Report of the Scientific Committee

Panama City, Panama, 11-23 June 2012

International Whaling Commission, Panama City, 2012

Scientific Committee Report

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The meeting was held at El Panama Hotel and Conference Centre, Panama from 11 June to 23June 2012 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

The Chair welcomed the participants to the 2012 IWC Scientific Committee meeting noting that the Committee faced a long and complex Agenda this year. In particular, she thanked the Government of Panama for providing the facilities for this year's meeting and the IWC Commissioner for Panama, Tomas Guardia for his assistance. The Committee paused in silence for Alexandre de Lichtervelde, the previous Commissioner from Belgium who had been deeply involved in the issue of ship strikes, and Frank Hester, a long time Committee member, who had both sadly passed away since the last meeting. They both will be greatly missed.

Simon Brockington, the Secretary to the IWC, addressed the meeting on behalf of the Commission to convey a message of gratitude. He noted that the Scientific Committee is rightly regarded as one of the foremost international fora dedicated to cetaceans, and that this reputation stemmed from the quality of research conducted by the participants. He hoped that the meeting would be productive both in terms of providing advice to the Commission, but also in allowing knowledge to be gained and shared between participants so as to allow improved research in the future. He wished all participants a successful meeting.

On behalf of the Government of Panama Giovanni Lauri, the Administrator General of the Aquatic Resources Authority of Panama (ARAP) addressed the Committee and welcomed the participants to Panama. He hoped that everyone would enjoy their time in Panama City and wished the meeting every success.

1.2 Appointment of rapporteurs

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

1.3 Meeting procedures and time schedule

Brockington 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

As intimated last year, (IWC, 2012f, p.59) and included in the draft agenda, a pre-meeting of the Standing Working Group on Environmental Concerns met from 9-10 June 2012 in Panama City to consider interactions between marine renewable energy developments and cetaceans. Its report is given as SC/64/Rep6.

A number of sub-committees and working groups were established. Their reports were either made annexes (see below) or subsumed into this report (see items 17 and 19).

Annex D – Sub-Committee on the Revised Management Procedure (RMP);
Annex D1 – Working Group on the *Implementation Review* 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 (SC);
Annex M – Sub-Committee on Whalewatching (WW);
Annex N – Working Group on DNA (DNA).

1.5 Computing arrangements

Allison outlined the computing and printing facilities available for delegate use**.**

2. ADOPTION OF AGENDA

The Adopted Agenda is given as Annex B1. Statements on the Agenda are given as Annex R. The Agenda took into account the priority items agreed last year and approved by the Commission (IWC, 2012a, pp.27-29). Annex B2 links the Committee's Agenda with that of the Commission.

3. REVIEW 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 papers entirely electronically had continued to grow. As last year, the Secretariat provided participants with a memory stick with all of the papers

that had been received by the official deadline. Revised or new papers and reports were uploaded onto the IWC website. The list of documents is given as Annex C. The issue of electronic papers is discussed further under item 24.

3.2 National Progress Reports on research

The Committee is in the transition phase from receiving paper progress reports to online submission into a database (Skaug, 2012, pp.2). A working group was established to facilitate this process and its report is given as Annex O. The Committee **reaffirms** its view of the importance of national Progress Reports and **recommends** that the Commission continues to urge member nations to submit them following the new online system. It thanks the Secretariat and especially Tandy and Miller for their development work on the portal.

3.3 Data collection, storage and manipulation

3.1.1 Catch data and other statistical material

Table 1 lists data received by the Secretariat since the 2011 meeting. As requested last year, the Secretariat had contacted both Canada and Indonesia to request information on recent catches. The information received from Canada is included in Table 1, but no response has been received to date from Indonesia. The Committee requests that the Secretariat try again to obtain data on catches off Indonesia.

3.1.2 Progress of data coding projects and computing tasks

Allison reported that Version 5.2 of the catch databases was released in November 2011 and a new release was due shortly. Work has continued on the entry of catch data into both the IWC individual and summary catch databases, including data received from the 2010 season. Sightings data from the 2010 POWER cruise (see item 10.8) has been validated.

Programming work during the past year has focussed on amending the control program and datasets for use in the North Pacific common minke whale *Implementation* trials and is discussed further under Item 6.3.

4. COOPERATION WITH OTHER ORGANISATIONS

The Committee noted the value of co-operation with other international organisations to its work. The observers' reports below briefly summarise relevant meetings of other organisations but the contributions of several collaborative efforts are dealt with in the relevant sub-committees.

4.1 Convention on the Conservation of Migratory Species (CMS)

4.1.1 Scientific Council

The report of the IWC observer at the CMS Scientific Council meeting held in Bergen, Norway from 17-18 September 2011 is given as IWC/62/4E. With relation to cetaceans, their agenda included items on critical sites and ecological networks for migratory species, impacts of marine debris on migratory species and presentation of the report of the Working Group on Aquatic Mammals. It was agreed that the narwhal and the North Pacific killer whale populations be considered for cooperative action. A draft resolution on a programme of work for cetaceans (to implement the previous CoP resolution 'Adverse human-induced impacts on cetaceans') was endorsed. Note was taken of the recent split of the finless porpoise into two species, *Neophocaena brevirostris* and *N. asiaeorietalis* and both were recommended for inclusion in Appendix II of the Convention.

The Committee thanked Perrin for his report and **agrees** that he should represent the Committee as an observer at the next CMS Scientific Council meeting. Further information can be found at *http://www.cms.int*.

4.1.2 Conference of Parties

The report of the IWC observer at the 10th Conference of Parties for CMS held in Bergen 20-25 September 2011 is given as IWC/62/4E. The Convention now has 117 Parties. Three Resolutions related primarily to cetaceans:

Resolution 10.14 *Bycatch of CMS-listed species in gillnet fisheries* called on Parties to *inter alia* assess the risk of bycatch arising from their gillnet fisheries and conduct research to identify and improve mitigation measures (including use of alternative fishing gear and methods) and instructed the Scientific Council to develop terms of reference for studies identifying the degree of interaction between gillnet fisheries and CMS-listed species;

(1) Resolution 10.15 *Global programme of work for cetaceans* laid out tasks for the Scientific Council, Secretariat and Parties to advance the conservation of CMS-listed cetaceans, organised primarily on a regional basis; and

Resolution 10.24 *Further steps to abate underwater noise pollution for the protection of cetaceans and other migratory species* among other recommendations strongly urged the Parties to prevent adverse effects on cetaceans and other marine species by restricting the emission of underwater noise, understood as keeping it to the lowest necessary level with particular priority given to situations where the impacts on cetaceans are known to be heavy.

Table 1

List of data and programs received by the IWC Secretariat since the 2011 meeting.

Date	From	IWC ref.	Details
Catch data from the previous season:			
08-07-11	St Vincent: R. Ryan	E103 Cat2011	Information on the St Vincent and the Grenadines humpback harvest 2011 season
01-03-12	Canada: A. McMaster	E103 Cat2011	Information on the Canadian bowhead harvest 2011 season
30-03-12	Iceland: E. Thordarson	E103 Cat2011	Individual catch records from the Icelandic commercial catch 2011
22-05-12	Russia: R.G. Borodin	E103 Cat2011	Individual catch records from the aboriginal harvest in the Russian Federation in 2011
24-05-12	Norway: N. Øien	E103 Cat2011	Individual minke records from the Norwegian 2011 commercial catch. Access restricted (specified 14-11-00).
11-06-12	Japan: S. Hiruma	E103 Cat2011	Individual data for Japan special permit catch 2011 N.Pacific (JARPN II) & 2011/12 Antarctic (JARPA II).
Other catch data:			
10-4-12	Canada: J. Ford	E105	Comparison of N. Pacific catch data held by Canada with the IWC database, including 1,471 new individual records.
Sightings data:			
01-12-11	K. Matsuoka	E102	2011 POWER cruise sightings data
22-12-11	K. Matsuoka	E102	Data from the JARPN II sighting survey in the North Pacific 2011 (SC/63/RMP12); inc. sightings, weather, effort and distance and angle experiment data.
Other:			
30-11-11	USA: D. Palka	E101	List of data for the NP gray Implementation Review in June 2012
23-03-12	A. Punt	E104	Programs and data used in AWMP gray whale trials up to March 2012 workshop
23-06-12	A. Punt	E104	Programs and data used in AWMP gray whale trials at SC 2012

The resolutions can be seen in full on the CMS website (*www.cms.int.*)**.**

The Committee thanked Perrin for his report and **agrees** that he should represent the Committee as an observer at the next CMS Scientific Council meeting.

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

There was not a meeting of parties in the intersessional period. The next meeting of parties will take place 22-24th October 2012, Brighton, UK. The report of the observer at the 19th meeting of the Advisory Committee to ASCOBANS held in Galway, Ireland 20-22 March 2012 is given as IWC/64/4F. Topics covered included:

(1) *Baltic Sea harbour porpoises*. Those in the Western Baltic, Belt Seas and the Kategat form a different population to those of the Baltic proper and North Sea and since 2005 there has been a 60% decline in the population size of the former. A separate conservation plan for this area should be established.
(2) *Working Group on a Conservation Plan for Harbour Porpoises in the North Sea*. A follow-up SCANS II survey was recommended, as was bringing smaller and recreational fisheries under the reformed Common Fisheries Policy.
(3) *Working Group on Bycatch*. A review of the 1.7% removal rate was recommended.
(4) *Dogger Bank surveys*. Independent surveys, both aerial and vessel-based, indicate that the harbour porpoise is the most common cetacean in the area, with most records on the slopes of the bank.
(5) *Small cetacean hunt outside agreement area*. Tagging data indicates the pilot whale population subject to the Faroese hunt also occurs in the ACOBANS agreement area. Because of considerable uncertainties regarding the population ASCOBANS welcomes future studies (e.g. SCANS, CODA, T-NASS).

A working group on marine debris was established and in collaboration with ACCOBAMS, the ASCOBANS Secretariat is working to acquire satellite based data on shipping density to identify high risk areas and trends. A joint ECS/ASCOBANS/ACCOBAMS workshop on management of Marine Protected Areas for cetaceans will be held at the 2013 ECS conference.

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)

No meetings of ACCOBAMS occurred intersessionally, but a Scientific Committee meeting is scheduled for November 2012. The Committee **agrees** that Donovan should represent the IWC at this meeting.

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)

There was no report related to the *MoU for Pacific Islands Cetaceans*. Donohue will represent the Committee at future activities. Further information can be found at *http://www.pacificcetaceans.org*.

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

The report of the IWC observer documenting the 2012 activities of ICES is given as IWC/64/4A. The ICES Working Group on Marine Mammal Ecology (WGMME) met in February 2011. It conducted a review of the effects of tidal turbines on marine mammals and provided recommendations on research, monitoring and mitigation schemes. The working group recommended identification of sites of low risk for turbine deployments before consenting to further devices or upscaling in more sensitive sites. It also recommended extreme care when extrapolating environmental impacts between species and device types and caution when scaling up environmental lessons learned from studies of single turbines.

Marine spatial planning practices were considered by the working group. It recommended that data on cetacean presence and occurrence be incorporated at a very early stage of planning and it emphasised the importance of including information on seasonal changes in distribution. Due to the wide-ranging nature of cetaceans the relevance of 'important areas' outside MPAs should be assessed within marine spatial plans.

The working group discussed designation of MPAs. It recommended that the boundaries should be decided based on long-term data series (of at least five years). Creation of MPAs in response to public opinion without scientific evidence to support their selection risks providing false assurances and could reduce the pressure for targeted action on the most significant threats.

The Working Group on Bycatch of protected species (WGBYC) met in February 2011. It reviewed the status of information on recent bycatch estimates and assessed the extent of the implementation of bycatch mitigation measures. Reports from 15 member states indicated extrapolated estimates of bycatch for 2009 of 879 striped dolphins, 1,500 common dolphins, 11,000 harbour porpoises and at least 10 bottlenose dolphins in a variety of fisheries. Estimates are patchy and monitoring obligations not being met by several member states. Implementation of bycatch mitigation measures was also found to be poor, with few countries able to confirm that obligations for pinger deployment were being met.

The 2011 ICES Annual Science Conference (ASC) was held in Gdansk, Poland, 19-23 September 2011. 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) integration of top predators into ecosystem management;
(2) integration of multi-disciplinary knowledge in the Baltic Sea to support science-based management; and
(3) Extraction of energy from waves and tides – consequences for ecosystems.

Butterworth advised that a World Conference on Stock Assessment Methods for sustainable fisheries will be held from 16-18 July 2013, in Boston, USA with Steve Cadrin, Mark Dickey-Collas and Rick Methot as Conveners, as part of the ICES SISAM initiative. A Scientific Steering Group (including Butterworth of the Scientific Committee), linked to SISAM, has been set up to assist the Conveners in planning the Symposium.

The symposium will be structured with presentation sessions, participatory workshops and open floor discussion groups. Further information can be found at *http://ices.dk/iceswork/symposia/wcsam.asp.*

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)

The report of the observer at the 82nd meeting of the IATTC held La Jolla, USA 4-8 July 2011 is given as IWC/64/4C. The Antigua Convention came into force on 27 August 2010 and under this the IATTC is expected to give greater consideration to non-target and associated species, including cetaceans, in taking management decisions. A summary of ongoing work describing what is known about the direct impact of the fisheries on other species in the ecosystem and the environment. This ongoing work will shape future directions of AIDCP (see 4.4) and IATTC measures aimed at managing fisheries and conserving dolphins.

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

4.4 Agreement on the International Dolphin Conservation Program (AIDCP)

The report of the observer at the 24th Meeting of Parties to the AIDCP held in La Jolla, USA on 21 October 2011 is given as IWC/64/4C. The AIDCP mandates 100% coverage by observers of fishing trips by purse seiners of carrying capacity greater than 363t in the agreement area and in 2011 all trips by such vessels were sampled by independent observers.

The overall dolphin mortality limit (DML) for the international fleet in 2011 was 5,000 animals and the

unreserved portion of 4,900 was allocated to 86 qualified vessels that requested DMLs. In 2010 no vessel exceeded its DML. The number of sets on dolphin associated schools of tuna made by vessels over 363t has been increasing in recent years, from 9,246 in 2008 to 10,910 in 2009 to 11,645 in 2010, however fewer were made in 2011 – 9,604. This type of set accounted for 44% of the total number of purse-seine sets made in the ETP in 2011. While fewer dolphin sets were made in 2011, this remains a frequent practice and the predominant method for catching yellowfin tuna by purse-seine in the ETP. Assessment surveys scheduled for 2009 and 2010 have been delayed so it is unclear when abundance estimates for cetaceans in the ETP will be available to update the 2006 survey data.

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

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

No observer for the IWC attended the 2011 meeting of ICCAT.

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

The report of the IWC observer at the 30th Meeting of the CCAMLR Scientific Committee (CCAMLR-SC), held in Hobart, Australia from 23-27 October 2011 is given as IWC/64/4J. 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; (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.

The publication status of documents from the 2008 joint CCAMLR-IWC workshop on ecosystem modelling was discussed. Almost all expert groups have completed their review papers. The review process for the papers, which will be published in either *CCAMLR Science* or the *Journal of Cetacean Research and Management*, will begin soon.

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 early 2011, convene a workshop to review progress, share experience and determine a work programme for the identification of MPAs; (3) by 2011 identify candidate areas for protection in as many priority regions as possible;

(4) by 2011, submit proposals for areas for protection to the CCAMLR-SC; and (5) by 2012 submit proposals on a representative system of MPAs to the CCAMLR Commission.

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. In addition, Butterworth will act as an observer at meetings of the WG-EMM.

4.7 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.

4.8 North Atlantic Marine Mammal Commission (NAMMCO)

4.8.1 Scientific Committee

The report of the IWC observer at the 18th meeting of the NAMMCO Scientific Committee (NAMMCO SC) held in Gjógv, Faroe Islands from 2-5 May 2011 is given as IWC/64/4I. The ICES-NAMMCO workshop on bycatch monitoring reviewed indirect and direct bycatch monitoring, data collection and fleet data needed for raising estimates to fleet level. It was noted that bycatch numbers could be high both in Norway and Iceland. The NAMMCO SC strongly encouraged Norway, Iceland and the Faroes to proceed with the implementation of their bycatch monitoring systems. The NAMMCO SC reiterated its recommendation to Greenland to investigate the degree to which bycatch is reported as catch.

Extensive biological sampling was conducted by Iceland from all fin whales landed in 2010. Analysis of all samples is complete and a DNA registry has been initiated.

The 2007 abundance estimates for humpback whales for all areas have now been provided to, reviewed and endorsed by the NAMMCO SC. For the first time since 1986 there was a quota for humpback whales in West Greenland and all nine whales were caught. The NAMMCO SC recommended eye sampling of the whales for age determinations, as well as tail photographs.

Corrected estimates for minke whales for the 2007 and 2009 Icelandic aerial surveys were endorsed. The best available estimate of abundance for 2007 was 48% of that

for 2001. Abundance in 2009 remains the lowest yet seen in all areas. The NAMMCO SC agreed that the new evidence presented strengthened the conclusion that the observed decline in abundance was not a result of error in measuring or analyses.

A conventional distance sampling abundance estimate of pilot whales for the Iceland-Faroes shipboard area was endorsed by the NAMMCO SC. They noted the difficulties in providing abundance estimates appropriate for management of this species given the absence of adequate data.

Observations of bowhead whales around Svalbard, Norway from 1940-2009 show an increase in abundance in the last decade. This could be due to an increase in the numbers of whales or increased tourism and a dedicated reporting system. An acoustic study that will continue through 2012 has shown that bowhead whales are present in the Fram Strait throughout the winter and generally during most of the year. A satellite tracked whale from the Spitsbergen stock moved from the so-called northern whaling ground to the southern whaling ground during summer and then back north again during winter. This is opposite of the general seasonal movement patterns for other bowhead whale stocks, but in accordance with reports from whalers in previous centuries.

An aerial survey in West Greenland was scheduled for spring 2012. The primary targets were planned to be narwhals and white whales, with bowhead whales and walruses secondary targets.

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.

4.8.2 Council

The report of the IWC observer at the 20th annual meeting of NAMMCO held in Oslo, Norway in September 2011 is given as IWC/64/4B. All requested stock assessments for large whale species in the North Atlantic have now been finalised based on sightings data from the Trans North Atlantic Cetacean Sightings Surveys (T-NASS) in 2007 and additionally in 2009. Management procedures applied have been derived from those already developed by the Scientific Committee of the IWC using the Revised Management Procedure (RMP) approach. An RMP-like approach has been recommended by the Scientific Committee of NAMMCO for some large whale stocks in their discussions on general models to be adopted by NAMMCO. These stock assessments by the constitute the main basis for catch limits set for some baleen whale stocks (fin and minke whales) in the North Atlantic.

Based on T-NASS data, an updated abundance estimate for pilot whales has been made in the areas surveyed in 2007. Although the combined area represented is small and not directly comparable with previous surveys, the available information gives no reason to amend previous conclusions on the sustainability of the Faroese catch. The next regular NASS is scheduled to take place between 2013 and 2015 and planning is already under way.

The working group on marine mammal-fisheries interactions continued its work on development of a large international ecosystem modelling project. A network has been established between several leading scientists in this field aimed at securing funding for the project which includes applying four different modelling approaches to two data rich areas, the Barents Sea and Icelandic coastal waters.

A training course for observers appointed under the NAMMCO joint control scheme for the hunting of marine mammals is to be organised this year.

The Committee thanked Katsuyama 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 on their website.[1]

4.9 International Union for the Conservation of Nature (IUCN)

Cooke and Reeves, the IWC observers, reported on the considerable cooperation with IUCN that had occurred during the past year and this is given as IWC/64/4K.

Western gray whales

The mandate of the IUCN Western Gray Whale Advisory Panel (WGWAP) has been renewed for a further five years, under the aegis of the IUCN Global Marine and Polar Programme. The Panel has expressed concerns about plans to install a third offshore platform for oil and gas extraction just offshore of the gray whale feeding ground, but this project has now been postponed. Analyses of the data collected during a 2010 seismic survey with respect of the effects on gray whales and the effectiveness of mitigation measures are still in progress. Similar mitigation and data collection arrangements are in place for a smaller seismic survey that is currently underway and further information is given in Annex F Appendix 9. The work of WGWAP is discussed further underwritten 10.4.2.

Red List updates

A current list of all cetacean species and populations that have been assessed for the Red List, and their current Red List classification, is maintained on the Cetacean Specialist Group site[2] with links to the assessments which are held on the Red List site *www.redlist.org*. Updates since the last Annual Meeting include separate assessments for the two recently recognied species of finless porpoises (*Neophocaena asiaeorientalis* and *N.*

[1] *http://www.nammco.no*

[2] *www.iucn-csg.org/index.php/status-of-the-worlds-cetaceans*

phocaenoides), both listed as Vulnerable. New assessments are underway for the dolphins in the genus *Inia*, which were recently split into two species, *Inia geoffrensis*, the Amazon River dolphin, and *I. boliviensis*, the Bolivian bufeo.

Cetacean Specialist Group
The website of the IUCN Cetacean Specialist Group (*www.iucn-csg.org*), contains regular updates of IUCN's cetacean-related activities and other work in which group members are involved. New items since last year relate to vaquita conservation efforts, Mekong River dolphins in Cambodia, Indus dolphins in Pakistan, new cetacean protected areas in Bangladesh.

World Conservation Congress
The IUCN 4-yearly World Conservation Congress will be held 6-15 September 2012 in Jeju, Korea with the theme 'Nature+'. The programme includes three cetacean-related events: a workshop on lessons learned from the IUCN western gray whale conservation initiative, a presentation on a local population of Indo-Pacific bottlenose dolphins found around Jeju Island, and a workshop on cetacean conservation and whale-watching in Africa[3].

The Committee thanked Cooke and Reeves for their report. It thanks Larsen for his contributions in the past and has left IUCN and agrees that Cooke should continue to act as observers to IUCN for the IWC.

4.10 Food and Agriculture Organisation (FAO) related meetings – Committee on Fisheries (COFI)
No observer for the IWC attended the 2011 meeting of COFI.

4.11 Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)
No observer for the IWC attended the 2011 meeting of CITES.

4.12 North Pacific Marine Science Organisation (PICES)[4]
The report of the IWC observer at the 20th annual meeting of PICES held 14-23 October 2011 in Khabarovsk, Russia is given as IWC/64/4H. The Marine Birds and Mammals Advisory Group (AP-MBM) recommended that PICES request the IWC Scientific Committee includes a seabird observer on the IWC POWER cruise survey vessel in the future.

Spatial ecology and conservation was selected as the basis of the new activity plan for the AP-MBM. The objectives are:

(1) synthesise distribution data on marine birds and mammals and its temporal change in the North Pacific;
(2) examine the physical and biological factors that correspond to the distribution and abundance of marine birds and mammals and their economic/ecological hot spots; and
(3) provide information on ecological areas in the PICES regions to aid understanding and sustainable use of marine resources.

Two sessions at the 2012 AP-MBM workshop were of relevance to the IWC, these were: (1) environmental contaminants in marine ecosystems: seabirds and marine mammals as sentinels of ecosystem health; and (2) the feasibility of updating prey consumption by marine birds, marine mammals and large predatory fish in PICES regions.

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.

4.13 Eastern Caribbean Cetacean Commission (ECCO)
No information on the activities of ECCO was provided.

4.14 Protocol on Specially Protected Areas and Wildlife (SPAW) of the Cartagena Convention for the Wider Caribbean[5]
The report of the IWC observer to SPAW is given as IWC/64/4D. The MSP LifeWeb Project was launched in October 2010, which aims to assist with the implementation of decisions from the Convention on Biological Diversity, as well as those of the Cartagena Convention and its SPAW protocol. Recent activities under this project include:

(1) a workshop on integration, mapping and GIS analysis of marine mammal migration routes, critical habitats and human threats in the wider Caribbean region (May 2011);
(2) assisting in the coordination of a conference on Marine Mammal Protected Areas (November 2011);
(3) identifying marine mammal data sources within the wider Caribbean Region and collating information in an online database;
(4) a workshop on broad-scale marine spatial planning (March 2012);
(5) analysis of identified marine mammal data in order to develop data layers and maps on the critical habitats for marine mammals in the wider Caribbean; and
(6) a workshop on broad-scale marine spatial planning and transboundary marine mammal management (May 2012).

[3] *www.worldconservationcongress.org*
[4] *http://www.pices.int*.
[5] *http://www.cep.unep.org/cartagena-convention*.

In 2011 a project focusing on marine mammal watching was implemented. It aims to improve and centralise the level of information and knowledge on the status, distribution and threats of marine mammals in the region. A related workshop was held in October 2011. The Committee thanked Carlson for attending on its behalf and agrees that she should represent the Committee as an observer at the next SPAW meeting.

4.15 Indian Ocean Commission (IOC)[6]

No information on the activities of IOC was provided.

4.16 Permanent Commission for the South Pacific (CPPS)[7]

No information on the activities of CPPS was provided.

4.17 International Maritime Organisation (IMO)[8]

The report of the IWC observer to the IMO is given as IWC/64/4G. The IWC has contributed to IMO discussions on addressing ship strikes and the impacts of underwater noise from shipping. The IMO has established a correspondence group to develop non-mandatory draft guidelines for reducing underwater noise from commercial ships (Donovan is a member of this group). This group will report to the IMO's 57th session of the sub-committee on Ship Design and Equipment in early 2013.

The IMO is also working to develop a mandatory Polar Code to control the expected increase in ship traffic in polar waters (the Arctic and the Antarctic) that results from climate and other changes. The Polar Code is intended to function alongside existing IMO conventions and to augment existing measures to reduce the environmental impacts of shipping taking into account the greater environmental sensitivity of polar waters. An IMO Workshop on Environmental Aspects of the Polar Code was held in Cambridge in September 2011 where there was considerable discussion of ship strikes and underwater noise impacts on whales. The Polar Code work is also co-ordinated by the IMO Design Sub-committee on Ship Design and Equipment.

The Committee thanked Leaper for his report and **agrees** that the IWC Secretariat should represent the Committee at the next IMO meeting.

4.18 Conservation in the SE Pacific under the framework for the Lima Convention

No information on Conservation in the SE Pacific under the framework for the Lima Convention was provided.

4.19 International Committee on Marine Protected Areas (ICMMPA)[9]

At its 60th annual meeting in Santiago, Chile, the Committee endorsed support for the first International Conference on Marine Mammal Protected Areas, which was subsequently held in Hawaii, in 2009. The committee that formed to organize that conference has remained intact and is now a task force of the IUCN. It hopes to continue its constructive relationship with the IWC- SC/64/O1 is the summary report of the second International Conference on Marine Mammal Protected Areas (ICMMPA) meeting. Some 150 marine mammal protected area (MMPA) researchers and managers as well as government and conservation group representatives from 42 countries and overseas territories convened in Martinique in the French Caribbean from 7-11 November 2011 for the Second International Conference on Marine Mammal Protected Areas (ICMMPA 2). The goal: to seek solutions to shared problems related to marine mammal conservation and to MMPA network and site design, creation and management. A secondary goal was to orient those working in MMPAs to set those protected areas in the broader context of marine management. The conference was co-hosted by the French MPA Agency (*Agence des aires marines protégées*) and the US National Oceanic and Atmospheric Administration (NOAA). Fifteen other international and regional sponsors, as well as a dozen supporting organizations, were actively involved.

The conference theme of 'Endangered Spaces, Endangered Species' was explored in keynote talks, panels and workshops focusing on monk seals, sirenians, river dolphins and other small and large cetaceans. In several workshops and plenary talks, special attention was given to the *vaquita*, the most endangered, space-restricted marine mammal in the world. Plenary sessions were divided into panels, followed by discussions, focusing on:

(1) special considerations for particularly endangered marine mammals and whether MPAs are the right tool;
(2) refining our understanding of marine mammal critical habitat and hotspots to inform MMPA designation;
(3) using marine spatial planning and ecosystem-based management to address broad threats to marine mammals;
(4) managing MMPAs for localized threats and mitigation by spatial protection and other means;
(5) development of MMPAs in the wider Caribbean region; and
(6) regional cooperation for MMPA scientific and technical networking.

[6] *http://www.coi-ioc.org*.
[7] *http://www.cpps-int.org*.
[8] *http://www.imo.org.*
[9] *www.icmmpa.org.*

The workshops focused on marine mammals and oil spills, decision-making with limited data, best practices for whale watching in MMPAs, integrating marine mammal data in marine spatial planning, forging agreements to establish effective MMPA networks, and the widespread mortality attributed to fisheries bycatch.

Proceedings of this second ICMMPA meeting will be available and released briefly and a third ICMMPA meeting is planned to be held in about two years' time. A proposal was received from Australian scientists and decisions on exact location an date are yet to be taken.

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

5.1 Complete the MSY rates review

Since 2007, the Committee has been discussing maximum sustainable yield rate (MSYR) 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 (IWC, 2008c; 2009b; 2010b; 2010h; 2011j). The current range is 1% to 7%, in terms of the mature component of the population. As part of its review, the Committee has been considering observed population growth rates at low population sizes. An important issue raised (Cooke, 2007) was that should variability and/or temporal autocorrelation in the effects of environmental variability on population growth rates be high, simple use of such observed population growth rates could lead to incorrect inferences being drawn over the lower end of the range of plausible values. In 2010, the Committee agreed a Bayesian approach (Punt, 2010) for calculating a probability distribution for the rate of increase for an 'unknown' stock in the limit of zero population size, once the inputs needed to apply it become available (IWC, 2011e).

Last year, the Committee had agreed that the review would be completed at this meeting (IWC, 2012f). However, given effectively no intersessional progress, the issue was furthered but not completed during the present meeting (Annex D, Appendix 2) as follows:

(1) values of demographic parameters to be used for the calculation of the CV and autocorrelation of the rate of increase were agreed for the 15 populations for which estimates of growth rate at low population size were available if it is assumed that only fecundity is stochastic;
(2) calculations were undertaken for the case where there is no variability in survival rate;
(3) progress was made on the implementation of two approaches for specifying variability in survival rate; one which results in the same CV for the rate of increase for variability in survival rate as the CV implied by the variability in fecundity, and another which is based on an approach involving optimal allocation of energy between reproduction and survival.

The Committee expressed serious concern that once again the process has not been completed and it carefully examined whether it was worth continuing the process. However, given the good progress during the meeting, and the workplan developed (Annex D, Item 2.1), the Committee **agrees** that no more than one further year would be allowed for this process. If the MSYR review cannot be completed at next year's meeting, the current range of MSYR rates (1% - 7% in terms of the mature component of the population) will be retained.

To ensure completion of these tasks, a three-day intersessional meeting is required, with at least five participants, ideally back-to-back with another intersessional meeting. An intersessional steering group (under Butterworth Annex R1) was appointed to co-ordinate the meeting and associated preparation. Any models related to variability in survival rate to be considered must be fully specified to the Steering Group at least one month before the intersessional meeting. The financial considerations are given under Item 23.

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

The Committee last discussed this issue in 2006 (IWC, 2007c) noting that it was originally intended that this work would occur in conjunction with the completion of the MSYR review (see Item 5.1 above). The Committee re-established a working group under Allison (Annex R1) to develop trials to examine the effects of possible environmental degradation in terms of trials in which *K*, and perhaps MSYR, varies over time. The Committee **stresses** that this work must be completed by the next Annual Meeting irrespective of the progress made under Item 5.1.

5.3 Evaluate the Norwegian proposal for amending the *CLA*

The Committee was unable to complete its evaluation of the Norwegian proposal given the discussions under Items 5.1 and 5.2 above. The Committee **agrees** that this task will be completed at the next Annual Meeting either using the revised values from the MSYR review or the existing values if the review is not completed.

5.4 Modify the 'CatchLimit' program to allow variance-covariance matrices

The 'CatchLimit' program implements the *Catch Limit Algorithm* and now allows variance-covariance matrices for the abundance estimates to be specified (IWC, 2012f). Allison noted that it includes some non-standard coding statements and she will be working with the Norwegian

Computing Center during the intersessional period to develop a final version of the program.

5.5 Update requirements and guidelines for conducting surveys and *Implementations*

The Committee's Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme (IWC, 2012v) were written when only design-based surveys were realistic. Subsequently, spatial modelling approaches have been developed as an additional realistic approach. In addition, many [quasi] design-based surveys do not formally meet design-based criteria, and there may be a question regarding on the adequacy of resultant estimates. The Committee has frequently considered model-based and quasi-design-based estimates (e.g., IDCR/SOWER and SCANS), but without explicit criteria and not necessarily in the context of the RMP. Two linked issues therefore arise: under what circumstances might approval from the Scientific Committee reasonably be given to surveys that are not design-based, and should the Guidelines should be amended to give more specific advice on the considerations for evaluating model-based estimates (including extrapolations) and/or quasi-design-based estimates.

The statistical issues involved are complex, both theoretically and in practice. A number of detailed starting points for discussion are noted in Annex D, Item 2.5, and sufficient experience with model-based methods has now accumulated to warrant a review. The Committee, also recognising the importance of this work for all sub-committees that consider abundance estimates in a conservation and management context, therefore **recommends** that such a review (covering model-based abundance estimation in theory and practice, and its relation to the design-based approach), be conducted. The review (Annex D, Appendix 4) will also provide draft text for inclusion in the Committee's Requirements and Guidelines for Conducting Surveys document. The financial considerations are given under Item 23.

5.6 Evaluate the optimisation method used when conditioning trials

Punt and Elvarsson (2011) developed and compared a number of ways to improve the performance of the optimisation algorithm underlying the conditioning process, as discussed in Annex D, Item 2.6. The Committee noted that the optimisation scheme used for conditioning the trials for the western North Pacific minke whales had been modified accordingly.

5.7 List of abundance estimates and their recommended uses

The list of accepted abundance estimates for those stocks that have been subject to RMP *Implementations* (and Reviews) are provided in Annex D, Appendix 2 along with references to discussions as to whether they are acceptable for use in conditioning; acceptable for use in trials, and/or acceptable for use in applications of the *CLA*. The only exception was for western North Pacific common minke whales where evaluation is ongoing (see Item 6.3).

5.8 Work plan

The Committee's views on the workplan developed by the sub-committee on the RMP are given under Item 21 and financial matters are considered under Item 23.

6. RMP – PREPARATIONS FOR *IMPLEMENTATION*

6.1 Western North Pacific Bryde's whales

6.1.1 Prepare for 2013 Implementation Review

The Committee was informed that Japan wished to postpone the 2013 *Implementation Review* for North Pacific Bryde's whales until 2016 because:

(1) Dedicated sighting surveys have been conducted in the western North Pacific since 2010 and additional surveys targeted towards Bryde's whales were planned for 2012 and beyond.
(2) Lower latitudinal waters in the eastern North Pacific will be covered during the IWC/POWER research program during 2013- 2015.
(3) There are currently no genetic samples for sub-area 2 (east of 180°). It is expected that biopsy samples will be collected from Bryde's whales during the IWC/POWER research programme.
(4) New genetic samples have been obtained for sub-area 1 (west of 180°) during JAPRN II as well as other sources, but the data have yet to be analysed.

6.1.2 Recommendations

Implementation Reviews should normally be scheduled not later than six years after the completion of the previous *Implementation* (or *Review*) (IWC, 2012w). The western North Pacific Bryde's whale *Implementation* was completed in 2007 (IWC, 2008). However, the Committee **recommends** that the *Implementation Review* for western North Pacific Bryde's whales be delayed until 2016 given: (a) the *Implementation* completed in 2007 considered a range of hypotheses related to stock structure and productivity; (b) three more years of catches are unlikely to lead to conservation concerns given the results of the *Implementation*; (c) that it cannot conduct more than one *Implementation Review* at a time (see Items 6.2 and 6.3 below); and (d) allow additional sightings and genetics data to be available.

6.2 North Atlantic fin whales

In 2009, the Committee agreed (IWC, 2010d) that if the RMP is implemented for North Atlantic fin whales,

certain variants (see table 4 of IWC, 2010d, pp.122) could be implemented without a research programme. It also agreed that another variant would be acceptable only with an agreed research programme for the reasons given in IWC (2010d). A primary aspect of this related to whether or not a particular stock hypothesis, 'hypothesis IV', was appropriate.

SC/64/RMP3 responded to a recommendation from the Committee last year that further analysis of the Discovery Marking data should be carried out within the framework of the *Implementation Simulation Trials* as detailed in Annex D, Item 3.2. The Committee noted that SC/64/RMP3 provided evidence suggesting that stock structure hypothesis IV is inconsistent with existing data but recognised that making a final decision on its acceptability could also involve additional trials. This can best be achieved within the context of an *Implementation Review*.

Annex D, Table 1 summarises new information available for an *Implementation Review*. The Committee **agrees** that the available information is sufficient to warrant an *Implementation Review* in 2013. It noted that while the *Implementation Review* would be focused on providing advice for the Icelandic hunt, the discussions of stock structure would also be valuable in the context of the SWG's work to develop an *SLA* for the aboriginal hunt off West Greenland (Annex E).

6.2.1 Recommendations

The Committee **recommends** that the *Implementation Review* for the North Atlantic fin whales be brought forward to 2013. The *Review* should start during a pre-meeting immediately before the 2013 Annual Meeting to ensure that it is completed in one year. An intersessional email Steering Group (Víkingsson, Gunnlaugsson, Donovan (chair), Butterworth, Allison) was established to coordinate the work prior to the 2013 meeting.

6.3 North Pacific common minke whales (continue *Implementation*)

The Committee is conducting an *Implementation Review* for western North Pacific common minke whales and is following the schedule set out in its Requirements and Guidelines (IWC, 2012a). At last year's meeting, the Committee had been unable to complete the tasks required for the First Annual Meeting, primarily because it had not been possible to complete conditioning of the *Implementation Simulation Trials*a major task given their complexity. This meant that the 2 year schedule for the *Implementation Review* had been disrupted.

This year's meeting was effectively a repeat of the First Annual Meeting with the same list of tasks that had been initiated last year. There had been another Intersessional Workshop in December 2011 to facilitate the work necessary to ensure that all relevant tasks could be completed at this year's meeting as described under item 6.3.1.1.

6.3.1 Report of the December 2012 Intersessional Workshop

Donovan presented a summary of the report of the Intersessional Workshop held 12-16 December 2012, kindly hosted by the Government of Japan (SC/64/Rep2). The primary objective of the Workshop was to ensure completion of the conditioning of trials in time for the 2012 Annual Meeting, although a number of other topics were addressed to assist the Committee in its work to complete the *Implementation Review*. Conditioning is the process of selecting the values for the parameters of the operating models that implement the trials such that the predictions from these models are consistent with the available data.

The Intersessional Workshop covered issues relating to: stock structure and mixing matrices; conditioning; abundance estimates for use in trials; specification of these trials; plausibility of stock structure hypotheses; and data/analyses to reduce the number of stock structure hypotheses in future *Implementations*. Considerable progress was made and details are given in Annex D1, Item 3 and SC/64/Rep2.

6.3.2 Conditioning

Following the Intersessional Workshop, a number of problems with the fits of the operating model to the data had been identified. Suggested changes to the trial specifications were developed, details of which are given in Annex D1, Item 4.1, which the Committee **endorses**.

The Committee reviewed the results for the six baseline trials (stock structure hypotheses A, B and C with MSY rates of 1% and 4%) given in Annex D1, Appendix 2 and **agrees** that the conditioning for these trials had been acceptably achieved. There was insufficient time to evaluate the results of the conditioning of all the sensitivity tests. However the Committee **agrees** that the results for trials for which 100 simulations were available suggested that it is possible to determine whether conditioning has been achieved successfully based on the fit of the operating model to the actual data.

The Committee received a summary report from a small group appointed to review the results of trials run to date. Allison reported that all trials for stock structure hypotheses A and C with MSYR = 1% had now been run with the actual data. Conditioning had been achieved for all these trials except two, for which the mixing matrices needed adjustment. Based on these results and on extensive past experience with reviewing the results of such trials, the Committee **agrees** that conditioning of the *Implementation Simulation Trials* of western North Pacific common minke whales had been acceptably achieved.

6.3.3 Update to standard datasets - abundance estimates

Abundance estimates play three roles in the *Implementation* process: (a) for use in conditioning trials; (b) for use when applying the *CLA* during *Implementation Simulation Trials*; and (c) for actual application of the *CLA*. The abundance estimates for use during conditioning were selected during the First Intersessional Workshop in December 2010 (IWC, 2012d). At this meeting, the Committee needed to select which abundance estimates to use when applying the *CLA* during *Implementation Simulation Trials*. The abundance estimates for use in actual application of the *CLA* will be finalised next year.

The Committee received a cruise report of a sightings survey in the Yellow Sea in May 2011 (SC/64/NPM6) and an estimate of abundance for minke whales from this survey (SC/64/NPM7); details are given in Annex D1, Item 5.1.1. 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. In discussion, the Committee raised a number of issues with the analysis that requires further work. Therefore this estimate was not accepted for use in implementation of the RMP at this meeting but the Committee looks forward to the presentation of a revised estimate in the future.

The Committee received SC/64/NPM2, an updated summary of the information on survey procedures for the Japanese dedicated sighting surveys conducted by the Institute of Cetacean Research (ICR) and the National Research Institute of Far Seas Fisheries (NRIFSF), in response to a recommendation from the December 2011 Intersessional Workshop (SC/64/Rep2). The authors concluded that sighting procedures for the ICR surveys follow the RMP requirements and guidelines for surveys, except that the surveys were not subject to Committee oversight, and that the survey procedures for the NRIFSF surveys met all these requirements and guidelines. The Committee also received SC/64/NPM3, which presented abundance estimates from JARPN II (see item 17) sightings data for minke whales in sub-areas 7CS, 7CN, 7WR, 7E, 8 and 9 collected during 2008 and 2009. Details are given in Annex D1, Item 5.1.2.

A number of issues were raised and discussed relating to survey design, survey direction relative to migration, survey protocol for responding to bad weather and achieved coverage; details are given in Annex D1, Item 5.1.2. One specific point was that the estimates of abundance for 2008 and 2009 use information from other years. The Committee therefore **recommends** that variance-covariance matrices be computed for the entire time-series of abundance estimates for sub-areas 7CS, 7CN, 8, and 9.

Whether and how to use estimates with low coverage or design concerns and the treatment of JARPN and JARPN II surveys (i.e. surveys that had not originally been intended to produce estimates for use in the RMP) that did not have Committee oversight raised issues beyond the specifics of the *Implementation Review* of western North Pacific minke whales. Accordingly, the Committee had a general discussion of these issues, the report of which is given under Item 5.8.

In light of that discussion, a small group reviewed all of the available abundance estimates to determine whether or not they were acceptable for use when applying the *CLA* during *Implementation Simulation Trials*. Each available estimate was categorized as 'Yes', 'No', 'No agreement', and 'Yes*' (see Annex D1, Appendix 3). The category Yes* indicates that they can be used in the trials but that further analysis needs to be considered for the estimate to become acceptable for application of the RMP. Surveys which had been accepted for use in the trials during the 2003 *Implementation* were automatically deemed acceptable. The Committee **endorses** the categorisations given in Annex D1, Appendix 3.

Regarding those estimates for which no agreement had been reached on whether or not they were acceptable for use in trials, the Committee **agrees** that the baseline trials should be conducted for the least and most aggressive RMP variants both using and not using the 'No agreement' estimates when applying the *CLA*. If the results of the trials are sensitive to the inclusion of the 'No agreement' estimates, the proponents would be requested to justify how the 'No agreement' estimates could become acceptable with further analysis. The final decision on whether further analysis is likely to allow 'No agreement' estimates to be acceptable will be made by the Intersessional Steering Group established under Butterworth (Annex R).

Annotation 21A to the RMP specifications (IWC, 2012w) states that 'A part of an *Area* which is unsurveyed in a single year may count as surveyed when the data from several years are combined, provided that an appropriate multi-year regression analysis is used, and additional variance is taken into account'. In response to a recommendation in SC/64/Rep2, the Committee received SC/64/NPM5, which extrapolated abundance estimates to parts of sub-areas 8, 11, and 12NE which were not covered during some past surveys, to eliminate the bias in estimated abundance trend which arises due to variable coverage. Details are given in Annex D1, Item 5.1.2.

The Committee noted that blocks B11-2 and B12NE-2 had only been surveyed once which meant that there are insufficient data to inform additional variance. The Committee **agrees** that the information for sub-area 8 satisfied the requirements for applying annotation 21A.

6.3.4 Update to standard datasets – best catch series

The Committee **agrees** with the recommendation in Annex D of SC/64/Rep2 that the 'Best' catch series was appropriate for the direct catches.

The Committee noted that a single series of bycatches would be used for all of the trials when applying the RMP, irrespective of the true values for the bycatches, which differ among trials, and simulations within trials. The Committee **agrees** that the bycatches would be set to the averages of the predicted bycatches based on the fit to the actual data of the operating model for the six baseline trials (see Annex D1, Appendix 4).

Regarding the specification of future bycatches in the trials, the Committee **agrees** that this should be achieved by assuming that the bycatch rate in the future equals the bycatch rate estimated for the trial in question averaged over the previous five years (Annex D1, Appendix 9).

6.3.5 Final consideration of plausibility

A key step in the Committee's Requirements and Guidelines for *Implementations* (IWC, 2012w) is assigning plausibility to hypotheses and, by extension, to all of the *Implementation Simulation Trials*. Trials are assigned 'low', 'medium' or 'high' weights, or are categorised as 'no agreement', which are treated as 'medium' weighted trials. Trials with 'low' weights are not considered further in the *Implementation*.

When the results of the trials are examined, for each management variant (see Item 6.3.1.5), 'acceptable' conservation performance is required for all 'high' weight trials but 'borderline' or 'unacceptable' conservation performance for a number of 'medium' weight trials, leads to further consideration of a possible 'with research' option, as detailed in IWC (2012w). Unacceptable performance of a management variant in any 'high' weight trial leads to that variant being eliminated from further consideration, including with respect to the 'with research' option.

The schedule for *Implementations* in the Committee's Requirements and Guidelines for *Implementations* (IWC, 2012w) required final decisions on the plausibility of hypotheses to be made at this year's meeting.

SC/64/Rep2 noted that the present meeting would decide whether analyses of CPUE data (or sighting per unit effort data, SPUE) could be used qualitatively to inform assignment of plausibility weights to the hypotheses (stock structure and MSYR) on which the trials are based (see Annex D1, Item 3.6). The Workshop had noted that a document outlining relevant operational factors needed to be developed for the Committee to make a decision in this regard, and it had made a number of recommendations regarding such a document.

SC/64/NPM4 summarised information pertaining to catch, sightings and effort data from Japanese small-type whaling during 1977–87 in relation to minke whales. The authors concluded that CPUE or SPUE data can be useful as an index of population trend if standardised.

The Committee thanked the authors of SC/64/NPM4, which covered most of the factors identified. It noted that there was considerable variation in where individual vessels operated during the year, and that if vessel movement reflects availability of whales, CPUE or SPUE may be biased as an index of relative abundance. It was suggested that focussing on April-May only may provide more consistency.

Following the presentation of the results of additional analyses, the Committee considered that further analysis and model diagnostics would need to be provided before the resultant SPUE trends could be used to assist the assignment of plausibility to hypotheses related to stock structure and MSYR. Given the time available, this was not feasible this year. It was noted that these data could be re-analysed and presented to the next *Implementation Review*, although some members considered that use of whaling SPUE data was inherently problematic and that no analyses of these data would lead to information which could inform plausibility.

6.3.5.1 STOCK STRUCTURE

In response to a request made intersessionally, the Committee received papers from the proponents of Hypotheses A/B (SC/64/NPM1) and of Hypothesis C (SC/64/NPM11) summarising their main features and supporting evidence. Details of these papers are given in Annex D1, Item 6.2. a graphical representation of these stock structure hypotheses is given in fig.1 of (IWC, 2012h, pp.103).

Two papers containing new genetic analyses were presented. SC/64/NPM9 used computer simulations to examine the effect of different sample sizes on the distributions of the correlations between θ and F_{IS}, following an analysis presented last year (SC/63/RMP7) in which it was proposed that, in a sample that contains individuals only from two distinct stocks, the largest departures from equilibrium (quantified as F_{IS}) should be seen at the loci that show the largest allele frequency differences between the two stocks (quantified as θ). Details are given in Annex D1, Item 6.2. given the considerable variability seen in the simulated data, the authors of SC/64/NPM9 suggested that further evaluation is required before the results of SC/63/RMP7 could be used as evidence against Hypotheses A and B.

In discussion, it was suggested that it would be useful to extend these analyses to the two-locus (linkage disequilibrium - LD) correlations that were also reported

in SC/63/RMP7. Additional discussion is given in Annex D1, Item 6.2.

SC64/NPM10 responded to a request from last year's meeting for follow-up analyses comparing the performance of two Bayesian clustering programs (STRUCTURE and HWLER) for detecting the number of gene pools represented in a sample. Details are given in Annex D1, Item 6.2. Both programs only detected one population when true panmixia was modelled, but both also failed to detect a second population at the weakest level of differentiation (F_{ST} = 0.007). STRUCTURE reliably detected two populations at F_{ST} = 0.02 but HWLER did not, but HWLER was more consistent in resolving mixtures for F_{ST} > 0.03.

In discussion, the Committee noted that the results provide additional confirmation that these Bayesian clustering methods cannot detect the weakest levels of population structure, at least using currently available numbers of genetic markers. Details of additional discussion are given in Annex D1, Item 6.2. Several more technical aspects of the performance of STRUCTURE at moderate levels of population differentiation (F_{ST} = 0.045-0.06) were also discussed; details are given in Annex I.

In response to a request in SC/64/Rep2, the summary information relating to key stock structure questions developed last year (Appendix 9 of Annex D1 of last year's report - IWC, 2012h) was reformatted and presented to the Committee. It was revised following discussion and a final version is given in Annex D1, Appendix 6. This table provided a useful starting point for final considerations of plausibility of stock structure hypotheses.

The Committee also received Annex D1, Appendix 7, which synthesised information relating to the relevance of departures from Hardy-Weinberg equilibrium at one and two gene loci, to distinguish between stock-structure hypotheses. The author's overall conclusion was that evidence from Hardy-Weinberg departures for more than two O+J stocks is only weak to moderate. Details of discussion are given in Annex D1, Item 6.2.

Following these presentations and discussions, the Committee considered a concise overall summary by the 'G5 group' of geneticists of their interpretation of the relative support for and against the five hypothesised stocks (JE, JW, OE, OW, Y), based on the cumulative genetic information presented and discussed during the last several years. This summary table is given in Annex D1, Appendix 8.

During the discussion, there was some attempt to reduce the number of stock structure hypotheses for consideration in the *Implementation Simulation Trials*. It was noted that the conclusion in Annex D1, Appendix 8 regarding Y stock did not depend on data on conception date, which some consider the strongest evidence for Y stock. Some members suggested that as a consequence, Hypothesis A be assigned 'Low' plausibility. This was not agreed to by the proponents of that hypothesis, who pointed out that reliability of the conception date data has been questioned (e.g. IWC, 2012h) and who argued that the genetic data are too limited to be considered strong support for existence of Y stock. Similarly, assigning 'High' plausibility to a 4-stock version of Hypothesis C that includes two O stocks but only one J stock, and 'Medium' plausibility to Hypothesis C did not receive agreement.

In the end, it was not possible to reach agreement on any of these alternatives and, as a consequence, all three main stock structure hypotheses (A, B and C) were 'no agreement'. The Committee **agrees** that they should therefore be treated as if they had been assigned 'Medium' plausibility and that the *Implementation Review* should proceed on this basis.

Pastene commented that although several types of data had been considered during the *Implementation* process thus far, he felt that the conclusions on plausibility were too heavily weighted to the genetic data. The Committee reaffirms the importance of using data from a suite of techniques.

Some members expressed their concern that, despite an enormous investment in research, no consensus had been reached on according low plausibility to the hypothesis of two J stocks. They noted the conclusion of five geneticists who were not proponents of any of the hypotheses (Gaggiotti, Hoelzel, Palsbøll, Tiedemann and Waples) that, based on existing genetic data and analyses, the evidence for the two J stock hypothesis is low and the evidence against it is medium or high (Annex D1, Appendix 8). They questioned whether it would ever be possible to agree, on the basis of genetic analyses, that a hypothesis be given low plausibility if such a statement was not considered by the Committee to be sufficient.

Other members considered that the genetic data were insufficient to evaluate any of the three stock structure hypotheses. They noted that genetic data do not provide information on annual mixing rates between *Small Areas*, which has been shown to be an important consideration in the application of the RMP (Martien *et al.*, 2008). They also noted the discussion under Item 6.1.3.8 on the lack of samples from the breeding grounds and recommendations for further research to determine the levels of demographic mixing between breeding populations in relation to management outcomes.

6.3.5.2 MSYR AND OTHER FACTORS

The previous *Implementation* assigned 'high' plausibility to $MSYR_{mat}$=4% and 'medium' plausibility to

$MSYR_{mat}$=1% (IWC 2005). It was noted that these whales are found in a region in which there are very large fisheries which might impact the prey base. However, the size of any such an effect on MSYR cannot be quantified at this time. In addition, the review of MSY rates will not be completed during the current meeting so there is effectively no new information related to MSYR for western North Pacific minke whales. The Committee therefore **agrees** to assign 'high' plausibility to $MSYR_{mat}$=4% and 'medium' plausibility to $MSYR_{mat}$=1%, as in the previous *Implementation*.

The baseline trials are based on the hypothesis $g(0)$=0.8, based on the estimate of $g(0)$ by SC/62/NPM9 for the combination of top barrel and upper bridge. The December 2010 First Intersessional Workshop (IWC, 2012d) had noted that this estimate is conservative because the $g(0)$ value is to be applied identically to all surveys, including those by Korean vessels which have lower top barrels, and hence seem likely to miss a greater proportion of minke whales on the trackline. The Committee therefore **agrees** to assign 'high' plausibility to $g(0)$=0.8 and 'medium' plausibility to $g(0)$=1.

Regarding the full set of sensitivity trials, the Committee **agrees** to assign 'medium' plausibility to all of the trials except for the following three:

(1) Trial 24, which is based on stock structure hypothesis C, but there is a single O-stock and two J-stocks. This trial was assigned 'low' plausibility given the results of the genetics analyses (see Annex D1, Appendix 8).
(2) Trials 21 and 29, which are based on the abundance in sub-areas 5 and 6W, respectively, being set to the 'minimum' values. These trials were assigned 'low' plausibility because the Korean surveys in sub-areas 5 and 6W only cover a small fraction of the overall area of these sub-areas.

The Working Group noted that results of trials 21 and 29 might provide useful information regarding the behaviour of the trials, and **recommends** that these trials be conducted if time is available.

Annex D1, Appendix 5 lists the factors considered in the trials and the final plausibilities assigned by the Committee to each factor.

6.3.6 Specifications of operational features and management variants

In order to implement the *CLA* in trials, specifications of proposed whaling operations are required. Japan intends to conduct coastal whaling in sub-areas 7CS, 7CN and 11, and pelagic whaling in sub-areas 8 and 9. Coastal whaling will be restricted to 10 n.miles. from the coast and during August-October in sub-area 11 to minimise catches of J-stock animals. Whaling in sub-areas 8 and 9 will take place during April-October. Korea intends to conduct whaling using small-type catcher boats in sub-areas 5 and 6W from March to November. Operations will be conducted up to 60 n.miles. from the coast in sub-area 5 and up to 30 n.miles. from the coast in sub-area 6W.

It is also necessary to specify the management variants that will be implemented in the trials. A management variant defines the way the *CLA* is applied to *Management Areas*. This includes specifying *Medium Areas*, *Small Areas* and combinations of *Small Areas* (*Combination Areas*), specifying from which *Management Areas* catches are to be taken, and selecting *Catch-cascading* and/or *Catch-capping* options.

The **agreed** RMP variants and the associated *Small* and *Medium Area* definitions are given in Annex D1, Appendix 9.

The Committee noted that the trials will take longer to run than in previous *Implementations* because the *CLA* will be implemented using the Norwegian 'CatchLimit' program rather than the Cooke version of the *CLA*. The Committee **agrees** that priority should be given to running all RMP variants for the baseline trials as quickly as possible so that any of the RMP variants that are clearly likely to perform 'unacceptably' can be excluded from further consideration. The process of distributing and evaluating trials will be co-ordinated by the Intersessional Steering Group (see Annex R).

6.3.7 Specifications and classification of final trials

The final trial specifications are given in Annex D1, Appendix 9.

The Committee **agrees** that for running the trials it will be assumed that the proportional coverage of sub-areas will remain unchanged.

The planned future surveys and a proposal for how past surveys can be combined to calculate survey estimates for *Small Areas* are given in Annex D1, Appendix 9.

SC/64/NPM8 reported that a survey in the Yellow Sea will be conducted during spring 2013. Details are given in Annex D1, Item 8.2. The Committee was pleased to hear that additional surveys would continue to be conducted in the waters off Korea and appointed An to provide oversight on its behalf. In relation to survey design, the Committee had recommended some changes to the survey design, which was subsequently modified during the meeting (see Annex D1, Item 8.2).

SC/64/O9 reported on a sightings and satellite tagging survey for common minke whales in sub-area 7 in April-June 2011. Only two animals were encountered and efforts to deploy a tag were unsuccessful. SC/64/O10 reported on a sighting and biopsy sampling survey for common minke whales in the Okhotsk Sea, including the

Russian EEZ, in May-June 2011. Three schools of minke whales were targeted for biopsy sampling, but no samples were obtained because of difficulties closing on the animals. The Committee expresses its support for continued efforts to collect telemetry and biopsy data to help elucidate stock structure for minke whales in this region. More details are given in Annex D1, Item 9.

6.3.8 Consideration of data/analyses to reduce hypotheses in future

The Committee had a general discussion of the fact that, in spite of many years of concerted efforts and a great deal of genetic and non-genetic data, considerable uncertainties remain regarding stock structure of western North Pacific minke whales. This issue is particularly difficult because of the lack of any samples from breeding grounds. The Committee considered a number of types of genetic analyses that might help to reduce these uncertainties in the future. These included sensitivity analyses of recently-used methods and development and application of new analyses, details of which are given in Annex D1, Item 9. The importance of considering further work on non-genetic data was also noted. The Committee notes that plans for internation collaborative work, including a workshop, to assist the Committee prepare for an *Implementation Review* under the RMP and the development of an AWMP *SLA* for the Greenland hunt for North Atlantic minke whales (Annex D, Appendix 6) could serve as a useful model for this.

In addition to proposed analyses specifically related to North Pacific common minke whales, the Committee considered an approach that would more broadly address core stock-structure problems that recur for many species in many areas. This general approach has two parts: (1) determining what levels of demographic mixing between breeding populations do and do not make a difference in terms of conservation goals or management outcomes; and (2) using genetic and other methods to determine whether actual levels of connectivity are above or below this threshold.

The Committee **agrees** that work towards this general approach should receive high priority. Suggestions to facilitate implementation of this approach are given in Annex D1, Item 9; further discussion is given in Annex I.

It was noted that the *Implementation Review* for North Atlantic common minke whales will undertake some of this work (see Annex D, Item 3.3) and that it would be desirable to coordinate efforts in that regard. It was also noted that similar work was being undertaken by scientists at the US Southwest Fisheries Science Center. Cumulative results of these analyses should make it apparent whether general rules of thumb about 'tipping point' levels of migration can be identified, or whether the outcomes are so diverse that each situation must be evaluated on its own merits.

As noted in SC/64/Rep2, in addition to issues of stock structure, other difficulties in conducting the present *Implementation Review* centred on abundance estimates, including their unavailability in some areas and the large CVs for some of the estimates that were available. The difficulties faced by the Committee in determining the acceptability of abundance estimates for use in trials (see Annex D1, Item 5.1.2) amplify this concern.

The Committee **agrees** that, to avoid such difficulties in future *Implementation Reviews*, it should consider taking a more active and collaborative approach to this issue. Examination of trial results will assist in identifying the key temporal and geographical areas where new/improved abundance estimates would be most valuable. The Committee should consider developing, in conjunction with the appropriate range states, a short-medium term survey strategy (including design and required effort) and analytical approach that would improve the availability of satisfactory abundance estimates with reasonable CVs at the appropriate geographical and temporal scale to facilitate future *Implementation Reviews*. This could follow a similar process to that used to develop the IWC-POWER programme (Annex G, Item 6.2).

6.3.9 Inputs for actual application of the CLA

The Committee **agrees** that the best estimates of the direct catches and the average predicted bycatch from the six baseline trial would be used for applications of the *CLA*.

The Committee did not have sufficient time to select abundance estimates for use in application of the *CLA*. This issue will need to be addressed at the Second Intersessional Workshop (see Item 20).

6.4 North Atlantic common minke whales

6.4.1 Review new information

SC/64/RMP4 summarised the results of aerial surveys covering most of the continental shelf waters of the Icelandic economic zone; the off season component was part of the Icelandic Research Programme of Common Minke Whales conducted during 2003-07. The Committee noted that SC/64/RMP4 will be considered during the review of this program in 2013 (see Item 17.1.3).

SC/64/RMP5 summarised a sighting survey conducted in the eastern Norwegian Sea in the *Small Management Area EW* during the summer 2011. Details are given in Annex D, Item 3.3.1 This was the fourth year in the ongoing six-year survey program 2008-2013. The Committee **welcomes** the information provided. The data will be included in developing a future abundance estimate for North Atlantic minke whales.

6.4.2 Prepare for 2014 Implementation Review

The Committee agreed last year (IWC, 2012i) to undertake an *Implementation Review* of common minke

whales in the North Atlantic in 2014. It has agreed that this will include a full review of stock structure and other issues, recognising that there has been substantial new information collected over the period since the original hypotheses were developed during the *Implementation* itself (IWC, 1993).

The Committee recognised that it was important to begin preparations for the review in sufficient time to allow for this thorough analysis. It therefore **recommends** the workplan (including a joint intersessional workshop with AWMP in 2014) as outlined in Annex D, Appendix 6, to consider stock structure hypotheses for North Atlantic common minke whales. It appointed a Steering Group under Palsbøll (Annex R).

6.5 North Atlantic sei whales

Víkingsson *et al.* (2010) represented a proposal to initiate a *pre-implementation assessment* of sei whales in the Central North Atlantic. As required (IWC, 2005), the paper provides a broad outline of the available data relevant to an pre-implementation assessmen, including historical catches, distribution and abundance from dedicated and non-dedicated sightings surveys, stock structure (Discovery marking, genetics and satellite telemetry), biological parameters, feeding ecology and pathology. The authors concluded that the data are sufficient to warrant a pre-implementation assessment of sei whales in the North Atlantic.

The decision whether to initiate an *Implementation* is made by the Commission. The Committee **recommends** that an intersessional group convened by Vikingsson (Annex R) should be established with Terms of Reference to review the available data for North Atlantic sei whales in the context of a *pre-implementation assessment* and provide a report to the 2013 Annual Meeting. The Committee will review the report and any new information so that the Commission can be advised whether sufficient information is available to proceed with the *pre-implementation assessment*.

6.6 Work plan

The Committee's views on the workplan developed by the sub-committee on the RMP are given under Item 21.

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, 2003d) because under the RMP, 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 (e.g. IWC, 2011b) while entanglement response is being considered by the Commission's Working Group on whale killing methods and associated animal welfare issues (e.g. see IWC/64/WKM&AWI Rep1).

7.1 Collaboration with FAO on collation of relevant fisheries data

There has been an ongoing effort by the Secretariat and Sea Mammal Research Unit to consolidate data on entanglements submitted in the National Progress Reports into a single database to be shared with FAO. All bycatch records reported to the IWC for the period 1967-2010 have now been entered. The IWC is currently an observer to the FIRMS partnership (Fisheries Resources Management System), a collaborative partnership organised by the FAO, which enables fishery management bodies to share information. It was hoped that FIRMS may hold data on fishing effort that could be useful in estimating bycatch but FIRMS appears to have changed its focus somewhat since initial discussions. The Committee **recommends** that the Secretariat contact FIRMS to establish whether the partnership is still attempting to collate data on fishing effort in such a way that could be of use to the Committee in estimating bycatch.

7.2 Estimation of bycatch mortality of large whales

A long-term data set on entanglements and disentanglements off South Africa showed two centres of entanglement involving humpback or southern right whales, one off the coast of KwaZulu-Natal involving nets set to protect bathers from sharks and the second off the coast of the Western Cape involving traps and attached lines set for rock lobster. Interventions were successful in removing gear from 81% of whales entangled in shark nets off KZN (38 humpback, 17 right whales), while 11 humpback and 2 right whales were found dead. Off the Western Cape, whales were successfully disentangled in 23% of cases (n = 90) and partially disentangled in another 12%. The trend in humpback whale entanglement since 1990 was compatible with the recorded rate of population increase. Entanglement rates of southern right whales apparently increased from 1990 and this could also be attributed to an increase in the population (Meyer *et al.*, 2011).

Entanglement data from the coasts of Newfoundland and Labrador, Canada from 1979 to 2008 included 1,209 large whale entanglements, consisting primarily of humpback whales (80%) and minke whales (15%). Reported entanglements dropped from an average of 64 prior to the

moratorium on cod fisheries in 1992 to 19 afterwards (Benjamins *et al.*, 2011).

The Committee noted the value of the extensive data sets described in these studies and that they contributed to an understanding of the impacts, rates and trends over time in entanglement mortality. Both studies had been able to identify trends over time and relate these to either population size or fishing effort. The Committee **recommends** the continuation (or initiation) of these and similar studies and encourages the presentation of results at future Committee meetings.

7.3 Estimation of risk and rates of entanglement

Recent capacity building on entanglement response, conducted by the IWC working in conjunction with both national and regional authorities in Argentina, stimulated an analysis of entangled southern right whales in the province of Chubut. Of nine confirmed cases of entanglement, five involved moorings and four involved marine debris or fishing gear. Six of these whales were successfully released. Many of the mooring systems contained heavy chain and relatively thick diameter rope, but were still found to entangle whales. Whales were often seen 'playing' with mooring and anchor lines and this behaviour is believed to be a primary mechanism for entanglement in this region.

The primary focus of the second IWC workshop on Welfare Issues Associated with the Entanglement of Large Whales held in 2011 (IWC/64/WKM&AWI Rep1) was on entanglement response and capacity building but several topics from the workshop were also relevant to estimating risk, including the mechanisms by which large whales become entangled. The Committee noted the value of data collected during entanglement responses and welcomed the efforts at the workshop to develop a data form to standardise the data now being collected around the world. The workshop participants had also proposed to form a 'global network of entanglement response teams' and seek the endorsement of the IWC as an expert panel to advise member nations on issues related to large whale entanglement including setting up response networks, methodologies for understanding scope and impact on local populations, and response capacity building. The Committee **supports** the call for the proposed group and a potential database noting that this will assist the work of the Committee. In many cases there are additional data available from entanglement incidents that could supplement the summary data currently requested in National Progress Reports. The IWC could become a repository for such data through a similar effort to the ship strike database.

7.4 Review progress on including information in National Progress Reports

Due to some delays with changing to electronic submission of Progress Reports, these were not reviewed at the meeting. It was noted that, when complete, electronic submission will facilitate linking relevant data to the ship strike database. Suitable links within the submission system could also encourage the entry of data to the ship strike database where more detailed information is available.

7.5 Ship strikes

New information on ship strikes was received for the Arabian Sea region, South Africa and Sri Lanka. A preliminary summary of strandings, lethal entanglements and ship strikes of large whales in the Arabian Sea region, revealed seven documented ship strikes and four lethal entanglements between 2000 and 2012 and included three Arabian Sea humpback whales. The Committee has noted its concern over the status of this population and the increasing shipping traffic in this region (see Item 10.7 for further discussion).

Of 71 recorded mortalities of southern right whales on the South African coast between 1999 and 2010 five bore injuries consistent with a ship strike.

The southern coast of Sri Lanka has one of the busiest shipping routes in the world and overlaps with an area of high whale sightings. Two pygmy blue whales were struck and killed in Sri Lankan waters in early 2012. In the absence of any abundance estimates for the local population, the population impacts of ship strikes are unknown. The Committee **draws attention** to the urgent need for long-term monitoring of the blue whale population in Sri Lankan waters and elsewhere in the northern Indian Ocean. The Committee **recommends** that the Secretariat send a letter to the Sri Lankan Government, drawing their attention to its discussion of this topic and ways in which the Committee may assist.

There is a need to better understand the variables that will affect whether a ship struck whale will strand and predict where death may have occurred. A deterministic model that uses wind archives and outputs of tidal models to predict the drift of floating object has been developed by MétéoFrance. The model can make forward calculations to predict a stranding location or backward calculations to estimate the likely origin of an object. This model had been used to predict whether small cetacean carcasses in the Bay of Biscay would reach the coast (Peltier *et al.*, 2012). It was noted that some carcasses may 'sail' across the wind to variable degrees and a large whale carcass may also 'swim' after death, because of the action of swell on its tail flukes. The Committee **recommends** further study of carcass drift, detection and deterioration for large whales that could be used to establish the location of death from a ship strike or other sources.

A better understanding of the relationship between vessel speed and collision risk is needed to assess risk. A recent study (Wiley *et al.*, 2011) evaluated the relative risk

reduction that might be achieved by speed restrictions. Two studies based on the locations relative to the ship at which humpback whales were observed from cruise ships inferred greater collision risks with increases in speed (Gende *et al.*, 2011; Harris *et al.*, 2012).

A workshop focusing on ship strikes in the Bay of Biscay was held in London in April 2012 (Bull and Smith, 2012). It made a series of recommendations, mainly dealing with mitigation measures but also related to assessing risk. In particular, the workshop considered ways in which a large data set of observations from vessels may be used. The Committee **welcomes** the approach taken by the workshop to engage a wide variety of stakeholders, and noted that the report could also be relevant to work in other regions. The workshop had considered what could be inferred from observations of 'near miss' incidents. The difficulties in defining a 'near miss' have been discussed before and further analyses leading to papers for next year's meeting were encouraged.

A proposal for a workshop of cetacean and shipping experts to agree on appropriate analytical and modeling techniques to assess ship strike risks arose out of the IWC-ACCOBAMS ship strike workshop in 2010 (IWC, 2011c). At the time there was some uncertainty about the availability and content of data on shipping density. Analysis approaches are likely to be most effective on a case by case basis and there are now commercial sources of raw data from Automatic Identification Systems (AIS). The Committee **agrees** that a dedicated workshop is not needed at this stage but **encourages** presentation of papers examining ship strike risks based on overlap of shipping and whale density.

7.6 Continue to develop global database of ship strike incidents

The IWC has been developing a global database of incidents involving collisions between vessels and whales since 2007[*]. A web based data entry system has now been in place for two years but there have been few new reports submitted. Most of the interessional database related efforts were to promote awareness, including work by Mattila who has been seconded to the Secretariat to assist with work on mitigating conflicts between whales and marine resource users. As last year, the Committee **agrees** that a more pro-active approach is needed to encourage data to be entered and it **repeats its recommendation** for the appointment of a dedicated IWC ship strike data coordinator with the tasks described in Annex J Appendix II (and see Item 23). The Committee also **recommends** that the Guide for Authors for the IWC journal should encourage authors of papers containing data on ship strike incidents to report these to the database.

Some members noted concern that ship strikes may increase in the Arctic as shipping begins to utilise increases in navigable waters resulting from reduced sea ice coverage. The Committee **welcomes** the offer to present new information on this issue at its next meeting.

7.7 Other issues

A number of papers concerning impacts of marine debris were considered under Item 12 (and see Annex K). The Committee **encourages** further activities that could help to quantify mortality related to marine debris, noting the difficulty in determining debris from actively fished gear.

7.8 Work plan

The Committees discussions on the sub-committee's workplan (Annex J) are incorporated under Item 21.

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 with special emphasis on the PCFG (the Pacific Coast Feeding Group); (2) undertaking an Implementation Review for BCB (Bering-Chukchi-Beaufort Seas) bowhead whales; (3) developing SLAs and providing management advice for Greenlandic hunts; and (4) review of management advice for the humpback whale fishery of St. Vincent and The Grenadines. This represented a significant workload.

8.1 Complete *Implementation Review* of eastern North Pacific gray whales with an emphasis on the PCFG

At the 2010 Annual meeting (IWC, 2011f), the Committee agreed that the information on stock structure and hunting presented, although some of it had not met the Data Availability Guideline requirements (IWC, 2004) for the 2010 review, warranted the development of trials as part of an immediate new *Implementation Review* to evaluate the performance of *SLA*s for hunting in the Pacific Northwest, with a primary focus on the PCFG. It had also agreed that the 2010 *Implementation Review* had shown that the population as a whole was in a healthy state, but that over the next few years, further work should be undertaken to investigate the possibility of structure on the northern feeding grounds, especially in the region of the Chukotkan hunts.

The Committee started the process of the new *Implementation Review* at an intersessional workshop in

[*] www.iwcoffice.org/sci_com/shipstrikes.htm

2011 (IWC, 2012c) and followed that with work at the 2011 Annual Meeting (IWC, 2012g). A second workshop was held in March 2012 kindly hosted by the SWFSC in La Jolla California (SC/64/Rep3). At that Workshop, most of the effort centred on finalising the operating model and trial structure and completing conditioning. The present meeting reviewed progress made at and since the workshop and focussed on finalising the *Implementation Review*. This summary here incorporates work from the intersessional workshops and the present meeting.

8.1.1 Stock structure

The *Implementation Review* considers three geographic regions:

(1) the 'north' area (north of 52°N i.e. roughly northern Vancouver Island);
(2) the PCFG area (between 41°N and 52°N); and
(3) the 'south' area (south of 41°N).

The trials consider two stocks ('PCFG' and 'north'). PCFG whales, which are treated as a separate management unit, are defined as gray whales observed (i.e. photographed) in multiple years between 1 June and 30 November in the PCFG area (IWC, 2011e, p.22). Not all whales seen within the PCFG area at this time will be PCFG whales and some PCFG whales will be found outside the PCFG area at various times during the year. However, this is not problematic since the historical catches north of 52°N occurred well north of 52°N and future catches will either occur in the Bering Sea or in the Makah U&A (Makah Usual and Accustomed Fishing Grounds). The remaining animals ('north') represent the large eastern North Pacific stock (the stock to which the whales taken during the Chukotkan hunt belong).

Several papers addressed stock structure and related issues (e.g. levels of immigration) at both the intersessional workshop (see SC/64/Rep3, item 2.4.2.2) and the present meeting (see Annex E, item 2.2.2). Notwithstanding the difficulties arising out of the complexities of the issue, the Committee was particularly pleased to see efforts to use the IWC's TOSSM framework (IWC, 2007) in SC/M12/AWMP4 and SC/64/AWMP4 (and see Item 11.3). In that context, it was recommended that future TOSSM analyses consider a broader range of parameter choices to explore the robustness of the conclusions to uncertainty. In concluding discussions on this issue, it was agreed that the trials (Table 3) covered a suitably broad range of immigration rates.

8.1.2 Abundance

The Committee reviewed the mark-recapture abundance estimates provided in SC/64/Rep3 and a new paper (SC/64/AWMP10). The agreed abundance estimates from a modified Jolly-Seber approach (**Laake, 2012**) are provided in Table 2 for the OR-SVI region (Oregon to southern Vancouver Island ~42-49ºN) and the NCA-NBC region (northern California to northern British Columbia ~41-52ºN). Given the large bias in the first (1998) estimate, the estimates for this year out of conditioning.

Table 2

Abundance estimates (N) and standard errors in OR-SVI and NCA-NBC after exclusion of known calves from the year in which they were identified as calves.

Region	Year	N	SE(N)	Region	Year	N	SE(N)
OR-SVI	1998	63	4.1	NCA-NBC	1998	101	6.2
	1999	78	8.4		1999	135	12
	2000	89	11.9		2000	141	13.2
	2001	117	8.9		2001	172	12.6
	2002	133	15		2002	189	9.2
	2003	151	13.7		2003	200	16.4
	2004	157	15.5		2004	206	14.9
	2005	162	15.7		2005	206	22.6
	2006	154	15.3		2006	190	18.8
	2007	152	14.5		2007	183	23.1
	2008	150	12.5		2008	191	16.1
	2009	146	14.9		2009	185	23.2
	2010	143	16.8		2010	186	18.7

Abundance estimates for the total eastern North Pacific are those provided by Laake *et al.* (2012); they are given in Annex E, Appendix 2,Table 4a.

8.1.3 Catch data (direct and incidental)

The agreed catch series for the period of the trials (i.e. 1930 onwards) are given in Annex E, Appendix 2, Table 1. Following work at the intersessional workshop and further review by an intersessional group established in SC/64/Rep3, it was agreed that the average annual kills during 2000-09 were 2 for the PCFG (December-May), 1.4 for the PCFG (June- November) and 3.4 for the 'south' (December-May) and this information was used to forecast future incidental catches.

8.1.4 Mixing

Mixing relates to (1) mixing of stocks in the three areas and (2) the relative probability of whaling in the Makah U&A taking a PCFG whale given the number of PCFG and 'north' whales. The latter can be estimated as the proportion of PCFG whales to total whales in photographs during December - May from the outer coast of northern Washington (0.3; SC/64/Rep3). However, there are a number of uncertainties and assumptions surrounding such an analysis resulting in the need for sensitivity tests (i.e. alternative trials spanning a range of values).

8.1.5 Biological parameters and MSYR

Biological parameter values were agreed last year (IWC, 2012j). The priors, based on the 2004 *Implementation,* are given in the trial specifications (Annex E, Appendix 2).

The most likely value for $MSYR_{1+}$ for the north stock was agreed to be 4.5% i.e. the posterior median from the most recent assessment of this stock (Punt and Wade, 2012). The *Evaluation Trials* also consider a value for $MSYR_{1+}$ for the north stock of 2% (rounded lower 90% posterior bound from the Punt-Wade assessment). There are insufficient data to estimate MSYR for the PCFG and so two scenarios are considered for the *Trials* as discussed last year (IWC, 2012j): (a) $MSYR_{1+}$ for the PCFG stock is the same as that for the north stock and there is no immigration (this is unlikely given the data but provides a conservative lower bound), and (b) three values of $MSYR_{1+}$ but with some immigration and emigration.

Table 3
SLA variants suggested by the Makah tribe used in the *Trials*.

Variant Number	PCFG Limit	Struck and Lost Count Toward APL
1	APL Formula	No
2	APL Formula	Yes
3	APL Formula	Yes
4	1	No
5	1	Yes
6	1	Yes
7	2	No
8	2	Yes
9	2	Yes
10	No limit	N/A
11	No limit	N/A

8.1.6 Variants

The management plan proposed by the Makah Tribe is given in Annex D of SC/64/Rep3 and a number of alternative *SLA*s were proposed for analysis in SC/64/Rep3 as given in Table 3. These variants explore:

(1) how the allowable bycatch of PCFG whales level[10] (APL) of PCFG whales is calculated (three options);
(2) the time of year in which the hunt is modelled to occur and hence whether struck and lost animals are counted against the APL (two options); and
(3) the effectiveness of the *SLA* if only PCFG whales are available for harvest (i.e. in effect a summer hunt).

Variants 1-3 use the APL[11] formula presented in the proposed plan, variants 4-9 have fixed bycatch limits, and variants 10 and 11 explore the impact of not having a limit on bycatch of PCFG whales (i.e. the hunt is only stopped if the total *Strike Limit* is reached, or the number of struck-and-lost animals reaches its limit, or the landing limit is reached).

Table 4
Details of factors considered in trials

Factors	Other Levels (Reference levels shown bold)
$MSYR_{1+}$ (north)	**2%**, **4.5%**
$MSYR_{1+}$ (PCFG)	**1%**, **2%**, **4.5%**
Immigration rate (annual)	**0, 1, 2**, 4, 6
Pulse immigration (1999/2000)	**0**, 10, **20**, 30
Proportion of PCFG whales in PCFG area, ϕ_{fut}	0, **0.3**, 0.6, 1
Struck and lost rate (PCFG area)	0, **50%,** 75%
Northern need in final year (linear change from 150 in 2010)	**340**, 530
Historic survey bias	**None,** Increasing between 1967 to 2002 from 0.5→1 (North only), 50% (PCFG only)
Future episodic events	**None,** 3 events occur between yrs 1-75 (at least 2 in yrs 1-50) in which 20% of the animals die, Events occur every 5 years in which 10% of the animals die
Time dependence in *K*	**Constant**, Halve linearly over 100yr, Double linear over 100yr
Time dependence in natural mortality, *M* *	**Constant,** Double linearly over 100yr
Parameter correlations	Yes, **No**
Probability of mismatching north whales, p_2	0, **0.01**, 0.01-0.05
Probability of mismatching PCFG whales, p_1	**0**, 0.5
Frequency of PCFG surveys	**Annual**, 6-year
Incidental catch	**Reference**, double reference, half reference
Future sex ratio	**0.5:0.5**, 0.2:0.8 (M:F)
Episodic events with future pulse events	**None,** 3 events occur between yrs 1-75 (with at least 2 in yrs 1-50) in which 20% of the north stock die and a pulse of 20 animals is added to the PCFG stock

8.1.7 Final trials and conditioning

The final trial structure was agreed in SC/64/Rep3. A summary of the factors considered in the trials is given as Table 4. The *Evaluation Trials* agreed are shown in Table 5 and the *Robustness Trials* are shown in Table 6. These trials were finalised at the March 2012 workshop (SC/64/Rep3). Conditioning the trials[12] began at the workshop and was evaluated after the meeting by an intersessional steering group (SC/64/AWMP11). Only three trials, B02C, I02C and P05A were eliminated after considering the conditioning results, leaving 72 *Evaluation Trials* in all.

[10] The Makah Tribe has proposed a hunt management plan with time and area restrictions to target migrating ENP whales, yet there is still a chance that PCFG whales are incidentally harpooned as bycatch to the targeted ENP gray whale hunt.
[11] The APL formula is provided in Annex E Appendix 2.
[12] Conditioning is the process of selecting the values for the parameters of the operating model such that the predictions from this model are consistent with the available data.

Table 5

The *Evaluation Trials*. Values given in bold type show differences from the base case trial. The final three columns indicate which trials apply to which 'broad' hypotheses (P=pulse, B=bias, I=intermediate – see IWC, 2012). For 'broad' hypotheses B and I, the number given is the pulse in 1999/2000. Unless specified otherwise ϕ_{PCFG} = 0.3, the struck and lost rate is 0.5, and there are no stochastic dynamics or episodic events. *Trials B02C, I02C and P05A removed after reviewing condition results – see text.

Trial	Need to condition	Description	$MSYR_{1+}$ North	$MSYR_{1+}$ PCFG	Final Need	Annual Immigration	Survey freq.	Survey Bias (North)	Hypothesis P	B	I
1A	Y	$MSYR_{1+}$ = 4.5%/4.5%	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	10
1B	Y	$MSYR_{1+}$ = 4.5%/2%	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	10
1C	Y	$MSYR_{1+}$ = 4.5%/1%	**4.5%**	**1%**	340 / 7	2	10 / 1	1	20	Y	10
1D	Y	$MSYR_{1+}$ = 2%/2%	**2%**	**2%**	340 / 7	2	10 / 1	**0.5→1**	20	Y	10
2A	Y	Immigration = 0	4.5%	4.5%	340 / 7	**0**	10 / 1	1	20	Y	10
2B	Y	Immigration = 0	4.5%	2%	340 / 7	**0**	10 / 1	1	20	Y	10
2C	Y*	Immigration = 0	**4.5%**	**1%**	340 / 7	**0**	10 / 1	1	20	Y	10
2D	Y	Immigration = 0	**2%**	**2%**	340 / 7	**0**	10 / 1	**0.5→1**	20	Y	10
3A	Y	Immigration = 1	4.5%	4.5%	340 / 7	**1**	10 / 1	1	20	Y	10
3B	Y	Immigration = 1	4.5%	2%	340 / 7	**1**	10 / 1	1	20	Y	10
4A	Y	Immigration = 4	4.5%	4.5%	340 / 7	**4**	10 / 1	1	20	Y	10
4B	Y	Immigration = 4	4.5%	2%	340 / 7	**4**	10 / 1	1	20	Y	10
5A	Y*	Immigration = 6	4.5%	4.5%	340 / 7	**6**	10 / 1	1	20	Y	10
5B	Y	Immigration = 6	4.5%	2%	340 / 7	**6**	10 / 1	1	20	Y	10
6A		High Northern Need	4.5%	4.5%	**530 / 7**	2	10 / 1	1	20	Y	
6B		High Northern Need	4.5%	2%	**530 / 7**	2	10 / 1	1	20	Y	
7A		3 episodic events	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	
7B		3 episodic events	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	
8A		Stochastic events 10% every 5 years	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	
8B		Stochastic events 10% every 5 years	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	
9A		Episodic events with future pulse events	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	
9B		Episodic events with future pulse events	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	
10A		Relative probability of harvesting a PCFG whale, ϕ_{PCFG} = 0.6	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	
10B		Relative probability of harvesting a PCFG whale, ϕ_{PCFG} = 0.6	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	
11A		Struck & Lost (25%)	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	
11B		Struck & Lost (25%)	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	
12A		Struck & Lost (75%)	4.5%	4.5%	340 / 7	2	10 / 1	1	20	Y	
12B		Struck & Lost (75%)	4.5%	2%	340 / 7	2	10 / 1	1	20	Y	
13A	Y	Higher 1999-2000 Pulse	4.5%	4.5%	340 / 7	2	10 / 1	1	**30**		
13B	Y	Higher 1999-2000 Pulse	4.5%	2%	340 / 7	2	10 / 1	1	**30**		
13C	Y	Higher 1999-2000 Pulse	**4.5%**	**1%**	340 / 7	2	10 / 1	1	**30**		
14A	Y	Lower 1999-2000 Pulse	4.5%	4.5%	340 / 7	2	10 / 1	1	**10**		
14B	Y	Lower 1999-2000 Pulse	4.5%	2%	340 / 7	2	10 / 1	1	**10**		

8.1.8 Review results of trials

Evaluation of *SLA*s is based on the objectives accepted by the Commission (IWC, 1983; 1995a) which are to:

(a) ensure that the risks of extinction to individual stocks are not seriously increased by subsistence whaling;
(b) enable aboriginal people to harvest whales in perpetuity at levels appropriate to their cultural and nutritional requirements, subject to the other objectives; and
(c) maintain the status of stocks at or above the level giving the highest net recruitment and to ensure that stocks below that level are moved towards it, so far as the environment permits.

Highest priority is accorded to the objective of ensuring that the risk of extinction to individual stocks is not seriously increased by subsistence whaling.

As their name implies, *Evaluation Trials* are used to examine the performance of the variant *SLA*s against the Commission's objectives. *Robustness Trials* are more extreme trials that are primarily to ensure whether an *SLA* performs as expected in such cases.

Table 6
The *Robustness Trials*.

Trial	Need to Condition	Description	$MSYR_{1+}$ North	$MSYR_{1+}$ PCFG	Survey freq.	Hypothesis P	Hypothesis B
1A		6 year surveys	4.5%	4.5%	10 / 6	20	Y
1B		6 year surveys	4.5%	2%	10 / 6	20	Y
2A		Linear decrease in K^{1+} [K halves over years 0-99]	4.5%	4.5%	10 / 1	20	Y
2B		Linear decrease in K^{1+} [K halves over years 0-99]	4.5%	2%	10 / 1	20	Y
3A		Linear decrease in PCFG K [K halves over years 0-99]	4.5%	4.5%	10 / 1	20	Y
3B		Linear decrease in PCFG K [K halves over years 0-99]	4.5%	2%	10 / 1	20	Y
4A		Linear increase in M [M halves over years 0-99]	4.5%	4.5%	10 / 1	20	Y
4B		Linear increase in M [M halves over years 0-99]	4.5%	2%	10 / 1	20	Y
5A		Linear increase in PCFG M [M halves over years 0-99]	4.5%	4.5%	10 / 1	20	Y
5B		Linear increase in PCFG M [M halves over years 0-99]	4.5%	2%	10 / 1	20	Y
6A		Perfect detection; p_1 =0; p_2=0.01-0.05	4.5%	4.5%	10 / 1	20	Y
6B		Perfect detection; p_1 =0; p_2=0.01-0.05	4.5%	2%	10 / 1	20	Y
7A		p_1 = 0.5	4.5%	4.5%	10 / 1	20	Y
7B		p_1 = 0.5	4.5%	2%	10 / 1	20	Y
8B	Y	Survey bias PCFG + p_1 = 0.5	4.5%	2%	10 / 1	20	Y
9B	Y	Correlation (draw for N; same quantile in the range for PCFG)	4.5%	2%	10 / 1	20	Y
10B	Y	Double incidental catches	4.5%	2%	10 / 1	20	Y
11B	Y	Halve incidental catches	4.5%	2%	10 / 1	20	Y
12A		Sex ratio = 0.2: 0.8	4.5%	4.5%	10 / 1	20	Y
12B		Sex ratio = 0.2: 0.8	4.5%	2%	10 / 1	20	Y
13A		Relative probability of harvesting a PCFG whale, ϕ_{PCFG} = 1	4.5%	4.5%	10 / 1	20	Y
13B		Relative probability of harvesting a PCFG whale, ϕ_{PCFG} = 1	4.5%	2%	10 / 1	20	Y

Table 7.
Final depletion and rescaled final depletion statistics for *SLA*s 1 and 2 for the trials with $MSYR_{1+}$=1% and the trials with $MSYR_{1+}$=2% for which conservation performance might be considered to be questionable.

Trial	SLA variant 1				SLA variant 2			
	Final Depletion		Rescaled Final Depletion		Final Depletion		Rescaled Final Depletion	
	Low 5%	Median	Low 5%	Median	Low 5%	Median	Low 5%	Median
$MSYR_{1+}$=1%								
GB01C	0.259	0.343	0.314	0.383	0.290	0.365	0.352	0.414
GP01C	0.382	0.461	0.400	0.472	0.438	0.515	0.460	0.528
GP02C	0.231	0.272	0.255	0.295	0.299	0.347	0.334	0.372
GI01C	0.378	0.446	0.399	0.459	0.434	0.497	0.457	0.513
$MSYR_{1+}$=2%								
GB08B	0.357	0.458	0.505	0.594	0.396	0.504	0.560	0.656
GB10B	0.492	0.556	0.492	0.557	0.575	0.633	0.576	0.635
GP08B	0.330	0.442	0.475	0.578	0.364	0.482	0.528	0.635
GP10B	0.475	0.536	0.476	0.538	0.556	0.619	0.557	0.621

The results of all of the trials, expressed in tabular and graphical form (see examples in Annex D, Appendices 3-5) for all agreed performance statistics (conservation and need related) are available from the Secretariat.

The SWG (Annex E, Item 2.5.1) screened the trials for conservation performance to focus on those that required more detailed examination. The criteria used were:

(1) The lower 5%ile of the final depletion distribution < than 0.6 (the MSYL level) and the lower 5%ile of the rescaled final depletion is lower than 0.6 for any of variants 1-10.
(2) The trial involved episodic events.
(3) The lower 5%ile of the trend in 1+ population size indicated a decline in population size of 5% or larger over the final 20 years of the 100-year projection period for any of variants 1-10.

After this initial evaluation a number of features became apparent (see Annex E, Items 2.5.1 and 2.5.2)), primarily related to conservation performance (apart from variant 5 which had poor need satisfaction) that led the Committee to eliminate further consideration of all but variants 1 and 2.

8.1.9 Conclusions and selection of SLAs

In order to minimise the risk of taking PCFG whales, the management plan developed by the Makah Tribe restricts the hunt both temporally (to the migratory season for gray whales i.e. 1 December – 31 May) and geographically (to the Pacific Ocean region i.e. the Makah U&A except the Strait of Juan de Fuca). Some PCFG whales are present during the migratory season and thus the plan proposes an allowable PCFG limit (APL) during hunts that are targeting eastern North Pacific migrating whales with the aim of ensuring that accidental takes of PCFG whales do not deplete the PCFG. Whales struck in May might have a higher probability of being PCFG whales since they feed in this area in June. The management plan thus proposes an additional requirement that all animals struck-and-lost in May are assumed to be PCFG whales (i.e. count against the APL), whereas whales struck between December and April are not.

Weather conditions and availability of whales makes it likely that most hunting will occur in May. However, there are insufficient data to assess the number of strikes by month. Thus, it is not possible to reliably estimate the proportion of struck-and-lost whales that would count towards the APL. Given this uncertainty about how the plan would respond to failing to take into account struck-and-lost PCFG whales, the Tribe had proposed two *SLA* variants (1 and 2) spanning the options as to when the hunt might occur.

SLA variant 1 proposes that struck-and-lost whales do not count towards the APL i.e., there is no management response to PCFG whales struck but not landed. *SLA* variant 2 proposes that all struck-and-lost whales count to the APL irrespective of hunting month. i.e., the number of whales counted towards the APL may exceed the actual number of PCFG whales struck. A number of other *SLA* variants were proposed by the Tribe to explore additional management options. However, none of the variants precisely mimicked the final management plan proposed.

The *Trial* results revealed:

(1) *SLA* variants 1 and 2 were potentially satisfactory and performed well in nearly all 72 *Evaluation Trials*;
(2) *SLA* variants 1 and 2 performed acceptably for all *Robustness Trials*.

Given this, the Committee focussed on those few trials for which conservation performance required further consideration. Trials with 1% $MSYR_{1+}$ are the most challenging and the conservation performance for some of these trials for both variants was not satisfactory (see Table 7). However, given the available information for the eastern North Pacific population as a whole (the observed recovery rate from severe historical depletion, as well as the current recovery rate from the 1999/2000 mortality event), the most recent assessment (Punt and Wade, 2012) resulted in an estimated MSYR rate of 4.6% [90% posterior interval 2.2%, 6.4%]. Therefore, the $MSYR_{1+}$=1% trials are at the lower bounds of plausibility and the Committee **agrees** that the conservation performance for these trials alone was not reason to preclude the conclusion that both variants have overall satisfactory conservation performance.

The Committee then focussed on certain trials within the 2% $MSYR_{1+}$ set for which conservation performance might be considered questionable. Trial 8b (pulse and bias) involved 10% declines in abundance every five years as a proxy for random biological, environmental or anthropogenic events (e.g. disease or contamination). As noted in Annex E, Item 2.5.1, these trials are in effect trials with lower $MSYR_{1+}$ than the nominal 2% of the trial. Given this, it **agrees** that both variants 1 and 2 had acceptable performance for these two trials.

Trial 10b (pulse and bias) involves an assumption that the relative probability of harvesting PCFG whales in the Makah U&A is double the observed ratio of PCFG whales to migrating whales observed in the available photo-identification studies. The conservation performance of *SLA* variant 2 was considered acceptable for this trial but that for variant 1 was considered marginal (Table 7). In discussing the results of this trial, the Committee noted that the ratio of PCFG whales to migrating whales could be monitored directly from data collected during the hunting period allowing this assumption to be evaluated.

In conclusion, the Committee **agrees**:

(1) *SLA* variant 2 performed acceptably and met the Commission's conservation objectives for conservation while allowing limited hunting;
(2) *SLA* variant 1 performed acceptably for nearly all the trials and could be considered to meet the Commission's conservation objectives provided that it is accompanied by a photo-identification programme to monitor the relative probability of harvesting PCFG whales in the Makah U&A , and the results presented to the Scientific Committee for evaluation each year.

The Committee **endorses** these conclusions and commends them to the Commission. It also **agrees** that the *Implementation Review* is completed. Management advice is discussed under item 9.2.3.

However, the Committee noted that the *SLA* variants tested did not correspond exactly to the management plan proposed by the Makah to the IWC. The Committee **agrees** to test such a variant intersessionally and examine the results at the next Annual Meeting.

8.1.10 Other business

Spatial mixing between eastern and western North Pacific gray whale stocks along the Pacific coast of North America outside the feeding season raises issues about the population structure within the Sakhalin feeding area (see SC/64/BRG 10 and IWC, 2012). The broad issue of stock structure of North Pacific gray whales is being addressed through a basinwide research programme (see item 10.4). However, as noted last year, this finding raises concern about the possibility of whales feeding in the Western North Pacific being taken during the proposed Makah Tribe hunt in northern Washington.

Last year (IWC, 2012f p.16) the Committee had stressed three points.

(1) The new information on movements of gray whales highlighted the importance of further clarification of the stock structure of North Pacific gray whales. In particular, the matches of animals from the Sakhalin feeding grounds with animals seen in the PCFG area and other areas along the west coast emphasised the need for efforts to estimate the probability of a western gray whale being taken in aboriginal hunts for Pacific gray whales (noting that this did not require incorporation of western gray whales into the *Implementation Review).*
(2) It had strongly endorsed the basinwide research programme, noting that the results of the research may require further trials for future *SLA* testing; this would be a matter for consideration at the next *Implementation Review* if not before.
(3) The Committee will continue to monitor the situation and was willing to respond to any guidance or requests for further information from the Commission.

SC/64/BRG9 provided an initial modelling approach to address point (1) above. It was discussed extensively in Annex E, Item 2.6 and although welcoming this work, a number of questions were raised and further work identified before any conclusions could be agreed. The Committee **recommends** that a revised document be developed for further review at next year's meeting, noting its potential importance for the provision of management advice. An Advisory Group (Annex Q) was appointed to provide guidance to the authors of SC/64/BRG9.

8.2 Complete *Implementation Review* of Bering-Chuckchi-Beaufort Seas bowhead whales

The procedure and purpose of *Implementation Reviews* for aboriginal whaling *SLA*s is summarised under Item 8.4. The Committee's task is to assess whether there is any new information that would suggest that the range of trials used to evaluate the *Bowhead SLA* is no longer sufficient to ensure that the *SLA* meets the Commission's conservation and user objectives.

8.2.1 Consideration of new information with a focus on whether this implies a need for new trials

A number of papers were submitted presenting new information on a variety of scientific matters relevant to *Implementation Review*. Full discussion of these papers is given in Annex E Item 3. The summary of discussions in the following sections is somewhat brief as it only focusses on the SWG's deliberations as to whether additional trials are required.

8.2.1.1 STOCK STRUCTURE

Four papers were relevant to stock structure issues.

SC/64/BRG1 reported on a satellite telemetry study of 57 BCB bowhead whales tagged during 2006–2011. The Committee commended the authors for providing relevant data on bowhead migration patterns, and recognised the cooperation of native hunters who were closely involved in all aspects of this study and deployed most of the tags. It **recommends** that such tagging and telemetry efforts continue.

SC/64/AWMP3 compared the use of SNPs and microsatellites for studying population structure, assignment and demographic analyses of bowhead whale populations in the Sea of Okhotsk, BCB and eastern Canada, SC/64/AWMP9 presented sequences from 3 mtDNA genes from 350 bowhead whales from the BCB, eastern Canadian Arctic and the Sea of Okhotsk and discussed methods to calculate gene and site specific mutation rates, while SC/64/AWMP1 investigated the demographic history the BCB

population of bowhead whales using a variety of analytical methods.

The Committee thanked the authors and **agrees** that the information in these papers provide no evidence to suggest that the trials evaluated during the previous *Implementation Review* (IWC, 2007b; 2008a; 2008d; 2008g) did not adequately address stock structure concerns.

8.2.1.2 ABUNDANCE AND RATE OF INCREASE

A new agreed abundance estimate is not required for completion of the BCB bowhead *Implementation Review*. When a new estimate becomes available it can be incorporated into the *Bowhead SLA* calculations to provide management advice.

SC/64/AWMP5 incorporates the 1985 and 2004 abundance estimates from aerial photography by Schweder *et al.* (2010) into the ice-based survey estimates to obtain an updated ROI for 1978-2004 (Fig. 1). The Committee **endorses** this estimate (3.5% with 95% CI of (2.2%, 4.8%)) as the best available estimate of annual rate of increase for the BCB bowhead population. It also **agrees** that the best estimate of current abundance is 12,631 (95% bootstrap percentile CI 7,900 -19,700; 5% lower limit 8,400) for 2004 (Schweder *et al.*, 2010).

The Committee was pleased to receive information from recent ice-based surveys (2011) that count whales migrating past Barrow, Alaska (SC/64/AWMP7). Full discussion of these surveys will occur in conjunction with the presentation of new abundance estimates within the next two years.

SC/64/BRG4 presented estimates of visual detection probabilities from the spring 2011 ice-based survey of bowhead whales migrating near Barrow, Alaska. The same methods will also be applied to similar data from the 2010 survey. These estimates are highly relevant since they constitute one foundation upon which a future population abundance estimate will be calculated from the 2011 survey counts. This abundance estimate will then be used as input to the *Bowhead SLA*. The authors intend to estimate 2011 abundance using detection probability estimates based only on the new independent observer data. The Committee **endorses** this approach, while also recognising that any possible implications of the shift to the superior IO method might merit future consideration in the context of long term trends. It **encourages** Committee members interested in abundance estimation to contact the authors of SC/64/BRG4 intersessionally with comments and suggestions so that the future abundance estimate for use in the *Bowhead SLA* can be based on an approved estimate of detection probabilities.

SC/64/BRG3 described an aerial photographic survey for BCB bowheads conducted from 19 April to 6 June, 2011. The field season was very successful, both in terms of total flight days and the very large number of whale images (approximately 6,800) obtained. These photographs are a significant contribution to the bowhead whale photographic catalogue. The Committee recognised the importance of this work as potentially providing an estimate of population abundance for use with the *Bowhead SLA* that is entirely independent of the ice-based survey estimate described in SC/64/BRG4. Analyses of the photo-id data may also provide better precision in estimates of bowhead whale life-history parameters such as adult survival rate. A detailed discussion of this paper is provided in Annex F.

8.2.1.3 CATCH DATA

SC/64/AWMP8 provides a preliminary summary of subsistence harvest of bowhead whales in Alaska from 1974 to 2011. Further discussion of the paper can be found in Annexes E and F. The Committee welcomes this information and noted that strikes have remained within the need envelope tested during development of the *Bowhead SLA*. It therefore **agrees** that no additional trials are warranted in this regard.

8.2.2 Discussion of new trials

In consideration of the evidence described above, the Committee **agrees** that there is no need for new trials or further simulation testing of the *Bowhead SLA*.

8.2.3 Conclusions and recommendations

The Committee thanked US scientists, the North Slope Borough, Alaska, and the native communities for continuing to provide a considerable body of high-quality scientific work which facilitated the SWG's *Implementation Review* process. The Committee **agrees** that the *Bowhead SLA* continues to be the most appropriate way for the Committee to provide management advice for the BCB population of bowhead whales. This completes the *Implementation Review* for the BCB bowhead whales. Management advice itself is provided under item 9.3.2.

8.3 Continue work on developing SLAs for the Greenlandic hunts (Annex E, Item 4)

In Greenland, a multispecies hunt occurs and the expressed need for Greenland is for 670 tonnes of edible products from large whales for West Greenland; this involves catches of common minke, fin, humpback and bowhead whales. The flexibility among species is important to the hunters and satisfying subsistence need to the extent possible is an important component of management for the hunters. For a number of reasons, primarily related to stock structure issues, development of *SLA*s for Greenland aboriginal hunts (especially for common minke and fin whales) will be more complex than previous *Implementations* for stocks subject to aboriginal subsistence whaling. The Committee has endorsed an interim safe approach to setting catch limits for the Greenland hunts in 2008 (IWC, 2009c), noting that this should be considered valid for two

blocks i.e. the target will be for agreed and validated *SLA*s, at least by species, for the 2017 Annual Meeting (assuming that the Commission sets 5-year block quotas in 2012 as scheduled).

The Committee noted the benefits in previous *CLA* and *SLA* developments of a co-operative competition amongst more than one developer. Several members of the SWG indicated that they may be interested in proposing *SLA*s. The Committee noted the multi-species nature of the Greenland hunts and Greenland's desire for flexibility amongst species in meeting its subsistence needs. It **reiterates** that its approach will first be to develop *SLA*s for individual species before considering whether and how to address multispecies considerations (e.g. IWC, 2010a; IWC, 2011i).

In response to a request made at the intersessional workshop (SC/64/Rep3), the Committee was pleased to receive four papers by Witting (SC/64/AWMP12-15) that summarised the available information on common minke whales, fin whales, humpback whales and bowhead whales off Greenland in the context of developing *SLA*s (summarised in Annex E, Appendix 6). In order to progress essential *SLA* development work, the Committee **agrees** that an intersessional workshop (to be held in winter 2013, probably in Copenhagen) was essential to maintain progress. As in previous years, the Committee also recommends maintenance of the AWMP Developer's Fund. Financial matters are discussed further under Item 23.

8.3.1 Common minke whales

The Committee notes that the SWG on the AWMP and the sub-committee on the RMP both have interest in North Atlantic common minke whales. It **endorses** the planned co-operative and collaborative process (Annex D, Appendix 6) developed that will culminate in a joint workshop on the stock structure of this species in the North Atlantic in early 2014. This is planned to inform the RMP *Implementation Review* process for common minke whales in the North Atlantic scheduled for 2014 as well as the *SLA* development process. The operating models developed for the RMP *Implementation* (perhaps with minor adjustment to take account of focus on different populations) will also serve as the basis for the *SLA* development process. The Committee also notes that aspects of the work to be undertaken by Punt described in Annex E Appendix 7 will assist developers of candidate *SLA*s for the Greenlandic hunts for common minke whales.

8.3.2 Fin whales

The Committee notes that the SWG on the AWMP and the sub-committee on the RMP both have interest in North Atlantic fin whales. A pre-meeting for a North Atlantic fin whale RMP *Implementation Review* is scheduled before the 2013 Scientific Committee meeting. The stock structure discussions at this meeting will provide useful input to the fin whale *SLA* development process. The operating models developed for the RMP *Implementation* (perhaps with minor adjustment to take account of focus on different populations) can also serve as the basis for the *SLA* development process. The Committee notes that aspects of the work to be undertaken by Punt described in Annex E Appendix 7 will also assist developers of candidate *SLA*s for the Greenlandic hunts for fin whales.

8.3.3 Humpback whales and bowhead whales

Development of *SLA*s for these hunts is relatively simple compared to the common minke whale and fin whale cases. The Committee **agrees** that it should be possible to develop an appropriate trial structures and operating models for the humpback and bowhead whale hunts before the next Annual Meeting to enable potential *SLA*s to be evaluated in the future. It **endorses** the proposal outlined in Annex E Appendix 7 to support this work.

8.4 Guidelines for *Implementation* Reviews

An integral part of the AWMP process is the undertaking of regular or 'special' *Implementation Reviews*, as noted for example during the development process of the *Bowhead Whale SLA* (IWC, 2003b).

The first BCB bowhead whale *Implementation Review* took place over two years and was completed in 2007 with most focus being on the issue of stock structure (IWC, 2007b; 2008a; 2008d; 2008g). No changes needed to be made to the *Bowhead SLA* after the review. The first *Implementation Review* for gray whales was completed in 2010 and the *Gray Whale SLA* was not changed with respect to providing advice on the Russian hunt off Chukotka (IWC, 2011f). However, as discussed above, during that review, information was received that led to the need to call for an immediate *Implementation Review* before providing advice for a potential hunt of gray whales by the Makah tribe on the west coast of the USA. That review is now complete (see item 8.1)

The Committee had agreed that it would be useful to develop guidelines for *Implementation Reviews*, given the experience gained thus far. The proposed guidelines are provided in Annex E, Appendix 8 and cover the following issues: (1) Objectives; (2) Timing of regular and special *Implementation Reviews*; (3) Outcomes; (4) Data Availability; (5) Computer programs.

The Committee **adopts** these guidelines.

8.5 Scientific aspects of an aboriginal whaling scheme (AWS)

In 2002, the Committee strongly recommended that the Commission adopt the Aboriginal Subsistence Whaling Scheme (IWC, 2003a). This covers a number of practical issues such as survey intervals, carryover, and guidelines for surveys. The Committee has stated in the past that the AWS provisions constitute an important

and necessary component of safe management under AWMP *SLA*s 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. Conversion factors for edible products for Greenland hunts

In 2009, the Commission appointed a small working group (comprising several Committee members) to visit Greenland and compile a report on the conversion factors used by species to translate the Greenlandic need request which is provided in tonnes of edible products to numbers of animals (IWC/62/9). At that time the group provided conversion factors based upon the best available data, noting that given the low sample sizes, the values for species other than common minke whales should be considered provisional. The group also recommended that a focused attempt to collect new data on edible products taken from species other than common minke whales be undertaken, to allow a review of the interim factors; and that data on both 'curved' and 'standard' measurements are obtained during the coming season for all species taken.

Last year the Committee had welcomed an initial report, recognising the logistical difficulty of collecting these kinds of data. However, it had noted that considerably more detail was needed, and requested that a detailed report be presented for consideration at the present meeting.

This year, a further report was received from the Greenlandic authorities that provided information on the data collected thus far (Annex E, Appendix 9).

The Committee **welcomes** this report and the provision of data. A comparison of these values and the Recommended Conversion Factors Per Animal (RCPFA) from IWC/62/9 showed reasonable agreement for humpback and bowhead whales (within 1 SD), but the yield for fin whales was lower than expected. It was not possible to examine this difference *inter alia* because no lengths of the animals included in the analysis were provided.

Although welcoming the report, the Committee expressed some concerns over the insufficient level of detail provided, some inconsistencies within the report, the efficiency of the sampling regime (relatively poor sample sizes) and the extrapolation procedure in which only one meat tote or bin is weighed.

In response to the concern over the lack of samples, it was noted that the Greenland Institute of Natural Resources (GINR) has been asked to investigate this and is working with the hunters and authorities to improve the sample size in the future. The Committee greatly **encourages** this and looks forward to a report on progress made. It also **encourages** the GINR to develop improved protocols including weighing as many of the meat, mattak, and qiporaq bins as possible. Providing a breakdown of products from bowheads would be valuable both for conversion factors and biological information.

Given these concerns, the Committee **reiterates** its recommendations from 2011 and 2011:

(1) the provision of a full scientific paper to the next annual meeting that details *inter alia* at least a full description of the field protocols and sampling strategy (taking into account previous suggestions by the Committee); analytical methods; and a presentation of the results thus far, including information on the sex and length of each of the animals for which weight data are available;

(2) the collection and provision of data on Recommendation No. 2 of IWC/62/9 comparing standard vs curvilinear whale lengths. This should be done for all three species on as many whales as possible. Guidelines and protocols are suggested in IWC/62/9.

8.7 Workplan

The Committees views on the workplan developed by the SWG on the AWMP are given under Item 21.

9. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT ADVICE

The Commission is considering a change from annual to biennial meetings. This has raised the issue within two Commission working groups as to whether there are any scientific implications for the Commission moving to setting block quotas for an even number of years rather than the present five-year intervals. This issue was addressed at the intersessional AWMP workshop (SC/64/Rep3) and that report is endorsed by the Committee and the conclusions incorporated below

The Committee recalled that trials for the B-C-B bowhead and Eastern North Pacific gray whale *SLA*s had shown satisfactory performance for surveys at intervals of 10 years (and even for some *Robustness Trials* for 15 years). The Committee **agrees** that there are no scientific reasons for the Commission not to set catch limits for blocks of even numbers of years up to 8-years for these stocks. However, it draws attention to its discussions of the AWS where it noted that despite the trial results it would not be appropriate for catches to be left unchanged if new abundance estimates were not available after 10 years (IWC, 2004).

The Committee notes that it does not require changing its regular process of *Implementation Reviews* approximately every five years (with the provision for 'special' reviews should circumstances arise) or an annual examination of new information and provision of advice if requested.

The Committee also notes that the interim safe *SLA* for the Greenland hunts (see Items 9.1 and Items 9.4 – 9.6 below) had also been tested for surveys at 10-year intervals and shown satisfactory performance and had been adopted by the Commission in 2008 (IWC, 2009a). However, as noted at the time, those tests had been for a restricted number of scenarios than the wider range of hypotheses customarily considered for such trials. It had thus been agreed that this *SLA* was appropriate for the provision of advice for up to two blocks or approximately 2018. The Committee **agrees** that there are no scientific reasons why the next quota block for the Greenland hunts could not be for a 6-year period, noting that the long-term *SLA*s will be available for implementation for the following block quota.

9.1 Eastern Canada and West Greenland bowhead whales

9.1.1 Review new information on Eastern Canada and West Greenland bowhead whales

Discussion within the Committee in recent years has focussed on stock structure and associated abundance estimates. The present working hypothesis is that bowhead whales in eastern Canada - West Greenland comprise a single stock; the alternative hypothesis assumes two stocks: one in Hudson Bay - Foxe Basin and another in Baffin Bay - Davis Strait. However, the Committee agreed on the need for further genetic analyses last year (IWC, 2012k), recognising the complications arising out of the fact that existing data pertinent to the question of stock structure are held by a non-member nation, Canada.

The Committee was pleased to receive several papers on Eastern Canada and West Greenland bowhead whales and details can be found in Annex F Item 2.2.

Alter *et al.* (in press) presented a study on genetic diversity and differentiation across all five putative stocks of bowhead whales, including Baffin Bay-Davis Strait (BBDS), Hudson Bay-Foxe Basin (HBFB), Bering-Beaufort-Chukchi, Okhotsk, and Spitsbergen. Ancient specimens (500-800 years old) from Prince Regent Inlet (PRI) in the Canadian Arctic were also compared with modern stocks. Results show low differentiation between Atlantic and Pacific, consistent with high gene flow between these areas in the recent past. No difference was observed between the two putative/hypothesized Canada-Greenland populations (HBFB/BBDS), which differ from previous results with more samples and a longer fragment of mtDNA. Significant genetic differences between ancient and modern populations were observed, which suggests that PRI harbored unique maternal lineages in the past that have been recently lost, possibly due to loss of habitat during the Little Ice Age and/or whaling. Unexpectedly, samples from this location show a closer genetic relationship with modern Pacific stocks than Atlantic, supporting high gene flow between the central Canadian Arctic and Beaufort Sea over the past millennium despite extremely heavy ice cover over much of this period.

The Committee **welcomes** this work, and noted that this type of collaborative effort across research groups is valuable in advancing the understanding of bowhead whale stock structure.

Spatial overlap of the extreme summer range of bowhead whales was identified from the eastern and western Arctic in the Canadian High Arctic (Heide-Jorgensen *et al.*, 2011). In the summer of 2010, one satellite tagged bowhead whale from West Greenland and one from Alaska entered the Northwest Passage from opposite directions and spent approximately 10 days in the same area but not at the same time.

Wiig *et al.* (2011b) updated on an abundance estimate for bowhead whales in the Disco Bay area of West Greenland. The study employed multi-locus genotype and sex to identify individual bowhead whales at 4 localities in eastern Canada (Foxe Basin, Pelly Bay, Repulse Bay, and Cumberland Sound) and at one locality in West Greenland (Disko Bay).

9.1.2 Review recent catch information

In 2011, one female bowhead whale was landed in West Greenland and none were struck and lost (SC/64/ProgRepDenmark). Two bowhead whales were found dead in West Greenland in 2011, entangled in fishing gear for crabs.

During 2011, three bowhead whales were taken in Canada. More detailed information (e.g. sex, size) was made available by Canada to the Secretariat. The Committee is pleased to receive this information including catch as well as struck/lost data. It requests that in the future Canada also provides information on any strandings, entanglements and ship strikes of bowhead whales.

9.1.3 Management advice

In 2007, the Commission agreed to an annual strike limit of 2 animals (for the years 2008-12) with a carryover provision (IWC, 2008). The Committee agreed an approach for providing interim management advice in 2008 and this was confirmed by the Commission IWC (2009). The Committee recalled that the agreed abundance estimate for Eastern Canada / West Greenland is 6,344 ((95% CI: 3,119-12,906; IWC, 2009d) for 2002. The most recent agreed estimate (IWC, 2012k; Wiig *et al.*, 2011b) for the spring aggregation in the West Greenland area is 1,747 (95% CI: 966-2,528) for 2010.

Using the agreed interim safe approach and the 2010 estimate for West Greenland, the Committee **repeats its advice** that an annual strike limit of 2 whales in West Greenland will not harm the stock.

The Committee **agrees** that it will review the updated analysis for the 2010 West Greenland (Wiig *et al.*,

2011a) at next year's meeting, noting that although slightly lower, if adopted it does not alter the management advice. The Committee is also aware that catches from the same stock have been taken by a non-member nation, Canada. 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. Given the importance of this issue, the Committee **recommends** that the IWC Secretariat continues to contact Canada requesting information about catches and domestic catch limits for bowhead whales.

9.2 Eastern North Pacific gray whales

9.2.1 New information

SC/64/AWMP2 presented the results of comparison of the genetics of gray whales sampled off Vancouver, Canada (i.e., PCFG whales), and San Ignacio Bay, Mexico. Results supported the conclusion that PCFG and the larger population are from the same breeding group. However results from other studies of photo-identification and mtDNA indicate that during the summer, whales of the PCFG represent a seasonal subpopulation driven by maternally directed site fidelity. The Committee's work (Item 8.1) is based on treating PCFG as a separate management stock.

There are at least two sets of genetic samples for PCFG whales, one is possessed by the research group in Canada, and the other by the Southwest Fisheries Science Center in La Jolla, USA. The Committee **recommends** that the two groups consider merging these data sets as this will result in a more robust evaluation of PCFG gray whales. The Committee also **suggests** that future work uses a greater number of microsatellites and increased mtDNA length.

The Committee received two papers on photo-identification studies undertaken in Mexican waters. SC/64/BRG14 provided information about the number of eastern North Pacific gray whales using Laguna San Ignacio, Baja California during the 2011 and 2012 winter breeding season. High counts of female-calf pairs in 2011 and 2012 suggest that more females whales are using the Laguna San Ignacio region as a winter aggregation area than during the 2007-2010 period. SC/64/BRG23 presented information on a new photographic identification programme in the Bahía Magdalena lagoon complex of gray whales in 2012 (there is little recent information from there). A total of 275 individual whales photographically identified, of which 234 were single whales and 41 were mother-calf pairs. 83% of the mother-calf pairs were sighted in waters around the López Mateos, and the majority of singles (89%) were sighted in waters near to mouth of Bahía Magdalena.

The Committee **thanks** the authors for these studies in Mexican waters which are discussed further in Annex F, Item 4.3.1, It noted the value of long-term datasets and **encourages** updates in future years.

SC/64/BRG18 presented results from a linear model relating the average ice cover over the Bering Sea during the first 15 days of May with estimates of northbound gray whale calves the following spring for the years 1994-2010 (ice years 1993-2009) and further used to predict calf estimates for 2011 to 2013. There is a negative relationship between the area of the Bering Sea covered by seasonal ice during the first two weeks of May and the number of gray whale calves estimated by shore-based counts off central California the following spring (Perryman *et al.*, 2011; Perryman and Rowlett, 2002). It is not clear whether an ice-shortened feeding season has a significant impact on overall population condition or health. Measurements of southbound gray whales in vertical aerial photographs collected in 2012 indicated that overall population condition was comparable to that in previous years when the observed strandings were about average.

The Committee **thanks** the authors for this analysis of data from an extremely valuable long-term dataset. The Committee **recommends** that continued annual shore-based counts be accorded high priority. It also recommends aerial photogrammetric body condition studies be continued next year, and results compared to existing data to test the hypothesis that ice conditions in May influence gray whale body condition and reproductive output. The Committee also **encourages** a more integrated analysis using ice cover data for spring in the Chukchi Sea and spring and autumn for the Bering and Chukchi seas.

Last year (IWC, 2012k) the Committee had encouraged the undertaking of a more quantitative integrated analysis for the lagoon counts in Baja California, Mexico and the northbound calf counts in California, given the length of the time series. It was also suggested that correlations between calf production in western and eastern gray whales be examined. The Committee **reiterates** its advice from last year.

SC/64/BRG21 provided information about coastal counts of gray whales off Chukotka Peninsula, Russia, and monitoring of the harvest. The Committee was pleased to see a variety of biological information collected from the harvested whales and **recommends** the collection of additional data and samples, such as tissue for genetic analyses, tissue samples for understanding the cause of 'stinky whales' (and see Item 12), and photographs for comparison with catalogues. Catch data are discussed further below.

9.2.2 Review of recent catch information

Russian Federation reported that a total of 128 gray whales were struck in Chukotka, Russia in 2011[13]; two

[13] This updates the information in SC/64/BRG21 for 2011

were lost and 126 were landed. Of the landed whales, two were stinky and not used for human consumption.

9.2.3 Management advice

In 2007, the Commission agreed that a total catch of up to 620 gray whales was allowed for the years 2008-2012 with a maximum of 140 in any year. No new data were presented this year to change the advice for the large eastern North Pacific population and therefore the Committee agrees that the *Gray Whale SLA* remains the appropriate tool to provide management advice for eastern North Pacific gray whales apart from the consideration of the PCFG and the Makah hunt (see Item 8.1). The Committee **reiterates** that the current strike limits will not harm the stock.

With respect to the management plan variants provided by the Makah Tribe, the *Implementation Review* was completed this year (Item 8.1) and the Committee **agrees**:

(1) hunt variant 2 performs acceptably;
(2) hunt variant 1 performs acceptably provided that it is accompanied by a photo-identification programme to monitor the relative probability of harvesting PCFG whales in the Makah U&A, and the results presented to the Scientific Committee for evaluation each year.

Matters related to the possibility of an animal feeding in the western North Pacific being taken in the PCFG area are discussed under Item 8.

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

9.3.1 New information

SC/64/BRG1 provided results of seasonal movements of the BCB stock of bowhead whales from a satellite telemetry study of 57 tagged whales during 2006–2011. All but one tagged whale migrated past Point Barrow in spring and went to Amundsen Gulf. That remaining whale was tagged at Barrow in summer, wintered in the Bering Sea and then summered along the Chukotka coast in the Chukchi Sea. While most whales summered within the Canadian Beaufort Sea, extensive summer movements included travel far to the north and northeast. Fall movements coincided in space and time with oil and gas activities and potentially with shipping activities. Likely important feeding areas included Amundsen Gulf in spring and summer; Barrow in summer and fall; Wrangel Island (some years) in fall; the northern Chukotka coast in fall; and the western Bering Sea in winter.

Full discussion of this paper can be found in Annex F Item 2. It was noted that this work indicates that earlier estimates of bowhead whales off Cape Pe'ek on the Chukchi Peninsula (Melnikov and Zeh, 2007) were probably BCB bowheads, and not a separate smaller stock. The Committee **encourages** the continuation of this work, including the future analysis of other environmental covariates (e.g. physical oceanography) relating to BCB bowhead migration and distribution.

Results of a year-long acoustic study of B-C-B stock of bowhead whales were reported (Moore *et al.*, 2012). Calls from bowhead whales were recorded in October 2008, and from March-August 2009, on a recorder deployed on an oceanographic mooring near the Chukchi Plateau (ca. 75°N, 168°W). The rate of bowhead whale call detection was highest from May through August, when sea ice diminished from nearly 100% surface cover to zero and corresponded to a period of very high zooplankton backscatter signal from June through August.

SC/64/BRG3 reported the results of aerial photographic surveys of bowhead whales near Point Barrow, Alaska during 2011. Aerial surveys have periodically been flown in this area since 1984. Sufficient photo recaptures from the 2011 surveys are expected to calculate a mark-recapture abundance estimate with reasonable precision. SC/64/AWMP7 provided details about a successful ice-based survey in 2011 (see Item 8.2.1.2 AWMP Chair's summary). An ice-based estimate of abundance is expected in 2014 and the photo-id estimate thereafter. This would provide a rare opportunity to compare two independent large-whale abundance estimates in the same season.

SC/64/BRG4 presented estimates of visual detection probabilities from the spring 2011 ice-based survey of bowhead whales migrating near Barrow, Alaska, based on a new method first discussed last year (Givens *et al.*, 2011). This paper is also discussed under Item 8.2. In discussion, it was noted that the estimates in SC/64/BRG4 were slightly lower but generally consistent with those from earlier surveys, and the precision of the new estimates was better due to the new experimental design and a larger dataset. The Committee **agrees** that the estimation approach and application of the resulting detection probabilities to applicable years of survey data represents a methodological improvement over previous efforts. As noted under Item 8.2. it **encourages** Committee members with any detailed comments to submit those to the authors intersessionally.

SC/64/BRG8 reported on progress being made to sequence the bowhead whale transcriptome. It was noted in discussion that this research has the potential to provide insights into the life history, ecology, evolution and genetics of bowhead whales, with broader implications for other great whales.

9.3.2 Management advice

SC/64/BRG2 presented information on the 2011 Alaskan hunt. A total of 51 bowhead whales were struck resulting in 38 animals landed. No bowhead whales were reported struck and lost at Chukotka.

In 2007, the Commission agreed that a total of up to 280 BCB bowhead whales could be landed in the period 2008-2012, with no more than 67 whales struck in any year and up to 15 unused strikes being carried over each year. In the light of the *Implementation Review* completed this year (see Item 8.2), the Committee **agrees** that the *Bowhead SLA* remains the most appropriate tool for providing management advice for this harvest. It **reiterates** that the present strike and catch limits are acceptable.

9.4 Common minke whales off West Greenland

9.4.1 New information

In the 2011 season, 174 minke whales were landed in West Greenland and 6 were struck and lost (SC/64/ProgRepDenmark). Of the landed whales, there were 133 females, 39 males, and two whales of unreported sex. Genetic samples were obtained from 90 of these whales. The Committee **re-emphasises** the importance of collecting genetic samples from these whales, particularly in the light of the proposed joint AWMP/RMP workshop (see Annex D).

9.4.2 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. In 2009, the Committee was for the first time ever able to provide management advice for this stock based on a negatively biased estimate of abundance of 17,307 (95% CI 7,628-39,270) and the method for providing interim management advice which was confirmed by the Commission. Such advice can be used for up to two five year blocks whilst *SLA*s are being developed. Based on the application of the agreed approach, and the lower 5th percentile for the 2007 estimate of abundance, the Committee **repeats** its advice of last year that an annual strike limit of 178 will not harm the stock.

9.5 Common minke whales off East Greenland

9.5.1 New information

Nine common minke whales were struck (and landed) off East Greenland in 2011, and one was struck and lost (SC/64/ProgRepDenmark). All landed whales were females. Catches of minke whales off East Greenland are believed to come from the large Central stock of minke whales. No genetic samples were obtained from minke whales caught in East Greenland. The Committee **re-emphasises** the importance of collecting genetic samples from these whales, particularly in the light of the proposed joint AWMP/RMP workshop (see Annex D).

9.5.2 Management advice

In 2007, the Commission agreed to an annual quota 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 Table 8). The Committee **repeats** its advice of last year that the present strike limit would not harm the stock.

Table 8
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)

9.6 Fin whales off West Greenland

9.6.1 New information

A total of five fin whales (all females) were landed, and none were struck and lost, in West Greenland during 2011 (SC/64/ProgRepDenmark). No genetic samples were obtained from caught fin whales in 2011. The Committee **re-emphasises** the importance of collecting genetic samples from these whales, particularly in the light of the proposed work to develop a long-term *SLA* for this stock.

9.6.2 Management advice

In 2007, the Commission agreed to a quota (for the years 2008-12) of 19 fin whales struck off West Greenland. This was subsequently modified and at the 2010 Annual Meeting Greenland voluntarily reduced the limit to 10 until 2012 (IWC, 2011). 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 blocks whilst *SLA*s were being developed. Based on the agreed 2007 estimate of abundance for fin whales (4,539 95%CI 1,897-10,114), and using this approach, the Committee **repeats** its advice that an annual strike limit of 19 whales will not harm the stock.

9.7 Humpback whales off West Greenland

9.7.1 New information

A total of eight (three males; five females) humpback whales were landed (none were struck and lost) in West Greenland during 2011 (SC/64/ ProgRepDenmark). Genetic samples were obtained from three of these whales. The Committee **re-emphasised** the importance of collecting genetic samples and photographs of the flukes from these whales, particularly with respect to the YoNAH and MoNAH initiatives (Clapham, 2003; YoNAH, 2001).

9.7.2 Management advice

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, 2009a, p.16). Based on the agreed estimate of abundance for humpback whales (3,039, CV 0.45, annual rate of increase 0.0917 SE 0.0124) and using this approach, the Committee **agrees** that an annual strike limit of 10 whales will not harm the stock.

9.8 Humpback whales off St Vincent and The Grenadines

9.8.1 New information

Last year the SWG noted that it had received no catch data from St Vincent and The Grenadines for 2010-11. This year the Secretariat received information from the government that a 35-foot whale was taken on 18 April 2011 (IWC/63/18) and a 33.75 foot female taken on 14 April 2012. 2.). After the meeting it was also informed of a struck and lost animal during the 2011 hunt. The Committee was pleased to hear that genetic samples and photographs were taken and that the United States and St Vincent and The Grenadines are discussing the transfer of tissue samples from this whale for analysis and storage at SWFSC (the IWC archive where *inter alia* SOWER samples are stored). Iñíguez reported information on a hunt on the 11 April 2012 and a struck and lost animal on the 22 March 2012.

It also repeats its previous strong **recommendations** that St Vincent and The Grenadines:

(1) provide catch data, including the length of harvested animals, to the Scientific Committee; and
(2) that genetic samples be obtained for any harvested animals as well as fluke photographs, and that this information be submitted to appropriate catalogues and collections.

9.8.2 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 (11,570 (95% CI 10,290-13,390) – (Stevick *et al.*, 2003). The Commission adopted a total block catch limit of 20 for the period 2008-12.

The Committee **repeats** its advice of last year that this block catch limit will not harm the stock.

10. WHALE STOCKS

10.1 Antarctic minke whales (Annex G)

The Committee is in the process of undertaking an in-depth assessment of the Antarctic minke whale. The primary abundance data are those collected from the 1978/79 to 2003/04 IWC-IDCR/SOWER cruises (e.g Matsuoka *et al.*, 2003) that had been divided into three circumpolar series (CPI, CPII and CPIII). Two different methods for estimating minke whale abundance from the last two circumpolar data series have been developed in recent years. Although they gave different estimates of abundance, both were consistent in estimating a decline in circumpolar abundance between CPII and CPIII (IWC, 2012l). The Committee has been working to resolve the differences between the estimates for some time and last year believed that it would be possible to present an agreed abundance estimate at this year's meeting. The Committee has also been discussing uncertainties about stock structure, especially in the Indian Ocean and Pacific sectors, which are the sectors where catches have been taken in recent years (IWC, 2008b).

10.1.1 Stock structure

Two genetically distinct populations of Antarctic minke whales have been identified in the Area IIIE-VIW feeding grounds (IWC, 2008b). There is no sharp boundary between them, only a "soft" boundary; the two populations overlap, but one predominates in the East, called the Pacific or P-stock, and the other in the West, called the Indian Ocean or I-stock. The extent and location of overlap is an important issue for assessment.

SC/64/IA4 presented a new integrated analysis of three different sources of data: morphometrics, microsatellites and mitochondrial DNA. The goal is to estimate longitudinal segregation of the breeding populations on the Antarctic feeding grounds. The model is intended to allow the location of the soft boundary to move from year to year. The method was applied to the extensive data for the Antarctic minke whales taken by the JARPA and JARPA II surveys. The results indicated that the spatial distribution of the two populations have soft boundary in Area IV-E and V-W, which does vary clearly and significantly by year. The results also suggest that the boundary is sex-specific.

The Committee noted that the approach used is simple and potentially powerful. Aside from the general relevance of the results to understanding Antarctic minke whale dynamics, it might in the future prove useful in allocating historical catches to stocks. The Committee **endorses** the specific investigations for further statistical analysis given in Annex G Item 5.1.

10.1.2 Abundance estimation of Antarctic minke whales

In order to reach its goal of having agreed abundance estimates by the 2012 Annual Meeting, an intersessional workshop was held in Bergen, Norway, in May 2012 (SC/64/Rep4). It made substantial progress in identifying reasons for the large differences between earlier 'trackline conditional independence' and 'hazard probability based' estimates of Antarctic minke whale abundance (the 'SPLINTR' model, Bravington and Hedley, and the 'OK' model, Okamura and Kitakado, respectively). It also identified aspects of the OK model that needed adjustment related to plausibility of mean dive-time estimates from fits of the model and the resultant effects on g(0), compared to independent estimates of g(0). A work programme was

agreed for completion by the 2012 Annual Meeting which resulted in three papers - SC/64/IA2, SC/64/IA12 and SC/64/IA13. The Committee thanked the authors for completing the workplan. Detailed discussions can be found in Annex G Item 5.3.

SC/64/IA12 analysed data from the IWC/SOWER 2004/05 video dive time experiments. The Committee was pleased to receive these estimates, which after discussion within the intersessional steering group became key inputs for the OK method. SC/64/IA2 presented a revision of the 'Norwegian Product' formulation of the OK model and investigated sensitivity to a number of factors. The abundance estimates were lower than previously estimated by versions of the OK model, after incorporating the new mean dive-times and the resultant lower g(0) values. SC/64/IA3 presented a 'Norwegian Product' version of SPLINTR, also using the externally-estimated dive-times. The authors noted that their fits showed some problems and counterintuitive results but also noted that they had insufficient time to investigate the model. They thus considered that although the framework of the model therein seemed reasonable, the actual estimates were not ready for consideration.

Based on considerable experience from previous years, the intersessional workshop had identified a core set of diagnostics most capable of revealing important model deficiencies when modelling IDCR/SOWER minke whale data (SC/64/Rep4). The main issue for SC/64/IA2, the OK model, was that the observed proportion of near-simultaneous compared to delayed duplicates was considerably lower than the predicted; this is potentially important in terms of estimating g(0) and thus overall abundance, because of the close link to mean dive-time. The likely cause of the misfit is the aggregation-over-time that is required in order to deal with rounding and measurement errors in timing and distance estimates in IDCR/SOWER, in conjunction with the clumped nature of real whale dive patterns (in contrast to the independence of successive dive-times assumed by OK models). For the reasons discussed in Annex G, however, the Committee **agrees** that the within-duplicate lack-of-fit was unlikely to imply serious bias in abundance estimates.

Given the progress made and results presented and discussed in Annex G, it was agreed that there was no need to consider further the process of averaging estimates from the two models proposed last year (IWC, 2012l). It was reassuring that two completely independent implementations of the Norwegian Product (NP) model appear to be giving consistent results and showed little sensitivity to the input values for mean dive-time in the neighbourhood of the best independent estimates of dive time from SC/64/IA12.

The starting point for determining the best available consensus estimate, was the authors' 'preferred estimates' in SC/64/IA2 using the best estimates of mean dive-time from SC/64/IA12, and then applying the appropriate adjustment factors agreed last year (IWC, 2012e) with some minor changes. All the adjustments are estimates, but are modest enough that their impact on CV can reasonably be neglected. A CPII spatial adjustment of 15% is the largest adjustment, and reflects some imbalance of coverage within survey strata in CPII, something that was much reduced in CPIII. All other adjustments are minor.

The resulting estimates are shown in Table 9. Because the northern extent of the surveyed regions differs between CPII and CPIII, two sets of estimates are given, 'survey-once' and 'CNB' (Common Northern Boundary). The survey-once estimates cover all of the surveyed regions in each CP series (using the most recent or most complete survey in cases of duplication). The CNB estimates exclude part of the surveyed regions in each series to ensure a consistent northern limit; these are the most appropriate estimates for a comparison of abundance estimates between CPII and CPIII. The CNB estimates are also the basis for the Additional Variance (AV) calculations (SC/61/Rep9) which address the non-synoptic nature of the surveys, i.e. that whales may move into and out of any given surveyed area from year to year. The 'CV internal' row reflects the uncertainty associated with the abundance estimate of whales in the surveyed region at the time of the survey, whereas the "CV with AV" row reflects the uncertainty associated with the average number of whales present in the surveyed region across the whole of that CP series, and is more useful for most subsequent analyses. CVs are approximately the same for survey-once as for CNB, so only one set is shown. Note that there are also correlations between the estimates (not shown) in different *Management Areas* within each CP (but not between CPs) since model parameters are estimated jointly for each whole CP.

The Committee **agrees** that the numbers in Table 9 represent the best available abundance estimates of Antarctic minke whales in the surveyed areas during the years of CPII and CPIII. The potential sources of bias have now been much more thoroughly addressed than in the existing "standard method" estimates (Branch, 2006), and the results are consistent with recent external datasets (e.g. the post-2004 SOWER cruise experiments on school size estimation, video dive time and BT-mode). The explanation for the large difference between the estimates from original OK (e.g Okamura and Kitakado, 2011) and original SPLINTR (e.g Bravington and Hedley, 2009) methods has been identified as the interaction between diving behaviour and timing errors and the difference has been reduced to plausible levels by imposing direct estimates of mean dive-time in the NP models. The Committee agrees that it is unlikely that any remaining bias is substantial.

Table 9
Best estimates of Antarctic minke whale abundance by *Management Area* adjusted by the factors agreed in Table 1. See text for explanation.

CP		IWC Management Area I	II	III	IV	V	VI	TOTAL
II	Survey once	85,688	130,083	93,215	55,237	300,214	55,617	720,054
	CNB	84,978	120,025	86,804	51,241	285,559	49,885	678,493
	CV internal	0.16	0.14	0.20	0.17	0.13	0.22	0.08
	CV with AV	0.34	0.40	0.44	0.39	0.31	0.39	0.18
III	Survey once	38,930	57,206	94,219	59,677	183,915	80,835	514,783
	CNB	34,369	58,382	68,975	55,899	180,183	72,059	469,866
	CV internal	0.20	0.19	0.15	0.34	0.11	0.14	0.09
	CV with AV	0.39	0.38	0.35	0.49	0.36	0.37	0.18
CPIII:CPII		0.40	0.49	0.79	1.09	0.63	1.44	0.69

The new **agreed** estimates for the survey-once case are 720,000 for CPII (1985/86-1990/91) with 95% CI [512,000, 1012,000], and 515,000 for CPIII (1992/93-2003/04) with 95% CI [361,000, 733,000]. The estimates are subject to some degree of negative bias because some minke whales would have been outside the northern and southern (surveyable, ice edge) boundaries. The improved analyses have resulted in many estimates differing appreciably from the 'Standard Method' estimates (Branch and Butterworth, 2001; IWC, 2006b, p.21). For CPII, the new best estimate of total abundance is slightly lower (720,000 compared to 769,000 standard estimate) whereas for CPIII the new best estimate is substantially higher (515,000 compared to 362,000). There are two primary reasons for the differences: (1) the spatial adjustment required for CPIII is much less than for CPII; and (2) the mean school size is appreciably smaller in CPIII than CPII which affects the net adjustment for g(0). The ratio of total abundance in CPIII to CPII, formerly 0.47 with the standard method, is now estimated to be 0.69 with 95% CI [0.43, 1.13] for the 'CNB' estimates.

Annex G Item 5.3.2 identified some future work, partly to check and deal with any small remaining bias issues, and also for the benefit of other abundance estimation in general. A valuable aspect of SOWER/IDCR is the consistency of its protocols and its large sample size, unparalleled amongst cetacean sightings datasets, which allow the development of realistic tests and sophisticated estimation methods applicable to many cetacean abundance estimation cases beyond Antarctic minke whales.

The Committee **expresses** its thanks to the Abundance Estimation Working Group for their tremendous collaborative efforts in obtaining agreed estimates after several years of intensive and innovative work. The developers (Bravington, Hedley, Kitakado and Okamura) are to be particularly commended as is the recent input and enthusiasm of Butterworth, Skaug and Walløe. The Committee now has confidence in these open-water estimates and a more comprehensive understanding of the modelling requirements for IDCR/SOWER data. The Committee also places on record its considerable appreciation to all those involved in the IDCR/SOWER cruises (1978/79 - 2009/10) – the Japanese Government (and in the early years the government of the then USSR), the IWC, the originators of the programme, the scientists and crews of the participating vessels, the planners of the cruises and the analysts, whose dedication and hard work over many years have led to this agreed result.

10.1.3 Reasons for differences between estimates from CPII and CPIII

The confidence interval for the ratio of the total estimated abundance from CPII and CPIII included 1.0 and thus a null hypothesis of no change in overall abundance between the two periods would not be rejected. Nevertheless, the Committee considered that a change was quite likely, and discussed possible reasons for a decline in the estimated abundance of whales in the surveyed areas.

Between CPII and CPIII, the point estimates of Antarctic minke whale abundance show a large decline in three Management Areas (I, II, and V) and an increase in Areas IV and VI (Table 9). Overall, the circumpolar estimates are some 30% lower between CPII and CPIII. Since the Committee is now satisfied that the remaining biases in the agreed estimates are unlikely to vary greatly over the duration of the CPII and CPIII cruises. Therefore the differences seen in Table 9 probably do reflect real changes in abundance in the open-water areas surveyed.

The Committee is exploring possible reasons for this. Noting that the IDCR/SOWER cruises were neither synoptic nor did they cover the entire range of potential minke whale habitat, one hypothesis is that the decline in estimated abundance was due to more whales being in unsurveyed regions during CPIII than in CPII. This suggests the following (not mutually exclusive) possibilities:

(1) a much higher proportion of whales in the pack ice or in open-water areas (polynyas) within the pack ice in CPIII, as compared to CPII

(2) extensive longitudinal (east-west) whale movements from year to year, and surveys conducted as part of CPII happened to encounter higher densities in certain areas, as compared to those during CPIII,
(3) a much higher proportion of the total population was north of 60ºS during CPIII,
(4) intra-year movements in open water within the surveyed areas that were not adequately covered by the trackline design in space and time, with respect to environmental variables, and
(5) a genuine decrease in abundance of Antarctic minke whales.

In order to examine (1) above, a sea ice intersessional group was established last year to: (i) consider technical aspects of sea ice data which will be used to bound or estimate the abundance of Antarctic minke whales in the south of the ice edge, and (ii) consider appropriate analysis methods to bound or estimate the abundance of whales south of the ice edge.

SC/64/IA3 reviews some technical aspects of the sea ice data obtained by IDCR/SOWER, ASPeCt (Antarctic Sea Ice Processes and Climate), satellite sensors and NIC (National Ice Center). The definitions of the sea ice edge vary between the different data sources because their objectives and applied techniques are different. The IDCR/SOWER definition of the sea ice edge is somewhat operational compared to that for other data sources. However, its definition is believed to be consistent for the period 1978 to 2003, and the authors believe it is the most appropriate boundary for abundance estimation in years and areas where IDCR/SOWER surveys were undertaken. They also conclude that the sea ice concentrations derived from passive microwave (PM) remote sensing are probably the best sea ice data to be used for the purpose of estimating abundance of Antarctic minke whales to the south of sea ice edge in areas where IDCR/SOWER observations are not available (the PM records date back to 1979).

SC/64/IA10 is an appraisal of methods and data to estimate abundance of Antarctic minke whales within sea ice covered areas of the Southern Ocean. With new estimates of densities of Antarctic minke whales (from aerial surveys) in certain areas of sea ice (i.e., Weddell Sea and east Antarctica), and model-based abundance methods which allow extrapolation, there is an opportunity to compare bounds and magnitudes of abundances, both inside and outside of the sea ice region, to assess how likely the 'moved-into-sea ice' hypothesis is. In the first instance, the authors recommended that comparisons of inside/outside abundances be made for areas and years where the aerial surveys were conducted. If these analyses are inconclusive from the perspective of the 'moved-into-sea ice' hypothesis, there is a recommendation to extend the analysis to estimating circumpolar densities, and extrapolating back over the period of CPII and CPIII. The recommended analysis will give full consideration to how variable minke whale densities can be over space and time. Furthermore it should be recognised that such analyses will involve a great deal of work and may not yield helpful results.

Since Antarctic minke whales congregate along the ice edge, potential problems in estimating abundance inside/outside of an ice region using satellite data were discussed in Annex G Item 5.3.3. The Committee **recommends** that sensitivity analyses as to the position of the sea ice boundary on Antarctic minke whale abundances derived from aerial survey data be assessed before any in-depth calibrations and analyses of operational sea ice boundaries be attempted.

It is not possible to obtain reliable absolute abundance estimates of Antarctic minke whales in sea ice regions corresponding in space and time with IDCR/SOWER surveys. The Committee thus **recommends** that relatively simple analyses be conducted to generate abundances using aerial survey data. These abundances, with a range of potential availability biases, will help in producing an overall magnitude or upper bound on the numbers of Antarctic minke whales in sea ice regions during CPII and CPIII.

At present, the Committee is unable to exclude the possibility of a real decline in minke whale abundance between CPII and CPIII. Population dynamics analyses of catch-at-age data from Area IIIE to VIW (e.g. as in SC/64/IA1) can potentially account for the changes in overall abundance in terms of variations over time in mortality and recruitment. Such explanations are descriptive but they do not attempt to explain why, for example, recruitment might have dropped commencing in the 1970s. There is a second class of more mechanistic explanations concerned with, for example, why pregnancy rates might fall; this is where ecosystem effects, competition, climate, etc. would need to be considered.

As noted in Annex G Item 5.3.3, Murase and Kitakado suggested that the difference in abundance estimates between CPII and CPIII can (to a large extent) be attributed to process error (i.e., additional variance), reflecting a large inter-annual variation in distribution of the Antarctic minke whales (Kitakado and Okamura, 2009). However, they also suggested that systematic environmental changes observed in some areas do not alone account for the process error. Others suggested that the that JARPA and JARPA II data can assist the interpretation of the CPII and CPIII differences given the long time series data in Areas IIIE, IV, V and VIW (e.g see Matsuoka *et al.*, 2011). Hakamada will present information on some diagnostics from analyses to estimate minke whale abundance from JARPA next year.

In conclusion, the Committee noted that after many years work it had now been able to **agree** on estimates of minke whale abundance within the areas surveyed in CPII and CPIII. As yet, though, there was no conclusion on whether (and if so to what extent) these numbers indicate a real decline in abundance of Antarctic minke whales between the periods of the two surveys. Time constraints meant that it was possible to have only preliminary discussions of this question this year; discussions will continue at next year's meeting.

10.1.4 Continue development of the catch-at-age models

Population dynamics modelling provides a way to explore possible changes in abundance and carrying capacity within Areas IIIE-VW, where appropriate data are available. The inputs are catch, length, age, and sex data from the commercial harvests and both JARPA programs, as well as abundance estimates from IDCR/SOWER. Early attempts used the ADAPT-VPA approach of Butterworth and Punt (1999); Butterworth *et al.* (2002); and Butterworth *et al.* (1996). A number of issues and concerns were raised with respect to that particular modelling framework for Antarctic minke whales, and it was concluded that an integrated statistical catch-at-age (SCAA) model was the most appropriate modelling framework (IWC, 2003c). Punt and Polacheck (2005; 2006) developed such a model, and it has been refined over the last few years. The SCAA approach allows for errors in catch-at-age data, more than a single stock, time-varying growth, multiple areas, environmental covariates, fleet-specific vulnerabilities, and changes over time in vulnerability. The technical problems and inconsistencies identified in previous years have largely been resolved (JCRM 2012, p180).

SC/64/IA1 provides a summary of the specifications of the current SCAA. The approach allows for multiple breeding stocks, which can be allowed to mix across several spatial strata on the summer feeding grounds where catches are taken. It also allows carrying capacity and the annual deviations in juvenile survival to vary over time. The model is fitted to length and conditional age-at-length data collected from the Japanese commercial and scientific permit catches, as well as indices of abundance from the IDCR/SOWER and JARPA/JARPA II cruises. The results provided in the paper are illustrative primarily because the IDCR/SOWER abundance estimates used had not been finalised, and the age-at-length data for recent years from JARPA II are not yet available.

As noted in Annex G Item 5.2, a number of suggestions for further work were made in this regard. Until now, application of the SCAA has been held up by the lack of agreed IDCR/SOWER abundance estimates, but that obstacle has now been removed, and the application of the SCAA in testing hypotheses concerning changes between CPII and CPIII abundance estimates has become a high-priority task. The time series of earplug age data, which is an important input that would improve the resolving power of the SCAA, has not been updated since 2004 or 2005 although samples are available through to 2011/12, because of difficulties in finding and validating age-readers. Preliminary age readings have been made from the 2006-2008 samples, but have not yet been validated. Last year, the Committee had recommended that these preliminary data be made available and included in the SCAA on a provisional basis pending validation (IWC, 2012l, p.180). This year, the Committee **reiterates** this recommendation; the recent age data should be incorporated into the SCAA model as soon as possible. The Committee recommends the SCAA modeless request the new data via the Data Availability Group and the data owners provide it as soon as possible.

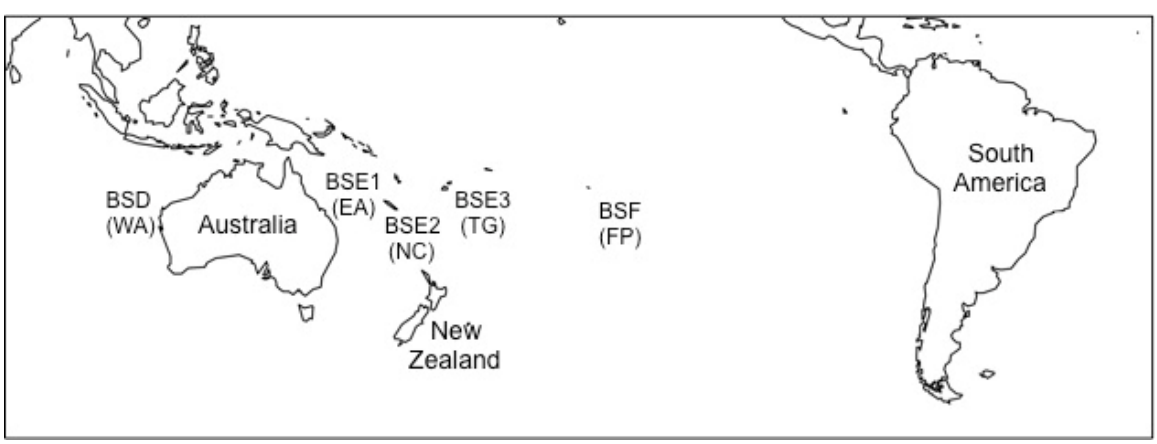

Fig 1. Distribution of Southern Hemisphere humpback whales breeding stocks grounds for BSD, BSE1, BSE2, BSE3 and BSF2 (WA = Western Australia, EA = Eastern Australia, NC = New Caledonia, TG = Tonga and FP = French Polynesia).

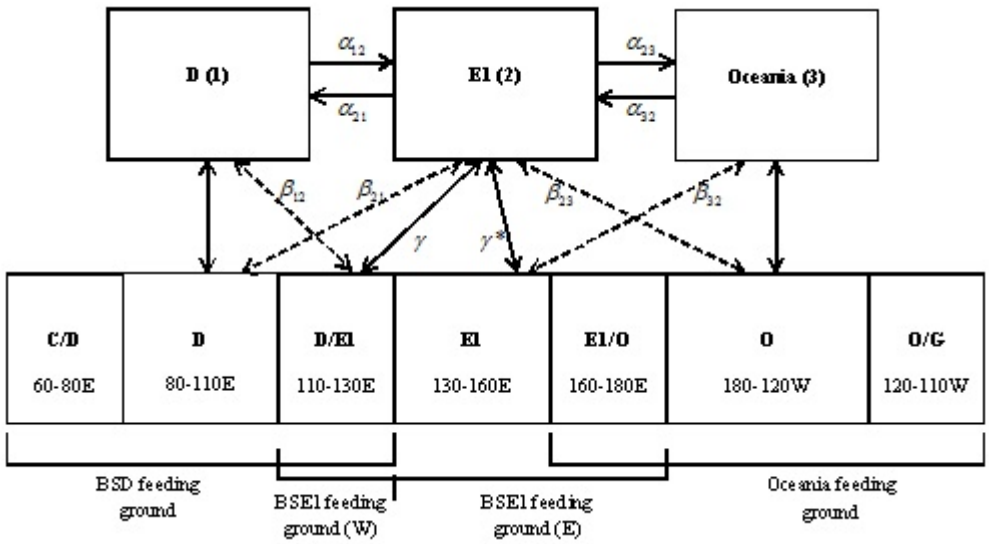

Fig. 2. Proposed model structure for breeding stocks D, E1 and Oceania. Arrows indicate possible interchange between stocks. These interchange rates will be estimated in the model, informed by data given in Table 1 of Annex H. Solid lines indicate movement of a breeding population to its own feeding ground, while dashed arrows indicate whales moving to a neighbouring feeding ground. Note that in order to avoid three breeding stocks mixing in the E1 feeding ground, an artificial boundary for catch allocation has been imposed. No catches taken east of this boundary will be allocated to BSD, while no catches taken west of the boundary will be allocated to Oceania. The longitude 130°E was chosen based on the longitudinal range of documented connections between BSD, Oceania and the Antarctic (J. Jackson, *pers. comm.*)

10.2. Southern Hemisphere humpback whales

The IWC Scientific Committee currently recognises seven humpback whale breeding stocks (BS) in the Southern Hemisphere (labelled A to G; IWC, 2011k), which are connected to feeding grounds in the Antarctic. An additional population that does not migrate to high latitudes is found in the Arabian Sea. Assessments of BSA (western South Atlantic), BSD (eastern Indian Ocean) and BSG (eastern South Pacific) were completed in 2006 (IWC, 2007d) although it was concluded that BSD might need to be re-assessed with BSE and BSF in light of mixing on the feeding grounds. An assessment for BSC (western Indian Ocean) was completed in 2009 (IWC, 2010) and for BSB in 2011 (IWC, 2012).

10.2.1 Begin assessment of breeding stocks D, E and F

Last year, the sub-committee on Southern Hemisphere whales initiated the re-assessment of BSD, and the assessment of BSE and BSF (IWC, 2012m). These stocks correspond, respectively, to humpback whales wintering off Western Australia (stock D), Eastern Australia (sub-stock E1) and the western Pacific Islands in Oceania including New Caledonia (sub-stock E2), Tonga (sub-stock E3) and French Polynesia (sub-stock F2) (Fig 1). For simplicity the combination of BSE2, BSE3 and BSF2 will be referred to as Oceania.

10.2.1.1 ABUNDANCE, TRENDS AND POPULATION STRUCTURE

SC/64/SH6 presented a POPAN open model abundance estimate of 562 whales (CV=0.19, CI 351-772) from the New Caledonia humpback whale breeding ground (BSE2) using fluke photo- identification data collected over 16 years (1996-2011). Beginning in 2006 through to the current estimate, all population models examined show a trend of increasing abundance with a large 'pulse' after 2008. Whether these whales represent part of the New Caledonia sub-stock or permanent or temporary immigration from different regions is currently unclear.

In discussion, it was noted that a phenomenon similar to that observed in New Caledonia in the late 2000s had also been recorded off Eastern Australia in the late 1980s (Chaloupka *et al.*, 1999). To attempt to examine this apparent increase, the Committee noted that a possible movement of Eastern Australia whales to New Caledonia was consistent with an observed decrease in the rate of population growth of whales migrating off the Australian coast (Noad *et al.*, 2011) and levels of F_{st} differentiation between E1 and E2 (0.01, Olavarría *et al.*, 2006) were the lowest among any pair of populations in Oceania. However, at this time the available data are not sufficient to explain the observed patterns.

Salgado Kent *et al.* (2012) provided new estimates of abundance and trends for Western Australian humpback whales. A number of statistical issues were raised in discussion as can be seen in Annex H. The Committee **encourages** further analyses and intersessional contact with the authors and that, if

necessary they are invited to SC65 for further discussion of their work.

SC/64/SH28 reported on the outcome of a workshop held in November, 2011 to discuss future surveys and analyses of Breeding stock D humpback whales at two locations off Western Australia - North West Cape and Shark Bay. The workshop proposed a pilot survey to trial both cue-counting and racetrack aerial abundance survey methods, in conjunction with land-based work at both locations, to determine the most appropriate survey method for a full-scale absolute abundance survey in the near future. Prior to the survey, simulation work will be conducted to determine the operational protocols for the racetrack abundance estimation method as applied to humpback whales. The Committee **concurs** that a pilot study is the appropriate next step in method development for the provision of an absolute abundance for the Western Australian stock of humpback whales.

Four documents were available for discussion of stock structure issues, SC/64/SH5, SC/64/SH15, SC/64/SH22, and Pastene *et al.* (2011). These documents were reviewed by the Working Group on Stock Definition and their conclusions are reported in Annex I, Item 3.1.1.

10.2.1.2 ASSESSMENT MODELS

In order to facilitate discussions and identification of further model runs, SC/64/SH29 provided initial results of population model fits to the Southern Hemisphere humpback whale breeding grounds D (West Australia; BSD), E1 (East Australia; BSE1) and Oceania (BSE2, BSE3, and BSF2). As anticipated, this led to considerable discussion and the details can be found in Annex H. As a result, the Committee **agrees** on a series of recommendations (details are in Annex H) regarding future work to facilitate the assessment:

(1) authors of some of the abundance estimates should be contacted to learn more about the estimates and how they might be incorporated into the assessment;

(2) a multinomial likelihood should be incorporated into the Bayesian population dynamics model;

(3) the new movement model structure (Fig. 2) should be incorporated to take into account the documented connectivity between breeding grounds in Western (D) and Eastern Australia (E1) and Oceania (E2+E3+F2) and between the breeding and feeding grounds;

(4) a two stock model for Eastern Australia and Oceania should be explored;

(5) catches should be allocated to the feeding areas associated with each of the three breeding stocks according to Hypothesis 1 of (IWC, 2010e);

(6) 'Discovery' mark data from the whaling period which contains information on movements between breeding grounds, between feeding grounds, and between breeding and feeding grounds, should be explored in the context of the assessments.

(7) the Pastene *et al.* (2011) analysis on relative proportions of mixing in the feeding grounds should be expanded to include samples from Eastern Australia (E1).

The Committee also **endorses** the input data for the population dynamics model given in Table 1 in Annex H and **agrees** that any additional datasets must be provided by 31 December 2012, after which time no more new data will be used for this assessment. The results of the analyses using the agreed model will be presented for discussion at the 2013 Annual Meeting. To ensure this work is completed, a work plan has been developed which identifies who will do each task (Table 2 in Annex H) and an intersessional working group has been appointed convened by Muller (Annex Q). The Committee anticipates that the assessment of these stocks should be completed in 2014.

Reconciliation of the large photo-identification catalogue (6,500 + IDs from 1984-2011) held by Pacific Whale Foundation with existing catalogues from Western Australia, Oceania and the Antarctic humpback whale catalogue is also encouraged to inform estimates of interchange for future assessments.

10.2.2 Review new information on other breeding stocks

10.2.2.1 BREEDING STOCK A

SC/64/SH17 reported 58 stranded humpback whales that were recorded between 1981 and 2011 off the coast of Rio de Janeiro, southeastern Brazil (annual mean 2.6, maximum 13 records in 2010). Reported strandings have increased over the past 20 years, which is consistent with the population increase observed for this stock. Three cases of entanglement were found (two were calves). Bacteriological agents in three live stranded whales assessed indicated evidence of animal impairment that resulted in or were associated with the cause of death.

The Committee **welcomes** this information but expressed concern that information is available from only a small part of the total Brazilian population. It **encourages** the provision of information from the full range of animals passing along the coast.

10.2.2.2 BREEDING STOCK B

SC/64/SH4 described a newly-discovered humpback whale wintering ground off northwest Africa with a seasonal signature consistent with a South Atlantic stock; the presence of adult/calf pairs, suggests it may be a nursery ground. Since the observations were six

months out of phase with the nearest (and only) known breeding ground in the northeast Atlantic – the Cape Verde Islands, these sightings possibly comprise the most northwestern component of the Southern Hemisphere BSB.

During a joint cruise organised by the South African Department of Environmental Affairs and the University of Pretoria in November 2011, a total of 107 biopsies were collected and numerous images obtained from humpback whales on the west coast of South Africa.

In discussion, numerous sightings of humpbacks have been made alone on the Atlantic African coast. The Committee **recommends** that the location and timing of all the existing Atlantic African records of distribution, seasonality, and timing of sightings should be synthesised in a single map/database to show the extent of range and movements for humpback whales within a calendar year.

10.2.2.3 BREEDING STOCK C

SC/64/SH3 provided the first description of humpback whale movements between breeding grounds in the Comoros Islands and coastal western Madagascar. During 11-14 October 2011, five satellite transmitters were deployed on humpbacks off Moheli Island (12° 24'S, 43° 45'E) in the Comoros Archipelago. Three individuals were tracked successfully: mean tracking duration was 18 days (range 8-28 days); mean distance travelled was 467 km (146-749 km) and mean travelling speed 26.7 ± 22.3 km/day. This is the first record of whales visiting different islands of the Comoros and western Madagascar in the same season.

Ersts *et al.* (2011) reported that between 1996 and 2006, nine whales (six males and three females) were identified using two breeding areas in separate years: the northern Mozambique Channel, currently the breeding region for sub-stock C2; and eastern Madagascar, currently a breeding region for sub-stock C3. This led the authors to believe that sub-stocks C2 and C3 were probably the same breeding sub-stock.

10.2.2.4 BREEDING STOCK D

Information was presented on examinations of eight neonatal humpback whales stranded on the Western Australian coast in 2011, all at least 1000 km south of the currently known major breeding grounds off the Western Australian northwest coast (see Annex H, item 2.3.4). Examinations indicated that all but one of the eight neonates was severely malnourished, and were believed to be non-viable from birth due to a lack of energy reserves and a compromised ability to thermoregulate and control buoyancy. Similar examinations are expected to be conducted on strandings on the Western Australian coast in 2012 and, hopefully, in future years.

10.2.2.5 BREEDING STOCK G

SC/64/SH16 provided information collected from whale-watching boats on distribution and behaviour of humpback whales from the south Pacific coast of Costa Rica, as discussed in Annex H, item 2.3.5.

In discussion, attention was drawn to the unusually high number of cow/calf pods reported together: nine groups with three or more adults with calves. The Committee **encourages** structured surveys to more completely document the distribution of these animals and **recommends** comparisons with catalogues from other areas, including breeding grounds, in the Southern Hemisphere.

SC/64/SH23 presented information on 1,580 individually photographed humpback whales off Ecuador that were compared with 611 animals identified in the southeast Pacific in four different catalogues. This confirmed Antarctica as the main feeding ground for humpback whales found off Ecuador and suggested that feeding areas for whales identified off Ecuador may extend as far east within Area II as the South Orkney Islands. The Committee was also informed that individual animals may migrate either to the Magellan Strait or the Antarctic Peninsula, but not to both. Comparison with the catalogue of animals found off Chiloe Island, Chile, had yet to be undertaken, and the Committee **recommends** that this comparison be undertaken and looks forward to receiving further information.

Information on 15 long-term resightings of humpback whales off Ecuador was reported in SC/64/SH24. One animal was resighted over a 26 year time span. The paper also provided the earliest connection from Ecuador to Antarctica and further supports the findings that waters around the Antarctic Peninsula are the main feeding area of humpback whales migrating to Ecuadorian waters. The Committee **endorses** plans to extend comparison of the Ecuadorian catalogue with animals from around South Georgia and Area II and looks forward to receiving a report at next year's meeting.

SC/64/O15 discussed observations from small boats during 2006-2012, within the Golfo Duce, Costa Rica and the surrounding area of Osa Peninsula. It was shown the area is an important wintering ground, where the whales' distribution was determined by bathymetry, water temperature and possibly currents. For example, whales seem actively to avoid areas with eddies. The area seems to be used mainly by singing adults and there were competitive groups present in depths less than 60m, suggesting that mating occurs there.

The Committee **endorses** the view that spatial distribution information obtained from this study should be taken into account in establishing guidelines for appropriate management of this important Costa Rican marine coastal habitat.

10.2.2.6 FEEDING GROUNDS

SC/64/SH21 presented new information about abundance, population structure, demographic, and reproductive trends of humpback whales from the Strait of Magellan feeding area using long-term data on sightings, photo-identification and molecular analysis. The waters of Chilean Patagonian fjords and the Strait of Magellan remain today as the only recorded Southern Hemisphere feeding area for humpback whales of breeding stock G outside Antarctic waters.

The Committee thanked the authors for bringing this new information forward. It noted that it could not fully evaluate the abundance estimates with the information provided in the document and looked forward to seeing additional documentation next year. The Committee **expresses concern** regarding the potential for ship strikes and habitat displacement if the coal mining development results in a substantial increase of ship traffic in the region. It **recommends** that potential impacts are carefully assessed and that effective mitigation measures are adopted where necessary.

10.2.2.7 ANTARCTIC HUMPBACK WHALE CATALOGUE

SC/63/SH1 provided an update on the Antarctic Humpback Whale Catalogue (AHWC). The recent submissions bring the total number of catalogued whales identified by fluke, right dorsal fin/flank and left dorsal fin/flank photographs to 4635, 414 and 409, respectively. Opportunistic data represent a significant portion of the AHWC. Progress continues in efforts to stimulate submission of opportunistic data from eco-tourism cruise ships in the Southern Ocean and from research organizations and expeditions working throughout this region and the Southern Hemisphere.

The Committee thanked the authors for their hard work and **recommends** that the AHWC continue. This item has financial implications as discussed under Item 23.

10.2.3 Work plan

The work plan for the assessment of Southern Hemisphere humpback whales is described in Table 2 in Annex H and will be furthered by an intersessional working group (Annex Q). The Committee's discussions of the workplan are discussed under Item 21 and financial implications under Item 23.

10.3. Southern Hemisphere blue whales

10.3.1 Review new information

10.3.1.1 PHOTO-IDENTIFICATION CATALOGUES

SC/64/SH8 provided an update on the Antarctic Blue Whale Photo-Identification Catalogue, which includes photographs collected during 20 years of IWC IDCR/SOWER cruises (1987-88 to 2009-10). In 2011 and 2012 the photographs of eight new whales and one re-sighted whale (2007-2010) were added. Currently the catalogue contains a total of 227 identified whales. Seven whales were re-sighted in multiple years. Mark-recapture analysis of Area III in the 3-year time period 2004/2005-2006/2007 yielded estimates of abundance ranging from 818 to 1097 whales.

The Committee welcomed this update and recognised that the data have also been submitted to the Southern Hemisphere Blue Whale Catalogue. Photographs of blue whales from the JARPA programme has not yet been included in the ABWPIC but have been submitted to the IWC Secretariat. The Committee **reiterates** that the photographs should be added to the catalogue and reconciled and a proposal to achieve this has been developed. This is discussed further under Item 23..

SC/64/SH20 presented an update on the Southern Hemisphere Blue Whale Catalogue that holds photo-identification catalogues of research projects from major areas off Antarctica, Eastern South Pacific and the Eastern Tropical Pacific (ETP). A total of 822 and 826 individual blue whales photographed from left and right sides respectively are held in this Catalogue. Left-side comparisons have been completed and right-side comparisons are underway for ETP and the other areas. There are re-sightings both within Chile and in the Southern Ocean. However, none of the 84 whales photographed off ETP have been re-sighted within or outside of the ETP.

The Committee **encourages** contributions of regional catalogues not yet in the Southern Hemisphere Blue Whale Catalogue (e.g. eastern and western Australia) to facilitate full reconciliation of the catalogue for the Southern Hemisphere blue whales and a proposal to achieve this has been developed. This is discussed under Item 23.

10.3.1.2 ANTARCTIC BLUE WHALES

SC/64/SH14 reported methodological developments for estimating relative abundance from historic Antarctic whaling records using catch per unit effort data (CPUE). Once the work has been completed and accepted by the Scientific Committee, the Committee welcomed the commitment of the authors to submit the datasets and script to the IWC Secretariat.

SC/64/SH11 summarised two voyages conducted by the Australian Antarctic Division off southeastern Australia to refine acoustic tracking methodologies to address the aims of the Southern Ocean Research Partnership's Antarctic Blue Whale Project (see Item 19 and Annex H, item 3.1.2.1). The primary aim of this project is to estimate the circumpolar abundance of Antarctic blue whales using mark-recapture methods. The passive acoustic tracking system, using DIFAR sonobuoys, operated continuously during the voyages recording nearly 500 hours of audio, while acousticians processed over 7,000 blue whale calls in 'real-time'. The two voyages yielded 52 sightings (104 animals) of blue or like-blue whales; 48 animals were identified photographically (one on both voyages). Some blue whales that had been seen were not heard.

SC/64/SH12 summarised the methodological development of the use of DIFAR sonobouys for real-time tracking of blue whales. The results indicate that acoustic surveys may offer increased effective range over purely visual surveys of blue whales.

SC/64/SH26 presented an exploration into what encounter rates are plausible using acoustic-assisted tracking of whales, as opposed to a traditional visual-only survey (such as IDCR/SOWER). Given the lack of data, and the number of assumptions, abstractions, and approximations required in this simulation exercise, the authors stressed that the estimates in the paper should not be considered accurate or precise.

SC/64/SH10 presented a great advancement on the feasibility study of methods to obtain a new estimate of circumpolar abundance of Antarctic blue whales. Using the seasonality and location of sightings and acoustic detections from IWC-SOWER surveys, and historical catch data, it was concluded mark-recapture surveys should target putative hotspots and make use of passive acoustic tracking to increase encounter rates. With a reasonable level of effort a viable estimate of circumpolar abundance could be obtained for Antarctic blue whales within a ten-year period (and see Item 19).

The Committee recognises that the longer-term timeline to estimate abundance of Antarctic blue whales is more appropriate and logistically more feasible than the shorter periods considered earlier in the project's development. It **welcomes** the suite of papers linked to the Antarctic Blue Whale Project and the considerable advancement in the project's development. Further mark-recapture simulations studies may be valuable to investigate the effects of variability in effort between years within the suggested ten year timeframe and also to investigate the interaction between spatial variability in effort and possible population structure. This simulation could assess the consequences of only targeting 'hotspots' and the potential heterogeneity in capture probability potentially generated through this approach.

Further the Committee **encourages** ships contributing to the ABWP to, whenever possible, also collect environmental data for habitat modelling and data on other whale species sighted. In some circumstances environmental data can be collected through remote sensing but this is often problematic around Antarctica due to extensive cloud cover. Gliders and floats may provide another opportunity to collect high resolution water column data.

10.3.1.3 PLANNING OF FUTURE RESEARCH

The Committee was pleased to receive a number of papers on future blue whale research (see Annex H, item 3.1.2.2 for full discussion of these).

SC/64/SH13 presented a preliminary plan for an Australian funded voyage to contribute to the SORP Antarctic Blue Whale Project. The aim of the Antarctic Blue Whale Project is to develop technologies and collect data that will ultimately deliver a new circumpolar abundance estimate for Antarctic blue whales. The voyage will focus on blue whales in waters west of the Ross Sea (i.e., 135-175°E), an area that has been associated with higher densities of blue whales. The plan will be further developed and reviewed once the project management structure for the Antarctic Blue Whale Project is established which includes the formation of technical committees on passive acoustics, individual identification, and survey design.

The Committee **emphasises** the importance of collecting opportunistic data on other whales (sightings, faecal collection, biopsies) and environmental data, while recognising the value of clear priorities, particularly when the number of days 'on-site' in good weather can be few, even for longer Antarctic voyages.

SC/64/O16 presented the South African Blue Whale Project which is intended to initiate a long-term monitoring programme of blue whales in the Antarctic sector east of the Greenwich meridian, coupled with investigations of their seasonal pattern of abundance at lower latitudes. Acoustic technology will be combined with traditional line transect sighting survey and mark-recapture methodology to study the distribution, abundance and movements of blue whales in the southeast Atlantic. This joint study is conducted by the University of Pretoria and the University of Washington, and has received funding for 3 years from the South African National Antarctic Programme, starting in 2012/13. One team member will receive training in AAR deployment during a cruise off Greenland this summer (SC/64/O17) under the SORP programme. Although data valuable to the SORP Antarctic Blue Whale Project will be collected on this voyage (photo-ID and biopsy samples), the project is more closely linked with another SORP project 'Acoustic trends in abundance distribution and seasonal presence of Antarctic blue whales and fin whales in the Southern Ocean (see SC/64/O13).

SC/64/SH25 proposed a project on the genetics of Antarctic blue whales in part using IWC samples. The contemporary Antarctic blue whale has been described by a relatively high mitochondrial DNA (mtDNA) haplotype diversity, and may have escaped a greater loss of genetic diversity due to its long life span, overlapping generations and the brief period of the bottleneck. The impact of 20th century commercial whaling on genetic diversity can be explored through a comparison of historic and contemporary genetic diversity. The Committee **recommends** that access to the samples continues for this work and encourages further sampling in South Georgia.

The Committee **endorses** these research projects and looks forward to reviewing the results.

10.3.1.4 PYGMY BLUE WHALES

SC/64/SH27 presented a study on the identity of blue whales that are regularly sighted in the Geographe bay region of Western Australia. Preliminary results based on measures of genetic structure indicate that the whales were all of the pygmy subspecies. Further samples from Geographe Bay are required to clarify whether these blue whales have fine scale genetic differentiation.

The Committee **welcomes** this paper which is discussed fully in Annex H, item 3.1.3, noting the contribution made by IDCR/SOWER samples to the study.

10.3.1.5 CHILEAN BLUE WHALES

The Committee was pleased to receive three papers on blue whales in Chilean waters and a full discussion can be found in Annex H, item 3.1.4.

Galletti Vernazzani et al. (in press) described the results of a collaborative research programme (the Alfaguara Project) conducted by Centro de Conservacion Cetacea on Chilean blue whales. From 2004 to 2010, eight aerial and 85 marine surveys were conducted off Isla de Chiloe, southern Chile, where a total of 363 individual blue whales were photo-identified. Recapture data support the hypothesis that the feeding ground off southern Chile is extensive and dynamic. Blue whale distribution off southern Chile was assessed and relative abundance, using sighting per unit effort and kernel density estimators was obtained.

SC/64/SH18 provided an update on the 2012 blue whale field season that reported the occurrence of a shift in blue whale distribution during 2012 from the southern Chile feeding area (Isla de Chiloe), as reported in previous years, to an additional feeding aggregation of blue whales in northern Chile (Isla de Chanaral).

The Committee recognized the value of such long-term datasets for understanding blue whale populations and **recommends** that they continue.

SC/64/SH19 presented an abundance estimate of Chilean blue whales by mark-recapture and line-transect techniques.

The Committee recognised that the area covered by the line-transect survey does not include the entire range of the population and so will underestimate the total population size. There are also issues related to possible structure amonf feedin groups and sampling that require further consideration with respect to mark-recapture estimation. The Committee **encourages** further work on this and looks forward to receiving additional analyses.

10.4 Western North Pacific gray whales

10.4.1 New scientific information

Results regarding mixing of western (WNP) and eastern (ENP) North Pacific gray whales illustrate the great conservation and management importance of a more comprehensive examination of gray whale movement patterns and population structure in the North Pacific. At last year's meeting the Committee noted that for such an effort to be successful it must be international and collaborative (Weller *et al.*, 2012). To facilitate this, and noting the existing safeguards for collaborators provided under the Committee's Data Availability Agreement, it recommended that a collaborative Pacific-wide study be developed under the auspices of the IWC, recognising that *inter alia* this will contribute to the Committee-endorsed Conservation Plan for Western North Pacific Gray Whales and incorporate previous recommendations made by the Committee. Appendix 7 of Annex F provides an update on progress made to date.

The Committee **commends** the highly collaborative, international research effort for the progress made to date and look forward to future updates. The Committee also received several papers on stock structure and movements of north Pacific gray whales that resulted from this or other related programmes. Details can be found in Annex F, Item 4.1.

10.4.1.1 SATELLITE TAGGING

Mate summarized results regarding the recent collaborative efforts between Russian and US scientists to satellite track western gray whales under a programme undertaken with guidance from the IWC Scientific Committee and the IUCN WGWAP (Western Gray Whale Advisory Panel). The main goal of the project was to determine migration routes and breeding areas of tagged gray whales from the western North Pacific in order to develop improved conservation measures for this very small population. A total of seven whales were tagged in 2010 and 2011. The three longest tracked whales moved east across the Bering Sea and into the northeast Pacific where they overlapped with the range of eastern gray whales. Each animal followed a different route. The transmitter for a whale tagged in 2011 has lasted almost a year and continues to transmit. It travelled to near the southern tip of Baja California, Mexico during the winter and returned to near Sakhalin Island, Russia this spring. The autumn and spring migratory routes differed. These results, along with those from photo-identification matches from the eastern and western Pacific have caused the Committee to examine overall stock structure of gray whales in the North Pacific and to initiate the ocean wide research programme referred to above.

Mate also presented information on a plan for the A.N. Severtsov Institute of Ecology and Evolution of the Russian Academy of Science (IPEE) and Marine Mammal Institute of the Oregon State University to continue tagging western gray whales following the guidelines already developed by the IWC (IWC, 2012k). It is intended to tag up to 20 animals off Kamchatka (there is some interchange between animals

off Kamchatka and Sakhalin) beginning in early July. The objective is to provide additional information on stock structure and to assist in developing conservation measures. The programme will also involve photo identification and biopsy work. Photos will be made available to all catalogues and genetic samples will again be submitted to the IWC archive.

There was some discussion about whether tagging in Kamchatka was as beneficial as further tagging off Sakhalin as detailed in Annex F. The Committee **agrees** on the value of future telemetry work off Kamchatka and Sakhalin and **reiterates** its previous guidelines for such work (IWC, 2012k). Advice from the IWC/IUCN steering group chaired by Donovan on the full proposal will be provided to the research team in sufficient time to assist preparations for the field programme. The Committee also **recommends** that an evaluation of healing of the wounds caused by the satellite tags be undertaken and provided at next year's meeting. .

The Committee also received information on plans for telemetry work on eastern gray whales. Quakenbush and her colleagues plan to tag up to 10 gray whales near Barrow and Saint Lawrence Island in 2012. The main goal is to document the distribution, movements, and feeding areas of gray whales relative to oil and gas activities in the Chukchi Sea. The project will include the collection of photographs and biopsies. Data will be shared with other gray whale research groups. Mate plans to tag some additional PCFG gray whales in 2012 in Oregon and northern California. The objective is to investigate if the variable migratory timing, routes, and Baja California destinations are similar to those found in 2009 and 2010.

10.4.1.2 PHOTO-IDENTIFICATION

SC/64/BRG13 provided results from a photographic comparison of gray whales off Sakhalin Island, Russia with animals in lagoons of Baja California, Mexico. Additional information about another match was reported subsequent to the submission of SC/64/BRG13. In total, photographs of 217 identified gray whales were obtained from the Sakhalin Island feeding grounds and compared with 6,546 photo-identified individuals from the Baja California breeding lagoons. The research team found a total of 14 matches from the 217 Sakhalin whales, including six males, six females and two animals of unknown sex. Thirteen whales had sightings in Russia prior to and after their respective sighting in Mexico. Five females with calves were sighted in the winter in Mexican waters and in the next summer off Sakhalin, three of them without calves suggesting that these females had either separated from their calves or that their calves did not survive. The matches made between whales sighted off Sakhalin and the Mexican Pacific are the first results of the multinational collaboration.

The Committee **thanks** the authors and their colleagues for reconciling the Mexican photo catalogue. This will be a useful tool to address many questions, such as the relationship between Sakhalin and Mexico gray whales. The Committee also **acknowledges** the collaboration among the international group of gray whale researchers as a great example of how scientists can work together to address questions of great importance.

Another example of the multinational collaboration involves the photo comparisons being conducted among three: the Russia-US Sakhalin catalogue, the Institute of Marine Biology (IBM) Sakhalin catalogue, and the IBM Kamchatka catalogue (Appendix 9 of Annex F presents preliminary results from this study).

Updated information on research and conservation in Japan was presented in SC/64/O8. In March 2012, a gray whale was sighted on the Pacific coast of Aichi Prefecture, in the middle of Japan and some photos of the animal were taken. No stranding or entanglement of this animal occurred. The Committee was also informed that there are some photographs (and genetic samples) in Japan that might contribute to a better understanding of stock structure of north Pacific gray whales. Japan expressed interest in joining the international collaboration and named Kato as the contact person. The Committee welcomes this news and **encourages** sharing of photographs and genetic samples with existing catalogues and genetic databases.

The Committee **commends** the above highly collaborative, international research effort for the progress made to date and **encourages** enhanced collaboration, if at all possible. The Committee **strongly recommends** the continuation of the IWC collaborative programme as outlined in Annex F, especially the plans to collect additional biopsy samples for genetic comparisons and photographs for catalogue comparisons. It was suggested that analyses be conducted to assess whether any patterns in the genetic data could be identified when Sakhalin whales known to have overwintered in the Eastern North Pacific are compared to the other sampled animals off Sakhalin as well as to those sampled in the Eastern North Pacific. The Committee also **recommends** that existing data be used to attempt to estimate the proportion of animals that regularly feed off Sakhalin and also migrate to the eastern North Pacific in the winter.

10.4.1.3 OTHER

SC/64/BRG10 provided a summary of past and current records of gray whales off the coasts of Japan, China and Korea. There are only 13 known sighting or stranding records in Japanese waters between 1990 and 2007 (Nambu *et al.*, 2003). Observations of gray whales in China are also exceptionally rare. Gray whales were once common and hunted off the coast of the Korean Peninsula but the last reported commercial catches were in 1966 and the last known sighting off

Korea was in 1977. This suggests that they have abandoned the migration corridor along the Korean Peninsula or that a subpopulation using the Korean Peninsula is now extinct. The evidence that some Sakhalin animals migrate to the west coast of North America during the winter/spring, along with observations off Japan, Korea and China during the winter/spring, in combination with significant genetic differences between the eastern and western populations (Lang *et al.*, 2011) suggest that the number of whales in the western North Pacific population is potentially smaller than the currently estimated ~150 whales that use the Sakhalin summer feeding area.

This paper stimulated considerable discussion as can be seen in Annex F. The Committee emphasises the importance of the collaborative oceanwide programme and the need to review stock structure of gray whales throughout the North Pacific. It was noted that photographs (albeit low quality) of a gray whale that died in fishing gear in China in November 2011 have been compared with several catalogues (i.e., the Russia-US, IBM Sakhalin, and IBM Kamchatka) but no matches have been made.

In conclusion, the Committee **welcomes** all of the information on this critically endangered population and the broader question of stock structure. It **encourages** further work and as in previous years, **re-emphasises** the importance of continued long-term monitoring. Recognising some difficulties of interpretation given the new information on movements, the Committee also encourages Cooke to complete and publish his assessment of the gray whales feeding off Sakhalin using the combined photo-identification datasets. This rich dataset can provide valuable information for assessing possible anthropogenic impacts on animals feeding in the area.

10.4.2 Conservation advice

As in previous years, the Committee **acknowledges** the important work of the IUCN Western Gray Whales Advisory Panel. This year's update on the panel's activities is given in Appendix 10 of Annex F. The Committee **re-emphasises** its view of the importance of the Panel's work and reiterates its support. Furthermore, the Committee **recommends** that appropriate monitoring and mitigation plans be implemented for all oil and gas activities that occur in the range of western gray whales, especially if another platform is to be built or installed off Sakhalin.

The Committee again **recognises** that the problem of net entrapment of western gray whales is a range-wide issue. It **welcomes** Japan's administrative actions related to conservation of gray whales (SC/64/O8) and the efforts of other range states to reduce mortality, such as net entrapments that occur in other range states, including Canada, US and Mexico on the eastern side of the Pacific. Continued international collaboration to elucidate population identity and stock structure, as emphasised above, will provide valuable information for future management advice.

10.5 Southern Hemisphere right whales

10.5.1 Review report from intersessional workshop

Bannister introduced the report of workshop, held in Buenos Aires, Argentina, from 13-16 September 2011 (see SC/64/Rep 5). He noted that although substantial progress had been made on much of the agenda, additional work was needed on some sections, especially the completion of analyses related to abundance and assessment. It was also noted that subsequent revisions of some analyses meant that sections of the report required clarification or amendment. As a consequence, two groups (an assessment group and a drafting group) were established to complete this work.

The Committee recognises the substantial work undertaken at the workshop and **welcomes** the report, thanking particularly the Chair, rapporteurs and the host. It noted the large number of recommendations the report contained and prepared the following consolidated version incorporating additional comments and recommendations from the Committee as appropriate.

10.5.1.1 LONG-TERM POPULATION MONITORING

The Committee has long recognised the value of long time-series in informing, prioritising and evaluating conservation and management actions for whales, including monitoring the effectiveness of mitigation measures and Conservation Management Plans. In particular, it stresses the value of maintaining annual data sets, especially those that include information on the calving intervals of individual females, for their potential importance in analysing the influences of climate and environmental variables on southern right whale reproduction. The Committee therefore **strongly recommends** that all existing southern right whale data sets of this nature (e.g. in Argentina, Australia and South Africa) be continued on an annual basis, and that similar programmes be established wherever possible for other areas.

In this connection, the Committee received a proposal requesting interim relief funding for the 2012 aerial survey off South Africa (Annex F, Appendix 2) and **recommends** its support (see item 23).

In addition, the Committee **recommends** that the annual CENPAT programme of aerial surveys around Península Valdés, which is independent of the long-term aerial photo-identification programme and substantially increases the areal and temporal survey coverage, should be continued on an annual basis.

10.5.1.2 POPULATION STRUCTURE AND LINKAGES

The population structure and stock identity of southern right whales remain incompletely described. A

particular challenge is to distinguish adjacent stocks with different demographic histories and apparent rates of recovery. To address this, the Committee **recommends** that a circumpolar collaboration proceed to assemble standard genetic information from all available samples (see SC/64/Rep5, Table 5), that could *inter alia* update the previous analysis by (Patenaude *et al.*, 2007) of the genetic structure of southern right whales on their calving/nursery grounds.

A number of standard genetic protocols are **recommended,** including standardisation of mtDNA preparation and nomenclature, standardisation of microsatellite loci, and the exchange of samples between laboratories to establish allelic standards and provide quality control (see SC/64/Rep5). Further tissue sampling is also **strongly recommended** in a number of areas including Australia, Chile/Peru, Southern Africa and Brazil (see Annex F and SC/64/Rep5 for more details). In addition, to investigate relationships with other southern populations, further analysis of existing genetic samples from South Africa (n = ~600) is **recommended**.

Recognising the importance of being able to allocate offshore ('pelagic') catches in the Southern Ocean and in low-latitude areas to the appropriate calving/nursery/breeding grounds, the Committee **recommends** that genetic (biopsy), photo-identification and satellite tagging data are applied to identify linkages.Further investigation is **recommended** of: (a) connections between whales in the New Zealand sub-Antarctic and those in mainland New Zealand and (b) philopatry to mainland New Zealand (for details see Annex F and SC/64/Rep3). It is also **recommended** that biopsy samples, satellite tagging data and photo-identification data be linked, where possible.

While recognising the value of genetic analyses in solving the problems of population structure and linkages, the Committee also **recommends** other approaches such as inter-catalogue comparisons. Similarly, the value of strategically deployed satellite tags in depicting movements has already been demonstrated for southern right whales, and the Committee **recommends** that such studies continue.

10.5.1.3 MODELLING

The Committee **recommends** further investigation of the conversion factor used to estimate total population size from the estimated adult female component. Such investigation needs to consider that there has been only a relatively short period of recovery and that therefore the age distribution is unlikely to be steady and the estimated survival rate is likely to be biased upwards from the average that would apply in a steady situation.

10.5.1.4 JOINT ARGENTINA/BRAZIL ASSESSMENT

Noting the preliminary nature of Cooke's analyses, the Workshop had decided not to append the results to their report. It had recommended that progress towards the 'joint assessment', using data from both Argentina and Brazil, be made as quickly as possible and that an update also be presented on this work at the 2012 Scientific Committee meeting. Cooke provided an assessment of the 2010 Argentine population including a rate of increase from 2000-2010 to the meeting (Annex F, Appendix 3). The Committee **welcomes** this and **agrees** to include the results in the Workshop's assessment of the status of the southern right whale population in 2009, appreciating that until a joint Argentine/Brazilian assessment had been completed these results must be considered preliminary in nature. The Committee **recommends** that the joint Argentine/Brazilian assessment be completed as soon as possible, and the results presented to the 2013 Annual Meeting.

10.5.1.5 ASSESSMENT OF THE CHILE/PERU POPULATION

In order to obtain information on the distribution and abundance of this Critically Endangered population, to clarify its status and identify any threats and possible mitigation actions, the Committee **recommends** that surveys, photo-identification and genetic studies should be conducted as a priority. Specifically, the following steps should be taken:

(1) determine geographical/temporal areas where quantitative studies can best be conducted, through analysis of existing historical whaling and sighting data and appropriate temporal/geographical spatial modelling;

(2) design a systematic survey programme (aerial surveys may be the most efficient) to cover potential calving or nursery areas, bearing in mind logistical and practical limitations; and

(3) further consider stock structure issues by examining existing genetic samples (including museum specimens where possible) and collect new samples in southern Chile/Argentina.

10.5.1.6 IDENTIFICATION OF CONCERNS AND THEIR MONITORING

Given that there was evidence of continuing direct removals via entanglements in fishing gear and ship strikes, the Committee **recommends** all countries to include reports of ship strikes and entanglement events in their annual progress reports to the IWC through the new online portal (see item 3.2).

The Committee **strongly reiterates** the research and management recommendations made at the Workshop on the Southern Right Whale Die-off (IWC, 2011h). In addition, in view of the severe impacts of gull attacks documented at Península Valdés and the risk that this learned behaviour on the part of gulls could proliferate, the Committee **recommends** that Brazilian authorities consider taking immediate action if and when similar gull behaviour is observed. Some members felt that this

action should specifically include the removal of attacking gulls, following similar steps being undertaken by Argentina in the Peninsula Valdes area.

The Committee noted that some concerns have been raised about the potential effects of fishing and climate change on krill and hence on krill predators. The Committee also noted that the CCAMLR Scientific Committee was investigating these matters and encourages further collaboration between IWC and CCAMLR on the development of relevant ecosystem models.

10.5.1.7 DEVELOPMENT OF CONSERVATION MANAGEMENT PLANS (CMPS)

The Committee **recommends** that any draft CMPs take into account the recommendations made at the Buenos Aires workshop and the workshop on the die-off of southern right whales and use these as the basis of action development (IWC, 2011h). The Committee was pleased to note that this was the case for the two draft CMPs it received (see below).

10.5.1.8 CONCLUSION

The Committee noted that the Workshop Report (SC/64/Rep5) had reached conclusions on the current status of the overall Southern Hemisphere right whale population based on a modelling exercise undertaken during the workshop using the best available parameter values. However, the Workshop had recognised that the calculations were very dependent on (1) the results of the as yet incomplete analysis of the Argentinian/Brazilian population to be provided by Cooke, and (2) on different conversion factors from mature female to total population size derived from the Argentine and South African populations.

Cooke advised that the parameter values for Argentina he had provided during this meeting (Annex F, Appendix 3) still required some updating. However, he agreed that he would forward them by 1 July 2012 to Butterworth and his colleagues so that a revised circumpolar analysis using the same approach as in Buenos Aires could be completed. It was agreed that the updated analysis would be incorporated into the Buenos Aires workshop report with an appropriate editorial note. This full report would then be circulated to workshop participants for any final comments and included in the published version in JCRM.

Cooke reported that it was impossible to undertake the recommended joint Argentina/Brazilian assessment until matching between photo-identification catalogues had been completed. However, he confirmed that excluding Brazil from the overall assessment was unlikely to have a major effect on the resultant circumpolar estimate because of its relatively small size (some other small populations for which no estimates exist are also excluded from the assessment). It was also noted that updated calculations using the Argentina and South African data had resulted in a convergence of conversion factors (Annex F, Appendix 3) so that these are no longer a major issue in estimating total population size for use in the assessment.

10.5.2 Review new information

10.5.2.1 SOUTHWEST ATLANTIC

The Committee received three papers on this population. They are briefly summarised below but a full discussion can be found in Annex F, Item 3.3.2.

SC/64/BRG12 presented updated information on the southern right whale die-offs at Península Valdés, Argentina for the 2010-2011 seasons. Systematic efforts to study the strandings have continued since 2003. A total of 482 dead whales were recorded at Península Valdés between 2003 and 2011. At least 55 whales died in 2010 and 61 died in 2011. As in previous years, the vast majority of strandings were calves of the season.

SC/64/BRG7 reported an analysis of metal levels in the skin of living southern right whales at Península Valdés, Argentina, as part of efforts to investigate the recent die-offs. The levels of nonessential and essential metals in the skin of 10 animals were on the low end of the spectrum of measured concentrations when compared to other studies. The authors cautioned that these low levels should not necessarily be interpreted as being safe since the effects of metals in marine mammals are largely unknown.

There was lengthy discussion on the possible reasons for changes in the observed calving interval. In conclusion, the Committee **reiterates** the recommendations of the southern right whale die-off workshop (IWC, 2011h) and **encourages** the continuation of the studies presented in SC/64/BRG7 and SC/64/BRG12 to better understand the mechanism(s) behind the observed mortality.

SC/64/BRG20 presented an abundance estimate of southern right whales by aerial line-transect surveys for a bay area of Bahía San Antonio, Argentina, from late summer to fall in 2009-2011. A corrected abundance estimate using g(0) is 207 (CI=99-315) in 2010, which is the maximum among the three years. These aerial surveys resulted in the first specific estimates of southern right whale abundance in this north Patagonian bay although more consistent aerial surveys should be conducted.

10.5.2.2 SOUTHERN AFRICA

SC/64/BRG24rev applied the three-mature-stages (receptive, calving and resting) model of Cooke *et al.* (2003) to photo-identification data available from 1979 to 2010 for southern right whales in South African waters. The 2010 mature female population is estimated to be 1,309, the total population is 4,725, and the annual population growth rate 6.8%. Information from re-sightings of grey blazed calves as adults with calves allows estimation of first year survival rate of

0.914 and an age at 50% maturity of 6.4 years. In contrast, the relative proportions of grey blazed animals amongst calves and amongst calving adults suggest rather a value of 10% (SE 8%). If the proportion losing markings is in fact 10%, first year survival rates estimate drops to [0.859] and the population growth rate to [6.6%] per year.

Best presented an analysis in which he had assembled data from foetuses, biopsied calves and stranded calves to test the assumption that the neonatal sex-ratio in southern right whales was 50:50. The most appropriate data set suggested a ratio closer to 46 male: 54 female (Annex F, Appendix 4). The base case model of SC/64/BRG24 with this alternative sex ratio of 54:46 resulted in the total population 4,359 (Annex F, Appendix 5). The main differences in the parameter estimates were a lower first year survival rate with a corresponding higher value of the estimate for the probability that a grey blazed calf maintains its markings until becoming an adult.

10.5.2.3 SOUTHWEST PACIFIC AND NEW ZEALAND

Carroll et al. (*in press*) provided results on paternity assignment and 'gametic recapture' to examine the reproductive autonomy of southern right whales on their New Zealand calving grounds. The 'gametic mark-recapture' estimate of male abundance 1,001 was directly comparable with the 'census estimate' of male abundance, N=1,085, for the stock, based on standard genotype mark-recapture modelling. Simulations indicated the assumption of equal reproductive success amongst males was not violated. Power analyses suggested that these findings would be highly unlikely if the population was open to gene flow from other, larger populations in the Indo-Pacific region. The authors concluded that these findings are consistent with the hypothesis that southern right whales returning to the New Zealand calving ground are reproductively autonomous on a generational timescale, as well as isolated by maternal fidelity on an evolutionary timescale.

10.5.2.4 AUSTRALIA

SC/64/ProgrepAustralia provides information on southern right whales obtained on survey flights off the southern Australian coast between Cape Leeuwin and Ceduna in August 2011. The most recent updated increase rate for this Australian 'southwest stock' for 1993-2011 is 6.82% for all animals (CI 4.24-9.47), and 7.21% for cow/calf pairs (CI 3.70-10.85) with current population size *ca* 2,900; including the much smaller 'south east' Australian stock, the Australian population as a whole is likely to number *ca* 3,500.

10.5.2.5 SOUTH EAST PACIFIC RIGHT WHALES

Off northwestern Isla de Chiloe, four sightings of the critically endangered Chile/Peru "sub-population" between September and November 2011 were documented, including the first incidence of reproductive behaviour and the first resighting of a known individual in Chile. In addition, some 30km north, the southernmost record of a mother-calf pair was recorded. These observations suggest that northwestern Isla de Chiloe is part of a breeding area with undetermined boundaries. This highlights the importance of these coastal waters and the need to continue long-term studies, both dedicated and opportunistic, to monitor this critically endangered population.

10.5.2.6 GENETIC RESEARCH

SC/64/BRG15 reported on progress with the investigation of the worldwide genomic diversity and divergence of right whales. Through collaborative agreements, the investigators have obtained representative samples from all three oceanic species. The investigators have used next-generation sequencing technology to develop genomic profiles by sequencing the complete mitochondrial genomes and multiple nuclear genes for each individual. To date, the results provide greatly increased resolution of the divergence between the three recognised species, and the diversity within each oceanic population.

The Committee noted that the project was generally methodologically sound and the objectives of the study were likely to be achieved. Although some concerns were expressed about limited number of samples and a possible need for more emphasis on the nuclear aspect of the survey, the Committee **recommends** funding the final stage of the project (see Item 23).

Review of "Draft Conservation Management Plans for Southern right whales"

The Commission has agreed that Southern right whales of South America should be candidates for IWC Conservation Management Plans (IWC, 2012b). As discussed in Annex F, two draft plans were available, one for Southwest Atlantic southern right whales (IWC/64/CC7Rev1) and one for southeastern Pacific southern right whales (IWC/64/CC9).

The Committee examined these draft CMPs for their scientific content and related actions and found them to be in accord with the results and recommendations from the IWC workshops on the Status of Southern Right Whales (SC/64/Rep3) and the Southern Right Whale Die-off (IWC, 2011h).

10.6 Other stocks of right whales and small stock of bowhead whales

An update was provided on North Atlantic right whales for the period November 2010 - October 2011, reflecting the work of North Atlantic Right Whale Consortium, 2011. A collaborative photographic catalogue suggested that there were 490 North Atlantic right whales in 2010. Five right whale deaths were documented during the report period. Additionally, there were 11 new entanglement cases documented.

The Committee **thanks** the authors for this update and looks forward to receiving further information next year.

SC64/ProgRepJapan reported that in February 2011, a right whale was found dead in a set net in Oita prefecture. A skin sample was sent to the Institute of Cetacean Research (ICR), where DNA was extracted and it was confirmed as a right whale. However, the ICR branch in the Tohoku region was hit by the tsunami on 11 March 2011 and the sample was lost.

SC/64/O6 reported sighting information for North Pacific right whales from sighting surveys conducted in May 2011 in the western North Pacific. A total of 13 schools (20 individuals) was sighted, from which 19 individuals were photographed and 14 biopsied successfully.

The Committee **welcomes** new information on North Pacific right whales, noting that such sightings were rare. It looks forward to receiving a fuller report of the sighting survey at the next meeting.

No update was available for the small stock of bowhead whales in the Sea of Okhotsk.

Moore *et al.* (2012) provided results of a year-long acoustic study of the Spitzbergen stock of bowhead whales from September 2008 to September 2009 in western Fram Strait (79°N, 5°W). The rate of bowhead whale call detection was high from September 2008 through May 2009, including calls detected on every day of the month from November through February when sea ice was 90-100% surface cover.

The Committee continues to **reiterate** its grave concern over these small stocks and **encourages** continued or expanded research on these small populations.

10.6.2 Work

The Committee's views on the workplan for these stocks are given under item 21.

10.7 Arabian Sea humpback whales

10.7.1 Review intersession progress

The Scientific Committee has in the past (most recently in IWC, 2012m), recommended further research to help address the serious conservation status of the Arabian Sea humpback whale which is recognized as an isolated resident sub-population of humpbacks with an estimated population size of 82 (95% CI 60-111; Cerchio *et al.*, 2008; Minton *et al.*, 2011).

SC/64/SH30 provided details of surveys, shore-based observations, and passive acoustic monitoring conducted in Oman during October 2011-March 2012. A total of 36 humpback whales was encountered, 33 of which were photographed and 16 were newly identified individuals. No feeding was observed in the southern survey site and there were nearly three times fewer whales encountered this year. Differences in relative density and feeding may be due to annual fluctuations in food availability as a result of variable oceanographic conditions. Three mother-calf pairs were recorded in Oman during 2011 - 2012, one of which entered the newly operational multi-purpose Port of Duqm. These are the first documented records of humpback whale calves in Oman since 2000. Two mortalities were recorded in January and April 2012. An adult female floating at sea was photographed by local fishermen and a juvenile that stranded live on a remote stretch of shoreline and was subsequently buried by the local municipal authority before scientific investigation could be conducted.

Observations of severe entanglement scarring, as well as coastal road development, operation of a large new port at Duqm, and the planned inauguration of several fast ferry routes through known humpback whale habitat are cause for concern. Efforts are underway to highlight the population's conservation needs with local, national and regional governments as well as the general public, and progress is being made toward the formation of a network of researchers and managers responsible for the design and implementation of a Conservation Management Plan, as recommended last year (IWC, 2012f, p.25).

The Committee expresses **concern** over the relatively large number of strandings from this small population (9 over a 12-year period). Given its endangered status under the IUCN red list and the potential for growth of unregulated whale watching in the region, the Committee **recommends** that whalewatching vessel operator training workshops should be conducted with a view to promoting best practice for whalewatching and to support the need for development of whalewatching guidelines (see Item 23.

The Committee further noted plans to produce an updated mark-recapture estimate of population size. It **reiterates** its earlier recommendation (see International Whaling Commission, 2011), regular abundance surveys to be repeated on a regular basis, with assistance in planning and analysis from relevant experts.

10.7.2 The development of a CMP

The Committee has previously noted that this population is a likely candidate for an IWC Conservation Management Plan (CMP). An intersessional working group was formed at last year's IWC meeting to facilitate this process in accordance with the guidelines adopted last year by the Commission (IWC, 2012b). A key component of any plan is that it is supported by a broad range of stakeholders including range state governments. The Committee welcomes the progress that has been made in assembling the documentation required to submit a proposal to the IWC for a candidate CMP. It strongly **recommends** that discussions between scientists and

relevant range state governments continue to further progress the CMP process.

10.7.3 Work plan

The Committees views on the workplan for BRG are given under Item 21.

10.8 Cruises

10.8.1 The IWC-POWER programme

10.8.1.1 PLANNING THE IWC-POWER[14] PROGRAMME

The Scientific Committee has been discussing the objectives and priorities of the IWC POWER programme since 2009 (e.g. IWC, 2012t) and this culminated in the discussions given in IWC (2012l).

The Committee and the Commission agreed the long-term objectives for the programme in IWC (2012l).

> 'The programme will provide information to allow determination of the status of populations (and thus stock structure is inherently important) of large whales that are found in North Pacific waters and provide the necessary scientific background for appropriate conservation and management actions. The programme will primarily contribute information on abundance and trends in abundance of populations of large whales and try to identify the causes of any trends should these occur. The programme will learn from both the successes and weaknesses of past national and international programmes and cruises, including the IDCR/SOWER programme.'

(IWC, 2012t) provided an extensive review of current knowledge in the region, and a list of medium-term priorities by species for the programme was developed.

SC/64/Rep1 presents the report of a meeting of the Technical Advisory Group (TAG) established last year. The report builds upon the extensive work already undertaken to provide an overall strategy and detailed 5-year plan for the IWC POWER programme, including statistical power calculations. The TAGshop initially focused on methodological issues to investigate distribution, abundance and trends. It made a number of practical recommendations for visual methods (SC/64/Rep1, Item 3.1) regarding survey mode, track design, and angle and distance experiments. Initial power analyses suggest the need for increased future effort (at present only one vessel is available) to be able to detect trends. The results of the short-term programme (see below) will allow improved power analyses and a better determination of required effort for the medium-long-term. Other techniques examined included mark recapture and acoustic methods and recommendations for further investigative and collaborative work were made. It also examined past data to investigate the amount of effort required to obtain photo-IDs and biopsy samples; this information is valuable for both short- and medium-term planning.

After reviewing the available information, an integrated short-term strategy (for the years up to 2015) was developed in light of the medium-long-term objectives (SC/64/Rep1, item 7.1). The objective is to complete an initial survey of the remaining poorly covered areas (SC/64/Rep1, fig 1) to facilitate choice of appropriate survey blocks and strata for a long-term monitoring plan along with the essential undertaking of a more specific power analysis of the effort required to detect trends in abundance should they occur.

The TAG also made recommendations on the need for improved data collection systems, archiving of all kinds of data collected during the programme and a mechanism to ensure prompt collaborative analyses of the data collected (SC/64/Rep1, item 6). A detailed proposal for how to address these issues will be made at the 2013 Annual Meeting.

The Committee welcomes this report and **endorses** its recommendations. Noting the valuable contributions already made by Japan, Korea, the USA and Australia, it **strongly encourages** range states and others to consider more active participation in the IWC-POWER programme.

10.8.1.2 REPORT ON THE 2011 IWC-POWER CRUISE

The 2nd annual IWC-POWER survey was successfully conducted from 11 July to 8 September 2011 in the eastern North Pacific (north of 40°N, south of the Alaskan Peninsula, between 170°W and 150°W) using the Japanese Research Vessel, the *Yushin-Maru No.3*. The cruise had five main objectives:

(a) to provide information for the proposed future in-depth assessment of sei whales in terms of both abundance and stock structure;
(b) to provide information relevant to *Implementation Reviews* of whales (e.g. common minke whales) in terms of both abundance and stock structure;
(c) to provide 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;
(d) to provide biopsy samples and photo-identification 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; and
(e) to provide essential information for the intersessional workshop to plan for a medium-long term international programme in the North Pacific.

[14] North **P**acific **O**cean **W**hale and **E**cosystem **R**esearch programme

Plans for the cruise were endorsed by the Committee (IWC, 2011) and the Committee agrees that it was duly conducted following the guidelines of the Committee.

On behalf of the Committee, Kato thanked the Cruise Leader, researchers, captain and crew for completing the second cruise of the POWER programme. The Government of the USA had granted permission for the vessel to survey in its waters, greatly contributing to the success of the cruise. The Government of Japan generously provided the vessel and crew for the survey.

Recognising the tremendous effort and expense in conducting the IWC-POWER survey, the Committee was yet again disappointed that potentially valuable data on stock structure was not able to have been collected as it had not been possible to resolve CITES permit issues regarding collection of biopsy samples collected outside of Japanese waters. The Committee **strongly recommends** that these issues are resolved. In planning for the 2013 survey, Hiruma reported that some initial progress on this front was made, and would continue. He hoped to be able to report a positive outcome to ongoing talks between the governments of Japan and USA in the near future. Brownell explained that the Japanese research vessel with biopsy samples collected on the high seas can enter and exit the US EEZ without a CITES permit, but biopsy samples cannot yet be collected in the USA.

10.8.1.3 THE 2012 IWC-POWER CRUISE

SC/64/Rep 7 presented the report of the detailed planning meeting for the 2012 IWC-POWER cruise that had been endorsed last year (IWC, 2012l). The cruise will take place north of 40ºN to the North American coast between 140°W and 135°W. The vessel kindly supplied by Japan will depart on 13 July 2012. The Committee **endorses** the report and looks forward to receiving the report of this cruise next year.

10.8.1.4 PLANS FOR THE 2013 IWC-POWER CRUISE

SC/64/O7 presented the research plan for the fourth survey in the IWC-POWER programme. The research area will be from the area from 160º-135ºW, between 30º- 40 ºN latitude. The plan was drawn up following guidelines agreed at the 2010 and 2011 Tokyo Planning Meetings (SC/63/Rep5 and SC/64/Rep1) and in light of the objectives developed in SC/64/Rep1. The cruise will collect line transect data, to estimate abundance, and biopsy/photo-id data. Biopsy sampling will be undertaken on priority species (sei, fin, right, blue and humpback whales) and on other species on an opportunistic basis. Some dedicated research time will also be allocated to photo-identification and/or video-taping of fin, right, blue and humpback whales. Final planning will take place at a planning workshop to be held in Tokyo in October 2012.

The Committee thanks the Government of Japan for its generous offer of providing a vessel for this survey.

10.8.2 Other North Pacific cruises (and see Item 6)

10.8.2.1 REPORT OF JAPANESE CETACEAN SIGHTING SURVEYS IN THE NORTH PACIFIC IN 2011

Three systematic dedicated cetacean sighting surveys were conducted in 2011 by Japan (ICR) as a part of JARPNII to examine the distribution and abundance of large whales in the Western North Pacific. The total searching distance was 4,060.3 n.miles. The sei whale was the main species sighted. The plans for these surveys were endorsed in the last year (IWC, 2012f) and the surveys were conducted as planned (SC/64/O6).

10.8.2.2 PLANS FOR JAPANESE CETACEAN SIGHTING SURVEYS IN THE NORTH PACIFIC IN 2012

SC/64/IA6 reports on plans for three systematic dedicated sighting surveys by Japan (ICR) as a part of JARPNII in the North Pacific in 2012, the first of which is currently underway. The main objective is to examine the distribution and estimate the abundance of common minke and Bryde's whales for the management and conservation purposes. Distance and angle estimation experiments will be conducted on all crises. Biopsy skin samples of blue, fin, humpback and right whales will be collected on an opportunistic basis. Photo-identification experiments on blue, right and humpback whales will be also conducted opportunistically. Reports of the three sighting surveys will be submitted to the 2013 Annual Meeting.

10.8.3 Cruises in the Antarctic Ocean

10.8.3.1 PROGRESS ON IDCR-SOWER CRUISES PUBLICATIONS

An intersessional email correspondence group (IWC, 2012s, Annex R) worked by correspondence and also met at this meeting. Its terms of reference were to consider:

(a) updating the IWC website; and
(b) creating a special volume of the Journal of Cetacean Research and Management.

Plans are already underway with respect to (a) including inclusion of photographs, video, acoustic recordings and links to key publications and reports. Pertaining to (b), the Group prepared a proposed outline for the volume, with suggested authors/lead persons for each topic identified (see Annex G).

The Committee endorses the approach proposed. It agrees to the appointment of Bannister to lead the creation of the commemorative volume. An Editorial Board was nominated and tasked with responsibility for the volume's preparation.

The Committee **agrees** that the work contributing to the volume would be greatly facilitated by the preparation of some standard sighting datasets (for species other

than Antarctic minke whales). The Secretariat kindly agreed to prepare such datasets from DESS in collaboration with knowledgeable scientists.

10.8.3.2 REPORT OF THE 2011/12 CETACEAN SIGHTING SURVEY IN THE ANTARCTIC

Plans for a dedicated sighting survey in the Antarctic in the 2011/12 austral summer season were presented last year and subsequently endorsed by the Committee (IWC, 2012f). The research vessels *Yushin-Maru No 2* and *Yushin-Maru No 3* were to survey in Area IIIE, Area IV and western part of Area V. The survey methods were to be the same as in IWC-SOWER surveys, and trackline design was improved to provide approximately uniform coverage probability. Furthermore, the planned sighting procedure was in accordance with the guidelines agreed by the Scientific Committee (IWC, 2012v). Unfortunately no research activity could be conducted due to external violent interference by an anti-whaling group (SC/64/IA8).

The Committee **expresses regret** that these actions had prevented the sighting survey from being conducted as reportedly planned. Following the cessation of the IDCR/SOWER programme in 2009, these surveys now provide the only dedicated cetacean sighting data in this region of the Southern Ocean that might be used for abundance estimation, and as such are extremely valuable to the work of the Scientific Committee.

10.8.3.3 PLANS FOR CETACEAN SIGHTING SURVEYS IN THE ANTARCTIC IN THE 2012/13 SEASON

A systematic two-vessel sighting survey for abundance estimation is planned in the Antarctic in the 2012/2013 season (SC/64/IA7) as part of JARPA II. The research area is south of 60°S in the Antarctic, in the eastern part of Area III, throughout Area IV and in the western part of Area V, between 35°E and 175°E from December 2012 to March 2013. Details of the cruise, which also incorporates biopsy sampling and photo-identification work are incorporated in Annex G, Item 6.5. The cruise report will be prepared by researchers and submitted to next year's annual meeting.

The Committee reviewed and endorses the plans for the proposed sightings survey. Noting the insight gained in SC/64/Rep4 on internally-estimated cue rates, it suggests that efforts be taken to ensure accurate times of sightings in IO mode, so that delayed and simultaneous duplicates could be more readily distinguished. The Committee **agrees** that this will be useful for estimating abundance from these data, and also invited any further suggestions for improved survey protocols from the developers of the methods described in SC/64/IA2 and SC/64/IA13, based on lessons learned in completing their analyses.

10.9 Progress towards an in-depth assessment of North Pacific sei whales

SC/64/IA11 presented an abundance estimate of North Pacific sei whales using data from the 2011 IWC-POWER cruise. Standard line transect methodology was applied to estimate abundance, assuming $g(0)=1$. In order to examine the robustness of the abundance estimate to alternative stratification options and detection functions, a sensitivity analysis was conducted. The abundance estimate for the surveyed area in the eastern North Pacific (north of 40°N, south of Alaskan Peninsula, between 170°W and 150°W), was 6,587 (CV=0.420). When data from recent cruises become available, a revised abundance estimate for North Pacific sei whales will be presented using the IWC-POWER sighting data from the period 2010-2012.

The Committee also received the report of the inter-sessional working group that had been appointed last year to prepare for the assessment. The group saw no impediment to conducting the In-Depth Assessment (IDA) as planned in 2013. It is anticipated that analyses of sei whale sightings from the POWER surveys through 2012 will be available for the assessment. The IDA will not address the question of suitability of data for use in the RMP.

Work on the historical catch series has proceeded. Allison has received new data on Canadian historic catches that is being entered into the IWC database. The findings of a new analysis of Soviet North Pacific catch records are also being incorporated. Sei whale catches in the IWC database are higher than the true catches because protected species like fin and humpbacks were reported as sei whales.

The Committee was informed that Mizroch and Ohsumi have recently analysed a sample of Japanese coastal whaling log books, and found that the catches of sei and Bryde's whales are differentiated in the log books, while this is not the case in the IWC individual catch data base, although the total numbers agree. The Committee **recommends** that this work be extended, in collaboration with Allison, to cover the years for which the IWC and Japanese figures differ. The Committee also **recommends** that the Secretariat be requested to consolidate other historical catch series for this species, and together with the Working group, being collating all available information in order to complete this assessment.

The Committee **recommends** that the sei whale IDA proceed as planned at the 2013 Annual Meeting. An intersessional steering group was appointed to oversee preparations (Annex Q).

11. STOCK DEFINITION

This agenda item was established in 2000, when a Working Group was established (IWC, 2001c). This year, updated Terms of Reference were adopted by the Working Group to reflect the evolving needs of the Committee (Appendix 2, Annex I). Continuing its

original purpose, the Working Group will develop a reference glossary of stock related terms, to aid consistent definition of 'stocks' in a management context for the Committee (see 11.4). The Working Group will also continue to develop guidelines for preparation and analysis of genetic data within an IWC context (see 11.1), and software that evaluates the management utility of various population genetic analyses (see 11.3). A major change stems from the Committee's request for the Working Group to discuss high-priority Committee papers related to population structure. The Working Group will now provide the Committee with feedback and recommendations concerning stock structure related methods and analyses used in those papers (see 11.2). The Report of the Working Group is given as Annex I.

11.1 Guidelines for DNA data quality and genetic analyses

Two sets of reference guidelines have been developed and endorsed by the Committee (IWC, 2009e) and form 'living documents' that can be updated as necessary. The first set addresses DNA validation and systematic quality control in genetic studies (SC/64/SD2). The second set provides guidelines for some of the more common types of statistical analyses of genetic data used in IWC contexts, and contains examples of management problems that are regularly faced by the Committee. Substantial progress on these latter guidelines was made during a small workshop in April, and this document will now be completed intersessionally (see Item 11.5). Both guidelines will also be published in the peer-reviewed literature.

11.2 Statistical and genetic issues related to stock definition

A number of stock related papers were discussed by the sub-group at the request of the following sub-committees and Working Groups: Revised Management Procedure (Annex D), Aboriginal Whaling Management Procedure (Annex E), Pre-Implementation Review of Western North Pacific Common Minke Whales (Annex D1), and Other Southern Hemisphere Whale Stocks (Annex H). Technical comments on these papers are given in Annex I.

Some general comments were made which are relevant to many papers submitted to the Scientific Committee. Firstly the Committee noted that uncertainty around point estimates is not always considered and urged that, where available, confidence intervals should always be reported in order that precision of estimates can be evaluated. Secondly, failure to reject a hypothesis, e.g. panmixia, is not equivalent to support for that hypothesis; strong statements of support should not be given to any null hypothesis that has not been rejected. Thirdly, there is often inconsistent treatment and interpretation of the genetic differentiation metric 'FST' amongst papers. Simplistic interpretations of this statistic should be avoided, such as conversion into migration rates, as these can misinform management scenarios.

The Committee **agrees** to compile results from past RMP trials of various species intersessionally, in order to try to identify where there were 'tipping points' in inter-population migration rates which made significant differences to trial outcomes, i.e. at what level does migration make a difference for each species? Such information may help to better define the parameter space over which inter-population migration rates are informative to management. This work will be presented at the 2013 Annual Meeting (see 11.5) and can be carried out in conjunction with projects being undertaken by the sub-committee on the RMP and the SWG on the AWMP (see Annexes D and E respectively).

11.3 Progress on the Testing of Spatial Structure Models (TOSSM)

The aim of TOSSM (IWC, 2007a) is to facilitate comparative performance testing of population structure methods intended for use in conservation 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. It is available for all to use and simulated datasets exist for three of the five stock-structure Archetypes previously proposed by the Committee (IWC, 2010c, p.51).

TOSSM is also a flexible simulation tool for investigating how certain observed genetic phenomena might arise among animals such as whales whose life histories are not well described by classical genetic theory. A practical example of this is provided by the Pacific Coast Feeding Group (PCFG) of eastern gray whales (see Annex E), which appears to be genetically different from the northern Aleutian feeding ground, yet also receives immigrants from it (which would be expected to influence observed genetic differentiation). Simulation testing of various immigration scenarios in the TOSSM framework was carried out in SC/64/AWMP4 (Annex E). The Committee welcomes this paper and noted its value in exploring the range of scenarios compatible with the observed differentiation, as it investigates a range of factors, including the degree and timing of isolation and effective population size of the PCFG. The results have informed the current *Implementation Review* of gray whales (Annex E, Item 2.2.2). Some longer term work items were suggested for this study: (1) to incorporate a minimum female calving interval into the most realistic (9-stage) life history model; (2) to report results using summary statistics that are as independent as possible (and therefore provide multiple checks on the similarity

between the simulations and the observed data); and (3) to identify research needs for future field surveys in order to improve current parameterisation of the models.

11.4 Terminology and unit-to-conserve

Defining and standardising the terminology used to discuss 'stock issues' remains a long standing objective of the Working Group, in order to help the Committee report on these issues according to a common reference of terms. A suite of definitions for Committee terms such as 'population', 'subpopulation', 'stock', 'sub-stock' and 'management unit' was provided in SC/64/SD3 as a first effort to build a 'living' glossary of stock related terms, with reference to past discussions within the Working Group and to terminology applied in other management contexts. This glossary will be developed intersessionally by members of the Committee, who will also try to come up with a series of agreed criteria for classifying population units by these terms, with reference to their usage in other management and conservation contexts (see Item 11.5).

11.5 Workplan

The Committee's view of the workplan for SD is given under Item 21.

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 (e.g. IWC, 1996; 1997a; 1998; 1999a; 1999b; 2001b). 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)

SOCER provides an annual update, requested by the Commission, on: (a) environmental matters that potentially affect cetaceans and (b) developments in cetacean populations/species that reflect environmental issues. It is tailored for a non-scientific audience. The 2012 SOCER (SC/64/E2) was restricted to the Indian Ocean as the regional focus, due in part to reduced funding. A primary source of information was the International Indian Ocean Cetacean Symposium, held in 2009 on the Maldives[15]. Overall, the awareness of environment-related threats to cetaceans is high in the region, but implementation and control measures are poor. However, this provides an opportunity to introduce best practices, state-of-the-art procedures for critical issues such as fisheries interactions, ship strikes, whalewatching, and new, well-thought-out Marine Protected Areas.

During discussion, it was noted that marine research in the Indian Ocean region is focused in a few locations, despite having expanded over the past five years. Cetacean, or indeed environmental, research is scant or absent in many areas and there are few peer-reviewed reports from the region. The Committee was pleased to learn that the next issue of JCRM (published this month) contains 15 peer-reviewed papers from the Indian Ocean.

Highlighting specific issues in the region, there are clearly 'hotspots' in terms of pollution, fisheries by-catch and environmental degradation (e.g. Arabian Gulf). Reports of mass mortality events (152 small cetaceans in Iran in Sept 2007, spinner dolphins and striped dolphins in two events, and 200-250 pantropical spotted dolphins in Pakistan in March 2009) on the northern coast of the Indian Ocean are particularly concerning because these three species do not usually mass strand in these numbers and the latter event occurred the day after the commencement of a multi-national naval exercise (AMAN 09) in Pakistan waters.

Next year the focus of the SOCER will be the Atlantic Ocean region and the SOCER editors request Committee members provide input, preferably in the form of pdf files, of papers published between 2011 and 2013.

12.2 Pollution

POLLUTION 2000+ is a long standing programme of the Committee. Three goals were identified at the IWC Intersessional POLLUTION 2000+ Phase II Workshop (IWC, 2011):

(1) develop integrated modelling approaches and risk assessment framework for evaluating the cause and effect relationship between pollutant exposures and cetacean populations;

(2) identify data needs and available datasets or case studies that would be appropriate for the models that are exposure driven, source driven or effects driven; and

(3) develop a prioritisation framework to evaluate the broad number of environmental pollutants.

12.2.1 Update on POLLUTION 2000+ Phase II progress

At the intersessional POLLUTION 2000+ Phase II workshop held in 2010(IWC, 2011d), four objectives for the cetacean pollutant exposure and risk assessment modelling component were agreed: (1) improve the existing concentration-response function for PCB-related reproductive effects in cetaceans (completed in

[15] www.mrc.gov.mv

2011); (2) derive additional concentration-response functions to address other endpoints (e.g., survival, fecundity) in relation to PCB exposure; (3) integrate improved concentration response components into a population risk model (individually-based model) for two case study species: bottlenose dolphin and humpback whale (completed in 2011); and (4) implement a concentration-response component for at least one additional contaminant of concern. The authors of SC/64/E5, funded by the IWC, investigated how contaminant-induced effects on immune function could be incorporated into the existing individual-based population framework constructed to assess the impact of polychlorinated biphenyls (PCBs) on cetacean populations (Objective 2).

By determining how the blubber PCB annual accumulation rates relate to concentrations in breeding females, comparisons with empirical data can be made and predictions about effects on various populations formulated. For example, based on the current blubber PCB concentrations determined in breeding females from two bottlenose dolphin populations in Sarasota Bay and St Joseph Bay, Florida, the model predicts that these populations would remain stable or increase slightly over the 50 –100 year timescales projected. Conversely, the bottlenose dolphin population in Brunswick, Georgia, where PCB levels in breeding females are 10 times higher, is predicted to decline over the same period without external population inputs through immigration.

In the future, impacts on other populations and species, such as humpback whales from the Gulf of Maine will be investigated (e.g., Hall *et al.*, 2011), as additional contaminant data for females become available. In addition, future developments of this model will include a sensitivity analysis; incorporation of a bioaccumulation model to estimate blubber concentrations for populations or species in which only levels in prey are known; and making the model available online with a user-friendly interface.

During discussion (Annex K), it was noted that body condition of cetaceans may have a significant effect on susceptibility to impacts from contaminant exposure. For example, body condition could affect immune function independently so when food is limited and animals are in poor condition this will further affect their ability to fight off pathogens. Furthermore, if PCBs are released from the blubber during periods of increased energy demand then more may be bioavailable. Although the current model does not account for body condition, the final phase of the project will incorporate a toxicokinetic model that will include body condition parameters, similar to an approach taken by Hickie *et al.* (1999).

The Committee **recognises** that cetaceans are exposed to a mixture of environmental contaminants. It **suggests** that, if possible, mixtures of contaminants should be added to the model. Due to the extremely high levels of PCBs measured the bottlenose dolphins in Brunswick, Georgia, USA, the Committee **strongly recommends** the continued monitoring of this population. The Committee **commends** the authors for the most recent results from the IWC's POLLUTION 2000+ programme and **strongly supports** their continued work to develop the necessary tools for analyses of pollutant exposure risk to cetaceans.

12.2.2 Oil Spill Impacts

12.2.2.1 UPDATE ON RESPONSE TO DEEPWATER HORIZON OIL SPILL IN THE GULF OF MEXICO

An update on the 2010 Deepwater Horizon (DWH) oil spill in the Gulf of Mexico was provided, where the injury assessment for cetaceans continues. The Natural Resource Damage Assessment (NRDA), a formal process in the USA to assess damages to natural resources, has included photo-identification, remote biopsy, live capture health assessments, and evaluation of stranding data for common bottlenose dolphins in nearshore waters. Analyses of tissue, blood, and urine samples from cetaceans in the Gulf of Mexico for PAHs and PAH metabolites have also continued, as outlined in the NRDA plans.[16]

In addition to the NRDA, an Unusual Mortality Event (UME) is ongoing in the northern Gulf of Mexico principally involving bottlenose dolphins [17]. The UME involved 745 cetacean strandings in the Northern Gulf of Mexico from 1 February 2010-10 June 2012, which started before the DWH oil spill. The historical average (2002–2009) for this area is 74 dolphins per year. The vast majority (95%) of stranded dolphins have been found dead; however, 35 stranded alive and seven were taken to facilities for rehabilitation. The UME is still ongoing, however stranding rates in the Northern Gulf in April and May 2012 were near-average.

Although it is typical to see strandings of dolphins less than 115cm (perinates) in the spring, there was a marked increase in strandings of this age class in spring 2011. Of these perinatal dolphin strandings, most were found to have died *in utero*. Twelve of 51 cases targeted for testing were positive for *Brucella,* and 8 cases were confirmed to have died of brucellosis. Compared to 2011, the number of stranded perinatal dolphins was lower during the spring of 2012. Three additional cetacean studies related to the DWH spill are underway in the Gulf of Mexico, including two passive acoustic surveys and one tagging study of sperm whales.

[16] http://www.gulfspillrestoration.noaa.gov .
[17] http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico2010.htm

The Committee **commends** this research related to the DWH oil spill and **strongly recommends** continued investigations into the impacts of the DWH oil spill on cetaceans, including exposure to oil spill related contaminants, biomarker investigations and health assessments. Furthermore, it **encourages** the early and full reporting of the findings of DWH studies into the public domain.

12.2.2.2 CAPACITY BUILDING REGARDING OIL SPILL IMPACTS ON CETACEANS

In 2011, the Committee agreed that there was significant need and interest in cross-training between the oil spill and marine mammal communities and it has established an intersessional e-mail group to evaluate the possibilities for such training (IWC, 2012o). As part of an effort to better understand and be prepared for oil spills and their impacts on marine mammals particularly cetaceans, workshops and planning exercises are underway or have taken place including: (1) an oil spill response workshop held at the International Conference on Marine Mammal Protected Areas (ICCMMPA)[18] and (2) dissemination of information and data on marine mammals at international meetings on oil spill response or with oil spill responders.

The ICCMMPA workshop included presentations from the Regional Marine Pollution Emergency Information and Training Centre (REMPEITC) in the Wider Caribbean Region and the Oiled Wildlife Care Network, industry, oil spill responders, and marine mammal scientists and managers. A number of recommendations developed at the workshop were reviewed and found similar in nature to those discussed last year (IWC, 2012o), in particular the desirability of companies, agencies, stakeholders and international organisations to work in cooperation with marine mammal specialists on oil spill response plans.

In discussion, the Committee noted that some response plans that are currently under development, especially those related to the Arctic, focus on identifying sensitive areas for marine mammals. However, in most areas, important baseline data are lacking and the Committee **recommends** that these data gaps be filled. It also **recommends** that oil spill response efforts throughout the world should include pelagic as well as coastal areas; further information on current capacities and mechanisms of oil spill recovery will be valuable. Last year, the Committee noted that a review of the capacity for oil spill response in the Arctic was an urgent priority in the aftermath of the DWH oil spill (IWC, 2012o). The Committee **agrees** that the recommendations from the 2011 MMPA workshop in Martinique will provide guidance on oil spill prevention and response in the Arctic at the upcoming intersessional Arctic Anthropogenic Impacts Workshop (see Item 12.5.3).

12.2.3 Other pollution related issues

Fossi provided information on Mediterranean odontocetes exposed to environmental stressors, in particular to persistent organic pollutants, emerging contaminants, polycyclic aromatic hydrocarbons and trace elements. In Panti et al. (2011), the response of 'gene expression biomarkers' was evaluated in Mediterranean striped dolphin in three sampling areas: the Pelagos Sanctuary (Ligurian Sea), the Ionian Sea, and the Strait of Gibraltar. The mRNA levels of five putative biomarker genes were measured for the first time by quantitative real-time PCR in cetacean skin biopsies. Striped dolphins from the Pelagos Sanctuary are more exposed to ecotoxicological hazard than those inhabiting the Ionian Sea and the Strait of Gibraltar. This evidence focuses attention on the potential risk to cetaceans inhabiting the largest pelagic MPA in Europe and the Committee **stresses** the importance of effective and long-term management of MPAs in order to preserve species in their habitats.

The sources of these contaminants in the study areas are unknown. The Committee **recommends** that the sources be identified, particularly for animals within the Pelagos Sanctuary, to enable the development and implementation of mitigation measures.

In 2005, the Conservation Committee agreed that a research program to address the issue of inedible 'stinky' gray whales caught by the Chukotkan aboriginal subsistence hunters should be established (IWC, 2006a). This year, the Committee examined IWC/64/CC10, which presented information on the various chemical compounds measured in tissues of malodorous ('stinky') and clean gray whales collected from 2005 through 2011. These included polycyclic aromatic hydrocarbons (PAHs), persistent organochlorines, benzene derivatives and chlorinated PAHs. The authors commented that the odorous carbonyl compounds measured in tissues of 'stinky' whales may be a result of slow metabolism of petroleum hydrocarbons that occur in the Pacific Ocean. They also noted concentrations of persistent organochlorines in the gray whale tissues were low or not detected (DDT).

It was noted (Annex F) that the finding of non-detectable DDTs is in contrast to the finding of measurable DDT levels in gray whale calves and mothers sampled in the lagoons in the Baja California region reported in SC/64/E4. Differences in DDT levels among these gray whales are most likely due to differences in contaminant levels on their feeding grounds although levels are generally low. The Committee **emphasises** that a clearer indication of which samples were 'stinky' and which samples were controls would make the information provided easier to

[18] http://second.icmmpa.org

interpret. Due to the lack of clarity in this regard (SC/64/CC10), no new conclusions could be drawn regarding 'stinky'gray whales. The Committee **reiterates** its previous **recommendations** (e.g. IWC, 2006c; 2007e; 2008f; IWC, 2009f) that futher efforts be made to determine the cause of the 'stinky whale condition.

12.3 CERD (Cetacean Emerging and Resurging Disease)

In 2007, the Committee recognised the need for increased research and standardised reporting in a wide range of disciplines dealing with cetacean health (IWC, 2008f), which led to the creation of the Cetacean Resurging and Emerging Disease (CERD) Working Group.

12.3.1 Update from CERD Working Group

An update to the CERD Work Plan agreed last year (IWC, 2012p) was presented. This workplan included: (i) identification of regional and national experts/points of contact via Steering Committee membership; (ii) creation of a listserve and a website; (iii) creation of a Framework Document; and (iv) identification of and contact with organizations synergistic with the goals of CERD. The CERD working group (WG) made significant progress on all tasks, except on the Framework Document, where work is now underway to better define the long-term vision and goals for the CERD working group.

12.3.2 Progress on CERD Website

The CERD website is being developed in two phases. The first phase focuses on large cetacean species and relies on a 'consultation and sharing' approach. The second phase is intended to include all cetacean species and incorporate a potential 'reporting' role. This website will have 'public' and 'registered user' levels. The public level will provide basic information on diseases in cetaceans, as well as access to selected discussion forum content. Registered users will have full access to the site, including in-depth information on cetacean disease, as well as to discussion forums and posting ability. On the main page, a 'map it' feature will allow registered users to record geographic locations of disease incidents, while a 'current events' header will alert website visitors to recent events in cetacean disease and facilitate international communication. Links will be provided for quick access to discussion boards that can be shared with groups focused on other topics such as pollution, ship strikes and marine debris.

It was noted that researchers examining photographs on the website may be able to distinguish between wounds from entanglements, ship strikes or marine debris and this discussion underlined the overlap among these areas. The Committee **agrees** that it will be useful to incorporate standardised tissue collection protocols on the CERD website. The Committee thanked the CERD WG and the Secretariat for their efforts on developing the website and **encourages** continued development of this tool.

12.3.3 Other disease related issues

SC/64/E1 presented the results of a study of six *Morbillivirus*-infected cetaceans stranded along the Italian coastline between 2009 and 2011. The authors concluded that: (1) *Morbillivirus* infection continues to represent a major threat to cetacean health and conservation in the Mediterranean Sea with an increasingly expanding 'host range' of the virus; and (2) the cases of morbilliviral infection characterized by an apparently exclusive involvement of the animal's brain tissues are a matter of concern, both from the conservation and from the comparative pathology standpoints, thereby underscoring the role of cetaceans as models for the study of their human neurological disease counterparts.

Discussion (Annex K) focused on the types of tests and assays performed on these animals and the need for increased surveillance for neurologic diseases in cetaceans. The Committee welcomed this study and **encourages** further studies on these pathogens in cetaceans.

The Committee also noted that there was worldwide press coverage over the recent (February - May) unusual mortality event (UME) of about 900 dead long-beaked common dolphins, Delphinus capensis, in Peru, but based on these press reports there remains considerable uncertainty about the cause of this UME. However, no scientific reports were available on this UME for the SC to review, but the SC looks forward to receiving reports on the UME next year.

In SC/64/E4 preliminary results were presented on contaminant levels (Organochlorine Compounds - OCs,) and biomarkers from biopsies in the San Ignacio Lagoon (Mexico). These preliminary data reveal an accumulation of OCs in gray whale calves resulting from the lactational transfer of these compounds from their mothers. Exposure to OCs (such as DDTs) at early life stages may have toxic impacts on their developing endocrine, immune and neural systems. The paper was discussed fully in Annex K.

The Committee welcomed this paper, noting its relevance to the IWC's POLLUTION 2000+ programme and **encourages** continued studies.

SC/64/E8 provided a review of diseases and microorganisms, as well as the public health and conservation impacts from cetaceans that stranded in Costa Rica during 2004-2011. Humans and cetaceans affected by marine *Brucella* can develop severe disease such as neurobrucellosis and osteomyelitis, and the authors concluded that conservation policies should support research that investigates incidence,

prevalence, geographic distribution and host range of *Brucella* infection in cetaceans. The paper is discussed fully in Annex K.

The Committee **welcomes** this paper, noting that data obtained from studies such as this are part of 'The One Health' concept - a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment[19]. The Committee recognised *Brucella* as an important zoonotic pathogen and **encourages** additional research on this disease agent.

12.4 Anthropogenic sound

In 2010, the Committee reviewed evidence of masking of cetacean calls from anthropogenic sound, with an emphasis on low-frequency sounds (< 1 kHz) from commercial shipping and airguns used during seismic surveys (IWC, 2011g). It had recommended that: (i) the masking potential of anthropogenic sources be quantified and acoustic measurements be standardised; and (ii) IWC member governments work to develop a quantitative approach for assessing cumulative impacts of anthropogenic sound on cetaceans.

12.4.1 Mitigation of effects of anthropogenic sound on cetaceans

US federal regulations require scientists and representatives of offshore industries to acquire incidental harassment authorizations for activities that may disturb marine mammals, but the potential impacts of sound are often considered on a project-by-project basis in isolation from one another. This precludes meaningful analysis of cumulative impacts from multiple sources. In response to consideration of offshore industrial activities in the Alaskan Arctic, Moore *et al.* (2012) proposed a three-step assessment framework based development of *acoustic habitats*, which constitute the aggregate sound field from multiple sources compiled at spatial and temporal scales consistent with the ecology of Arctic marine mammals. Assessment framework steps include: (i) the development of acoustic habitat maps depicting anticipated sound fields from multiple sources; (ii) an overlay of acoustic-habitat maps with marine mammal seasonal distribution and density maps to identify areas or periods of concern and data gaps; (iii) development of precautionary measures to protect marine mammals from potential impact and a prioritisation of data gaps and research needed to address those gaps.

In the US, the Cetaceans and Sound (CetSound) project is now working toward mapping products envisioned in the first two steps of this framework[20]. The CetSound project consists of two working groups convened to develop mapping tools: the Underwater Sound-field Mapping (SoundMap) and the Cetacean Density and Distribution Mapping (CetMap). The overarching objective of the SoundMap group is to create maps depicting the temporal, spatial, and spectral characteristics of both chronic (e.g., shipping) and episodic (e.g., seismic survey) underwater noise. The overarching objective of the CetMap group is to create regional cetacean density and distribution maps that are time- and species-specific, using survey data and models that estimate density using predictive environmental factors. To augment the more quantitative density mapping and provide additional context for impact analyses, the CetMap group is also identifying known areas of specific importance for cetaceans, such as reproductive areas, feeding areas, migratory corridors, and areas in which small or resident populations are concentrated. The Committee **commends** the initial development of these powerful mapping tools, **endorses** this work and **strongly recommends** support for further development and improvement of these tools.

The Committee also **welcomes** the information on work being undertaken regarding noise by IUCN's Western Gray Whale Advisory Group and especially its Noise Task Force[21] (see Annex F, Appendix X).

12.4.2 Other anthropogenic sound related issues

Underwater noise from commercial shipping is chronic (IWC, 2011g). The IMO has established a correspondence group (CG) to develop non-mandatory guidelines to address noise from commercial ships; the IWC Secretariat participates in this group (IWC/64/4G). The IMO CG will finish the first draft of their report by the end of 2012 and it will be presented to the IMO in early 2013. The Committee **commends** the continued discussions between the IMO and IWC regarding efforts to reduce noise of newly built vessels. Further, it noted the importance of identifying ship acoustic signatures and **encourages** the collection of these data, as well as the coupling of this information with the appropriate automatic identification system data.

At past meetings, the Committee has received updates on the development of a modelling effort to determine the population consequences of acoustic disturbance (PCAD) on marine mammals initially proposed by the US National Research Council in 2005. In 2009, the US Office of Naval Research supported a Working Group whose objectives included building a formal mathematical structure for the framework, which led to key adaptations to the original framework, including the incorporation of other sources of disturbance, physiological change and the use of health as the primary metric through which changes in individuals can potentially impact the population. Combined, this led to the framework being renamed the population consequences of disturbance (PCoD). The SWG noted

[19] http://www.onehealthinitiative.com/index.php and http://www.oie.int/en/

[20] http://cetsound.noaa.gov/index.html

[21] http://www.iucn.org/wgwap/wgwap/task_forces/

that PCoD is a significant improvement on the PCAD model. Although the current model focuses on single stressors, accumulative effects, behavioural responses and other factors (e.g., acoustic masking) that could potentially affect health could also be added to the model. The SWG **strongly encourages** further work on this model and looks forward to progress updates.

12.5 Climate Change

12.5.1 Progress on recommendations from the 2nd Climate Change Workshop

At the 2nd Climate Change workshop (IWC, 2010i), three themes were recommended with regard to the study of cetaceans in the Arctic: (i) single species-regional contrast; (ii) trophic comparison; and (iii) distribution shift. With regard to the first theme, results of passive acoustic sampling in 2008-09 provided a means to compare seasonal patterns in call detection from bowhead whales in the B-C-B and Spitzbergen stocks, providing a contrast in seasonal occurrence for this species between the Atlantic and Pacific sectors of the High Arctic (Moore et al. 2012b). Details of this work are discussed in Annex K.

As also discussed in Annex K, an overview of a new programme was received which was called the Synthesis Of Arctic Research (SOAR). It is a US-based activity, which aims to bring together a multidisciplinary group of Arctic scientists and Alaskan coastal community representatives to explore and integrate information from completed and ongoing marine research in the Pacific Arctic sector[22]. While SOAR is not focussed specifically on cetaceans, eight projects under its auspices will focus on aspects of beluga and bowhead whale ecology, which are related to the three study themes of the 2nd Climate Change Workshop.

The Committee **welcomes** these updates on cetacean-related science in Arctic waters, **endorses** the work undertaken thus far and requests future updates.

12.5.2 Small cetacean restricted habitats Working Group

Building upon the work of an intersessional working group to further recommendations made at the IWC Climate Change Workshop on Small Cetaceans in 2010 (IWC, 2012u), the Committee **agrees** to the following definition:

The spatial extent of the range occupied by these populations may vary by orders of magnitude, but one or more of the following conditions apply: (i) the species/population has narrow habitat requirements; (ii) the habitat is bounded by physiographic or oceanographic barriers; and (iii) other suitable habitat which the population might be able to access is unavailable because it is occupied by competitors. The first two conditions might apply to fixed populations, such as the vaquita - the third condition in particular requires further consideration and development. These conditions may also apply to populations of large whales (e.g. fin whales in the Mediterranean Sea and the Gulf of California) and it was agreed that large whales would be considered in future discussions on this topic.

The Committee **welcomes** this effort to further advance our understanding of the potential impacts of climate change in cetaceans. However, it also **urges** caution with regard to which populations and species should be focused upon with respect to climate change, so as not to detract from efforts to address more imminent threats and stressors such as bycatch. Creating a list of species or populations to which this definition might apply was suggested as one way to further develop the topic. The Committee also noted the importance of integrating and considering the findings of climate change-related analyses that have been conducted for other marine mammal species (e.g. polar bears and ice seals) when considering the issue for cetaceans.

12.5.3 Planning for intersessional Arctic Anthropogenic Impacts Workshop

In 2010, the Commission asked the Committee to develop an agenda for a workshop on Arctic Anthropogenic Impacts on Cetaceans (IWC, 2011a). Last year, a draft agenda was completed and a steering group formed (IWC, 2012q) to further develop a plan for the workshop. A revised agenda that focused on anthropogenic activities related to oil and gas exploration, commercial shipping and tourism was developed intersessionally. The Committee noted that the workshop agenda should be expanded to include consideration of other anthropogenic activities such as commercial fishing and scientific research. Given rapid environmental changes and increasing human activities in the Arctic, the Committee **encourages** the continued development of an Arctic Anthropogenic Impacts workshop focused on climate change, but **strongly recommends** that it:

(1) carefully define the geographical area to be addressed;
(2) focus only on Arctic cetacean species (i.e., bowhead whales, white whales, and narwhals);
(3) consider a broad suite of anthropogenic activities; e.g., oil and gas development, commercial fishing, commercial shipping, tourism, continental shelf mapping and scientific studies;
(4) specifically include possible impacts from underwater sounds, spilled oil, dispersants, invasive species and discharges (including dumping of ballast water) related to exploratory drilling and shipping;
(5) include a discussion about assessing the cumulative and synergistic impacts of anthropogenic activities.

[22] http://www.arctic.noaa.gov/soar/

The topic of anthropogenic impacts to cetaceans in the Arctic is broad and complex and the Committee **recommends** that the process should involve an initial scientific workshop followed by a more inclusive Commission meeting that addresses management and policy aspects of Arctic Anthropogenic Impacts on Cetaceans. It is anticipated that final specification for the scope, agenda and schedule for the workshop will be undertaken jointly by the workshop steering group and representatives of the IWC and Secretariat.

12.5.4 Other climate change related issues

The IMO is working to develop a mandatory Polar Code to manage the increases in ship traffic in Arctic and Antarctic waters anticipated with the reduction of sea ice associated with climate change (IWC/64/4). The Polar Code work is coordinated by the sub-committee on Ship Design and Equipment, as is the work regarding ship quieting (see item 9.2). The IWC's endorsement of noise reduction goals (i.e., 3dB in 10 years; 10 dB in 30 years) advanced at an international workshop on shipping noise and marine mammals (Wright and Okeanos Foundation for the Sea, 2008) were re-iterated in a document entitled *Status on Implementation of the Arctic Marine Shipping Assessment 2009 Report Recommendations*, available on the Arctic Council website[23]. The Committee **welcomes** this information, **reiterates its endorsement** of noise reduction goals and looks forward to continued collaborations between the IWC and the IMO on this topic.

12.6 Interactions between MREDs and cetaceans

Given information and a review provided last year, the Committee had endorsed a proposal for a workshop on interactions between marine renewable developments (MREDs) and cetaceans.

That workshop was held immediately prior to the present Annual Meeting and its report, 'Marine Renewable Developments and Cetaceans Worldwide' is given as SC/64/Rep6.

Simmonds presented the report and noted that a variety of MREDs are now being deployed worldwide, with the highest concentrations in the Northern Hemisphere, especially in northern Europe. The three main forms of MREDs at this time are: (i) wind farms; (ii) tidal-stream driven devices; and (iii) wave energy converters. Each of these, as well as their supporting infrastructure, has the potential for interaction with cetaceans during the construction, operation and decommissioning phases (Simmonds *et al.*, 2010).

The workshop received detailed reports on the current state of development and management of marine renewable energy in waters of Germany, the United Kingdom, Belgium and the USA, including trans-boundary issues now arising in the busy waters of Europe (SC/64/Rep 6, fig. 1). The workshop focused on the three main types of MREDs; and considered potential impact to cetaceans on aspects of 'supporting infrastructure' for MREDs. A number of papers and websites informed discussions throughout the workshop (Rep 7 Appendix 2); of particular use was a special synthesis of the work on MREDs conducted by ICES (Murphy *et al.*, 2012).

The Committee noted that MREDs may well play a major role in the mitigation of climate change, which may profoundly affect cetacean populations as discussed at prior climate change workshops (IWC, 1997b; 2010i). The Committee thanked Simmonds for the successful Workshop. In particular it **endorses** the Workshop's conclusions and recommendations (see especially SC/64/Rep6, item 5). These are briefly summarised below.

1. Strategy to minimise risk

Risks from both lethal and sub-lethal effects can be minimised via a series of actions: the collection, collation and analysis of appropriate baseline cetacean data and appropriate industrial data will allow the identification and quantification of threats and their potential implications for conservation objectives. All stakeholders need to be involved from the outset such that impacts from all factors are considered, ensuring that appropriate mitigation measures and associated monitoring programmes are developed. Suitable scientific evaluation and compliance mechanisms are needed to ensure that mitigation and monitoring are adequate.

2. Broad management

Governments, managers and other stakeholders need to co-operate in strategic planning for MREDs taking into account the trans-boundary nature of cetaceans. Uncertainties over the level of impacts require a staged approach to developments taking into account lessons learned from other developments and other human activities that affect cetaceans, in order to be adequately precautionary. IWC member governments can assist in encouraging the development of international collaboration in this regard, and in particular, they can assist in emphasising the importance of incorporating consideration of cetaceans from an early stage and the value of following the broad strategy and principles outlined in the Workshop report and summarised in Fig. 3.

3. 'Fundamental' research

International collaboration will be required to determine population structure, status, distribution and procedures for assessing impacts. The Committee can assist with design and evaluation of population and impact assessments. While there are established methods for assessing lethal takes, data on the effects of (sub-lethal) stressors on cetaceans are also needed.

[23] http:arcticcouncil.gov/pame/amsa/

4. Evaluation of threats
All lethal and non-lethal impacts of human activities should be considered in an integrated manner, e.g. using modelling approaches that take into account the cumulative impacts from all threats when evaluating whether conservation objectives are likely to be met.

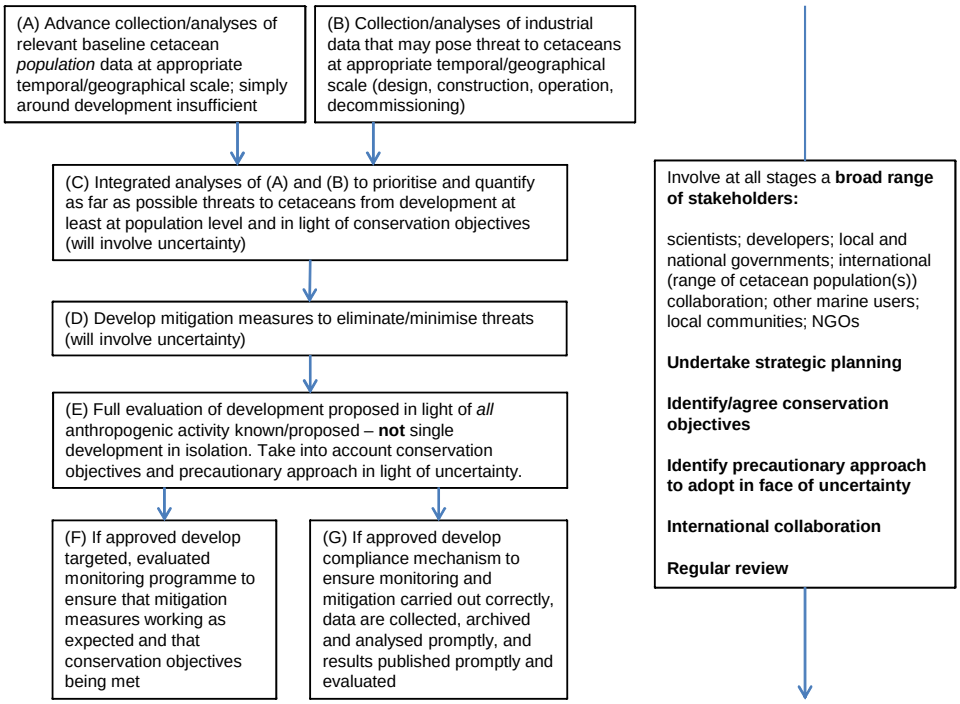

Fig. 3. Simplified schematic summary of a general strategy and principles to minimise environmental threats posed by MREDs. Some stages will occur in parallel and will involve feedback. See report for details

The Committee has considerable expertise in developing management frameworks and testing their performance against specified objectives.

5. Monitoring
Monitoring should be designed carefully, to assess impacts against pre-determined conservation objectives and to measure the efficacy of any mitigation measures that are implemented.

6. Data sharing and the future role of the IWC Scientific Committee in the consideration of MREDs
Improved information and data-sharing were identified as key and the Workshop encouraged the Committee to continue to act as a forum to review the development of MREDs and their implications for cetaceans, including promoting the sharing of data. Countries were encouraged to help in this by providing appropriate information.

In addition to the workshop report, the Committee received information from two papers on the topic of interactions between cetaceans and MREDs focused on waters offshore Scotland (SC/64/E3) and a preliminary assessment of the effectiveness of small Marine Protected Areas (MPAs) to protect dolphins offshore Wales (SC/64/E6). It also received an update on Chilean renewable energy projects (SC/64/E12) and noted that consideration should be given on the impacts of coastal wind farms, particularly in regions that support critical habitats for cetaceans. The Committee strongly **recommends** urgent development of environmental impact studies in this area of Chile and urges that a precautionary approach should be used with regard to critical cetacean habitats.

The Committee also **agrees** that there is an urgent need to develop or improve effective noise mitigation measures or quieter foundation installation methods, as noted in past reviews of anthropogenic sound (e.g. IWC, 2010f; IWC, 2012o).

12.7 Other habitat related issues
Primary papers submitted on topics related to other habitat related issues, included potential impacts of marine debris, cumulative impacts and results of a large-scale aerial survey programme in the French tropical EEZ.

12.7.1 Cetaceans and marine debris

In addition to receiving five papers on the topic of marine debris (SC/64/E7, E10, E13, E15, FI 10), the SWG received the results from an intersessional working group (Debris WG) that had considered the issue of both ingestion and entanglement of cetaceans in marine debris. The intersessional group offered the following conclusions and recommendations:

(1) Marine debris is a growing concern for marine wildlife in general, but its interactions with cetaceans are poorly understood.
(2) To better evaluate the potential impacts of marine debris on cetaceans and to provide a forum where relevant data can submitted it, a workshop on marine debris and cetaceans should be convened.
(3) The primary aim of this workshop would be to determine how to best investigate quantitatively the ways in which marine debris is affecting cetaceans and how best to monitor and mitigate for these effects. The workshop could also consider how best to develop a centralised database to collate cases of debris interactions, including the development of standardised criteria for data to allow more certain identification of the types of debris and the interactions involved.

Two key issues fundamental to assessing impact of marine debris on cetaceans were identified: (1) how to distinguish cetaceans that have died in active fishing gear versus those entangled in debris (including abandoned, lost, discarded - or 'ghost' -fishing gear) and the need to identify the 'worst culprit' types of fishing gear causing entanglement; and (2) how to investigate the potential accumulation of debris in the deep sea feeding areas of beaked and sperm whales. In addition, more effort is needed to investigate the impacts of microplastics on cetaceans, including baleen whales, which potentially ingest micro-litter by filtrating feeding (see Fossi *et al.*, 2012).

The Committee **recommends** that a workshop on marine debris and cetaceans be held (Annex K, Appendix 3) noting also its relevance to the Working Group on Bycatch with regard to entanglement issues (see Item 7.8). A number of potential data sources for data on marine debris were identified including those of international bodies such as CCAMLR and well as national and local bodies in several countries. SC/64/Rep1 noted the work being undertaken in by the USA, Korea and Japan and the Steering Group for the IWC-POWER cruises who are investigating how those cruises can contribute to international efforts to gather information on marine debris (see also Annex G).

12.7.2 Issues related to the March 2011 tsunami in the NW Pacific

Concerns have been raised with regard to increased marine debris transport to the eastern Pacific Ocean, as well as radioactive contamination of marine debris a result of the 2011 tsunami in Japan. Modelling efforts estimate that the bulk of the debris related to this event is probably dispersed north of the Main Hawaiian Islands and east of Midway Atoll.[24] Furthermore, as predicted by these modelling efforts, some buoyant debris reached the east Pacific coast from Oregon to Alaska during winter 2011-2012 and continues to occur in the region. It is highly unlikely that debris transported from Japan to the eastern North Pacific poses a radioactive risk. However, transport of non-native, invasive species or pathogenic microorganisms on tsunami-released debris could occur and pose a threat to eastern Pacific coastal ecosystems. Details of potential impacts of the tsunami released marine debris on marine mammals and the potential increase in either ingested marine debris or risk of entanglement are summarised in Annex K. Discussion of some Japanese work related to the effects of the tsunami on the marine ecosystem also occurs under Item 17.

12.7.3 Cumulative impacts of anthropogenic activities

SC/64/E11 reported on cumulative impacts of several anthropogenic activities on cetaceans. While there are a number of quantitative processes for assessing the combined impacts of multiple stressors being developed, some are active and used in management. For example, five actions to mitigate cumulative impacts were developed during the permit cycle of the Greenland Bureau of Minerals and Petroleum for the mitigation of cetacean exposures to disturbance from seismic surveys, as given in Annex K.

The Committee **welcomes** information on efforts to develop effective tools to address concerns regarding cumulative impacts of anthropogenic activities on cetaceans. It was noted that the effects of climate change on marine ecosystems may compound the cumulative impacts of anthropogenic stressors, such as chemical pollutants and noise.

12.7.4 REMMOA aerial surveys in the French EEA

The Committee received an update of the REMMOA project (Mannocci *et al.*, ; SC64/E14), aimed at providing maps of hot spots for pelagic megafauna in the French tropical EEZ and some EEZ of neighbouring countries. The long-term objective of the REMMOA surveys are to establish a baseline of information on cetaceans and other pelagic megafauna diversity and relative abundance and to build up a monitoring strategy to be implemented in the future. Mannocci *et al.* () present analyses of the Caribbean-Guiana survey where the aim of the study was to document top predator communities in terms of encounter rates, composition, abundance and spatial distribution and to compare them between these two contrasting ecosystems. SC/64/E14 presented the analysis of the southwest Indian Ocean survey with a focus on comparing cetacean and other pelagic

[24] http://marinedebris.noaa.gov/info/japanfaqs.html

megafauna communities in areas characterized by contrasted oceanographic conditions. The Committee **welcomes** these updates and **encourages** the results of their work to be presented next year.

12.8 Work plan

The Committee expressed its great appreciation to Moore for her superb guidance and chairing of the SWG over the 5-year period of her service as Chair.

The Committee discussions of the Workplan developed in Annex K is given under Item 23.

13. ECOSYSTEM MODELLING

The Ecosystem Modelling Working Group was first convened in 2007 (IWC, 2008e). 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 a number of other responsibilities of the Committee and the Commission has stated their interest in such work in a number of resolutions (IWC, 1999a; 2001b; 2002).

The Working Group's topics to address at this year's meeting were:

(1) review of ecosystem modelling efforts undertaken outside the IWC;
(2) explore how ecosystem models contribute to developing scenarios for simulation testing of the RMP; and
(3) review of other issues relevant to ecosystem modeling within the Committee

The report of the Working Group on Ecosystem Modelling is given as Annex K1.

13.1 Review of ecosystem modelling efforts undertaken outside the IWC

13.1.1 Ecosystem modelling in the context of ecosystem-based fisheries management

SC/64/EM1 outlined several ecological questions relevant to whale populations that can be addressed by ecosystem models. These included: What species and fisheries can potentially compete with whale feeding? How would one evaluate the potential magnitude of such competition? What are the potential, indirect food web effects on whales? What are the ecosystem tradeoffs that most warrant evaluation? What are the best scenarios (to model) to mitigate any of these concerns? How well do such (simulated) scenarios perform? The author also provided a review of the major classes of ecosystem model being employed globally in an ecosystem-based management context, provided a map of ecosystem models as they relate to these and similar questions, and described how global best practices are being adopted in the use of these ecosystem models. A key message was that the choice of model depends strongly on the questions being addressed. It is probably better to start with the simple multi-species models (with few components) or extended single-species models. The more complex multi-species models, food-web models or whole-system models are more suited to addressing broader questions.

SC/64/EM2 reported on efforts to place initial quantitative bounds on consumption estimates for a suite of marine mammals in the Northeast US Large Marine Ecosystem, including baleen whales, odontocetes and seals. Daily individual consumption rates were compiled from the literature and explored with sensitivity analyses to derive feasible ranges for each species which then could be raised to annual population-level consumption based on existing population abundance estimates. The results indicated that marine mammal consumption in this region might be similar in magnitude to commercial fishery landings for small pelagic and groundfish prey groups, although previous studies have indicated that targeted sizes may differ. Marine mammals probably consume as much prey as finfish predators, thus meriting continued evaluation despite the inherently wide confidence intervals of their consumption estimates.

The Committee **welcomes** this information, noting that with the move toward ecosystem-based management, consumption by marine mammals warrants inclusion as a source of natural mortality in assessments of mammal prey stocks. It also noted that reference points for marine mammal management, such Optimum Sustainable Production, had yet to be suitably defined in a multi-species context.

13.1.2 Ecosystem models of the effect on predators of fishing forage fish

Recent studies (Cury *et al.*, 2008; Fulton *et al.*, 2011; Pikitch *et al.*, 2012) have addressed the effects of exploitation of forage fish on their predators in several ecosystems, indicating that fishing of forage fish down to their MSY level can have major impacts on predators, including birds and marine mammals. In view of the importance of this issue to cetaceans, the Committee **agrees** that this should be a priority topic for next year.

13.1.3 Status update on NAMMCO ecosystem modelling

At last year's meeting, the Committee received an update on NAMMCO's initiative to implement a series ecosystem modelling exercises in the Barents Sea and the waters around Iceland. This year, the Committee was informed that the efforts have been delayed due to a lack of funding. However, the Committee remains interested in receiving information on these exercises as it becomes available.

13.2 Explore how ecosystem models contribute to developing scenarios for simulation testing of the RMP

Recent discussions in the sub-committee on the RMP (e.g. IWC, 2011e) on variation of *r* and *K* values in the face of environmental variability has shown that it can be useful to try to model the effects of food availability more explicitly, because this can have implications for the effects of prey abundance on whale population dynamics. The Committee **emphasises** the value of implementing this in small steps rather than going immediately to complex models and **agrees** that consideration of simple models of whales and prey should be a priority issue for next year.

13.3 Review of other issues relevant to ecosystem modelling within the committee

13.3.1 Update on Antarctic minke whale body condition analyses

Last year, the Committee discussed issues regarding the statistical significance of a decline (of about 0.2mm per year) in mean blubber thickness of Antarctic minke whales over the 18-year JARPA period reported by Konishi *et al.* (2008). The issues had been raised by De La Mare (2011), who found that the methods used by (Konishi *et al.*, 2008) could result in spurious apparent significance of trends because the nature of the sampling process and the associated components of the variance structure of the data were not taken into account. A reanalysis of the data at last year's meeting by Skaug (2012) using mixed-effect regression models to account for some of the additional variance structure resulted in a much higher variance of the estimated trend, but the point estimate changed little, and the estimated trend was still significant. Given the relevance of body condition indices to its work, the Committee agreed that further analysis of the data was warranted to determine: (i) whether the models fitted so far captured all the main features of the data; and (ii) whether the estimate of trend (whose confidence limits using the best fitting model ranged from near zero to values that could be of appreciable biological significance) could be made more precise. The Committee requested, *inter alia*, results from analysing the two sexes separately and the inclusion of slopes by latitudinal band as a random effect. It also suggested that the authors of De La Mare (2011) and of Konishi *et al.* (2008), apply for access to the data under Procedure B of the Data Availability Agreement, so that further analyses of these data could be reviewed by the Committee this year.

This year, de la Mare reported that he had applied for access to data through the Data Access Group but that a mutually satisfactory agreement was not reached. The generic data access questions raised in this case is discussed under Item 24. Pastene noted that Japan had offered to make available all data that had been requested by the Committee last year under the conditions of Procedure B (see Attachment B of SC/64/SCP1). De la Mare responded that conditions attached to the offer were in his opinion not in accordance with Data Access Agreement Protocol B and so was unacceptable.

In SC/64/EM3, he also presented an analysis of sex ratio and female length at 50% maturity using the JARPA data available in the IWC's catch database that showed unlikely trends and much higher levels of variability than would be expected in these parameters from a biological population. He noted that this indicated the presence of 'lurking variables' that had important effects on the dependent variable but that were not included in the predictor variables under consideration. Similar adverse effects could be present in the analyses of body condition described above, with possible sources of unaccounted variance including inter-annual variability in the locations and dates on which whales were taken, the spatial distributions of one or more biological populations and the co-effects of seasonality by sex and reproductive state. Using a statistical simulation of catches along random transects, SC/64/EM3 further showed that standard errors calculated using individual animals as the sample size underestimates the true variability because of spatial/temporal pseudo-replication, and that transects are the basic sampling units, not the individual catches.

There was considerable discussion of SC/64/EM3 and the implications for inferences on biological parameters derived from JARPA data. Some members emphasised that failing to estimate the variance associated with random transect placement means that the variances in the analyses of biological parameters will be underestimated such that hypothesis tests will be invalid. They further noted that the reported catch locations in the IWC database show that clearly identifiable transects that can be treated as replicates have not been realised and where transects are identifiable they have not been traversed in random time order. Consequently these members considered that the conditions for the appropriate analysis of the data have not been met.

Other members considered that non-independence can be accounted for by using jack-knife methods, as was done during last year's meeting with the blubber thickness data, using one year as the jack-knifing unit (IWC, 2012n). This approach showed that while the estimated SE increased from 0.0225 to 0.0836 on the regression slope (-0.213 mm/year), the slope estimate itself did not change and thus was still significantly different from zero at the 5% level. This jack-knife result should, according to these members, take care of concerns about dependence between observations. In addition, as mentioned above, mixed-effects models were also applied during last year's meeting to account for some of the additional variance structure resulting in a best model (based on the AIC criterion) with a

slope of -0.19 mm/year and SE = 0.07; (Skaug, 2012 pp. 259-62). In discussion, these members understood de la Mare to have claimed that these results did not take care of all possibilities for statistical dependence between whales (e.g. whales sampled on the same track line), but they considered it highly unlikely that such dependence could be so large as to destroy the findings of negative trends in blubber thickness, fat weight, girth or weight of stomach contents.

The Committee noted that valid conclusions can often be drawn from non-random samples as long as this is accounted for in the analysis. It further **recommends** that the authors of Konishi *et al.* (2008) investigate independence issues by using mixed-effects models with track line as a random effect to address the concerns raised above. These authors will consider carrying out such analyses before next year's meeting.

13.3.2 Other issues

A decline in energy storage in Antarctic minke whales over almost two decades (Konishi *et al.*, 2008) suggests that food availability may have been declining recently. To test this hypothesis, at this year's meeting Konishi presented a paper (Konishi *et al.*, in review) that examined whether there was any annual trend in the stomach contents of the whales using catch data from 20 seasons in JARPA and JARPA II (1990/91-2009/10). Results from linear mixed-effects analyses showed a 39% (95% CI 3.2-47.3%) decrease in the weight of stomach contents over the 20 years. A similar pattern was found in both males and females, except in the case of females sampled at higher latitude (particularly in the Ross Sea), suggesting a decrease in the availability of Antarctic krill for Antarctic minke whales in the lower latitudinal range of the JARPA/JARPA II research area. However, prey availability has not changed in the Ross Sea, where both Antarctic krill (*Euphausia superba*) and ice krill (*E. crystallorophias*) are available. The decrease in Antarctic krill availability could be due to environmental changes or to an increase in the abundance of other krill-feeding predators. The latter appears more likely, given the rapid recovery of the humpback whale in the area and the fact that humpback whales are not found in the Ross Sea, where no change in prey availability was observed for minke whales.

There was considerable discussion of this paper, focusing on two main areas:

(1) statistical issues, similar in nature to those discussed above with respect to the blubber thickness analysis, in particular as to whether the analysis takes account of all components of variance and whether the statistical significance of the apparent trends is reliable; and
(2) the biological issues associated with the relationship between stomach fullness and food intake and between stomach fullness and prey availability.

With respect to the statistical issues, members repeated many of the points summarised above with respect to the blubber thickness analysis and made a number of suggestions regarding additional statistical treatment of the data (see Annex K1). The Committee **recommends** that these analyses be conducted if possible.

With respect to the biological issues, some members noted the importance of considering the stomach evacuation rate and its relationship to the timing of feeding. The strong decline in mean stomach contents over the day, as shown in the results, is indicative that most feeding is occurring at night. It is possible to envisage a situation where high food abundance would lead to whales being satiated relatively early in the night, such that by the next day the stomachs are not very full. Conversely, during periods of lower food abundance, feeding may be spread over a longer period, such that more food tends to be found in the stomach during the day. Thus, the direction of the relationship between food availability or intake and observed stomach content weight is not obvious *a priori*. In response, other members draw attention to information such as the negative trend in blubber thickness, which supported the lower food availability hypothesis. Data collected during JARPA on the freshness of food in the forestomach may provide further information on the timing of feeding, and the Committee **recommends** that these data be analysed.

The Committee **agrees** that for an understanding of the possible relationships between food intake and stomach fullness, analyses of the consequences of the diurnal patterns of food intake should be reported. Furthermore, alternative models for stomach evacuation (such as linear and exponential models) should be examined. The Committee **agrees** to keep the issue on the agenda for next year and encouraged submissions on this issue.

13.4 Review new information on ecosystem model skill assessment

No new information was available for discussion on this topic.

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).

14.1. Review status of ziphiids whales in the North Pacific and northern Indian Ocean

The last worldwide assessment on the status of ziphiids was in 1988 (IWC, 1989). Last year the Committee reviewed the status of ziphiids in the North Atlantic and adjacent waters (IWC, 2012, Annex L). At this meeting, the priority is to review the status of the ten beaked whale species in the North Pacific and Northern Indian Ocean (Table 1). Considerable information was submitted for the review and details can be found Annex L (see Table 1 for agenda items). Only a general overview is given here.

Table 1

Ziphiids in the the North Pacific and Northern Indian Ocean

Name	Distribution	Item in Annex L
Cuvier's (*Ziphius cavirostris*)	worldwide except polar waters	3.1
Blainville's (*Mesoplodon densirostris*)	tropical and warm-temperate waters worldwide	3.5
Baird's (*Berardius bairdii*)	cold-temperate waters of the North Pacific	3.2
Hubbs' (*Mesoplodon carlhubbsi*)	cold-temperate waters of the North Pacific	3.4
Stejneger's (*Mesoplodon stejnegeri*)	cold-temperate waters of the North Pacific	3.9
pygmy (*Mesoplodon peruvianus*)	mainly in the Eastern Tropical Pacific (ETP)	3.8
Perrin's (*Mesoplodon perrini*)	Poorly known – few California specimens	3.7
Ginkgo-toothed (*Mesoplodon ginkgodens*)	Poorly known - tropical and warm-temperate Indian and Pacific	3.6
Longman's (*Indopacetus pacificus*)	Poorly known - tropical and warm-temperate Indian and Pacific	3.3
Deraniyagala's (unidentified *Mesoplodon* taxon)	Poorly known - tropical and warm-temperate Indian and Pacific	3.10

SC/64/SM 21 analysed passive archival acoustic data from across the North Pacific. Species-specific frequency modulated (FM) echolocation pulses made by Baird's, Blainville's, Cuvier's, Longman's and Deraniyagala's beaked whales at Palmyra Atoll, have been recorded and described, with visual confirmation of species identity. The species-specific features appear to be consistent within all sequences labelled to signal type level, making possible the discrimination of species. It was agreed that Cross Seamount was a good site to identify ginkgo-toothed beaked whale call signatures.

The Committee **welcomes** the report on the spatio-temporal distribution of species-specific acoustic echolocation signals of beaked whales in the North Pacific. Future research using visual sightings with biopsies in conjunction with acoustic recordings will be necessary to link several species and signal types.

SC/64/SM11 provided estimates of abundance and trends for Baird's beaked whale, Cuvier's beaked whale and Mesoplodon spp. in the California Current from 1991-2008 using a Bayesian hierarchical modelling approach. The analysis indicated declining abundance for Cuvier's (2.9% per year) and *Mesoplodon* spp. (7.0% per year) in the study area but no evidence of a trend for Baird's beaked whales.

The Committee **agrees** that these results should be interpreted cautiously given the variability in ocean conditions in the region since the early 1990s. In the 1990s, both *M. stejnegeri* and *M. carlhubbsi* occurred as far south as San Diego, but since the late 1990s, previously rare warm-water ziphiids appear to have moved into the area which is thought to be near the northern end of their range. An analysis of the pattern of strandings of Ziphius along the US west coast might be informative for evaluating the apparent decline suggested in SC/64/SM11.

SC/64/SM13 summarised records of five documented ziphiid species in the EEZ of Costa Rica. There are only a few scattered records of all species except Cuvier's beaked whale, which is sighted relatively frequently, and *Mesoplodon* sp. A (almost certainly *M. peruvianus*), which could mean Costa Rican waters are a significant part of the range of this poorly known mesoplodont.

14.1.1. Cuvier's beaked whale (Ziphius cavirostris)

SC/64/SM34 reviewed current knowledge of Cuvier's beaked whale in the North Pacific and northern Indian Ocean. It occurs in deep waters worldwide and ranges from equatorial tropical to cold-temperate waters in the North Pacific, north to the Gulf of Alaska, along the Aleutian and Commander Islands in the Bering and Okhotsk Seas. It is commonly found where the steep continental slope occurs close to shore, such as around the Hawaiian Islands, San Clemente Island (California), Isla de Guadalupe (Mexico – see SC/64/SM18) and the Aleutian Islands.

Few estimates of density or abundance are available, primarily due to the rarity and difficulty of detecting and identifying beaked whales. In addition large-scale cetacean abundance surveys are often focused in areas such as continental shelf waters where beaked whales usually do not occur.

14.1.1.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

Cuvier's beaked whale is classified in the IUCN Red List as of Least Concern. Abundance estimates are available only for the Eastern Tropical Pacific, the Hawaii EEZ and the west coast of the USA (to 300 n.miles offshore). Numbers in the California Current appear to have declined in recent years. Some anthropogenic mortality is known from fisheries in waters off California and Japan and probably occurs elsewhere (e.g. in driftnet fisheries off Mexico). This

species is vulnerable to noise produced by naval sonar and seismic research. Research priority should be given to understanding population trends off California and studying population structure. The Committee **agrees** that there is no basis for revising the status of Cuvier's beaked whale at the species or population level at this time.

14.1.2. Baird's beaked whale (Berardius bairdii)

Reviews of published (and some unpublished) information on Baird's beaked whales in the North Pacific were provided in SC/64/SM 8 and by Brownell and Allen. Additional information on distribution and abundance was provided in SC/64/SM5, SM11 and SM21 and by Wade.

Baird's beaked whale is endemic to the cold temperate waters of the North Pacific. It appears to be more abundant in the western than the eastern part of the basin despite the long history of exploitation in the west and relatively little exploitation in the east.

SC/64/SM5 reported on a study of Baird's beaked whales at the Commander Islands in the western Bering Sea. Baird's beaked whales were found within about 12 km of the coast, and mostly on the continental slope at depths of 100-1000m (maximum depth at sighting about 3000m). A total of 78 individuals was identified. Photo-identification confirmed associations over several years and the authors suggested that Baird's beaked whales live in a fission-fusion society. Evidence of killer whale predation was provided. More than half of the whales had marks the authors attributed to fishing gear and 3/75 had scars of possible anthropogenic origin, one apparently from harpooning.

Wade provided information on Baird' beaked whale sightings (n=25) made during nine killer whale surveys in nearshore waters of the Aleutian Islands, between 2001 and 2010. Baird's beaked whales were seen on every survey, generally close to the continental shelf edge break, in deeper waters on the continental slope. The extent of predation by killer whales on beaked whales might be considerable and ongoing stable fatty acid analyses may elucidate the importance of beaked whales in their diet.

14.1.2.1. LIFE HISTORY PARAMETERS

There are considerable data on life history parameters obtained from carcasses of whales taken on the Chiba ground and processed at the Wadaura station in the 1975 and 1985-1987 summer seasons (Kasuya *et al.*, 1997). This information has been interpreted assuming annual deposition of tooth growth layers (Kasuya, 1977). Full details are given in Annex L, section 3.2.4.

14.1.2.2. ABUNDANCE AND TRENDS

Abundance estimates for Baird's beaked whales are given in Table 2 and section 3.2.5. of Annex L.

14.1.2.3. TAKES INCLUDING BYCATCH

Baird's beaked whales have been hunted by hand harpoon in Japan since around 1600 and by Norwegian type whaling since 1907. Kasuya (2011) reviewed published information on the Baird's beaked whale fishery in the Chiba Prefecture.

Recent catch statistics by Japanese small-type whaling are summarised in Annex L, Table 3. Official statistics since 1932, except 1943-1946, are given in Annex L Appendix 2. The reported statistics for the 1950s may be unreliable because of the likely inclusion of illegally caught and misreported sperm whales at Wadaura, Chiba between 1959 and 1974 (Kasuya, 2011). Similarly, illegal catches of sperm whales by small-type whalers in Ayukawa on the Pacific coast of northern Honshu (Kondo and Kasuya, 2002) may have been reported as Baird's beaked whales, thus contributing to the surprisingly high numbers of the latter reported in the catch statistics in the 1950s and 1960s. The reported annual take of Baird's beaked whales in Japan (mostly along the Pacific coast) ranged between 107 and 322 during the period 1950-1969 (3,896 animals in 20 years).

The number of catcher boats operating for Baird's beaked whales off Chiba has been regulated by the prefectural government since 1920. The government introduced a licensing system to the small-type whale fishery in 1947 to limit the total number of boats operating. A voluntary quota system was introduced for Baird's beaked whales in 1983. The initial quota of 40 has since been increased to 66 (Annex L, Table 3). In 1985, the Committee noted (IWC, 1986) that such a catch level represents about 1% of the estimated population size but was unable to determine whether this was sustainable. To investigate this question further it was agreed that studies on school structure would be desirable (IWC, 1986) - see above regarding the study in the Commander Islands. The Government of Japan has increased the quota several times and whaling operations have expanded since the late 1990s into the Sea of Japan (Appendix 1 and Tables 3 in Annex L).

In the eastern Pacific, small numbers of Baird's beaked whales were taken by whaling stations in California (15) and British Columbia (29) between 1956 and 1970 (Rice, 1974).

Five cases of stranded Baird's beaked whales in Japan were categorised as incidental fishery takes (Table 4 in Annex L).

14.1.2.4. OTHER ACTUAL AND POTENTIAL THREATS

High concentrations of mercury, HDBPs and/or PCBs have been found in this species (Endo et al., 2003, 2005; Haraguchi et al., 2006; also see SC/64/SM3). Concern has been raised since the accidents at Fukushima No1 nuclear power plant but there is no

evidence yet for exposure of Baird's beaked whales. Their range is mainly to the north of Fukushima.

14.1.2.5. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

The species is classified in the IUCN Red List as Data Deficient. Abundance estimates for the US west coast reported in SC/64/SM11 showed no trend for the period 1991-2008. The three populations off Japan have been assessed as Rare by the Japan Fisheries Agency and Mammalogical Society of Japan. The Committee **agrees** that there is no basis for revising the status of the Baird's beaked whale at the species or population level at this time.

The Committee **recommends** the following:

(1) it is especially important to clarify population structure and geographical boundaries of the stocks off Japan, particularly as long as hunting continues there.
(2) improved and updated abundance estimates are needed for each population, and trends in abundance should be assessed. These needs particularly apply to exploited stocks.
(3) better understanding is needed of the movements of animals from the respective stocks into and out of the three sea areas of Japan (Sea of Japan, Sea of Okhotsk, Pacific coast).
(4) the study in the Commander Islands (SC/64/SM5) should be expanded to include biopsy sampling for determination of sex and paternity and maternity in order to support studies of social and population structure, as well as satellite tagging to learn about movements and stock relations;
(5) the limited information suggests a peculiar life history and social structure-it is uncertain whether the characteristics of Baird's beaked whales are common, rare or even unique among the Ziphiidae, but further studies such as those recently initiated in the Commander and Aleutian Islands are encouraged to continue.

14.1.3. Longman's beaked whale (Indopacetus pacificus)

Published information on this species was reviewed in SC/64/SM26. It is probably endemic to tropical waters of the Indian and Pacific Oceans. The west- and southernmost record is Natal, South Africa, the northernmost is Hakodate, Hokkaido, Japan, and the easternmost is Maui, Hawaii.

Two stranded specimens in northeastern Taiwan on 22 July 2005, provided the first genetic and external morphological descriptions in the western Pacific (SC/64/SM32).

14.1.3.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

Longman's beaked whale is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of Longman's beaked whale at either the species or population level as no abundance estimates are available, except around the Hawaiian Islands, and there is no information on trends. The species is best known from the western North Pacific. Some anthropogenic mortality is known to have occurred in fisheries around Sri Lanka and strandings in Taiwan may have been associated with naval activities. Ingestion of plastic debris and exposure to morbillivirus are also of concern.

No high-priority research needs were identified but efforts are needed to better document the species' overall range, especially in the Indian Ocean. Continued efforts are encouraged to investigate and sample stranded animals at every opportunity following standardised protocols for beaked whale necropsy. Necropsy results should be made available in the literature and in relevant publicly accessible databases as quickly as possible.

14.1.4. Hubbs' beaked whale (Mesoplodon carlhubbsi)

SC/64/SM 27 reviewed published information on Hubbs' beaked whale from the seas around Japan and from North America (<60 records). It is endemic to the North Pacific and found in cold temperate currents off Japan and along the west coast of the United States and southern British Columbia, Canada. It has rarely been reported at sea.

14.1.4.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

Hubbs' beaked whale is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of Hubbs' beaked whale at either the species or population level. Some concern was expressed at the apparent decline of mesoplodonts off the U.S. west coast (SC/64/SM11) as this probably includes Hubbs' beaked whales. No species-specific abundance estimates are available. Some anthropogenic mortality is known to occur in fisheries off both Japan and the USA and these whales may be vulnerable to anthropogenic noise from naval sonar and seismic research.

The Committee **agrees** that priority should be given to studies of possible population differences between Japan and the USA (genetics primarily but also external and internal parasites and cookie-cutter sharks scars). Acoustic studies (e.g. SC/64/SM21) may help to better determine the range of Hubbs' beaked whale, if a species-specific signal is found.

14.1.5. Blainville's beaked whale (Mesoplodon densirostris)

Published information on this species (primarily from strandings) was reviewed in SC/64/SM33. This has the most extensive distribution of any *Mesoplodon*. Its acoustic signal type (the same as in the North Atlantic) was the predominant signal type in the Pacific Islands region (SC/64/SM21). It is found in tropical and warm temperate waters of all oceans, including deep offshore waters, tropical oceanic archipelagos and continental or insular coasts bordered by warm waters. There are no records from polar or other high latitude regions. It is reported infrequently at sea, and positive field identification can be difficult unless key diagnostic characters of the head are observed.

14.1.5.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

Blainville's beaked whale is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of Blainville's beaked whale at either the species or population level. Some anthropogenic mortality is known to occur in fisheries off both Japan and the USA and this species may also be vulnerable to anthropogenic noise from naval sonar and seismic research.

In addition to the general recommendations under item 3.12, the Committee **recommends** expanded photo-identification and tagging efforts in Hawaii to monitor movement patterns (seasonal as well as ranges) to determine whether there is site fidelity to specific types of habitat.

14.1.6. Ginkgo-toothed beaked whale (Mesoplodon ginkgodens)

There is only limited information on this species which is found in warm temperate and tropical waters of the Pacific and westward into the Indian Ocean. It is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of ginkgo-toothed beaked at either the species or population level. No abundance estimates exist. Some anthropogenic mortality is known from fisheries in at least Japan, Sri Lanka, Taiwan and Micronesia, and from anthropogenic noise from naval sonar (Wang and Yang, 2006 JCRM). It is important to confirm the species identifications of all available specimens because a number have been misidentified in the past. Its status and abundance in its apparent 'hotspot' around southern Japan and Taiwan should be investigated.

14.1.7. Perrin's beaked whale (Mesoplodon perrini)

IWC/64/SM30 reviewed the existing information on Perrin's beaked whale. Very little is known about this species that was described in 2002 by Dalebout *et al.* (2002) based on five stranded specimens from south and central California – it remains known only from strandings in California and may have the most restricted range of any species of Mespolodon. Many or most of the unidentified mesoplodonts observed in ship surveys off California (SC/64/SM11) may be Perrin's beaked whales.

The species is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of Perrin's beaked at either the species or population level. As with all of the beaked whales, Perrin's beaked whales are probably at risk from anthropogenic noise produced by military sonar and seismic surveys as well as to fishery bycatch in areas of overlap. There is a need is to determine distribution and abundance in the eastern North Pacific including opportunistic biopsy sampling and correlated acoustic sampling.

14.1.8. Pygmy beaked whale (Mesoplodon peruvianus)

IWC/64/SM30 reviewed the existing information on pygmy beaked whales, which appear to be endemic to the eastern tropical Pacific. Most sightings are from the 'Eastern Pacific Warm Pool', an area with sea surface temperatures >27.5°C (Fiedler and Talley, 2006). It may be particularly abundant in the southern Gulf of California, Mexico (e.g. Ferguson *et al.*, 2006). There are a few records from Mexico (Urban-R, 2010) and it may be relatively common off Costa Rica (SC/64/SM13). The northernmost record is Moss Landing, California, the southernmost record in the eastern Pacific is from northern Chile (Sanino *et al.*, 2007) and the only record outside the eastern Pacific was from South Island, New Zealand (Baker and van Helden, 1999). Whether this latter specimen is indicative of a wider distribution for this species, or just an errant individual, is uncertain.

14.1.8.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

This species seems be fairly common within its range (Ferguson and Barlow, 2001). It is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of pygmy beaked whale at either the species or population level given the sparseness of information. Confirmation is needed that *Mesoplodon* sp. A is M. *peruvianus*; while biopsy samples (male) seem unlikely, a colour-pattern description of a freshly stranded adult male M. *peruvianus* would suffice. The southern Gulf of Californias seem to be a promising region for either of these events.

14.1.9. Stejneger's beaked whale (Mesoplodon stejnegeri)

IWC/64/SM25 reviewed information on this species, mainly from waters around Japan but including data from North America. It is endemic to the cold temperate North Pacific and has not been reported from any of the central Pacific islands. Four mass strandings occurred in Kuluk Bay, Alaska between 1975 and 1989

(Walker and Hanson, 1999). It is the most commonly stranded ziphiid in Japan although rare on the Pacific coast of Japan (Brownell *et al.*, 2004). Park (1999) reported five strandings and two incidental catches along the east coast of South Korea (35° to 38°N).

The presence of cookie-cutter shark bites present on animals around the Aleutian Islands but not the Sea of Japan, suggest some population structure in the central and western North Pacific. Brownell *et al.* (2004) suggest that the northern Sea of Japan should be considered as a provisional management unit.

14.1.9.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

Stejneger's beaked whale is classified in the IUCN Red List as Data Deficient. The Committee **agrees** that there is no basis for revising the status of Stejneger's beaked whale at either the species or population level. No species-specific abundance estimates are available. Some anthropogenic mortality is known to occur in fisheries off both Japan and the USA and at least one case of a ship strike has been confirmed. The mass strandings in the Aleutian Islands were suspected of being related to naval sonar.

In addition to the general recommendations under Item 14.1.11, the Committee **recommends** regular and extensive sample collection from stranded or bycaught specimens (especially off Japan) in order to better understand the species' ecology, life history and vulnerability to threats. Genetic research is needed to determine whether western and eastern populations can be differentiated. Better understanding of its biology and abundance in the apparent 'hot spot' in the Sea of Japan off Honshu could be accomplished by (i) strengthening the stranding programme in order to collect specimens in fresher condition, (ii) acoustic monitoring and (iii) small-scale surveys to assess abundance.

14.1.10. Deraniyagala's beaked whale

SC/64/SM3 presented new genetic and morphological data supporting the recognition of a previously described but unnamed Mesoplodon in the tropical Indo-Pacific. Genetic identification has related new specimens, including those initially described by Baker *et al.* (2007), to a type specimen in Colombo, Sri Lanka described as *M. hotaula*, in 1963. Known from at least seven specimens it is genetically distinct but closely related to (and possibly conspecific with) *M. ginkgodens.* Its distribution seems to be tropical in both the Indian and Pacific Oceans. SC/64/SM3 argued that available evidence was sufficient to accept the revised taxon as a new subspecies of *M. ginkgodens* and that further characterisation could result in the resurrection of M. hotaula Deraniyagala, 1963 as a full species. The Committee suggested the provisional common name 'Deraniyagala's beaked whale' for this taxon, in recognition of the original description.

Further genetic investigation, including biopsy sampling of live animals, is required to clarify the systematics and taxonomy. Visual and acoustic reports from around Palmyra Atoll have been attributed to this new taxon (see SC/64/SM21) and this area clearly provides the opportunity to collect fresh tissue samples for genome-level analyses.

SC/64/SM4 reported on the species identity and local use of Deraniyagala's beaked whales (and Blainville's and Cuvier's beaked whales) in the Gilbert Islands, Republic of Kiribati. This investigation, conducted with the help of government agencies, visited several of the outer Gilbert Islands in June-July 2009 and collected bones and artefacts.

It is important to obtain new specimen material from oceanic islands and atolls in the central tropical Pacific and and to confirming the identities and provenances of existing museum specimens attributed to *M. ginkgodens*. Consideration should be given to the possibility that there are island-associated nearshore populations that are geographically and demographically isolated or semi-isolated from offshore populations of both Deraniyagala's beaked whales and ginkgo-toothed beaked whales, as is the case with Blainville's beaked whales.

Almost nothing is known about overall distribution, population structure, life history, abundance or takes of Deraniyagala's beaked whales, with the exception of those in Kiribati (SC/64/SM4). The five beaked whales strandings from Palmyra Atoll and Kingman Reef between 2002 and 2007 is high for such a small area and high compared to the number of beaked whale strandings reported on other Pacific Islands.

14.1.10.1. CONCLUSIONS AND OTHER CONSIDERATIONS OF STATUS

No IUCN Red List has been made for Deraiyagala's beaked whale at either the species or population level. The Committee **agrees** that there was insufficient data to assess this status at either the species of population level. The Committee expressed concern about the apparently high numbers of strandings around Palmyra Atoll in recent years. Deraniyagala's beaked whales are probably vulnerable to sound from naval sonar and seismic research, similar to other beaked whales. Assuming that the beaked whale recorded both acoustically and visually around Palmyra Atoll is Deraniyagala's beaked whale, the first priority is to make this determination genetically.

14.1.11. Common issues and threats

14.1.11.1 MILITARY SONAR AND OTHER NOISE SOURCES

Evidence of gas bubble lesions (gas embolism) and fat embolism have been reported at necropsy in beaked whales from atypical mass stranding events (MSEs),

which were coincidental with nearby use of mid-frequency sonar (Fernandez *et al.*, 2004). Exposure to sonar may alter the behaviour and/or physiology of beaked whales, potentially resulting in decompression sickness (DCS) in some circumstances.

Bernaldo de Quirós and Fernandez Rodriguez (2011) studied gas presence and composition in order to compare decompression vs. decomposition gases present at necropsy. Bubbles alone cannot be used to determine cause of death and it is important to differentiate between gas embolism and putrefaction gases. They recommended scoring gas bubble presence and sampling bubbles for gas composition analysis within 24 hours, but preferably within 12 hours, to minimise the masking effects of putrefaction gases.

The Committee **recommends** that groups working on mass strandings make all reasonable efforts to examine dead animals within 12 hours (or at most 24 hours) after death. Response teams should, if at all possible, include a veterinarian, a veterinary pathologist or a responder with experience in necropsy and sample collection. Routine necropsy protocols should include examination of bubbles present in tissues, scoring relative prevalence and sampling for gas composition analysis, particularly to detect and describe intravascular and peri-renal subcapsular emphysema bubbles.

The Committee took note of the latest investigations of MSEs in the Canary Islands, Spain associated with the use of naval sonar (Fernandez *et al.*, 2004). No further atypical MSEs have occurred since international naval exercises ended in 2004 following a recommendation of the parliament of the European Union and a Spanish government resolution banning the use of military sonar around the Canary Islands. This supports the inference that the atypical MSEs before the ban were caused by mid-frequency sonar.

Noting the ample evidence about the vulnerability of beaked whales to military sonar and seismic surveys and the potential for impacts at the population level (including not only animals that strand and are detected but also the potentially large number that die at sea and do not strand), the Committee strongly recommends that military exercises and seismic surveys should avoid areas of important habitat for beaked whales; that further effort should be made to mitigate their impacts; and that further efforts should be made to identify such areas (MacLeod and Mitchell, 2006; Cañadas, IWC/63/SM10).

The Committee also reiterates two previous recommendations.

(1) The continuation and expansion of studies of how anthropogenic noise, especially from naval sonar and seismic survey airguns, affects ziphiids. These should include efforts to determine if and how vulnerability differs between species, habitat types, animal activities (e.g. travelling, foraging) etc.

(2) Collaborative arrangements with military and industry authorities should be made to ensure researchers have advance notice of sonar exercises, seismic surveys and other activities so that the possibility of beaked whale stranding events can be anticipated with enhanced beach surveillance etc.

14.1.11.2. MARINE DEBRIS

Available data from the North Pacific and northern Indian Ocean (IWC/64/E10; Simmonds in press) indicates that beaked whales may be especially vulnerable to the ingestion of plastics and other marine debris; this can cause pathology and mortality. The population-level and long-term implications of the ingestion of plastic debris are unknown. The Committee **recommends** that this issue is further investigated via the collection, collation and analyses of relevant data from around the world concerning ingestion rates, debris types and associated pathology. It also **recommends** that standardised protocols are developed for pathology investigations. Consideration should also be given to investigating marine debris accumulation and associated processes in areas of important habitat for small cetaceans.

14.1.11.3 GENERAL RECOMMENDATIONS

The Committee **recommends** that for all North Pacific and northern Indian Ocean ziphiid species, further efforts are made to define population structure, delineate population boundaries, obtain estimates of abundance and identify and rank threats. Attention should be given to populations known or suspected to be small and/or exploited. The available evidence suggests that most ziphiid species occupy relatively narrow ecological niches and occur as local, largely isolated groups, which should be regarded as putative subpopulations (in the IUCN Red List sense).

The Committee **recommends** that more effort be made to investigate and validate methods of estimating population size for ziphiids, including those that incorporate passive acoustics for application in areas where the local species are acoustically distinguishable. Further data are needed to adjust density estimates from line transect surveys to account for visibility bias (given that these deep-diving whales spend relatively little time at the surface and species are difficult to distinguish) and for responsive movement. Consideration should also be given to interrupting line transect surveys (closing mode) in order to obtain photographs and biopsies as a way of reducing the 'unidentified ziphiid' component of abundance estimates.

Initial efforts have been made to map high-use areas for ziphiids on a global scale (MacLeod and Mitchell,

2006) to provide guidance for mitigation measures to reduce the risks from naval sonar and seismic survey operations. However, a more detailed examination is needed of these 'hotspots', including fine-scaled habitat characterisation and predictive habitat modelling. The Committee **recommends** that collaborative efforts similar to those described last year in SC/63/SM10 be made by the relevant scientists and research groups in the North Pacific and Northern Indian Ocean where anthropogenic sound is considered a problem.

Ziphiids are at risk of entangling in nets, especially pelagic driftnets, which tend to be deployed in or near their habitat. They are also known to get hooked or entangled in longline gear. The Committee **recommends** that methods be developed and applied to estimate fishery-related mortality, giving special attention to areas where there is direct evidence of incidental mortality as well as to areas where driftnetting and longlining operations overlap known concentrations of ziphiids.

Evidence of beaked whale population decline along the North American coast (SC/64/SM11) raised concern that beaked whales, and particularly resident populations, may be negatively affected by large-scale environmental change. The Committee **recommends** efforts be devoted to understanding impacts of changes in habitat on the distribution and abundance of beaked whales. This could involve pursuing an improved understanding of beaked whale feeding ecology and deep-water oceanographic processes as well as prey-community dynamics.

The Committee further **recommends** broad-scale collaborations to generate integrated results from analyses of genetic material, photograph collections and survey data. Particularly for *Mesoplodon* species, biopsies should be obtained from live animals to verify species identification. This is especially important for females and young males. Efforts are also needed to validate acoustic signatures of *Mesoplodon* species by collecting biopsies (and good photographs) along with acoustic recordings at sea.

14.2. Report on the voluntary fund for small cetacean conservation research

14.2.1. Status of the voluntary fund for small cetacean conservation research

In 2009, Australia made a generous donation toward the IWC Small Cetacean Conservation Research Fund of about £250,000 which enabled eight grant awards to research and conservation projects on small cetaceans (IWC, 2012r). At the Commission meeting in 2011 and during the interessional period, France, Italy, the United Kingdom and a number of NGOs provided extra funding of £73,000 which allowed: (i) the full funding of the two remaining projects recommended by the Committee in 2011; (ii) support for invited participants in 2011 and 2012; and (iii) a chance to start rebuilding the Fund. The Committee **thanks** the above governments and the NGOs for their generous contributions to the fund and hopes that the next Conservation Committee and Commission meetings will generate new funding that will allow another call for projects by the end of 2012.

14.2.2. Review on Progress on Funded Projects

The Committee reviewed brief project reports on five of the nine projects selected in 2011 (Annex 2) and received more extensive reports on three of them, which are presented in Annex L (Solomon Islands, in this section; franciscana, Item 14.3.3; Atlantic humpback dolphin, Item 14.3.5).

SC/64/SM23 presented preliminary results of an assessment of dolphins in the Solomon Islands where there is a long history of exploiting dolphins through traditional drive-hunts. More recently, the Indo-Pacific bottlenose dolphin (Tursiops aduncus), has been live-captured for export, with a current annual export quota of 50. This Committee as well as several intergovernmental bodies (CITES, CMS, IUCN, SPREP) have expressed concern in the past about the potential conservation implications of these removals.

The Committee expresses its appreciation for this work and acknowledges the constructive involvement of the Solomon Islands Fisheries and Environment ministries in collaborating and providing support. The preliminary results reinforce previously expressed concerns regarding the sustainability of past and ongoing live-capture removals of *T. aduncus* from what appear to be small island-associated populations. The Committee **encourages** the authorities responsible for conservation management (e.g. under CITES) to carefully consider the information from this study. It recommends that efforts to integrate the current and historical photo-identification catalogues be pursued as a priority.

14.3. Progress on previous recommendations

14.3.1. Vaquita

The Committee has expressed its grave concern over the status of this species and its continuing decline over many years. Last year, the Committee was informed about the pilot phase of implementation of an acoustic monitoring programme to track future changes in vaquita abundance in the Upper Gulf of California (IWC, 2012w). SC/64/SM19 provided further information on the implementation of the scheme in the first full sampling season. An overall loss rate of 44% of the detectors resulted in data being available for 38 sampling sites within the refuge. Deployment of buoys is the only way to obtain year-round information so an alternative method of deployment that reduces loss must be found. An analysis of the acoustic encounter rates in 2008 (0.74 encounters/day, CV 0.44) compared to those from the current study in 2011 (0.58 encounters/day, CV 0.05) is indicative of further

decline of the population since 2008, i.e. when strategies to reduce fishing effort by the Federal Government were already being implemented.

Jaramillo-Legorreta noted that redeployment of the array in late spring of 2012 was delayed because the presence of 87 boats fishing illegally within the refuge at that time presented too great a risk of loss of equipment; deployment was underway at the time of the Committee meeting.

The subcommittee considered the report[25] of the fourth Meeting of the International Committee for the Recovery of Vaquita (CIRVA) held in Ensenada, Mexico from 20-23 February 2012. The role of CIRVA has been recognised by the Government of Mexico in the agreement for the creation of the Vaquita Protection Refuge and in the current federal Action Program for the Conservation of Vaquita (PACE-Vaquita). Hence, the recommendations of CIRVA are important in terms of driving recovery actions. The report notes that the population has continued to decline, with an estimated reduction of nearly 60% between 1997 and 2008 and possibly as few as 220 porpoises remaining in 2008 (CIRVA, 2012). The report is discussed in detail in Annex L.

CIRVA's assessment of progress is that switch-out programmes (conversion to vaquita-safe gear) has been poor with only a very small proportion of the total fleet using such gear. Fishermen using such alternative trawl gear would have great difficulty operating safely in the middle of the large gillnet fleet. A working group has been engaged in a public process to amend the Mexican Official Standard 002-PESCA that regulates shrimp fishing. A three-year process beginning in 2013-14 to ban shrimp gillnets and exchange them for the new small artisanal trawl net design has been approved but not yet published in the Federal Register.

Details on CIRVA recommendations are given in Annex L and the Committee **strongly endorses** the CIRVA recommendations.

At last year's meeting the Committee concluded, as it has in several previous meetings, that the only reliable solution for vaquita conservation is to eliminate vaquita by-catch by replacing gillnets with alternative fishing gear. In a detailed recommendation, the Committee strongly supported robust gear trials to assess alternative gear effectiveness and economic viability (IWC, 2012r).

The Committee again **reiterates its extreme concern** for the status of this species and, as stated in 2011 (IWC, 2012r), **reaffirms** that the only reliable approach for saving the species is to eliminate vaquita bycatch by removing entangling gear from areas where the animals occur. It **strongly recommends** that, if extinction is to be avoided, all gillnets should be removed from the upper Gulf of California immediately. This is in accord with the Committee's strong recommendation made in 2009 (IWC, 2012f, p.66) regarding the extinction of the vaquita.

In light of reports on the successful development of an alternative shrimp trawl and the CIRVA recommendations summarised in Annex L, the Committee also **recommends** that vaquita conservation efforts focus on:

(1) expedited approval and adoption of the small shrimp trawls as an alternative to gillnets and prohibition of shrimp fishing with gillnets throughout the entire range of the vaquita;
(2) continued research on technologies to replace gillnetting for finfish or otherwise to remove all gillnets from the vaquita's entire range.

In this regard the Committee **notes** the ongoing project funded under the Voluntary Fund for Small Cetacean Conservation Research "Supporting the assessment of alternative fishing gears for replacing gillnets that cause bycatch of vaquita (*Phocoena sinus*) in the Upper Gulf of California, Mexico" and **looks forward** to a progress report at next year's meeting.

14.3.2. Harbour porpoise

In 2001, the Committee acknowledged the efforts by ASCOBANS to address serious harbour porpoise bycatch problems in the Baltic, Kattegat/Belt and North Sea areas and encouraged further efforts in that regard (IWC, 2010g). Since then, the ASCOBANS Jastarnia Group has met and considered new analyses of survey and bycatch data, which have had the effect of reinforcing and increasing concern about sustainability of bycatch as well as other factors potentially affecting the porpoise populations in the region, including declines in availability of prey, ship traffic, construction work, seabed exploitation, contaminants, and diseases.

The Committee remains concerned about the status of harbour porpoises in the western Baltic, the Belt Seas and the Kattegat ('Gap' area, also known as Belt Sea stock according to the ASCOBANS Jastarnia Group). Although the abundance estimates for harbour porpoises from SCANS and SCANS II were almost identical for the wider North Sea area, there was a southward shift in density distribution of porpoises between SCANS and SCANS II. However, there are indications of a possible decline in abundance in the Gap area. Bycatch is the major source of anthropogenic mortality and should be monitored and mitigated. EC Regulation 812/2004 does not adequately protect harbour porpoises from bycatches in this area because it requires bycatch monitoring only on boats > 15m and pinger use only on boats >12m.

In the current state of scientific uncertainty, the Committee looks forward to receiving the results of a

[25] http://www.iucn-csg.org/index.php/downloads/

planned dedicated shipboard survey to be conducted in the Gap area in the summer of 2012 with the intention of obtaining a new abundance estimate.

The Committee recommends with regard to the Gap area to:

(1) assess porpoise bycatch levels;
(2) monitor porpoise abundance on a regular basis;
(3) introduce measures to mitigate bycatch and other anthropogenic mortality;
(4) monitor the health status of the porpoises;
(5) ensure all bycaught and stranded animals are reported and delivered to qualified institutions for necropsy and sampling;
(6) implement the recovery plan for harbour porpoises which is currently being developed by ASCOBANS for the Gap area.

The Committee also repeats its longstanding concern regarding the critically endangered harbour porpoise population in the inner Baltic ('Baltic proper') and encourages all possible efforts to eliminate the bycatch there and address other factors that may be preventing this very small population's recovery. The current process of developing management plans for Special Areas of Conservation under the European Habitats Directive, offers a concrete chance to implement monitoring and mitigation as foreseen by the Jastarnia Plan. The Committee urges that effective monitoring and mitigation measures focusing on harbour porpoises be included in such national management plans.

14.3.3. Franciscana

SC/64/SM17 describes results of a project conducted with funding from the IWC Small Cetacean Conservation Fund. The main goal of the study was to assess distribution and obtain an abundance estimate of franciscanas inhabiting the region known as Franciscana Management Area I (FMA I), as recommended in IWC (2004). In December 2011 and January 2012, design-based aerial surveys were conducted to assess distribution and to estimate abundance of franciscanas in FMA I. The fully corrected abundance estimate was 1,998 (CV=0.48, 95% CI: 796-5,013). The most recent (2001-2002) estimate of incidental mortality in FMA I (Di Beneditto, 2003) corresponds to 5.5% of the estimated population size presented here. This indicates high and unsustainable bycatch if current mortality is similar to that in the early 2000s.

The Instituto Chico Mendes para a Conservacao da Biodiversidade (ICMBio) is the government agency responsible for establishing management and conservation strategies for endangered species in Brazil. In 2010, ICMBio published the 'National Action Plan for the Conservation of the Franciscana' (Di Beneditto et al., 2010) and made a series of general recommendations for research and monitoring (summarised in Annex L) which the Committee endorsed.

The Committee further recommends the following with respect to FMA 1

(1) Additional aerial surveys with increased sampling effort in order to:
  a) produce more robust (lower CVs, estimates for the northern range of FMA I) population estimates;
  b) further assess distribution (e.g. offshore limits, discontinuity);
  c) evaluate potential habitats that could be protected (e.g. by one or more no-take zones, marine protected areas) to improve conservation.
(1) Resume systematic and long-term by-catch monitoring in northern Rio de Janeiro and Espírito Santo, in order to produce more up-to-date mortality estimates.
(2) Studies be conducted to assess areas within the range of the species where other human activities could pose a threat to the long-term viability of franciscanas in FMA I.

Melcon *et al.* (2012) illustrated the potential for the use of autonomous acoustic detectors or towed arrays designed specifically for the identification of porpoise-like signals (e.g. C-PODs or A-tags) in franciscana research.

14.3.4. Narwhal and white whale

Bjørge reported on progress towards organising and convening a proposed global review of the monodontids (IWC, 2012 p. 279). The NAMMCO Secretariat has indicated interest in organising and convening such a review jointly with the IWC Scientific Committee and the inter-sessional correspondence group has identified a list of scientists interested in attending from four of the five range states (Norway, United States, Canada, Russia). Broader involvement of other scientific groups and individual scientists for a range-wide workshop or symposium on monodontid science may be appropriate. The involvement of groups as disparate as oceanaria and environmental NGOs as co-conveners might bring greater organisational motivation and financial resources to support such a workshop or symposium. The Committee recommends that a steering committee (Bjørge, Reeves, Suydam, a scientist from Canada, Donovan and Mario Aquarone from NAMMCO Secretariat) be established to meet intersessionally to discuss these issues and report back at next year's meeting.

14.3.5. Atlantic humpback dolphin

SC/64/SM22 presents a brief update on the project funded by the IWC Small Cetacean Conservation Research Fund for Atlantic humpback dolphins in

Gabon and Congo. There have been some challenges and shifts in focus and priorities over the last year, given boat failures and the discovery of a significant bycatch problem in Congo. As the project is ongoing, more complete reporting will be provided next year. The Committee thanks the authors for this preliminary report and expressed its appreciation for their perseverance in the face of the difficult challenges faced to date in this research.

14.3.6. River dolphins

IWC (2001) recommended that 'scientists with appropriate theoretical and/or analytical skills should be directly involved in river cetacean studies, so that surveys result in statistically robust estimates of abundance'. In 2002, two biologists and two statisticians led a pilot survey (line and strip transect data and some photo-ID data) of boto (*Inia geoffrensis*) and tucuxi (*Sotalia fluviatilis*) in portions of the Amazon in Colombia and Peru (IWC 2003). SC/64/SM24 revisited this dataset and reported on preliminary analyses. Participants drew attention to the existence of both older and more recent abundance estimates for the study area and suggested that a three-way comparison of abundance estimates would be of great value. The Committee expresses its appreciation to the Government of Brazil for supporting a proposed PhD studentship to work on this issue.

14.3.6.1. BOTO AND TUCUXI

Two largely sympatric endemic cetaceans, the tucuxi and the boto, inhabit the Amazon basin and both are increasingly killed for use as bait in the piracatinga (*Calophysus macropterus*) fishery (see IWC, 2007; 2008; 2009; 2012). Catches in this fishery, primarily for export to Colombian markets but also for sale in domestic markets, have increased in Brazil in recent years. Alves et al. (in press) reported on an interview study with fishermen and traders, to elucidate interactions between fishermen and river dolphins, including the occurrence of illegal, indiscriminate killing and growing trade in dolphin carcasses. In the view of fishermen, botos damage gear, steal (and also probably damage) catches. Botos are negatively portrayed in numerous traditional Amazonian folk myths and superstitions. These factors make them extremely unwanted or even hated and they are considered as pests. Now they have also become an economic resource as bait in the increasing piracatinga fishery. Addional information suggests that the true extent of the area of the piracatinga fishery and the area of direct takes is unclear, although the reported expansion of the piracatinga market and fishing effort add to concerns regarding the impacts on dolphins.

As previously noted (IWC, 2001), the population status of botos and tucuxis has been assessed in only relatively small portions of their Amazonian range. The Committee reiterates its serious concerns with the potential population implications of the intentional killing of botos and tucuxis for use as bait in the piracatinga fishery. It welcomes the information provided at this year's meeting but notes that the true extent of this exploitation throughout Amazonia is poorly understood. It also emphasises that this relatively new and rapidly growing problem is in addition to other historical and ongoing threats to these dolphins, e.g. from incidental mortality in fisheries, vessel traffic, construction of hydroelectric dams, mining and other development.

In view of these concerns and the information gaps, the Committee recommends the organisation of an international scientific workshop involving scientists and managers from the range states, with the goals of addressing research and conservation priorities, standardising methodologies and planning long-term strategies. The following specific topics could be discussed at the workshop:

(1) geographic and temporal extent of the piracatinga fisheries and associated dolphin use;
(2) methods to assess abundance and mortality (rapid assessment as well as longer-term approaches);
(3) improved understanding of dolphin movements and habitat use (including population structure) ;
(4) ways to reduce (or preferably eliminate) the pressure on dolphin populations from exploitation as bait for the piracatinga fishery.

The Committee agrees that the status of the boto and tucuxi should be added as a recurrent item on its agenda.

14.3.6.2. INDUS RIVER DOLPHIN

WWF-Pakistan hosted the Indus River Dolphin Conservation Strategy Planning Workshop in Lahore (Pakistan) last April. The objective was to lay the groundwork for development of a ten-year strategic action plan for conservation of endangered Indus River dolphins (*Platanista gangetica minor*), which are restricted to the Indus River system in Pakistan. Details can be found in Annex L, section 5.6.2.

14.3.6.3. MEKONG RIVER POPULATION OF IRRAWADDY DOLPHINS

A Mekong Irrawaddy Dolphin Conservation Workshop was held in Kratie, (Cambodia) last January. The workshop was jointly hosted by the Commission for Dolphin Conservation and Development of Mekong River Dolphin Ecotourism, the Fisheries Administration of the Ministry of Agriculture, Forestry and Fisheries, and the World Wide Fund for Nature – Cambodia. Participants reviewed the available evidence on possible causes of mortality of Irrawaddy dolphins in the Mekong in particular, the high and as-yet-unexplained level of calf mortality. Details can be found in Annex L, section 5.6.3.

All freshwater populations of Irrawaddy dolphins (*Orcaella brevirostris*) are listed on the IUCN Red List as Critically Endangered. The Mekong River population is estimated at 85 individuals (95% CI 78-91), excluding young calves (Ryan et al. 2011) with recruitment close to zero. Although births occur, few animals survive to adulthood. The available information, suggests a slow decline (2.2%/year during the study period). If confirmed, the current population composition has serious implications for the long-term viability of the Mekong River population.

Last year, the Committee expressed grave concern about the rapid and at least partially unexplained decline of this riverine population. Unfortunately, the high mortality of young calves has continued as has the occasional mortality of adults from entanglement. The Committee **recognises** and **commends** Cambodian government agencies and WWF-Cambodia for making serious, concerted efforts since the last meeting to diagnose the cause(s) of calf mortality and further reduce the risk of entanglement. The Kratie Declaration[26] is a major step forward and the Committee recommended that it be fully implemented as quickly and as effectively as possible.

14.3.7. Killer whales

The Committee was pleased to receive information on the first photo-ID catalogue of killer whales in Adélie Land, East Antarctica (SC64/SM6) as discussed in Annex L. This catalogue will be augmented in coming years and made available for regional matching and for a global Antarctic killer whale catalogue.

14.3.8. Clymene dolphin

The Committee was pleased to receive information a study underway on the first molecular characterisation of the Clymene dolphin (*Stenella clymene*) a recently rediscovered dolphin species. It has been suggested that the species could have had a hybrid origin, with *S. coeruleoalba* and *S. longirostris* acting as parental species (see Annex L).

14.4. Takes of Small Cetaceans

Annex L (Appendix 3) presents information on catches and associated quotas for small cetaceans from 1997-2010 obtained by Funahashi from the Japanese National Research Institute of Far Seas Fisheries website. The Secretariat developed the summary of catches of small cetaceans in 2009-2011 from this year's national Progress Reports.

The importance of these reports was noted, but concern was expressed that the Committee was not doing enough to take advantage of the significant information therein. The Committee **agrees** to explore intersessionally more specific terms of reference for evaluating direct take data, including the idea of developing case studies (e.g. assessing sustainability of bycatch in Europe) or other analyses from this information.

The Committee **thanks** Funahashi and the Secretariat for their work in compiling this information for the Scientific Committee each year and reiterated the importance of having complete and accurate catch and bycatch information and encourages all countries to submit data, appropriately qualified and annotated.

The Committee **expresses** its continuing concern about the lack of assessment of the exploited stock or stocks of killer whales in Greenland where reported catches were 14 in 2009 and 15 in 2010.

14.5. Local studies

SC/64/SM20 reported on the presence of long-beaked common dolphins in coastal waters of northern Colombia for the first time. These sightings extend the known range in the Caribbean, previously known primarily from the eastern Caribbean, some 700-800km.

Bolaños-Jiménez reported on: (1) work to gather records and sightings of killer whales in the Caribbean Sea and adjacent waters in collaboration with other North Atlantic killer whale studies and databases; (2) preliminary abundance estimates of Atlantic spotted and common bottlenose dolphins in the State of Aragua, central Venezuela, on the basis of mark-recapture models and photo-ID techniques as part of efforts to provide a stronger foundation for proper management and monitoring of dolphin-watching activities; and (3) new records of common dolphins in central-western Venezuela-common dolphins have recently been recorded on the Colombian side of the Guajira Peninsula (SC/64/SM20).

SC/64/BC2 reported on unusual strandings of two species of oceanic dolphins on the Pacific coast of Costa Rica. The first was a mass stranding of 38 rough-toothed dolphins in 2002, 34 of which were returned to the sea. The second was of an adult female Fraser's dolphin in 2006. Both strandings are the only ones known for each of these species in Costa Rica.

SC/64/SM10 reported on studies to identify critical habitats for coastal pantropical spotted dolphins in Golfo Dulce, Costa Rica, as the foundation of the design and implementation of Marine Spatial Planning and Marine Protected Areas. The current study investigates the underlying behavioural mechanisms that govern patterns of niche differentiation and the resulting conservation implications.

The Committee expresses its gratitude to the presenters of local research papers and noted that such work to establish baselines, distribution records, and habitat requirements is essential to addressing the concerns of the Committee.

[26] http://www.iucn-csg.org/wp-content/uploads/2010/03/Kratie-Declaration-signed-with-appendices-1.pdf

14.6 Hector's dolphins

Slooten reported on a number of recent findings and processes in New Zealand concerning Hector's dolphins. Bycatch in gillnet and trawl fisheries is the most serious threat to this endangered species. A substantial increase in survival rates (5.4%/yr) has been detected in one of the protected areas created to reduce the overlap between dolphins and these fishing methods (Gormley et al., 2012). The Banks Peninsula population was declining at approximately 6%/yr before 2008 and is now declining at about 1%/yr (Gormley et al., 2012; Slooten and Dawson, 2010). The population was predicted to recover if the boundaries of the protected areas were extended to the 100m depth contour. Slooten explained that the survival rate increase demonstrates that protected areas can work if (i) they are large enough and in the right place; (ii) key threats are managed by removing rather than displacing them; (iii) no new threats are added (e.g. in this example marine mining, tidal energy generation); and (iv) effective monitoring and enforcement is in place.

Bycatch in 'exemption' areas without protection measures, and in areas with incomplete protection, is causing continued population declines and population fragmentation (DOC and Mfish, 2007; (Davies *et al.*, 2008) Slooten and Dawson, 2010; SC/64/ProgRepNewZealand). Weak protection on the west coast of South Island, a lack of protection on the north coast of South Island and 'exemption' areas in other regions are slowing or preventing species recovery ((Davies *et al.*, 2008) Slooten and Dawson, 2010). There is also continued bycatch from illegal setnetting inside protected areas.

Full details are given in section 7.2 of Annex L.

The Committee expresses particular **concern** about the low abundance of Maui's dolphins (North Island subspecies of Hector's dolphin). The latest abundance estimate of 55 individuals over one year old (CV 0.15) was calculated from a genetic mark-recapture analysis (Hamner *et al.*, 2012).

The Committee **recommends** the immediate implementation of the proposal by the New Zealand Ministry for Primary Industries to extend the North Island protected area to approximately 80km south of the latest dolphin bycatch site (Maunganui Bluff to Hawera), offshore to the 100m depth contour, including the harbours, for gillnet and trawl fisheries. This would protect part of an area with high gillnet and trawl fishing effort between the North and South Islands. Further population fragmentation could be avoided by also protecting the north coast of the South Island, providing safe 'corridors' between North and South Island populations (Hamner *et al.*, 2012).

Adequate observer coverage across all inshore trawl and gillnet fisheries is important in order to obtain robust scientific data on continuing bycatch as a means of assessing the effectiveness of protection measures.

14.7. Workplan

The Committee's views on the workplan for the sub-committee on small cetaceans is given under Item 21.

The sub-committee reviewed its schedule of priority topics which currently includes:

(1) status of ziphiids in the Southern Hemisphere;
(2) systematics and population structure of *Tursiops*.

There is a need for extensive preparatory work for the proposed *Tursiops* review. Therefore the Committee agrees that the review of the systematics and population structure of *Tursiops* should be conducted in 2014 and an *ad hoc* group (Brownell, Perrin, Fortuna) was established to prepare for this. The Committee will need to carefully manage other agenda items to allow sufficient focus on the priority topics.

The Committee agrees that ziphiids of the Southern Hemisphere will be the priority topic at the 2013 Annual Meeting.

The Committee on small cetaceans intersessional group evaluating the feasibility of having the so-called 'marine bushmeat' issue as a future priority topic agreed on a number of attributes important for defining and delineating the issue (see Annex L). The Committee agrees to proceed with planning for a workshop characterised along the lines of 'poorly documented hunts of small cetaceans for food, bait or cash' although this may change somewhat at the discretion of the Convenor. It was emphasised that terminology and definitions as well as the scope and purpose of any workshop should be clarified to in advance. A steering group was established under Ritter (Annex Q).

15. WHALEWATCHING

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). The Commission also has a standard working group on whalewatching (IWC/64/CC6) that reports to the Conservation Committee (see Item 15.4.1).

15.1 Assess the impacts of whalewatching on cetaceans

SC/64/WW1 reviewed recent advances in whalewatching research. Steckenreuter *et al.* (2012a) investigated the impact of vessel interactions on the behaviour of a genetically distinct population of Indo-Pacific bottlenose dolphins; Steckenreuter *et al.* (2012b) examined the effectiveness of two Speed Restriction Zones (SRZs) in a dolphin-watching area;

and Harris *et al.* (2012) documented interactions between cruise ships and humpback whales at Glacier Bay National Park (GBNP) in Alaska. Summaries are presented in Annex M, item 5.

SC/64/WW2 reported on a resident population of bottlenose dolphins in Bocas del Toro, Panama, of 100-150 animals. Their predictability and site fidelity has encouraged the development of several dolphin-watching operations. Resolution ADM/ARAP No. 01 (2007) regulates whalewatching activities but few operators are well-informed about the regulations and their importance. This preliminary study found that group size and group presence decrease with increasing number of dolphin-watching boats, although this trend was not statistically significant and that overall, dolphins interacting with boats showed more avoidance behaviour. Future studies in the region will increase survey effort and include new data collection parameters to better characterise effects of dolphin-watching boats on these animals. Discussion and concerns expressed by some members of the sub-committee regarding SC/64/WW2 are detailed in Annex M, item 5.

The discussion further noted that one factor influencing the high volume of operators watching dolphins at the same time is that all operators have similar tour schedules. This results in competition among boat captains, little compliance with the regulations, and an increased risk of boat strikes (three dolphins were killed by dolphin watching boat strikes in 2011). The Committee **draws attention** to the need for developing strategies that minimise the impact of dolphin watching on the dolphin population, including staggering departure times to even out boat presence at any one time of day.

The Committee thanks the author for her presentation regarding a relevant situation in the host country and expressed concern regarding the intense and uncontrolled dolphin watching in Bocas Del Toro. The Committee **strongly recommends** that Panamanian authorities enforce the relevant whalewatching regulation (ADM/ARAP No. 01) and in particular promote adherence to requirements regarding boat number and approach speed and distances. It also **welcomes** the continuation of the Cooperative Agreement between Argentina and Panama to develop and conduct operator training workshops The Committee **recommends** continued research to monitor this dolphin population and the impacts of tourism on it.

SC/64/WW7 presented a controlled study on the swim-with-whale operations targeting humpback whales in Tonga. Up to five swimmers approached the whales while behaving in one of three ways: quietly slipping into the water and approaching at the surface making minimal noise; approaching whales at the surface making loud vigorous splashes; or, approaching whales with surface swimming and subsurface diving. The control treatment involved the boat approaching whales with no swimmers entering the water. The measure of disturbance was the time until the whales moved from their original location. Preliminary analyses suggest there was no significant difference between the quiet approach and the control, whereas there was a significantly shorter time to departure when the swimmers were loud and splashing, suggesting the management of swimmer behaviour could reduce the disturbance. Discussion is detailed in Annex M, item 5.

SC/64/WW3 presented a modelling approach to examine the potential effects of dolphin watching. Health was used to link individual behavioural changes to vital rates, since health can moderate survival and reproduction. Behaviours had a cost-benefit relationship with dolphin motivations (e.g. foraging reduces hunger), and health was linked to hunger to avoid biologically unrealistic variation. Trade-offs between motivations (e.g., hunger versus fear) then determines behaviour. Application to a bottlenose dolphin population in New Zealand found increased time foraging and decreased time resting leading to a negative shift in the population's health. A theoretical, larger population was then considered, looking at the potential loss of foraging time due to whalewatching vessels. Population-level impacts were dependent on population size and the intensity of whalewatching activities: larger populations required greater disturbance intensity to realise a population-level effect. These results highlight the need to consider whalewatching impacts and management at the population level. Short-term changes in behaviour can be significant, but do not automatically indicate a threat to the population's long-term health. Discussion and concerns over some aspects of SC/64/WW3 are detailed in Annex M, item 5.

The Committee **welcomes** the use of modelling to address the effects of whalewatching on cetaceans. It was suggested that Bocas del Toro, Panama, might be a location where this model could be tested.

15.2 Review whalewatching off Central America

SC/64/SH16 reported on whalewatching operations used as platforms of opportunity in Costa Rica, mainly offering trips to Marino Ballena National Park and Isla del Caño Biological Reserve, areas used by humpback whales during the winter. It was noted that this is a location where, without action, whalewatching could expand without sufficient oversight or control. It was suggested that this could be an important location for future focussed work to assess the development and evaluation of regulations, monitoring efficacy and compliance. The Committee **expresses** concern that whalewatching operators appear to target mothers and calves, especially as the season progresses.

A survey investigating whalewatching tourists' attitudes toward cetacean conservation issues was undertaken in Blackbird Caye, Turneffe Atoll, Belize in 2007 and 2008 (Patterson, 2011), an area that provides year-round habitat to approximately 200 coastal bottlenose dolphins. Two main types of whalewatching were identified: dedicated cetacean research and incidental cetacean watching. Information relevant to the Committee is detailed in Annex M, item 6.

Annex M, Appendix 2 presents information summarising the known whalewatching operators, areas and targeted species in Central America. All Central American countries have whalewatching activities, primarily concentrated in the Pacific, but only Costa Rica and Panama have organised their industries with tour operator associations. In the south Pacific coast of Costa Rica, workshops to train and certify operators in best practices are being held twice a year. In Panama, operator training started in 2006 and will continue this year. In Guatemala and Nicaragua, whalewatching operators are becoming organised. Belize, Honduras, and El Salvador do not yet have organised whalewatching operators or associations or whalewatching regulations.

The Committee **welcomes** the information provided in Annex M, Appendix 2. It was noted that more whalewatching may be occurring in the region, but it is likely to be incidental or opportunistic.

15.3 Reports from intersessional working groups

15.3.1 Large-scale whalewatching experiment (LaWE) steering group

The convenor for this intersessional correspondence group was unable to attend this year's meeting. A detailed progress report of this group's intersessional work is provided in the appendix of SC/64/WW6.

SC/64/WW6 introduced a meta-analysis to test for significant changes in speed, activity budget, inter-breath intervals and cetaceans' paths during whalewatching events. These changes could lead to increased energy expenditure and reduced foraging. In a call for participants, 10 ultimately provided data, after accounting for quality assurance and control procedures. A random effects model allowed for incorporation of heterogeneity due to moderators, such as study quality and body size. Only presence versus absence of vessels was modelled due to data limitations. Whalewatching activities had an impact in all studies, although the magnitude of the response varied. The only consistent response across species was path linearity and changes in resting behaviour. The only significant moderator was the effect of body size: smaller species and populations were less likely to rest in whalewatching vessels' presence. Researchers were receptive to suggested protocols meant to improve the quality of data collected.

15.3.2 LaWE budget development group

This intersessional group was unable to make progress. The convenor sought information on budget requirements from the LaWE principals, but did not receive sufficient information to develop a budgetary framework. The Committee **strongly recommends** that the principal researchers on the LaWE steering group provide concrete information on budget requirements to the convenor of the budget development intersessional group well before the next annual meeting, to allow this group's work to progress.

15.3.3 Online database for worldwide tracking of commercial whalewatching and associated data collection

Work continued intersessionally to develop a database to keep track of the details of whalewatching operations worldwide. The database developer is working towards putting the current version on the Commission's server for evaluation by the Committee.

15.3.4 Swim-with-whale operations

The questionnaire for operators (Rose *et al.*, 2007) was field-tested on three companies in the Dominican Republic in early 2012. Their responses indicated that the questionnaire was appropriate and sufficient to present more widely to operators. Further work will be undertaken intersessionally to distribute the questionnaire to more operators and report results at IWC 66. The Committee thanks Rachel Ford, who conducted the field test of the questionnaire and the Pacific Whale Foundation which funded Ford's trip to the Dominican Republic.

15.3.5 In-water interactions

The Committee discussed the issue of human-cetacean in-water interactions in the wild in 2011 and an intersessional correspondence group was established (see IWC 2012). In order to examine potential risks to both cetaceans *and* humans, key points will be to identify for whom these in-water interactions are dangerous and what is considered dangerous. Definitions are elaborated in Annex M, item 7. In its workplan, the group proposes to work on a comprehensive list of human cetacean in-water interactions, based on Scheer (2010), and to elaborate a list of areas and operations where in-water-interactions take place.

In discussion, the Committee noted that the Commission's Five Year Strategic Plan for Whalewatching (see Item 15.4.1) may not adequately account for swim-with-whale and in-water interactions as forms of whalewatching. The Committee **recommends** that the Commission address issues that arise uniquely from operations that allow customers to swim with or feed cetaceans. It was suggested that the Commission refer to the Committee's definitions of types of whalewatching, as reported in Parsons *et al.*

(2006), as well as the General Guidelines[27] as it progresses its work on whalewatching.

15.4. Other issues

15.4.1 Review scientific aspects of the Commission's Five Year Strategic Plan for Whalewatching

The Committee **agrees** that the goal of its review was to offer the Commission advice that will lead to results that benefit both the work of the Conservation Committee's SWG on whalewatching as well as the Scientific Committee's work. It was clarified that while the Committee focused its input on Objectives 1 (Research) and 2 (Assessment), all five objectives of the Strategic Plan could benefit from further cooperation between the two Committees, particularly in regards to elements such as regulatory frameworks, where this Committee could contribute expertise, data, and other work. The Committee again recognises the ambitious scale of the science-related work programme found in the Strategic Plan and noted that the Commission should consider which actions would require additional time to address (see Annex M, Appendix 3). A working group was convened to formulate the Committee's comments back to the Commission. The Committee **endorses** the results of their consultation, which can be found in Annex M, Appendix 3.

An intersessional correspondence group (Annex Q) was established to discuss and develop guiding principles per Action 1.1 in the Strategic Plan. Action 1.2 should be completed intersessionally, with results reported to the next meeting.

15.4.2 Consider information from platforms of opportunity of potential value to the Scientific Committee

The United Nations Environment Programme-Caribbean Environment Programme (UNEP-CEP), through the Specially Protected Areas and Wildlife Protocol and with the support of the National Environmental Authority of the Government of the Republic of Panama, convened a regional Workshop on marine mammal watching on 19-22 October 2011 in Panama City, Panama (Anon. 2011), bringing together marine mammal tour operators and government regulators from across the wider Caribbean region (WCR). The participants concluded that the data collected during marine mammal watching operations have the potential to answer questions about marine mammal populations in the WCR. Furthermore, these data should involve a network of collectors that cover larger field areas and archived so that they can be accessed and facilitate collaborations. Acknowledging the importance of standardised data, a template data form was developed. A copy of the proposed data form for the WCR may be found in Appendix V of the workshop report.

The Committee **welcomes** this report on UNEP-CEP's activities and encouraged the submission of work related to this initiative to future meetings (and see Item 15.4.3)

Sollfrank and Ritter () presented results from a study conducted on La Gomera (Canary Islands). Boat-based studies have been on-going for years, but little effort has been made to observe cetaceans systematically from land. This study demonstrated that it is possible to direct whalewatching boats to cetaceans spotted from land, allowing comprehensive and simultaneous data collection from land-based stations and boat-based platforms of opportunity. Land-based observations are the best way to monitor compliance with whalewatching regulations and to measure impacts from whalewatching vessels, as the presence of a research vessel does not influence operators or confound impact results.

M.E.E.R. (2012) laid out a model for a marine protected area for sustainable whalewatching in the Canary Islands. Almost 15 years of cetacean data collected exclusively on whalewatching vessels (platforms of opportunity) were used to elaborate a marine protected area (MPA) model. With anthropogenic threats increasing, the MPA model is especially designed for long-term development of whalewatching and other uses in a sustainable way. It is hoped that this report will contribute to the process of designating effectively managed marine protected areas within the European Union and elsewhere.

The Committee **welcomes** this presentation, as it represents the type of data most relevant to this agenda item and the work of the Committee as it can be applied toward science-based management decisions and actions.

SC/64/O12 reported on the situation in Samaná Bay, Dominican Republic, part of a national marine mammal sanctuary (along with the Navidad and Silver Banks). The Samaná Bay Boat Owners Association provides space aboard whalewatching vessels as platforms of opportunity. Data obtained over a period of 12 years were analysed to determine the spatial and temporal distribution of humpback whales in Samaná Bay. This information has played a vital role in the marine spatial planning of Samaná Bay and the creation of a conservation zone with restricted fisheries and tourism activities during the whale calving season. Details on the results of the study and discussion are found in Annex M, item 8.2

In particular given the expanding development of tourism in Samaná Bay, the Committee **recommends** that monitoring and research continue, especially in

[27] http://iwcoffice.org/conservation/wwguidelines.htm

light of the increasing number of cruise ships entering the bay during the calving season.

SC/64/SH16 reported that along the South Pacific coast of Costa Rica, whalewatching boats have been used as platforms of opportunity to collect data on distribution and behaviour of humpback whales from breeding stock G from 2009-2011. The results indicated a high number of mother-calf pairs and the use of coastal waters as a breeding ground. It was suggested that this location might be a good place to study the efficacy of a MPA by conducting research on the behaviour of animals inside and outside the MPA.

15.4.3 Review whalewatching guidelines and regulations

Carlson noted that the compendium of regulations and guidelines[28] on the Commission website was open, as always, to additions and updates. The Committee thanks Carlson for her committed work in this regard and **agrees** that the compendium is a valuable tool and should be continued. SC/64/WW5 analysed the compendium. The analyses, like the compendium, are intended as a reference, in this case to demonstrate both the diversity and similarities in existing rules. The Committee **agrees** that this analysis would also be a useful reference for the Commission and **recommends** that it also be posted on the Commission website.

The Committee reviewed the General Principles[29] and considers them robust. However, it **recommends** that they be renamed 'General Guidelines' (to avoid confusion with the term 'guiding principles'). It **agrees** to revisit them on a more regular basis to ensure they remain representative of 'best practices' and to address them under the standing agenda item on reviewing whalewatching guidelines and regulations.

SC/64/WW1 reviewed several studies that addressed whalewatching guidelines and regulations: Howes et al. (in press*)* investigated the effectiveness of the Ticonderoga Bay Sanctuary Zone to mitigate pressures of dolphin-swim operations on a small population of bottlenose dolphins*;* Alves et al. (2011) report on tourists swimming with and feeding Amazon river dolphins in Brazil; Ponnampalam (2011) collected baseline data on the nature of whalewatching in the Sultanate of Oman; and Pacheco *et al.* (2011) describe the success rate of sighting humpback whales from a marine wildlife-watching vessel operating in the coastal waters off northern Peru. Summaries are found in Annex M, item 8.3.

A product of the regional Workshop on marine mammal watching held in Panama (Anon., 2011) was the development of overarching principles and best practice guidelines for marine mammal watching in the WCR (UNEP-CEP, 2011a; 2011b). These principles and guidelines take into consideration pre-existing codes of conduct and regulations from countries within, and outside, the WCR and closely follow the steps and language used in the document *Pacific Islands Regional Guidelines for Whale and Dolphin Watching* (IFAW, 2008). All of the principles and guidelines developed for the WCR were agreed upon by the tour operators and regulators present at the workshop and may serve as the basis upon which each country's own codes of conduct and regulations may be developed.

Galletti reported that the Chilean Government enacted whalewatching regulations in 2012. Many of the recommendations made by the Scientific Committee in 2007 were included, such as a maximum 300m approach distance for blue whales and allowing only land-based whalewatching for critically endangered southern right whales. Regulations will be translated into English and submitted for the compendium. The Committee **welcomes** this news.

15.4.4 Review of collision risks to cetaceans from whalewatching vessels

No new information was presented under this item.

15.4.5 Swim-with-whales operations

SC/64/WW1 presented information on swim-with programs: Mangott et al. 2011a, reported on swim-with dwarf minke whales on the Great Barrier Reef. The summary is found in Annex M, item 8.5. The Committee **reiterates its recommendation** from item 15.3.5.

15.4.6 Emerging whale watching industry in Oman

Oman's whalewatching industry has experienced gradual growth over the last 10 years, reflecting a steady increase in tourism and a growing awareness of cetacean fauna. The Arabian Sea humpback whale has recently become a target of opportunistic and unregulated whalewatching in southern Oman. The Committee has previously expressed concern over the status of this population which is discussed further under Item 10.7; unregulated whalewatching represents an additional potential threat to this population.

Existing, unofficial whalewatching guidelines in Oman are now over 10 years old. Progress has been made on updating these guidelines as well as gathering data on whalewatching operations, but further technical support is required to finalise the new guidelines as well as to assist with the training of operators.

The Committee **strongly recommends** that operator training workshops should be conducted with a view to promoting best practice for whalewatching and to aid the interpretation and implementation of revised whalewatching guidelines (and see Item 21).

15.5 Work plan

This is discussed under Item 21.

[28] www.iwcoffice.org/conservation/whalewatching.htm#regulations

[29] http://iwcoffice.org/conservation/wwguidelines.htm

15.6 Other matters

It was noted that the development of general data requirements on the effects of whalewatching would be valuable in situations where a country is considering whether it would be sustainable to increase the level of whalewatching (e.g., a proposed increase in whalewatching permits for Kaikoura, New Zealand). The concept of assessing 'whalewatching carrying capacity' is of interest in the management and scientific communities and the Committee **encourages** presentation of a paper outlining the situation in New Zealand at the next meeting of the Committee to facilitate its discussions of the broader issue.

16. DNA TESTING

The report of the Working Group on DNA is given as Annex N. This particular agenda item has been considered since 2000 in response to a Commission Resolution (IWC, 2000).

16.1 Review genetic methods for species, stock and individual identification

No documents were presented this year. The Committee encourages the preparation of technical documents on methods for species, stock and identification for discussion at the next year meeting (see also Item 16.5).

16.2 Review results of the amendments of sequences deposited in GenBank

During the first round of sequence assessment (IWC, 2009 pp. 347) some inconsistencies were found that appeared to be due to a lag in the taxonomy recognized by GenBank or uncertainty in taxonomic distinctions currently under investigation: 23 labelled as *Balaenoptera acutorostrata* in GenBank were identified as *B. bonaerensis*; 9 labeled as *B. edeni*; and 10 labeled as *Eubalaena glacialis* were identified as *E. australis* and *E. japonica*. The Committee had recommended notifying the original submitter about the inconsistency and encouraging an amendment to be made to the entry.

Following 2010/11 intersessional work, amendments were made for four cases of Bryde's whale and one case of minke whale, respectively (IWC, 2012 p 52). In view of the limited responses, the Committee had requested that an official letter be sent from the Secretariat requesting the submitters to make the amendments in Gen Bank. This was done for three scientists for which addresses were available, involving nine cases of right whale (one scientist), one case of right whale (one scientist) and one case of Bryde's whale (one scientist). Unfortunately no responses have yet been received and thus no amendments have been made in GenBank during the intersessional period.

In view of this, for the next period, the Committee **reiterates** its previous suggestion on the addition of a field in GenBank where comments on taxonomy updates of the entries can be made (IWC, 2012 p 52). The Committee **agrees** that Cipriano should make a request to GenBank and that he should inform the IWC Secretariat and the Convenor of the DNA Testing Group if a more formal request is required.

16.3 Collection and archiving of tissue samples from catches and by-catches

Last year, the Committee endorsed a new format for the updates of national DNA registers to assist with the review of such updates (IWC, 2012 p 53). The updates of the DNA registers by Japan, Norway and Iceland this year were based on this new format.

The collection of tissue samples in Japan is from special permit whaling in the North Pacific (JARPN-JARPN II) and Antarctic (JARPA-JARPA II), and from bycatches. It includes coverage for 1994-2011 (JARPN-JARPN II), 1987/88-2011/12 (JARPA-JARPA II). In the case of bycatches it includes coverage for 2001-2011 (see Appendix 2 of Annex N).

The collection of tissue samples in Norway is from the commercial catches of North Atlantic common minke whales. It includes coverage for the period 1994 to 2011 (see Appendix 3 of Annex N).

The collection of tissue samples in Iceland is from scientific whaling and from commercial catches. It includes coverage for 2003-2007 (permit whaling) and 2006-2011 (commercial whaling) (see Appendix 4 of Annex N).

16.4 Reference databases and standards for diagnostic registries

In the Japanese register, almost all common minke whale sampled by JARPN-JARPN II in 1994-2011 were screened for mtDNA and microsatellites. Almost all of minke whales bycaught in 2001-2010 were screened for mtDNA and microsatellites. For animals bycaught in 2011, the percentage for microsatellite is lower (77.8%). This lower percentage is a result of the loss of 26 samples after the 2011 tsunami in Japan (see Appendix 2 of Annex N).

Almost all Bryde's whales sampled by JARPN II in 2000-2011 were screened for mtDNA and microsatellites. Genetic work for mtDNA and microsatellite was completed for four whales bycaught in 2001-2010. Almost all sei whales sampled by JARPN II in 2002-2011 were screened for mtDNA and microsatellites (see Appendix 2 of Annex N).

Almost all sperm whales sampled by JARPN II in 2000-2010 were screened for mtDNA and microsatellites. The single animal sampled in 2011 was screened for mtDNA. Microsatellite work has not been completed yet. All sperm whales bycaught in 2001-

2010 were screened for mtDNA and microsatellites (see Appendix 2 of Annex N).

In the case of Antarctic minke whales, 16.5% and 92.3% of the whales sampled by JARPA in 1987/88-2004/05 were screened for mtDNA and microsatellites, respectively. Work for mtDNA is ongoing. Many of the samples of JARPA II (2005/06-2010/11) were lost after the 2011 tsunami in Japan. DNA work is ongoing on the recovered samples. For animals sampled in 2011/12, the mtDNA and microsatellite work has not yet been completed. For Antarctic fin whales, the 17 samples collected by JARPA II in 2005/06-2010/11 were screened for mtDNA and microsatellites. The DNA work on the single animal sampled in 2011/12 is ongoing (see Appendix 2 of Annex N).

All North Pacific humpback whales bycaught in 2001-2011 were screened for mtDNA and microsatellites. Two North Pacific right whales and three North Pacific fin whales bycaught from 2001-2010 were screened for both mtDNA and microsatellites (see Appendix 2 of Annex N).

Almost all samples in the Japanese DNA registry have been sexed (see Appendix 2 of Annex N).

A suggestion was made that the genetic data of bycaught humpback whales could be of utility for testing hypotheses on stock structure of this species in the western North Pacific.

In the Norwegian register, after discounting for duplicates, missing samples and laboratory problems, 100% of the North Atlantic common minke whale caught in 1997-2011 were screened for mtDNA and microsatellite (see Appendix 3 of Annex N). The Committee **commends** the analyses on quality control carried out on the Norwegian DNA register (Glover *et al.*, 2011).

In the Icelandic registry, all common minke whales sampled under scientific permit whaling in 2003-2007 were screened for mtDNA and microsatellites. The percentage for both markers is 6.1% for whales taken by commercial whaling in 2007-2010. The percentage is 3.5% for whales taken by commercial whaling in 2011. All fin whales caught by commercial whaling in 2006-2010 were screened for both mtDNA and microsatellites (see Appendix 4 of Annex N). A question was raised on the low percentage for the commercial samples of common minke whale. In response, Víkingsson noted that while not required by IWC rules or regulations, tissue samples had been collected for the DNA register from all animals caught in the Icelandic commercial hunt. The delay in the laboratory analyses of samples collected since 2007 is due to funding restrictions but these will be completed before the *Implementation Review* of North Atlantic common minke whales scheduled for 2014.

The Committee appreciates the efforts of Japan, Norway and Iceland in compiling and providing detailed information on their registries in the new format. The Committee **agrees** that the information provided in the new format facilitated greatly the annual review.

16.5 Work plan

The Committee **encourages** the submission of papers in response to requirements placed on the Committee by the IWC Resolution 1999-8 (IWC, 2000). Relevant information in documents submitted to other groups and sub-committees of the Committee will be reviewed next year. Results of the 'amendments' work on sequences deposited in GenBank will be reported next year.

17. SCIENTIFIC PERMITS

This Agenda Item was discussed by the Working Group on Special Permits in two late afternoon sessions to enable all Committee members who wished so to attend. Bjørge was elected Chair of the Working Group. Weller acted as Rapporteur, and the Working Group report has been directly incorporated here.

17.1 Review of results from existing permits

As in previous years, the Committee received short cruise reports on activities undertaken but spent relatively little time on discussion of the details. For long-term programmes the Committee has agreed that regular periodic detailed reviews (following 'Annex P') were more appropriate.

17.1.1 JARPN II

17.1.1.1 AUTHORS' SUMMARIES

SC/64/O3 presented the results of the 2011 Japanese Whale Research Program under Special Permit in the Western North Pacific-Second Phase (JARPN II) offshore component survey in sub-areas 7, 8 and 9 of the western North Pacific. There were three main research components: the whale sampling survey; the dedicated sighting survey; and the whale prey species survey. Two sighting/sampling vessels (SSVs), 1 research base vessel (NM whale sampling survey component), 1 whale prey survey vessel equipped with scientific echo sounder (PSV and 3 dedicated sighting vessels (SVs) were used. The whale sampling survey took place from 11 June to 5 September 2011. A total of 5,156 n. miles was surveyed in 76 days (by the SSVs and NM) sightings included, 53 common minke, 476 sei, 149 Bryde's, 295 sperm, 66 fin and 8 blue whales. A total of 49 common minke, 95 sei, 50 Bryde's and one sperm whale were sampled by the SSVs. Sampled whales were examined on board the research base vessel. In July, common minke whales fed mainly on Japanese anchovy near Syiriya, and they fed mainly on walleye pollock around east of Hokkaido. There were geographical changes of prey species of minke whales

in sub area 7. Sei whales fed mainly on copepods and Japanese anchovy from June to August in sub areas 8 and 9. Bryde's whales fed mainly on krill in sub area 7 in July. Dominant prey species in the stomach of the sperm whale included mid- and deep-water squid. The dedicated sighting surveys took place from 28 April to 6 June 2011 in sub areas 8 and 9. During 4,060 n. miles surveyed 3 common minke, 51 sei, 6 Bryde's, 116 sperm, 31 fin and 4 blue whales were sighted. The prey species survey was carried out from 13 to 28 June in 2011. In parts of sub areas 8 and 9 by the PSV. Its objective was to estimate sei whale habitat and prey preference in relation to oceanographic and prey environments as well as productivity in early summer. Data obtained in this research will be used to elucidate the role of whales in the marine ecosystem through the study of whale feeding ecology in the western North Pacific.

SC/64/O4 presented the results of the 2011 JARPN II - coastal component- survey in spring. Usually the coastal spring survey is carried out in the locality of Ayukawa. On March 11 2011 the Ayukawa town, including all research facilities of JARPN II there, was destroyed by a large earthquake and tsunami. For this reason, the 2011 spring coastal survey was conducted in Kushiro, from 25 April to 10 June, using three vessels. Sampling occurred within 50 n. miles from Kushiro port, and animals were landed at the JARPN II research station. A total of 3,867.4 n. miles was surveyed and 36 schools (43 individuals) of common minke whales were seen and 17 common minke whales were sampled. Average body length was 6.70 m (SD=0.84, *n*=9) for males and 6.29 m (SD=1.02, *n*=8) for females. Dominant forestomach prey species were walleye pollock (*Theragra chalcogramma*) throughout all of the survey period, and krill (*Euphausia pacifica*) that was observed less frequently. Walleye pollock is one of the most important food items for common minke whales in Kushiro in both spring and autumn seasons. Distribution of common minke whales appeared to differ between spring and autumn surveys in Kushiro, at least for some years.

SC/64/O5 outlined the results of the autumn survey of the JARPN II coastal component off Kushiro, northeast Japan (the sub-area 7CN) in 2011. The survey was conducted from 9 September to 30 October 2011, using four vessels. During 5,367.8 n. miles searched, 144 schools and 150 individual common minke whales were sighted and 60 whales were sampled. Average body length was 6.24 m (SD=1.06, *n*=35) for males and 6.05 m (SD=1.08, *n*=25) for females. Overall, 19 of the 35 males (54.3%) and 3 of the 25 females (12.0%) were sexually mature. The dominant forestomach prey species was Japanese anchovy (*Engraulis japonicas*) (61.7%), followed by walleye pollock (26.7%), and krill (8.3%). Pacific saury (*Cololabis saira*) and Japanese common squid (*Todarodes pacificus*) were not observed. The frequent sightings of whales in combination with the slightly higher ratio of mature and larger whales in the 2011 survey, as compared to the 2010 survey, as well as more whales comsuming Japanese anchovy suggested that the abundance and distribution of this prey item may have attracted whales to the coastal waters off Kushiro in autumn 2011. During the survey, no apparent impact due to the earthquake in March 2011 was detected in the distribution, density or catch composition of common minke whales. This implied that effect of the earthquake on the migration of common minke whales in the coastal waters off Kushiro might be negligible.

17.1.1.2 DISCUSSION

Following the cruise report presentations, there was some discussion of how the cruise tracks for the coastal survey off Kushiro were designed and if the intent was to obtain a representative sample or rather to increase the probability of encountering whales. The authors of SC/64/O5 explained that survey vessels used during the coastal component of the programme departed port each day following a number of predetermined lines with 15° radials that were selected on a daily basis after review of weather, oceanographic conditions and the distribution of whales. Survey tracks were concentrated relative to whale distribution and differed from standard line transect methods in that the first 30 n. miles were dedicated to survey search mode followed then by the vessels moving freely within the study area.
In further discussion, the Working Group was reminded that at last years meeting it was suggested that whales taken during coastal operations be examined for radionuclides, especially caesium-137, for use in stock elucidation (IWC, 2012). The authors of SC/64/04 stated that one of the three objectives of the JARPN II programme was to monitor environmental pollutants in cetaceans and the marine ecosystem. Data collection for radionuclide assessment is being undertaken and data are available on the website of the Fisheries Agency of Japan.

17.1.2 JARPA II

17.1.2.1 AUTHORS' SUMMARY

SC/64/O2 presented the results of the 2011/12 survey of the Second Phase of the Japanese Whale Research Program under the Special Permit in the Antarctic (JARPA II). Two dedicated sighting vessels (SV), one sighting and sampling vessel (SSV) and one research base vessel engaged in the research for 66 days, from 1 January to 6 March 2012 in Areas V (130°E - 170°W) and VI West (VIW: 170°W - 145°W). Unfortunately, the research activities were interrupted several times by the violent sabotage activities of an anti-whaling group. The planned dedicated sighting survey had to be cancelled so that the vessels could undertake security tasks. The research activity of the SSV was also interrupted several times. The total search distance by the SSV of 3,040.5 n. miles, was approximately one-

third of the search distance in 'normal' years. Eight species including six baleen whales (blue, fin, sei, Antarctic minke, humpback and southern right whale) and two toothed whales (sperm and southern bottlenose whales) were seen. The most common species seen (284 schools, 684 individuals) was the Antarctic minke whale followed by the humpback (112 schools, 208 individuals) and fin whales (11 schools, 31 individuals). A total of 266 Antarctic minke whales (99 males and 167 females) and one fin whale (female) were sampled examined on the research base vessel. A total of five blue, six humpback and four southern right whales were photo-identified. Two biopsy samples were collected from humpback whales and four from southern right whales. In March, satellite tags were deployed on two southern right whales. Oceanographic surveys to investigate vertical sea temperature profiles were also implemented using XCTD. In summary (1) whale composition in the research area was stable compared to previous JARPA and JARPA II surveys in the same area; (2) the ice-free extent in Area VIW was substantially larger than in previous seasons; (3) high density areas of Antarctic minke whales were observed near the ice edge; (4) mature female Antarctic minke whales were dominant in the southern part of Area VIW (66.8%); and (5) Antarctic minke whales in the 'transition area between 130°E and 165°E' (area of stocks mixing), were successfully sampled.

17.1.2.2 DISCUSSION

Following the presentation of the 2011/12 JARPA II cruise report, it was noted that the lack of discussion did not imply there is agreement on the issue of scientific whaling under special permits. Differing views on this activity remain and the Working Group was referred to the statements made in Annex P1 and Annex P2.

17.1.3 Planning for a final review of results from Iceland - North Atlantic common minke whale

The results from the Icelandic programme on common minke whales will be subject to final review during the coming intersessional period. 'Annex P' (IWC, 2009) documents the review process. The only time this procedure has been used was to review the JARPN II Special Permit in 2009 (IWC, 2010a). While the process worked well in general (IWC, 2010b), improvements on some aspects of the implementation of the process have been agreed and are detailed in Annex P4 of last year's report (IWC, 2012 pp. 310-311). One change in implementing the 'Annex P' procedure (IWC, 2009) will be the presence of observers. The general outline of the workshop includes an initial session where a restricted number of scientists associated with the proposal will present results of their research and answer questions. Then the main part of the review workshop will be closed sessions where the expert panel evaluates the results. At the end of the workshop there will be a short open session where the expert panel can ask scientists associated with the proposal questions for clarification. Observers will be allowed to the open sessions. In light of these modifications, the timetable to be used for the Iceland and JARPA II reviews is presented in Table 3 of Annex P4 (IWC, 2012 pp. 310-311).

Vikingsson stated the Working Group that Iceland will meet the requirements of the time schedule of Annex P4 (IWC, 2012 pp. 310-311) for a review in 2013. The Working Group **agrees** that the review of results from Iceland will occur February/March 2013.

SC/64/SCP1 addressed the data availability under Procedure B of the Data Availability Agreement. A small group was set up to consider this document. The Committee agrees the clarifications to 'Annex P' (IWC 2009) included as Annex P3.

17.1.4 Planning for a periodic review of results from JARPA II

The Working Group **agrees** that the review of results from JARPA II will occur February/March 2014.

17.2 Review of new or continuing proposals

17.2.1 JARPA II

Japan reported that there was no plan to change the JARPA II programme.

17.2.2 JARPN II

Japan reported that there was no plan to change the JARPN II programme.

18. WHALE SANCTUARIES

The Committee received no new proposals for sanctuaries this year. The report of an international workshop on Marine Protected Areas (SC/61/O20) was discussed under Annexes K and M.

19. SORP

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 to improve the coordinated and cooperative delivery of relevant scientific information to the IWC. The Partnership now includes ten countries: Argentina, Australia, Brazil, Chile, France, Germany, New Zealand, Norway, South Africa and the USA. A framework and set of objectives for SORP have been endorsed by the Committee (IWC, 2011) and six SORP research projects were endorsed last year (IWC, 2012). Progress of these research projects was reviewed this year. The IWC has a budget specifically related to the work of SORP established with a contribution from Australia in 2008 and supplemented by additional voluntary contributions from Australia and the USA in 2011. This budget is administered by the IWC Secretariat.

SORP was originally discussed in an open session, chaired by Gales and rapporteured by Bell. The report of that session is incorporated directly into the plenary report here.

The Committee noted that in April 2012, Bell was appointed the Southern Ocean Research Partnership coordinator replacing Childerhouse and Wadley was appointed the Antarctic Blue Whale Project coordinator.

19.1 Review of progress since IWC 63

SC/64/O13 summarised the progress of SORP since IWC63. Progress was made on the following major items:

(1) *Overall support and progress of the six SORP research projects* – progress reports for the 2011/12 period are available in SC/64/O13;
(2) *Provision of interim funding* – funding was provided for all six SORP projects to support research during 2011/12 (SC/63/SC-report);
(3) *Further development of the* SORP Antarctic Blue Whale Project *(formerly known as the SORP Year of the Whale Project)*;
(4) *Planning and implementation of collaborative SORP Antarctic blue whale expeditions* – two expeditions led by Australia were undertaken in the austral summer of 2011/12 (SC/64/SH11) to develop and test methodologies that will be employed during the SORP Antarctic Blue Whale Voyage planned for early 2013 (SC/64/SH13). Further development of acoustic methods (SC/64/SH12) and survey design (SC/64/SH10, SH14, SH26) was also undertaken;
(5) and *Completion of the core SORP project*: The Living Whales Symposium and Workshops, held in Chile in March 2012 (SC/64/O14).

These items are covered in more detail below. The Committee was **pleased** to note that SORP is being successfully implemented and **welcomes** the results.

19.1.1 SORP Antarctic Blue Whale Project

The title 'Antarctic Blue Whale Project' (ABWP) now replaces 'The Year of the Whale' (YOTW) to reflect the fact that the proposed research will require a multi-year, multi-platform, integrated and coordinated research effort. This became clear following discussions within the Committee and intersessionally, particularly given the extensive methodological development (SC/63/SH3; SC/63/SC-report Annex H; SC/64/SH10-14, SH26) reported. A single season effort is not an appropriate strategy to deliver an estimate of circumpolar abundance, given logistical constraints and the preferred sampling regime under a mark-recapture approach.

The specific objectives of this initiative are to:

(1) provide a circumpolar abundance estimate for Antarctic blue whales;
(2) improve understanding of Antarctic blue whale population structure;
(3) improve understanding of connectivity between blue whale feeding and breeding grounds;
(4) and to characterise foraging habitat of blue whales.

SC/64/O13, SH10-14 and SH26 were discussed in Annex H. The project was very well received as an investigation to determine the viability of ideas and methods. Gales welcomed the maturing ideas and methods under development and their implementation in the Southern Ocean during 2012/13. Results from the ABWP have been presented at international scientific meetings, including the International Polar Year conference in Montreal, April 2012.

The importance of SORP as a means to engender international cooperation was noted. There are encouraging signs that estimating the circumpolar abundance of blue whales will be possible.

19.1.2 Ways to expand Antarctic Blue Whale Project (ABWP) work

SC/64/O16 provided information about the South African Blue Whale Project (SABWP) and it was discussed in annex H. Despite evidence of recent increase, the population of Antarctic blue whales remains severely depleted from commercial whaling. Both the high concentrations of sightings of Antarctic blue whales in the 0-20° E sector of the Antarctic in recent years (IWC IDCR/SOWER and SOWER sighting records) and the high historic catches of some 12,000 probable Antarctic blue whales off the west coast of South Africa, Namibia and Angola prior to 1930, suggest that the southeastern Atlantic Ocean and neighbouring Southern Ocean region should provide exciting opportunities for research on Antarctic blue whales. The South African Blue Whale Project (SABWP) has been recently funded by the South African National Antarctic Programme (SANAP) and the National Research Foundation (NRF) to investigate the seasonality, distribution and relative abundance of this species in these areas with the long-term aim of determining relative abundance indices to measure the population trend. Research efforts will be concentrated in two regions; 67°S to the ice edge and 0-20°E region in summer, and off the south-western Cape coast in winter. Autonomous Acoustic Recorders (AARs) will be deployed in both the high and low latitude regions to determine distribution and seasonality patterns of this migratory species. Line-transect surveys (incorporating photo-identification, biopsy sampling and ship-based passive acoustic monitoring) will be carried out in the Antarctic region during summer to provide abundance and call-rate measurements for 'broadbrush' ground-truthing of Antarctic AAR data. Low–latitude AAR data will provide information on where and when to concentrate future research efforts off the south-

western Cape coast. Data from this voyage will contribute to the ABWP and other SORP projects. A proposal for one of the team to receive training in AAR deployment during a cruise off Greenland this summer (SC/64/O17) has been adopted.

Norway joined SORP two years ago. Norway may contribute to SORP in the following manner:

(1) Financially: upon provision and favourable review of a budget and research proposal from existing or new SORP projects, Norway would be willing to fund research. Norway does not have to be involved in the research proposal.
(2) In kind support: annually, Norway sends scientists on fishing vessels that work in the Southern Ocean, in 2012/13 primarily around the South Orkney Islands. Biannually, the Norwegian vessel R/V *G O Sars* operates in the Southern Ocean I.A. in the area around Bouvet Island. This is a dedicated research vessel that can be directed to other areas. It will next sail in 2013/14 (to be confirmed). Berths on these vessels could be made available to SORP researchers.
(3) Personnel: the expertise of Norwegian scientists could be provided for collaboration on SORP research projects.

Particular interest was expressed in contributing to the Antarctic Blue Whale Project.

The Committee **greatly welcomes** Norway's offer of monetary, in kind and personnel support for SORP and **agrees** that it will be resolved intersessionally how it will be managed and administered.

The Committee was informed of France's intention to use the R/V *l'Astrolabe* to carry out a photo-identification and sightings surveys of blue whales in Terre Adelié. Surveys will be carried out over the next two years and it is hoped it can be continued for up to four years. A marine science voyage is also being considered in the southern Indian Ocean, south of Kerguelen on the Marion Dufresne. It is hoped that time may be allocated on this to perform blue whale research but it is a highly competitive process.

The Committee was informed of Germany's intention to perform their fifth cetacean survey from January to mid-March 2013 in the western Weddell Sea. This will be a repeat of the 2006/7 survey. The aim is to relate krill abundance to hydrography and oceanography. Helicopters will be used as the survey platform.

The Committee was also informed of plans by the International Fund for Animal Welfare for a Southern Ocean voyage that may be able to contribute to the Antarctic Blue Whale Project through combined acoustic surveys and photo-identification.

It was noted that collaboration with the wider Antarctic community is underway with SCAR, COMNAP, IAATO and CCAMLR to pursue the objectives of the ABWP.

The Committee **encourages** international involvement in the SORP Antarctic Blue Whale Project in the form of research, ship time or personnel. The Committee also stressed the importance of standardised protocols and shared data access across a range of data types, and **encouraged** their adoption across international cetacean research programmes.

19.1.3 Killer whales in the Southern Ocean

The principal investigators once again participated as 'visiting scientists' on board the tour vessel M/V *National Geographic Explorer*, during four consecutive trips to the Antarctic Peninsula from 7 January to 15 February 2012; approximately 3000 photo-id images of over 200 individually-recognisable animals for future mark-recapture analyses were obtained; 2 skin biopsy samples were obtained (samples archived at SWFSC), and 3 individuals were satellite-tagged. Data are presented in the full project report in Annex 1 of SC/64/O13. Other tour ships operating in the Antarctic Peninsula area were also canvassed for killer whale photographs and thousands of images were obtained from over two dozen killer whale encounters. The principal investigators feel confident that within the next year or two they should have enough images to estimate population sizes for the three types of killer whales that are recognised in the Peninsula Area.

The Committee **commends** the work of the principal investigators.

The Committee was also informed of new killer whale photo-id data from the Institut Polaire Française (IPEV), CEtacés Terre Adélie project that is available for 35 individuals in Terre Adélie, eastern Antarctica (SC/64/SM6).

19.1.4 Foraging ecology and predator prey interactions of baleen whales and krill

During the funding period, significant progress was made towards the overall goal of understanding the foraging ecology and predator-prey interactions between baleen whales and krill in the waters around the Western Antarctic Peninsula. Analysis was completed describing the diving behaviour of humpback whales from suction-cup tags deployed in 2009 and 2010. These results were presented at numerous scientific meetings including the Biennial Conference on the Biology of Marine Mammals (Tampa, FL, November 2011), and the recent SORP workshop on non-lethal research techniques for studying cetaceans (Puerto Varas, Chile, March 2012). A full project report is included in Annex 1 of SC/64/O13.

The main findings of the project to date are summarised below:

(1) Humpback whales were found to feed almost exclusively during night-time hours in late autumn (May/June), spending daylight hours either resting or traveling. The initiation of feeding was often proceeded by deep exploratory dives that are hypothesised to sample the water column to determine where prey are distributed.
(2) Humpback whales appear to achieve or conform to ecological predictions of optimal foraging theory in two significant ways: By increasing the number of feeding lunges executed per dive with increased dive depth; and by targeting higher densities of krill as feeding depth increases
(3) While both of these findings are significant, the fact that the principal investigators have been able to quantify increases in prey density concurrent to whale feeding is novel. The information provided from this relationship will be a substantial component of the manuscripts that are currently in preparation to be submitted for peer review.
(4) Humpback whales vary the depth of their feeding in relation to the diel vertical movement of krill in the water column.

The Committee **welcomes** these results and **encourages** further work to enhance understanding of humpback whales that overwinter in Antarctica. Gales noted that additional satellite and datalogger work on humpback and minke whales was planned.

19.1.5 Oceania humpback whale mixing

The focus of this project has been on preparing for the proposed 2013 satellite tagging work at the Kermadec Islands and American Samoa (SC/63/O13). The Oceania humpback whale population estimate has been published (Constantine *et al.*, 2012) with a sex-specific POPAN super-population model, which accounted for residents and whales migrating through the survey areas, giving an estimate of 4329 whales (3345−5313) in 2005.

In the winter of 2011, satellite tagging work was undertaken in New Caledonia (Garrigue in collaboration with Zerbini and Clapham) adding to the 2007 (Garrigue *et al.,* 2010) and 2010 tagging efforts. The general trend observed was for the majority (~75%) of whales to head in a south-southeasterly direction once they left the New Caledonia breeding grounds. Some whales stopped at seamounts or other undersea geographic features along the way for varying lengths of time.

The Raoul Island (Kermadec group) single day four hour survey conducted between 0800 and 1200 hrs was conducted on the 8th October 2011. This adds to the previous three years of October surveys using a standard set of seven land-based locations (Potier, 2008; Brown, 2009; Brown, 2010)[30]. Previous whale-counts from these surveys have ranged from 62-153 whales and the 2011 survey counted 126 individual whales (Potier and Shanley, 2012)[30]. The consistently high number of humpback whales observed migrating past Raoul Island, peaking in October, confirms the Kermadec Islands as the southernmost location in Oceania with regular whale sightings and the ideal site to attach satellite tags as the whales migrate south. Constantine will visit the Kermadec Islands in August 2012 to consider this research site. Research in American Samoa conducted in the 2011 field season continued preparation for the planned satellite tagging in 2013.

Future work will focus on addressing two questions.

(1) What is the connection between the humpback whales from Area V feeding grounds and their migratory corridors and breeding grounds in Australia and Oceania?
(2) Do whales from Area V represent a single breeding ground or are they a mix of individuals from several distinct breeding grounds?

A full project report is included in Annex 1 of SC/64/O13.

19.1.6 Fin and blue whale acoustics

Understanding baleen whale distribution and abundance in the Antarctic, particularly blue and fin whales, is complicated by the pelagic distribution of both species, the difficulty of working in the Southern Ocean (SO) and the massive decline of both due to commercial whaling. After a half-century of protection, little is known about the present-day status of each species. Blue and fin whales are congeners that are the largest mammals on earth. Both occur in all oceans of the world with similar distribution patterns. In particular, each species occurs in high latitudes in the Southern Hemisphere. In the Antarctic, blue whales are generally thought to occur closer to the ice edge than fin whales. Blue whales are designated as different subspecies, i.e. Antarctic (*B.m. intermedia*) and pygmy types (*B.m. brevicauda*), and Chilean blue whales are also considered an unnamed subspecies, or at least a separate management unit. In the case of fin whales in the Southern Hemisphere, two subspecies have been considered: *B. physalus quoyi* for the Southern Ocean form and the pygmy fin, *B. p. patachonica* found in the northern parts of the Southern Hemisphere.

Both blue and fin whales were targets of commercial whaling, particularly from the early 1900's through the 1930's, leading to heavy depletion. Blue whales were protected internationally from whaling in 1966 and fin whales in 1985. At present, both species are listed as Endangered by the IUCN and there are no reliable population estimates for either species globally. A recent examination of almost 40 years of sighting data resulted in an estimate of 2,280 (CV = 0.36) Antarctic blue whales, which is less than 1% of the original

[30] Unpublished field reports

population (Branch 2007). There are no equivalent estimates for SH fin whales.

From 1978 to 2010 the IWC supported the annual IDCR/SOWER Antarctic cruises that consisted of three circumpolar sets of cruises over multiple years that focused primarily on minke whale abundance but that also provided an estimate of abundance for Antarctic blue whales (Branch *et al.* 2004). Only two of the recent cruises focused on fin whales (Ensor *et al.* 2006, 2007). Given the amount of effort, ship time, high risk of poor weather and cost of sighting cruises, it is unlikely that the tremendous shipboard effort of IDCR/SOWER will be repeated. In order to continue to monitor Antarctic blue and fin whales, the use of a network of long-term passive acoustic recorders has been proposed *in lieu* of dedicated circumpolar visual surveys.

Passive acoustic monitoring is a robust means of monitoring blue and fin whales in remote areas over long time periods, including around the Antarctic. The present analysis of all the available data shows the geographic and seasonal occurrence of blue and fin whales around the Antarctic. However the lack of overlap in the years and locations monitored, the differences among instruments and analysis methods used, underlines the need for coordinated effort. To best exploit passive acoustic data long term, a pan-Antarctic monitoring system needs to be put in place and maintained. Thus far there has been a positive response from many countries regarding this project. In the near term the principal investigators need to find the finances and continue instrument development to facilitate a coordinated research effort. Further a single method either for each species or for both needs to be adopted for analysing the data. A review of existing methods for estimating relative abundance from passive acoustic sensors demonstrates that the scientific question of interest will drive the analysis methods chosen. The principal investigators suggest that the Australian Marine Mammal Centre, based at the Australian Antarctic Division, Hobart, maintain a database of the metadata and data from hydrophones and make these freely available if possible.

Acoustic data from a single hydrophone present unique challenges to density estimation: to overcome these, the principal investigators need to improve their knowledge of call rate, acoustic behavior and source level of whales; detection distance and sound propagation (environmental parameters and ambient noise level). Methodology to estimate the density of whales from acoustic data is advancing rapidly and it is anticipated that if understanding of the parameters above is improved, density estimation using passive acoustic data will become the state of the art for monitoring Antarctic blue and fin whales. A full project report is included in Annex 1 of SC/64/O13.

The Committee **commends** the work of the principal investigators and it was noted that this project addresses the research priorities identified by SORP to meet the overall objectives of the IWC.

It was highlighted that it will provide valuable data for blue whales and may provide the only practical way to obtain data about fin whale abundance, information that the scientific community currently does not have. From this data it may be possible to estimate trends in blue and fin whale populations over decadal scales.

This work is closely aligned with the objectives of the Antarctic Blue Whale Project. It was also noted that that the global economic situation is very likely to reduce the amount of ship time available to researchers in the future, therefore the development of acoustic methods such as these are essential for continued, non-lethal cetacean research.

19.1.7 Living Whales Symposium and non-lethal research techniques workshops

SC/64/O14 summarised the Southern Ocean Research Partnership Symposium and Workshops entitled 'Living whales in the Southern Ocean: advances in methods for non-lethal cetacean research'.

The Symposium and accompanying workshops were held in Puerto Varas, Chile from 27-29th March 2012, to discuss recent advances in methods for non-lethal research on whales in the Southern Ocean. The Symposium was attended by 124 registered participants from 16 countries and was also live streamed on the web, allowing an 1,553 simultaneous viewers.

The first day was an open Symposium with invited experts who showcased new non-lethal research methods for whales in the Southern Hemisphere. The Symposium talks were divided across five sessions that covered an overview of the history of whaling, evolution of non-lethal techniques and the role of whales in Southern Ocean ecosystem. These were followed by sessions on molecular techniques, biologging, remote sensing and long-term non-lethal research. A PDF of the talks are already available[31] and the videos of each talk, in English and Spanish, will soon be available.

The Symposium was followed by two days of Workshops that covered specific research areas. The Workshops were each one day in duration and covered the following topics:

(1) health assessment of live cetaceans;
(2) advances in long term Satellite Tagging Techniques for Cetaceans;
(3) population dynamics and environmental variability; and
(4) estimation of diet and consumption rates from non-lethal methods.

[31] www.simposioballenas.cl

The workshop health assessment of live cetaceans reviewed several techniques obtained from blow samples, biopsy samples, collection of faeces, visual health assessment, photogrammetry, blow intervals and respiration rates, among others. The workshop identified two main aspects:

(1) health assessment data and studies should be integrated with population dynamics data, where possible; and
(2) integration of live animal health assessment with studies on dead and stranded animals, particularly within the same geographical region, is highly informative and should be a priority. The priority areas for further consideration in health assessment include nutritive stress and body condition; feeding and fasting or starvation state; skin lesions; stress; emerging issues and exposures; and particularly, standardisation of methodologies.

The workshop on large whale population dynamics and environmental variability explored which life history parameters can be connected with environmental variability and highlighted the need for researchers to collect data on body condition, mortality and reproductive output, among others. The workshop also evaluated different analytical and simulation techniques to incorporate environmental variability into population models and recognised the need of long term data sets to detect such effects. The workshop recommended that long-term studies, photo-identification and biopsy sampling be routinely collected and promoted the use of geochemical tracers (e.g. stable isotopes) and other 'eco-markers', including DNA, since this approach can help to identify foraging locations of populations.

The workshop advances in Long-Term Satellite Tagging Techniques for Cetaceans and their Application to Address Research Questions in the Southern Ocean reviewed advances on tag development and dedicated studies to address possible physical and physiological effects of satellite tags on cetaceans. The workshop highlighted that effort could be directed to minimise the size and diameter of body-penetrating satellite tags in order to minimise trauma of implant and water ingress and promoted the use of an alternative to body-penetrating tags, such as new designs with external electronics and a long anchoring system. It was agreed that new designs for cetacean tags ought to be developed and that priority should be given to accelerometer and dive/surface interval data and to the development of algorithms that can compress data for transmission via Argos. The workshop also recognised that some devices have the potential to cause considerable tissue damage and that studies on carcasses derived from incidental mortality should be conducted, as well as monitor tagged animals. Finally, the workshop highlighted the need to create awareness on the use of these techniques within local communities, regulatory agencies and the general public prior to tagging project.

The workshop on Estimation of Diet and Consumption Rates highlighted several techniques that might be used to achieve this difficult objective. Tagging studies could provide information about foraging effort, photogrammetric techniques about individual fitness and steroid-hormone samples (from faeces or biopsy) about reproductive status. Understanding interspecific differences in prey preference will help to predict how climate driven changes affect krill and, ultimately whales. The value of understanding how local oceanographic conditions and prey availability affect the foraging behaviour and distribution was highlighted. Also recognised was the need to improve understanding of foraging strategies, prey choices, feeding destinations, etc. and recommended the use of several dietary tracers, such as stable isotope analysis, and molecular techniques, for diet reconstruction alongside fecal sampling and fatty acid analysis.

In summary, the Symposium and Workshops were very successful. The event drew a large audience and the Symposium organisers recommend the use of live broadcast technologies alongside simultaneous translation as a means to reach a wider audience in future events. The workshops gave an excellent overview of existing and new research techniques and contributed enormously toward setting guidelines and prioritising research needs for improving our current scientific understanding and techniques.

The Symposium organisers and the SORP Scientific Steering Committee **thanked** the sponsors of the Symposium and Workshops: the Ministry of Foreign Affairs, Chile; the directorate of Maritime Territory and Merchant Marine of Chile; the Australian Government; the National Oceanic and Atmosphere Administration of the United States (NOAA); Oregon State University; the International Fund for Animal Welfare; the South Pacific Research Whale Consortium; Altavoz; and the Cetacean Conservation Center Chile. The Symposium and Workshops represent a completed Southern Ocean Research project. The full report can be found in SC/64/O14.

The Committee **thanks** the Symposium organisers, in particular Galletti, Baker and their teams for their work and congratulated them on their success. The usefulness of the Symposium and Workshops for improving current non-lethal techniques for cetacean research was stressed. It was noted that some of these will be applied to research to be conducted in the coming field season, e.g. by Argentinean researchers. It was also noted that useful recommendations came out of the Workshops with regard to research on climate change impacts on cetaceans, e.g. Southern right whales in the southwest Atlantic, in line with wider SORP objectives.

Table 10

SORP funding requests and allocations for 2012/13

Project	PI	Line item	Requested (GBP)	Allocated (GBP)
SABWP	Best	Travel	2,500	2,500
SORP 1: ABWP	Wadley	-	0	11,700
SORP 2: Killer whales	Pitman	Travel	2,235	2,235
		6 x wildlife computers on location-only tags	10,360	10,360
		6 Wildlife Computers depth and location tag	17,267	0
SORP 3: Baleen whales	Friedländer	Coordinator's salary#	13,430	0
SORP 4: Blue and fin whales	Stafford	Salary	7,963	7,963
		Support for coordination and development activities	15,926	15,926
		Steering Committee meeting*	4,778	0
SORP5: humpback whales	Constantine	Photo-ID and tissue sampling	9,548	9,548
		Project assistant**	6,376	6,376
		Steering Committee meeting*	3,819	0
SORP 6: Symposium	Baker/Galletti	-	0	0
Total requested 2012/13			94,202	
Total allocated 2012/12				**54,908**

The Committee requested clarification of the use of the money requested for consideration intersessionally.

*No money was allocated to individual projects for Scientific Steering Committee meetings because of proposals to hold a SORP conference in 2013 (see workplan item 6).

** The principal investigators also requested 182,748 GBP to support research in 2013/14. It was noted that SORP cannot support such large requests for money. Therefore, the Committee **encourages** that SORP funds allocated for 2012/13 be used in part to allow the project assistant to write proposals for additional project funding.

19.2 Budget

The IWC has a budget specifically related to the work of SORP established with a contribution from Australia in 2008 and supplemented by additional voluntary contributions from Australia and the USA in 2011. This budget is administered by the IWC Secretariat.

19.2.1 Budget overview

Bell presented a summary of the SORP money spent to date and remaining funds. A total of 76,947 GBP remain unallocated and unspent. A figure of £37,730 GBP[32] remains in the SORP budget allocated but unspent.

19.2.2 Request for funds from projects

Table 10 summarises the requests for SORP funds received from existing SORP projects for 2012/1.

SC/64/O17 requested 2,500 GBP for the South African Blue Whale Project (SABWP; SC/64/O17) to support travel for one investigator, Meredith Thornton, from South Africa to Greenland to participate in a week-long cruise cruise in which five Autonomous Acoustic Recorders (AARs) will be deployed west of Disko Bay in August 2012. The cruise will be led by the Greenland Climate Research Centre and Applied Physics Laboratory of Washington University. The intention is that the investigator gain the necessary technical experience in deployment of AARs at sea, that otherwise might entail an experienced person accompanying a long supply voyage from Cape Town to the ice and back just for a few days' work. An official response from the organisers of the cruise has still not been received.

The Committee **approved** this request for funding.

Funding requests from existing core SORP research projects for 2012/13 are outlined in Table 10 alongside the agreed allocations.

19.2.3 Reallocation of funds

A small group was formed consisting of the SORP Scientific Committee and other interested parties to discuss reallocations of remaining SORP funds to projects in 2012/13.

A figure of £37,730 GBP remains in the SORP budget allocated but unspent. The Committee **agrees** that 11,700 GBP of this be reallocated to the Antarctic Blue Whale Project and the remaining 26,030 GBP be

[32] This figure has not been finalised because of possible outstanding invoices from the 2011/12 allocation to SORP Project 6:

rolled-over into the general SORP budget for reallocation in the future.

19.2.4 Allocation of funds
The Committee **agrees** to allocate SORP funds for 2012/13 as outlined in Table 10.

19.2.5 Seeking additional funding
Following the reallocations and 2012/13 allocations, £48,069 GBP will remain in the SORP budget administered by the IWC Secretariat.

The Committee **thanks** the Government of Australia and the USA for their generous contributions to the SORP and **encourages** support and voluntary contributions from other nations to ensure the continuation of this exciting initiative.

19.3 Requirements for formalising participation in SORP and development of new projects
The Committee is keen to promote continued and new involvement in SORP. Partners are **encouraged** to formalise their involvement in the form of a letter to the SORP Secretariat. If Partners require more formal protocols, such as a Memorandum of Understanding, this can be arranged by the SORP Secretariat. The Committee **encourages** the involvement of new and existing Partners in SORP scientific steering Committees, working groups and technical Committees.

19.4 Workplan
The Workplan is discussed under Item 21. The Committee **agrees** that data management and sharing was an important issue to consider. Gales reiterated the importance of workplan item 7.

20. RESARCH AND WORKSHOP PROPOSALS AND RESULTS

20.1 Review results from previously funded research proposals
Research results from previously funded proposals are dealt with under the relevant agenda items.

20.2 Review proposals for 2012/13
No unsolicited research proposals were received this year. Proposals for the voluntary fund for small cetaceans were discussed under Item 14.3 and those relating to SORP are discussed under Item 19.

Table 11 lists the proposed intersessional meetings and workshops. Financial implications and further details are dealt with under Item 23.

21. COMMITTEE PRIORITIES AND INITIAL AGENDA FOR THE 2013 MEETING

As in recent years and with the Scientific Committee's agreement, the Convenors met after the close of the Committee meeting and finalised the following basis

Table 11

Proposed workshops for the intersessional period

Subject	Agenda Item	Venue	Dates
Review of MSYR workshop and WNP common minke whale's Second Intersessional Workshop	5.1; 6.6	To Be Determined	late Feb-Apr 2013
AWMP Greenland hunt SLA development	8.3	Copenhagen, Denmark	3 days within 12-18 Dec 2012
Planning for the 2013 IWC-POWER cruise	10.8.1.3	Toyko, Japan	25-27 Oct 2012
Workshop on Arctic anthropogenic impacts on cetaceans	12.5.3	Anchorage, Al aska	late Feb - Mar 2013
Workshop on assessing the impacts of marine debris	12.7	location of SC meeting	4 day pre-meeting; mid May - mid Jun 2013
"Marine bushmeat" workshop	14.6	location of SC meeting	2 day pre-meeting; mid May - mid Jun 2013
Icelandic Special Permit expert panel review workshop	17.1.3	Reykjavik, Iceland	Feb-Mar 2013

for an initial agenda for the 2013 meeting. The same criteria as previous years were taken into account and this was based on the recommended work plans developed by sub-committees and the general discussion of these within the Committee. The Committee **recognises** that it is the Commission who establishes the Committee's overall priorities. Thus priorities may have to be reviewed in light of decisions made by the Commission. Items of lower priority on sub-committee agendas will only be discussed if time allows. Therefore, the Committee **stresse**s that papers considering anything other than priority topics will not be addressed at next year's meeting. This information will be included on the website when the information about document submission is published next year. Convenors will receive timely information on the titles of papers intended for the discussion within their gaps, and may contact authors if they believe the papers are unlikely to be discussed.

Revised management procedure (RMP)
The following issues are high priority topics:

(1) Review new information on western North Pacific Bryde's whales

(2) Conduct an *Implementation Review* for North Atlantic fin whales starting during a pre-meeting before SC65 and continuing during the 2013 Annual Meeting

(3) Prepare for the 2014 *Implementation Review* for the North Atlantic minke whales

(4) Review information available for North Atlantic sei whales in the context of a *pre-implementation assessment*

Western North Pacific common minke whales
Complete *Implementation Review*(including hold intersessional workshop)

Bycatch group (BC)
The focus of the group will remain in estimating mortality due to bycatch and ship strikes. The work plan will include:

(1) reviewing progress in including information in online National Progress Reports,

(2) estimating risk and rates of bycatch and entanglement,

(4) development of methods to estimate mortality from ship strikes,

(5) continuing development and use of the international database of ship strikes,

(6) review of information on other sources of mortality.

Special Permit

(1) Review results of the expert workshop in the Icelandic special permit programme;

(2) Plan for expert workshop on JARPA II;

(3) Review new and existing proposals as appropriate

Bowhead, right and gray whales (BRG)
High priority items will include:
(1) perform the annual review of catch information and new scientific information for BCB stock of bowhead whales and eastern gray whales;

(2) review any new information on all stocks of right whales, especially results of assessments for southern right whales;

(3) review North Pacific gray whale stock structure and movement

(4) review any other new information on western and eastern North Pacific gray whales and other stocks of bowhead whales.

Environmental concerns (E)
(1) Receive the SOCER (focus: Atlantic Ocean)

(2) Pollution issues

(3) Cetacean Resurging & Emerging Diseases (CERD)

(4) Impacts of anthropogenic sound

(5) Climate change issues

(6) Marine debris and cetaceans (including report from the Marine Debris Workshop)

(7) Other habitat-related issues

7.1. (MREDs)

7.2. Cumulative impacts

(8) Unusual mortality events incl. Peru

Ecosystem modelling (EM)
(1) Modelling of the direct relationship between baleen whale populations and the abundance of their prey.

(2) Coordination with CCAMLR's Ecosystem Monitoring and Management Programme will also be sought on its efforts to advance krill-predator models.

Aboriginal subsistence whaling management procedure
(1) Highest priority will be to work towards the development of long-term SLAs for the Greenland hunts;

(a) Develop trial structures and operating models for the Greenland hunts of bowhead and humpback whales to be presented initially at an intersessional workshop

(b) Develop an AWMP/RMP-lite program to assist developers of *SLA*s for the Greenland hunts of fin and common minke whales;

(c) Review a full scientific paper on the work in Greenland related to the collection of information on conversion factors

(2) Present *Evaluation* and *Robustness Trial* results to the SWG of an *SLA* variant that corresponds exactly to the management plan proposed by the Makah Tribe to the US Government;

(3) Review a revised document on the probability of a gray whale that regularly feeds in the western North Pacific being taken in a Makah hunt;

(4) Review a document that provides advice on the development of *SLA*s and their evaluation

.
In-depth assessment (IA)
High priority will be given to:
(1) The development and application of the SCAA models to the agreed estimates and the most recent aging data.

(2) Further work examining reasons for the differences between estimates from CPII and CPIII.

(3) Further development of the IWC simulated datasets, specifically to

3.1 provide a testing framework for hazard probability models for internally-estimated cue rates from Antarctic minke whale schools

3.2 provide one realistic scenario for testing variance estimation.

Now that minke whale abundance estimates had been agreed, the main remaining issues are listed as follows:

(4) Modify the Hazard Probability model to cope better with real diving patterns,

(5) Improve remaining misfits, for example, to the way that the simultaneous/delayed duplicate fit changes with school size (linked to item 4 above).

(6) Embed refined Hazard Probability models into a spatial framework,

Lower priority items are:

(7) Data management

7.1Further validation of IDCR/SOWER data

7.2 Curation of experimental IDCR/SOWER data

7.3 Production of standard datasets for analyses of species other than Antarctic minke whales.

(8) Review of abundance estimation data collected during CPII and CPIII; their utility for estimating abundance of Antarctic minke whales; and review of data insights.

SORP

Workplan items include:

(1) establishment of ABWP management structure and Committee;

(2) establishment of intersessional technical committees for methodological development;

(3) refinement of the ABWP survey plan for the 2013 ABW voyage(s);

(4) development of uniform sampling protocols for ABW sampling and voyage(s);

(5) continuation of five ongoing SORP research projects;

(6) planning and implementation of an intersessional SORP conference prior to the next annual meeting;

(7) intersessional development of a paper on data management and legacy.

22. DATA PROCESSING AND COMPUTING NEEDS FOR 2011/12

The Committee agrees the requests for intersessional work by the Secretariat given in Table 12.

23. FUNDING REQUIREMENTS FOR 2012/13

Table 13 summarises the complete list of recommendations for funding made by the Committee. The total required to meet its preferred budget is £327,000. The Committee recommends all of these proposed expenditures to the Commission.

However, it understands that the projected amount available for funding is about £315,000. Following some initial suggestions produced by the Convenors group, the Committee therefore carefully reviewed the proposed full list, taking into account its work plan, priorities and the possibility that some of the work requiring funding could be postponed to a future year or years. Such considerations are difficult and the Committee stresses that projects for which it has had to suggest reduced funding are still important and valuable. Should the Commission be unable to fund the full list of items in Table 13 the Committee agrees that the final column given in the table represents a budget that will allow progress to be made by its sub-groups in its priority topics. Progress will not be possible in some important areas, as outlined below and the Committee strongly request that the Commission or individual member governments provide additional funding in these areas. The Committee strongly recommends that the Commission accepts its reduced budget of £315,000.

Table 12

Computing tasks/needs for 2012/13.

RMP – PREPARATIONS FOR I*MPLEMENTATION*
(1) Work with the Norwegian Computing Centre to modify the Norwegian CatchLimit program so that only standard FORTRAN-95 statements are used (Annex D Item 2.4)
(2) Work to specify and run additional trials for testing amendments to the *CLA* (Annex D Item 2.2)
(3) Work related to the *Implementation Review* for North Atlantic fin whales (Annex D Item 3.2)
(4) 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 (carried over from last year)
NPM
Complete conditioning of the North Pacific minke whale trials and run a full set of trials (Annex D1)
AWMP
Work arising from the proposed workshop (see Annex E Item 4)
IN-DEPTH ASSESSMENT
Prepare a catch series for North Pacific sei whales including incorporation of additional information from Japanese log book records and a new analysis of Soviet North Pacific catch records (see Annex G Item 7)
Validation of the 2011 POWER cruise data (see Annex G Item 8)
Complete validation of the 1995-97 blue whale cruise data and incorporate into the DESS database
WHALE STOCKS
Documentation of the catch data available for Antarctic minke whales in preparation for the *pre-implementation assessment* (see Item 10.1, carried over from last year).

A summary of each of the items is given below, by sub-committee or standing Working Group. Full details can be found under relevant Agenda Items and Annexes as given in Table 13.

Table 13

Budget requests (see text). Note that in addition, the budget request for SORP is given in Table10.

Title		Agenda Item	Full (£)	Reduced (£)
(1)	Development of an operating model for West Greenland humpback and bowhead whales	8. AWMP	5,000	5,000
(2)	Workshop on development of SLAs for Greenlandic hunts	8. AWMP	8,000	8,000
(3)	AWMP developers funds	8. AWMP	3,000	3,000
(4)	Ship strike database coordinator	7.8 Ship strikes	10,000	8,000
(5)	Right whale survey off of South Africa	10.5 SH right whales	21,730	21,730
(6)	Genomic diversity and phylogenetic relationships among right whales	10.6 N Pacific right whales	7,000	0
(7)	Photographic matching of gray whales	9.2 E Pacific gray whales	9,000	9,000
(8)	Contribution to the preparation of the State of the Cetacean Environment Report (SOCER)	12.1 SOCER	3,000	3,000
(9)	Pre-meeting workshop on assessing the impacts of marine debris	12.8 Habitat related issues	20,500	20,500
(10)	Develop simulation of Southern Hemisphere minke line transect data	10.1 Antarctic minke whales	9,000	5,000
(11)	IWC-POWER cruise	10.8.1 IWC-POWER cruise	60,754	60,754
(12)	Preparation for the application of the statistical catch-at-age assessment method for Southern hemisphere minke whales	10.1 Antarctic minke whales	4,000	4,000
(13)	"Second' intersessional workshop on the Implementation Review for wNP common minke whales	6.3 N Pacific common minke whale Implementation Review	20,000	18,500
(14)	Essential computing for RMP/NPM and AWMP	22. Data processing and computing needs	25,000	25,000
(15)	MSYR review workshop	5.1 MSY rates review	5,000	5,000
(16)	Review and guidelines for model-based and design-based line transect abundance estimates	5.7 Abundance estimates	5,000	5,000
(17)	Modeling of Southern Hemisphere humpback whale populations	10.2 SH humpback whales	3,000	3,000
(18)	Antarctic humpback whale catalogue	10.1 Antarctic minke whales	15,000	13,000
(19)	Photo matching of Antarctic blue whales	10.3 SH blue whales	3,000	3,000
(20)	Southern Hemisphere blue whale catalogue 2012/13	10.3 SH blue whales	3,000	3,000
(21)	Expert workshop for final review of Iceland's Special Permit programme on common minke whales	17.1 Review of existing scientific permits	30,000	24,000
(22)	Whale watching guidelines and operator training in Oman	10.7 Arabian Sea humpback whales	3,500	3,500
(23)	Invited Participants (IP's) funds	All	64,000	64,000
TOTAL			**337,484**	**314,984**

(1) DEVELOPMENT OF AN OPERATING MODEL FOR WEST GREENLAND HUMPBACK AND BOWHEAD WHALES

The Committee developed interim *Strike Limit Algorithms* (*SLA*s) for the minke, fin, humpback and bowhead whales off West Greenland. These *SLA*s need to be reviewed and perhaps revised, ideally by the 2017 Annual Meeting. Development of *SLA*s for the hunts of minke and fin whales can be coordinated with the *Implementation Reviews* for these whales which are being conducted by the RMP sub-committee. In contrast, the situations for humpback and bowhead whales are relatively straightforward (essentially

single-stock situations), but without a fully-specified and coded operating model progress on these cases will be limited. The first step in the process of developing *SLA*s is constructing an operating model and associated trials, and this project aims to make sufficient progress that an AWMP Workshop (in late 2012) could finalize trials and initiate testing.

The key activities covered by the proposal:

(1) Extend the single-stock gray whales trials so that trials can be conducted for humpback and bowhead whales.
(2) Outline a set of evaluation and robustness trials which could form the basis for the evaluation of *SLA*s for these two groups of whales.
(3) Present the trial specifications and results for (a) the interim *SLA*s and (b) an alternative *SLA* at an intersessional AWMP workshop.
(4) Develop an AWMP/RMP-lite to assist developers of *SLA*s for the cases of fin whales and common minke whales.

(2) WORKSHOP ON DEVELOPMENT OF SLAS FOR GREENLANDIC HUNTS

The existing interim safe procedure for the Greenlandic hunts agreed in 2008 (IWC, 2009) was agreed to be valid for up to quota blocks so up to 2018. The Committee has identified completion of the development of long-term *SLA*s for these hunts as high priority work. With the completion of the BCB bowhead and gray whale *Implementations* this year, the SWG on the AWMP will give highest priority to the Greenland work, particularly for the complex cases of common minke whales and fin whales. In addition to the proposal for work by Punt (Annex E, Appendix 6), to meet the proposed timeframe an intersessional Workshop is required. The objectives of the workshop are to: (1) to review the work undertaken by Punt to develop proposed operating models and trial structures for the relatively easy cases of the bowhead and humpback whale hunts with a view to finalising these at the 2013 Annual Meeting; and (2) review the work undertaken by Punt to develop simple (AWMP/RMP-lite programs) to facilitate initial work on developing potential *SLA*s to allow the development of SLAs for West Greenland fin and common minke whales in light of the current operating models used in RMP *Implementations*. The Workshop will be held in winter 2013 for four days in Copenhagen, Denmark and the costs are for the IPs travel.

(3) AWMP DEVELOPERS FUNDS

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. As noted above these tasks are of high priority to the Committee and the Commission. The fund is essential to allow progress to be made. It now stands at £12,000 and a request of £3,000 is made to restore it to the initial target level of £15,000.

Bycatch and other human-induced mortality

(4) SHIP STRIKE DATABASE COORDINATOR

The ongoing development of the IWC ship strike database requires data gathering, communication with potential data providers and data management. The Working Group on Bycatch and Other Human Induced Mortality recommended a part-time post initially for 3 months a year to undertake the tasks described in Annex J. This includes:

(1) Identify national contact points, organisations or groups that hold data on ship strikes that have not been contributed to the database and facilitate and encourage contributing data to IWC database;
(2) Monitor and respond to emails addressed to the shipstrikes@iwcoffice.org email address, including reports of new incidents, giving feedback to data providers and dealing with requests for summary information from the database;
(3) Keep IWC ship strike web site pages up to date including updating publicly available summaries from the database;
(4) Develop and document a communication strategy;
(5) Provide an annual update to Scientific Committee;
(6) Data entry of new records including data presented in meeting papers and National Progress Reports at annual meetings of Scientific Committee;
(7) Work with data review group to ensure that all new records are appropriately reviewed including identification of potential duplicate reports;
(8) Further development of database handbook including criteria for determining whether ship strike was a cause of death. Ensure database documentation remains up to date;
(9) Maintain data base and data entry system, making adjustments as appropriate in response to user problems and suggestions.

Bowhead, right and gray whales

(5) RIGHT WHALE SURVEY OFF OF SOUTH AFRICA

The southern right whale population visiting the South African coastline (arguably the largest in the Southern Hemisphere) has been monitored annually by aerial surveys since 1971 and since 1979 by a photo-identification survey. The results have been presented to several meetings of the SC, such as the Buenos Aires workshop in September 2011, where four papers were presented (SC/S11/RW15, 16, 18, 29). Since its inception the photo-id surveys have concentrated on adult females with calves: the catalogue (2010) stands at 1,217 adult females, of which resighting rates average 70% annually, leading to very precise

estimates of population size and growth rate, adult survival rate, age at first parturition and juvenile female survival rate. The application of an individual-based model has now allowed estimation of the probability of females calving at various intervals (SC/64/BRG24), which can be correlated in turn with the occurrence of oceanographic anomalies to determine the influence of environmental variation on reproductive success. The project has been funded domestically almost since its inception and has just completed a 3-year funding cycle. Unfortunately an application to the South African National Antarctic Programme for renewed funding was rejected as being geographically inappropriate, so interim funding is being sought to enable the 2012 survey to take place while an application is made for a new cycle commencing in 2013. The survey is scheduled to take place in mid October. All images should be matched by 1 April 2013 and results ready for the 2013 SC meeting.

(6) GENOMIC DIVERSITY AND PHYLOGENETIC RELATIONSHIPS AMONG RIGHT WHALES

The investigators request supplemental funding, as described in SC/64/BRG15, to do the following:

(1) assess genetic diversity and estimate Nmin within the central North Pacific right whale population, represented by 27 individuals (including 3 from Russia), using complete mitochondrial genomes and sequence from 23 nuclear loci;
(2) compare mtDNA diversity in eastern North Pacific right whales with other oceanic populations based on complete mitochondrial genomes (16386 base pairs), rather than the limited resolution currently based on control region sequences (286 base pairs); and
(3) confirm reciprocal monophyly and phylogenetic relationships among right whale species using sequence from complete mitochondrial genomes and 23 nuclear loci.

The primary funding for this project, provided by the Pacific Life Foundation, has support the development of the primary datasets but this funding is now exhausted. This proposal seeks supplemental support for two months for a postdoctoral fellow to complete analysis of the primary dataset and estimation of N_{min} for the central population of the North Pacific right whale.

(7) PHOTOGRAPHIC MATCHING OF GRAY WHALES

Results regarding mixing of western (WNP) and eastern (ENP) gray whales illustrate the great conservation and management importance of a more comprehensive examination of gray whale movement patterns and population structure in the North Pacific. The committee noted that for such an effort to be successful it must be international and collaborative. To facilitate this, and noting the existing safeguards for collaborators provided under the Committee's Data Availability Agreement, it recommended that a collaborative Pacific-wide study be developed under the auspices of the IWC, recognizing that *inter alia* this will contribute to the Committee-endorsed Conservation Plan for Western North Pacific Gray Whales and incorporate previous recommendations made by the Committee. Such a study should involve collaborative analysis and sharing of existing data as well as the collection of new data (IWC, 2011). This is the second year of the project. The report of the results of the first year was presented in the document SC/64/BRG13 (Urbán et. al 2012). The funds requested for this year is to match gray whale photographs to photographs from Sakhalin and Kamchatka.

Environmental concerns

(8) CONTRIBUTION TO THE PREPARATION OF THE STATE OF THE CETACEAN ENVIRONMENT REPORT (SOCER)

SOCER is a long-standing effort to provide information to Commissioners and SC members on environmental matters that affect cetaceans in response to several Commission resolutions. The focus for 2012 will be on the Indian Ocean. Funds are for salaries, library services, and printing.

(9) PRE-MEETING WORKSHOP ON ASSESSING THE IMPACTS OF MARINE DEBRIS

In 2011, the IWC agreed to (1) endorse the Honolulu Commitment; (2) establish a standing item on marine debris on the Conservation Committee agenda and (3) request the Scientific Committee continue reviewing potential threats to cetaceans arising from marine debris. It is proposed that a workshop be held on marine debris and cetaceans where the primary aim is to develop tools that allow quantification of whether or how marine debris is affecting cetaceans and how best to monitor and mitigate for these effects.

The objectives of the workshop are to:

(1) Better understand the effects of debris interactions at an individual and population level;
(2) Identify and classify key types and sources of debris that contribute to entanglements, or are ingested by cetaceans and examine the mechanisms by which they arrive in the marine environment, with the goal of identifying possible mitigation measures;
(3) Design and develop a centralised database to collate cases of debris interactions to obtain more accurate estimates of the incidence of mortality and injuries, help detect trends over time and identify hotspots; and
(4) Contribute towards a quantitative assessment of the extent of the threats for cetaceans.

The report of the Workshop will, in addition to providing the analyses, review and recommendations

listed under Item 2 above, develop: (1) a series of research and conservation actions that will include a rationale, actions required and proposed responsible persons/groups; and (2) a two-year work plan to be considered. The report will be submitted to the IWC and made publicly available on their website. It is proposed to publish the results of the workshop in a peer-reviewed journal. Funds are to assist some of the expected 20 participants for a 4-day pre-meeting held before the 2013 Scientific Committee meeting.

In-depth assessments

(10) DEVELOP SIMULATION OF ANTARCTIC MINKE LINE TRANSECT DATA

This year an abundance estimate for Antarctic minke whales had been agreed upon. As discussed this estimate had to use externally-estimated cue rates from a small sample of Antarctic minke whales, though an internally estimated cue rate would be preferred to estimate a more accurate and perhaps precise estimate. However, additional methodological develop is needed to achieve this. To test these newly development methods, it was proposed to use simulated line transect data where the true abundance estimate is known to validate the new methods are working correctly. These funds are proposed to further develop the IWC simulated datasets to (i) provide a testing framework for hazard probability models for internally-estimated cue rates from Antarctic minke whales schools, and (ii) provide a realistic scenario to test variance estimation methods.

(11) IWC-POWER CRUISE

The Committee has strongly advocated the development of an international medium- to long-term research programme involving sighting surveys to provide information for assessment, conservation and management of cetaceans in the North Pacific, including areas that have not been surveyed for decades. The finalisation for the integrated mid-long-term program (IWC-POWER; the Pacific Ocean Whales and Ecosystem Research programme) that will provide information on stock structure, abundance and ultimately trends has been completed. The focus of the 2013 cruise is defined as the area bounded by longitudes 135W and 160W, and latitudes 30N and 40N. Line transect sightings abundance data collection, biopsy sampling, and photo-identification of cetaceans is planned. The cruise will last approximately 60 days between July and August 2013. By far the most important component of the cost of the provision of a research vessel, crew and fuel (up to US$1m) and that is generously being provided by Japan. The IWC funding will provide for international researchers, equipment and a meeting to finalise the details of the 2013 cruise.

(12) PREPARATION FOR THE APPLICATION OF THE STATISTICAL CATCH-AT-AGE ASSESSMENT METHOD FOR ANTARCTIC MINKE WHALES

This year the Committee received a full description of the statistical catch-at-age (SCAA) developed by Polachek and Punt, along with initial suggestions for a baseline analysis and sensitivity tests (SC/64/IA1). This approach allows for errors in catch-at-age data, more than a single stock, time-varying growth, multiple areas, environmental covariates, fleet-specific vulnerabilities, and changes over time in vulnerability. The SCAA can be used to evaluate various hypotheses regarding the reason (or reasons) for the change in abundance estimates from CPII to CPIII, as well as other questions regarding the dynamics of the Antarctic minke whale, such as whether growth and carrying capacity have changed. This proposal is to obtain the latest datasets and update the outputs and reference models to conduct baseline and key sensitivities. A final report will be presented to the 2013 Annual Meeting and the final code, data sets and documentation will be lodged with the Secretariat.

North Pacific minke whales

(13) "SECOND' INTERSESSIONAL WORKSHOP ON THE IMPLEMENTATION REVIEW FOR WESTERN NORTH PACIFIC COMMON MINKE WHALES

The Implementation Review for western North Pacific minke whales is more complex than an previous Implementation. The Committee is one year behind the normal Schedule for Implementations. The Committee is not ready to undertake the tasks allocated to the 'second' intersessional workshop according to it guidelines (IWC, 2012). The priority tasks are to run and evaluate all trials in accordance with guidelines and present the results at the 2013 Annual Meeting to enable the Committee to complete its review in 2013.

Revised Management Procedure

(14) ESSENTIAL COMPUTING FOR RMP/NPM AND AWMP

The approach used to evaluate RMP variants during *Implementations* as well as candidate SLAs involves two main steps: (1) specification and conditioning of trials, and (2) projecting simulated populations forward under alternative RMP variants/SLAs. The complexity of the operating models on which simulation evaluations are conducted has increased in recent years. Unfortunately, the relatively simple optimization methods include in current control programs (which was more than adequate in the past), combined with a complicated objective function, has led to problems producing conditioned trials quickly. This proposal will provide the Secretariat with the essential support required to complete this issue during the intersessional period. It will also continue the arrangement of recent years by which essential support is provide to the Secretariat, particularly in the key area of estimating stock mixing proportions in input to the trials), both

intersessionally, and during meetings. Without this support it will be impossible for the Committee to undertake its present work on RMP *Implementations* and development of SLAs.

(15) MSYR REVIEW WORKSHOP

Since 2007 the Committee has been discussing maximum sustainable yield rate (MSYR) in the context of a general review of the plausible range to be used in population models used for testing the Catch Limit Algorithm (CLA) of the RMP. The Committee has agreed that it will finish work on this topic in 2013 whether or not the review can be completed. It has developed a work plan to try to ensure completion of the review. As part of this it is essential that a three-day intersessional meeting be held, with at least five participants, ideally back-to-back with another intersessional meeting, thus reducing overall costs of this workshop.

All sub-groups using abundance estimates

(16) REVIEW AND GUIDELINES FOR MODEL-BASED AND DESIGN-BASED LINE TRANSECT ABUNDANCE ESTIMATES

The RMP's 'Requirements and Guidelines for conducting surveys" (RIWC (Suppl.) 13: 509-517) were written when the only realistic paradigm for planning and analyzing good sighting surveys was the design-based approach. However, there is now potentially a legitimate alternative to design-based estimates: model-based estimates using spatial modeling (smoothers), which unlike design-based approaches, also give some basis for limited spatial extrapolation. In addition, many surveys resemble design-based surveys but do not strictly meet the design-based criterion, and in such cases there is a question regarding the adequacy of design-based estimates. The Committee has frequently considered model-based and quasi-design-based estimates, but without explicit criteria and not necessarily in the context of the RMP. This proposal will (1) review statistical aspects of design-based estimators for surveys which do not strictly adhere to design-based principles, and (2) review past and current issues related to model-based abundance estimators, drawing on examples from experience with these types of models. Empirical and simulation-based diagnostics will be suggested, and a quantitative description of pitfalls when extrapolating estimates beyond the surveyed area will be given. The intended outcome of the project is (1) propose a basis to assess the reliability of an abundance estimate either from a design-based analysis for which the statistical criteria are not met, or from a model-based analysis; and (2) provide draft text for inclusion in the "Requirements and Guidelines for conducting surveys" document. The work will be presented to the 2013 Annual Meeting and is for salary to complete this project.

Other Southern Hemisphere whale stocks

(17) MODELING OF SOUTHERN HEMISPHERE HUMPBACK WHALE POPULATIONS

The project will focus on a combined assessment of Southern Hemisphere humpback breeding stocks D, E and Oceania using the model proposed at this year's meeting, SC64. Methods used will be based upon the Bayesian methodology as developed and presented for breeding stock C and breeding stock B comprehensive assessments recently completed. Initial results will utilize the data agreed at SC64, and results will be presented at the 2013 SC Annual Meeting. Further model developments and refinements in association with the final set of agreed data (and their sensitivities) would be presented at 2014 SC meeting should the Scientific Committee decide to so request.

(18) ANTARCTIC HUMPBACK WHALE CATALOGUE

The Antarctic Humpback Whale Catalogue collates photo-identification information from Southern Hemisphere humpback whales. Increasing awareness of the project among research organizations, tour operators and other potential contributors has widened the scope of the collection; research efforts in areas that had not previously been sampled have extended the geographic coverage. This catalogue has grown by 25% in the last two years, adding 1127 new individuals, and increasing the time required to analyse photographs. In addition to these requested IWC funds, we will seek funding from other sources to provide the remaining funds required. Additional resources are provided by College of the Atlantic, including equipment, student assistants, and time donated by principal investigators of this proposal. As a result this catalogue is in an excellent position to make a substantial contribution to SORP and other research and management initiatives.

(19) PHOTO MATCHING OF ANTARCTIC BLUE WHALES

The goal of this project is to compare the existing IWC-SOWER Antarctic blue whale catalogue (about 160 individuals) and the existing photo-id material collected from JARPA which are already digitized. This project may add new individuals to the Antarctic blue whale catalogue and provide new data on the movements of Antarctic blue whales both within and between years. The Committee has requested for several years that this work be undertaken.

(20) SOUTHERN HEMISPHERE BLUE WHALE CATALOGUE 2012/13

The Southern Hemisphere Blue Whale Catalogue is an international collaborative effort to facilitate cross-regional comparison of blue whale photo-identifications catalogues. Results of comparisons among different regions in Southern Hemisphere will improve the understanding of basic questions relating to blue whale populations in the Southern Hemisphere such as defining population boundaries, migratory

routes and model abundance estimates. In 2008, the Committee endorsed a proposal to establish a central web-based catalogue of blue whale identification photographs, known as the Southern Hemisphere Blue Whale Catalogue (IWC, 2008).

Currently this catalogue holds photo-identification catalogues of researchers from major areas off Antarctica, Australia, Eastern South Pacific and the Eastern Tropical Pacific (IWC, 2011). Comparisons among catalogues off Chile found one match over ten years (Galletti Vernazzani and Cabrera, 2011). Preliminary results of the 2011-2012 catalogue comparisons between the eastern South Pacific Ocean, Eastern Tropical Pacific Ocean (ETP) and Southern Ocean found no matches (Galletti Vernazzani and Olson, 2012).

During 2012-2013 it is expected that comparisons between Australian catalogues and with the ETP, Southeast Pacific and Antarctica will be finalized. Results of these comparisons will be presented to the 2013 Committee Annual Meeting.

Special Permits

(21) EXPERT WORKSHOP FOR FINAL REVIEW OF ICELAND'S SPECIAL PERMIT PROGRAMME ON COMMON MINKE WHALES

Activities under Article VIII of the Convention should be reported to the Committee for review. The Committee has agreed a procedure for periodic and final reviews of results from Special Permit research (Annex P, IWC 2009). This procedure outlines an intersessional review meeting by an expert panel. The report from the intersessional expert meeting will be reviewed and discussed at the 2013 Committee Annual Meeting, SC65. The Icelandic Special Permit progamme on common minke whales is complete and thus is subject to a review by an expert panel during the 2012/2013 intersessional period. The experts to the review workshop will be identified by September 2012 and the expert workshop will be convened during four days in February/March 2013. The requested funds are for travel for the invited experts.

Whale watching

(22) WHALE WATCHING GUIDELINES AND OPERATOR TRAINING IN OMAN

Oman's whale watching industry has experienced gradual growth over the last 10 years reflecting a steady increase in tourism in the country and a growing awareness of the rich and accessible cetacean fauna, especially around the capital city of Muscat. Currently, dolphins are the main target of the industry, whilst sperm whales and other large whales are increasingly sighted as operators become more knowledgeable of their presence and distribution. The Arabian Sea humpback whale has recently become a target of opportunistic whale watching by a SCUBA dive operator in southern Oman. The precarious status of this species, represented by a resident and discreet sub-population numbering fewer than 100 individuals, and the identification of escalating anthropogenic impacts and threats has led to expression of serious concern by the IWC and recommendation for the development of a Conservation Management Plan (work in progress). Unregulated whale watching represents another potential threat to Arabian Sea humpback whales.

Most operators are currently unaware of (unofficial) guidelines for whale watching in Oman. Recognizing the need to complete the drafting of new guidelines for Oman with appropriate technical assistance, and to train operators to enable interpretation and implementation of guidelines, this proposal includes a request for funding to complete the revision of whale watching guidelines in Oman and to hold a training workshop for operators on the interpretation and implementation of the guidelines to promote best practice in the industry. Travel for relevant experts to Oman has already been secured and expert and other participant time will be donated and/or covered by other on-going projects.

All groups

(23) INVITED PARTICIPANTS (IPS) FUNDS

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 role 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.

24 WORKING METHODS OF THE COMMITTEE

24.1 Reducing the costs of Committee meetings

In 2011 the Commission asked the Secretariat to continue exploring opportunities for cost savings. One source of cost savings is to reduce freight charges and increase use of electronic documents at annual meetings of the Scientific Committee and Commission. A review of expenditures in 2011 indicated the costs of maintaining a paper based infrastructure for the meetings was around 5% of the IWC core budget. Particular cost arise because of packing and air freight of the pigeonholes and pre-prepared documents which are both heavy and bulky, and also the hire of high volume copiers which are usually dramatically more expensive than low volume copiers.

The Committee discussed the advantages and disadvantages of moving to an electronic distribution of primary papers, working papers, and reports. If there was to be electronic distribution of paper, then the

memory sticks with the primary documents will need to still be available in a timely manner. Members would be encouraged to submit meeting papers as soon as possible to allow other members to make their own copies at home before the meeting. There would also need to be a number of modern desktop laser printers available to members and especially a local high bandwidth secure wi-fi network and document server that would be available to only the Committee members and so would be independent to local internet access and thus be robust to local IT issues.

After much discussion, the Committee agrees that primary documents should be distributed wholly electronically both on the IWC webpage and on the memory sticks. In contrast, the Committee agrees that draft and final reports of sub-groups and plenary should be distributed by paper to ensure these reports are properly edited. The Committee also agrees that working papers should, at least for a trial period, be distributed mostly by paper, with the option of some working papers, particularly very long ones, be distributed mostly electronically. To reduce freight costs of the pigeonholes, the Committee suggests the Secretariat consider having pigeonholes for sub-groups as a means to distribute working papers rather than having personal pigeonholes.

24.2 Clarifying information on data availability for Procedure B requests

The present description of the process for obtaining data for issues that fit under Procedure B is described in the Data Availability Agreement (DAA; IWC 2004). SC/64/SCP1 described a recent incident where it became evident that the DAA process needed additional clarification. The Committee notes that the DAA process has generally worked well and especially so when the Committee has been able to properly specify the data request during the Committee meeting. Procedure B is designed for cases where the Committee itself believes that particular analyses (whether completely new analyses or revised analyses) are important in providing advice to the Commission. In such cases, it is important that the Committee takes the necessary time to complete and explicitly including the following within the report: objectives of the data request; details of the data required addressing the objectives; broad overview of the methods; and the principal investigators recommended by the Committee. With such report text, the Data Availability Group (DAG) can then complete and endorse a DAA request following the appropriate protocol in a timely manner. This would have, for example, removed the ambiguity that arose out of interpretation of the recommendation made last year on the blubber thickness analysis (IWC, 2012, Annex K1).

As the requests under Procedure B relate to Committee recommendations, it also seems appropriate that all correspondences between researchers and data holders are channelled through the DAG until a request has been granted. It should also be emphasised that DAG involvement in data requests applies only to requests based on recommendations by the Committee. Requests by individual scientists should occur at the bilateral level without DAG involvement.

In addition, there appears to have been some uncertainty over what is meant by collaboration and offers of co-authorship under the DAA. This has also been considered under Agenda Item 17, Special Permit reviews and 'Annex P'.

The Committee has always encouraged collaboration in all research projects. In the context of Annex P this was clarified in a footnote. For a more formal clarification, the Committee recommends an additional point be added to the DAA Procedure B text as follows, where the text under Item 2 is new:

Procedure B

This applies to data required for analyses deemed important in providing advice to the Committee other than catch limits (e.g. on the status of stocks not subject to whaling). For data not subject to Procedure A, the data owners shall produce, in collaboration with the Committee, a published protocol for data access that applies to requests generated by the Committee, to ensure clarity and a mutual understanding of the process.

(1) The Committee shall specify the nature of the work and the data required during the meeting at which the recommendation is made, to the fullest extent possible in the time available at the meeting and in accordance with the published protocol. It should also name the appropriate scientists to undertake the work and designate an appropriate timeline.

(2) The Committee encourages collaboration between the data requestors and data providers, although this is not mandatory. As a minimum, data requestors and providers should discuss the data sufficiently to avoid misinterpretations over the nature of the data themselves. When the data requestors send their draft paper to the data providers in accordance with the timetable, they must provide an offer of co-authorship to them. The data providers may or may not accept this offer. If data requestors and data providers do not agree with the contents of the paper then they may present separate analyses or comments to the Committee. This then allows the Committee to review all analyses. The Committee will then get a balanced single conclusion from the analyses for advice to the Commission. This is in line with the spirit of collaboration the Committee encourages.

(3) Applications to the data owners following the published protocol referred to above, should be submitted by the Data Availability Group assisted by a nominated member of the relevant delegation or

institute. The Data Availability Group will consult with relevant members of the Committee if further explanation or clarification is required.

(*4*) If the above process is followed, then the data owners will normally approve the applications within a specified time period in accordance with the published protocol.

(*5*) Applications shall only be granted under conditions given above.

24.3 Updating the Committee's guidelines and Handbook

After discussion last year, the Committee agreed that the Chair of the Scientific Committee should develop a review document for consideration at this year's meeting that discusses whether or not there is a need to expand on the guidelines related to Convenors, in particular with respect to further details about the roles of Convenors and co-convenors, time frames of service etc., as well as the roles of Heads of Delegation and, if so, to provide proposed text. This review document provided background information that clarified some of these issues and suggested additional text to be considered by the Committee that could be added to the Scientific Committee's Handbook (SC/63/SCP2).

This year the Committee discussed this review document and recommends the basic responsibilities of Convenor's and co-Convenor's as described in the Handbook did not need changing. However, it recommends that the full Committee should receive the list of proposed projects to be funded by the Commission in a timely manner to allow everyone to fully consider the prioritised list. Following this recommendation, the guidelines on the role of convenors should include a new item 'f' and move the present 'f' to 'g', where the new item 'f' should read:

> 'To develop with other members of the Convenors' Group a prioritised list for funding that should to be made available to the full Committee at least by 6 pm on the penultimate day of the Scientific Committee Annual Meeting.'

Co-Convenor's were created three years ago to assist some of the busier sub-groups and provide an opportunity to create a pool of experienced people that could become future Convenors. This concept has worked well, so the Committee recommends the following text on the eligibility of Convenors and co-Convenors be added to the Handbook:

> 'All Committee members are eligible to become Convenors or co-convenors. A co-convenor may be appointed to assist the Convenor of a sub-group, gain experience in chairing and learn Committee procedures. Requirements include appropriate scientific background and/or chairing experience, knowledge of Committee procedures and appropriate communication skills.'

The Committee discussed at length the time frame of Convenors' service. Some members suggested a general, though flexible, time frame could be added to the Committee's Guidelines, where this time frame would not a fixed length and would not be mandatory. However, other members considered the existing guidelines were sufficient and have worked effectively in the past and so did not need to be modified. Consequentially no changes to the Committee's guidelines were recommended this year. However, as noted in the existing guidelines, it was agreed that the Chair of the Committee would take carefully into account the length of service when choosing convenors. If necessary this issue can be revisited in future years.

The roles of Heads of Delegations were also discussed and the Committee agrees that the present guidelines are adequate as provided in the Handbook. The Committee also agrees that the Handbook, when updated, will also be available as a pdf file.

24.4 Assistance to new members on the working of the Committee

In order to assist new members, the Committee recommends that an introductory lecture should be given during the first or second day for new (and indeed nay) members that would cover primarily practical r issues including: methods of working, background history of the sub-groups and commonly used acronyms (the latter will also be added to the Handbook). In addition, the Committee recommends that all attendees are reminded of the website location of the Scientific Committee's Handbook when registering for the Annual Meeting.

24.5 Other

Galletti noticed that while management recommendations are widely given in some sub-committees, especially when addressing whaling issues, in other sub-committees and/or standing working groups, the attention seems to be more focused on scientific recommendations and only a few conservation recommendations arise. She believed that his was particularly true for small cetaceans, where there have been differences throughout the years. In this sense, the practice of the Scientific Committee should be reviewed and when there is concern over the status of any cetacean species or threats are identified, there should also be a focus on providing conservation recommendations.

Given the limited time available at this meeting, the Committee **agrees** that this matter should be placed on the agenda for discussion at next year's meeting.

25. ELECTION OF OFFICERS

This is the third and last year in the terms of the Committee's Chair (Palka - US) and Vice-Chair (Kitakado - Japan). Kitakado has agreed to assume at

the end of the 2012 Commission Annual Meeting the Chair of the Scientific Committee. To fill the vacant Vice-Chair position, the Heads of Delegations were happy to unanimously nominate Caterina Fortuna (Italy). Fortuna accepted the Vice-Chair position. The Committee stood in acclaim to thank Palka for her great contribution to the Committees work during the past three years and congratulated Kitakado and Fortuna on their new positions.

26. PUBLICATIONS

This had been a difficult year for the Journal with staff limited by maternity leave, reduced hours, illness and a change in staff. Despite that the department produced:

(1) the 520pp supplement;
(2) 3 issues of the journal (two are at the printers) with one more almost complete; and
(3) the special issue on Southern Hemisphere humpback whales.

Illness to Donovan resulted in less progress than anticipated on the special issue devoted to the RMP but the timetable for its publication has been finalised and it should be available in early 2013. Most of the chapters written by Hammond and Donovan are nearing completion and will be ready for formal review in autumn 2012. These include: (1) an introductory guide to the RMP; (2) a history of the scientific approach to whale management within the IWC prior to the RMP development; (3) a history of the RMP development process including the development of various Requirement and Guidelines; (4) a history of the *Implementation* (and *Implementation Review)* process summarising the cases for western North Pacific common minke whales, western North Pacific Bryde's whales, North Atlantic common minke whales, and North Atlantic fin whales; (5) a concluding overview. In addition, the volume will include the papers from all of the original developers summarising their work in the format determined by Kirkwood. Allison is preparing the appropriate graphs and tables in the new format, including the results of the cross validation trials developed after the *CLA* was adopted.

The special volume commemorating the IDCR/SOWER cruises will be undertaken under an Editorial Board under Bannister as reported elsewhere.

The testing and trial process for the online submission, review and finalisation process has been recently completed and has recently become operational – thanks are due to those members of the Committee who kindly acted as 'guinea pigs' and have helped shape the site and develop the online instructions.

All of the *Journal* volumes are now available as pdf files and the *Journal* will become available in that format either directly via the new IWC website or through an existing company; we are in the process of examining the practical and financial implications of this and will report back to the Committee next year, after consultation via a questionnaire by email. This issue has become particularly important given the difficulties with printers that have occurred over the past two years and the recent news that the Cambridge University Press printing division is likely to be taken over by another company.

The Committee thanked Donovan and his team for the excellent work on publications. It **reiterates the importance** of these to its work as well as providing outside scientists the opportunity to benefit from the Committee's work and to encourage co-operation.

27. OTHER BUSINESS

No other business was discussed.

28. ADOPTION OF REPORT

The report was adopted at 1700 on 23 June 2012. As is usual final editing was carried out by the convenors after the meeting. In closing the meeting the Chair thanked the Secretariat for carrying out its duties in its customary friendly and efficient manner, as well as once again thanked the Government of Panama and other Panamanian contributors for their hosting of the meeting and for providing snacks and lunches for us, which greatly enhanced productivity and mental health.

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Report of the Scientific Committee

Panama City, Panama, 11-23 June 2012

Annex A: List of Participants

Annex B1: Agenda

Annex B2: Relationship Between Commission and Scientific Committee Agendas

Annex C: List of Documents

International Whaling Commission, Panama City, 2012

Annex A

List of Participants

ARGENTINA
Miguel Iñíguez (H)

AUSTRALIA
Mike Double (H)
Nick Gales (AH)
Elanor Bell
William de la Mare
Natalie Kelly
Stephanie Ierino
Victoria Wadley

AUSTRIA
Michael Stachowitsch (H)

BELGIUM
Fábian Ritter (H)

BRAZIL
Milton Marcondes
Arthur Andriolo

CHILE
Barbara Galletti Vernazzani (H)

COLOMBIA
Suana Caballero

COSTA RICA
Gabriela Hernandez (H)
Jose David Palacios
Javier Rodriguez
Frank Garita
Amaru Marquez Artavia

DENMARK
Lars Witting (H)

ECUADOR
Cristina Castro (H)

FRANCE
Vincent Ridoux (H)
Jean-Benoît Charassin

GERMANY
Karl-Hermann Kock (H)
Petra Deimer-Schütte (AH)
Helena Feindt-Herr
Justin Cooke

ICELAND
Gisli Víkingsson (H)
Thorvaldur Gunnlaugsson
Christophe Pampoulie
Bjarki Thor Elvarsson

ITALY
Caterina Fortuna (H)
Giovanni Di Guardo
Cristina Fossi
Giancarlo Lauriano
Adriano Mariani
Simone Panigada
Michela Podestá

JAPAN
Hidehiro Kato (H)
Kiyoshi Katsuyama (AH)
Tomio Miyashita (AH)
Luis Pastene (AH)
Yuji Uozumi (AH)
Shinji Hiruma
Takashi Hakamada
Naohisa Kanda
Toshihide Kitakado
Toshiya Kishiro
Hiroshi Okamura
Takaai Sakamoto
Saemi Baba (I)
Hiroko Yasokawa (I)

REPUBLIC OF KOREA
Hawsun Sohn (H)
Yong-Rock An
Gi Hun Kim
Hyun Woo Kim
Jung-Youn Park
Kyum Joon Park

LUXEMBOURG
Pierre Gallego (H)
Andrea Cosentino

MEXICO
Armando Legorreta Jaramillo (H)

NETHERLANDS
Meike Scheidat (H)

NEW ZEALAND
Louise Chilvers (H)

NORWAY
Lars Walløe (H)
Arne Bjørge
Nils Øien
Hans Julius Skaug

PANAMA
Anna Nuñez
Lissette Trejos

RUSSIAN FEDERATION
Valentin Ilyashenko (H)
Andrey Vinnikov
Olga Etylin (I)

SPAIN
Santiago Lens (H)

SWITZERLAND
Patricia Holm (H)

UK
Beatriz Roel (H)
Russell Leaper
Mark Simmonds
Chris Parsons
Sarah Baulch

USA
Robert Brownell, Jr. (H)
Debra Palka
Dee Allen
C. Scott Baker
John Bickham
John Craig George
Geof Givens
Aimee Lang
Jeff Moore
Sue Moore
Robert Pitman
Lori Quakenbush
Cheryl Rosa
Howard Rosenbaum
Jonathan Scordino
Raphaela Stimmelmayr
Robert Suydam
Peter Thomas
Paul Wade

Robin Waples
David Weller
Gina Ylitalo
Judy Zeh

INVITED PARTICIPANTS
Rob Baldwin
John Bannister
Simone Baumann-Pickering
Peter Best
Liliana Betancourt
Jaime Bolaños
Anabela Brandão
John Brandon
Mark Bravington
Koen Broker
Louise Burt
Doug Butterworth
Carole Carlson
Frank Cipriano
Carryn De Moor
Jennifer Dupont
Naoko Funahashi
Oscar Gaggiotti
Phil Hammond
Sharon Hedley
Rus Hoelzel
Jennifer Jackson
Toshio Kasuya
Kenji Konishi
Greg Kaufman
Aimee Leslie
Bruce Mate
Juan Mate
Koji Matsuoka
Laura May-Collado
Andrea Muller
Hiroto Murase
Leslie New
Daniel Palacios
Per Palsbøll
Andre Punt
Randall Reeves
Naomi Rose
Jorge Urbán-Ramirez
Mariano Sironi
Liz Slooten
Ralph Tiedemann
Olga Tyurneva
Rob Williams
Andrew Wright
Tadusu Yamada
Alexandre Zerbini
Igor Zhmaev (I)

OBSERVERS
Mark Simmonds (ASCOBANS)
Karl-Hermann Kock (CCAMLR)
Justin Cooke (IUCN)
Hidehiro Kato (PICES)
Carole Carlson (SPAW)

LOCAL SCIENTISTS
Inez Campbell

IWC
Cherry Allison
Simon Brockington
Greg Donovan
Marion Hughes

(I)=Interpreter
(H)=Head of Delegation
(AH)=Alternate Head of Delegation

Annex B1

Agenda

1. Introductory items
    - 1.1 Chair's welcome and opening remarks
    - 1.2 Appointment of rapporteurs
    - 1.3 Meeting procedures and time schedule
    - 1.4 Establishment of sub-committees and working groups
    - 1.5 Computing arrangements
2. Adoption of agenda
3. Review data, documents and reports
    - 3.1 Documents submitted
    - 3.2 National Progress Reports on research
    - 3.3 Data collection, storage and manipulation
        - 3.1.1 Catch data and other statistical material
        - 3.1.2 Progress of data coding projects and computing tasks
4. Cooperation with other organisations
    - 4.1 Convention on the Conservation of Migratory Species (CMS)
        - 4.1.1 Scientific Council
        - 4.1.2 Conference of Parties
        - 4.1.3 Agreement on Small Cetaceans of the Baltic and North Seas (ASCOBANS)
        - 4.1.4 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)
        - 4.1.5 Memorandum of Understanding (MoU) on the Conservation of the Manatee and Small Cetaceans of Western Africa and Macaronesia
        - 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)
    - 4.2 International Council for the Exploration of the Sea (ICES)
    - 4.3 Inter-American Tropical Tuna Commission (IATTC)
    - 4.4 Agreement on the International Dolphin Conservation Program (AIDCP).
    - 4.5 International Commission for the Conservation of Atlantic Tunas (ICCAT)
    - 4.6 Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR)
    - 4.7 Southern Ocean GLOBEC (SO-GLOBEC)
    - 4.8 North Atlantic Marine Mammal Commission (NAMMCO)
        - 4.8.1 Scientific Committee
        - 4.8.2 Council
    - 4.9 International Union for the Conservation of Nature (IUCN)
    - 4.10 Food and Agriculture Organisation (FAO) related meetings – Committee on Fisheries (COFI)
    - 4.11 Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)
    - 4.12 North Pacific Marine Science Organisation (PICES)
    - 4.13 Eastern Caribbean Cetacean Commission (ECCO)
    - 4.14 Protocol on Specially Protected Areas and Wildlife (SPAW) of the Cartagena Convention for the Wider Caribbean
    - 4.15 Indian Ocean Commission (IOC)
    - 4.16 Permanent Commission for the South Pacific (CPPS)
    - 4.17 International Maritime Organisation (IMO)
    - 4.18 Conservation in the SE Pacific under the framework for the Lima Convention
    - 4.19 International Committee on Marine Protected Areas (ICMMPA)
5. Revised Management Procedure (RMP) – general issues (see also Annex D)
    - 5.1 Complete the MSY rates review
    - 5.2 Finalise the approach for evaluating proposed amendments to the *CLA*
    - 5.3 Evaluate the Norwegian proposal for amending the *CLA*
    - 5.4 Modify the 'CatchLimit' program to allow variance-covariance matrices
    - 5.5 Update requirements and guidelines for conducting surveys and *Implementations*
    - 5.6 Evaluate the optimisation method used when conditioning trials
    - 5.7 List of abundance estimates and their recommended uses
    - 5.8 Work plan

6. RMP – Preparations for *Implementation*
    - 6.1 Western North Pacific Bryde's whales
        - 6.1.1 Prepare for 2013 *Implementation Review*
        - 6.1.2 Recommendations
    - 6.2 North Atlantic fin whales
        - 6.2.1 Recommendations
    - 6.3 North Pacific common minke whales (continue *Implementation*)
        - 6.3.1 Report of the December 2012 Intersessional Workshop
        - 6.3.2 Conditioning
        - 6.3.3 Update to standard datasets - abundance estimates
        - 6.3.5 Final consideration of plausibility
            - 6.3.5.1 Stock structure
            - 6.3.5.2 MSYR and other factors
        - 6.3.6 Specifications of operational features and management variants
        - 6.3.7 Specifications and classification of final trials
        - 6.3.8 Consideration of data/analyses to reduce hypotheses in future
        - 6.3.9 Inputs for actual application of the *CLA*
    - 6.4 North Atlantic common minke whales
        - 6.4.1 Review new information
        - 6.4.2 Prepare for 2014 *Implementation Review*
    - 6.5 North Atlantic sei whales
    - 6.6 Work plan
7. Estimation of Bycatch and other Human-Induced Mortality (BC)
    - 7.1 Collaboration with FAO on collation of relevant fisheries data
    - 7.2 Estimation of bycatch mortality of large whales
    - 7.3 Estimation of risk and rates of entanglement
    - 7.4 Review progress on including information in National Progress Reports
    - 7.5 Ship strikes
    - 7.6 Continue to develop global database of ship strike incidents
    - 7.7 Other issues
    - 7.8 Work plan
8. Aboriginal Subsistence Whaling Management Procedure (AWMP)
    - 8.1 Complete *Implementation Review* of eastern North Pacific gray whales with an emphasis on the PCFG
        - 8.1.1 Stock structure
        - 8.1.2 Abundance
        - 8.1.3 Catch data (direct and incidental)
        - 8.1.4 Mixing
        - 8.1.5 Biological parameters and MSYR
        - 8.1.6 Variants
        - 8.1.7 Final trials and conditioning
        - 8.1.8 Review results of trials
        - 8.1.9 Conclusions and selection of *SLA*s
        - 8.1.10 Other business
    - 8.2 Complete *Implementation Review* of Bering-Chuckchi-Beaufort Seas bowhead whales
        - 8.2.1 Consideration of new information with a focus on whether this implies a need for new trials
            - 8.2.1.1 Stock structure
            - 8.2.1.2 Abundance and rate of increase
            - 8.2.1.3 Catch data
        - 8.2.2 Discussion of new trials
        - 8.2.3 Conclusions and recommendations
    - 8.3 Continue work on developing *SLA*s for the Greenlandic hunts (Annex E, Item 4)
        - 8.3.1 Common minke whales
        - 8.3.2 Fin whales
        - 8.3.3 Humpback whales and bowhead whales
    - 8.4 Guidelines for *Implementation Reviews*
    - 8.5 Scientific aspects of an aboriginal whaling scheme (AWS)
    - 8.6. Conversion factors for edible products for Greenland hunts

8.7 Workplan
9. Aboriginal Subsistence Whaling management advice
9.1 Eastern Canada and West Greenland bowhead whales
9.1.1 Review new information on Eastern Canada and West Greenland bowhead whales
9.1.2 Review recent catch information
9.1.3 Management advice
9.2 Eastern North Pacific gray whales
9.2.1 New information
9.2.2 Review of recent catch information
9.2.3 Management advice
9.3 Bering-Chukchi-Beaufort (B-C-B) Seas stock of bowhead whales
9.3.1 New information
9.3.2 Management advice
9.4 Common minke whales off West Greenland
9.4.1 New information
9.4.2 Management advice
9.5 Common minke whales off East Greenland
9.5.1 New information
9.5.2 Management advice
9.6 Fin whales off West Greenland
9.6.1 New information
9.6.2 Management advice
9.7 Humpback whales off West Greenland
9.7.1 New information
9.7.2 Management advice
9.8 Humpback whales off St Vincent and The Grenadines
9.8.1 New information
9.8.2 Management advice
10. Whale stocks
10.1 Antarctic minke whales (Annex G)
10.1.1 Stock structure
10.1.2 Abundance estimation of Antarctic minke whales
10.1.3 Reasons for differences between estimates from CPII and CPIII
10.1.4 Continue development of the catch-at-age models
10.2. Southern Hemisphere humpback whales
10.2.1 Begin assessment of breeding stocks D, E and F
10.2.1.1 Abundance, trends and population structure
10.2.1.2 Assessment models
10.2.2 Review new information on other breeding stocks
10.2.2.1 Breeding stock A
10.2.2.2 Breeding stock B
10.2.2.3 Breeding stock C
10.2.2.4 Breeding stock D
10.2.2.5 Breeding stock G
10.2.2.6 Feeding grounds
10.2.2.7 Antarctic Humpback Whale Catalogue
10.2.3 Work plan
10.3. Southern Hemisphere blue whales
10.3.1 Review new information
10.3.1.1 Photo-identification catalogues
10.3.1.2 Antarctic blue whales
10.3.1.3 Planning of future research
10.3.1.4 Pygmy blue whales
10.3.1.5 Chilean blue whales
10.4 Western North Pacific gray whales
10.4.1 New scientific information
10.4.1.1 Satellite Tagging
10.4.1.2 photo-identification

10.4.1.3 Other
10.4.2 Conservation advice
10.5 Southern Hemisphere right whales
10.5.1 Review report from intersessional workshop
10.5.1.1 Long-term population monitoring
10.5.1.2 Population structure and linkages
10.5.1.3 Modelling
10.5.1.4 Joint Argentina/Brazil assessment
10.5.1.5 Assessment of the Chile/Peru population
10.5.1.6 Identification of concerns and their monitoring
10.5.1.7 Development of Conservation Management Plans (CMPs)
10.5.1.8 Conclusion
10.5.2 Review new information
10.5.2.1 Southwest Atlantic
10.5.2.2 Southern Africa
10.5.2.3 Southwest Pacific and New Zealand
10.5.2.4 Australia
10.5.2.5 South East Pacific right whales
10.5.2.6 Genetic research
10.6 Other stocks of right whales and small stock of bowhead whales
10.6.2 Work
10.7 Arabian Sea humpback whales
10.7.1 Review intersession progress
10.7.2 The development of a CMP
10.7.3 Work plan
10.8 Cruises
10.8.1 The IWC-POWER programme
10.8.1.1 Planning the IWC-Power Programme
10.8.1.2 Report on the 2011 IWC-Power Cruise
10.8.1.3 The 2012 IWC-Power Cruise
10.8.1.4 Plans for the 2013 IWC-Power Cruise
10.8.2 Other North Pacific cruises (and see Item 6)
10.8.2.1 Report of Japanese cetacean sighting surveys in the north Pacific in 2011
10.8.2.2 Plans for Japanese cetacean sighting surveys in the north Pacific in 2012
10.8.3 Cruises in the Antarctic Ocean
10.8.3.1 Progress on IDCR-SOWER cruises publications
10.8.3.2 Report of the 2011/12 cetacean sighting survey in the Antarctic
10.8.3.3 Plans for cetacean sighting surveys in the Antarctic in the 2012/13 season
10.9 Progress towards an in-depth assessment of North Pacific sei whales
11. Stock Definition
11.1 Guidelines for DNA data quality and genetic analyses
11.2 Statistical and genetic issues related to stock definition
11.3 Progress on the Testing of Spatial Structure Models (TOSSM)
11.4 Terminology and unit-to-conserve
11.5 Workplan
12. Environmental Concerns (E)
12.1 State of the cetacean environment report (SOCER)
12.2 Pollution
12.2.1 Update on POLLUTION 2000+ Phase II progress
12.2.2 Oil spill impacts
12.2.2.1 Update on response to Deepwater Horizon oil spill in the Gulf of Mexico
12.2.2.2 Capacity building regarding oil spill impacts on cetaceans
12.2.3 Other pollution related issues
12.3 CERD (Cetacean Emerging and Resurging Disease)
12.3.1 Update from CERD Working Group
12.3.2 Progress on CERD Website
12.3.3 Other disease related issues
12.4 Anthropogenic sound

12.4.1 Mitigation of effects of anthropogenic sound on cetaceans
12.4.2 Other anthropogenic sound related issues
12.5 Climate change
12.5.1 Progress on recommendations from the 2nd Climate Change Workshop
12.5.2 Small cetacean restricted habitats Working Group
12.5.3 Planning for intersessional Arctic Anthropogenic Impacts Workshop
12.5.4 Other climate change related issues
12.6 Interactions between MREDs and cetaceans
12.7 Other habitat related issues
12.7.1 Cetaceans and marine debris
12.7.2 Issues related to the March 2011 tsunami in the NW Pacific
12.7.3 Cumulative impacts of anthropogenic activities
12.7.4 REMMOA aerial surveys in the French EEA
12.8 Work plan
13. Ecosystem Modelling
13.1 Review of ecosystem modelling efforts undertaken outside the IWC
13.1.1 Ecosystem modelling in the context of ecosystem-based fisheries management
13.1.2 Ecosystem models of the effect on predators of fishing forage fish
13.1.3 Status update on NAMMCO ecosystem modelling
13.2 Explore how ecosystem models contribute to developing scenarios for simulation testing of the RMP
13.3 Review of other issues relevant to ecosystem modelling within the committee
13.3.1 Update on Antarctic minke whale body condition analyses
13.3.2 Other issues
13.4 Review new information on ecosystem model skill assessment
14. Small Cetaceans (SM)
14.1. Review status of ziphiids whales in the North Pacific and northern Indian Ocean
14.1.1. Cuvier's beaked whale (*Ziphius cavirostris*)
14.1.1.1. Conclusions and other considerations of status
14.1.2. Baird's beaked whale (*Berardius bairdii*)
14.1.2.1 Life history parameters
14.1.2.2. Abundance and trends
14.1.2.3. Takes including bycatch
14.1.2.4. Other actual and potential threats
14.1.2.5. Conclusions and other considerations of status
14.1.3. Longman's beaked whale (*Indopacetus pacificus*)
14.1.3.1 Conclusions and other considerations of status
14.1.4. Hubbs' beaked whale (*Mesoplodon carlhubbsi*)
14.1.4.1 Conclusions and other considerations of status
14.1.5. Blainville's beaked whale (*Mesoplodon densirostris*)
14.1.5.1 Conclusions and other considerations of status
14.1.6. Ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*)
14.1.7. Perrin's beaked whale (*Mesoplodon perrini*)
14.1.8. Pygmy beaked whale (*Mesoplodon peruvianus*)
14.1.8.1 Conclusions and other considerations of status
14.1.9. Stejneger's beaked whale (*Mesoplodon stejnegeri*)
14.1.9.1 Conclusions and other considerations of status
14.1.10. Deraniyagala's beaked whale
14.1.10.1 Conclusions and other considerations of status
14.1.11. Common issues and threats
14.1.11.1 Military sonar and other noise sources
14.1.11.2. Marine debris
14.1.11.3 General recommendations
14.2. Report on the voluntary fund for small cetacean conservation research
14.2.1. Status of the voluntary fund for small cetacean conservation research
14.2.2. Review on Progress on Funded Projects
14.3. Progress on previous recommendations
14.3.1. Vaquita
14.3.2. Harbour porpoise

14.3.3. Franciscana
14.3.4. Narwhal and white whale
14.3.5. Atlantic humpback dolphin
14.3.6. River dolphins
14.3.6.1 Boto and tucuxi
14.3.6.2 Indus river dolphin
14.3.6.3 Mekong river population of irrawaddy dolphins
14.3.7 Killer whales
14.3.8 Clymene dolphin
14.4 Takes of small cetaceans
14.5. Local studies
14.6 Hector's dolphins
14.7. Workplan
15. Whalewatching
15.1 Assess the impacts of whalewatching on cetaceans
15.2 Review whalewatching off Central America
15.3 Reports from intersessional working groups
15.3.1 Large-scale whalewatching experiment (LaWE) steering group
15.3.2 LaWE budget development group
15.3.3 Online database for worldwide tracking of commercial whalewatching and associated data collection
15.3.4 Swim-with-whale operations
15.3.5 In-water interactions
15.4. Other issues
15.4.1 Review scientific aspects of the Commission's Five Year Strategic Plan for Whalewatching
15.4.2 Consider information from platforms of opportunity of potential value to the Scientific Committee
15.4.3 Review whalewatching guidelines and regulations
15.4.4 Review of collision risks to cetaceans from whalewatching vessels
15.4.5 Swim-with-whales operations
15.4.6 Emerging whale watching industry in Oman
15.5 Work plan
15.6 Other matters
16. DNA testing
16.1 Review genetic methods for species, stock and individual identification
16.2 Review results of the amendments of sequences deposited in GenBank
16.3 Collection and archiving of tissue samples from catches and by-catches
16.4 Reference databases and standards for diagnostic registries
16.5 Work plan
17. Scientific Permits
17.1 Review of results from existing permits
17.1.1 JARPN II
17.1.1.1 Authors' summaries
17.1.1.2 Discussion
17.1.2 JARPA II
17.1.2.1 Authors' summary
17.1.2.2 Discussion
17.1.3 Planning for a final review of results from Iceland - North Atlantic common minke whale
17.1.4 Planning for a periodic review of results from JARPA II
17.2 Review of new or continuing proposals
17.2.1 JARPA II
17.2.2 JARPN II
18. Whale sanctuaries
19. SORP
19.1 Review of progress since IWC 63
19.1.1 SORP Antarctic Blue Whale Project
19.1.2 Ways to expand Antarctic Blue Whale Project (ABWP) work
19.1.3 Killer whales in the Southern Ocean
19.1.4 Foraging ecology and predator prey interactions of baleen whales and krill

19.1.5 Oceania humpback whale mixing
19.1.6 Fin and blue whale acoustics
19.1.7 Living Whales Symposium and non-lethal research techniques workshops
19.2 Budget
19.2.1 Budget overview
19.2.2 Request for funds from projects
19.2.3 Reallocation of funds
19.2.4 Allocation of funds
19.2.5 Seeking additional funding
19.3 Requirements for formalising participation in SORP and development of new projects
19.4 Workplan
20. Research and Workshop proposals and results
20.1 Review results from previously funded research proposals
20.2 Review proposals for 2012/13
21. Committee priorities and initial Agenda for the 2013 meeting
22. Data processing and computing needs for 2011/12
23. Funding requirements for 2012/13
24. Working methods of the Committee
24.1 Reducing the costs of Committee meetings
24.2 Clarifying information on data availability for Procedure B requests
24.3 Updating the Committee's guidelines and Handbook
24.4 Assistance to new members on the working of the Committee
25. Election of Officers
26. Publications
27. Other business
28. Adoption of Report

Annex B2

Relationship Between Commission and Scientific Committee Agendas

This table is intended to assist readers in finding information relative to the Commission agenda (IWC/64) in the Scientific Committee Report (SC/64) and the Chair's Report (2012) of IWC/63 (held in 2011). Commission agenda items not in this summary were not addressed at the Scientific Committee meeting.

No.	Commission Agenda (IWC/64)	Scientific Committee Agenda Item and Annex (SC/64)	Chair's Report (IWC/63: Agenda Item)
4.	SANCTUARIES		9
4.1	South Atlantic Whale Sanctuary		9.2
4.2	Other sanctuary issues raised in the Scientific and Conservation Committees		
4.2.1	Report of the Scientific Committee	18	9.1.1
4.2.2	Report of the Conservation Committee		9.1.2
5	THE IWC IN THE FUTURE		4
6.	WHALE STOCKS		5
6.1	Antarctic minke whales		5.1
6.1.1	Report of the Scientific Committee	10.1; Annex G	
6.2	Southern Hemisphere humpback whales		5.2
6.2.1	Report of the Scientific Committee	10.2; Annex H	
6.3	Southern Hemisphere blue whales		5.3
6.3.1	Report of the Scientific Committee	10.3; Annex H	
6.4	Western North Pacific gray whales		5.4
6.4.1	Report of the Scientific Committee	10.4; Annex F	
6.5	Southern Hemisphere right whales		5.5
6.5.1	Report of the Scientific Committee	10.5; Annex F	
6.6	North Pacific and North Atlantic right whales and small stocks of bowhead whales		5.6
6.6.1	Report of the Scientific Committee		
	• Right whales	10.6; Annex F	5.6.1
	• Bowhead whales	8.2, 9.1, 9.3, 10.6; Annexes E, F	
	• Gray whales	8.1, 9.2, 10.4; Annexes E, F	
6.7	North Pacific Research cruises (SOWER and North Pacific)		5.7
6.7.1	Report of the Scientific Committee	10.7; Annex G	
6.8	Other stocks		
7.	ABORIGINAL SUBSISTENCE WHALING		7; Annex F
7.1	Aboriginal Subsistence Whaling Management Procedure		7.1
7.1.1	Report of the Aboriginal Subsistence Whaling Sub-committee	8; Annex E	7.1.1
7.2	Aboriginal Whaling Scheme		7.2
7.2.1	Report of the Aboriginal Subsistence Whaling Sub-committee	8.3; Annex E	7.2.1
7.3	Aboriginal subsistence whaling catch limits		7.3
7.3.1	Report of the Aboriginal Subsistence Whaling Sub-committee	9; Annexes E, F	7.3.1.1, 7.3.2.1, 7.3.3.1, 7.3.4.1, 7.3.5.1, 7.3.6.1, 7.3.7.1, 7.4.1
8	CONSERVATION COMMITTEE		18; Annex G
8.1	Investigation of inedible 'stinky gray whales		
8.1.1	Report of the Conservation Committee	12.2.3; Annex K	
8.2	Ship Strikes		
8.2.1	Report of the Conservation Committee	7.7, 8.8; Annex K	
8.3	Southern Right Whales of Chile-Peru		
8.3.1	Report of the Conservation Committee	10.6.1; Annex F	
8.4	National Reports on Cetacean Conservation		
8.4.1	Report of the Conservation Committee		
8.5	Marine Debris		
8.5.1	Report of the Conservation Committee	12.7.1; Annex K	
8.6	Voluntary fund for small cetacean conservation research		
8.6.1	Report of the Conservation Committee	14.2; Annex L	
9.	CONSERVATION MANAGEMENT PLANS		14; Annex G
9.1	Report of the Conservation Committee	10.4, 10.5.2, 10.7; Annexes F, H	
10.	WHALEWATCHING		15; Annex G
10.1	Report of the Conservation Committee	15; Annex M	
11.	WHALE KILLING METHODS AND ASSOCIATED WELFARE ISSUES		6

No.	Commission Agenda (IWC/64)	Scientific Committee Agenda Item and Annex (SC/64)	Chair's Report (IWC/63: Agenda Item)
11.1	Report of the Working Group on Whale Killing Methods and Associated Welfare Issues		6.1
12.	SOCIOECONOMIC IMPLICATIONS AND SMALL-TYPE WHALING		10
13.	REVISED MANAGEMENT PROCEDURE (RMP)		8.1
13.1	Report of the Scientific Committee		8.1.1
13.1.1	General issues	5; Annex D	8.1.1.1
13.1.2	*Implementation* process		8.1.1.2
	• Western North Pacific Bryde's whale	6.1; Annex D	8.1.1.2
	• Central North Atlantic fin whales	6.2; Annex D	8.1.1.2
	• Western North Pacific common minke whales	6.3; Annex D1	8.1.1.2
13.1.3	Bycatch	7; Annex J	8.1.1.3
14.	SCIENTIFIC PERMITS		11
14.1	Report of the Scientific Committee	17	
14.1.1	Review of results from existing permits	17.1	
14.1.2	Review of new or continuing proposals	17.2	
14.1.3	Procedures for reviewing scientific permit proposals	17.1.3	
14.1.4	Other		
15.	SAFETY ISSUES AT SEA		12
16	CATCHES BY NON-MEMBER NATIONS		19
16.1	Report of the Scientific Committee	9.1	
17.	INFRACTIONS, 2011 SEASON		20
18.	ENVIRONMENTAL AND HEALTH ISSUES		13
18.1	State of the Cetacean Environment (SOCER)		
18.1.1	Report of the Scientific Committee	12.1; Annex K	
18.2	POLLUTION 2000+: Phase II Planning Workshop		
18.2.1	Report of the Scientific Committee	12.2; Annex K	
18.3	Cetacean diseases		
18.3.1	Report of the Scientific Committee	12.3; Annex K	
18.4	The impacts of oil and dispersants on cetaceans		
18.4.1	Report of the Scientific Committee	12.2; Annex K	
18.5	Marine renewable energy developments and cetaceans		
18.5.1	Report of the Scientific Committee	12.6; Annex K	
18.6	Anthropogenic sound		
18.6.1	Report of the Scientific Committee	12.4; Annex K	
18.7	Climate Change		
18.7.1	Report of the Scientific Committee	12.5; Annex K	
18.8	Ecosystem modelling		
18.8.1	Report of the Scientific Committee	13; Annex K1	
18.9	Proposal for a workshop on anthropogenic impacts to cetaceans in the Arctic		
18.9.1	Report of the Scientific Committee	12.5.3; Annex K	
18.10	Reports from Contracting Governments on national and regional efforts to monitor and address the impacts of environmental change on cetaceans and other marine mammals		
18.11	Health issues – Commission discussions and action arising		
18.12	Other		
19.	OTHER SCIENTIFIC COMMITTEE ACTIVITIES, ITS FUTURE WORK PLAN AND ADOPTION OF SCIENTIFIC COMMITTEE REPORT		17
19.1	Small cetaceans		17.1
19.1.1	Report of the Scientific Committee	14; Annex L	17.1
19.2	Regional non-lethal research partnerships		17.2
19.2.1	Report of the Scientific Committee	10.3;19; Annex H	17.2
19.3	Other activities		17.3
19.3.1	Report of the Scientific Committee	11, 16, 20, 22, 24-28	17.3
19.4	Scientific Committee Future Work Plan		17.4
19.4.1	Report of the Scientific Committee	21, 23	17.4
20	CO-OPERATION WITH OTHER ORGANISATIONS		16
20.1	Report of the Scientific Committee	4	
21	ADMINISTRATIVE MATTERS		21
21.1	Meeting arrangements and Procedures		21.1
21.2	The Commission's website		21.2
21.3	Operational effectiveness		
21.4	Cost saving measures		
22	FORMULAT FOR CALCULATING CONTRIBUTIONS AND RELATED MATTERS		21.5

No.	Commission Agenda (IWC/64)	Scientific Committee Agenda Item and Annex (SC/64)	Chair's Report (IWC/63: Agenda Item)
23	REPORT OF THE INTERSESSIONAL CORRESPONDENCE GROUP ON STRENGTHENING IWC FINANCING		
24	FINANCIAL STATEMENTS, BUDGETS AND OTHER MATTERS CONSIDERED BY THE BUDGETARY SUB-COMMITTEE		21.7
25	ADOPTION OF THE REPORT OF THE FINANCE AND ADMINISTRATION COMMITTEE		21.8
26	DATE AND PLACE OF FORTHCOMING MEETINGS		22
27	ADVISORY COMMITTEE		23
28	SUMMARY OF DECISIONS AND REQUIRED ACTIONS		24
29	OTHER MATTERS		25

Annex C

List of Documents

SC/64/AWMP

1. Philips, C.D., Hoffman, J.I., George, J.C., Suydam, R.S., Huebinger, R.M., Patton, J.C. and Bickham, J.W. Molecular insights to historical demography in bowhead whales. 20pp.
2. D'Intino, A.M., Darling, J.D., Urbán-Ramirez, J. and Frasier, T.R. Substructuring of mitochondrial, but not nuclear, markers in the 'southern feeding group' of eastern North Pacific gray whales. 14pp.
3. Morin, P.A., Archer, F.I., Pease, V.L., Hancock-Hanser, B., Robertson, K.M., Huebinger, R.M., Martien, K.K., Bickham, J.W., George, J.C., Postma, L.D. and Taylor, B.L. An empirical comparison of SNPs and microsatellites for population structure, assignment, and demographic analyses of bowhead whale populations. 27pp.
1. Lang, A.R. and Martien, K.K. Update on the use a simulation-based approach to evaluate plausible levels of recruitment into the Pacific Coast Feeding Group of gray whales. 34pp.
2. George, C. and Zeh, J. Population trend, 1978-2004, of Bering-Chukchi-Beaufort bowhead whales (*Balaena mysticetus*). 3pp.
3. George, C., Suydam, R., Givens, G.H., Bickham, J., Stimmelmayr, R., Moore, S. and Zeh, J. Selected research relevant to the 2012 bowhead *Implementation Review*. 17pp.
4. George, C., Herreman, J., Givens, G.H., Suydam, R., Mocklin, J., Clark, C., Tudor, B. and DeLong, R. Brief overview of the 2010 and 2011 bowhead whale abundance surveys near Point Barrow, Alaska. 9pp.
5. Suydam, R. and George, C. Preliminary analysis of subsistence harvest data concerning bowhead (*Balaena mysticetus*) taken by Alaskan Natives, 1974 to 2011. 13pp.
6. Bickham, J.W., Huebinger, R.M., Philips, C.D., Patton, J.C., Postma, L.D., George, J.C. and Suydam, R.S. Assessing molecular substitution patterns in the mitochondrial control region compared to protein coding genes in bowhead whales: update of SC/63/BRG13. 12pp.
7. Laake, J. Evaluation of potential bias in abundance estimates for seasonal gray whales in the Pacific Northwest. 10pp.
8. Brandon, J.R., Scordino, J., Butterworth, D.S., Donovan, G.P. and Punt, A.E. Towards the selection of a final set of trials for the 2012 ENP gray whale *Implementation Review*. 6pp.
9. Witting, L. Information of relevance on Evaluation Trials for West Greenland fin whales. 23pp.
10. Witting, L. Information of relevance on Evaluation Trials for West Greenland humpback whales (including general non-species specific issues). 14pp.
11. Witting, L. Information of relevance on Evaluation Trials for the hunt of bowhead whales in West Greenland. 9pp.
12. Witting, L. Information of relevance on Evaluation Trials for West Greenland minke whales. 11pp.

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1. Bellazzi, A., Orri, R. and Montanelli, S. Entanglement of southern right whales (*Eubalaena australis*) in Gulf Nuevo, Chubut, Argentina. 12pp.
2. Rodriguez-Fonesca, J., Cubero-Pardo, P., Montenegro-Hidalgo, V. and Jimenez-Tabush, Z. Three remarkable strandings in the last ten years in the Pacific of Costa Rica (eastern tropical Pacific). 4pp.

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1. Quakenbush, L., Citta, J., George, J.C., Heide-Jørgensen, M.P., Small, R., Brower, H., Harwood, L., Adams, B., Brower, L., Tagarook, G., Pokiak, C. and Pokiak, J. Seasonal movements of the Bering-Chukchi-Beaufort stock of bowhead whales: 2006-2011 satellite telemetry results. 22pp.
2. Suydam, R., George, J.C., Person, B., Hanns, C., Stimmelmayr, R., Pierce, L. and Sheffield, G. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaskan Eskimos during 2011. 8pp.
3. Mocklin, J., George, J.C., Ferguson, M., Brattström, L.V., Beaver, V., Rone, B., Christman, C., Brower, A., Shea, B. and Accardo, C. Aerial photography of bowhead whales near Barrow, Alaska, during the 2011 spring migration. 9pp.
4. Givens, G.H., Edmondson, S.L., George, J.C., Tudor, B., DeLong, R.A. and Suydam, R. Detection probability estimates from the 2011 ice-based independent observer surveys of bowhead whales near Barrow, Alaska. 25pp.
5. Burdin, A.M., Sychenko, O.A. and Sidorenko, M.M. Status of western gray whales off northeastern Sakhalin Island, Russia, 2011. 10pp.
6. No paper.
7. Martino, J., Wise, S.S., Perkins, C., Kerr, I., Rowntree, V.J., Sironi, M. and Wise, J.P., Sr. Metal levels in southern right whale (*Eubalaena australis*) skin biopsies from Península Valdés, Argentina. 8pp.
8. Bickham, J.W., Stuart, G.W., Patton, J.C., George, J.C. and Suydam, R.S. Bowhead Whale Genome Project: progress on the transcriptome. 6pp.
9. Moore, J.E. and Weller, D.W. Probability of taking a western North Pacific gray whale during the proposed Makah hunt. 5pp.
10. Weller, D.W. and Brownell, J.R. A re-evaluation of gray whale records in the western North Pacific. 4pp.
11. No paper.
12. Sironi, M., Rowntree, V.J., Di Martino, M., Chirife, A., Bandieri, L., Beltramino, L., Franco, M. and Uhart, M. Southern right whale mortalities at Península Valdés, Argentina: updated information for 2010-2011. 5pp.
13. Urbán R., J., Weller, D., Tyurneva, O.Y., Swartz, S.L., Bradford, A., Yakovlev, Y.M., Sychenko, O., Rosales, N., Martinez, S., Burdin, A.M. and Gómez-Gallardo, U. Report on the photographic comparison of the western and Mexican gray whale catalogues. 6pp.
14. Swartz, S.L., Urbán R., J., Gómez-Gallardo, U., Martinez, S., Olavarrieta, T., Lopez, D.C., Rodirguez, L. and Rojas-Bracho, L. Numbers of gray whales (*Eschrichtius robustus*) utilizing Laguna San Ignacio, Baja California Sur, Mexico during the winter breeding seasons: 2007-2012. 8pp.
15. Slikas, B., Baker, C.S., Clapham, P., Frasier, T.R., Seger, J., Valenzuela, L.O. and Wade, P. Proposal to the Scientific Committee: Worldwide genetic diversity and phylogenetic relationships among right whales based on next-generation sequencing of complete mitochondrial geneomes and multiple nuclear loci. 8pp.

16. No paper.
17. No paper.
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19. Vladimirov, V.A., Starodymov, S.P. and Kornienko, M.S. Distribution and abundance of western gray whales and their prey off northeast Sakhalin Island, Russia, 2011 (with retrospective comparisons). 20pp.
20. Vermeulen, E. and Cammareri, A. Abundance estimates of southern right whales (*Eubalaena australis*) in Bahia San Antonio, Patagonia, Argentina. 7pp.
21. Blokhin, S.A., Litovka, D., Vimmikov, A.V. and Kosiak, A.V. Gray whale *Eschrichtius robustus* coastal counts and harvest monitoring results off Chukotka Peninsula, Russian Far East, 2011. 6pp.
22. Tyurneva, O.Y., Yakovlev, Y.M. and Vertyankin, V. Photographic identification study of gray whale (*Eschrichtius robustus*) offshore northeast Sakhalin Island and southeast Kamchatka peninsula, Russia: 2002-2011. 13pp.
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24. Brandão, A., Butterworth, D.S., Müller, A. and Best, P.B. Application of a photo-identification based assessment model to southern right whales in South African waters. 15pp.
25. No paper.

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2. Stachowitsch, M., Parsons, E.C.M. and Rose, N.A. State of the Cetacean Environment Report (SOCER) 2012. 6pp.
3. Dolman, S.J. and Simmonds, M.P. Ensuring adequate consideration of cetaceans in Scotland's ambitious marine renewable energy plans. 20pp.
4. Fossi, M.C., Marsili, L., Panti, C., Maltese, S., Coppola, D., Guzman C., D., Aguilar S., M. and Urban, J. Preliminary results on ecotoxicological investigation on gray whales (*Eschrichtius robustus*) in the San Ignacio Lagoon, Mexico. 7pp.
5. Hall, A.J., Schwacke, L.H., Kershaw, J.K., McConnell, B.J. and Rowles, T.K. An individual based modelling approach to investigate the impact of pollutants on cetacean population dynamics - effects on calf survival and immunity. 31pp.
6. Simmonds, M.P., Green, M., James, V.C., Eisfeld, S.M. and Lott, R. Towards evaluating the effectiveness of MPAs for cetacean conservation in Wales. 22pp.
7. Dyke, K.N. and Simmonds, M.P. Does the literature on marine debris and its impacts on cetaceans indicate any trends? 7pp.
8. Hernandez-Mora, G., Palacio-Alfaro, J.D. and González-Barrientos, R. Stranded cetaceans in Costa Rica: micro-organism and diseases with public health and conservation impact. 7pp.
9. No paper.
10. Baulch, S. and Perry, C. A sea of plastic: evaluating the impacts of marine debris on cetaceans. 24pp.
11. Wright, A.J. and Kyhn, L.A. Practical cumulative impact management. 6pp.
12. Galletti Vernazzani, B. and Veirs, V. Wind farm projects near cetacean critical habitat in Chile: a case study. 7pp.
13. Asmutis-Silvia, R., Kennedy, J., Schulte, D., Toepfer, M. and Bradt, S. High risk of marine debris ingestion by large whales in the southern Gulf of Maine, USA. 6pp.
14. Laran, S., Doremus, G., Mannocci, L., Van Canneyt, O., Watremez, P., Cadinouche, A., Dulau-Drouot, V., Mayer, F.X., Monthy, D., Andrianarivelao, N., Razafindrakoto, Y., Toilibou, A. and Ridoux, V. Progress of the REMMOA aerial surveys conducted in the French EEZ and adjacent waters: contrasted cetacean habitats in the southwest Indian Ocean. 14pp.
15. Scheidat, M. and Feindt-Herr, H. Collecting data on marine debris during cetacean aerial surveys. 3pp.

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1. Link, J.S. An overview of ecosystem models germane to whale population issues. 10pp.
2. Col, L.A., Link, J.S., Cadrin, S. and Palka, D. Marine mammal consumption on the northeast US continental shelf. 52pp.
3. De La Mare, W.K. Lurking variables and the interpretation of statistical analyses of data collected under JARPA. 65pp.

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1. Punt, A.E., Hakamada, T. and Pastene, L.A. A full description of the statistical catch-at-age analysis method for Southern Hemisphere minke whales. 39pp.
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2. International Whaling Commission. Report of the second 'First Intersessional Workshop' for the *Implementation Review* of western North Pacific common minke whales. 17pp. [Data files available separately].
3. International Whaling Commission. Report of the AWMP Workshop focussing on the PCFG gray whale *Implementation Review*. 31pp.
4. International Whaling Commission. Report of the 2012 intersessional IA Workshop on estimating abundance of Antarctic minke whales. 8pp.
5. International Whaling Commission. Report of the IWC workshop on the assessment of southern right whales. 39pp.
6. International Whaling Commission. Report of the workshop on interactions between marine renewable projects and cetaceans worldwide. 32pp.
7. International Whaling Commission. Report of the planning meeting for the 2012 IWC-POWER cruise. 14pp.

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