 presented a similar preliminary study for the Alaskan Beaufort Sea, using data from the Bowhead Whale Aerial Survey Project (BWASP) in 2000-09, with comparisons to historical data. Bowhead distribution was similar in 2000-09 compared with the observed distribution from earlier years with light ice cover.

The Committee **recommends** that these surveys continue on an annual basis in the future in light of their capacity to monitor the effects of climate change and other factors (including anthropogenic activities) on cetacean distributions in the Beaufort Sea.

SC/62/BRG17 provided information about acoustic monitoring during attempts to count migrating bowhead whales near Point Barrow, Alaska in 2009 and to test new acoustic equipment. Results demonstrated the efficacy of a new seafloor array procedure and indicate that it can be used in the future as the method for obtaining acoustic data for the bowhead census and population estimation process. The Committee **welcomes** this report and **encourages** the use of autonomous seafloor acoustic recorders when monitoring migrating bowhead whales.

The Committee also received information on summarised preliminary analyses on identifying yearling bowhead whales in aerial photographs (SC/62/BRG29) and recent efforts to estimate the population size of this stock of bowhead whales (Annex F, item 4.1.1). The Committee welcomed this new information and notes that a full survey effort is being planned again in 2011. In discussion, the importance of monitoring the tails of the distribution of migrating whales was noted in the light of information from this year's migration.

9.3.2 Management advice

SC/62/BRG18 provided information on the 2009 Alaskan hunt. A total of 38 bowhead whales were struck resulting in 31 animals landed). Challenging sea ice conditions and weather contributed to a poor spring hunt. Of the landed whales, 12 were males, 18 were females, while sex was not determined for one animal. Hunters mistakenly harvested two female calves (lengths of 6.2m and 6.6m) in the autumn thinking they were small independent whales. Autumn calves are close in body length to yearlings and it is difficult to determine their status when swimming alone. Other details

are given in Annex F, item 4.1.2. It was reported that there were no catches of bowhead whales by Russia this year.

The Committee **reaffirms** its advice from last year that the *Bowhead SLA* remains the most appropriate tool for providing management advice for this harvest. The results from the *SLA* show that the present strike limits are acceptable.

The next *Implementation Review* for B-C-B bowhead whales is scheduled in 2012. The purpose of the *Implementation Review* is to evaluate new information which has become available since the last *Implementation Review* and assess whether the current state is outside the realm of plausibility covered by the *Implementation* trials. If so, it may be necessary to conduct further trials incorporating such information. Therefore, the Committee **encourages** researchers to present relevant papers and new information for consideration during next year's meeting, so that preparations for the next *Implementation Review* can proceed efficiently.

The Committee reviewed the catch limits in table 4 of 'Proposed consensus decision to improve the conservation of whales from the Chair and Vice-Chair of the Commission' (IWC/62/7rev). For B-C-B bowhead whales, the maximum strike limit is 67 per year (plus a carryover provision of 15 unused strikes from the previous year) for total landed of 560 (580 written in footnote 8 is a typo). The Committee **agrees** that the strike limits for B-C-B bowhead whales listed in table 4 are in accord with the management advice provided by the *Bowhead SLA*, noting that the normal regular review is also intended.

9.4 Common minke whale stocks off Greenland (AWMP)

9.4.1 West Greenland

9.4.1.1 SUMMARY OF PREVIOUS SEASON'S CATCH

In the 2009 season, 153 minke whales were landed in West Greenland and 11 were struck and lost. Of the landed whales, there were 105 females, 47 males, and one whale of unreported sex. Genetic samples were collected for 97 of the 153 minke whales landed in 2009.

9.4.1.2 MANAGEMENT ADVICE

In 2007, the Commission agreed that the number of common minke whales struck from this stock shall not exceed 200 in each of the years 2008-12, except that up to 15 strikes can be carried forward. Prior to last year, the Committee has never been able to provide satisfactory management advice for this stock. Last year, the Committee was for the first time able to provide management advice for this stock. It had adopted a new abundance estimate and agreed method for providing interim management advice. Such advice can be used for up to two five-year blocks whilst *SLAs* are being developed (IWC, 2009c). Based on the application of the agreed approach, and the lower 5th percentile for the 2007 estimate of abundance (i.e. 8,918), the Committee **repeats its advice** of last year that an annual strike limit of 178 will not harm the stock.

9.4.2 East Greenland

9.4.2.1 SUMMARY OF PREVIOUS SEASON'S CATCH DATA

Three males and one female common minke whale were struck (and landed) off East Greenland in 2009 (no animals were struck and lost; see SC/62/ProgRepDenmark). Genetic samples were obtained from two of these whales. Catches of minke whales off East Greenland are believed to come from the much larger Central stock of minke whales.
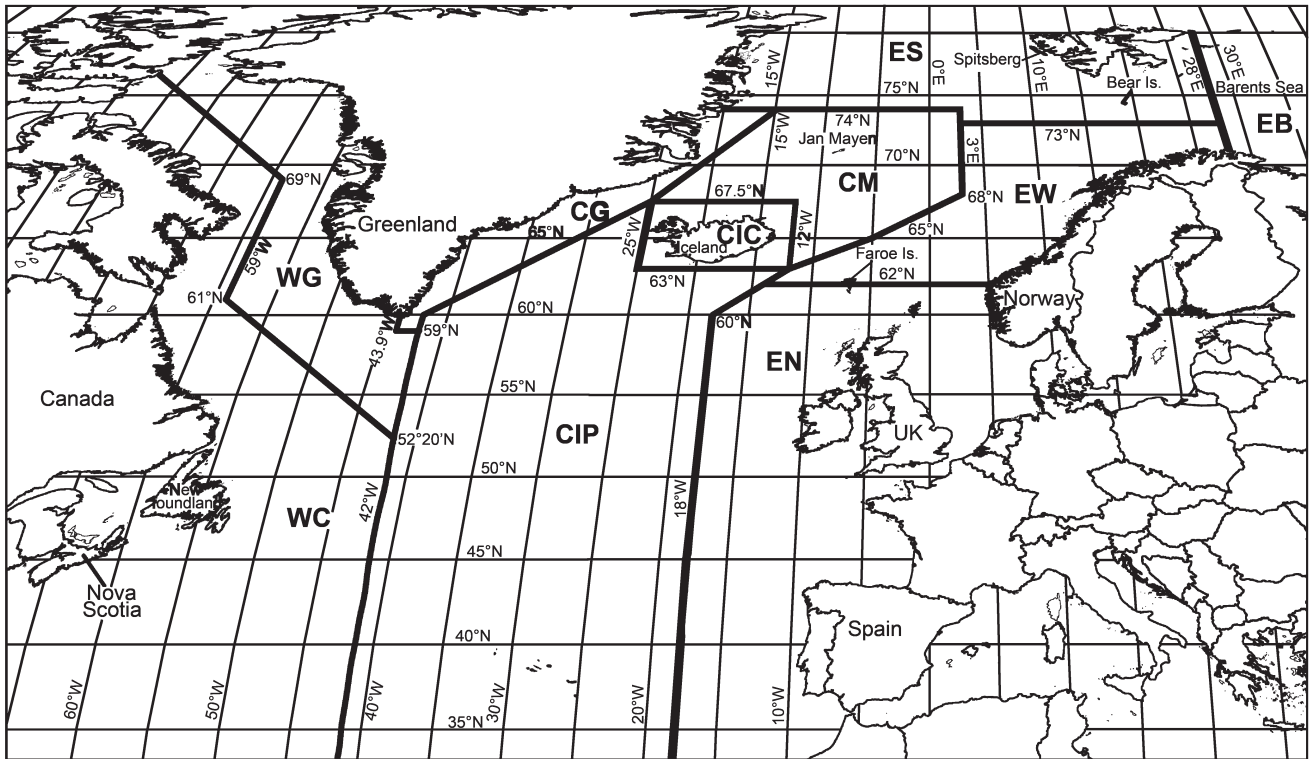
Fig. 2. The specifications for the Small Areas for the North Atlantic minke whales.

Table 3

Most recent abundance estimates for minke whales in the Central North Atlantic.

Small Area(s)	Year(s)	Abundance and CV
CM	2005	26,739 (CV=0.39)
CIC	2007	10,680 (CV=0.29)
CG	2007	1,048 (CV=0.60)
CIP	2007	1,350 (CV=0.38)

9.4.2.2 MANAGEMENT ADVICE

In 2007, the Commission agreed to an annual strike limit of 12 minke whales from the stock off East Greenland for 2008-12, which the Committee stated was acceptable in 2007. The present strike limit represents a very small proportion of the Central Stock (see Fig. 2 and Table 3). The Committee **agrees** that the present strike limit will not harm the stock.

9.5 Fin whales off West Greenland

9.5.1 Summary of previous season's catch data

A total of 8 (1 male; 7 females) fin whales were landed, and 2 struck and lost, in West Greenland during 2009 (SC/62/ProgRepDenmark). Genetic samples were collected for 5 of the 8 fin whales harvested during 2009.

9.5.2 Management advice

In 2007, the Commission agreed to a strike limit (for the years 2008-12) of 19 fin whales struck off West Greenland. The Committee agreed an approach for providing interim management advice in 2008 and this was confirmed by the Commission. It had agreed that such advice could be used for up to two five-year blocks whilst *SLA*s were being developed (IWC, 2009c). Based on the application of the agreed approach in 2008 (IWC, 2009c), the Committee **agrees** that an annual strike limit of 19 whales will not harm the stock.

9.6 Humpback whales off West Greenland

In 2007, the Committee agreed an approach for providing interim management advice and this was confirmed by the Commission. It had agreed that such advice could be used for up to two five year blocks whilst *SLA*s were being developed (IWC, 2009c). Using this approach, as last year, the Committee **agrees** that an annual strike limit of 10 whales will not harm the stock.

9.7 Humpback whales off St Vincent and The Grenadines

9.7.1 Summary of previous season's catch data

The Committee was advised that three females (lengths 34', 34'3" and 43'2") were taken during 2010. Neither genetic samples nor photographs were available for these animals. The Committee has encouraged St Vincent and The Grenadines to submit as much information as possible about any catches to the Committee via an Annual Progress Report.

The Committee **strongly recommends** collection of genetic samples for any harvested animals as well as fluke photographs, and submission of these to appropriate catalogues and collections. In respect of genetic samples, the Committee again **agrees** that the North Atlantic Whale Archive maintained by Per Palsbøll is an appropriate facility.

9.7.2 Management advice

In recent years, the Committee has agreed 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 2008-12. The Committee **agrees** that this block catch limit will not harm the stock.

10. WHALE STOCKS

10.1 Antarctic minke whales (IA)

The Committee is currently continuing an in-depth assessment of the Antarctic minke whale. To complete this assessment, agreed abundance estimates from CPII and CPIII[3] are needed. Two different abundance estimation methods have been developed during the last few years, and although they give quite different point estimates, both are consistent in that they show an appreciable decline from CPII to CPIII. During the JARPA review in 2009, the quality of the Japanese ageing methods was questioned with implications for the catch-at-age analyses. During the present meeting, the priority topics discussed included: the two abundance estimation methods; the reasons for the differences between CPII and CPIII; age reading and the catch-at-age assessment models.

10.1.1 Produce agreed abundance estimates of Antarctic minke whales using IDCR/SOWER data

Skaug reported on work conducted by the Abundance Estimation Intersessional Working Group. Tasks to be considered by the group were directed towards elucidating possible causes for the difference in abundance estimates for Antarctic minke whales from the IDCR/SOWER data from the recent OK (Okamura and Kitakado, 2009) and SPLINTR (Bravington and Hedley, 2009) models. In completing most of these tasks, substantial progress had been made towards this in two regards: (i) development of a reference dataset for model comparisons; and (ii) Bravington had completed a non-spatial version of the SPLINTR model. For (i), a number of internal inconsistencies in the 'standardised' dataset were identified; as noted in IWC (2010f), it is essential that when comparing models, the data are identical. Since the purpose of this dataset is to allow appropriate comparisons between the models, the Committee **agrees** that this dataset is suitable for this purpose.

SC/62/IA14 provided results from applying the IWC 'standard' method (Branch, 2006), and the OK and SPLINTR models to simulated data, focussing on the latter two. In general, both models performed well, although when bias did occur, it tended to be positive for the OK model and negative for SPLINTR. The Committee thanked Palka for co-ordinating this extensive study. The simulated datasets have proved valuable in helping to develop and refine the models and for examining the differences between them. No simulated scenarios show the level of difference between the OK and SPLINTR estimates that the real data analyses reveal. This suggests either that the magnitudes of factors currently in the simulations do not cover the ranges found in the real data (either singly or in combination), or that there are additional factors not currently in the simulations that are important for modelling the real data.

During the pre-meeting and using the reference dataset, the OK and non-spatial SPLINTR outputs were compared. Estimated mean school sizes, effective strip half-widths, and encounter rates were combined using the simple line transect formula for estimating abundance. The resulting examination revealed that: (1) these estimated quantities from each model were being combined correctly to estimate abundance; (2) the effective strip half-widths for OK were about half of those of SPLINTR (i.e. the estimated abundances were approximately doubled, highlighting a

need for further investigation); and (3) that the difference between the two models was not due to the data used and was probably not due to differences in mean school size. The Committee questioned whether sufficient progress had been made to determine whether further investigation was likely to determine the reason for the difference between the models. It **agrees** that if the Work Plan, including an intersessional workshop, is accomplished, there is a reasonable chance that this will be the case. It therefore **agrees** to proceed with these investigations until the 2011 Annual Meeting. The Committee also **agrees** a number of technical points related to this intersessional work (Annex G, item 5.1.8).

However, contingency plans (e.g. producing model-averaged estimates of abundance) will also need to be considered if it does not prove possible to resolve the difference in the estimates. Skaug compared estimates from OK, SPLINTR and a model-averaged estimate on the simulated data and found that the model-averaged estimator had smaller bias than either of the two individual models. There was some discussion on the appropriateness of using model-averaged estimates on the real data. However, as noted above, given the progress made this year, it is anticipated that the best outcome would be a resolution of the issue as a result of the intersessional work.

SC/62/IA3 and SC/62/IA12 presented the following 'survey-once' estimates (see Branch and Butterworth, 2001b) of abundance for the CPII and CPIII surveys from the OK and SPLINTR models respectively, as summarised in Table 4.

The Committee thanked both sets of authors for producing estimates and for the substantial amount of intersessional work, much of it collaborative. As last year, the issue is not that either set of diagnostics suggests not accepting the estimates, but rather that the estimates themselves are so different. This leads to the need to consider three – not necessarily unrelated – issues for next year: (1) pursuing the work to explain the differences; (2) the implications, if any, for future surveys; and (3) the procedural question of what the Committee should do if (1) does not succeed. As part of IWC/62/7rev, the Committee is expected to undertake an RMP *Implementation* for Antarctic minke whales in 2015 (and see Item 20). There is thus a pressing need for agreed absolute abundance estimates for the past surveys and an agreed method for analysing data from future surveys.

The Committee **strongly recommends** that the work plan and timeline set out in Annex G, Appendix 3 to finalise estimates be followed and completed. A workshop, to be held by February 2011 at the latest (see Item 21), is an essential component of this.

10.1.2 Conduct an analysis of aging errors that could be used in catch-at-age analyses

Lockyer presented the results of the Antarctic minke whale ageing exercise (SC/62/IA11) which she had carried out intersessionally following the 'blind' experimental design agreed by the Scientific Committee (IWC, 2009e, p.209). The study was assisted by staff from the laboratory at the Tokyo University of Marine Science and Technology, under the supervision of Kitakado. This had involved reading 250 earplugs from 1974/75-2005/06, i.e. including both Antarctic commercial and JARPA samples. The primary aim of the work was to determine whether evidence exists of a drift in reader performance, and, if so, to quantify it. A secondary aim was to quantify age-reading error variability.

The Committee thanks Lockyer and the Japanese graduate students who had assisted her, and for the professional manner in which they conducted the experiment. It also

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[3]CPII and CPIII refer to the second and third set of IWC cruises, referring to 1985/86-1990/91 and 1991/92-2003/04, respectively.

Table 4

Comparison of 'survey-once' estimates of abundance, by Management Area, from the OK and SPLINTR models. Estimates shown have been extracted from the papers SC/62/IA3 and SC/62/IA12 and rounded, with CVs incorporating additional variance given in parentheses.

	Area I	Area II	Area III	Area IV	Area V	Area VI	Total
CPII							
OK	209,000	261,000	187,000	104,000	635,000	90,000	1,486,000
	(0.35)	(0.38)	(0.42)	(0.37)	(0.29)	(0.39)	(0.17)
SPLINTR	117,000	141,000	87,000	61,000	282,000	59,000	747,000
	(0.38)	(0.39)	(0.55)	(0.36)	(0.34)	(0.40)	(0.19)
CPIII							
OK	65,000	93,000	126,000	79,000	244,000	105,000	712,000
	(0.34)	(0.37)	(0.33)	(0.45)	(0.33)	(0.34)	(0.17)
SPLINTR	35,000	56,000	59,000	36,000	140,000	57,000	382,000
	(0.33)	(0.35)	(0.31)	(0.33)	(0.31)	(0.33)	(0.17)

endorses the recommendation by Lockyer that a standard reference set of minke earplugs be maintained for age-reading training purposes.

SC/62/IA2 explored the impact of period/reader on age-determination by comparing age-estimates for the above 250 earplugs for the control reader (Lockyer) and three Japanese readers (Masaki, Kato and Zenitani). Overall, the results demonstrated that the Japanese readers and the control reader differed in terms of both expected age given true age and variance in age-estimates. The results also suggested that the expected age and random uncertainty in age-estimates differed among the Japanese readers although the differences were not severe. This work will assist in determining how catch-at-age data are used in the statistical catch-at-age analyses and in future virtual population analyses.

The Committee **welcomes** this study as an important advance. It was noted that: (a) Lockyer tended to report greater ages than the Japanese readers; (b) differences amongst the Japanese readers were slight; and (c) that there was no indication of a trend in bias in Japanese readings over the period examined (i.e. from commercial whaling to special permit whaling). It was also noted that SC/62/IA11 does not provide any information about the accuracy of the age readings in absolute terms, given the absence of known-aged individuals. The absence of known-aged individuals is also the general norm for fish populations although for a number of these there are indications that layers were formed seasonally. Similarly, studies of fin whales, as well as corpora counts and information from animals with known histories, all indicate that the growth layers groups used to estimate whale ages are laid down annually.

In conclusion, the Committee **agrees** that no further experiments or analyses on age reading errors are needed to resolve ageing related problems raised in e.g. the JARPA review.

The Committee also **recommends** that, where they do not already, national or other guidelines for dealing with stranded animals include encouragement to obtain samples which could provide information on the animal's age.

10.1.3 Continue development of the catch-at-age models
SC/62/IA6 examined the impact of allowing for ageing error based on the analyses of the above (Item 10.1.2) age-reading experiment when conducting assessments for Antarctic minke whales in Areas III-E, IV, V and V-W using statistical catch-at-age analysis by means of sensitivity tests. These sensitivity tests explored three scenarios: (a) no ageing error; (b) ageing error is modelled as in previous base-models; and (c) ageing error is based on the results from

SC/62/IA2. Time-trajectories of total (1+) population size and recruitment were qualitatively the same, irrespective of how age-reading error was modelled.

In discussion, it was noted that while estimates from recent years of recruitment and abundance for the three different assessments were close, absolute values showed relatively large differences until the 1960s, and estimation variance would be expected to be much higher over this period.

Though the Committee **agrees** that no further experiments or analyses on age reading errors are necessary. This decision did not, however, imply that other issues associated with the data and analyses, such as reasons for the different length distributions at age for younger-aged commercial and JARPA, had been resolved.

Completion of the work on investigation of catch-at-age based assessments requires undertaking the tasks as detailed in Annex G, item 5.2.4. These investigations will require an extension of permission from Japan for use of their Antarctic minke whale catch-at-age data, and would be improved if data from the most recent JARPA cruises could also be made available. The Committee **recommends** that such an approach be made to Japan under Procedure B of the DAA. Kato indicated that corpora count data were available, and that these data would be provided if necessary. An intersessional steering group under Punt was established to co-ordinate this work (see Annex Q).

10.1.4 Continue to examine the difference between abundance estimates from CPII and CPIII
Estimates from the OK, SPLINTR and standard methods (Branch, 2006) were consistent in that they showed a decline from CPII to CPIII. Conclusions reached about the reasons for these changes should integrate information from other sources such as changes in ice coverage during the survey periods concerned. Until recently, there was little quantitative information on the number of Antarctic minke whales that might be present within the pack ice. This year the Committee was pleased to receive several papers reporting on, and analysing data from, surveys of whales within the pack-ice.

SC/62/IA4 investigated trends of sea ice in the period of IWC IDCR/SOWER circumpolar surveys from CPI to CPIII (1978-2004). The sea ice trends are fundamental information to understand the year-to-year sea ice variability. The authors concluded that the difference in abundance estimates between the CPII and CPIII surveys can be partly explained by the change in the amount of open sea areas within the sea ice field. The Committee **agrees** that further region-specific investigation is necessary to examine the extent

of the role changes in sea ice may play in examining the change in abundance estimates between CPII and CPIII. In this context the Committee received a progress report from the intersessional working group established to examine this issue (SC/62/IA5). The authors have made progress importing satellite sea ice data from Area II into a GIS database but the work is not expected to be completed until the next Annual Meeting. The Committee **recommends** that every effort be made to complete this important work on time. Although the exact nature of any models relating minke whales densities in open water to those in the ice was not discussed, it is important to continue investigation of the relationships between whale density and ice characteristics.

This requires investigation of at least: (1) the relationship between whale density and days after sea-ice melt; and (2) the relationship between estimates of abundance and sea ice characteristics. The Committee **agrees** the detailed plan for this work given in Annex G, item 5.1.8. Bravington, Murase, Kitakado and Kelly will co-operate in this work.

This year, the Committee was pleased to receive reports (SC/62/IA8 and SC/62/O15) from two aerial survey programmes: the Australian East Antarctic programme (which co-ordinated in 2009/10 with the SOWER survey) using a fixed wing plane; and the German programme surveying the area in the Weddell Sea from a helicopter launched from the ice breaker vessel, the *Polarstern* (which was also used as a Platform of Opportunity for cetacean sightings). These programmes represent some of the first attempts to gather quantitative data to estimate densities of minke whales in the pack ice. Preliminary analyses from each programme can be found in SC/62/IA9 and SC/62/IA13.

The Committee **welcomes** this work and a full discussion can be found in Annex G, item 5.1.6.2. It thanked the governments of Australia, Germany and the Netherlands for supporting this research. It also was **pleased** to see the successful collaboration (both in collection of data, and in regular communications and data exchanges) between the Australian programme and the SOWER survey.

10.2 Southern Hemisphere humpback whales
The report of the Committee on the assessment of Southern Hemisphere humpback whales is given in Annex H. This assessment has been on the agenda of the Scientific Committee since 1992. The Committee currently recognises seven breeding stocks (BS) in the Southern Hemisphere (labelled A to G - IWC, 1998b), which are connected to feeding grounds in the Antarctic (Fig. 3). Preliminary population modelling of these stocks was initiated in 2000 (IWC, 2001g) and in 2006 (IWC, 2007a), the Scientific Committee completed the assessment of BSA (eastern South America), BSD (western Australia) and BSG (western South America). The assessment of BSC was completed in 2009 (IWC, 2010g). Since then, the completion of the assessment of BSB (western Africa) has been considered a priority by the Committee (IWC, 2010g, p.234).

10.2.1 Breeding Stock B
10.2.1.1 DISTRIBUTION
The Committee received several papers addressing the distribution, new records or habitat use of humpback whales along the central and northern Atlantic coast of Africa (Bamy *et al.*, 2010; Carvalho *et al.*, In review; Picanço *et al.*, 2009; Weir, 2010).

10.2.1.2 POPULATION STRUCTURE
It has been hypothesised that there may be two humpback whale sub-stocks in the eastern South Atlantic (IWC, In press). Breeding sub-stock B1 winters along the central West African coast and around the northern islands of the Gulf of Guinea and sub-stock B2 has been observed off the west coast of South Africa (WSA), in an area which appears to serve as a feeding site or possibly a migratory corridor. The breeding site of sub-stock B2 is unknown. A boundary between these two sub-stocks has been tentatively placed in the vicinity of 18°S (IWC, In press), see Fig. 4. At this meeting, the Committee further evaluated the evidence for BSB substructure, in light of new information.

SC/62/SH30 presented three stock structure hypotheses that were used in the assessment models. These hypotheses included: (1) a single, fully-mixed stock; (2) two breeding stocks that mix only on the feeding grounds and (3) two breeding stocks with partial migratory overlap along the west coast of Africa. SC/62/SH8 described temporal population structure in humpback whales on the west coast of Africa using maternally (mitochondrial DNA control region) and bi-parentally (10 microsatellites) inherited markers. Results showed significant genetic differentiation, low gene flow and
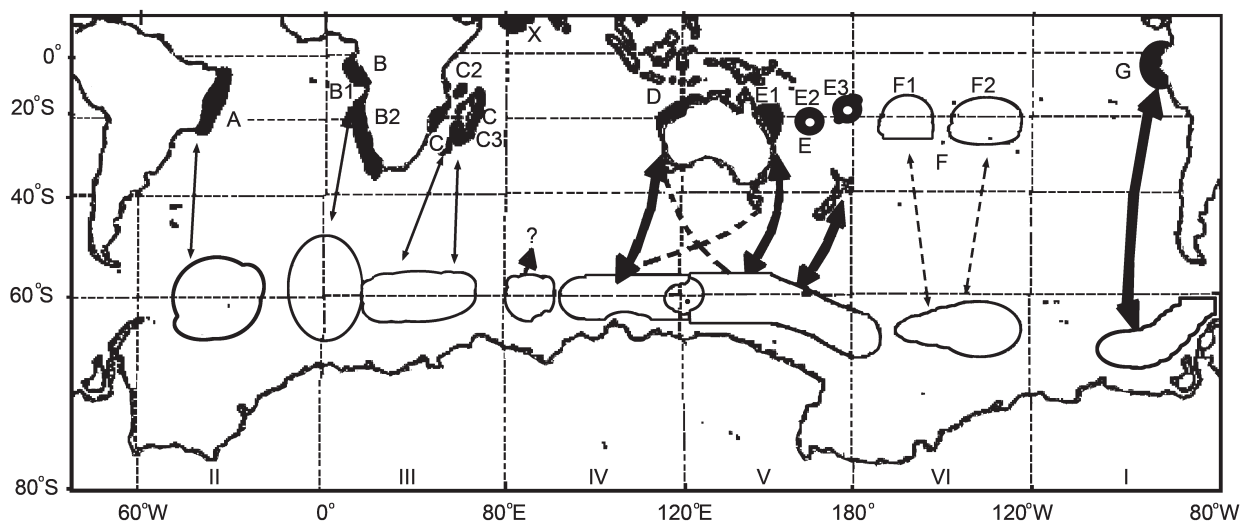

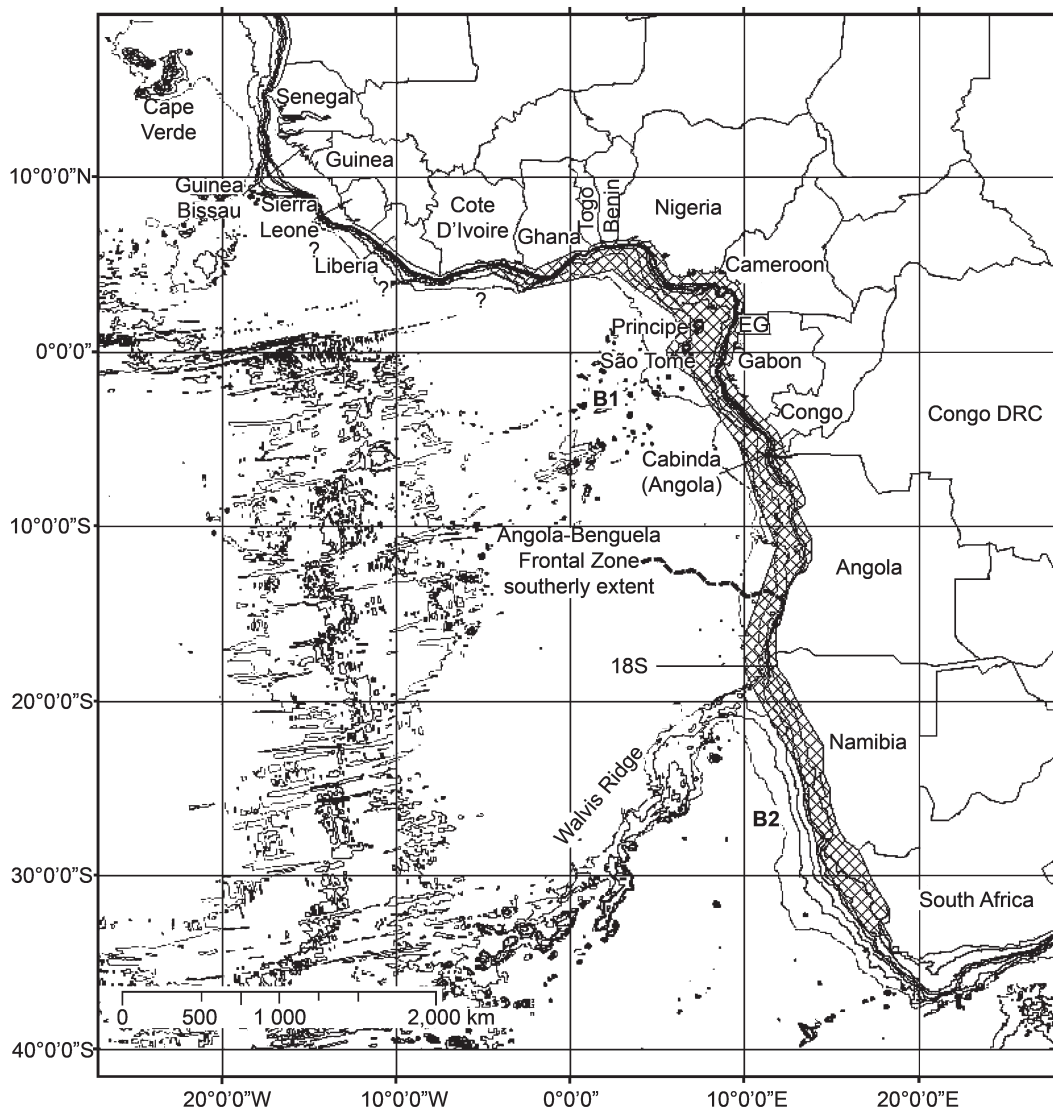Fig. 3. Southern Hemisphere humpback whales, breeding stocks and feeding grounds (IWC, in press).

Fig. 4. Distribution of humpback whales in west Africa. The boundary between B1 and B2 has been proposed to be near 18°S (IWC, in press).

seasonal differences between WSA and Gabon. Movements of genetically identified individuals, both males and females, indicate that interchange occurs between these two region, with all movements to date being from north to south.

SC/62/SH15 examined humpback whale genetic structure in the Antarctic and evidence of connectivity to breeding grounds using biopsy samples collected during the 2006/2007 SOWER cruises. An updated analysis of the mitochondrial DNA (mtDNA) data presented in this paper was received during the meeting. Population structure was evaluated for the feeding grounds associated with BSB and BSC, under the catch allocation Hypotheses 1 and 2 developed by the Committee last year (Findlay *et al.*, 2010, fig.1). Under Allocation Hypothesis 1, Gabon was found to be significantly different from the Nucleus feeding areas of both BSB (10°W to 10°E) and BSC (30°E to 60°E). For Allocation Hypothesis 2, samples from Gabon were found to differ significantly from the BSB Nucleus (10°W to 10°E) and BSB/BSC Margin (10°E to 40°E). WSA was significantly different from BSB and BSC Nucleus, as well as the BSB/C margin area. Feeding grounds of BSB and Margin of B/C were found to be significantly different from the Nucleus

area associated with BSC under Allocation Hypothesis 1. No significant differentiation was found across feeding areas under Allocation Hypothesis 2.

An analysis of mtDNA on feeding grounds (10°W-10°E) by latitudinal gradient revealed that no significant difference between Gabon and samples collected north of 60°S. WSA differed from samples obtained both north and south of 60°S on the basis of F_{ST} but significance was only found for samples obtained north of 60°S. These results were interpreted as indicative of some type of latitudinal variation in the distribution of whales from BSB in the Antarctic.

The Committee welcomed the genetic studies described above; this research is relevant to the assessments of Southern Hemisphere humpback whale stocks. The Committee **recommends** that a mixed stock analysis be performed to better inform stock structure assumptions and to increase the available data for population dynamics modelling.

The Committee also considered new photo-id matching results relevant to the stock structure of BSB. SC/62/SH10 presented preliminary results of photographic matching between Gabon, WSA and Antarctic Areas II and III. A total of three matches were found between Gabon and WSA. SC/62/

SH31 reported no matches resulted from the comparison of a photo-id catalogue from WSA and another from the south coast of east South Africa and southern Mozambique (BSC1). It was noted that a substantial number of images held by Oceans and Coast (the South African governmental agency from BSC1) have not been compared to WSA. In this regards, the Committee **recommends** comparisons of the WSA fluke photographs to the Oceans and Coast catalogue and **requests** that the relevant photographs and associated information be made available.

Barendse *et al.* (2010) described the results of shore-based observations on humpback whales off Saldanha Bay, WSA. This area was presumed to be a migration corridor for whales from the postulated BSB2 breeding sub-stock. The authors concluded that the area off WSA is not strictly a migration corridor, but also a primary or supplementary feeding ground. Discussion of this paper is given in Annex H, item 2.1.2.

SC/62/SH5 reviewed the catch history, seasonal and temporal trends in availability and the migrations of humpback whales along the west coast of southern Africa. After the initial decline in availability in all areas pre World War I, the catch history in Gabon differed markedly from those in the three southern grounds, especially off South Africa. This suggests some degree of stock sub-structure within BSB. A hypothesis of a single breeding ground (in the Gulf of Guinea) but separate, maternally-directed migratory routes to and from different feeding grounds was proposed.

The Committee concluded that the following points were relevant to the development of stock structure hypotheses based on its extensive review of information:

(1) there is probably more than one genetically distinct humpback whale population in the eastern South Atlantic;
(2) Gabon is a breeding ground and WSA exhibits characteristics of both a feeding ground and a migratory corridor;
(3) at least some of the animals sampled at Gabon migrate to the Antarctic to feed and that migration may follow an inshore route (via WSA), an offshore route or both (if the latter individual migrants maintain fidelity to a particular route or maintain alternate routes);
(4) some of the whales that breed at Gabon may maintain maternal feeding site fidelity to west South Africa, such that they do not migrate to the Antarctic; and
(5) individuals observed at WSA may migrate to an unidentified breeding site that is distinct from Gabon (if so, some fraction of those individuals may pass by Gabon, *en route* to that breeding site) or the breeding ground of these individuals may lie between Gabon and WSA.

In light of the new information presented above, the Committee indentified new stock structure hypotheses and progressed with exploratory population dynamics model runs. Results of these analyses are presented under Item 10.2.1.4 below. A minority statement in relation to item (5) above is found in Annex H, item 2.1.2.

10.2.1.3 ABUNDANCE ESTIMATES

The Committee received two papers with abundance estimates based on capture-recapture data. SC/62/SH2 reported on within-region photo identification and genotypic matching for WSA. Resightings between six different time-periods and five different datasets (three from photo-id data, one from microsatellite data and one combined) resulted in estimates of abundance ranging from 223 (CV=0.35)

to 939 (CV=0.38) individuals. SC/62/SH11 presented estimates of abundance for humpback whales in Gabon for the period 2001-06 using photographic and genotypic data. While the estimates themselves provided in this paper were not discussed, the capture-recapture data were used in preliminary assessment models presented at the meeting (SC/62/SH30). Details of these papers and the data therein are presented under item 2.1.3 in Annex H.

10.2.1.4 POPULATION ASSESSMENT

After initial discussion of the assessment models in SC/62/SH30, the Committee developed additional stock structure hypotheses on the basis of the new information presented in Item 10.2.1.2. Additional model runs were then undertaken to inform the Committee about possible implications of various stock structure hypotheses and input data selection for population model outputs. Preliminary results suggested that the assessment model parameter estimates were relatively robust across the proposed stock structure hypotheses and input data for sub-stock B1 (Gabon). However, the population trajectories varied widely for sub-stock B2 (WSA). Based on these results, the Committee concludes that additional modelling was required and **agrees** upon a suite of stock structure hypothesis that would probably be used in the assessment of BSB (Annex H, item 2.1.4). The Committee selected three priority hypotheses that it **recommends** should be used in further population assessment (Fig. 5).

The Committee also discussed model input data and possible sensitivity analysis when evaluating the results of the stock assessment models (details in Annex H, item 2.1.4). Input data included allocation of breeding and feeding ground catches, values for minimum past population sizes (N_{min}), type of capture-recapture data (photo-id, genotype), proportions of whales migrating to breeding and feeding grounds, and rate of struck and lost whales. The Committee **agrees** to a selection of input data to be used as the reference cases and sensitivity scenarios in the population dynamic models, as presented in Table 5.

The Committee **agrees** that considerable progress was made during the meeting. However, there was insufficient time to complete the assessment of BSB. In this regard, the Committee notes that last year it had agreed to complete the assessment of BSB as a single stock if an assessment at the sub-stock level was not possible. However, in light of the new information brought forward this year, the Committee **agrees** that a considerably more robust assessment could be finalised if additional work was conducted intersessionally. The Committee **agrees** that the completion of the assessment of BSB by 2011 is a matter of the highest priority for the sub-committee on other Southern Hemisphere humpback whales. It **strongly recommends** that the strict work plan outlined in Table 6 be followed to facilitate completion at next year's meeting. Regular progress on these tasks will be monitored and reported by Zerbini to an intersessional group (Annex Q). The Committee **recommends** a pre-meeting to the Annual Meeting to ensure the timely completion of this work.

The modelling required to complete the assessment has financial implications for the Committee and this is discussed under Item 24.

The Committee **agrees** that it will conclude the assessment of BSB humpback whales at next year's meeting. Therefore, the Committee **recommends** that assessments of BSE and BSF humpback whales should be initiated and a progress report be presented at SC/63. An intersessional e-mail group was established under Jackson to assemble all the relevant

Table 5

Input data reference cases and sensitivities selected for use in population modelling for the assessment of BSB.

Data category	Population	Reference case	Sensitivity analysis
Capture-recapture	Gabon	Microsatellites, males-only* (see note below)	Flukes; microsatellites (both sexes)
Capture-recapture	WSA	Microsatellites* (see note below)	Right dorsal fin; flukes
Minimum past population	Gabon	N_{min} = 68	None
Minimum past population	WSA	N_{min} = 24	None
Catch allocation (north of 40°S)	Gabon	Congo and 50% Angola	Congo and Angola; Congo only
Catch allocation (north of 40°S)	WSA	50% Angola, Namibia and WSA	Namibia and WSA; Angola, Namibia and WSA
Catch allocation (south of 40°S)	Gabon	Allocation Hypothesis 1 developed last year	None
Catch allocation (south of 40°S)	WSA	Allocation Hypothesis 1 developed last year	None
Migration to unknown breeding ground	Gabon	25%	None
Migration to Antarctic	WSA	50%	100%; 0% (does not migrate)
Struck and loss rate	Both	0.15 (as presented in SC/62/O2)	0

*Microsatellite data will only be used as a reference case for capture-recapture data if genotyping errors can be incorporated into assessment models. Otherwise flukes will be used.

Table 6

Intersessional tasks to finalise the assessment of BSB humpback whales.

Task	Responsible persons	Final deadlines	
		Circulation to group for consideration	Decision regarding use in model
Work on data inputs to model and possible refinements to stock hypotheses			
Inspection of mark-recapture data within and between Gabon and WSA for consideration in stock structure hypothesis refinement.	Barendse and Collins	15/12/10	31/01/11
Investigate and update estimates of potential and realized error in genetic and photo-identification data.	Carvalho, Collins, Rosenbaum, Cerchio	15/12/10	31/01/11
Re-analyse mark-recapture data from WSA using multi-year Program MARK (or equivalent) models to examine the effects of heterogeneity (for fluke data), tag loss (for dorsal fin data) and genotype error on abundance estimates, and assess the most appropriate data on interchange.	Barendse, Cerchio, Best	15/12/10	31/01/11
Conduct feeding-breeding ground mixed-stock analysis in order to estimate stock mixing proportions between Gabon and WSA and the Antarctic in order to further refine stock structure hypotheses for assessments.	Rosenbaum, Carvalho, Loo	15/12/10	31/01/11
Examine catch data for incorporation in population models, which should be sex-disaggregated, if possible.	Best and Butterworth	15/12/10	31/01/11
Comparison of WSA catalogue to South African government Oceans and Coast Catalogue (advantageous but not critical).	Barendse, Findlay and Meyeo	01/12/10	31/01/11
Modelling work			
Development of assessment models consistent with stock structure hypotheses selected by the Committee. Highest priority is for the models in Annex H, table 2. To the extent time permits variants of these models will be considered as sensitivities (Annex H, table 3).	Butterworth, Muller, Johnston	Some initial runs for highest priority stock hypotheses	Final runs for at least highest priority stock hypotheses
The assessment models should use the input data identified as the reference cases and sensitivities in table 2 above. Data output should include the posterior median and the 90% probability interval for the year for which the abundance prior corresponds.		15/01/10	One week before pre-meeting
Present results for at least highest priority hypotheses.			

data needed for these assessments. The assessment of BSD humpback whales (western Australia) had been completed at the SC meeting in 2005 (IWC, In press), but because of extensive mixing in the feeding grounds with other stocks (e.g. BSE) this stock might needed to be re-assessed along with BSE and BSF. The intersessional group will also consider the inclusion of BSD humpback whales in the assessments of the two other stocks.

The Committee **agrees** that a new item will be added to its agenda to consider new information on the Arabian Sea humpback whale population.

10.2.2 Review new information on other breeding stocks
10.2.2.1 BREEDING STOCK A
The Committee welcomed two papers with new information relevant to BSA. SC/62/SH27 reported a photographic match of a female humpback whale between Abrolhos Bank, Brazil (BSA) and the east coast of Madagascar (BSC3), which represents a new mammalian distance record. SC/62/SH28 presented a new line-transect abundance estimate of 9,330

whales (95% CI=7,185-13,214; %CV=16.13) for the coast of Brazil in 2008. This stock appears to be undergoing a steady growth, but further studies are necessary to reduce uncertainties associated with $g(0)$ estimation and other potential sources of bias. Further details are described in Annex H, item 2.2.1.

10.2.2.2 BREEDING STOCK D
Two papers provided information relevant to Breeding Stock D. These are summarised below, with additional details provided in Annex H, item 2.2.2. SC/62/SH21 reported on the deployment of 23 satellite tags on southward migrating whales off Kimberley coast, northwestern Australia. In total, 263 days of location data tracked whales over a total distance of nearly 20,000km. This work has provided the most detailed movement data off northwestern Australia to date and revealed an unexpected 1,200km movement from the coast into the Indian Ocean.

SC/62/SH24 described an unusual peak in recorded mortalities (n=47) of humpback whales in Western Australia
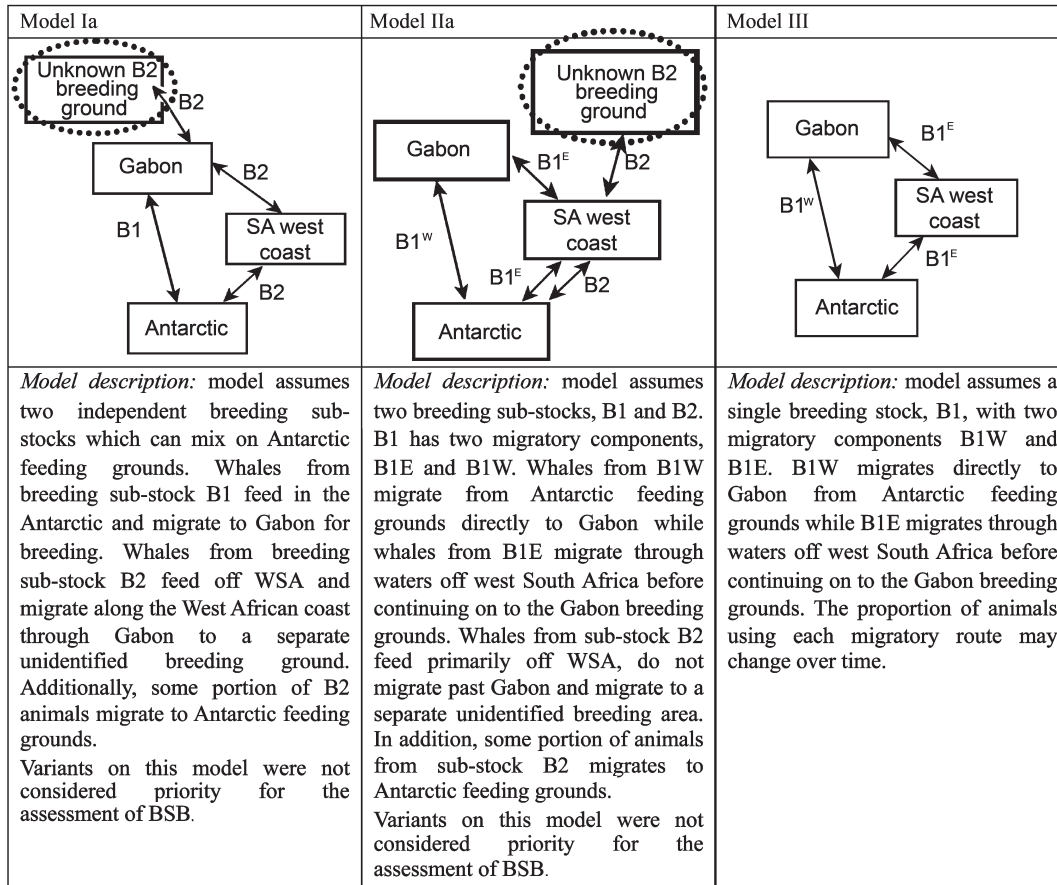
Model Ia	Model IIa	Model III
Model description: model assumes two independent breeding sub-stocks which can mix on Antarctic feeding grounds. Whales from breeding sub-stock B1 feed in the Antarctic and migrate to Gabon for breeding. Whales from breeding sub-stock B2 feed off WSA and migrate along the West African coast through Gabon to a separate unidentified breeding ground. Additionally, some portion of B2 animals migrate to Antarctic feeding grounds. Variants on this model were not considered priority for the assessment of BSB.	*Model description:* model assumes two breeding sub-stocks, B1 and B2. B1 has two migratory components, B1E and B1W. Whales from B1W migrate from Antarctic feeding grounds directly to Gabon while whales from B1E migrate through waters off west South Africa before continuing on to the Gabon breeding grounds. Whales from sub-stock B2 feed primarily off WSA, do not migrate past Gabon and migrate to a separate unidentified breeding area. In addition, some portion of animals from sub-stock B2 migrates to Antarctic feeding grounds. Variants on this model were not considered priority for the assessment of BSB.	*Model description:* model assumes a single breeding stock, B1, with two migratory components B1W and B1E. B1W migrates directly to Gabon from Antarctic feeding grounds while B1E migrates through waters off west South Africa before continuing on to the Gabon breeding grounds. The proportion of animals using each migratory route may change over time.

Fig. 5. Stock structure hypotheses selected as priority for use in the BSB assessment.

in 2009. Only a few mortalities have been reported per year in previous decades. The authors hypothesised that this event could represent:

(1) an artefact of searching effort and coastal oceanography;
(2) a temporary increase in mortality rates; or
(3) the start of an increasing trend in mortality.

They considered the latter two hypotheses to be the most plausible, but noted that additional research would be required to discriminate between them. The Committee noted the importance of continued stranding monitoring to clarify the cause of such unusual events.

10.2.2.3 BREEDING STOCKS E AND F
The Committee welcomed papers on Breeding Stocks E and F and noted these will be relevant for the forthcoming assessment of these stocks. Two papers provided new information on the distribution and habitat use of humpback whales along the east coast of Australia (BSE1).

SC/62/SH21 described results from 13 satellite tags from northward migrating humpback whales off Evans Head, eastern Australia. In total, 371 days of location data tracked whales for nearly 21,000km. The results represent the first detailed movement data of this species in their proposed calving area around the southern Great Barrier Reef.

SC/62/SH25 described the first on-water photo-id study of humpback whales in the Great Barrier Reef Marine Park Cairns/Cooktown Management Area. Thirty percent of the 28 groups observed contained young calves, indicating that this may be an important nursery area for BSE1. Seven individuals were matched to sightings in other areas of

east Australia in previous years. Group size, composition, distribution and behaviour were also discussed. Further work is planned and data are available for collaborative research.

Three papers provided new information on the population structure and dynamics of BSE and BSF. SC/61/SH14 presented annual realised growth rates and survival of post-yearling BSE1 humpback whales off New South Wales, Australia (1994-2009). Several caveats were noted and suggestions for further analysis of these data are described in Annex H, item 2.2.2.

SC/62/SH7 reported on a large collaborative comparison of microsatellite genotypes from the migratory corridor along eastern Australia (n=734), the South Pacific Islands (n=1,086) and Antarctic feeding Areas I-VI (n=175). Breeding ground interchange was detected between Eastern Australia-New Caledonia (n=11) and Eastern Australia-Tonga (n=1). The only matches made to feeding grounds were between Eastern Australia and Antarctic Area V (n=3), despite larger sample sizes from Areas IV and VI. The authors concluded that breeding sub-stocks may be mixing on both their breeding and feeding grounds.

They also highlighted the feasibility of this type of collaborative research for studying migratory interchange on a large-scale. SC/62/SH18 reported photographic and genotypic mark-recapture estimates of abundance for humpback whales breeding at the South Pacific Islands (BSE2, BSE3 and BSF) for the period 1999-2003 and concluded that total combined abundance for these breeding stocks likely lies between 2,361 and 3,520 whales. No significant trend in abundance for this population was detected.

Additional details on the discussion of papers on BSE and BSF can be found in Annex H, item 2.2.3.

10.2.2.4 BREEDING STOCK X (ARABIAN SEA POPULATION)
The Committee received two papers with new information on the status of breeding stock (BSX). It had been given this name at a 2006 workshop on Southern Hemisphere humpback whales (IWC, In press). The population is believed to be resident to the Arabian Sea, is currently estimated at 82 individuals (95% CI=60-111) (Minton *et al.*, In press) and recently listed by the IUCN as endangered (Minton *et al.*, 2008). The Committee **agrees** to henceforth call this the Arabian Sea population.

SC/62/SH6 reported on the genetic distinctiveness and current population status of the Arabian Sea population. Genetic analyses based on 11 microsatellite markers and mtDNA sequences revealed significant differentiation between whales sampled off the coast of Oman (*n=67*), relative to the North Pacific and four Southern Hemisphere regions. Estimated levels of differentiation are among the highest recorded for humpback whale populations worldwide.

It is very unlikely that there is currently any exchange between the Arabian Sea and the Southern Indian Ocean stocks. Tests of population expansion suggest that the population has not yet started recovering and may still be in decline. SC/62/SH20 discussed the anthropogenic threats facing this population and challenges faced in monitoring this endangered population. Baleen whales in this region are potentially vulnerable to impacts from fishing, coastal development, shipping and noise and impacts. At least one live humpback whale entanglement in a gillnet is known to have occurred during the period 2007 and 2009. Research effort has been severely limited in recent years.

The Committee thanked the authors for this new information, noting its **great concern** over the status of this population. The Committee **strongly recommends** the continuation of research on humpback whales in the Arabian Sea in light of the small population size and escalating threats (see also Annex J, item 9.3). It further recognised the difficulty of undertaking such studies for small populations in remote areas.

The Committee also makes the following **recommendations** (in order of priority) for this population:

(1) studies that enable identification and quantification of threats to the Arabian Sea population should be initiated, including an in-depth investigation into the impact of bycatch;

(2) studies and surveys in Oman should be continued and expanded in scope to include more detailed genetic, acoustic and behavioural studies, as well as satellite telemetry studies;

(3) surveys should be encouraged in additional locations in confirmed range countries (Kuwait, India, Iran, Iraq, Oman, Pakistan, Sri Lanka, United Arab Emirates, Yemen), with particular focus on those countries with large coastal regions, such as Pakistan and India - in this regard, abundance surveys should be repeated on a regular basis in order to enable determination of population abundance and trend;

(4) further investigation into humpback whale occurrence in suspected/potential range countries (Bahrain, Maldives, Qatar, Saudi Arabia) should also be conducted; and

(5) studies and surveys to determine the population identity of whales in the Seychelles Exclusive Economic Zone should be performed.

The Committee further noted that given that this is a small population with known anthropogenic threats, it may well benefit from the development of a conservation management plan, following the model for western gray whales described under Item 10.4 and based upon Donovan *et al.* (2008). The Committee **agrees** that this should be explored further, perhaps within the context of conservation management plans being discussed by the IWC Conservation Committee

Further discussion of the Arabian Sea population is found in Annex H, item 2.2.4

10.2.2.5 FEEDING GROUNDS
SC/62/SH3 described a pilot study of cetacean distribution off Adélie Land that was launched by the French Polar Institute (IPEV) as part of the Southern Ocean Research Partnership (SORP). One photo-id match supported a migratory link between BSE and Area V. The Committee **recommends** the continuation of this programme, noting its relevance and utility for the forthcoming assessments of BSE and BSF.

SC/62/O12 presented a preliminary report of a joint Australian-New Zealand Antarctic Whale Expedition. Thirty humpback whales were satellite tagged on the Southern Ocean feeding grounds, and over 60 biopsy skin samples and approximately 60 individual fluke photographs were also collected. The Committee welcomed this research, which will make an important contribution to forthcoming assessments, and **recommends** its continuation. It also **recommends** that photo-id, biopsy sampling and satellite tagging research be conducted in other poorly surveyed areas of the Southern Hemisphere. The Committee **appreciates** the data sharing that has occurred post-expedition; this has been very productive with respect to matches identified with the East Australian breeding region and it **recommends** the continuation of such open collaborations. Finally, the Committee further **recommends** that long-term studies of humpback whales be undertaken and continued in the Southern Hemisphere.

SC/62/SH19 reported molecular genetic species identification of 281 whale bones collected between 2006 and 2007 in South Georgia. The prominence of humpback, fin and blue whale bones correspond to the early catch record in this area. Historical and contemporary humpback whale mtDNA haplotype diversity will be compared to measure the extent of the 'exploitation bottleneck' of stocks around South Georgia. The Committee **welcomes** this work and strongly **encourages** the continuation of bone collection for 'historical' DNA analysis. It further noted that this research will be important for the comparison of historic and current population abundance and diversity.

10.2.2.6 PRELIMINARY MULTI-STOCK ASSESSMENT
SC/62/SH33 reported preliminary results from the development of a population model that aimed to include all seven Southern Hemisphere humpback whale breeding stocks in a single joint assessment, with the purpose of allowing high-latitude historic catches to be allocated to breeding stocks in proportion to abundance, rather than on set ratios. The Committee **encourages** the further development of this model and the presentation of results in future meetings.

10.2.3 Antarctic Humpback Whale Catalogue
SC/62/SH17 described the progress of the Antarctic Humpback Whale Catalogue (AHWC). A total of 899 photographs of 721 individuals were catalogued from Antarctic and Southern Hemisphere waters for the interim

period. Images were submitted by 21 individuals and research organisations. These submissions bring the total number of catalogued whales identified by fluke, right dorsal fin/flank and left dorsal fin/flank photographs to 3,665, 413 and 407, respectively. New inter-area matches were as follows: BSG-Antarctic Peninsula (19), BSG-Chile (3), BSA and BSC3 (1; see SC/62/SH27) and BSE-Antarctic Peninsula (2; see Robbins *et al.*, 2008). Re-sightings were also made at the Antarctic Peninsula (3) and within BSG (11). Progress continues to encourage contributions from researchers and eco-tourism. A new on-line catalogue using Flickr is in development and can be viewed at *http://www. flickr.com/ahwc*. The Committee noted the importance of this IWC-supported work and **recommends** its continuation.

10.3 Southern Hemisphere blue whales
In 2002, the Committee recommended that the assessment of blue whales be started in 2005, after the completion of the IDCR/SOWER review (IWC, 2003a, p.41). In 2008, the Scientific Committee completed a circumpolar assessment of Antarctic blue whales (IWC, 2009f) and recommended that area-specific analysis be examined to evaluate whether separate assessments can be done for each IWC Management Area (IWC, 2009f). The Committee also recommended gathering data relevant for the assessment of non-Antarctic (pygmy-type) blue whales. Detailed discussions from this year can be found in Annex H, item 3.

10.3.1 New information
The Committee welcomed new abundance estimates of blue whales off Chile. A new analysis of line transect data collected as part of the 1997/98 SOWER cruise off Chile (Williams *et al.*, 2009b) resulted in an estimate of 303 individuals (95% CI=217-455). Aerial line transect surveys conducted off Isla Chiloé in 2007, 2009 and 2010 resulted in estimates of 97 (CV=0.51), 154 (CV=0.32) and 163 (CV=0.39) individuals, respectively. Further details of these surveys are presented in Annex H, item 3.1.

At last year's meeting, the Committee noted that available line transect estimates probably do not represent the total size of the population(s) present and recommended other approaches be used to estimate blue whale abundance. Progress was reported on the Alfaguara Project's field season off Isla de Chiloe (southern Chile), and particularly its continuing blue whale photo-id research. A preliminary mark-recapture abundance estimate was also presented for pygmy blue whales at the Perth Canyon, Western Australia. Further description of that on-going work is provided in Annex H.

The Committee **recommends** that new or revised estimates of abundance be provided to next year's meeting; specifically from Chile (Galletti and Hucke-Gaete). For Western Australia (Perth Canyon) the level of research necessary to improve the mark recapture data (which is currently very sparse in recaptures) for updated abundance estimates is unlikely to be affordable in the coming year. The Committee also **recommends** that the intersessional e-mail group under Bannister continues to work toward providing new estimates of mark-recapture abundance of blue whales and to report new information at next year's meeting.

The Committee was informed of progress on the development of a cooperative Southern Hemisphere blue whale photo-identification catalogue (SHBWC). Nine groups have joined the SHBWC, including researchers in Chile, the Eastern Tropical Pacific, Australia, Sri Lanka,

and Antarctica. Photo-id data from the Japanese Institute for Cetacean Research (ICR) Whale Research Program under special permit in the Antarctic (JARPA 1987/88-2004/05 seasons) has also been submitted to the IWC Secretariat and will be added to the SHBWC through the appropriate data availability channels. The Committee **welcomes** the update on the work of the SHBWC and **recommends** its continuation. It **recommends** that the photographs from the ICR catalogue should be compared to those already held at the Southwest Fisheries Science Center.

SC/62/SH29 reported on archiving and matching of blue whale photographs collected by the IDCR/SOWER cruises between 1987/88 and 2008/09. Over 23,000 photographs were obtained from all six IWC Management Areas, with 219 individual whales identified. Results suggest some degree of residency within a summer feeding season.

The Committee **recommends** that work on the Southern Hemisphere Blue Whale Catalogue (SHBWC) be continued. Over the next two years this will require completion of the matching from the three regions. Budget implications are given under Item 24.

SC/62/SH21 reported on satellite tagging of pygmy blue whales off southwestern Australia. Three tags were deployed (two males, one female) and the whales were tracked for over 8,000km. The tag with greatest longevity (137 days) provided definitive evidence of a link between whales that feed offshore of the Perth Canyon and those that occur around eastern Indonesia, such as the Banda Sea where reports of blue whales appear to be increasing.

The Committee welcomed a number of studies on blue whale acoustics. SC/62/SH26 described the migratory patterns and estimated population sizes of pygmy blue whales traversing the Western Australian coast. An analysis of passive acoustic data estimated that 662-1,559 pygmy blue whales passed the sampling instrument during the 2004 southbound migration. The Committee noted that the acoustic approach to estimating population size reported here represents an important theoretical development, but noted that a number of assumptions of this method needed to be explored in more detail before it could be considered to produce robust estimates of abundance. The Committee also encouraged the continuation of this work.

Gedamke and Robinson (2010) reported the results of an acoustic survey for whales and seals in eastern Antarctic waters (30-80°E) between January and February 2006. Blue whales were the most commonly recorded species identified. They were detected in large concentrations where relatively extensive sea ice remained off the continental shelf and the more eastern waters off the Prydz Bay region. Two detections of pygmy blue whales represent the most southerly recordings of these species.

SC/62/SH13 described results from passive acoustic monitoring for the presence of baleen whales off the coast of Northern Angola, off the Congo River outflow. A series of pygmy blue whale calls were detected by two marine autonomous recording units deployed between March and December 2008, 15km and 24km offshore. This represents the first confirmed modern documentation of this sub-species in Southeast Atlantic waters north of 60°S since the cessation of commercial whaling for blue whales in the region. The calls were of the type attributed to the Sri Lanka population of pygmy blue whales, and not previously recorded outside of the Indian Ocean. Antarctic blue whale calls were not detected. The recording of Sri Lanka pygmy blue whale calls in the Atlantic Ocean was considered to be of great interest.

Progress was reported on a genetic study of Antarctic blue whales, which has been carried out with access to 218 IDCR/SOWER biopsy samples provided by the IWC. More than half of the haplotypes detected thus far have not previously been described. Analysis of the samples is ongoing and the results will be used to estimate the minimum historical population abundance of the Antarctic blue whale. The Committee welcomed this work and **recommends** its continuation. It was observed that this study expands on the haplotype data originally reported by LeDuc *et al.* (2007); the additional haplotypes reported here likely originated from IWC Management Areas II and III (Donovan, 1991), which were under-sampled in the previous study.

The Committee welcomed information on an upcoming study of the global taxonomy of blue whales using mitogenomic and nuclear sequence data. This work aims to conduct a comprehensive genetic assessment of blue whale taxonomy using next-generation sequencing methods to sequence whole mitogenomes and a large number of nuclear regions, for phylogenetic analysis. The project will particularly focus on determining the sub-specific status of blue whales in the North Pacific. The Committee **strongly encourages** continued collaborative efforts to acquire blue whale samples globally, and welcomed further updates on the results of the study

Four blue whale genetic projects are currently in progress: (1) genetics of blue whales in Geographe Bay, Western Australia, as part of a southern Australian study (11 samples collected, 11 analysed and archived, Möller, see SC/62/ProgRepAustralia); (2) a genetic population structure study of blue whales in the southeast and Eastern Tropical Pacific regions (Flores-Torres); (3) a global taxonomy study of blue whales (Lang); and (4) a genetic analysis of the diversity of IDCR/SOWER Antarctic blue whale biopsy samples and South Georgia whalebones (Sremba). The Committee **encourages** continuation of this research and **recommends** that results from these studies be reported when they become available.

10.4 Western North Pacific gray whales (BRG)
10.4.1 New scientific information
Considerable information was presented, and this is discussed in Annex F, item 6.1. Only a brief summary of that work is given here.

In SC/62/BRG11, data generated using a panel of 13 microsatellite loci were combined with updated information from mtDNA control region sequences to further assess the population structure of gray whales in the North Pacific. The results are consistent with the possibility that there may be some dispersal between two populations but that observed genetic differentiation is supportive of two populations.

SC/62/BRG10 presented the results of a paternity analysis conducted on the western gray whale population. The results suggest that some males that contribute to reproduction in this population may not regularly use the primary Sakhalin feeding ground. This highlights the need to collect genetic samples from animals recorded in other areas of the western gray whale's range. The results also provide evidence of interbreeding among animals that show fidelity to the Sakhalin feeding ground.

SC/62/BRG5 presents the first analysis of genetic (mtDNA) data obtained from the gray whales migrating along the Japanese coast (n=6) and incorporated comparison of these with a sample of animals from the Chukotkan hunt in 2008 (n=7). In summary, while recognising the small sample size: (a) all of the mtDNA haplotypes found had been

previously reported; (b) the level of genetic diversity within samples was surprisingly high; (c) no genetic heterogeneity in haplotype frequencies was detected between the two samples; and (d) phylogenetic analysis of the haplotypes detected no distinct cluster for the Japanese whales.

The Committee **welcomes** these analyses. It **encourages** the collection of more samples from areas outside Sakhalin feeding ground when they are available and **recommends** a more detailed analysis of samples currently available and a number of suggestions are given in Annex F, item 6.1.

The Committee also received a number of papers on distribution and abundance. A number of points of interest were raised by these papers including:

(1) the potential for western gray whales to reoccupy parts of their former range if the currently small population expands (SC/62/BRG3);
(2) significant annual variation in whale densities among years within the Piltun and offshore feeding areas (SC/62/BRG4);
(3) updated information on an industry-sponsored monitoring programme using photo-id included the movement of animals between Sakhalin and Kamchatka and mother-calf pairs in Olga Bay, Kamchatka (SC/62/BRG9);
(4) updated information from the 2009 collaborative Russia-U.S. research programme (SC/62/BRG6);
(5) comparison of age at sexual maturity in western and eastern gray whales suggesting that the range 6-12 yrs is appropriate for both populations although further data would be welcome (SC/62/BRG2); and
(6) updated information on research and conservation in Japan including information on skeletal studies and an educational programme for fishermen (SC/62/O7).

The Committee **welcomes** all of the new information on this critically endangered population. It **encourages** further work and as in previous years, re-emphasises the importance of continued long-term monitoring. The Committee **recommends** that, if the observed density of gray whales in the Piltun feeding area continues to decline or remains lower than in previous years, future studies should investigate whether this reflects natural variation (e.g. in prey availability), industrial disturbance or some other factors.

Donovan reported on progress with the telemetry programme on western gray whales that has been recommended by the Committee (e.g. see IWC, 2010c). He reported that the programme is progressing and that all involved are grateful to Ilyashenko and his colleagues at IPEE for their work to try to ensure that this project goes ahead, particularly at this stage with respect to the permit issue. An overall administrative and scientific structure has been agreed between the participating institutions and companies, the IWC and IUCN. The scientific steering group is continuing to work on finalising the protocols that will ensure that the IWC Scientific Committee safeguards and guidelines are met as it has been tasked by the Committee; the final protocols will be drawn up in co-operation with IPEE and OSU. IWC, IUCN and the funding companies are also working hard on difficult budgetary issues. It is hoped that it will be possible for the programme to take place this summer.

10.4.2 Conservation advice
The Committee again **recognises** that the problem of net entrapment of western gray whales is a range-wide issue. It **welcomes** the efforts of Japan to reduce mortality, including the educational programme, and notes that net entrapments

could occur in other range states. Brownell summarised plans for seismic surveys off Sakhalin Island in 2010. There is concern that anthropogenic sound, especially from seismic surveys, will negatively affect western gray whales in their primary feeding area. Previously, the Commission expressed concern and passed resolutions on this topic. Two seismic surveys in or near the feeding area are planned for 2010. It was noted at the recent meeting of the IUCN Western Gray Whale Advisory Panel that the company (Rosneft) planning the later survey has not followed the same procedures in regard to monitoring and mitigation as the company planning the first survey (by Sakhalin Energy). As currently planned, the Rosneft survey will occur while the highest number of feeding gray whales, including cow and calves, are present. The Committee is **extremely concerned** about the potential impact on western gray whales and **strongly recommends** that Rosneft postpone their survey until at least June 2011 The Committee also **recommends** that Rosneft use monitoring and mitigation measures similar to those used by Sakhalin Energy (see Annex F, Appendix 4), which have been independently reviewed by experts, and that all energy companies operating in the feeding areas of western gray whales should use comprehensive monitoring and mitigation measures to protect western gray whales.

As in previous years, the Committee **acknowledges** the important work of the IUCN Western Gray Whale Advisory Panel (WGWAP). This year's update on the panel's activities is given in Appendix 4 of Annex F. Noting that the WGWAP's present contractual five year life span ends after December 2011, the Committee **re-emphasises** its view that its work is important and should be **continued** if at all possible, and the Committee **requests** the Secretariat to send a letter to IUCN in this regard.

In 2009, the Committee welcomed the report of the IUCN range wide workshop (IUCN, 2009). An important conclusion of that workshop was the need for the development of a conservation plan for western gray whales and this recommendation was endorsed by the Scientific Committee.

This year, the Committee was extremely pleased to receive the first draft of this important Plan (SC/62/BRG24). It **commends** the authors, who include scientists from range states as well as elsewhere, for this important document. The Plan follows the guidelines developed for such plans by Donovan *et al.* (2008) that were endorsed by the Committee (IWC, 2009a). Much of it is based on the report and recommendations of the IUCN rangewide workshop that have also been endorsed by this Committee. The Committee emphasised that the Plan should be supported and endorsed by many stakeholders, including national and local governments, industry, and non-governmental organisations, as well as international organisations such as IWC and IUCN. The overarching goal of the Plan is to reduce mortality related to anthropogenic activities to zero as quickly as possible. The Plan includes 11 focussed actions (related to co-ordination, public awareness, conservation research, monitoring and mitigation) of high importance for the conservation of this critically endangered population. The most immediate, in terms of ensuring the success of the Plan is the appointment of a Steering Committee and of finding funds for and appointing a full-time Co-ordinator. This is also critical to the need, identified by the authors, to engage broad stakeholder participation in the Plan as soon as possible.

The Committee **strongly endorses** this Plan and **commends** it to the Commission and range states. It also **recommends** that it is broadly distributed, including being posted on the IWC and IUCN websites. Consideration is being given to it being published by the *JCRM*. The Committee **recommends** the Plan as a model for the development of other conservation plans for cetacean populations.

10.5 Southern Hemisphere right whales
10.5.1 Australian and New Zealand areas
The Committee received a number of papers on southern right whales from these areas. Details can be found in Annex F, item 5.3. A number of points of interest from these are given below:

(1) genetic comparison of animals around the subantarctic Auckland Islands and the main islands of New Zealand provided documented evidence for the first time of the movement between the two regions and, along with other available data, is most consistent with either the one stock or the extirpation/recolonisation hypotheses (SC/62/BRG16);

(2) results from satellite telemetry provided data on migratory movements of three whales tagged at the Auckland Islands revealed that animals from this nursery area/breeding ground can move north to their feeding ground - the reverse of the generally accepted migratory pattern for southern right whales (SC/62/BRG19);

(3) information on acoustic contact calls from southern right whales near the Auckland Islands (SC/62/E13); and

(4) updated information on long-term aerial survey monitoring programme along the southern Australian coast results in an annual increase rate for cow/calf pairs of around 7.5% (95%CI 3.2, 12.0) for the period 1993-2009 and a minimum population size of 2,530, with a total Australian population of about 3,000.

Difficulties or complications experienced in obtaining permits for biopsy sampling of right whale calves were discussed. Although there were legitimate concerns over possible disturbance to mother-calf pairs, no adverse effect had been shown on subsequent calving interval in a study of the effects of biopsying over 100 cow-calf pairs off South Africa, although the statistical power was low (Best *et al.*, 2005). Given the potential value of such sampling, particularly in establishing issues of paternity the Committee **recommends** that permitting authorities should view requests for biopsy sampling of cow-calf pairs on their scientific merit and apply appropriate safeguards to limit the degree of disturbance where necessary.

10.5.2 South America area
The primary item discussed under this item was the report of a workshop (convened by Brownell) held at the Centro Nacional Patagónico (CENPAT) in Puerto Madryn, Argentina from 15-18 March 2010. The goal of the workshop was to investigate the causes of the high mortality of southern right whales around Península Valdés, Argentina. Participants included experts on the ecology and marine environment of the Península Valdés region, scientists studying right whales in the South Atlantic and international experts on whale strandings and mortality.

Small numbers of strandings have been recorded in the region since 1971. However, since 2003, when the Southern Right Whale Health Monitoring Program (SRWHMP) was established, a total of 366 right whale deaths have been recorded, with peaks in 2003 (31), 2005 (47), 2007 (83), 2008 (95) and 2009 (79). Over 90% of the deaths have been

of first-year calves. After investigating thoroughly a range of possible causes for these first year deaths, the workshop agreed three leading hypotheses (it was not possible to determine which was most likely and some combination of factors may have occurred, at least in some years): (1) reduced food availability for adult females; (2) biotoxins; and (3) infectious disease.

The workshop recommended a number of steps to build a better understanding of the cause or causes as listed in Annex F, item 5.3.2.

Of these, continuation of the long-term aerial photo-id programme, other complementary monitoring effort and the SRWHMP are highest priority. The workshop agreed that cooperation and collaboration among research groups is essential for addressing complex questions concerning the die-offs. A western South Atlantic right whale consortium (the North Atlantic right whale consortium) could be used to establish and maintain links among researchers and to share information (this should also include researchers in different parts of the range). Efforts to improve such cooperation and collaboration should be a high priority for local and national governments, NGOs and INGOs.

It was also agreed that the absence of conclusive information regarding the cause(s) of exceptional right whale mortality should not preclude authorities from proceeding with some management measures, particularly in relation to kelp gulls, where gull lesions are clearly harmful to the whales, especially the calves.

The workshop also recognised: (1) the considerable efforts of the researchers in Argentina (and abroad) to investigate the die-offs in the face of fiscal and logistical constraints; and (2) the importance of governmental commitment to the long-term conservation of right whales in Argentina.

The Committee thanked Brownell for his presentation and **endorses** the workshop report. The Committee **welcomes** the announced intention of the Argentine authorities to introduce this year a pilot plan for the control of nuisance gulls.

As in previous years, the Committee **recognises** the value of the long-term photo-id programme of right whales at Península Valdés that had now lasted 40 years, particularly in being able to describe the significance of the recent die-off events and test certain causation hypotheses. It **strongly recommends** its continuation. It also noted that this year emergency funding had been provided by the US Marine Mammal Commission to enable the necropsy programme to take place and strongly **recommends** the continuation of this programme to investigate the reason(s) for the die-off.

The Committee also considered SC/62/BRG15, a preliminary assessment of the genetic structure of the southern right whales from Península Valdés, Argentina. A number of comments to assist in future analyses were raised in discussion (Annex F, item 5.3.2) and the Committee looks forward to an updated analysis next year.

The Committee was pleased to receive information on the 2009 flights of an aerial survey programme off Brazil and it **recommends** the continuation of the surveys.

10.5.3 South Africa area
The Committee was pleased to receive updated information on demographic parameters obtained from the long-term monitoring programme of South Africa (SC/62/BRG30). The results are discussed in Annex F, item 5.3.3 but key features include an annual growth rate of about 7% (95% CI 6.5%, 7.5%); a mean calving interval of about 3.2 years; and a population size in 2006 as about 4,100 animals.

SC/62/BRG31 examined the possibility of changes in some demographic parameters for right whales off South Africa through the analysis of re-sighting data for females with calves over the 1979-2006 period. No statistically significant change in adult survival rate or population growth rate was found but a reduction in mean calving interval from 3.2 to 3.1 years was detected.

SC/62/BRG33 reported on the recent announcement of the intention to drill exploratory boreholes for natural gas in eight districts of the coastal region of the southwest coast of South Africa, three of which included nearshore waters that were home to the largest concentration of cow-calf pairs on the African coastline. About 75% of cow-calf pairs on the southern African coast occur in this region in spring, some of which are resident for up to three months, while the westward coastal movement seasonally means that an even larger proportion of the population almost certainly uses the region.

The Committee viewed this potential development with concern, noting the current lack of information available on the proposed activities. It **recommends** to the South African government that all permits issued for exploratory activities should contain mandatory mitigation measures to avoid disturbance to right whales, including confining all marine drilling activity to the season when right whales are absent (January to May). It also **recommends** that if gas production is ultimately planned for the region, the use of closed areas or the development of further mitigation measures such as directional drilling should be considered.

The Committee **endorses** a proposal for the establishment of a Southern Ocean Right Whale Photo-identification Catalogue (the Antarctic Humpback Whale Fluke catalogue). The intention is to provide a resource that could be consulted when researchers holding images taken in coastal waters wished to establish linkages with feeding grounds in pelagic waters (see Appendix 2 of Annex F for detail). It was confirmed in discussion that this would be supplementary to such coastal catalogues. The Committee looks forward to receiving a progress report at its next meeting. Funding is dealt with under Item 24.

10.5.4 Plans to review southern right whales
Brownell reported on progress in preparing for the Southern Right Whale Assessment Meeting, planned to be held at Puerto Madryn, Argentina, in September 2011. Given that this meeting would be held very shortly after next year's IWC meeting a budget would have to be prepared at this meeting (and reserved until 2011). A small group was set up to draw up the budget and draft the Terms of Reference for the meeting (see Annex F, Appendix 3). The Committee **agrees** that this should be funded next year.

10.5.5 Other
The Committee recognises the importance of long-term studies, to provide biological information from photo-id and information on trend and population size from sighting and mark-recapture analyses. It **strongly recommends** the continuation of such long-term studies in relevant areas.

10.6 Other stocks of right whales and small stock of bowhead whales
10.6.1 North Atlantic right whales
An update was provided on North Atlantic right whales for the period May-October 2009, as an addendum to information presented in Pettis (2009). The summary reflects the work of the North Atlantic Right Whale Consortium (NARWC). A shared photographic catalogue was used to produce a 'best'

estimate of population size of 438 for 2008. This total did not explicitly account for unphotographed whales in the population and may change slightly as additional data are incorporated into the catalogue. One right whale death was documented during the report period, but the cause was not determined. Additionally, there were three new entanglement cases and eight previous entanglement cases that had not yet been resolved.

The Committee **agrees** that the documented growth in the catalogue plus successive years of improved calf production gave grounds for cautious optimism over the future status of this population. However, while welcoming the management measures that have been taken to date, 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.

10.6.2 North Pacific right whales

SC/62/BRG3 reviewed past sightings of North Pacific right whales off western Kamchatka from spring to autumn. A number of sightings of these whales were made during Japanese-led surveys from 1989 to 2003; these were mostly restricted to the southern portion of study area. However, there were also a few sightings in earlier years by Soviet scientists, including in the northern part of the area. These sightings also highlight the need for directed research and monitoring of right off western Kamchatka in areas overlapping with fishery and oil and gas development activities.

SC/62/NMP22 provided results of observations of North Pacific right whales during the common minke whale sighting and biopsy survey conducted in the Okhotsk Sea in summer 2009. The research area was set north of 46°N, south of 57°N and west of 152°E in the Okhotsk Sea including the Russian EEZ. 17 schools (29 animals) of North Pacific right whales were found, mainly in the offshore waters deeper than 200m. Of these, 16 schools were targeted for photo-id research and 22 animals in 15 schools were individually identified (there are no re-sightings among them).

The Committee welcomes the sighting and photo-id information from these cruises and **encourages** continuing these studies in the area.

Wade *et al.* (2010) used photographic and genotype data to calculate the first mark-recapture estimates of abundance for right whales in the Bering Sea and Aleutian Islands. The estimated abundance data reveal this to be an extremely small population of perhaps around 30 animals. The results will be updated using more samples and images from another survey planned in the eastern North Pacific this year and the Committee looks forward to receiving this information.

Noting the extremely small size of this population, and also the potential for disturbance and ship-strike mortality from greatly increased ship traffic resulting from the likely opening of the northeast or northwest Passages due to sea ice retreat, the Committee considers it **a matter of absolute urgency** that further research be conducted on eastern North Pacific right whales, and **recommends** that this research focus on assessing status and identifying any current sources of anthropogenic mortality.

10.6.3 Small stocks of bowhead whales

SC/62/BRG3 summarised sightings of bowhead whales off western Kamchatka from existing published literature and other available sources. Okhotsk Sea bowhead whales were recorded only a few times in the study area during the spring-autumn period, with one sighting during winter; however it is known from historical whaling data that this species was abundant in the area, particularly in the northern regions during periods of open water.

SC/62/BRG20 reported the results of a survey for bowhead whales conducted in the Fram Strait during 29 March-14 April 2010. Two observations were made, but it was determined based on identifiable scars that both encounters were of the same individual.

Witting reported that 12 sighting of bowhead whales were made in the Northeast Water Polynia off Northeast Greenland during an aerial survey for walrus during August 2009. He also reported that a female with a calf was seen off Norske Island, Northeast Greenland in July 2009. In discussion, it was noted that two passive acoustic recorders were deployed in the Fram Straight during 2008-09 and that these instruments detected numerous bowhead sounds including songs.

The Committee welcomes the above information and **encourages** future updates and research.

10.7 Antarctic cruises

10.7.1 General review of 2009/10 cruise

The planning meeting for the 2009/10 IWC/SOWER cruise was held in Tokyo, Japan in September 2009 (SC/62/Rep6). The cruise took place in Area IV and had two main objectives: (1) to undertake a sightings survey in collaboration with an Australian Antarctic Division aerial survey; and (2) to continue research on the priority species (southern right, blue, fin, and humpback whales). The total number of minke whales sighted in the research area was 83 groups, comprising 152 animals; humpback whales were the most frequently sighted species (174 groups comprising 322 animals). Biopsy samples and individual identification photographs were taken from 21 and 45 humpback whales and 22 and 26 southern right whales, respectively. A total of 28 groups of southern right whales (38 animals) were sighted (SC/62/IA1).

The Committee thanks the Government of Japan for generously providing the vessel and crew for this survey, and also thanks the Cruise Leader for her efforts. Noting that this was the last IDCR/SOWER cruise, the Committee also extended its appreciation to all member nations and researchers who had contributed to this extensive programme, and particularly to the governments of Japan and the former Soviet Union, for providing the survey vessels. The data collected during the programme provide an unparalleled source of information on Antarctic cetaceans. The experience gained from these surveys will continue to be of use in planning future studies, in the Southern Ocean and elsewhere. The Committee **agrees** that a Special Issue of the *JCRM* on the IDCR/SOWER surveys is warranted and re-establishes the working group to progress this idea (see Annex Q).

10.7.2 Plans for cetacean sighting surveys in the Antarctic in the 2010/11 season

SC/62/O17 described a dedicated, systematic cetacean sighting survey which was being planned to take place from December 2010 to February 2011 in order to obtain estimates of abundance for use in the RMP. The research area will be south of 60ºS in Area V and the western part of Area VI (130ºE-145ºW), including the Ross Sea. This survey will be conducted in relation with the Japanese Whale Research Programme under special permit in the Antarctic (JARPA II). Two dedicated, sighting survey vessels, *Shonan-Maru No.2* and *Yushin-maru No.3*, will be used and the survey procedures will be based on the standard

SOWER search modes; closing (NSC) mode and passing with the independent observer (IO) mode.

In order to minimise difficulties associated with survey design, an intersessional Working Group was established under Matsuoka (Annex Q). The Committee **agrees** that Matsuoka is responsible for IWC oversight.

10.8 North Pacific cruises
10.8.1 Recommendations for 2010 cruise and short term objectives
During the last year's Scientific Committee meeting, Japan presented a proposal for a medium- to long-term research programme involving sighting surveys to provide information for cetacean stock management in the North Pacific. The Scientific Committee welcomed the initiative and agreed the value of a large-scale, medium-long term integrated research programme in the North Pacific and encouraged this in the context of international collaboration under IWC auspices.

A meeting to discuss the North Pacific survey programme was held in Japan in September, 2009 (SC/62/Rep3). The meeting agreed four terms of reference:

(1) review the Scientific Committee's issues in the North Pacific;
(2) review the past and ongoing survey activities and available data in range states;
(3) consider possible line transect survey plans and additional data collection (e.g. photo-id and biopsy) for the 2010 season; and
(4) prepare a proposal for an intersessional workshop (to be held between SC/62 and SC/63) on future surveys beyond 2011.

SC/62/IA15 was provided in response to the first term of reference from the meeting and provided a summary of the Scientific Committee issues relating to North Pacific sei, common minke, Bryde's, right and blue whales. The distributions of these whale species were described and requirements for further surveys, in order to estimate abundance and investigate stock structure, were considered.

SC/62/IA10 presented the research plan for an IWC/Japan whale sighting survey taking place in summer 2010. The plan had been drawn up following guidelines agreed at the North Pacific programme intersessional meeting. The research area (170°E-170°W) had been chosen because for some species it spans proposed stock boundaries and has been poorly covered by previous surveys, representing an important information gap for several large whale species. The cruise will collect line transect data to estimate abundance, and biopsy/photo-id data contributing to the work of the Scientific Committee on the management and conservation of populations of large whales in the North Pacific. It will provide:

(1) information for the proposed future in-depth assessment of sei whales in terms of both abundance and stock structure;
(2) information relevant to *Implementation Reviews* (e.g. common minke whales) in terms of both abundance and stock structure;
(3) baseline information on distribution and abundance for a poorly known area for several large whale species/populations, including those that were known to have been depleted in the past but whose status is unclear; and
(4) biopsy samples and photo-id photos to contribute to discussions of stock structure for several large whale

species/populations, including those that were known to have been depleted in the past but whose status is unclear.

The cruise will last about 60 days (including transit time) between July and August. In order to adequately cover the longitudinal range, the latitudinal range is restricted between a southern boundary at 40°N and a northern boundary at the Aleutian Islands chain. Four researchers can be accommodated on this cruise; US and Korean scientists will participate. The cruise will follow the requirements for reports and documentation developed for cruises that could provide data for use under the RMP and will be the responsibility of the Japanese scientists.

The Committee thanked the Government of Japan for its generous offer of a vessel for this survey. Matsuoka was assigned responsibility for IWC oversight.

Brownell reported that a scientist from SWFSC had now been identified for the cruise, but major problems regarding CITES permits remain; these issues are similar to those described in SC/62/NPM22 that were encountered between Japan and Russia for the collection of minke whale biopsy samples in the Russian EEZ. There are CITES issues for both inside and outside the US EEZ, because samples collected outside the US EEZ have to enter US waters and then all samples must be exported to Japan. A possible solution (institutional permits) has been proposed to Japan and it is being considered. If these problems are not worked out, it will not be possible to collect any biopsy samples (inside or outside the US EEZ) during this cruise. This would be a major scientific loss to advancing our understanding of the stock structure of baleen whales in the North Pacific, specifically sei whales. The Committee **recognises** the importance of the CITES issue and agreed that it should be resolved among parties concerned expeditiously. The Committee **endorses** the working group's report, and **recommends** that the investigations regarding the use of Institutional permits to exchange biopsy samples proceed as soon as possible, with the results of the investigations being reported to the Planning Meeting scheduled for October 2010.

SC/62/O16 described two sighting surveys for cetaceans, taking place in the North Pacific in 2010, to examine the distribution of sei, Bryde's and minke whales and to estimate abundance for use in the RMP. Both surveys are in the middle part of the Western North Pacific. The main target species are sei and minke whales for the first survey and Bryde's whale for the second survey. The Committee assigned responsibility to Matsuoka for IWC oversight.

10.8.2 Mid- to long-term plans for the North Pacific Survey Programme
In addition to plans for a 2011 cruise, the Committee **recommends** that a coherent multi-year plan be developed for the survey programme in accordance with the discussion given in SC/62/Rep3. A Steering Group to oversee the IWC North Pacific surveys was established under Kato (Annex Q). It was proposed that a meeting of the Steering Group should be scheduled immediately prior to the Planning Meeting for the 2011 cruise, in order to develop the programme of research to be undertaken over the next few years.

10.9 Other
The precise taxonomic relationships and species delineations within the Bryde's/Eden's whale complex are currently uncertain. In South Africa, 'inshore' and 'offshore' forms of Bryde's whale have been described (Best, 1977), and there has been some uncertainty as to whether they should

be referred to as *B. edeni* and *B. brydei* respectively. The Committee received a proposal for opportunistic collection of biopsy samples of Bryde's whales during a forthcoming research cruise between the Strait of Gibraltar and Cape Town, South Africa. These samples would be used to facilitate more in-depth genetic analysis of the relationship between the 'offshore' form and other more well sampled Bryde's whale species. The Committee **recommends** this proposal, assuming that relevant permits will be acquired. The Committee also **recommends** that biopsy samples from other whales be obtained, where legally permitted to do so.

11. STOCK DEFINITION (SD)

This Agenda Item was established in 2000, and has been handled since then by a Working Group; see IWC (1999d, p.83) for the original Terms of Reference. The term 'stock' has been used with different meanings in different contexts at different times, both within IWC and in other management and conservation contexts. These multiple meanings have sometimes hindered the Committee's ability to provide management advice. The Working Group was set up to clarify the issue of 'stocks' in a management context (see Item 11.3), to create a bridge between IWC and the expertise of the wider population genetics community (see Items 11.2 and 11.3), to develop software that evaluates the management utility of various population genetic analyses (see Item 11.2), and to develop guidelines for preparation and analysis of genetic data within an IWC context (see Item 11.1). These issues are of fundamental importance to the Committee's discussions on assessments and to the development of management advice. The Report of the Working Group is given as Annex I.

11.1 Statistical and genetic issues related to stock definition

11.1.1 Guidelines on DNA data quality
The Committee has previously endorsed a general set of guidelines for ensuring sufficient quality in genetic data used for management advice (IWC, 2009g; *http://www.iwcoffice. org/sci_com/handbook*). These guidelines constitute a 'living document' that will be updated as necessary. Since the issues involved are complex, the guidelines currently lack any numerical reference points, and the Committee again **encourages** suggestions accordingly. The intersessional e-mail group established in 2008 (Annex Q) was unable to report back this year, but will be continued in the coming year. The item remains on the agenda for the 2011 Annual Meeting.

11.1.2 Guidelines on genetic and statistical analysis
In parallel with the development of data quality guidelines, the Committee is developing guidelines for some of the more common types of statistical analyses of genetic data that are employed in IWC management contexts. These guidelines, which are being developed through another intersessional working group, are at an earlier stage of development than the DNA data quality guidelines. The proposed structure of the document, including a motivating example, was shown last year (IWC, 2009h).

This year, the Committee reviewed a preliminary version of the guidelines (SC/62/SD1), with drafts of several of the sections. Some further work is required, but after one further iteration, the guidelines should be able to appear on the IWC website. Following review of the text so far, a number of suggestions were made for the next iteration, including an 'FAQ' and the possible use of simulated datasets from

TOSSM (see Item 11.2) as worked examples. The full list may be found in Annex I. This document will entail a great deal of effort, but should be of lasting importance. It deserves to be published, both online via IWC and in peer-reviewed literature.

11.1.3 Other approaches to stock identification
The Committee has previously considered the utility of acoustic data in questions of stock definition (IWC, 2005e, pp.248-49). Acoustics may be an efficient tool for proposing stock distinctions and boundaries, but interpretation can be difficult unless *inter alia* the stability of individual acoustic behaviour over time is known. This year, paper SC/62/SD2 presented results from acoustic monitoring of fin whales in different seasons and regions of the Mediterranean. The Strait of Gibraltar and Alborán Sea areas experience an influx, during the breeding season only, of fin whales that are acoustically consistent with Icelandic or Norwegian animals, but distinct from other Mediterranean fin whales. The results suggest a possible explanation for the low levels of gene flow that have been found between Mediterranean and North Atlantic fin whale populations. The Committee noted the value of these new data in suggesting rather precise areas where stock mixing and/or separation may occur, and consequently in assisting development of economical sampling design. It **encourages** plans to follow up this study with biopsy sampling.

11.2 TOSSM (Testing of Spatial Structure Models)
The aim of the TOSSM project is to facilitate comparative performance testing of population structure methods intended for use in conservation and management planning. From an IWC perspective, the TOSSM software package allows evaluation of methods for detection of genetic structure, in terms of how well the methods can be used to set spatial boundaries for management. As noted last year, the framework is now complete and the software is available for all to use; simulated datasets exist for three of the five stock-structure archetypes previously proposed by the Committee (IWC, 2009a, p.51). To date, ten methods have been tested on datasets from the two simplest Archetypes (single-stock panmixia, and two populations with limited migration sampled and harvested on the breeding grounds). No new results were received this year. Just as last year, though, the Committee noted the relevance of Archetype IV to North Pacific common minke whale discussions, where program STRUCTURE (Pritchard *et al.*, 2000) is receiving extensive use. It may well be possible to use TOSSM datasets to investigate the likely performance of STRUCTURE in a North Pacific minke whale-like setting, not merely in terms of overall 'boundary setting' but also in terms of specifics such as ability to assign individuals to specific stocks.

Mark-recapture data are another powerful tool for investigating stock issues. These have not yet been considered in TOSSM; next year, the Committee will consider the feasibility of incorporating mark-recapture data into TOSSM datasets. Another potentially powerful tool is the suite of coalescent-based methods but no coalescent-based approaches to boundary-setting have yet been considered in TOSSM. The Committee hopes to consider results of a TOSSM on the coalescent-based software MDIV next year.

There has been much discussion of how to interpret results from the program STRUCTURE, specifically in assigning individuals either to a smaller number of stocks which mix to a different extent in different places,

or to a larger number of 'new' stocks that are less mixed. The Committee **encourages** the submission of papers investigating the performance of STRUCTURE for this question, and noted that datasets from TOSSM (existing ones, or new ones if necessary) might be a good starting point for such investigations.

11.3 Unit-to-conserve
'Unit-to-conserve' is a standing item on the SD Working Group agenda. It provides for discussion of potential 'definitions of stock' in a management context, including their operational implications for measurement and management. No new proposals were considered this year.

12. ENVIRONMENTAL CONCERNS (E)
The Commission and the Scientific Committee have increasingly taken an interest in the possible environmental threats to cetaceans. In 1993, the Commission adopted Resolutions on research on the environment and whale stocks and on the preservation of the marine environment (IWC, 1994a; 1994b). A number of resolutions on this topic have been passed subsequently (IWC, 1996a; 1997; 1998a; 1999b; 1999c; 2001c). As a result, the Scientific Committee formalised its work on environmental threats in 1997 by establishing a Standing Working Group that has met every year since then. Its report this year is given as Annex K.

12.1 State of the Cetacean Environment Report (SOCER)
The SOCER aims to provide Commissioners and Scientific Committee members with a non-technical summary of events, developments and conditions in the marine environment relevant to cetaceans. The report is compiled annually, in response to IWC (2001c), with a focus on one pre-selected region each year plus a global section.

The 2010 SOCER was focused on the Arctic and based on peer-reviewed papers published between 2008 and 2010. The overwhelming issue for the Arctic was climate change – e.g. rate of ice loss and ecosystem shifts – but many of the papers in the review period had already been summarized in previous Committee reports because of their global significance. There were few pollutant studies specifically on cetaceans in 2008-10, but the Arctic Monitoring and Assessment Programme (AMAP) 2009 Assessment of Arctic Pollution Status (*http://www.amap.no/*) provides a comprehensive review of pollutant levels in the Arctic. Globally, the environmental issue that received the most attention over the past year was underwater noise, especially disturbance from boat traffic, impacts of sonar on beaked whales and the acoustic impacts of wind farms. Of note, a bibliometric analysis showed that there has been a shift in focus in the cetacean research literature from basic biology topics, which were prevalent in the literature in the 1970s, to conservation topics in recent years. Next year the SOCER will focus on the Southern Ocean.

12.2 Review progress in planning for POLLUTION 2000+, Phase II
The IWC-Pollution 2000+ programme was initiated to investigate pollutant cause-effect relationships in cetaceans, and arose from a Workshop on chemical pollution and cetaceans held in Bergen, Norway in 1995 (Reijnders *et al.,* 1999). Following the Bergen workshop, a planning meeting was held in 1997 (Aguilar *et al.,* 1999a) and a workshop was held in 1999 (Aguilar *et al.,* 1999b), where Phase I of

the POLLUTION 2000+ programme was launched. Phase I had two objectives: (1) to select and examine biomarkers for exposure to and/or effects of PCBs; and (2) to validate/calibrate sampling and analytical techniques. The results of Phase I were reviewed and a general framework for POLLUTION 2000+ Phase II was outlined (IWC, 2008a). Discussion for Phase II studies since that time has determined the need to: (1) produce a framework for modelling the effect of pollutants on cetacean populations; (2) identify cetacean populations to be studied under Phase II; and (3) develop a protocol for validating biopsy samples and applying this protocol to any large whale species selected.

Last year, the Committee had proposed the following modified goals for the Phase II programme:

(1) develop an integrated modelling and risk assessment framework to assess cause-effect relationships between pollutants and cetaceans at the population level, building on the progress made during Phase I and on recent research, using modification of a tiered risk assessment paradigm;
(2) extend the work to new species and contaminants as appropriate; and
(3) validate further biopsy sampling techniques for use in addressing issues related to pollution, including legacy contaminants and new contaminants of concern and associated indicators of exposure or effects.

In February 2010, an expert workshop (with expertise in chemical contaminants, toxicology, cetacean biology, veterinary medicine and biomarkers) was held to further develop proposals for Phase II of the programme (SC/62/Rep4). Presentations were made on risk assessment frameworks, chemicals of emerging concern, contaminant exposure, modelling approaches and case studies. Biomarkers of chemical exposure and effects were also discussed, with the workshop purposefully selecting those that have been validated in cetaceans. An international prioritisation survey for chemical contaminants was developed and will be distributed to subject matter experts, with a final report on survey results to be presented at the 2011 IWC Scientific Meeting.

The Committee **endorses** four **recommendations** made at the Workshop:

(1) to improve existing concentration-response (CR) function for PCB-related reproductive effects;
(2) to derive additional CR functions to address other endpoints (i.e., survival) in relation to PCB exposure;
(3) to integrate improved CR components into a population risk model (e.g., individual-based model) for one or more case study species (e.g. bottlenose dolphin and/or humpback whale); and
(4) to develop new biomarkers and improve the linkages between lower and higher levels of organisation (molecular - individual - population). The highest priority for biomarker development should include those with direct relevance to population-level endpoints such as reproduction and survival.

A plan to make progress on Phase II can be found in Annex K. The Committee noted data gaps and research needs identified at the Workshop, specifically noting that progress on this topic will require initiating new studies or additional support of existing efforts

The ICES Working Group on Marine Mammal Ecology (WGMME) met in April 2010 in part to 'Review the current contaminant loads reported in marine mammals in the ICES area, the cause-effect relationships between

contaminants and health status, and the population-level effects of environmental impacts.' The SWG had reviewed recommendations made by the WGMME with regard to pollutants in marine mammals (*http://www.ices.dk/reports/ ACOM/2010/WGMME/wgmme_final_2010.pdf*). and the Committee **endorses** these recommendations.

The Committee received new information (SC/62/E9) on the development of a suite of sensitive biomarkers from non-lethal sampling to evaluate the toxicological status of Bryde's whale in the Gulf of California. A 'multi-trial-biomarker-tool' was developed, combining protein biomarkers with concentrations of organochlorines and polycyclic aromatic hydrocarbons. A second biomarker study (SC/62/ E10) examined a multi-response *in vitro* method to detect toxicological effects of contaminant mixtures on skin samples from cetaceans in the Mediterranean Sea. Preliminary findings indicate that the combination of protein biomarkers, gene expression levels and tissue contaminant levels may be a useful tool in determining 'multiple toxicological stress' in free-ranging cetaceans. The Committee **welcomes** these studies but **emphasises** the importance of standardisation of contaminant concentration reporting.

The Committee received an overview of the oil spill that followed the explosion on board and subsequent loss of the drilling structure 'Deepwater Horizon' on 20 April 2010, approximately 50 miles southeast of Louisiana in the Gulf of Mexico. The incident claimed the lives of 11 workers. Immediately after the spill, response networks for marine mammals, sea turtles, and birds were established, including four facilities for de-oiling of manatees, dolphins, and sea turtles.

As of 4 June, 31 dead dolphins and 277 dead sea turtles had been documented, with numerous accounts of large and small cetaceans seen swimming in oil-contaminated waters. The Committee **commends** all groups that are responding to impacted marine mammals and turtles in the region.

It also **agrees** that it is extremely important to learn as much information as possible from this tragedy in order to accurately assess impacts and be better prepared for potential future oil spills. In this regard, the Committee **strongly recommends** that the government of the USA, range states of the Gulf of Mexico and the responsible parties:

(1) search for and examine as many cetacean carcasses as possible that may have been impacted by the spill through detailed necropsies and thorough tissue sampling;

(2) analyse tissues for contaminants specifically related to spilled oil (i.e. polycyclic aromatic hydrocarbons, dispersants and mixtures of the two);

(3) provide detailed chemical composition of the dispersants that have been used in the Gulf of Mexico;

(4) develop and examine a suite of biomarkers that will be useful for understanding impacts from the spilled oil and use of dispersants in the Gulf of Mexico; and

(5) conduct biomarker studies of cetacean populations in the Gulf of Mexico, especially bottlenose dolphins, sperm whales and Brydes whales.

The situation in the Gulf of Mexico also emphasises the need for adequate environmental baseline data *before* oil and gas exploration, development, or production occurs in any region and for these data to inform mitigation and management decisions. Therefore, for member governments with on-going or planned offshore oil and gas activities within their territories the Committee **strongly recommends** the collection of baseline data to include:

- contaminant levels in cetaceans, their prey, and in sediments, especially polycyclic aromatic hydrocarbons (PAHs) and other contaminants that may interact with PAHs;
- biomarker levels in cetaceans and their prey;
- abundance and distribution of cetaceans and their prey; and
- condition of cetacean habitats (i.e. water quality, sediment quality, etc.).

Finally, the Committee **strongly recommends** contingency planning and training for oil spill responses in areas of oil and gas development. It looks forward to receiving an update on the studies into the effects of this spill at future meetings.

12.3 Review progress of CERD Working Group

The CERD working group was established in response to the report of a workshop on infectious and non-infectious diseases of marine mammals and impact on cetaceans that was held in 2007 (IWC, 2008d). The Committee received an update on its intersessional accomplishments and plans (Annex K, item 8), which are summarised in five categories: (1) skin disease; (2) diagnostic laboratories and veterinary experts; (3) prioritization of pathogens; (4) emergency response; and (5) enhancement of capacity and communications among stranding networks. With regard to the last category, capacity building workshops were held in four regions: West Africa, Caribbean, Brazil and India. Drawing information from the ICES working group and the IWC Ship Strike Working Group, a global inventory of stranding networks has been developed and the CERD working group is developing recommendations to maintain and provide access to the inventory.

The Committee also noted a prioritisation of cetacean pathogens developed on behalf of the US Working Group on Marine Mammal Unusual Mortality Events, from a survey that evaluated 76 pathogens based upon five factors. Of the pathogens included in the survey, most were potentially zoonotic, while others were associated with emerging/ re-emerging human diseases in the United States. The ten highest priority pathogens among small cetaceans were morbillivirus, parapoxvirus, *Brucella* spp. anisakis, calicivirus, herpesvirus, nasitrema, *Clostridium* spp., and toxigenic *Escherichia coli*. Although the CERD WG is not tasked to compare cetacean-borne pathogens to those in terrestrial species, the Committee expressed interest in this broader approach, which is consistent with the global *One Health* approach to medicine (*http://onehealthinitiative. com/index.php*). Specifically, *One Health* highlights the importance of integration of surveillance systems in wildlife, domestic animals, public health and environmental health. The Committee **commends** projects that integrate a *One Health* approach to build capacity in countries that are responding to diseases that are shared by people and wildlife. Further, it **recommends** that marine species be considered by all organisation that are implementing the *One Health* approach. Finally, the Committee **commends** the many and varied accomplishments of the CERD WG and **endorses** the work plan for 2011 (Annex K, Appendix 3).

12.4 Review new information on anthropogenic sound: focus on 'masking sound'

The Committee's SWG on environmental concerns has included an item on underwater sound on its agenda each year since 2004 (IWC, 2005f, p.268). In 2009, a presentation on low-frequency 'masking sound' precipitated adopting it as a

focal-topic. Low-frequency (LF) ocean noise has increased substantially in recent decades, concomitant with a three-fold increase in commercial shipping and other offshore industrial activities. The Committee reviewed a mechanistic model that dramatically demonstrates the reduction in the 'communication space' of baleen whales that now occurs, especially near shipping lanes and busy ports (Annex K, item 9). It then reviewed a variety of evidence with regard to the masking sound and its possible effects on whales, including: (1) altered calling patterns and frequency in the presence of LF sound from shipping and seismic airguns shown by fin whales in the western Mediterranean Sea and humpback whales off the coast of Northern Angola; (2) chronic exposure of the small population of humpback whales in the Arabian Sea to LF sound from construction, shipping and seismic surveys; and (3) the elevation of LF sound levels at distances from 450 to 2,800km from a seismic survey area south of Tasmania in the Southern Ocean. Based on the aggregate information presented to the SWG with regard to masking sound from anthropogenic sources, the Committee **recommends** that:

(1) seismic surveys be regulated in the same legal frame, whether for scientific or commercial purposes;
(2) baseline data be collected, satisfactorily analysed and modelled using appropriate techniques, regarding the seasonal and spatial distribution of whales in areas of interest to the geophysical community (scientific and commercial) before survey operations;
(3) the masking potential of anthropogenic sources be quantified and acoustic measurements be standardized to ensure that datasets among researchers are comparable; and
(4) in studies examining potential changes in whale acoustic behaviour, the ability to detect whale calls during periods of exposure and non-exposure to anthropogenic LF sound be quantified.

Further, the Committee **strongly recommends** that further research be conducted on the Arabian Sea humpback population (and see Item 10.2.2.4), including studies directed at quantifying the impacts of acoustic disturbance and masking to support conservation planning and protection for this small population.

The SWG had reviewed available information on plans for seismic surveys in support of oil and gas development planned for the Russian Far East, including the Sea of Okhotsk, Anadyr Gulf, the East Siberian and Chukchi Seas (Annex K, item 9.1). The scale of these activities is 'matched' by plans for broad-scale seismic surveys in the US Chukchi and across the US-Canadian Beaufort sea region. At least six endangered whale species (e.g. North Pacific right whales and Okhotsk Sea bowhead whales) occur in low numbers in waters offshore western Kamchatka, where seismic surveys are anticipated during summer 2010.

In light of this, the Committee **recommends** that additional surveys to provide baseline information on cetaceans be conducted in waters off western Kamchatka, and that seismic surveys and other potentially disturbing industrial activities should be conducted during times of lower cetacean abundance in all ocean regions whenever possible (e.g. see the mitigation and monitoring plan for a seismic survey in the Sakhalin region developed under the auspices of IUCN's Western Gray Whale Advisory Panel, and information regarding other seismic survey issues specific to western gray whales under Item 10.4 above). When informed that industry has initiated research into

alternative (quieter) technology (vibroseis), the Committee **strongly encourages** this research and **recommends** continued development of such methods.

The conclusions from the workshop on 'Cumulative Impacts of Underwater Noise with Other Anthropogenic Stressors on Marine Mammals' were reviewed (Annex K, item 9.3). That workshop had agreed that cumulative impact assessments (CIAs) are needed to account for sub-lethal effects of human disturbance. The Committee **recommends** that member governments work to develop a quantitative approach for assessing cumulative impacts, including ways that anthropogenic sounds might impact cetaceans and their prey.

In regard to reducing LF sounds from shipping, the SWG (Annex K, item 9.4) had noted rapid progress, especially in the past three years, towards addressing this issue, including both the formation of a Correspondence Group within the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO) and the granting of IMO 'observer status' to the IWC (IWC/62/4). With reference to the IWC's awareness of the critical nature of acoustic communication to whales and that interference, or masking, of this communication is to some extent preventable, the Committee **strongly recommends** that:

(1) the goal of noise reduction from shipping advanced in 2008 (i.e., 3dB in 10 years; 10dB in 30 years in the 10-300Hz band) be actively pursued;
(2) new and retro-fit designs to reduce noise from ship propulsion be advanced within the goals of the IMO, when and wherever practicable; and
(3) the IWC and IMO continue to work collaboratively to advance the goal of worldwide reduction of noise from commercial shipping when and wherever practicable including reporting progress on noise measurements and implementing noise reduction measures.

12.5 Review progress on work from the 2nd Climate Change Workshop
The 2nd Climate Change Workshop (IWC, 2010j) resulted in a series of recommendations summarised under three headings corresponding to working groups established at the workshop: Arctic; Southern Ocean; and Small Cetaceans (and see Annex K, item 10). With regard to the Arctic, three study themes were established: (a) Single Species-Regional Contrast; (b) Trophic Comparison; and (c) Distribution Shift. With reference to theme (a), planning discussions have been completed for a comparison of physical indicators of climate change and available data on population dynamics and behavioural ecology of the Bering-Chukchi-Beaufort Seas and Hudson Bay-Davis Strait populations of bowhead whales. In the Southern Ocean, the SWG was provided an update on the responses of the southern right whale population of Península Valdés, Argentina to climate driven changes on their feeding grounds off South Georgia. As was reported in the Southern Right Whale Die-Off Workshop (SC/62/Rep1 and see Item 10.5 above), one of three possible hypotheses to explain recent peaks in calf mortalities is a decline in food availability for adult females on their feeding ground during the year or two prior to calving. This hypothesis will be explored by updating an analysis on the relationship between changes in sea surface temperature and calving success. The Committee reviewed a draft agenda for a Small Cetaceans and Climate Change Workshop planned for November 2010, where the main focus will be: (1) restricted habitats – estuaries, reefs, environmental

discontinuities, rivers and shallow waters; and (2) range changes – i.e. evidence of changes in distributions, reasons and consequences; and (3) with a review planned for small cetaceans in the Arctic Region and suggested that the definition of restricted habitat be broadened (Annex K, item 10). Noting that last year the Committee had recommended that countries should pay more attention to tertiary concerns arising from climate change, the Committee noted that Alter *et al.* (2010) provide arguments suggesting that tropical, coastal and riverine cetaceans are particularly vulnerable to those aspects of climate change that are mediated by changes in human behaviour.

12.6 Other habitat related issues
There has been a rapid expansion of marine renewable energy devices (MREDs) in European seas as governments strive to meet renewable energy commitments. Today there are some 89 such sites in various stages of development (most of these are wind farms), representing a five-fold increase in numbers since 2000, with a concomitant major increase in the size of planned developments. The SWG reviewed concerns associated with the construction, operation, maintenance and (ultimately) decommissioning of wind, tidal and wave renewable energy technologies (Annex K, item 11.1) and the Committee **strongly recommends** that countries co-operate to limit impacts on marine wildlife from these sources. The SWG subsequently discussed the ICES WGMME recommendations with regard to the effects of wind farm construction and operation on marine mammals (Annex K, item 11.1) and the Committee **endorses** those recommendations.

The French Agency for Marine Protected Areas (AAMP) has initiated the REMMOA project, a series of surveys across the French EEZ to identify hotspots of abundance and diversity. Extensive surveys have been conducted across the EEZ of Martinique and Guadeloupe, off Guiana and in the southwest Indian Ocean region. The South Pacific regions will be surveyed during 2010-11 (French Polynesia) and 2011-12 (southwest Pacific Ocean around New Caledonia and Wallis and Futuna) and the Atlantic survey is planned for 2012-13. The Committee also received information on systematic monitoring of density and abundance of the most common cetacean species of the Pelagos Sanctuary and in the seas surrounding Italy. The aim of this work, funded by the Italian Government, is to inform conservation measures throughout the Mediterranean Basin. It also responds to priority actions in a number of other international bodies (e.g. the Sanctuary Management Plan, ACCOBAMS, the Specially Protected Areas and Biodiversity Protocol under the Barcelona Convention, the EU Habitat Directive and the Convention on Biological Diversity). The Committee **commends** both of these studies and encourages their continuation. It noted the impressive advancements of current methods giving the authors the ability to correlate cetaceans with specific habitat features as well as other megafauna.

Finally, there has been limited progress since the update on the Madagascar Mass Stranding Event (MMSE) given in 2008 (IWC, 2009a, p.71). Two potential scenarios to move forward with an Independent Scientific Review Panel (ISRP) were identified: (1) a National Office of the Environment (ONE) to request and oversee an ISRP; or (2) the Environmental Governance Commission to serve as an intermediary body between the Government and/or ONE to promote the need for an ISRP to assess the results of the MMSE. The Committee welcomed this update and

thanked The Wildlife Conservation Society and its partners' continuing efforts to bring the results of the MMSE to an appropriate conclusion through an ISRP process, as well as keeping the SWG updated on the current challenges and progress.

13. ECOSYSTEM MODELLING
The Ecosystem Modelling Working Group was first convened in 2007 (IWC, 2008c). It is tasked with informing the Committee on relevant aspects of the nature and extent of the ecological relationships between whales and the ecosystems in which they live. This advice is important to other responsibilities of the Committee: it can be used to simulate an ecosystem framework in which to evaluate management strategies; it can provide a bio-physical context within which to try to understand spatial or temporal (e.g. interannual, interdecadal, or long-term climate-driven) variability in cetacean population dynamics, distribution, behaviour, and health; it can provide insight into interactions between whales and fisheries; and it may inform the prioritisation and design of future IWC research projects by identifying critical information gaps and offering recommendations of when, where and how field efforts should be conducted to successfully collect new data that are necessary for providing insight into key questions. The Commission has stated their interest in such work in a number of resolutions (IWC, 1999a; 2001c; 2002a). Each year the Working Group reviews the progress in developing ecosystem models relevant to the work of the IWC, which is a broad task encompassing the evaluation of model inputs, assumptions, structure and outputs. In addition, the Working Group has placed a priority on discussions and collaborations with institutions outside of the IWC to facilitate the exchange of information on the state of the science of ecosystem modelling and, where applicable, to collaborate to achieve a common goal. No primary ecosystem modelling papers were received this year, so the Working Group dedicated its time to three general tasks: (1) reviewing ecosystem models and modelling approaches that were developed outside of the IWC; (2) learning about the Climate Impacts on Oceanic Top Predators (CLIOTOP) project; and (3) discussing and planning the future role of this Working Group within the Scientific Committee. The report of the Working Group is given as Annex K1.

13.1 Review ecosystem models relevant to the Committee's work
This year, Lehodey introduced the CLIOTOP project and in particular the ecosystem model that he and his colleagues developed to analyse and predict the spatio-temporal dynamics of tuna populations under the influence of environmental and fishing pressures (Lehodey *et al.*, 2008). The model has been applied to skipjack, bigeye, yellowfin and albacore tuna in the Pacific Ocean (Lehodey and Senina, 2009) and also been used to investigate potential influences of climate change on tuna population dynamics (Lehodey *et al.*, 2010).

CLIOTOP is a global project implemented under two International Geosphere-Biosphere Programme (IGBP) international research programmes: Global Ocean Ecosystem Dynamics (GLOBEC) and Integrated Marine Biogeochemistry and Ecosystem Research (IMBER). Its general objective is to enhance the understanding of oceanic top predators in their ecosystems in the context of both climate change and fishing, and to develop new tools leading

to the evaluation of management strategies. CLIOTOP and the IWC share many common scientific interests, including: studying the behaviour, movement patterns and habitat of large predators; developing and applying technology for animal tracking; estimating food consumption rates; understanding and modeling predation by, and competition among, large predators; modelling and acoustic monitoring of prey fields; investigating various approaches to ecosystem modelling; and addressing issues of bycatch. The Committee **encourages** the establishment of collaborations between the IWC and CLIOTOP.

As part of its remit to preview general developments in ecosystem modelling to identify new modelling approaches and develop an evaluation framework that may be of benefit to the Committee's work, four recently published papers were reviewed (A'Mar *et al.*, 2009; Allen and Fulton, 2010; Buckley and Buckley, 2010; Hannah *et al.*, 2010). These covered issues of model structure, assumptions, complexity and validation. In discussion, it was noted that some existing research suggests that management strategies relying on empirical data through fisheries statistics performed better than those that incorporated ecological information; however, ecological data are valuable for constructing and constraining the range of ecosystem models that could be used to evaluate management strategies within the Scientific Committee.

13.2 Recommendations on the role of this Working Group within the Committee
SC/62/EM1 motivated discussions about the future of the Ecosystem Modelling Working Group. It provided background into the initial objectives and the history of the Working Group; reiterated the distinction between 'tactical' models (those used to set catch limits or to make other management advice) and 'strategic' models (those used to simulate an environment in which to test simpler models); listed some of the ecological and analytical issues that have been recurrent in Committee discussions to date; and introduced several recommendations to help the Committee evaluate ecosystem models, given the numerous uncertainties inherent in the modelling process. As did the Working Group, the Committee **agrees** to the following recommendations, based on those in SC/62/EM1:

(1) standardised templates should be developed for documenting metadata and analytical techniques;
(2) performance criteria should be established, including testing model fit to historic or present data and assessing its ability to generate ecologically reasonable predictions into the future;
(3) sensitivity analyses should be conducted to quantify and provide insight into the importance of model inputs (which can guide data collection priorities) and assumptions on model outputs;
(4) Scientific Committee members should be given access to relevant background information (such as the full mathematical specification) used in any presented ecosystem models that may inform management decisions (via the Secretariat);
(5) the Scientific Committee should explore various ecosystem modelling approaches for a system in order to compare performance across models;
(6) intersessional meetings should be used, when necessary, to allow in-depth examination of competing models; and
(7) the EM Working Group should continue to convene every year at the annual meetings to address issues relevant to the Scientific Committee and to remain informed about new developments in the ecosystem modelling field.

The Committee **emphasises** that the Working Group is an important forum for evaluating ecosystem model inputs, structure, assumptions and predictions related to its work. *Inter alia*, it is also the appropriate sub-group within the Committee for reviewing the ecosystem aspects of ongoing special permit whaling programmes.

The Committee **recognises** the need to involve outside experts in the Working Group. Work is underway to establish an avenue for exchanging information about new developments in ecosystem modelling and its feedback into management, and to solicit feedback on how ecosystem models could inform IWC management decisions.

The Committee **agrees** that the activities of the Working Group should be structured around the timetable of RMP assessments and *Implementations*, enabling ecosystem models relevant to a specific stock being assessed to be reviewed prior to the assessment; the North Pacific is the appropriate region for 2011. The Working Group will take efforts during the intersessional period to engage researchers involved in the North Pacific Marine Science Organization (PICES) and the North Pacific Research Board (NPRB) to collaborate on primary papers for next year's meeting on how North Pacific ecosystem models can be used to inform the RMP process. Two additional issues were highlighted for discussion next year, if primary papers can be prepared in advance. One is a review of functional responses, and the second is a review of methods for evaluating ecosystem models. It is expected that the latter will result in a framework that the Committee will use to guide future ecosystem model evaluations, providing model developers specific details regarding the information required to determine whether the input data and parameters, the model and the resulting predictions should be considered acceptable to inform the work of the Committee.

13.3 Work plan
The work plan is detailed under Item 24. The Working Group requests no funds for the upcoming year.

14. SMALL CETACEANS (SM)
The Committee has been discussing issues related to small cetaceans since the mid-1970s (IWC, 1976). Despite the differences of views over competency (IWC, 1993), the Commission has agreed that the Committee should continue to consider this item (IWC, 1995c). The report of the sub-committee on small cetaceans is given as Annex L.

14.1 Review taxonomy, population structure and status of small cetaceans of northwestern Africa and the Eastern Tropical Atlantic (ETA)
The priority topic this year was the review of the status of small cetaceans of northwestern African and eastern tropical Atlantic waters (Fig. 6), a region with a variety of ecosystems and coastal habitats. The review was greatly assisted by the availability of published review papers and documents prepared for this meeting by scientists working in Canary Islands (Spain), Mauritania, Cape Verde, Guinea, Ghana, Togo, Benin, Nigeria, São Tomé and Príncipe, Cameroon, Gabon, Congo and Angola.

The following sections represent a short summary of the extensive review. Details can be found in Annex L.
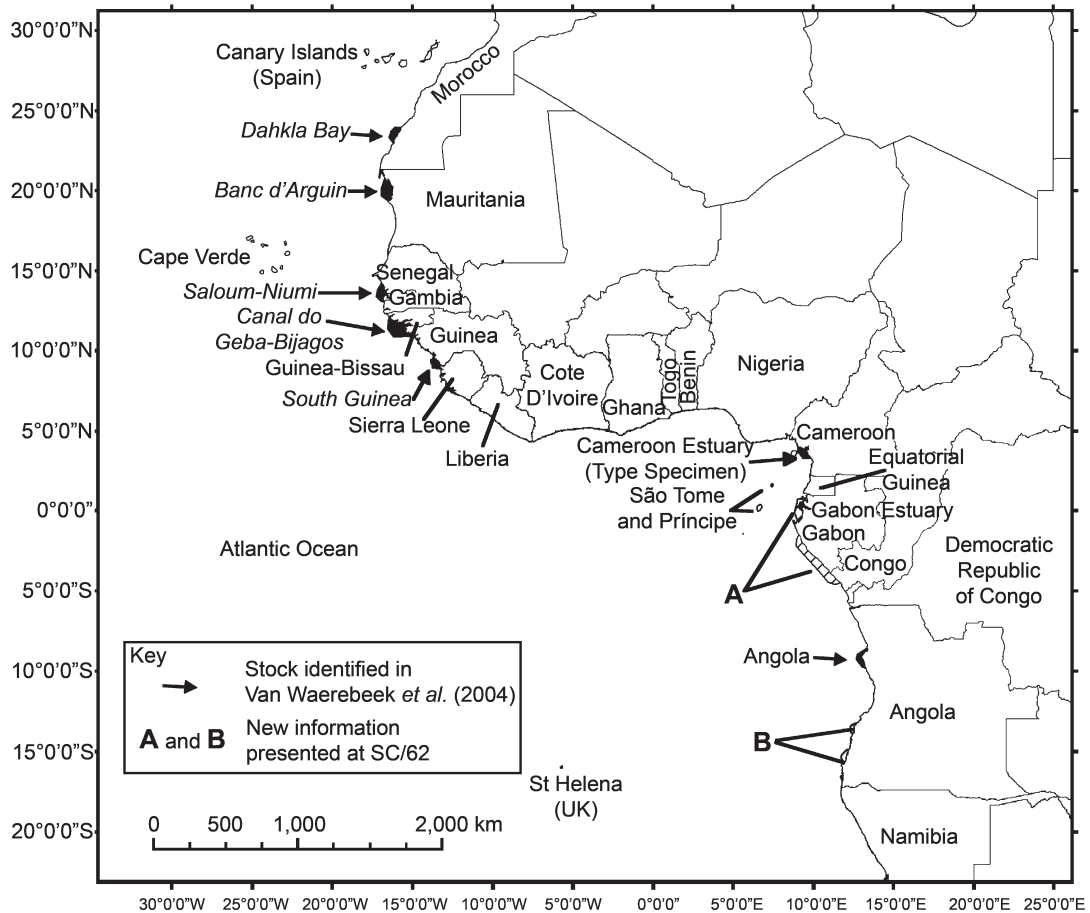
Fig. 6. Map of the northwestern and western African countries relevant to the cetacean distribution review.
A=Information from SC/62/SM9. B=Information from SC/62/SM6.

Weir (2010) reviewed cetacean occurrence (sightings, strandings, direct captures, bycatch) in West African waters from the Gulf of Guinea to Angola, updating Jefferson *et al.* (1997). At least 21 odontocetes (including at least 17 delphinids) have been documented in the region. The author stressed that the region's cetaceans face several threats including bycatch, direct capture (e.g. in Ghana and Togo) and threats to them and their habitat, e.g. due to oil and gas development. Moore *et al.* (2010) reported information on cetacean bycatch from interview surveys in 2007 and 2008 in fishing communities of seven countries: Sierra Leone, Cameroon, Nigeria, Tanzania, Comoros, Malaysia and Jamaica They provided information on reported cetacean bycatches in Sierra Leone and Cameroon.

Further information on the region's cetaceans came from a number of papers focussing on country reports.

SC/62/SM9 reviewed recent information on Atlantic humpback dolphins in Gabon and Republic of Congo. Both countries have large and diverse national park systems that include protected coastal habitat. Given the low human population densities and the extent of relatively undisturbed habitat in Gabon and northern Congo, this region may represent a stronghold for the species. However, bycatch and evidence of dolphins in the bushmeat trade give cause for concern, particularly as the demand for fish in cities increases. The Committee commends the authors for their efforts in the region and **recommends** that research, monitoring and conservation efforts for humpback dolphins along the coast of Gabon and Congo continue.

The Committee received two papers covering Nigeria (SC/62/SM12 and SM1). Cetaceans occur throughout

Nigerian coastal waters in the Gulf of Guinea, although there has been little directed cetacean research. Potential threats include: bycatches (a reported zero bycatch rate for Nigeria obtained in an interview survey by Moore *et al.* (2010) is not credible, probably due to low sample size); direct catches of delphinids (SC/62/SM1) for sale as 'marine bushmeat' (Clapham and van Waerebeek, 2007) which may be widespread; and habitat degradation (e.g. uncontrolled trawling operations, indiscriminate dumping of non-biodegradable nylon and plastic products and household items). The absence of monitoring may explain the lack of detailed information on direct catches. SC/62/SM1 reiterated the suggestion by Van Waerebeek *et al.* (2004) that Atlantic humpback dolphins inhabited the Niger Delta before large-scale oil exploration and extraction altered the coastal environment.

Information on Ghana was provided in SC/62/SM10 with an emphasis on the captures of small cetaceans in artisanal fisheries, mainly using drift gill nets. Cetaceans have been documented from three fish landing ports since 1995 but these landings do not represent the total for the country. It is often unclear if 'bycaught' cetaceans in Ghana are the result of unintentional or intentional taking. The species most frequently 'bycaught' are the clymene dolphin (24.5%), pantropical spotted dolphin (12.3%) and common bottlenose dolphin (12.3%). SC/62/SM10 suggested an increasing trend in the scale of landings between 1999 and 2010, and particularly since 2002-03. Once the practice of catching and marketing cetacean products becomes established, it can escalate rapidly as implied in the existing catch series. Although aquatic mammals are protected by

law, there are no explicit regulations concerning the use of cetaceans killed in nets and the use of dolphin meat as bait in shark fisheries and for human consumption is not considered illegal. This means that catches are not concealed for fear of sanctions and therefore catch statistics can be obtained. This makes it feasible to study trends and carry out biological studies based on carcass sampling protocols.

As stated in SC/62/SM10, traditional taboos against catching dolphins are rapidly eroding in the Volta Delta region. This seems to happen in some areas of Nigeria as well. One important development is that the monetary value of a small cetacean is now roughly equivalent to that of a similar-sized large billfish. In fact, more money can be earned by selling the cetacean carcasses for shark bait as the export market in Asia for shark fins is lucrative and growing.

The Committee thanks the researchers working in Ghana for their efforts and notes that the evidently close cooperation with fisheries officials is encouraging.

Tchibozo summarised the current knowledge on small cetaceans along the 124km coastline of Benin (Tchibozo and van Waerebeek, 2007). The presence of four species has been confirmed: Atlantic spotted dolphins, common bottlenose dolphins, false killer whales and *Delphinus* sp. There have been no systematic studies on the distribution, abundance or ecology of small cetaceans in Benin. Although bycatch of cetaceans is known to occur in fisheries along the entire coast, no monitoring programme is in place.

SC/62/SM11 confirmed the presence of four small cetaceans in Togo's coastal waters: pantropical spotted dolphins, common dolphins, pilot whales and killer whales. However, there is no information concerning abundance, natural history or ecology. The main potential threats are:

(1) bycatch in fisheries, with the possibility that this has led or soon will lead to directed taking as has been observed elsewhere; and

(2) severe chemical pollution due to the mining of phosphorites and discharge of phosphate-rich mud into coastal waters.

Bamy *et al.* (2010) reported that four odontocetes occur along Guinea's 300km coastline: common bottlenose dolphins, Atlantic humpback dolphins, Atlantic spotted dolphins and pygmy sperm whales. It is probable that short-finned pilot whales, rough-toothed dolphins and common dolphins also occur there. This information comes mainly from observations during irregular, largely opportunistic surveys of fishing communities in 2001-03 by personnel from Guinea's Centre National des Sciences Halieutiques de Boussoura (CNSHB). There is no evidence of substantial directed or incidental takes (e.g. at the scale reported in Ghana) but monitoring and reporting have been limited. There is evidence that bycaught small cetaceans and a stranded whale were used for human consumption. The authors expressed concern about even occasional catches of Atlantic humpback dolphins.

During discussion, reference was made to the study by Brashares *et al.* (2004) on the relation between declining fish supplies in West African waters and the increase in hunting for 'bushmeat' and consequent declines in wildlife populations.

SC/62/SM8 updated Picanço *et al.* (2009) with information on small cetaceans off São Tomé and Príncipe. At least four species of small cetaceans are known to occur there with the common bottlenose dolphin and pantropical spotted dolphin being the most numerous.

Several species of small cetaceans were hunted historically in the Cape Verde Islands using hand harpoons.

Despite protective legislation, cetaceans are still captured occasionally and their meat is sold and consumed (Hazevoet and Wenzel, 2000; Reiner *et al.*, 1996).

Vely summarised cetacean occurrence in Mauritania between 1987-95 based on dedicated surveys in two main areas: (a) between the southern border with Senegal and the village of Nouamghar at the northern entrance of the National Park of Banc d'Arguin (PNBA); and (b) within the PNBA. Species observed at sea were common bottlenose dolphins, Atlantic humpback dolphins and killer whales. Stranded specimens included harbour porpoises, clymene dolphins, common dolphins, Risso's dolphins, melon-headed whales, short-finned pilot whales, pygmy sperm whales, dwarf sperm whales and Cuvier's and Gervais' beaked whales.

Smit *et al.* (2010) summarised information on the presence and distribution of small cetaceans off the coast of La Gomera (Canary Islands), where a total of 21 species were observed at sea. The five most abundant species (87% of sightings) were common bottlenose dolphins, short-finned pilot whales, Atlantic spotted dolphins, short-beaked common dolphins and rough-toothed dolphins.

The Committee thanks all of the contributors but noted that its review was characterised by rather scarce information from the northwest African countries (see Annex L). However, enough new information was available from West Africa to update and make some corrections to the existing state of knowledge on cetaceans along the west African coast (see table 1 of Annex L).

IUCN Red List status for 21 out of 22 species is either Least Concern or Data Deficient (2008). The Atlantic humpback dolphin is listed as Vulnerable. There is a general lack of relevant information on many of the species, not only for western African waters but also globally, on taxonomy, population structure, abundance, life history and ecology.

The scarcity of information prevented the Committee from being able to make a reliable evaluation of the status of any of the species in the region. That being said, the information available in the review showed that nearly all species are taken either intentionally or unintentionally (SC/62/SM1, SM10 and SM11; see also Bamy *et al.*, 2010; Van Waerebeek *et al.*, 2008; and Weir, 2010). Especially for one species, the clymene dolphin, the Committee **expresses serious concern** about the ongoing observed landings in Ghana.

The Committee then reviewed two species on which there was a little more information.

Killer whales
Killer whales observed off Angola, Gabon and São Tomé were similar in external appearance to, and their appearance was consistent with, the Type A 'nominate' killer whale form described by Pitman and Ensor (2003). Weir *et al.* (2010) summarised published records from Liberia, Côte d'Ivoire, Ghana, Annobón Island (Equatorial Guinea) and Gabon as well as 31 sightings from Angola, Gabon and São Tomé, and a single record from Cameroon. De Boer (2010) provided an additional record of killer whales in the offshore waters of Gabon. Most sightings have been recorded since 2001, corresponding with the onset of dedicated survey work in the region. Bamy *et al.* (2010) found no confirmed records for the stretch of coast from southern Senegal (Casamance) to Liberia. They also questioned whether killer whales venture into the shallow waters of Guinea-Bissau, Guinea and Sierra Leone.

No information was received regarding recent intentional takes although one killer whale was recorded as landed in Ghana between 1998 and 2000 (SC/62/SM8).

The killer whale can be considered a regular component of the cetacean community off Angola and in the Gulf of Guinea. However, more survey work is required throughout the region to clarify its status and biology off tropical West Africa (Weir *et al.*, 2010). The IUCN Red List status of the species is Data Deficient.

Atlantic humpback dolphin
The Atlantic humpback dolphin - an endemic species for this region - was a priority species in 2002 (IWC, 2003b) but at that time the review focused on the Indo-Pacific humpback dolphin.

The taxonomy of the genus *Sousa* remains largely unresolved. Although three putative or nominal species have been widely discussed (*chinensis*, *plumbea* and *teuszii*), the IWC presently recognises only two, the Atlantic species *S. teuszii* and a geographically widespread Indo-Pacific species *S. chinensis*. Although the Committee was informed by Rosenbaum of a collaborative study to clarify the taxonomy of *Sousa*, the Committee **agrees** to retain its present nomenclature until formal publication of this information. It also **recommends** that samples from *S. teuszii* be provided to Rosenbaum as soon as possible so that they can be included in the ongoing efforts described above, which are essential for resolving questions questions concerning taxonomy and population structure.

Van Waerebeek *et al.* (2004) reviewed the state of knowledge on Atlantic humpback dolphins and proposed eight provisional management stocks based on the fragmentary information available to them. Six were confirmed as extant based on recent records: Dakhla Bay (Western Sahara), Banc d'Arguin (Mauritania), Saloum-Niumi (Senegal, Gambia), Canal do Gêba-Bijagos (Guinea-Bissau), South Guinea and Angola. The other two – Cameroon Estuary and Gabon – were considered historical. Those authors also noted the 'potential existence' of a western Togo stock. They concluded that there were nine confirmed range states: Morocco (including Western Sahara), Mauritania, Senegal, The Gambia, Guinea-Bissau, Guinea-Conakry, Cameroon, Gabon and Angola.

Van Waerebeek *et al.* (2004) stated that the species was limited to tropical and subtropical waters very near shore from Western Sahara in the north to Angola in the south; the distribution is patchy and limited to particular stretches of coastline separated by gaps of absence or very low density. In many cases, it was unclear whether the absence of records from an area means the species naturally does not occur there, or it has been extirpated in the area, or search effort and reporting have been insufficient.

Bamy *et al.* (2010) considered as uncertain the degree of distributional continuity and gene flow between the provisionally defined 'South Guinea stock' and other provisionally defined stocks (Van Waerebeek *et al.*, 2004). As in Guinea-Bissau, most of Guinea's coastline has features suitable as humpback dolphin habitat: warm and shallow waters on a shelf extending up to 200km from shore, with extensive mangrove creeks around four main river mouths. The lack of sighting records is probably partly due to the small amount of near-shore survey effort. Ghana represents a confirmed gap (SC/62/SM10).

Although much remains unknown about distribution and the extent to which it has changed over time as a result of human activities (e.g. bycatch, habitat degradation), current understanding is that there are regional pockets of relatively high density, such as in Senegal-The Gambia-Guinea-Bissau-Guinea-Sierra Leone, Gabon-Congo and Cameroon-Angola-Namibia.

Although its typical habitat was thought to be shallow coastal waters, especially estuaries, mangrove systems and sheltered bays (Van Waerebeek *et al.*, 2004), new information on the presence, distribution and behaviour of Atlantic humpback dolphins was received from Flamingos (southern Angola), Gabon and Congo (SC/62/SM9), also see Weir *et al.* (2009). In Gabon, Congo and elsewhere in the southern range of the species, humpback dolphins are regularly observed on open coastlines.

The loss and fragmentation of habitat due to expanding coastal communities, coastal development, dredging, trawling, deforestation, mangrove destruction, pollution, eutrophication and oil spills also threaten this species. Its preference in many areas for shallow, nearshore and estuarine habitat would render it particularly vulnerable to ubiquitous inshore set gillnets, beach seines and disturbance.

The Committee **agrees** that there is ample evidence for serious concern about the conservation status of this species (SC/62/SM1; SM6; SM9-SM11, and see also Bamy *et al.*, 2010). Although quantitative data or even good qualitative data (e.g. confirmation of species presence/absence) are lacking for much of the known or suspected range, the information available from areas where cetaceans have been consistently studied (e.g. Ghana, Guinea) indicates that the overall population is fragmented, bycatch (if not also directed catch) is occurring, and habitat conditions are deteriorating. Populations in Gabon and northern Congo appear healthy, but recently documented bycatches and utilisation in Congo may be indicative of a growing reliance on non-fish marine wildlife, including dolphins, as food.

In view of the growing concern (e.g. summarised in SC/62/SM6) that the Atlantic humpback dolphin faces some of the same threats that led to the extinction of the baiji and caused the vaquita to become critically endangered, the Committee **recommends** that IUCN reassess the Atlantic humpback dolphin's status in the light of new information.

It also **recommends** the following items for further conservation and research action for Atlantic humpback dolphins, taking into account *inter alia* the CMS regional action plan for the conservation of West African small cetaceans[4].

(1) Coordinated data collection should be facilitated in order to improve knowledge of the abundance, distribution and conservation status of *S. teuszii* throughout its known range. Specifically:
  (a) estimates of abundance and distribution are urgently required (including where feasible photo-id);
  (b) tissue samples should be obtained at every opportunity from stranded or bycaught Atlantic humpback dolphins. These need to be appropriately preserved and provided to scientists for genetic analyses investigating population structure;
  (c) critical habitats should be identified, including areas of high density and regular occurrence ('hotspots') and migratory pathways (if such exist), as candidates for focused conservation effort; and
  (d) overviews of existing knowledge, national species lists, specimen collections, research centres and protected areas should be compiled.

(2) Identify and mitigate known and potential threats to *S. teuszii*, particularly entanglement in fishing gear, and directed take and anthropogenic noise. Specifically this should include:

[4]Action Plan for the Conservation of Small Cetaceans of Western Africa and Macronesia, ratified in 2008 by West African member nations of CMS.

(a) improving the understanding of the causes, levels and impacts of bycatch on *S. teuszii*;

(b) assessment of the causes, level and intensity of directed small cetacean takes;

(c) efforts should be made to minimise the ecological impacts of fisheries on, and direct takes of, *S. teuszii* through the implementation of explicit fisheries management measures; and

(d) ensure that all littoral developments and activities take into account their potential for having negative effects on small cetaceans and the environment.

(3) The designation and management of national and transboundary marine protected areas that include *S. teuszii* habitat based on scientific data and broad stakeholder involvement should be encouraged.

The Committee also specifically **recommends** that regional or sub-regional research projects be conducted that would allow the preparation of management plans for the conservation of Atlantic humpback dolphins in particular areas. Candidate areas are: (a) off Flamingos, Angola; (b) along the coasts of Gabon-Congo; (c) Senegal-The Gambia-Guinea-Bissau-Guinea-Sierra Leone where the humpback dolphin population(s) may be transboundary and where bycatch is a serious concern; and (d) Mauritania where humpback dolphins were observed regularly in Banc d'Arguin National Park and environs over many years, but may have declined recently (Van Waerebeek and Perrin, 2007).

The Committee **strongly encourages** scientists in the range states to submit collaborative proposals for funding so that transboundary problems can be addressed in a comprehensive way, possibly cooperating with the staff of National Parks.

General recommendations relevant to all species
In general, the Committee **acknowledges** that the failure to manage industrial fisheries sustainably has often caused coastal artisanal and subsistence fisheries to suffer and, in turn, has led local people to seek alternative resources for consumption, including cetaceans.

Given the observed threats and the existing knowledge, the Committee makes the following general **recommendations** applicable to all small cetacean species in the west and northwestern Africa.

(1) The tallying of cetacean landings should be implemented as a standard procedure for fisheries observers at the national level, including the collection of photographic material, recognizing that small cetaceans are a *de facto* exploited marine living resource and therefore need to be monitored on a permanent basis.

(2) An intensive biological sampling programme based on fresh carcasses, collecting data on morphological variation, reproduction, growth, feeding, stock identification, genetics, migratory habits, etc. of cetacean species should be implemented.

(3) Use of platforms of opportunity should be intensified to collect data on distribution, relative abundance and behaviour of cetaceans.

(4) Further assessment of the links between declining fish catches and increasing takes of small cetaceans in West Africa should be made.

In at least three west African countries, Ghana, Togo and Guinea, the ongoing activities represented good examples of how the first two of these recommendations could be realised. The Committee **acknowledges** the contributions already being made by scientists in Nigeria and Benin and recognised that there is a great need for capacity building and financial support before such programmes can be implemented. The same is true for São Tomé and Príncipe where the status of small cetacean populations has not been fully assessed and for the Cape Verde Islands, where no study of small cetaceans has ever been conducted. With regard to the third recommendation, the Committee noted and commended the published work by Weir (2007; 2010) and de Boer (2010), much of which was based on data from platforms of opportunity (e.g. seismic survey vessels, oceanographic research vessels); these are seen as excellent examples of how this recommendation can be realised in more areas.

In conclusion, the Committee **recommends** international collaboration for funding and capacity building to support programmes for monitoring, management and conservation of coastal marine living resources in this region.

14.2 Review report from the working group on climate change and small cetaceans
The Committee received a summary on the ongoing plans for an IWC workshop on the effects of climate change on small cetaceans. The workshop plan (10-12 invited participants meeting for 3 days) was agreed last year but the workshop was not held in the last intersessional period as the final *tranche* of funding was only confirmed late in the year. The steering group and convener (Simmonds) are now finalising plans for the workshop, which will probably be held in Vienna in November 2010 (see Appendix 2 of Annex L). The focal topics are: (a) restricted habitats; (b) range changes; and (c) the Arctic region. During discussion it was suggested that pathogens should also be discussed.

The Committee **re-confirms** its support for the meeting and looks forward to receiving a full report of this workshop at the next annual meeting in 2011.

14.3 Review progress on previous recommendations
IWC Resolution 2001-13 (IWC, 2002b) directs the Scientific Committee to review progress on previous recommendations related to critically endangered species and stocks of cetaceans on a regular basis and the Committee noted that its previous recommendations stand until new information is received and considered.

14.3.1 Vaquita
The Committee reviewed new information on the critically endangered vaquita. SC/62/SM3 reported on a survey in the Upper Gulf of California that was conducted from mid-September, through October and November 2008 in a joint effort between the governments of Mexico and the US. The primary objective was to test alternative acoustic detection technology as a means of monitoring trends in vaquita abundance. Total abundance (based on both acoustic and visual data) was estimated as 250 animals (95% CI 110, 564). The estimate for waters inside the Vaquita Refuge was 123 (95% CI=64-239). The total estimate for 1997 had been 567 (95% CI=177-1,073). Analyses strongly support a population decline over the 11 years from 1997 to 2008. The overall distribution did not change between the two surveys, indicating that the apparent decline was not an artifact of a distributional shift. Approximately half of the population appears to be present inside the Vaquita Refuge area at any time, with individuals moving freely into and out of the refuge. Hence, they are at risk of interaction with fishing operations when outside of the refuge, and this means that

protection from bycatch is only partial. Fishermen consider waters inside the Refuge to be a prime shrimping area and thus fishing activity is very intensive immediately outside its borders. The buyout programme begun by the Mexican government in 2007 has reduced the fishing effort by about 40%, but over 600 artisanal boats (*pangas*) are still fishing and those fishermen who remain active are strongly committed and unlikely to accept the buy-out offers from the government. This makes it crucial to develop alternative fishing methods that do not involve the risk of vaquita bycatch.

The Mexican government made a commitment to reduce the vaquita bycatch to zero within three years starting in 2008. There are no data to confirm that the bycatch rate has been reduced apart from an inference from the reduction in fishing effort; because of the regulatory situation, fishermen generally no longer report and deliver bycaught vaquitas to authorities. This makes the implementation of regulations particularly challenging.

SC/62/SM5 reported on the development of a monitoring plan to assess trends in vaquita abundance based on acoustics using C-POD. It is anticipated that the scheme will be in operation by the end of this year (2010). Jaramillo-Legorreta acknowledged the financial support provided to this work by a number of agencies and organisations in addition to the Mexican government: National Marine Fisheries Service, WWF, the Cousteau Society, Ocean Foundation, US Marine Mammal Commission and International Fund for Animal Welfare.

The Committee thanks Jaramillo-Legorreta for this update and commends those involved for their hard work and commitment to saving the vaquita. The Committee **agrees** that it would be useful to document (in working papers or publications) all of the costs of the vaquita conservation and monitoring efforts for future reference for other Countries with similar bycatch problems.

The Committee **remains gravely concerned** about the fate of the vaquita and it **reiterates its previous recommendation** (IWC, 2010h, p.324) that, if extinction is to be avoided, all gillnets should be removed from the upper part of the Gulf of California. The Committee further **recommends** intensified development and testing of alternative fishing gear (e.g. through a smart-gear competition) that fishermen can use in place of entangle gears. It **strongly encourages** Mexico to continue and intensify its efforts to conserve the vaquita.

14.3.2 Harbour porpoise
No primary papers on harbour porpoises were presented at this meeting.

A joint workshop of ASCOBANS/ECS recommended a revision of EU regulation 812/2004 on monitoring and mitigation of cetacean bycatch in gillnet and pelagic trawl fisheries, as at present it does not include small vessels of less than 15m length. The Committee **recommends** that the EU regulation should be reviewed if realistic total estimates of bycatch are to be provided.

Available information for the German North Sea and Baltic from 2003 to 2009 suggests an increasing trend in bycatch. As last year, the Committee **expresses concern** about the ongoing evidence of large-scale bycatch in this region, including the western Baltic (as discussed last year when the Committee called for more research). The Committee **notes**, in particular, that the harbour porpoise population in the Baltic proper is considered Critically Endangered. Better information on both the scale of incidental mortality and the stock affinities of the affected porpoises is essential.

Attention was drawn to the vulnerability of the recently identified a isolated Iberian population of harbour porpoises. The Committee **recommends** further study of this population.

14.3.3 Franciscana
The franciscana, endemic to the eastern coasts of Brazil, Uruguay and Argentina, is regarded as one of the most threatened small cetaceans in South America due to high bycatch levels as well as increasing habitat degradation throughout its range. It is classified as Vulnerable by IUCN. Secchi *et al.* (2003) proposed four management stocks (known as Franciscana Management Areas or FMAs): three in Brazil (FMA I-III), one in Uruguay (FMA III) and one in Argentina (FMA IV).

Mendez *et al.* (2010) stressed that considering all franciscana genetic analyses to date, there is strong evidence for the existence of at least three populations in Brazil (FMAs I, II and III), one in Uruguay (FMA III) and three in Argentina (FMA IV).

The Committee welcomes the new information concerning franciscana stocks in Argentina and encourages the continuation of research and conservation efforts on the species there, particularly in light of the high bycatch rates. It **recommends** that the possibility of further population structure within the range of the franciscana be investigated.

SC/62/SM7 presented information on distribution and provided the first estimate of abundance of franciscanas in FMA II (Brazil) from aerial surveys conducted in December 2008 and January 2009. Coverage included an area believed to correspond to a hiatus in the distribution between FMA I and FMA II. Sightings were confined to the coastal stratum, but offshore effort was low due to poor weather conditions. Corrected abundance was estimated to range between 8,000 and 9,000 individuals (CVs=0.32-0.35) although some additional sources of possible bias require investigation. Current estimates of incidental mortality in FMA II correspond to 3.3-6.2% of the estimated population size presented here, which is likely unsustainable.

The Committee **welcomes** this paper that addresses recommendations from previous years (IWC, 2005g, p.309). It notes that the estimates of abundance were probably negatively biased because of limited coverage of the offshore stratum and because estimates of group size from aircraft are consistently smaller than those from boats and land observation sites.

With regard to the aerial surveys in FMA II, the sub-committee commends Zerbini and his co-workers for their excellent work and **recommends** that further studies be carried out to:

(1) improve estimates of visibility bias;
(2) evaluate potential biases in the estimation of group sizes; and
(3) estimate franciscana diving parameters in areas where such information is not available.

The Committee also **recommends** that bycatch be estimated in additional areas and assessments be carried out of other possible threat factors such as underwater noise, chemical pollution from coastal development and industrial and human waste discharge, oil and gas exploration activities and vessel traffic.

14.3.4 Narwhal
Last year (IWC, 2010h, p.325), the Committee noted that new estimates of narwhal abundance had recently become

available. Subsequently, the results of aerial surveys in Canada indicating total abundance greater than 60,000 narwhals were published (Richard *et al.*, 2010). The NAMMCO Scientific Committee considered new estimates from Greenland in its management advice given in April 2009 (IWC/62/4). At its 2009 meeting, the NAMMCO Council (NAMMCO Annual Report 2009, pp.96-97) considered the new information on narwhal abundance and revised its management advice accordingly. The 2005 NAMMCO assessment had concluded that narwhals in West Greenland were highly depleted and that annual sustainable harvest levels would be as low as 15-75 animals. However, population modelling with the new survey data from 2007 and 2008 indicated that overall abundance was at 51% (95% CI: 27-79%) of carrying capacity, with a 2009 modelled abundance of 12,000 (95% CI: 6,200-26,000), and NAMMCO concluded that its management objectives would be met at 70% probability with annual total removals of 310 (West Greenland) and 85 (East Greenland).

The Committee **thanks** the NAMMCO observer for providing information and **encourages** closer links between the NAMMCO and IWC Secretariats in sharing information, e.g. catch data. The possibility of a joint special meeting or workshop on monodontids (involving IWC, NAMMCO, Canada-Greenland Joint Commission on Narwhal and Beluga) should be considered in the near future, assuming that a data availability agreement can be established in advance. The next meeting of the Joint NAMMCO SC and JCNB scientific working group on narwhal and beluga will probably be in 2012, leaving adequate time to explore the potential of a joint meeting/workshop. The Committee **agrees** that an e-mail working group convened by Bjørge will follow up this possibility during the intersessional period and report back next year.

14.3.5 Irrawaddy dolphin
The freshwater population of Irrawaddy dolphins in the Mekong River is Critically Endangered (Smith and Beasley, 2004).

SC/62/WW4 reported on dolphin-watching tourism in the Mekong where photo-id studies indicate dolphins exhibit high site fidelity to particular deep-water pool areas that are very limited in size (1-2 km^2). The authors argued that an adaptive, precautionary approach is essential to managing tourism that targets small, closed, resident communities of cetaceans such as in this case. SC/62/WW4 recommended a range of management interventions, all aimed at decreasing the exposure of dolphins to dolphin-watching vessels.

The Committee received information from World Wide Fund for Nature (WWF)-Cambodia indicating that there are fewer than 100 dolphins based on a photographic mark-recapture analysis. At least 92 dolphins (>63% of them classified as calves) died in the period 2003-09, likely due primarily to entanglement in fishing gear and conservation efforts have focussed on the elimination of gill nets in the core habitat for dolphins in the 200km stretch of the Mekong between Kratie town and the Lao border. The conservation of dolphins in the Mekong is primarily the responsibility of the Commission on Dolphin Conservation and Ecotourism Development (Dolphin Commission). Despite its efforts, the mortality rate has remained high and the population apparently is continuing to decline. Dolphin conservation efforts in Cambodia reportedly have been hindered by inadequate funding for the Dolphin Commission and the lack of regulations that could help to reduce or eliminate the use of gill nets. There is also a need for much better cooperation among the Dolphin Commission, the Fisheries Administration and WWF. WWF and the Fisheries Administration are currently working to develop protected areas and other regulatory tools to protect dolphins. WWF and local NGOs are also working with local communities to reduce gill net use and to develop alternative livelihoods in order to reduce fishing pressure in core dolphin habitat.

The Committee **expresses grave concern** about the rapid and not fully explained decline of this riverine population. It commends the efforts by Cambodian government agencies and WWF-Cambodia to diagnose the cause(s) of the decline, and **strongly recommends** that every effort be made to stop and reverse it, e.g. by immediately eliminating entangling fishing gear in the pool areas used most intensively by the dolphins and by taking immediate steps to reduce the exposure of the dolphins to tour boat traffic.

14.3.6 Other
The Committee received an update (SC/62/SM2) of Amaral *et al.* (2009), the goal of which is to revise the model of worldwide population structure of common dolphins, genus *Delphinus,* using a multilocus approach. It has become clear that the long-beaked population in the northeastern Pacific is highly differentiated from all other populations based on both nuclear and mitochondrial markers. The differentiation between short-beaked populations occurring in different oceans is even higher than suggested in Amaral *et al.* (2009). Future analyses will estimate divergence times and migration rates between the different populations. This study also highlighted the difficulty of obtaining informative molecular markers other than mitochondrial DNA and microsatellites, due to the low overall level of polymorphism in the nuclear genome of common dolphins.

The Committee **encourages** the continuation of this global study of the genus. It also **recommends** that efforts should be made to obtain samples from regions where both short-beaked and long-beaked forms occur, as is the case in West Africa and the southeastern Pacific.

14.4 Other information presented
SC/62/BC6 presents a preliminary global review of operational interactions between odontocetes and the longline fishing industry and potential approaches to mitigation. This is a global problem for both cetaceans and fishermen. Mitigation strategies are needed to ensure the sustainability of both the odontocete populations and the longline fisheries. Bycatch occurs in many longline fisheries and involves at least 13 species but there are few quantitative data. The inadequacy of life history and population data adds to the difficulty of assessing the sustainability of the bycatch in most cases. Considerable effort has been devoted to solving the depredation problem and potential solutions have included acoustic and physical tools. Acoustic approaches to mitigation have proven problematic but recent trials using physical depredation mitigation devices have yielded promising results.

In discussion it was noted that longline fisheries for halibut and Greenland halibut in the northern North Atlantic have increasingly experienced problems with depredation of catches by northern bottlenose whales (*Hyperoodon ampullatus*).

New information was presented on the ongoing commitment of the Italian government (Ministry of the Environment) to conduct systematic abundance aerial surveys of small cetaceans in Italian waters (Ligurian, Tyrrhenian, Sardinian and Ionian seas) and in the Pelagos Sanctuary. Initial scientific and technical support was

provided by the IWC Head of Science. The surverys are a priority action common to the Sanctuary Management Plan, ACCOBAMS and RAC/SPA UNEP. Among the preliminary conclusions from the completed surveys were: (1) the Sanctuary does not cover the full population range of striped dolphins; and (2) there is substantial seasonal variation in the density and abundance of striped dolphins (higher in summer). These density and distribution data from the surveys will be instrumental to the proposed ACCOBAMS basin-wide survey and will help guide the development of a long-term monitoring programme. The Committee also **welcomes** news of a complete survey of the Adriatic Sea funded by the Italian Government in July-August 2010.

The ACCOBAMS observer reported that a basin-wide survey of cetaceans in the Mediterranean and Black Seas remains one of ACCOBAMS' highest priorities. Activities are underway with the aim to start such a survey in the next triennium (2011-13).

The Committee **welcomes** the new information and **supports** continuation of such efforts in the Mediterranean Sea and adjacent areas. It specifically **endorses**, as it has in the past, implementation of the ACCOBAMS basin-wide survey, as soon as possible.

14.5 Review of takes of small cetaceans
At the last meeting, the sub-committee discussed various problems associated with the compilation of data on takes of small cetaceans including both direct catches and bycatch (IWC, 2010h, pp.326-28). It recommended a series of changes in how the data should be compiled, reported and interpreted. The process of setting up a system for direct electronic submission of these data by national representatives is still ongoing. The information retrieved by the Secretariat from national progress reports was reviewed. Data on bycatch of small cetaceans was presented in 12 National Progress Reports (Annex L, table 2).

The Committee **reiterates** the importance of having these data submitted and **encourages** all countries to do so.

The observer from NAMMCO advised that catch data from member countries are routinely published in the NAMMCO Annual Reports that are available on the website *http://www.nammco.no*.

Concern was expressed about the information from 12 West African countries indicating human consumption of cetaceans, exchange of cetacean meat in markets or direct capture of cetaceans (see Annex L, table 1); consumption and exchange can lead to targeted and unregulated direct hunting.

Information was received on small cetacean interactions with fishing gear in Machalilla National Park, Ecuador. Four species of cetaceans were caught incidentally: common bottlenose dolphins, dwarf sperm whales, Risso's dolphins and pantropical spotted dolphins. The Committee **expresses concern** about the implications of the bycatch documented in this preliminary study and looks forward to a more detailed report next year on the scale of the fisheries involved and therefore the implied magnitude of the cetacean bycatch.

14.6 Voluntary Fund for Small Cetaceans Conservation Research
The Committee discussed a proposed mechanism and procedure for allocating project support for high priority conservation projects (e.g. improving status of threatened species, capacity building) from the IWC Small Cetacean Research Fund. Australia's recent contribution to the fund is intended to support high priority research that demonstrably

links to improving conservation outcomes for small cetaceans globally, particularly those that are threatened or especially vulnerable to human activities. Preference for funding will be based on a determination of need, the quality of the research application and the demonstration of links between research and conservation outcomes. Proposals that demonstrate a capacity building legacy will be viewed favourably.

In order to maximise the number of projects supported by the fund, and hence enhance conservation outcomes for small cetaceans, any single proposal will be limited to a maximum of £34,000. Other IWC member governments will also be encouraged to provide additional voluntary donations to the fund to further support small cetacean research.

A funding application form is being developed and made available via the IWC Secretariat. Applications should be received by the Secretariat at least 60 days prior to the start of the Committee's Annual Meeting. A Review Group will be appointed by the Convenor of the Small Cetacean sub-committee to review proposals in accord with agreed criteria. The group will make recommendations for funding to the Small Cetaceans sub-committee. It may suggest improvements to proposals where appropriate and can solicit the assistance of other researchers in the review process if necessary.

The recommended projects and budgets will be reviewed by the Small Cetacean sub-committee and the full Scientific Committee. Recommended proposals will be added to the Committee's budget as a specific request to the Voluntary Research Fund for Small Cetaceans. The Secretariat will organise contracts for the projects that are approved for funding by the Commission.

The Committee **emphasises** the importance of ensuring that proposal review and project selection meet the criteria and priorities of the sub-committee on small cetaceans. In addition to a call for proposals via a circular from the IWC Secretariat to all members of the Scientific Committee, a broader announcement mechanism will be developed.

The Committee **expressed** its gratitude to the Government of Australia for its generous contribution to the Voluntary Fund for Small Cetacean Conservation Research, which will make a significant difference to the Fund's ability to pursue its conservation priorities.

The Committee also **emphasises** the importance of building the Fund by obtaining donations from other sources. It was noted that good outcomes from the funded research should encourage more countries to contribute.

14.6.1 Project Proposal for the Voluntary Fund for Small Cetacean Conservation Research
A proposal for funding by the Small Cetacean Conservation Research Fund entitled '*Threatened Franciscanas: Improving Estimates of Abundance to Guide Conservation Actions*' was presented (Annex L, Appendix 3). The proposed work is directly linked to previous recommendations of the sub-committee, and responds directly to recommendations made at the present meeting based on consideration of SC/62/SM7 (see Annex L).

The sub-committee **strongly supports** the proposal, based on the following considerations:

(1) the franciscana is threatened by a variety of human activities in the region, particularly artisanal fishing;
(2) the proposal addresses a clear conservation need as expressed in present and previous recommendations; and

(3) more robust estimates of franciscana abundance (along with improved, more nearly complete estimates of bycatch as well as assessments of other threat factors) are needed to assess the status of populations and develop appropriate mitigation efforts.

The proponents have a strong track record (e.g. as reflected in the quality of the work described in SC/62/SM7).

The Committee therefore **recommends** that the proposal be funded by the Voluntary Fund for Small Cetacean Conservation Research and that a full report on the results be provided for consideration at a future meeting.

14.7 Work plan
The sub-committee on small cetaceans reviewed its schedule of priority topics which currently includes:

(1) systematics and population structure of *Tursiops*;
(2) status of ziphiids worldwide; and
(3) fishery depredation by small cetaceans.

The Committee **agrees** that the priority topic for the next annual meeting will be the status of ziphiids (beaked and bottlenose whales) worldwide.

Further discussion of potential future topics can be found in Annex L. As part of the discussion it was agreed to establish an intersessional correspondence group convened by Ritter to consider whether the issue of the consumption of cetaceans ('marine bushmeat') as some type of substitute for other resources that are becoming scarce should be added to the priority topic list. The group will collate information intersessionally and report back at the next annual meeting.

The Committee will also review the report from the Workshop on climate change and small cetaceans.

15. WHALEWATCHING (WW)
The report of the sub-committee on whalewatching is given as Annex M. Scientific aspects of whalewatching have been discussed formally within the Committee since a Commission Resolution in 1994 (IWC, 1995b).

15.1 Proposal for a large-scale whalewatching experiment (LaWE; including reports from the intersessional steering group and the advisory group)
The Committee received a proposal from the large-scale whalewatching experiment (LaWE) intersessional steering group. The report elaborated on the objectives, aims, methodology, design, management and funding considerations for this initiative (Annex M, Appendix 2).

Three options were presented for procedural mechanisms to manage the different components of the LaWE project, ranging from top-down (in which the IWC would play a steering group role) to decentralised (in which the IWC would play a coordinating role (Annex M, item 5.1, fig. 1). After discussion, the Committee **agrees** that a transitional process is preferable, with a top down approach (hierarchical structure) at the initial stage of the project progressing into a mechanism where the IWC would play more of a coordinating role (network structure). Discussions are detailed in Annex M, item 5.1.

IWC member nations will be able to use the results of the project as the basis for appropriate scientific management of whalewatching. The information collected during LaWE will also provide data on general biology and life history parameters of cetaceans that are relevant to other aspects of the Committee's work. There are a variety of potential funding sources for the LaWE effort including:

(1) IWC membership: funding derived from fees/contributions from member nations;
(2) national/regional initiatives: funding derived from national or regional governments involved in the support/promotion of whalewatching;
(3) NGOs: funding derived from national/international NGOs involved in the conservation of cetaceans;
(4) whalewatching operators: funding derived from whale/dolphin-watching operators; and
(5) hybrid model: targets key operators in high profile whalewatching areas with additional funding sought from host countries, IWC, NGOs, and other sources.

The Committee **recommends** that an e-mail correspondence group be formed to further develop the budget for the LaWE, although it noted that until power analyses are completed and species and sites are chosen, only approximate budgets can be created.

The Committee **agrees** to combine the two previous LaWE intersessional groups into one 'steering group' to maximise collaborative discussions (see Annex M, item 5.1).

The budget request to assist the LaWE intersessional work to develop procedural mechanisms to centralise data received from research groups relevant to LaWE with the Secretariat and commence power analysis for key parameters depending on data received is discussed under Item 24. In addition, funding is requested for a pre-meeting of the LaWE steering committee to review and advance intersessional progress on all aspects of the project, including reviewing data received, advancements in power analysis, and the selection of appropriate study species and sites.

There was no formal report from the advisory group, as the LaWE is not yet at the point of selecting research sites.

15.1.1 Other
SC/62/WW5 presented a summary of progress from a working group tasked with developing a formal mathematical structure from the US National Academy of Sciences Population Consequences of Acoustic Disturbance (PCAD) conceptual framework. The working group decided to develop three statistical models to provide the linkages from disturbance to population dynamics. Work has focused on the first models (disturbance to physiological conditions). First implementations with simple systems (southern elephant seals at-sea movement) proved extremely successful and body condition time series could be estimated and validated against body weight when the seals returned to the colony. A similar, albeit more complex, model was developed for coastal dolphin population case studies and will be implemented over the next year.

Discussions on the motivational state-space approach to the PCAD model and concern about the restrictions on the remit of the PCAD project are detailed in Annex M, item 5.1.

15.2 Review of whalewatching off North Africa
SC/62/SM8 reported on cetacean sightings, local human activities and conservation off São Tomé (São Tomé and Príncipe), Gulf of Guinea, West Africa. This region seems to be an important area for cetaceans; however, the status of species or populations has not been assessed due, in part, to lack of information and effort. A similar situation may exist in the Cape Verde Islands where there are resorts and a significant number of tourists. It was noted that several measures regarding the conservation of natural populations of cetaceans are needed for these areas (including international standards of operation, educational

programmes and research) to reinforce a change to a more conservation-oriented perspective with direct involvement of local communities.

The Committee welcomed the report and noted the lack of information on whalewatching activities in western and northern Africa. Furthermore, it **expresses concern** at the potential for expansion of whalewatching activities in the region without sufficient scientific information on cetaceans and called for an assessment of the scope of activities to be made by relevant authorities as soon as possible.

An overview of whalewatching activities in the Mediterranean will be prepared under ACCOBAMS. More information is available on the Agreement's official website, *http://www.accobams.org*.

15.3 Assess the impact of whalewatching on cetaceans
SC/62/WW4 reported on the critically endangered Irrawaddy dolphin population inhabiting the Mekong River. Studies indicate dolphins exhibit high site fidelity during the dry season, have low genetic diversity and a high mortality rate. The locations of dolphin-watching areas are at two of the critical habitats for the remaining population in the river, numbering less than 100 individuals. Initially, at both locations, the dolphin-watching industry was land-based, with a few row-boats occasionally taking tourists into the pool to view dolphins. By the early 2000s this expanded to approximately 15 larger motorised boats that offered dolphin tours. Now it numbers more than 20. The authors believe that an adaptive, precautionary approach is essential to managing tourism that targets small, closed, resident communities of cetaceans and that for this Critically Endangered population, a 'no vessel-based dolphin tourism' policy is desirable. It was noted that the issues associated with Cambodian cetacean-watching tourism may be generic to developing countries.

The Committee reiterated **its concern** over the critically endangered Mekong River Irrawaddy dolphin population. In 2006, it had noted that there was compelling evidence that the fitness of individual odontocetes repeatedly exposed to tour vessel traffic can be compromised and that this can lead to population level effects (IWC, 2007b). It also stated that, in the absence of data, it should be assumed that such effects are possible until indicated otherwise – particularly for small, isolated and resident populations. Accordingly, the Committee **strongly recommends** that the Cambodian government and relevant agencies make every effort to reduce the exposure of dolphins to vessel-based tourism in deep-water pools in the Mekong River.

SC/62/WW1 reported on behavioural responses of southern right whales to human approaches in Bahia San Antonio, Rio Negro, Argentina. Results are listed in Annex M, item 6. The Committee noted the small sample size but commended the before-during-after experimental design.

SC/62/WW2 summarised recent advances in whale-watching research. Noren *et al.* (2009) investigated the prevalence of 'surface active behaviours' (e.g. spy hops, breaches) in the vicinity of boats in southern resident killer whales; Arcangeli and Crosti (2009) conducted a study on an Australian common bottlenose dolphin (*Tursiops truncatus*) population in the coastal waters of Bunbury; Christiansen *et al.* (2010) used a Markov chain analysis to investigate changes in Zanzibar Indo-Pacific bottlenose dolphin (*T. aduncus*) behavioural states in relation to boat traffic; Scarpaci *et al.* (In press) reported on the impact of swim-with-cetacean tourism on bottlenose dolphins within a 'sanctuary zone' in Port Phillip Bay, Australia; Sousa-Lima

and Clark (2009) used automated acoustic recordings to monitor and track the singing behaviour of male humpback whales in Abrolhos Marine National Park, Brazil, a major humpback whale breeding ground; Stamation *et al.* (2010) monitored the behaviour of groups of humpback whales off Queensland Australia from both whalewatching vessels and land-based platforms; Filla and Monteiro (2009) investigated various types of whalewatching on estuarine or 'guianensis' dolphins (*Sotalia guianensis*) in Cananéia, southeast Brazil; and Jensen *et al.* (2009) found that common bottlenose dolphin and pilot whale (*Globicephala macrorhynchus*) communication calls could be masked substantially by small outboard engine noise. Summaries are presented in Annex M, item 7.

The Committee **welcomes** this review and encouraged the author to prepare a similar review for the next meeting. It was clarified that these reviews are not critiques of methods or results but rather a compilation of new research results of interest.

SC/62/WW3 reported on the US National Oceanic and Atmospheric Administration's efforts to develop management plans to reduce the exposure of resting spinner dolphins (*Stenella longirostris*) to human activity in Hawaiian waters. One management approach under consideration focuses on time-area closures to reduce the number and intensity of interactions between humans and dolphins during critical rest periods in particular bays. Research will combine boat-based and land-based visual observations with passive acoustic monitoring and is an international collaboration between researchers from American, Australian and Scottish universities. Time area closures will not be implemented until a full year of pre-closure data collection has been completed. The authors highlighted this study as a possible candidate project for inclusion in the Large-scale Whalewatching Experiment (LaWE) initiative, as it incorporates many facets that the LaWE initiative strives to achieve.

The Committee **commends** this study and deems it relevant to the LaWE initiative.

SC/62/WW8 presented a precaution on interpreting the results of impact study data analysis. The paper discussed the possibility of confounding variables when interpreting correlations between whalewatching exposure and reproductive parameters of female humpback whales (see Weinrich and Corbelli, 2009). Discussion is presented in Annex M, item 7.

The Committee **welcomes** this paper as an important consideration in impact analyses. It was noted that this contribution clarifies that whalewatching is essentially another habitat variable, and should be treated as such in multivariate models.

Parrot *et al.* (2010) report on an agent-based simulation platform to assess the characteristics of interactions between whales and vessels under different scenarios. The simulation is composed of a spatial environment in which a whale individual-based model and a boat agent-based model can evolve. It simulates the spatiotemporal movement of marine mammals and vessel traffic in the St Lawrence Estuary. It estimates movement parameters from long-term data collected using both onboard GPS and vessel monitoring systems for vessels and a variety of land-based and boat-based focal follows as well as sightings for marine mammals from whalewatching boats.

This platform can be used to inform decision-making by simulating different vessel and whalewatching traffic scenarios.

This project is highly relevant to the LaWE objectives and offers an avenue to simulate boat interaction consequences for cetaceans using behavioural statistical models of disturbance effects. The Committee **welcomes** this effort.

The Committee noted that its work on whalewatching has been influential with other research initiatives to understand effects of disturbances on cetacean populations.

At last year's meeting, there was discussion on the impacts of aerial whalewatching (IWC, 2010i). Groch noted that she was not able to analyse behavioural data collected in previous years during southern right whale photo-id surveys from a helicopter in Brazil. Sironi reported that a trial was conducted to record before-during-after behavioural observations during the 2009 southern right whale photo-id aerial survey in Argentina from a fixed-winged aircraft. Dedicated flights are required to obtain more accurate behavioural data.

15.4 Review reports of intersessional working groups

15.4.1 Online database for worldwide tracking of commercial whalewatching/associated data collection
Robbins summarised the status of an online database for tracking whalewatching operations and associated data collection programmes. This database was originally described in Robbins and Frost (2009) and is intended to facilitate studies of whalewatching impact as well as to allow better assessments of the scientific value of data collection programmes. Database development has made considerable progress intersessionally and should be available to go online prior to next year's meeting. The Committee **recommends** that the intersessional working group continue and report back next year (see Annex Q).

15.4.2 Swim-with-whale operations
Rose reported that due to time constraints, no progress was made intersessionally on field-testing a questionnaire to further assess the extent of swim-with-whale operations. However, a draft questionnaire is ready to be distributed and plans are in place to do so in the Dominican Republic and possibly Australia before next year's meeting. The Committee welcomes the commitment of funding for this effort by the Pacific Whale Foundation and **recommends** that the intersessional working group continue and report back next year (see Annex Q).

15.5 Other issues

15.5.1 Consider information from platforms of opportunity of potential value to the Scientific Committee
Progress continues in efforts to stimulate submission of opportunistic data from ecotourism cruise ships in the Southern Ocean to the Antarctic Humpback Whale Catalogue (AHWC). The availability of these data has broadened understanding of the exchange between areas and in some cases provided information that was previously not available. Ritter (2010) reported on a near-miss event involving a large vessel and humpback whales off Antarctica (see Annex M, item 9.1).

Smit *et al.* (2010) reported on opportunistic research off the coast of La Gomera, Canary Islands (Annex M, item 9.1). The study highlights the importance and the potential of mutual long-term co-operation between whalewatching operators and scientists. The Committee welcomes the reports and reiterated the value of collaboration between researchers and whalewatching operations and other platforms of opportunity.

15.5.2 Review of whalewatching guidelines and regulations
The compendium of whalewatching guidelines and regulations around the world is in the process of being updated and will be available on the IWC's website in August. SC/62/WW2 described several papers relating to guidelines and compliance including Noren *et al.* (2009), Williams *et al.* (2009a); Stamation *et al.* (2010); Sousa-Lima and Clark (2009); and Jensen *et al.* (2009). Summaries of the reports are found in Annex M, item 9.2.

15.5.3 Review of risk to cetaceans from collisions with whalewatching vessels
No new information was brought to the meeting this year. Some members indicated that papers on this item would be submitted to next year's meeting. The Committee noted that this issue will be discussed at a joint workshop with ACCOBAMS in Monaco from 21-24 September 2010.

15.5.4 Future of the sub-committee on whalewatching
The Committee took note of IWC/62/CC8 and the possible interface between the Conservation Committee's work and its own work on whalewatching. The Conservation Committee has established a Standing Working Group on Whalewatching and intends to develop a draft strategic plan for five years (2010-15). IWC/62/CC8 made reference to the work of the Committee and various scientific issues and the section on Capacity Building and Development states that actions 'may include… provision of expert assistance through the Scientific Committee's sub-committee on whalewatching'.

The Committee requests clarification on the mechanism by which this expert assistance will inform the work of the Standing Working Group. It welcomes the opportunity to liaise with the Conservation Committee and Commission, but noted its own terms of reference, and believes that the advice it offers should be within that framework. One possible mechanism, for example, would be to designate a representative from the Committee to work directly with the CC on this issue, thereby providing a formal interface.

The Committee is also seeking clarification on the envisioned management objectives for whalewatching, as IWC/62/CC8 states both 'growth' and 'sustainability' objectives. Clarification will guide the scientific work of the Committee for Objective 7 of the LaWE project ('Develop an integrated and adaptive management framework for whalewatching that accounts for uncertainties, and includes monitoring and feedback mechanisms').

The Committee draws the attention of the Conservation Committee to the definitions of whale ecotourism developed at previous meetings (IWC, 2006c) and considered it important that the Conservation Committee takes a strategic view of what it might achieve in the five years. It also **stresses** the importance of a good scientific basis for the work that it is recommending to the Commission.

It was noted that it would be valuable to increase communication with and explore possibilities for collaborate with the UN World Tourism Organisation, as its remit complements the work of the sub-committee in a number of aspects. Lusseau agreed to liaise for this purpose.

15.5.5 Other
Eisfield *et al.* (2010) reported on the behaviour of a female solitary sociable dolphin studied on the southeast coast of England in 2007, previously addressed by the Committee. The report is summarised in Annex M, item 9.5.

The Committee **reiterates its recommendation** of 2008: habituation of solitary dolphins can make them vulnerable to harm, including being killed, and should be avoided.

16. DNA TESTING (DNA)

The report of the Working Group on DNA is given as Annex N. This particular Agenda Item has been considered since 2000 (IWC, 2001d; 2001e; 2001h) in response to a Commission Resolution (IWC, 2000).

16.1 Review genetic methods for species, stock and individual identification
No new documents were submitted under this Item this year. Last year, the Committee had reviewed Cipriano and Pastene (2009), which provided a comprehensive review of current knowledge of techniques to extract DNA from 'difficult' samples.

16.2 Review results of the amendments of sequences deposited in GenBank
During the first round of sequence assessment (IWC, 2009i, p.347), some inconsistencies were found for some sequences assigned to right and minke whales. These appeared to have been due to a lag in the taxonomy recognised by *GenBank* or uncertainty in taxonomic distinctions currently under investigation (e.g. the number of species and appropriate names for recently described species of 'Bryde's whales').

Last year, the Committee noted that the original submitter would be notified of the inconsistencies and a suggestion made that an amendment be made to the entry. Pastene reported that he had contacted *GenBank* officers to make the above indicated amendments. He was informed that only the original submitters of the sequences can make amendments to their submissions. In view of this he contacted the relevant scientists encouraging them to make the relevant amendments. As a result, the notification regarding Bryde's whale taxonomy (IWC, 2010c, p.73) was made. Amendment work by the original submitters of right and minke whale sequences is ongoing and this work will be completed during the next intersessional period.

The Committee thanked Pastene for his work in this regard.

16.3 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 2009. A total of 484 whales were landed in 2009 (see Annex N, Appendix 2).

The collection of samples in Japan is from special permit whaling in the Antarctic (JARPA II) and North Pacific (JARPN II), bycatches and strandings. The collection includes complete coverage for 2009 and the 2009/10 Antarctic season. A total of 506 genetic samples of the Antarctic minke whale and one of the fin whale were collected from the 2009/10 austral summer survey of JARPA II. From JARPN II in the western North Pacific (NP) samples stored in 2009 were: NP common minke whale, $n=162$; NP Bryde's whale, $n=50$; NP sei whale, $n=100$; and NP sperm whale, $n=1$. The samples from bycatch stored in 2009 were: NP common minke whale, $n=119$; NP humpback whale, $n=3$. Genetic samples were stored for the following stranded whales in 2009: NP common minke whale, $n=3$; NP humpback whale, $n=1$ and NP sperm whale, $n=1$ (see Annex N, Appendix 3).

The collection of samples from Iceland in 2009 was from commercial catches of North Atlantic common minke whales ($n=81$) and fin whales ($n=125$). Samples are currently in hand for all whales taken in 2003-09 (see Appendix 4 of Annex N).

The Committee welcomes this information from Norway, Japan and Iceland.

16.4 Reference databases and standards for diagnostic registries
Genetic analyses have been completed and data on mtDNA, microsatellites and sex entered in the Norwegian register for years up to 2007. The laboratory work on the 2008 samples is completed but has not yet been analysed. Laboratory work is ongoing for the 2009 samples (see Annex N, Appendix 2).

For the Japanese register, the genetic analyses based on mtDNA have been completed for North Pacific common minke, Bryde's, sei and sperm whales taken by special permit whaling up to 2009. Laboratory work on microsatellites for these samples is ongoing.

The genetic samples of Antarctic minke whales obtained by JARPA II have not yet been analysed, except for sex and for microsatellites of 190 samples taken in 2006-07 (six loci) and 551 taken in 2007-08 (six loci). For bycatch samples, genetic analyses based on mtDNA have been completed for all samples up to 2009. Laboratory work on macrosatellites for these samples is ongoing. Laboratory work is ongoing for stranded animals in 2009 for both mtDNA and STR (see Annex N, Appendix 3).

For the Icelandic register, genetic analyses (mtDNA and microsatellites) have been completed for common minke whales taken by special permit whaling in 2003-07. Laboratory work of samples taken under commercial whaling in 2006-09 is ongoing. Genetic analyses were completed for fin whale commercial samples collected in 2006 and 2009 (see Appendix 4 in Annex N). It was noted that only whales intended for export from Iceland were currently being genotyped for inclusion in that country's registry and that other whale samples will be genotyped as soon as possible.

The Committee **recommends** the adoption of a standard format for the updates of national DNA register to assist with the review of such updates in the future and agrees that the format used by the Norwegian registry update provides a suitable model. Pastene will work intersessionally with colleagues from Norway, Japan and Iceland to agree on the standard format. In addition, the Committee **agrees** that it would be useful to add a 'per cent completed' column for genetic analysis of tissue samples to assist in the annual review.

Whilst agreeing with these recommendations, Víkingsson reminded the Committee that Norway, Japan and Iceland are providing updates of their registries to the Committee on a voluntary basis.

The Committee noted that full technical specifications for the Japanese and Icelandic DNA registries have not been received or reviewed. Although such information is provided voluntarily, such a review would be helpful for the Committee's annual review of the status of DNA registries under its standing agenda items. The Committee recalled that updates of registers should include a list of references including the relevant documents on protocols used.

16.5 Other
SC/62/O19 describes a proposal to the IWC DAG under Procedure B, requesting access to the Japanese DNA register

for the purposes of evaluating the technical aspects of traceability/trackability of sei, fin and Antarctic minke whale products purchased at commercial outlets in Santa Monica, USA and Seoul, South Korea. SC/62/O19 requested that the proposal be considered for endorsement by the Group.

The Committee could not reach an agreement on whether or not to endorse the proposal in SC/62/O19 of the current policy of Japan, Norway and Iceland regarding DNA registers access and market survey, although it recognised that the matching exercise proposed would, in principle, be valuable for testing functionality of DNA registers for identifying and tracking whale products.

16.6 Work plan
Members of the Committee were encouraged to submit papers in response to requirements placed on the Committee by the IWC Resolution 1999-8 (IWC, 2000). Results of the 'amendments' work on sequences deposited in *GenBank* will be reported next year.

17. SCIENTIFIC PERMITS (SP)
This Agenda Item was discussed by the Working Group on Special Permits in an evening session to enable all Committee members who wished to do so to attend. Bjørge was elected Chair of the Working Group. Reeves acted as Rapporteur, and the report has been directly incorporated here.

17.1 Review of activities under existing permits
All cruise reports from Japanese scientific permits from 1987 to the present are publicly available on the website of the Institute for Cetacean Research[5]. As in recent years, documents describing activities carried out in the preceding year were received by the Committee but not presented or discussed, except for points of clarification. Authors' summaries are included below. Full discussions will occur during the periodic reviews (see Item 17.3).

17.1.1 JARPN II
SC/62/O4 presented the results of the eighth full-scale survey of the Japanese Whale Research Program under Special Permit in the Western North Pacific-Phase II (JARPN II)-offshore component-, which was conducted from 10 May to 29 July 2009 in sub-areas 7, 8 and 9 of the western North Pacific. A total of five research vessels was used: one trawl survey vessel equipped with scientific echo sounder (TSV), one dedicated sighting vessel (SV), two sighting/sampling vessels (SSVs) and one research base vessel. A total of 6,374n.miles was surveyed. During that period 63 common minke, 482 sei, 93 Bryde's and 287 sperm whales were sighted. A total of 43 common minke, 100 sei, 50 Bryde's and one sperm whales was caught by the SSVs. All whales caught were examined on board the research base vessel. A total of 53 kinds of samples and data were obtained from each whale. A total of 16 skin biopsy samples were collected from blue (6), sei (9) and sperm (1) whales. As in previous surveys, common minke whales fed mainly on Pacific saury (*Cololabis saira*) and Japanese anchovy (*Engraulis japonicus*). Bryde's whales fed mainly on Japanese anchovy and oceanic lightfish. Sei whales fed mainly on copepods, Japanese anchovy and mackerels. Dominant preys in the stomach of one sperm whale were various kinds of squids, which inhabit the mid- and deep-waters. Qualitative and

quantitative data on stomach contents will be used in the development of ecosystem modelling.

SC/62/O5 outlined the results of the sixth JARPN II survey (coastal component), conducted off Sanriku, northeastern Japan (i.e. the middle part of sub-area 7). The survey was carried out from 22 April to 21 May 2009 using four small sampling vessels and one echo sounder-trawl survey vessel. The research area was set within 50n.miles of Ayukawa port in the Sanriku district. The prey species survey was also conducted by the echo sounder-trawl survey vessel. A total of 4,756n.miles (464 hours) was surveyed and 111 schools (112 individuals) of common minke whales were sighted. No other large cetacean species was sighted. A total of 60 common minke whales were caught (27 males and 33 females) and landed at the JARPN II research station for biological examination. Only one individual in each sex was sexually mature. In addition the female was pregnant. The dominant prey species found in the forestomach was adult Japanese sand lances (*Ammodytes personatus*). The Japanese anchovy (*Engraulis japonicus*) and krill (*Euphausia pacifica*) were also observed but their frequency of occurrence was much lower. The prey species survey revealed high density of Japanese anchovy in the sampling area for common minke whale. These results suggest that during the 2009 survey common minke whales had prey preference for Japanese sand lance.

SC/62/O6 reported the results of the seventh JARPN II survey (coastal component), conducted off Kushiro, northeastern Japan (i.e. the northern part of sub-area 7). The survey was conducted from 5 September to 17 October 2009 using four small sampling vessels. The research area was set within 50n.miles of Kushiro port. The total searching effort by the sampling vessels was 5,136n.miles (494 hours) and 106 schools of common minke whales (107 individuals) were sighted; 59 animals were caught (36 males and 23 females) and landed at the research station. Of the males, 12 were sexually mature. None of the females sampled had attained sexual maturity. The walleye pollock (*Theragra chalcogramma*) was the most dominant prey species in the forestomach, followed by krill (*Euphausia pacifica*), Japanese anchovy (*Engraulis japonicus*), and Japanese common squid (*Todarodes pacificus*). Pacific saury (*Cololabis saira*) was not observed this year. All the animals feeding on walleye pollock were sexually immature. These results were almost the same as in the previous coastal surveys off Kushiro. The results suggest differences in feeding habits between immature and mature common minke whales off Kushiro in autumn. During the survey, other baleen whales were also sighted: 51 fin, 5 sei, and 22 humpback whales. They were observed in the vicinity of sampling positions of common minke whales that were feeding on krill.

17.1.1.1 POINTS OF CLARIFICATION
In response to a question regarding what new information of value in ecosystem modelling could be learned from the taking of one sperm whale last year (relative to the large number that had been caught and examined, with similar results regarding prey, in previous commercial whaling), the proponents stated that previous data on sperm whale diet from commercial catches were non-quantitative and did not consistently identify prey items to species level. They stated that this limited their utility in models such as ECOSIM and ECOPATH, and that data obtained from JARPN II were effectively used for ecosystem modelling. Others considered that this was not the case, and reiterated their view, and that of the JARPN II Review Panel (IWC, 2010a), that the catch of sperm whales in JARPN II is not scientifically justified.

[5]*http://www.icrwhale.org/CruiseReportJARPA.htm* and *http://www.icrwhale.org/CruiseReportJARPN.htm*.

17.1.2 JARPA II
SC/62/O3 presented the results of the third full-scale survey of the Japanese Whale Research Program under the Special Permit in the Antarctic-Second Phase (JARPA II), which was conducted during the 2009/10 austral summer season. Two dedicated sighting vessels (SVs), two sighting and sampling vessels (SSVs) and one research base ship were engaged in the research for 97 days from 14 December 2009 to 20 March 2010 in Areas III East (35°E-70°E), IV (70°E-130°E), V West (130°E-165°E) and part of Area V East (165°E-175°E). The total searching distance was 8,232n.miles. Eleven species including six baleen whales (Antarctic minke, blue, fin, sei, humpback and southern right whales) and two toothed whales (sperm and southern bottlenose whales) were identified during the research period. A total of 986 groups (2,242 animals) of Antarctic minke whales were sighted. It was the dominant species in the research area followed by the humpback whales (603 groups, 1,187 animals), and fin whales (56 groups, 186 animals). The number of sightings of the Antarctic minke whales was about 1.9 times higher than that of humpback whales in this survey. A total of 506 Antarctic minke whales and one fin whale were caught. All whales caught were examined on board the research base vessel. A total of 55 kinds of samples and data were obtained from each whale sampled. A total of 8 blue, 110 humpback and two southern right whales was photographed for natural marks. A total of 86 skin biopsy samples were collected from fin (1), humpbacks (84) and southern right (1) whales. To investigate vertical sea temperature profiles oceanographic surveys were conducted at 57 points using TDR. The main results of this survey were as follows: (1) whale composition in the research area was stable compared to previous JARPA II surveys in this area; (2) the ice-free extent of the research area was substantially larger than in past seasons and high density areas of Antarctic minke whales were observed near the continental shelf; (3) mature females of Antarctic minke whale were dominant in Prydz Bay; and (4) humpback whales were widely distributed in the research area and its density index was higher than that of the Antarctic minke whales in Areas IV West and V East. The 1994/95 IWC/ SOWER cruise was conducted in similar areas and periods as in the present survey. In 1994/95 Antarctic minke whales were the most dominant species. The number of sightings of Antarctic minke whales in 1994/95 was about five times higher than that of humpback whales. According to the authors of SC/62/O3, comparison of whale abundance between these two surveys suggests that humpback whales were increasing and expanding into the research area.

17.1.2.1 POINTS OF CLARIFICATION
In response to a question on information on whether vomiting and faecal observations (SC/62/O3 table 7) referred to 'natural' events or were due to harpooning, the proponents explained that the recording of such observations was for the purpose of helping to evaluate the relative merits of lethal versus non-lethal sampling, and thus that there was no value in including observations of vomiting due to harpooning.

17.1.3 Planning for final review of results from Iceland's scientific take of North Atlantic common minke whales
Víkingsson summarised the status of Iceland's analytical work on the 200 common minke whales taken as part of its scientific research programme between 2003 and 2007; annual reports had been provided while the programme was still active. Last year it had been expected that most analyses would be completed and available in 2011; this would have allowed a formal review of the programme in 2012 following

the Committee's guidelines (IWC, 2009j) provided the appropriate deadlines had been met. He reported that most of the laboratory analyses are either completed or in a final stage (see SC/62/ProgRepIceland). There had been changes and delays in some components, particularly those involving outsourced chemical analyses that required CITES permits. In addition, the serious economic difficulties experienced by Iceland in recent years have affected the programme and delayed completion of some analyses. Nonetheless, the necessary adjustments had been made to the workplan and he remained optimistic that the work would be completed on schedule.

In discussion, Víkingsson clarified that some of the analyses indicated in SC/62/ProgRep Iceland concerned species and specimens other than the 200 minke whales caught and sampled under Special Permit. Iceland's Special Permit programme had ended when the last of the 200 minke whales was taken in 2007.

In summary, an update on progress will be provided at the next Annual Meeting and approximately three months later a document will be submitted by Iceland that initiates the process leading to external review of the final results of this programme.

17.2 Review of new or continuing proposals
The Chair noted that both JARPA II and JARPN II are continuing on the basis of plans already submitted and reviewed in the Scientific Committee. There was no further discussion of this item. However, a statement in relation to this Agenda Item was received and can be found in Annex U. This statement reflects the view of many members. The response to this statement can be found in Annex U.

17.3 Procedures for reviewing Scientific Permit proposals
The Chair recalled that the Scientific Committee had spent considerable time in the past discussing this matter, and agreement on a process had been reached in 2009 (IWC, 2009j, colloquially known as 'Annex P') that had been used for the review of results of JARPN II. He noted that criticism by some members following the JARPN II review centred on how the procedures in 'Annex P' had been implemented rather than on the adequacy of the procedures themselves. Specifically, concerns had been expressed about the 'independence' of the specialists who served on the review panel, the Chair's decision not to request panel members to submit a conflict-of-interest declaration and the Chair's decision not to allow additional observers to attend the specialist workshop. The Chair noted in that regard that he also had not allowed scientists affiliated with the JARPN II programme to attend the deliberations of the expert panel.

Last year, it had been agreed to revisit at this meeting the question as to whether changes are needed to 'Annex P'. However, the Chair identified two factors weighing against the idea of having a full discussion at this time. First, given the ongoing discussions of the 'consensus package' prepared by the Commission Chair and Vice-Chair, it would be sensible to wait for outcome of those discussions before further discussion of 'Annex P'. Secondly, he believed that the dissatisfaction of some with the performance of the procedures for reviewing JARPN II was related to how these were implemented, rather than the wording of procedures themselves. In any event, Bjørge stressed that if the Committee decides to open 'Annex P' to revision, in his view such revision should be limited to only those aspects that have been controversial, i.e. the selection of experts to the review panel and the admission of observers. In discussion,

it was further noted that given the schedule for reviewing the Iceland programme (as summarised under Item 17.1.3), there should be no need to implement 'Annex P' during the upcoming intersessional period. The Committee **agrees** that no further discussion of the procedures was needed at this time.

Childerhouse asked whether the adoption of a 'consensus package' would mean that Special Permit whaling would therefore end and preparations for reviews should begin. Bjørge replied that he was not in a position to advise on that, but he assumed that if the Commission reaches a decision that includes Special Permit whaling, it would then be incumbent on the Commission to provide guidance to the Scientific Committee on how permit reviews should be handled in the future.

18. WHALE SANCTUARIES

In the major discussion about sanctuaries in 2004, the Committee recommended procedures to facilitate the review of future proposals and future sanctuary reviews (IWC, 2005a, pp50-51). No new proposals for Sanctuaries were received this year. The item will remain on the Agenda for future meetings.

19. SOUTHERN OCEAN RESEARCH PARTNERSHIP

The Southern Ocean Research Partnership (SORP) was proposed by the Australian Government to the IWC in 2008 (IWC/60/16) with the aim of developing a multi-lateral, non-lethal scientific research programme that will improve the coordinated and cooperative delivery of relevant scientific information to the IWC. A framework and set of objectives for SORP were presented, discussed and endorsed last year (IWC, 2010c, pp.80-82).

At this year's meeting it was agreed to hold discussions at an evening session to allow all members who wished to attend to be able to do so without conflict with other sub-group meetings; that session was chaired by Gales and rapporteured by Childerhouse. It was agreed that the report of those discussions would be incorporated directly into the Plenary report.

19.1 Intersessional progress
SC/62/O9 reported on the intersessional progress on SORP. Progress was made on the following major items:

(1) establishment of a SORP Steering Group (SSG) with associated terms of reference;
(2) the holding of a Workshop further develop the SORP in Seattle in December 2009 (SC/62/O8);
(3) identification of seven proposed projects that will form the basis for SORP work into the future (SC/62/O10);
(4) the development of a funding mechanism for SORP projects (see below); and
(5) the holding of a first cruise of the joint Australia-New Zealand Antarctic Whale Expedition, AWE (SC/62/O12).

These items are covered in more detail below. It was noted that a full discussion of SC/62/O12 had taken place in the sub-committee on Southern Hemisphere whales (Annex H). The brief discussion under the present item focussed on suggested improvements in future cruises related to estimating abundance, the representativeness of the study area, the use of faecal sampling, the effect of satellite tagging on animals and some comments on the ability of the project to meet its objectives.

19.2 Report of the SORP Workshop, Seattle, December 2009
The SORP workshop (SC/62/O8) was hosted and supported by the Government of the USA and attended by 15 people from five nations. Its main aims were to continue developing the mechanism by which SORP would conduct its business and achieve its objectives. The workshop agreed that a focused approach to the research was required and this was best achieved through the development of research projects that were consistent with both the agreed SORP objectives and priority issues identified by the IWC Scientific Committee. To address this latter issue, a summary document of recommendations relevant to the Southern Ocean had been compiled. The proposed draft SORP projects that were developed at the workshop are described below.

19.3 Summary and consideration of proposed SORP projects
Several draft research projects were presented to the Committee in order to obtain comments and advice (SC/62/O10). The selection process had followed a lengthy consultation process starting at the Sydney SORP workshop (Southern Ocean Research Partnership, 2009) where broad themes were developed and these themes were endorsed by the Committee last year (IWC, 2011). *Inter alia* these draft projects developed at the Seattle SORP workshop are those that were considered to benefit from large scale, multi-regional participation and were consistent with both SORP objectives and IWC priority issues. The purpose of presenting these draft projects to the Committee this year was to seek initial comments and perhaps general endorsement of the overall approaches. The intention is that the project leaders will take any comments made into account when developing the projects intersessionally. It was clarified that there was no intention for the Committee to approve the draft budgets appended to the projects at this stage. These and other aspects of the proposals would require further development and should be re-submitted using the agreed funding mechanism (see Item 19.4) at the 2011 Annual Meeting.

19.3.1 Killer whales in the Southern Ocean
A short project description of 'Distribution, relative abundance, migration patterns and foraging ecology of three ecotypes of killer whales in the Southern Ocean' was presented. There are three ecotypes of killer whales described from Antarctic waters. Little is known about these ecotypes and it is important to understand these populations as killer whales play a key role in the Antarctic marine ecosystem. This is especially true with respect to the impacts that they have on prey populations including marine mammals, fish and penguins.

This project will investigate factors related to their ecosystem impact in Antarctica and adjacent waters, by focusing on their systematic relationships, abundance, distribution, movement patterns and prey preferences. It will include analyses of lipid, isotopes and contaminants from biopsy samples. Collaborators are from USA, Brazil, France and Brazil/Canada.

In discussion, it was agreed that this was an ambitious and valuable project outline. It was noted that the proposal required considerably more detail on the proposed analytical methods before it can be properly evaluated and that this was true for most of the draft projects presented. It is also important that any final proposal includes information on the conceptual and analytical and framework linking

the sub-projects together. Suggested additional potential collaborators included Lauriano from the Italian Antarctic Programme and Bester from South Africa who is undertaking related work at Marion Islands.

19.3.2 Foraging ecology and predator prey interactions of whales and krill

A short project description of 'Foraging ecology and predator/prey interactions between baleen whales and krill: a multiscale comparative study across Antarctic regions' was presented. Little is known about the dynamics of predator-prey interactions and the response of baleen whales to the distribution of their prey in the Antarctic. As an important marine ecosystem (e.g. with respect to issues of climate change impacts as well as international management of marine living resources), research focused on cetacean foraging ecology in the Antarctic should help to fill a critical data gap. The project will use novel tagging technologies combined with traditional scientific hydroacoustic methods to quantify the types and frequency of prey consumed and daily consumption rates of poorly understood yet ecologically integral and recovering krill predators in the Antarctic: the humpback whale and the Antarctic minke whale. Collaborators are from USA and Australia for phase 1 and potentially Brazil, South Africa and Germany for phase 2.

In discussion, it was noted that this was an ambitious and valuable project. In addition, the proposal generally provides a good example of the level of detail required to allow for a full scientific evaluation. There were some methodological issues that required additional thought, including how the results from detailed studies collected at a fine spatial scale would be expanded to the medium and large scale, and also about the reliability of the method for estimating gulp volume. In response, it was noted that this project represents a step along the line in estimating consumption rates and that moving out from very fine to middle to large scale will be represent a challenge and needs further consideration. The similarity between aspects of this project and the Committee's SOWER 2000 project (IWC, 2000) developed but never implemented was noted and it was suggested that this may provide some useful additional ideas and information for the developers of the current project.

19.3.3 Oceania humpback mixing

A short project description of 'What is the distribution and extent of mixing of Southern Hemisphere humpback whale populations around Antarctica? Phase 1: East Australia and Oceania' was presented. An improved understanding of the movements and mixing of humpback whales around Antarctica has been identified as a priority for the Committee as part of its Comprehensive Assessment of Southern Hemisphere stocks. This information is integral to assessing the recovery of depleted populations. A key step in assessing recovery is estimating pre-exploitation size which requires knowledge of stock identity and appropriate allocation of historic catches to correct stocks. An improved understanding of the migratory and feeding behaviour of humpback whales should allow an appropriate allocation of catches made in this region to breeding stocks, which will improve the accuracy of recovery assessments and estimates of pre-whaling population sizes. Collaborators include New Zealand, Australia, USA, France, Samoa, Tonga and Chile.

In discussion, it was noted that when exploring allocation of past catches to breeding stocks, additional information would need to be considered given the potential temporal and spatial mixing of different breeding stocks and sexes on the feeding grounds and given the relatively small number of SOWER/IDCR samples available from this region. Similar work was being undertaken by other researchers (e.g. low to high latitude matches from Japanese and SOWER/IDCR data sets) which would help broaden the context for this work. It was noted that the outline study presented represents only Phase One; the focus is on Oceania and will include all the SOWER/IDCR data available. Future work is already being planned and there are plans to collaborate with researchers across the Southern Hemisphere (e.g. Africa, Chile, Brazil, Australia) using both mitochondrial and microsatellite data. It was suggested that the telemetry component of the study would be better structured if animals were tagged on the feeding rather than breeding grounds as this would provide more information on mixing. In response, it was noted that this had been the plan of the AWE but due to technical failure with the tags this had not been achieved. The issue of collaboration and inclusiveness was raised (as it had been at the IWC workshop on Southern Hemisphere humpback whales held in 2006) and it was noted that the proposal did not include all potentially valuable datasets. The Committee agreed that it was important that SORP projects are open to all researchers who hold appropriate datasets.

19.3.4 Fin and blue whale acoustics

A short project description of 'Acoustic trends in abundance, distribution, and seasonal presence of Antarctic blue whales and fin whales in the Southern Ocean' was presented. This initiative aims to implement a long term acoustic research programme that will examine trends in Southern Ocean blue and fin whale population growth, distribution, and seasonal presence through the use of passive acoustic monitoring techniques. Current understanding of blue and fin whale life history characteristics, population abundance, and any post-whaling recovery is extremely limited. While obtaining accurate absolute abundance estimates is currently beyond the reach of passive acoustic methods, measures of relative abundance and trends are more easily obtainable and can be conducted in a consistent manner. Comparison of relative abundance estimates from individual locations across many years collected by acoustic surveys can provide a precise measure of population growth. Comparison of relative abundance estimates within and between locations and years can further be used to assess trends in distribution and seasonal presence over time. Collaborators are from Australia, France, USA and Germany.

In discussion, it was noted that the primary focus was on the Indian Ocean. The Committee agreed that it would be useful to consider including similar acoustic data from other sources (e.g. the GLOBEC acoustic data that had been collected for six years at the Antarctic Peninsula) and was pleased to hear that the inclusion of such data is planned and that GLOBEC researchers will be approached soon. The plan to develop less expensive acoustic loggers was welcomed as an excellent step forward in the use of acoustics as a tool for monitoring. There was some thought that the timetable to complete the feasibility stage of the project (one year) may be too ambitious. As for other projects, more detail of the analytical methodology was requested. In terms of assessing the extent to which the project would meet its objectives (i.e. estimation of trends), it was noted that it would be helpful to see the detection range of the loggers as the small number of loggers planned to be deployed would cover a relatively small part of the Southern Ocean. It was recognised that complete coverage of the South Ocean was not possible given logistical constraints (i.e. the limited number of vessels in the area and where they go) but part of the future planning

was to consider the best sites for deployment to maximise the usefulness and representativeness of those sites and to try and capture representative variability. It was suggested that it would be useful for the loggers to collect environmental as well as acoustic data which would help to provide context for any variability seen, provided this could also accommodate the objective of keeping the units small and affordable. The Committee noted that using such data to estimate absolute abundance is a long term and extremely ambitious objective of the project. The project leaders acknowledged that this would not be easy, noting that the project would start by estimating relative abundance to quantify trends and work towards absolute abundance. With respect to the long-term aim, it was suggested that the developers of the programme approach scientists such as Len Thomas (University of St Andrews) who had made some progress in the development of new analytical approaches to estimate density from acoustic data.

19.3.5 Year of the Blue Whale 2013/14
As one of the major initiatives within the SORP, the Committee discussed a proposal for a multi-vessel, circumpolar research project to focus on Antarctic blue whales in the austral summer of 2013/14. The proposed objectives for this 'Year of the Blue Whale' would be to:

(1) provide a circumpolar abundance estimate of Antarctic blue whales based on data collected during a single-season, multi-vessel survey design that incorporates acoustic localisation of blue whales and traditional sightings surveys;

(2) improve our understanding of Antarctic blue whale stock structure through the collection of genetic, photographic and acoustic data;

(3) improve understanding of linkages between blue whale feeding and breeding grounds using satellite telemetry; and

(4) characterise foraging habitat of blue whales on the basis of sightings surveys and satellite telemetry data.

It was recognised that any research effort to satisfy these ambitious objectives in a single year of field work will require substantial methodological development (e.g. to determine how to combine visual and acoustic survey techniques) as well as a need to build in provisions for substantial 'off-survey' activities (e.g. satellite tagging, biopsy sampling and individual photo-id). The project will also require substantial logistical planning to access and coordinate shipping and research activities around Antarctica within a single season. It had been proposed that a small scientific steering committee be established with the task of: (1) developing a full research proposal for the Year of the Whale; (2) determining the optimal scale of shipping and research effort required to fulfil the objectives; (3) initiate processes towards accessing these shipping resources; and (4) reporting back to the 2011 Annual Meeting.

In discussion, there was broad agreement about the general concept and draft proposal and several members expressed an interest in participating in planning for the SORP Year of the Whale. There was a short discussion of a suggestion that fin whales could be included in the proposal but it was noted that high density areas of blue and fin do not always overlap and that to include fin whales might dilute the effort with respect to blue whales. The Committee agreed that the inclusion of other species, while desirable, must be considered in light of the primary objective of assessing blue whales. Recent experience during the AWE had demonstrated that acoustics was a practical method of finding blue whales

and that this would allow a blue whale cruise to minimise the amount of time searching and maximise the amount of time spent with blue whales. Recognising the ambitious nature of the project, it was suggested that the timeframe of 2013/14 was optimistic and that a delay in 1-2 years might be considered, given the enormous coordination and organisational effort required to ensure the success of such a large project. Consideration may also need to be given to spreading effort out over two years. The Committee **agrees** that until the proposal is more fully developed, it will not be possible to assess the logistical requirements necessary to complete the work. It was suggested that a small group of survey and other specialists, including those familiar with organising large multi-vessel multinational projects, should work together to further develop the proposal and report back to the SSG and the Committee next year (see Item 21); Gales agreed to co-ordinate this. Their task would *inter alia* be to determine the level of resources required, provide an outline of research methods (and analyses) and survey design, and assess the feasibility and timeframe of the project (if that group deemed it necessary, a short workshop might be considered).

19.3.6 Whales and climate change
This project has been identified as a potential project since the Sydney SORP workshop and it has been further discussed at the second IWC climate change workshop (IWC, 2010c), last year's Scientific Committee meeting and the recent Seattle SORP workshop. Long-term southern right whale datasets have been identified as the most likely existing data for correlation with long term climate changes. Leaper *et al.* (2006) demonstrated the utility of the long-term Argentinean study for assessing correlations with climate variables. It has been proposed that a project along these lines could be developed using a common method that can be applied to the Australian, South African and Brazilian long-term datasets, provided an initial examination revealed them suitable for this purpose. In this regard, consideration should be given to the development of recommendations about how existing programmes/datasets could be improved/modified to make them more suitable for future work along these lines.

As the Committee has previously recognised, an understanding of these issues requires long-term data on prey and/or climate as well as long-term whale data; this will require incorporation of relevant experts in these fields in the project. The Committee also agreed that it was worth examining the potential use of time series of whale oil production, provided that suitable climate data over the same period can be found. Investigation of long-term datasets from other species in the same ecosystem could also be valuable. The Committee **agrees** that formal proposals for work under a climate change project would be welcome for consideration at the 2011 Annual Meeting.

19.3.7 Non-lethal research techniques workshop
This proposal is for a technical conference/workshop to review the strengths and weaknesses of available non-lethal research methods for studies of living whale in the Southern Ocean and their ecological roles in the Southern Hemisphere. The objectives are to advance the synergies of non-lethal methods for investigations addressing a range of research themes. Presentations at the workshop will focus on methodological or technological advances to non-lethal methods, including those that are still under development, or with specific applications to populations in the Southern Hemisphere. Preliminary planning has been undertaken and it is likely to be held in Chile in late 2011.

It was suggested that the workshop could take place in association with the proposed Assessment workshop on southern right whales planned for Argentina in September 2011. A draft Agenda for this workshop can be found in Annex R.

19.4 Funding mechanism for SORP

The Committee **endorses** the process for evaluating requests for funding under the IWC/SORP research fund given in Annex R. It agrees that the IWC Head of Science and Chair of Scientific Committee should be included in the SORP Steering Committee.

20. ACTIONS ARISING FROM INTERSESSIONAL REQUESTS FROM THE COMMISSION

As part of the Commission's work on the Future of the IWC, the Chair and the Vice-Chair of the Commission, based on discussions within the Chair's Support group and the Small Working Group on the Future of the IWC, developed the 'Proposed Consensus Decision to Improve the Conservation of Whales'. The Committee received a short PowerPoint presentation explaining the background to the document, focussing on issue of relevance to the Scientific Committee. In particular, the Committee was asked, via the Small Working Group on the Future of the IWC, to provide scientific advice on a number of aspects of the proposed Consensus Decision; the Terms of Reference for our work are given in Annex G of IWC/62/6 rev. They are also given as Annex S to this report.

The parts of the report requiring review and advice, along with the sub-groups of the Committee that took the initial review can be summarised as follows:

(1) Review of Annex {DNA} on DNA registers and market sampling – jointly by the Working Group on DNA and the Working Group on the estimation of bycatch and other human induced mortality – see Annex N, item 9;

(2) Reviews of Annex {SI} on scientific information required from the catch and Annex {OI} review of operational information – the sub-committee on the RMP – see Annex D;

(3) Review of the potential workplan for the Scientific Committee – relevant sections were reviewed by the sub-committee on the RMP and the sub-committee on in-depth assessments (Annexes D, and G, respectively); and

(4) Review of the report of the Scientific Assessment Group (IWC/M10/SWG6) in the light of the numbers in table 4 of IWC/62/7rev (the table of catch limits) - relevant sections were reviewed by the sub-committee on the RMP, the working group on the *pre-Implementation assessment* of common minke whales in the western North Pacific, the sub-committee on in-depth assessments, the sub-committee on other Southern Hemisphere whale stocks (Annexes D, D1, G, and H, respectively).

The discussions within the sub-committees form the basis of the Committee's advice given below.

With respect to tasks (1)-(3) above, the complete Annexes incorporating our recommendations are included in Annex T, as is an updated timetable.

20.1 Review of Annex {DNA} on DNA registers and market sampling schemes

The Committee was requested to review Annex {DNA} of IWC/62/7rev for clarity and completeness. Annex {DNA} of IWC/62/7rev is based on the report of an earlier specialist workshop held from 7-9 March 2005 (IWC/M05/RMSWG 5). The objective of the review is to ensure that the Annex remains a cost-effective, robust, independent and transparent system in conjunction with the other monitoring and control measures.

To address the above objectives, the Committee **recommends** that the text given in Annex S replaces Annex {DNA} of IWC/62/7rev. Here follows a summary of the recommended changes.

1. SPECIFICATIONS FOR THE ESTABLISHMENT/ MAINTENANCE OF A DIAGNOSTIC DNA REGISTER/ TISSUE ARCHIVE
1.1 Laboratories
1.1.1 Minimal laboratory requirements

1.1.1 (6)	to clarify the length of time that archived samples were to be stored;
1.1.1 (7)	to clarify requirements that a variety of error-checking procedures should be followed and that sample quality should be checked routinely prior to genetic analysis.
1.1.1 (9)	to take into account several different factors in calibration exercises.
Footnote text	a more comprehensive definition of 'diagnostic DNA register'.

1.2 Sample collection
1.2.1 Size of the samples
1.2.2 Preservations

1.2	to specify training of and information to be collected by persons who may be involved in the collection of genetic samples for DNA registries other than commercial, scientific and indigenous catches (e.g. bycatches or stranded animals).
1.2.1 and 1.2.2	to clarify the sample preservation requirements.

1.4 Markers and methods of analysis
1.4.1 Mitochondrial DNA
1.4.2 Microsatellites
1.4.3 Sex identification

1.4.1, 1.4.2 and 1.4.3	to clarify that the analytical methods adhering to the quality standards as specified in the IWC genetic data quality guidelines must be approved by the international expert group.

1.7 External audit of DNA registers

1.7	to specify that the international expert group shall submit an annual report to the Secretariat of the IWC for distribution to contracting governments and the Commission (and, if necessary subsidiary bodies of the Commission) at least two months before it must be considered.

1.8 Submission procedure for samples for comparison with registers

The Committee considered all of section 1.8 in light of the stated objective of Annex {DNA}: 'to ensure a robust, independent and transparent system'. Item 1.8 makes a crucial contribution to these objectives, by providing a mechanism for sample verification that is not reliant on national market sampling schemes, and is also not reliant on the international expert panel, whose role is to audit the system rather to focus on individual samples. The Committee **agrees** that the current wording of item 1.8 does not fully make clear the intent of the mechanism and has thus provided new clarifying wording (including in the heading).

It also **agrees** to a new item 1.9, to specify the submission of DNA profiles to the IWC' central register from contracting governments under whose jurisdiction whales and whale products may be legally marketed.

2. SPECIFICATIONS FOR THE ESTABLISHMENT/ MAINTENANCE OF MARKET SAMPLING SCHEME
2.2 Development of appropriate market sampling schemes including audit

New 2.2 (4)	to take into account that some 'degraded' and/or 'processed' samples from market surveys could not be analyzed using exactly the same procedures as those currently used for 'fresh' and 'unprocessed' samples, but that methods could be developed to allow accurate comparison of such samples with profiles in DNA registries.

2.4 Reporting

2.4	a slight revision of the text concerning reporting to the IWC by the international expert group: the international expert group shall submit an annual report to the Secretariat of the IWC for distribution to contracting governments and the Commission (and, if necessary bodies of the Commission) at least two months before it must be considered.

20.2 Review of Annex {SI} to IWC/62/7rev – scientific information requirements
The draft Annex was based on previous recommendations of the Committee in the context of RMS discussions (IWC, 1995d). The Committee reviewed the Annex. In discussion it was recalled that the Committee has previously agreed that bulla do not provide a reliable means for estimating age (IWC, 2002c, p.12). It also noted that earplugs do not provide reliable age estimates for North Atlantic common minke whales. Walløe and Víkingsson reported that lengths could not always be recorded for minke whales in North Atlantic in the manner specified, although estimates of length are reported to the Secretariat.

Given the above the Committee **recommends:**

(1) reference to 'bulla' be removed from point 2(b); and
(2) the following footnote be added to point (a) 'Onboard small coastal whaling vessels such as those participating in Norwegian and Icelandic operations, it may be difficult to obtain accurate length measurements because whales are handled on a limited space. It is recognised that measurements in these cases may not be as accurate as those taken in ideal situations.'

The full revised Annex is given as Annex T.

20.3 Review of Annex {OI} to IWC/62/7rev – operational information requirements
The Committee **endorses** the operational information requirements as given in the proposed Annex.

20.4 Review of proposed timetable for future *Implementations* and *Implementation Reviews* (IWC/62/7rev Appendix B, p. 37)
The Committee **concurs** with the SAG that the schedule in Section 5 of IWC/62/7rev, updated following its deliberations as Table Y below, is ambitious. It noted that *Implementations* and *Implementation Reviews* can (and do) involve considerable time and resources from national scientists and, especially in cases when *Implementation Simulation Trials* are required, the Secretariat. Moreover, delays can occur when conducting *Implementations* given

that the same members of the Committee are involved in many of the *Implementations* and *Implementation Reviews*.

The Committee has previously agreed that it can only conduct one *Implementation* at a time. The schedules for Western North Pacific Bryde's whales, and for North Atlantic common minke and fin whales given in IWC/62/7rev match the schedules expected from the *Implementations* for these species in terms of the Committee's agreed guidelines (IWC, 2005b). The Committee has previously been able to complete an *Implementation Review* during a single meeting, provided that no *Implementation Simulation Trials* are required.

The Committee therefore cannot conduct *Implementations* for Western North Pacific sei and Antarctic minke whales at the same time. The SAG had considered it more important to conduct an *Implementation* for Western North Pacific sei whales first given the size of current catches and the estimates of abundance for this stock. However, the Committee noted that there are also reasons to conduct an *Implementation* for Antarctic minke whales starting in 2012. After discussion of the relative amount of preparatory work required for *In-depth* and *pre-Implementation assessments* of North Pacific sei whales compared to Antarctic minke whales, the Committee **recommends** to deal with North Pacific sei whales before minke whales, as in IWC/62/7rev, and further **recommends** the schedule given in 20.5.3.4 below.

The Committee **recommends** that two years should be allowed for the *pre-Implementation assessment* for Antarctic minke whales irrespective of when the *Implementation* for these whales starts (under the current schedule, the first year of the *pre-Implementation assessment* would be 2014). It was also recognised that the current *Implementation* for these whales is sufficiently dated (1993) that it was unreasonable to expect that this 1993 *Implementation* can simply be reviewed after almost 20 years of developments in how to *Implement* the RMP.

The Committee therefore **recommends** that '/IR' (for *Implementation Review*) be deleted from the box for 2015 for Antarctic minke whales.

20.5 Review of the Scientific Assessment Group (SAG) Report
As part of the Commission's discussions on the Future of the IWC, the Commission's Chair and Vice-Chair developed the document 'Proposal Consensus Decision to Improve the Conservation of Whales' (IWC/62/7rev). During the development process but before finalisation of IWC/62/7rev, a small Scientific Assessment Group (SAG) was established to provide a report (IWC/M10/SWG6) of a concise scientific review on whether proposed catches were such that the long-term status of the populations concerned would be negatively affected. The numbers in table 4 of the proposed consensus decision (i.e. proposed whale catches for the period 2010/11-2019/20) are below those considered by the SAG. The terms of reference developed by the Small Working Group on the Future of the IWC (SWG) for the Committee's review of the SAG report in the light of the numbers in table 4 of IWC/62/7rev are given in Annex S and summarised below.

The Committee shall follow the terms of reference of the SAG (IWC/M10/SWG, Annex B), recognising:

(a) the need to be concise;
(b) the fact that there are a number of different approaches to evaluating short-term catches and no single method will be appropriate in all circumstances; and

(c) that the report should provide an integrated, pragmatic view on whether or not the proposed short-term catches (i.e. before the RMP can be used) are likely to negatively affect the long-term (i.e. RMP simulation framework timeline of 100 years) status of the stock *given* the timetable for RMP work.

It had also been requested that the Chair of the Scientific Committee should ensure that the time spent on this review should be such that it does not interfere with the Committee's focus on completing RMP-related work as soon as possible.

The SAG had noted that there were two categories of stocks for which advice was required: those for which the RMP could be applied immediately, and those for which it could not. The report below follows a similar pattern, focussing initially on the application of the RMP (western North Pacific Bryde's whales, North Atlantic common minke whales, North Atlantic fin whales) and then turning to those stocks for which it cannot immediately be applied (Antarctic minke whales, Southern Hemisphere fin whales, western North Pacific common minke whales, and western North Pacific sei whales).

20.5.1 General issues related to using the RMP
20.5.1.1 CATCH LIMIT CALCULATIONS (ACTIVATION, YEARS, INPUTS AND OUTPUTS)
As part of the SAG process, the RMP was applied to three species-Region combinations (western North Pacific Bryde's whales; North Atlantic minke whales; and North Atlantic fin whales) upon instruction from the Chair of the Commission. The calculations reported are therefore the results of applying the RMP itself, although results are also shown for tunings other than the Commission-agreed 0.72 tuning (the 0.6 tuning). The Committee repeated the RMP catch limit calculations for these stocks. Differences from the SAG's calculations are documented in the following sections. When applying the *CLA*, the phase-out rule was applied for each *Small Area* after the catch limit was cascaded to the *Small Areas* from the *Medium Area* rather than applying the phase-out rule before cascading the *Medium Area* catch limit to *Small Areas*, in accordance with RMP specifications (RMP specification 3).

20.5.1.2 TUNING LEVELS
The SAG report (and Annex D, Appendix 8) provides results for the 0.72 and 0.6 tunings of the RMP because the whaling countries in the Commission's support group had requested the latter tuning. This issue is discussed more fully in the SAG report.

The Committee noted that although the 0.6, 0.66 and 0.72 tunings of the *CLA* were recommended to the Commission by the Committee, having been subjected to testing during the development of the RMP, the *Implementation Simulation Trials* have only been conducted by the Committee for the 0.72 tuning of the RMP. Norwegian scientists have run the *Implementation Simulation Trials* for minke whales in the Northeast Atlantic for the 0.6 tuning of the RMP, but these calculations were not undertaken nor reviewed in detail by the Committee. In addition, which RMP variants are 'acceptable' may change if the tuning level is changed. The Committee **agrees** that the tuning level which was used when calculating catch limits using the *CLA* should be that which is tested in *Implementation Simulation Trials*; in this case only the 0.72 tuning. In principle, the *Implementation Simulation Trials* could be repeated for a new tuning if requested by the Commission. However, the criteria used to evaluate whether performance of an RMP variant is 'acceptable', 'borderline' or 'unacceptable' is linked to the 0.6 and 0.72 tunings of the RMP. The present criteria may need to be investigated if the Commission requested that a different tuning of the RMP should be considered.

20.5.1.3 OTHER ISSUES
The Committee notes that its advice is based on the schedule of RMP *Implementations* proposed in Appendix B of the Chair's and Vice-Chair's proposal (IWC/62/7rev). The Committee brings to the attention of the Commission its concern that delays in completion of these implementations may increase risks to whale populations. Attention is drawn to the two-year schedule for completion of an *Implementation* as set out in the Committee's agreed guidelines (IWC, 2005b) - proposals made in this report follow from the Committee's intent to progress work in terms of this schedule.

On a more general issue, the Committee draws the Commission's attention to the fact that the RMP and AWMPs are designed to provide advice on catch and strike limits for periods of up to 6 years. Further work may be needed to assess the risks associated with setting catch limits for longer periods than 6 years.

20.5.2 Application of Stocks/Regions for which the RMP can immediately be applied
The Committee reviewed the specifications (provided by the Secretariat) of how the RMP was applied during the SAG meeting to western North Pacific Bryde's whales, North Atlantic minke whales, and North Atlantic fin whales. The following items summarise the modifications to the initial applications by the Secretariat made by the Committee in reaching its agreed applications: these primarily involve clarifications with respect to time-stamps of abundance estimates and the addition of newly agreed abundance estimates. Table 7 lists the resulting catch limits from the 0.72 and 0.6 tunings of the *CLA*. The format used to document the input and present the results (see Annex D, Appendix 8 for the final format) illustrates the calculations made, and emphasises the results calculated using the Commission-agreed 0.72 tuning.

20.5.2.1 WESTERN NORTH PACIFIC BRYDE'S WHALES
The application of the RMP to western North Pacific Bryde's whales was based on a single abundance estimate for the *Region* (time-stamped at 2000). The Committee requested that the time-stamps for the *Small Areas* when applying catch cascading be set to the effort-weighted years.

It was noted that survey data were available for 1988-96 and some of these data were used when computing the additional variance for the 1998-2002 surveys (Shimada *et al.*, 2008). An abundance estimate can be computed for 1988-96, but the Committee has only accepted the estimate from the 1998-2002 surveys (IWC, 2009b). Although abundance estimates could be calculated using the 1988-96 data, account would need to be taken of the correlation of these estimates with those for 1998-2002 if they were included in RMP calculations of catch limits. However, the presently-coded version of the RMP does not allow input of a variance-covariance matrix for the abundance estimates. The Committee therefore **recommends** that:

(1) the program for the *CLA* be modified to allow variance-covariance matrices to be input (Annex D, item 2.4); and

(2) the data and resulting abundance estimates from the 1988-96 surveys should be reviewed for possible use in the RMP during the next *Implementation Review*.

Table 7

Summary of the application of the RMP (full details of the inputs to the RMP as well as relevant intermediate calculations are given in Annex D, Appendix 8). Phaseout has been applied where applicable.

Year	WNP Bryde's whales	North Atlantic fin whales		North Atlantic minke whales					
Sub-area	1W+1E	WI (variant 6)	WI (variant 2)	CIC	CM	ES	EB	EW	EN
Catch limits based on the 72% tuning (Commission's agreed value)									
2010	**5**	**46**	**87**	**224**	**135**	**58**	**92**	**152**	**70**
2011	**3**	**46**	**87**	**224**	**135**	**58**	**92**	**152**	**70**
2012	**1**	**46**	**87**	**224**	**135**	**46**	**92**	**152**	**70**
2013	**0**	**46**	**87**	**224**	**135**	**35**	**92**	**152**	**56**
2014	**0**	**46**	**87**	**224**	**108**	**14**	**92**	**152**	**42**
Catch limits based on the 60% tuning									
2010	33	90	155	345	208	122	195	322	148
2011	19	90	155	345	208	122	195	322	148
2012	4	90	155	345	208	97	195	322	148
2013	0	90	155	345	208	73	195	322	118
2014	0	90	155	345	166	29	195	322	89

The final specifications for how the RMP was applied to these whales are listed in Annex D, Appendix 8A.

20.5.2.2 NORTH ATLANTIC MINKE WHALES
The Committee **recommends** the following changes to the abundance estimates for minke whales in the Central North Atlantic:

(1) use the estimates in Annex D, Table 1 to construct an abundance estimate for *Small Areas* CG+CIP and include this abundance estimate in that for the C *Medium Area* for 2006;
(2) use the estimate for the CM *Small Area* in 2005 of 12,043 (CV 0.28) in place of the estimate of 6,174 (CV 0.36) because the former estimate is based on surveys which covered more of the CM *Small Area*; and
(3) use the revised version of the estimate of abundance for 2005 of 26,739 (CV 0.39) in place of the estimate of 24,890 (CV 0.45);

Allison recalculated the CVs for the abundance estimates for the C *Medium Area*.

The Committee **recommends** that the catch limits for the minke whales in the eastern North Atlantic be based on the latest sex ratio data (i.e. 2005-09) rather than 2004-08 as was used for the SAG report. The final specifications for how the RMP was applied to North Atlantic minke whales are listed in Annex D, Appendix 8B.

20.5.2.3 NORTH ATLANTIC FIN WHALES
The Committee had no changes to the application of the RMP used in the SAG report. The specifications for how the RMP was applied to North Atlantic fin whales are listed in Annex D, Appendix 8C. As noted under Item 6.2.1, the Scientific Committee has already confirmed that *Variant 2* would be acceptable for 10 years, followed by *Variant 1*, if accompanied by an acceptable research programme. No final research proposal to distinguish between stock structure hypotheses has yet been adopted. Therefore, *Variant 2* is not an available option at this time. However, a preliminary proposal was submitted and discussed at this meeting. The Scientific Committee made two specific recommendations for improvement. The proposal will be modified accordingly, in consultation with an advisory committee appointed by the Scientific Committee, and submitted to the next Annual Meeting for adoption.

20.5.3 Advice on Stocks/Regions for which the RMP cannot immediately be applied
20.5.3.1 ANTARCTIC MINKE WHALES
Information on the timetable for undertaking an *Implementation* of Antarctic minke whales is given under Item 20.4. If this timetable can be met, it is expected to be completed in 2016.

20.5.3.2 SOUTHERN HEMISPHERE FIN WHALES
Section 2.6 of IWC/M10/SWG6 considered Southern Hemisphere fin whales. It is proposed that catches would be taken alternately in the Indian Ocean (between 35°E-130°E) and Pacific Ocean (between 130°E and 145°W) sectors of the Antarctic. A total of 10 annual catches would be taken in the period 2010/11-2012/2013, starting in the Pacific Ocean sector. Catches would be reduced from 10 to 5 individuals from 2013/14 until 2019/2020.

The Committee noted that in the past there was extensive exploitation (nearly 750,000 fin whales were killed in the 20th Century), and that recent information on fin whales in the Southern Hemisphere is poor. The Committee also noted that there were additional abundance estimates for this population, derived from IDCR/SOWER surveys, which had not been considered by the SAG (e.g. Branch and Butterworth, 2001a; Butterworth and Geromont, 1995). Branch and Butterworth (2001) estimated that the circumpolar abundance of fin whales south of 60°S was 2,100 (CV=0.36), 2,100 (CV=0.45) and 5,500 (CV=0.53) for CPI, CPII and CPIII respectively. These estimates are negatively biased since the areas north of 60°S were not covered[6].

It is unlikely that sufficient information will become available in the interim period (up to 2020) for an RMP *Implementation* to occur. Nevertheless, some members noted that if the *CLA* of the RMP was used it would result in a catch limit of 0. The Committee **concurs** with the general conclusions of the SAG, i.e. that it is unlikely that the proposed catches will affect the long-term status of the stock[s]. Some members were concerned about providing *ad-hoc* advice on catch limits without any likelihood of a formalised procedure being available in the foreseeable future. They did not want this exercise to set a precedent for providing *ad-hoc* advice.

[6]IWC (1996b) reports IDCR estimates extended to south of 30°S by using Japanese Scouting Vessel survey results to provide an index of relative abundance.

20.5.3.3 WESTERN NORTH PACIFIC COMMON MINKE WHALES

Information on the timetable for undertaking an *Implementation Review* of western North Pacific common minke whales is given under Item 20.4. Given the progress made at this meeting (see Annex D1), it is expected that this will be completed in 2012.

The Committee noted that it was not possible to apply the RMP to the data for these minke whales owing to the considerable changes to the understanding of stock structure in recent years. It **agrees** that the present uncertainty precludes giving adequate advice regarding the catches in Table 4 of IWC/62/7rev The Committee generally **agrees** with the conclusions of the SAG; the Committee summarised its conclusions as follows.

(1) The *Implementation* process should be completed as quickly as possible. Completing the *Implementation Review* will allow advice on catches to be based on the RMP, which has been selected to ensure that catches are sustainable.

(2) A high priority should be accorded to research to determine the proportions of 'O' and 'J' stock in sub-area 12 because the implications of any proposed catches for both 'O' and 'J' stock clearly differ depending on this proportion. In this respect, the Committee welcomed the survey of sub-area 12 planned for summer 2010 and **emphasises** the importance of collecting as much data as possible to estimate stock proportions in sub-area 12.

(3) The proposed catches by coastal whalers in Table 4 of IWC/62/7rev may not help to improve the status of 'J' stock compared to current JARPN II catches. The incidence of 'J' stock in the catch decreases with distance offshore. The Committee received an analysis which estimated the number of 'J' stock animals under catch levels of 150 inshore and 70 offshore (Annex G1, Appendix 8). The Committee recognised the value of analysis such as those in Annex G1, Appendix 8 and **recommends** that further analyses be conducted using a finer spatial resolution and quantifying the uncertainty associated with the predictions, including the likely level of inter-annual variation in catches of 'J' stock animals.

(4) The Committee was unable to agree on the impact of the proposed catches on the 'O' stock. However it **agrees** that the risk to the 'O' stock will be minimised if the *Implementation Review* is completed as soon as possible so that advice can be based on the RMP and hence also **agrees** that catches of 'O' stock should not exceed present levels.

Table 8

Scientific Committee work plan for RMP *Implementations.*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	202
Western North Pacific Bryde's whales				IR					IR		
NA common minke whales - eastern and central medium areas				IR							IR
NA fin whales - central medium area				IR					IR		
Western North Pacific common minke whales	PIA		RMP	[RMP]					IR		
Western North Pacific sei whales		IDA		PIA	RMP	[RMP]					IR
Antarctic minke whales			PIA	PIA		RMP					

IR= *Implementation Review* (often possible to complete in one year). PI = *pre-Implementation assessment* (may take more than one year). RMP completed *Implementation* (takes two years once the PIA is completed IDA= in-depth assessment, usually takes two years or more and feeds in a *pre-Implementation assessment.* As explained in the text, the plan ambitious and it may not be possible to achieve all of the work by th years indicated. Square brackets are used to express possible but perha less likely dates.

20.5.3.4 WESTERN NORTH PACIFIC SEI WHALES

Information on the timetable for undertaking an *Implementation* of western North Pacific sei whales is given under Item 20.4. If the *Implementation* turns out to be as simple as suggested there, it is expected to be completed by 2014.

The SAG report was based on the assumption that the In-depth Assessment for North Pacific sei whales would be conducted in 2010 as planned last year. This year, the Committee has concluded that in view of the relatively simple information available on the population, the In-depth Assessment and *pre-Implementation assessment* could most efficiently be combined into a single exercise, and **agrees** a compromise date of 2013 for the combined assessment, with RMP catch limits to be set the following year if no complications arise. The Committee **concurs** with the SAG that priority for the Committee should be to complete the RMP *Implementation* as soon as possible rather than to develop formal interim management advice. The Committee was unable to agree on the impact of the proposed catches on sei whales. The Committee **recommends** that as a minimum there should be no increase in the present level of catches until the RMP *Implementation* has been completed. Catches for North Pacific sei whales resumed in 2002 and the annual catch since 2004 has been 100 animals.

Table 9

Workshops and intersessional meetings planned for 2010/11.

Subject	Agenda item	Venue	Dates	Steering Group
North Pacific sighting survey workshop	Item 10.8.1; Annex G	Tokyo	28-30 September 2010	Q15
North Pacific 2011 cruise: planning	Item 10.8.2; Annex G	Tokyo	24-26 September 2010	Q15
Small cetaceans and climate change workshop	Item 12.5; Annex K	Vienna	28 November- 1 December 2010	Q24
Abundance of Antarctic minke whales workshop	Item 10.1.1; Annex G	Bergen?	January 2011	Q13
North Pacific minke whale preparatory meeting	Item 6.3; Annex D1	Tokyo	25-27 September 2010	Q4
North Pacific minke First Intersessional Workshop	Item 6.3; Annex D1	Korea	14-17 December 2010	Q4
Workshop on AWMP	Items 8.2; 8.3; Annex E	TBA	March 2011	Q1

Possible pre-meetings immediately before SC/63 depending on intersessional progress: AWMP gray whale *Implementation Review*; western North Pacific common minke whale *Implementation Review;* assessment of humpback whale Breeding Stock B.

21. RESEARCH AND WORKSHOP PROPOSALS AND RESULTS

Table 9 lists the proposed intersessional meetings and workshops. Financial implications and further details are dealt with under Item 24.

Results from last year's intersessional IWC workshops are dealt with under the relevant Agenda Items.

21.1 Review results from previously funded research proposals

Results from IWC funded projects are dealt with under the relevant agenda items.

21.2 Review proposals for 2010/11

No unsolicited research proposals were received. The Committee has **agreed** mechanisms for reviewing proposals under the SORP programme (Item 19) and the Small Cetaceans Voluntary Fund (Item 15).

22. COMMITTEE PRIORITIES AND INITIAL AGENDA FOR THE 2011 MEETING

Revised Management Procedure (RMP)
The following issues are high priority topics:

GENERAL MATTERS
(1) complete review of the range of MSYR values for use in the RMP;
(2) finalise approach for evaluating proposed amendments to the *CLA*;
(3) evaluate the Norwegian proposal for amending the *CLA*;
(4) consider implications that the phase-out rule in the RMP is applied by *Small Area* when catch cascading is applied and the abundance estimates are based on multi-year surveys; and
(5) modify the Norwegian 'CatchLimit' program to allow variance-covariance matrices to be specified for the abundance estimates.

IMPLEMENTATION REVIEW FOR NORTH PACIFIC COMMON MINKE WHALE
(1) review results of intersessional workshops; and
(2) complete the work assigned to the 'First Annual Meeting' in accord with our guidelines.

IMPLEMENTATION FOR THE WESTERN NORTH PACIFIC BRYDE'S WHALES
(1) review the research proposal for the 'variant with research'.

IMPLEMENTATION FOR THE NORTH ATLANTIC FIN WHALES
(1) review revised research proposal for the 'variant with research'; and
(2) review abundance estimates for use in the *CLA*.

IMPLEMENTATION FOR THE NORTH ATLANTIC MINKE WHALES
(1) review any new abundance estimates.

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 with the primary focus on:
   (a) completing work on a sex-ratio based assessment of common minke whales off west Greenland; and
   (b) progress on developing *SLA*s for West Greenland fin and common minke whales;

(3) the *Implementation Review* for the eastern North Pacific gray whales; and
(4) consider any new scientific information related to conversion factors for edible products for Greenland fisheries.

Bowhead, right and gray whales (BRG)
The following issues are high priority topics:

(1) perform the annual review of catch information and new scientific information for B-C-B stock of bowhead whales and prepare for the 2012 *Implementation Review*;
(2) review stock structure and abundance for Eastern Canada and West Greenland bowhead whales;
(3) review scientific information on North Pacific and North Atlantic right whales;
(4) review progress towards southern right whale workshop;
(5) review new information on western gray whales;
(6) review information on other stocks of bowhead whales; and
(7) review new information on eastern gray whales (not relevant to *Implementation Review*).

In-depth assessment (IA)
The following issues are high priority topics:

(1) resolve the reasons for the differences between estimates of abundance of Antarctic minke whales between the OK and SPLINTR models;
(2) continue development of the catch-at-age models of Antarctic minke whales, including sensitivity tests to examine various assumptions regarding ageing errors and age-length keys; and
(3) continue examination of the differences between minke abundance estimated from CPII and CPIII, by further investigation of the relationship between sea ice and minke whale abundance.

Bycatch and other human-induced mortality (BC)
The following issues are high priority topics:

(1) collaboration with FAO on collation of relevant fisheries data and joining FIRMS;
(2) review progress in including information in National Progress Reports;
(3) continue development of the international database of ship strike incidents;
(4) consider methods for estimating risk and rates of bycatch and entanglement;
(5) consider methods and data sources for establishing time series of bycatch;
(6) review methods to estimate mortality from ship strikes; and
(7) review methods for assessing mortality from acoustic sources and marine debris.

Stock definition (SD)
The following issues are high priority topics:

(1) furtherance of guidelines for genetic analyses;
(2) updates on guidelines for DNA Data Quality;
(3) statistical and genetic issues concerning stock definition;
(4) TOSSM; and
(5) unit-to-conserve.

DNA (DNA)
The following issues are high priority topics:

(1) review genetic methods for species, stock and individual identification;

(2) review of results of the 'amendments' work on sequences deposited in GenBank;
(3) collection and archiving of tissue samples from catches and bycatches; and
(4) reference databases and standard for diagnostic DNA registries.

Environmental concerns (E)
The following issues are high priority topics:

(1) SOCER;
(2) review progress on POLLUTION 2000+;
(3) review new information impact of oil and dispersants on cetaceans;
(4) review progress of the CERD Working Group;
(5) review progress on recommendations from 2010 focus sessions on masking sound;
(6) review approaches as available from other international forums with regard to mitigation of effects of anthropogenic sound on cetaceans;
(7) review progress on work from the 2nd Climate Change Workshop; and
(8) review of marine renewable energy development.

Ecosystem modelling (EM)
The following issues are high priority topics:

(1) review ecosystem models from the North Pacific that may be relevant to assessments and RMP *Implementations*;
(2) review other issues relevant to ecosystem modelling within the Committee; and
(3) review ecosystem modelling efforts undertaken outside the IWC.

Southern Hemisphere whales other than Antarctic minke whales (SH)
The following issues are high priority topics:

(1) humpback whales-complete the assessment of breeding stock B;
(2) blue whales (Antarctic and pygmy): population estimates and continue work on the Southern Hemisphere blue whale catalogue;
(3) prepare for assessment of humpback whale breeding stocks D, E and F;
(4) review new information on the Arabian humpback populations.

Small cetaceans (SM)
The following issues are high priority topics:

(1) the status of status of Ziphiidae (beaked and bottlenose whales) worldwide;
(2) directed takes of small cetaceans;
(3) review report from climate change-small cetaceans workshop;
(4) other topics e.g. marine bushmeat; and
(5) review of progress on previous recommendations.

Whalewatching (WW)
The following issues are high priority topics:

(1) assess the impacts of whalewatching on cetaceans;
(2) review reports from intersessional working groups:
    (a) large-scale whalewatching experiment (LaWE) Steering Group;
    (b) LaWE Budget Development Group;
    (c) on-line database for world-wide tracking of commercial whalewatching and associated data collection; and
    (d) swim-with-whale operations;

(3) consider information from platforms of opportunity of potential value to the Committee;
(4) review of whalewatching guidelines and regulations; and
(5) review of collision risks to cetaceans from whalewatching vessels.

Scientific Permits
The following issues are high-priority topics:

(1) Review of activities under existing permits.
(2) Review of new or continuing proposals.
(3) Procedures for reviewing scientific permit proposals.
(4) Planning for final review of results from Iceland's scientific take of North Atlantic common minke whales.

23. DATA PROCESSING AND COMPUTING NEEDS FOR 2010/11

The Committee identified and agreed the requests for intersessional work by the Secretariat given in Table 10.

Table 10

Computing tasks/needs for 2010/11.

RMP – preparations for *Implementation*
Run a full set of trials using the Norwegian 'CatchLimit' program for North Atlantic fin whales, Western North Pacific Bryde's whales; and North Atlantic minke whales and place the results on the IWC website (Item 5.3).

AWMP
Work in preparation for/arising from the proposed workshop (Item 21).

NPM
Update the control program for North Pacific minke whales and undertake any work arising from the Preparatory Meeting and the First Intersessional Workshop including assembling the catch data at the appropriate spatial and temporal resolutions and coding and conditioning the operating models themselves (Item 6.3.2).

In-depth assessment
Validation of the 2009/10 SOWER cruise data for incorporation into the DESS database; complete validation of the 1995-97 blue whale cruise data and incorporate into the DESS database; prepare a catch series for North Pacific sei whales (Item 10.9.1).

Southern Hemisphere whale stocks
Documentation of the catch data available for Antarctic minke whales in preparation for the *pre-Implementation assessment* (Item 20.4).

Bycatch
Input bycatch data from the last season (2009) and for previous seasons (from 2003 back) into the bycatch database (Item 7.1).

24. FUNDING REQUIREMENTS FOR 2010/11

Table 11 summarises the complete list of recommendations for funding made by the Committee. The total required to meet its preferred budget is £316,700. The Committee **recommends** all of these proposed expenditures to the Commission. This is slightly above the projected amount available for funding (£315,750). 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.

A summary of each of the items is given below, by sub-committee or standing Working Group. Full details can be found in the relevant Annexes as given in Table 11.

The Committee was pleased to note that procedures have been agreed to review proposals for funds from the Small Cetaceans Voluntary Fund and the Southern Ocean Research Partnership (Items 14 and 19). One proposal under the former has been recommended (see Item 14.6.1). The Committee was also pleased to note that funding has been found for the Workshop on Small Cetaceans and Climate Change (see Item 12.5).

Table 11

Summary of budget requests.

	Annex	Short title	Requested (£)
RMP			
1	Annex D	Analysis and use of time-series of data on calving rates and intervals for use in the MSYR review.	7,000
NPM			
2	Annex D1	Pre-meeting and 1st Intersessional Workshop towards *Implementation Review* for WNP common minke whales.	25,000
AWMP			
3	Annex E	AWMP Workshop on Greenlandic fisheries and preparing for gray whale *Implementation Review.*	12,000
4	Annex E	AWMP developers fund.	8,000
BRG			
5	Annex F	Southern Ocean right whale photo-id catalogue.	3,800
IA			
6	Annex G	Investigate the relationship between sea-ice characteristics and Antarctic minke whale abundance estimates.	5,000
7	Annex G	Resolving differences in minke whale abundance estimates.	15,000
8	Annex G	Import of 2009/10 SOWER data and assist abundance working group.	3,000
9	Annex G	North Pacific sighting cruise.	58,000
10	Annex G	Workshop to plan medium-long term North Pacific sighting survey programme.	7,000
11	Annex G	Statistical catch-at-age estimators for Antarctic minke whales.	2,500
SH			
12	Annex H	Southern Hemisphere Blue Whale Catalogue Project.	18,900
13	Annex H	Modelling of Southern Hemisphere humpback whale populations.	3,000
14	Annex H	Antarctic humpback whale catalogue.	15,000
BC			
15	Annex J	Further development and maintenance of the IWC ship strike database.	5,000
16	Annex J	Development of an online submission database for Progress Reports.	5,000
E			
17	Annex K	Risk assessment modelling to determine the impact of pollutants on cetacean populations.	52,500
18	Annex K	State of the Cetacean Environment Report (SOCER).	3,000
WW			
19	Annex L	Data compilation and power analyses for the LaWE.	4,000
ALL			
20		Invited Participants to the 2011 Annual Meeting.	64,000
Total			**316,700**

Revised Management Procedure

(1) ANALYSIS AND USE OF TIME-SERIES OF DATA ON CALVING RATES AND INTERVALS FOR USE IN THE MSYR REVIEW

The Committee is conducting a review of the range of MSYR values to include in simulation trials when selecting among variants of the RMP. The third intersessional workshop on the review of MSYR assembled a number of datasets on calving rates and calving intervals for baleen whales. Efforts were made following the workshop to fit models which accounted for both process and observation error to the data on calving rates and calving intervals. However, numerical problems were encountered when implementing these models. Funding is required for researchers to overcome these problems to provide the inputs needed to apply the Bayesian hierarchical method adopted by the Committee for computing a posterior distribution for r_0.

North Pacific minke whales

(2) PREPARATORY MEETING AND FIRST INTERSESSIONAL WORKSHOP TOWARDS THE IMPLEMENTATION REVIEW FOR WESTERN NORTH PACIFIC COMMON MINKE WHALES

The schedule for an *Implementation Review* specifies that between the finalisation of the *pre-Implementation assessment* and the following annual meeting of the Scientific Committee, an intersessional workshop shall be held to address a number of issues. Given the complexity of this *Implementation Review*, it is important to hold a preparatory meeting before the First Intersessional Workshop.

Aboriginal Whaling Management Procedure

(3) WORKSHOP ON GREENLANDIC FISHERIES/PREPARATION FOR GRAY WHALE IMPLEMENTATION REVIEW

The Committee has a number of priority areas related to Greenlandic fisheries and an intersessional Workshop is required to address:

(1) progress on developing *SLAs* for West Greenland fin and common minke whales;
(2) progress on the development of the sex-ratio method; and
(3) preparation for the *Implementation Review* for eastern North Pacific gray whales.

(4) AWMP DEVELOPERS FUND

The developers fund has been invaluable in the work of *SLA* development and related essential tasks of the SWG. 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 and the Commission. The fund is essential to allow progress to be made.

Bowhead, right and gray whales

(5) SOUTHERN OCEAN RIGHT WHALE PHOTO-ID CATALOG

For several decades, extensive photo-id surveys have been carried out for southern right whales in the coastal waters of South America, southern Africa and Australia during winter and spring, and much valuable data on the demographics of these populations has been collected. Together with genetic information, these data also provide the opportunity to investigate interchange and mixing between the coastal

populations. However, because of its geographic limitations it is uninformative about the links between these populations and those found (generally at higher latitudes) in summer where extensive catches were taken in pelagic whaling. Funding is requested to address this gap by compiling images of southern right whales taken away from coastal waters of the continents, in a catalogue and associated database.

In-depth assessments
(6) INVESTIGATE THE RELATIONSHIP BETWEEN SEA ICE CHARACTERISTICS AND ANTARCTIC MINKE WHALE ABUNDANCE ESTIMATES
No conclusions have yet been reached on the reasons for the appreciable decline in abundance estimates from CPII and CPIII. Changes in sea ice characteristics, such as its extent and configuration, have been considered as one of the most likely influential factors. In order to investigate this carefully, funding is required to enable the preparation of the following sea ice related data sets:

(1) timing of the ice melt index for the entire time series of CPII and CPIII; and
(2) sea ice characteristics (e.g. area of sea-ice-field) in the south of ice edge for the entire time series of CPII and CPIII.

(7) RESOLVING DIFFERENCES IN MINKE WHALE ABUNDANCE ESTIMATES
Over the past two years, two methods have been presented to estimate abundance from the CPII and CPIII IDCR/SOWER cruise data. However, there are large differences between the estimates. These differences are much greater than statistical uncertainty, and than generally seen in the simulated datasets. Following intersessional work by correspondence a workshop is required to attempt to finally resolve the difference between the two approaches.

(8) IMPORT 2009/10 SOWER DATA AND ASSIST ABUNDANCE WORKING GROUP
Funds are required to enable the 2009/10 IWC/SOWER data to be incorporated into DESS and to provide general support to the IWC Secretariat regarding DESS. Errors will be corrected in the 'standard' and IDCR/SOWER datasets before the 2010 Scientific Committee meeting.

(9) AND (10) 2011 NORTH PACIFIC SIGHTING CRUISE AND ASSOCIATED MEETINGS
A new medium- to long-term research programme involving sighting surveys to provide annual information for cetacean stock management in the North Pacific is scheduled to commence in 2011. The cruise will last a total of about 60 days between July and August and the vessel *Kaiko Maru* will generously be provided by the Japanese Government. A two-day planning meeting for the 2011 cruise will be held in Tokyo. It will be preceded by a three-day workshop to develop the medium to long term objectives of the research programme and associated fieldwork.

(11) STATISTICAL CATCH-AT-AGE ESTIMATORS FOR ANTARCTIC MINKE WHALES
The Committee is trying to understand the reasons for the apparent large declines in abundance indicated by estimates produced from these surveys. Several of these reasons can be explored by population dynamics modelling. In 2005, Punt and Polacheck developed the statistical catch-at-age (SCAA) model, which has been refined over the last few years and is considered the most appropriate modelling framework for addressing these issues. Funding is requested for Committee's researchers to implement the

recommendations so that in 2011 it will be in a position to apply the SCAA model to the most recent datasets.

Other Southern Hemisphere whale stocks
(12) SOUTHERN HEMISPHERE BLUE WHALE CATALOGUE PROJECT
Little is known about the present-day migration of blue whales, population structure and abundance or the level of interchange among populations. In 2008, the IWC supported the creation of a Southern Hemisphere blue whale catalogue and Centro de Conservacion Cetacea in Chile was tasked with developing a central web-based system by which Southern Hemisphere blue whale photo-id matching could take place. Matching will be conducted during the next two years through this platform by researchers from three Southern Hemisphere regions. Comparisons of blue whale photo-id and the significant number of individuals catalogued will be time consuming and researchers will not have enough free time to dedicate to the matching process. Therefore funding is required to ensure the matching process is completed. This will be a two-year project and a further request for funding (£11,200) will be submitted next year.

(13) MODELLING OF SOUTHERN HEMISPHERE HUMPBACK WHALE POPULATIONS

(1) Deliberations at the 2010 Annual Meeting have led to a number of proposed variants of stock-structure models for breeding stock B. Computer software needs to be developed to implement these models to take account of tag-recapture data.
(2) Simultaneous analysis of all 7 breeding stocks using the current age-aggregated model is desirable so that:
   (a) the catch allocation uncertainty is taken into account in a consistent and even-handed manner;
   (b) uncertainties in the boundaries for such allocations can be properly included in the analysis; and
   (c) likely similarities in intrinsic growth rate parameters for the different stocks can be properly factored into the analyses.

Development of this model has commenced but still needs further development. A contribution towards the salaries of researchers is requested to enable progress to be made with (1) and (2).

(14) 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 funds are required to continue the cataloguing of submitted photographs and further develop and enhance the system for on-line access. The work will be carried out by Carlson and Allen.

Bycatch and other human-induced mortality
(15) FURTHER DEVELOPMENT AND MAINTENANCE OF THE IWC SHIP STRIKE DATABASE
Development of the IWC ship strike database has continued intersessionally. Funding is required for: (1) completing work on public summaries; (2) the development of a handbook; (3) data entry and validation; and (4) annual ongoing work by the data review group. The need for a global database of incidents involving collisions between vessels and whales has previously been recognised by the Committee, as well as other bodies such as the International Maritime Organization (IMO) and ACCOBAMS.

(16) DEVELOPMENT OF AN ONLINE SUBMISSION DATABASE FOR PROGRESS REPORTS
In 2009 the possibility of developing an online form/ database for submission of national Progress Reports was discussed as part of work on bycatches and small cetaceans, in addition to the general work of the Committee. Due to time constraints it was not possible to progress this further. A small group met this year to design an initial template and the Committee is now in the position to start trialling such a database. Funding is required for an expert to work with the IWC Secretariat to create this database and an initial version will be available at the next Annual Meeting.

Environment
(17) RISK ASSESSMENT MODELING TO DETERMINE THE IMPACT OF POLLUTANTS ON CETACEAN POPULATIONS
The report of the Phase II Intersessional IWC Pollution 2000+ Workshop (SC/62/Rep4) recommends that a number of modelling exercises be undertaken. This will involve the development and implementation of two demonstration projects, using the risk assessment framework (based on an individual based model approach). Funding is required to employ a post-doctoral research assistant to conduct this work under the direct supervision of Schwacke and Hall, with input and guidance from the Pollution 2000+ Steering Committee. This will be a two-year project and a further request for funding (£70,750) will be submitted next year.

(18) STATE OF THE CETACEAN ENVIRONMENT REPORT (SOCER)
The Committee regards SOCER to be a useful document that provides a 'snapshot' of environmental developments relevant to cetaceans that was requested by the Commission. Money is requested to support the production of this report.

Whalewatching
(19) DATA COMPILATION AND POWER ANALYSES FOR THE LAWE
The LaWE initiative aims to understand the possible effects of whalewatching on the demographic parameters of cetacean populations. In order to develop procedural mechanisms to centralise relevant data and to commence power analysis for key parameters, funding is required to employ a research assistant for 6 weeks.

Other
(20) INVITED PARTICIPANTS (IPs) 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.

25. WORKING METHODS OF THE COMMITTEE

25.1 Citation of Scientific Committee documents
SC/62/SCP1 was produced in response to the discussion last year about the Committee's policy with respect to the citation of Scientific Committee documents (IWC, 2010c, p.92). At that time the Committee had noted that *inter alia* its policy must ensure transparency with respect to advice provided by the Committee and to respect the rights of scientists to first publication of data.

The authors of SC/62/SCP1 had examined both the policy of the *Journal* and that of the Committee with respect

to the question of including 'Not to be cited (or used) without the permission of the author(s)' at the top of a paper. They noted that there was some ambiguity in the present rules that required clarification and suggested that the ability to include a 'not to be cited....' restriction to a paper should be removed and replaced by a 'please inform authors when citing outside an IWC meeting' header.

There was considerable discussion of this proposal. The Committee, as before was concerned to:

(1) ensure transparency;
(2) respect rights to first publication; and
(3) avoid the possibility that authors may refuse to submit papers of value to the Committee's work.

Recognising the sensitivities involved and the need to find an appropriate balance amongst items (1)-(3) above, the Committee **agrees** that in future, all papers presented to the Scientific Committee contain the following header (this information will also be included in the Scientific Committee Handbook and when providing information on document submission to meetings and workshops):

> 'Papers submitted to the IWC Scientific Committee are produced to advance discussions within that Committee: they may be preliminary or exploratory. It is important that if you wish to cite this paper outside the context of an IWC meeting, you notify the author at least six weeks before it is cited to ensure that it has not been superseded or found to contain errors.'

The Scientific Committee List of Documents attempts to keep track of papers that have been presented to Scientific Committee meetings and can be found on the IWC website[7]. Authors who are aware of particular problems with any of their past papers are invited to inform the Secretariat who will keep an updated compilation.

25.2 Working papers, late papers and related issues
As a result of discussions during the meeting, the Committee **agrees** on the need to clarify certain issues with respect to working papers and primary papers that arrive late. The definitions and rules regarding these (and other categories of paper including 'For Info' papers) can be found in the Scientific Committee Handbook[8].

Primary papers must be submitted by the end of the first day of the Annual Meeting. Considerable flexibility has been shown by the Chair and Head of Science in the way they have dealt with papers for which a title has been submitted but which for one reason or another, arrive late. Formally, they can be called working papers because they have missed the deadline and then immediately be 'upgraded' to primary papers to minimise copying. Unfortunately, this flexibility is tending to be abused as a larger number of papers are being submitted past the deadline. For this reason, the Committee **agrees** that in future only in exceptional circumstances will late papers be accepted. In addition, Chairs will be very strict on the criteria for accepting working papers i.e. they must arise from discussions and be requested and/or be likely to expedite resolution of disagreements or stimulate debate within the meeting.

Notwithstanding the question of late papers, the Committee **agrees** that there may be circumstances in the future where it is appropriate for certain working papers to be 'elevated' to the status of a primary paper during the meeting. The Chair and Head of Science will apply the following two criteria:

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[7]*http://www.iwcoffice.org/publications/pubmain.htm.*
[8]*http://www.iwcoffice.org/sci_com/handbook.htm.*

(1) the working paper has been presented and discussed within a sub-group or the plenary, such that an opportunity to comment on it has been given; and

(2) the text of the sub-group or plenary report would be significantly improved, streamlined or clarified by the ability to reference the paper as a primary document.

26. ELECTION OF OFFICERS

The Committee **agrees** that there was no need for elections this year.

27. PUBLICATIONS

Donovan reported on issues relating to the production of the *Journal*. Unfortunately, the year has been plagued by a series of problems with respect to getting the *Journal* published, due to internal problems at the printers that the IWC has used for many years. Sadly, after attempts to secure further investment, they are no longer trading but the Secretariat had very little notice in terms of finding an alternative. We have managed to find another company that we are using on a trial basis, and thanks to the page-setting abilities of Andrea Cooke, we managed to at least get the large *Supplement* out on time. We are now dealing with a different company and the *Journal* and Supplements should once again appear promptly. That being said, the Secretariat is in the process of examining a number of companies for ability and price. It is expected that the resultant backlog of papers will be reduced or eliminated in the coming year. In addition, the possibility of including electronic subscriptions is being investigated. The most efficient and cost effective way to digitise earlier reports is also being investigated. The Committee, as in previous years, **reiterates** the importance of the *Journal* to its work and encourages members to urge their institutes to subscribe.

28. OTHER BUSINESS

This is the final meeting for Nicky Grandy, Secretary of the Commission. The Scientific Committee rose in appreciation of her dedicated work in organising its meetings over the last decade. It noted the calm, efficient, good humoured way that she (and the team she ran) had assisted the Scientific Committee, even in the face of its sometimes unreasonable demands. On behalf of the Committee, its elder statesman, John Bannister, presented her with a specially painted card and a beautiful Moroccan rug, wishing her the very best for the future – she will be greatly missed.

29. ADOPTION OF REPORT

In closing the meeting, Palka thanked the Secretariat for carrying out its work in the usual efficient manner. The report was adopted at 17:20 on 11 June 2010. As is usual, final editing was carried out by the Convenors after the meeting.

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