Report of the Scientific Committee

The meeting was held at the Lotte Hotel, Ulsan, Korea, from 30 May-10 June 2005 and was chaired by Doug DeMaster. A list of participants is given as Annex A.

1. INTRODUCTORY ITEMS

1.1 Chair's welcome and opening remarks
DeMaster welcomed the participants to the meeting. He thanked the Government of Korea, the City of Ulsan and the local organising Committee for hosting the meeting and for providing the excellent facilities. He also extended his gratitude to the Korean organisers for all their help and for making all participants very welcome in Ulsan.

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

1.4 Establishment of sub-committees and Working Groups
Three meetings preceded the start of the Scientific Committee. The AWMP Standing Working Group (SWG) met 28-29 May, in which agenda items covered were incorporated into the AWMP main agenda and report (Annex E). Two-day Workshops on the Use of Market Sampling to Estimate Bycatch of Large Whales (27-28 May) and High Latitude Sea Ice Environments (28-29 May) were also held and the reports of these Workshops are given as SC/57/Rep4 and SC/57/Rep5 respectively.

A number of sub-committees and Working Groups were established. Their reports were either made annexes (see below) or subsumed into this report.
Annex D – Sub-Committee on the Revised Management Procedure (RMP);
Annex 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 L – Standing Sub-Committee on Small Cetaceans (SM);
Annex M – Sub-Committee on Whalewatching (WW);

Annex N – Working Group on DNA (DNA); and
Annex O – Working Group on Scientific Permits (SP).

1.5 Computing arrangements
Allison outlined the computing and printing facilities available for delegate use. Requests for Secretariat computing would be addressed according to priorities set by the Convenors.

2. ADOPTION OF AGENDA
The adopted Agenda is given as Annex B1. Statements on the Agenda are given as Annex S. The Agenda took into account the priority items agreed last year and approved by the Commission (IWC, 2005c, pp.52-4). Annex B2 links the Committee's Agenda with that of the Commission.

3. REVIEW OF AVAILABLE DATA, DOCUMENTS AND REPORTS

3.1 Documents submitted
Donovan reported that the new pre-registration procedure had again been successful. With such a large number of documents, pre-specifying papers had reduced the amount of photocopying and unnecessary paper dramatically.

The list of documents is given as Annex C.

3.2 National progress reports on research
Progress reports presented at the 2001-05 meetings are accessible on the IWC website. Reports from previous years will also become available in this format in future.

The Committee reaffirmed its view of the importance of national progress reports and **recommends** that the Commission continues to urge member nations to submit them following the approved guidelines (IWC, 1998b). Non-member nations wishing to submit progress reports are welcome to do so.

A summary of the information included in the reports presented this year is given as Annex Q; the modified report template, taking account of the updates made in 2004, is available on the IWC website (*www.iwcoffice.org/commission/sci_com/scprogress*). The Committee **agrees** that the bycatch reporting tables for small cetaceans should be brought into line with those for large whales with respect to reporting fishing gear types (see Item 13.4).

3.3 Data collection, storage and manipulation
3.3.1 Catch data and other statistical material
Table 1 lists data received by the Secretariat since the 2004 meeting.

3.3.2 Progress of data coding projects and computing tasks
Allison reported that the first phase of work to encode the revised Soviet individual catch data from the Southern Hemisphere had been completed and the data are in the process of being validated. The validation stage is particularly important for these data, as the source records

Table 1

List of data and programs received by the IWC Secretariat since the 2004 meeting.

Date	From	IWC ref.	Details
Catch data			
5/4/05	Norway: N. Øien	E56	Individual common minke catch records from the Norwegian 2004 commercial catch. Access restricted (specified 14/11/00).
30/5/05	Japan: J. Morishita	D175	Individual catch records from the 2004 Japanese Whale Research Programme under special permit in the North Pacific (JARPN II) and the 2004/05 Japanese whale research programme under special permit in the Antarctic (JARPA).
30/5/05	Russia: R.G. Borodin	D176	Individual catch records from Russian gray and bowhead whale hunt 2004.
6/6/05	St. Vincent and the Grenadines: S. Punnett		Details of the humpback whale taken by St. Vincent and the Grenadines, 2005.
28/9/04	T. Kasuya	CD46	Data in support of Kondo and Kasuya (2002) on revised Japanese coastal catch statistics.
1/2/05	Korea: H. Sohn	E51	Korean data for the North Pacific common minke IA: (i) data for common minke bycatch or stranded 1996-2004; (ii) revised individual catch data 1980-86.
16/3/05	Greenland: L. Witting	E54	Greenland individual common minke and fin catch data, 1988-2004 (2000-04, incomplete) including skin sample data.
30/5/05	J. Brandon	E58	Individual Russian aboriginal gray whale catch records coded from the whale passports 1980-91 (supplied to Brandon by R. Brownell).
Sightings data			
18/3/05	P. Ensor	CD48(E)	2004/05 Southern Ocean Whale and Ecosystem Research Programme (SOWER) cruise data including blue whale data (sightings, effort, weather, ice edge, inter-stratum and way-pt.).
5/4/05	L. Burt	CD50	Database and Estimation of Software System (DESS) version 3.5.
4/1/05	Japan: T. Miyashita	E49	Japanese North Pacific common minke whale sighting data 1994, 1999-2003 for use in the forthcoming North Pacific common minke IA.
1/2/05	Korea: H. Sohn	E51	Korean sightings data 1999-2004 for North Pacific common minke IA.
Other data			
7/1/05	Japan: Y. Fujise	E57	Revised age data for JARPA Antarctic minke earplug samples 1987/88-2000/01, to replaces data sent 11/5/04.
21/1/05, 10/2/05	C.S. Baker	E50, E53	Genetic data for the North Pacific common minke IA. Revised data received 10/2/05.
7/2/05	Iceland: A. Daníelsdóttir	E52	Overview of North Atlantic fin whale genetic samples examined at the Marine Research Institute, Iceland.
30/5/05	D. Palka	CD51-52	Simulation data sets 2004 (SC01-SC16) and 2005 (SC17-SC32).

are handwritten and many are of poor quality. The detailed biological data are not being coded in this first phase of the coding work.

The small technical workshop on the revised Soviet Southern Hemisphere catch data (consisting of Allison, Brownell, Donovan, Mikhalev and Tormosov plus an interpreter, see IWC, 2004b, p.2 and p.55) to consider how best to fill the gaps in the data, is expected to take place in September or October 2005. The Steering Group (Annex P(1)) appointed to assist with this work was retained and augmented with Findlay and Clapham with respect to Southern Hemisphere humpback whales (*Megaptera novaeangliae*) (see Item 10.3.1.2).

Data received from the 2003 season has been entered into the individual catch database and work has begun to enter the Faroese data from 1902 onwards supplied by Dorete Bloch.

Allison reported good progress on the summary catch database (begun last year), which aims to be a complete listing of all 20th century whaling catch data and to supplement the data held in the individual catch database. The summary database is now substantially complete and has been used to extract the revised catch series for use in the in-depth assessment of Southern Hemisphere humpback whales (see Item 10.3.1.2). Review of the database by members of the Scientific Committee would be appreciated; specifically, assistance would be welcomed in identifying any errors or additional sources of catch data.

Allison has worked with Bloch on catch data in the Northeast Atlantic with a view to obtaining a common agreed catch series with the North Atlantic Marine Mammal Commission (NAMMCO) (see also Item 6.2.2).

Information on catches of western North Pacific Bryde's whales (*Balaenoptera edeni*) has been collated using information supplied by Ohsumi since the North Pacific Bryde's whale workshop in March (see Annex D, item 6). In addition the information was being used to identify Bryde's whales in the individual database which were not distinguished from sei whales (*B. borealis*).

Data from the 2003/04 SOWER sightings cruises have been validated and incorporated into the DESS database.

4. CO-OPERATION WITH OTHER ORGANISATIONS

4.1 Convention on the Conservation of Migratory Species (CMS)
4.1.1 Scientific Council
The 2005 meeting of the Scientific Council had not occurred during the IWC intersessional period. Perrin will attend as the IWC observer at the series of meetings in November 2005.

4.1.2 Agreement on Small Cetaceans of the Baltic and North Sea (ASCOBANS)
The report of the IWC observer at the 12th Meeting of the ASCOBANS Advisory Committee (AC) held in Brest, France is given as IWC/57/5F. Preparation for SCANS II was discussed and surveys will be conducted from 27 June-29 July 2005. This will cover the entire North Sea, Celtic Shelf and Gulf of Biscay and is intended to extend to offshore European waters during 2007. New data on population sizes, distribution and structures were reviewed and this included results of sighting schemes, genetic studies and photo-identification.

The IWC POLLUTION 2000+ programme was reviewed, and the AC looks forward to the final report of Phase I in 2006. The AC noted the value of such co-operation between the IWC and ASCOBANS and plans to

contact the IWC to re-establish the IWC-ASCOBANS Working Group on Harbour Porpoises (*Phocoena phocoena*). The AC intends to review its earlier management advice that a bycatch rate of 1.7% is not sustainable, and that 1% should be an alert to consider management measures (and see Item 13.2.3). Drafting of a Recovery Plan for harbour porpoises in the North Sea was continued, focusing on recommending specific management measures in specific areas where high bycatch rates are known to occur.

Implementation of the ASCOBANS Baltic Harbour Porpoise Recovery Plan, The Jastarnia Plan, is progressing and a related Working Group consisting of both environmental and fisheries stakeholders met in Bonn, Germany during March. Two recovery recommendations were extensively discussed; analyses of stock affinities in the transition zone and the development and application of acoustic monitoring techniques. Other relevant items discussed were bycatch reduction, marine protected areas (MPAs) and public awareness. The full report of this meeting is available on the ASCOBANS website (*www.ascobans.org/index0504.html*).

In light of the EU-Council Regulations, it was agreed that managing observer schemes on vessels under 12m should be investigated.

Further topics of interest to the IWC Scientific Committee included:

(1) disturbance to small cetaceans due to seismic surveys;
(2) approaches and progress in reducing/eliminating the adverse effects of military activity; and
(3) comprehensive assessment of bottlenose dolphins (*Tursiops truncatus*) in European waters, including abundance estimates, distribution, ranging patterns, population social structure and gene flow and design of an integrated monitoring protocol to assess conservation status.

The full report of the meeting is available on the ASCOBANS website at *www.ascobans.org/index0502.html*.

The Committee thanked Reijnders for attending the meeting on its behalf and **agrees** that he or Donovan should attend the next AC.

4.1.3 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)
The report of the IWC observer at ACCOBAMS meetings is given in IWC/57/5I. At the 2nd meeting of the parties to ACCOBAMS held in Majorca, Spain from 9-12 December, a number of resolutions were adopted concerning:

(1) a major abundance survey in the region;
(2) improved compliance with rules concerning pelagic gillnets;
(3) interaction between cetaceans and fisheries;
(4) guidelines for the use of acoustic deterrent devices;
(5) exchange of tissue samples;
(6) guidelines on tissue banks;
(7) photo-identification studies;
(8) guidelines on research and disturbance;
(9) a Conservation Plan for common dolphins (*Delphinus delphis*);
(10) the impact of anthropogenic noise;
(11) facilitation of research (e.g. by providing permits);
(12) the value of protected areas;
(13) effects of prey depletion; and
(14) release of cetaceans into the wild.

The full report of the meeting is available on the ACCOBAMS website (*www.accobams.org*). The Committee thanked Donovan for attending on its behalf.

A Workshop on obtaining baseline cetacean abundance information for the ACCOBAMS area was held in Valsain, Spain from 17-19 December 2004. Cañadas, Fortuna and Donovan acted as the Steering Group. Previously, the ACCOBAMS Scientific Committee agreed that obtaining such data was the highest priority for research in the area and without it, it will be impossible to *inter alia* determine whether ACCOBAMS is meeting its conservation objectives. The first stage of the proposed project is obtaining baseline population estimates (stock structure and abundance) and distributional information in the ACCOBAMS area. The second stage will be to develop a long-term monitoring framework, both basin-wide and in identified local key areas. The workshop, chaired by Donovan, identified areas, species, potential methods and logistical requirements for a major acoustic and visual survey of the region and outlined a process for taking the project to completion. The full workshop report is available from ACCOBAMS and Donovan.

The 3rd meeting of the Scientific Committee of ACCOBAMS was held in Cairo, Egypt from 15-17 May. Donovan had been unable to attend and thanked Reeves for acting as an informal observer. Topics of interest to the IWC Scientific Committee included:

(1) a major abundance survey in the area;
(2) incidental catches in driftnets;
(3) interactions between dolphins and fisheries;
(4) anthropogenic noise;
(5) fin whales (*B. physalus*) (Workshop proposed for November 2005);
(6) vessel collisions (Workshop proposed for November 2005);
(7) conservation plans, particularly for common dolphins, bottlenose dolphins and harbour porpoises in the Mediterranean Sea and all Black Sea cetaceans;
(8) protected areas;
(9) web-based whalewatching database;
(10) live strandings;
(11) prey depletion;
(12) IUCN Red List status of cetaceans in the Agreement Area; and
(13) proposed amendments to CMS appendices.

The Committee thanked Donovan for his work with ACCOBAMS and **agrees** that he should represent the IWC at the next ACCOBAMS meeting.

4.2 International Council for the Exploration of the Sea (ICES)
The report of the IWC observer documenting the 2004 activities of ICES is given as IWC/57/5A. During the year, the ICES Working Group on Marine Mammal Ecology (WGMME) met and discussed various issues, however these were not relevant to discussions of the IWC Scientific Committee.

During the Annual Science Conference held in Vigo, Spain (September 2004) several theme sessions incorporated discussions on marine mammals:

(1) life history, dynamics and exploitation of living marine resources;

(2) recent advances in the oceanography and biology of the Iberian waters and adjacent shelf seas; and
(3) modelling marine ecosystems and their exploitation.

Further details under these topics are given in the observer's report. The Committee thanked Haug for the report and **agrees** that he should represent the IWC at the next ICES meeting.

4.3 Inter-American Tropical Tuna Commission (IATTC)

The 2005 meeting of the Scientific Council had not occurred during the IWC intersessional period. The Secretariat will ask Reilly if he will attend as the IWC observer at their next meeting.

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

The report of the IWC observer at the 14th extraordinary meeting of ICCAT held in New Orleans, USA is given as IWC/57/5E. Many topics were discussed and numerous recommendations made, although none directly relevant to cetaceans. The Committee thanked Centenera for attending on its behalf and **agrees** that Kell should represent the IWC at the next ICCAT meeting.

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

The report of the IWC observer at the 23rd meeting of the CCAMLR Scientific Committee held in Hobart, Australia, October 2004 is given as IWC/57/5B. Results from the 2004 IWC meeting relevant to CCAMLR were presented by Kock, including a request from the IWC Scientific Committee for CCAMLR to participate in the IWC Workshop on Sea Ice, which was held in Ulsan, 28-29 May and discussion of whale catches within the CCAMLR Convention area. The main items considered at the CCAMLR meeting of relevance to the IWC included status and trends of Antarctic fish stocks and krill, incidental mortality of marine mammals, ecosystem monitoring and management, and management under conditions of uncertainty.

CCAMLR will be participating in the International Polar Year (IPY) 2007/08 and this will include contributions to the Census of Marine Life (CoML). Countries conducting activities during the IPY, either as part of their national activities or specifically for the IPY include Australia, Argentina, Brazil, Chile, France, Germany, India, Italy, Japan, Republic of Korea, Russia, New Zealand, Norway, South Africa, Sweden, UK and USA. The CCAMLR Scientific Committee agreed that a synoptic survey in the South Atlantic region would be the most appropriate activity for CCAMLR in the IPY. Although focusing on krill, the survey would collect ancillary and biological data, including observations of marine mammals. The Scientific Committee of CCAMLR encouraged the participation of the IWC in both the planning and implementation of the cruise.

An intersessional Steering Group was established under Seigel (Germany) to progress the proposed IPY synoptic survey. The Antarctic CoML is likely to consist of a series of meridional transects around the Antarctic using vessels from a number of CCAMLR members. The Working Group on Ecosystem Monitoring and Management (WG-EMM) will provide standard protocols for measurements, which

will include scientific acoustics and ship-based surveys for mammals.

The Working Group on Fish Stock Assessment (WG-FSA) highlighted the records in CCAMLR of encounters of killer whales (*Orcinus orca*) and sperm whales (*Physeter macrocephalus*) with the Patagonian and Antarctic toothfish long-line fisheries. One incidental whale mortality was observed in the 2003/04 season. Its identity is yet to be confirmed, but it is tentatively thought to have been an Antarctic minke whale (*B. bonaerensis*). It was found entangled in the mainline of the longliner *Piscis* in CCAMLR sub-area 88.1.

Discussion of the IWC-CCAMLR collaboration appears under Item 12.3.2 and in Annex K, item 8.2. Reports of the CCAMLR Scientific Committee and its Working Groups are available through the CCAMLR secretariat and on its website. Edith Fanta (Brazil) was elected as Chair of the CCAMLR Scientific Committee for the next two years. The Committee thanked Kock for attending on its behalf and **agrees** that he should represent the IWC at the next meeting of the CCAMLR Scientific Committee.

Reilly or Thiele will attend WG-EMM meetings on behalf of the Committee.

4.6 Southern Ocean Global Ecosystem Dynamics (SO-GLOBEC)

Details of SO-GLOBEC activities and collaboration with the IWC are given under Item 12.3.2 and in Annex K, item 8.2. The Committee thanked Thiele for promoting and coordinating the collaboration and **agrees** that she should continue in this work, in conjunction with the Southern Ocean Collaboration (SOC) Steering Group (Annex P(21)).

4.7 North Atlantic Marine Mammal Commission (NAMMCO)

The report of the IWC observer at the 12th meeting of the NAMMCO Scientific Committee held in Viðareiði, Faroe Islands, October 2004 is given as IWC/57/5G. The full report of the meeting will shortly be published in the NAMMCO annual report and is presently available on the NAMMCO website (*www.nammco.no*).

Preliminary results from the Icelandic research programme on common minke whale diet, and a new multi-species model incorporating common minke whales, harp seals and three fish species in the Barents Sea were reviewed. The Committee noted the lower than expected activity in the area of multi-species modelling and emphasised that progress will not be made unless significant additional resources are dedicated to it.

Advice for several cetacean species in West Greenlandic waters was requested from the Committee. Without a new abundance estimate for the area, the Committee was unable to comment on the sustainable yield levels for humpback whales. The Committee also could not review abundance, stock structure, migration and feeding ecology of killer whales in this area without additional information. The Committee welcomed the introduction of quotas for narwhals (*Monodon monoceros*) and white whales (*Delphinapterus leucas*) in West Greenlandic waters, but noted that the quotas still exceed the total removals recommended. The Committee reiterated its view that delaying the implementation of catch reductions will delay stock recovery and will lower available catches in the medium term.

The Committee evaluated the data collection and estimation procedures used in the Icelandic bycatch monitoring programme, and made several recommendations to improve the accuracy of bycatch estimation by Icelandic fisheries. The Committee outlined its priorities for 2005/06 and those relevant to IWC discussions can be summarised as:

(1) assessment of North Atlantic fin whales, with refinement of assessments for the EGI area, and development of assessment models for Norwegian stocks;
(2) assessment of narwhal and white whale stocks, particularly for West Greenland, in co-operation with the Scientific Working Group of the Canada/Greenland Joint Commission; and
(3) planning for the North Atlantic Sightings Survey in 2007.

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

4.8 International Union for the Conservation of Nature (IUCN)
The IUCN Independent Scientific Review Panel on Impacts of Sakhalin II Phase 2 on Western North Pacific Gray Whales and Related Biodiversity delivered its report in February 2005, which is available online[1]. In accordance with IWC Resolution 2004-1 on the western gray whale (*Eschrichtius robustus*), Donovan participated on the panel. Recommendations from the panel are discussed under Item 10.4.5. A follow-up workshop was held in May 2005 to provide an opportunity for the Sakhalin Energy Investment Company, the potential lending banks and other stakeholders to discuss issues arising from the panel report. The workshop report is available at the IUCN website[2].

The IUCN Cetacean Specialist Group collaborated with the *baiji.org* Foundation, the Institute of Hydrobiology (Wuhan) and the Chinese Ministry of Agriculture to hold a Workshop on Conservation of the Baiji and Yangtze Finless Porpoise in late 2004. The full report is not yet ready, but a summary report is available online[3].

The IUCN Red List of Threatened Species (*www.redlist.org*) continues to be updated in the light of new information and changes in status and several cetacean entries are currently under review.

The Committee thanked Cooke for his report. No meetings of IUCN are expected in the intersessional period.

4.9 Food and Agriculture Organisation (FAO)
The 26th Session of the Commission on Fisheries (COFI) held in Rome, Italy, March 2005 marked a decade of implementation of the FAO Code of Conduct for Responsible Fisheries. The report of the IWC observer at this meeting is given as IWC/57/5C.

COFI expressed its condolences to the countries and families of the victims of the Tsunami. Many participants reconfirmed their support for previous requests to investigate the interaction between marine mammals and fisheries. However, others were concerned that the foremost aim of the IWC is the conservation and management of whales, and they expressed their concern that discussions of whaling in COFI might detract from other more important fisheries-related issues.

The Committee thanked Mae for attending on its behalf. No meetings are expected in the intersessional period.

The report of the IWC observer at the 21st session of the Co-ordinating Working Party on Fishery Statistics (CWP) in Copenhagen is given as IWC/57/5M. Issues of relevance to the Scientific Committee included agreement by the CWP on revised vessel classifications which are included in the 2005 International Standard Statistical Classification of Fishing Vessels (ISSCFV). The CWP received the report of the 2nd session of the FIRMS (Fisheries Resources Monitoring System) Steering Committee which preceded the CWP meeting, and included an invitation to the IWC to join FIRMS. FIRMS is a global information system on fisheries aimed at providing timely, reliable strategic information on fishery status and trends on a global scale. The FIRMS system includes the species, fishing technology, resources, fisheries, vessels, and management systems domains of information, which will be of use to the Scientific Committee in its work in estimating levels of bycatch. This matter is discussed further under Item 19.2 and in SC/57/Rep4.

4.10 North Pacific Marine Science Organisation (PICES)
The report of the IWC observer at the 13th annual meeting of PICES held in Hawaii, USA, October 2004 is given as IWC/57/5H. A one-day workshop held by the Marine Birds and Mammals Advisory Panel (MBM-AP) reviewed the region-specific trend of diet and feeding habits of marine birds and mammals, including cetaceans in the North Pacific and the following points were noted:

(1) diet composition of top predators varies between west and east regions of the North Pacific;
(2) diet composition of top predators has switched dramatically at decadal levels, probably related to regime shifts, El Niño and other climate factors; and
(3) marine birds and mammals may be useful as ecosystem indicators.

A workshop entitled 'Factors Affecting Distribution and Foraging Ecology of Top Predators in the Okhotsk Sea' will be held at the next PICES annual meeting. Following a review of MBM-AP activities over its five-year existence, it was agreed that they should in future focus on new activities such as:

(1) updating estimates of prey consumption for top predators;
(2) development of climate and ecosystem indicators;
(3) development of an understanding of the biogeography of top predators in the North Pacific; and
(4) improving technology for oceanography using top predators as sampling devices.

The Committee thanked Kato for attending the meeting on its behalf and **agrees** that he should represent the IWC at the next PICES meeting.

4.11 Eastern Caribbean Cetacean Commission (ECCO)
The work programme of ECCO for the year 2004/05 was intended to focus on Grenada and Carriacou. The annual meeting to elaborate on these plans/programmes was

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[1] *http://iucn.org/themes/business/isrp/index.htm.*
[2] *http://www.iucn.org/themes/business/ISRP_Followup/ISRP_Followup_Workshop%20Report_Final_6June05.pdf.*
[3] *http://www.baiji.org/workshop_2004/report.html.*

scheduled for October of 2004. Due to the passage of hurricane Ivan and its devastating onslaught on Grenada, all planned activities and meetings had to be put on hold. A report on further developments will be ready for presentation to the next Scientific Committee meeting in 2006. The Committee thanked Lawrence for this information and **agrees** that he should represent the IWC at the next ECCO meeting.

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

5.1 Finalise the guidelines and requirements for implementing the RMP
5.1.1 Develop the thresholds for defining 'acceptable' and 'borderline' performance for classifying the performance of RMP variants for Implementation Simulation Trials
Last year, the Committee recommended and the Commission endorsed the 'Requirements and Guidelines', for *Implementation*s, noting that further work was needed to determine the thresholds that define 'acceptable', 'borderline' and 'unacceptable' conservation performance for *Implementation Simulation Trials* (*ISTs*). SC/57/RMP1 presented calculations for these thresholds based on suggestions made last year. However, the author pointed out that applying them would lead to the 0.6 tuning of the *Catch Limit Algorithm* (*CLA*) performing 'unacceptably' when the initial depletion is 0.6.

The Committee concurred and **agrees** that the new approach described in Annex D (item 5.1.1) should provide the necessary threshold values when evaluating the conservation performance of each RMP variant for each *IST*. It also **agrees** that the approach should be evaluated intersessionally before final adoption by the Committee. The analyses required are detailed in Annex D (item 5.1.1) and the criteria evaluation will be conducted by Allison and Punt, under the guidance of an intersessional email group (see Annex P(31)).

5.1.2 Develop a list of agreed stock structure archetypes
The Committee **agrees** that the list of agreed stock structure archetypes should be developed as a number of case studies (e.g. for North Pacific Bryde's whales, North Atlantic fin whales) have been completed, thereby benefiting from the experience gained during the process.

5.2 Further develop the 'simple model filter'
The Committee had welcomed the development of the 'simple model filter' (Punt, 2003) as a computationally economical approximation of the RMP as an aid to developing *ISTs*.

The 'simple model filter' had been extended by Punt to be able to incorporate tagging data in parameter estimation. The result of applying it to western North Pacific Bryde's whales is discussed under Item 6.1.2.1. The Committee thanked Punt for this work which will prove extremely valuable in its future work.

5.3 Finalise the issue of spatio-temporal considerations
At previous meetings, options have been discussed for handling cases where whaling on migrating populations (e.g. North Pacific common minke whales) can cause difficulties in defining *Small Areas*. The Committee **agrees** a modification to Annotation 2 to the RMP (Annex D, Appendix 2) which provides for the possibility of some

temporal and/or spatial restriction on whaling within a *Small Area* as part of an RMP *Implementation*. This is to make allowance for the possibility that *Small Areas* are specified in which whaling could take animals from stocks in proportions different to those present in such *Small Areas*. In such cases, simulations to test for the conservation performance of such an approach must be conducted so that whaling within a *Small Area* is assumed to occur in such a way as to maximise the risk with respect to depletion, while at the same time remaining consistent with operating procedures for the whaling activities proposed by the nation or nations concerned.

5.4 Finalise the issue of the CATCHLIMIT program for running it in trials situation
Given improvements in computing speed, the Committee **agrees** it is no longer necessary to adjust the convergence criteria for the CATCHLIMIT program to make it feasible for use in simulation trials; that would only be required if it turns out to be necessary when the program is actually used in specific trials. Hence, this issue does not need to be included on next year's agenda.

5.5 Proposal for revision of the RMP
Last year, the Committee was formally notified (IWC, 2005j, p.10) that for common minke whales in the North Atlantic, Norway intends to propose a change to the *CLA* of the current RMP. SC/57/RMP3 presented a progress report on their work to complete the development process. The Committee noted the new information. Comments by Committee members are reported in Annex D, item 5.5.

5.6 Other
SC/57/O21 (see Annex G, item 3.3.3) presented an example of an analysis showing that the dynamics of populations for multi-species models could, under certain scenarios, differ appreciably from those under conventional single species models. The authors suggested that this might have implications for the RMP, and that it might at some stage be informative to investigate the performance of the RMP using such models as operating models.

The Committee noted that the RMP trial structure had included scenarios such as changing carrying capacity that *inter alia* can be considered to reflect multi-species behaviour. It therefore **agrees** that there is no need to conduct additional trials to confirm that the conservation performance of the RMP was satisfactory. The current difficulties of being able to develop multi-species models with adequate predictive capabilities are well known (e.g. IWC, 2005b, pp.413-26). Only if such capabilities are realised, should attempts to refine the RMP to take explicit account of multi-species effects be considered. Naturally any such refinements would need to demonstrate performance superior to that of the existing RMP under an appropriate set of trials.

5.7 Work plan
As noted under Item 5.1.1, the Committee **agrees** that the intersessional evaluation of criteria developed to determine whether the conservation performance of an RMP variant is 'acceptable', 'borderline' or 'unacceptable' will be a priority item for next year.

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

6.1 Western North Pacific Bryde's whales

6.1.1 Report from the intersessional Workshop on the pre-Implementation assessment *for western North Pacific Bryde's whales*

The Committee considered the report of the intersessional Workshop (SC/57/Rep3), chaired by Donovan. The Workshop's objective was to work towards completion of the *pre-Implementation assessment* for western North Pacific Bryde's whales. It had considered the aspects required under the 'Requirements and Guidelines' for *Implementations* (IWC, 2005k, p.80) to complete a *pre-Implementation assessment*, specifically:

(1) abundance estimates;
(2) catches;
(3) stock structure hypotheses;
(4) dispersal rates; and
(5) data for conditioning.

The Workshop had examined existing catch data and developed preliminary catch series for Japan (coastal and Bonin Islands), the USSR, the Philippines and China, Taiwan. It had identified several data sources as the basis for alternative catch series for simulation trials, and additional work needed to finalise the catch series for use in trials. Based on the stock hypotheses developed by the IWC (1999, p.116); together with additional genetic and non-genetic information, it identified five alternative stock hypotheses. Those were considered to be sufficiently inclusive that collection of new data during the *Implementation* process is unlikely to suggest a new stock hypothesis. The Workshop had agreed that the various stock hypotheses were not equally plausible, but did not assign plausibility weights to these hypotheses as this is scheduled for the 'First Annual Meeting' after it has been agreed that the *Implementation* process should begin. It identified several tasks to assist in assigning plausibility weights to trials.

Abundance data were reviewed and it had been agreed that the set of blocks surveyed in August-September would serve as the basis for using the early, as well as the most recent, survey data when estimating abundance and additional variance. Specifications were developed for calculations for computing the abundance estimates to be used for conditioning (and their variance-covariance matrix). Areas to be excluded when calculating abundance estimates for the offshore form of Bryde's whales to avoid including the small coastal form (or forms) were also identified.

The Workshop had identified information needed to estimate the rates of dispersal (defined as permanent transfer of individuals between breeding stocks) and mixing (temporary movement of animals spatially) and had established a small group to estimate mixing rates in sub-area 1. It had reviewed the specifications for the biological and technological parameters selected by the Scientific Committee in 1999 (IWC, 2000b, pp.10-11) and endorsed their use in future *ISTs*. It had also reviewed information pertinent to the *Maximum Sustainable Yield Rate* (*MSYR*) and identified work that might restrict the range of plausible values.

After reviewing the criteria for deciding whether the *pre-Implementation* process was complete and an *Implementation* could begin (IWC, 2005e, pp.85-6), the Workshop had agreed that provided its recommendations were followed, the *pre-Implementation* process could be considered as completed.

The Committee accepted the Workshop report, and thanked the participants for substantially advancing the *pre-Implementation assessment* for western North Pacific Bryde's whales.

6.1.2 Preparation for Implementation
6.1.2.1 PROGRESS ON *PRE-IMPLEMENTATION*
The catch series for use in *IST*s was progressed based on the recommendations of the intersessional Workshop (SC/57/Rep3). The catches reported as sei/Bryde's whales were split to species, and several alternative catch series were identified. A few remaining minor issues will be resolved before the 'First Intersessional Workshop'. The Committee **agrees** that the catch series to be finalised by SC/58 should form the basis for the North Pacific Bryde's whale *IST*s.

SC/57/PFI1 reviewed the abundance estimates from the 1998-2002 surveys to complete the *pre-Implementation assessment*. Additional variance was estimated. The abundance estimate for sub-areas 1 and 2 based on the 1998-2002 surveys is 26,172 under the assumption of different mean school sizes, and 25,852 when the mean school size is assumed to be independent of block; their CVs are about 40%. A possible explanation for the high additional variance was provided.

Annex D, Appendix 3 takes account of the possible systematic change in whale distribution between the two survey periods. All the interaction terms are significant, and support a systematic change in distribution between survey periods. A drop in the estimate of the CV for the total abundance from about 40% to about 35% suggests that the additional variance reported in SC/57/PFI1 includes variation due to non-random effects.

The Committee **agrees** that the estimates of additional variance in SC/57/PFI1 and Annex D, Appendix 3 are adequate for the purposes of developing *IST*s. It also identified three refinements to the approach in SC/57/PFI1 that could form an improved basis for analyses presented to the 'First Intersessional Workshop'. They are detailed in Annex D, item 6.1.2.1.

The Committee noted that, although not required for the *pre-Implementation assessment*, it will be necessary for it to review and agree the abundance estimates (and their variance/covariances) to be used when applying the RMP. However, that step can only be finalised once specifications for *Small Areas* are completed.

SC/57/PFI2 described an approach using mark-recapture data to estimate distribution proportions for putative stocks/sub-stocks in sub-area 1. It was based on Japanese marking data, the 'simple model filter' approach of Punt (2003), and the specifications developed by the Committee to include mark-recapture data when conditioning *IST*s for western North Pacific Bryde's whales.

The Committee thanked the authors of SC/57/PFI1 and SC/57/PFI2 for their work and looked forward to the results of additional analyses. It noted that if they are to be used, analyses related to SC/57/PFI2 need to be completed by the 'First Annual Meeting', while those related to SC/57/PFI1 need to be completed by the 'First Intersessional Workshop'.

The Committee noted that the intersessional Workshop had not specified the lower bound for $g(0)$ for use in trials

(the upper bound was agreed to be 1), but had agreed that the decision regarding this lower bound would be made this year taking account of evaluations reported in papers to the present meeting. No papers regarding the lower bound for $g(0)$ were received. The Committee therefore **agrees** that the lower bound for $g(0)$ for the purposes of *ISTs* will be 1.

The Committee also **agrees** that the *ISTs* will need to account for possible systematic changes in distribution in the future if the estimates of additional variation are to be based on the approach outlined in Annex D, Appendix 3.

6.1.2.2 RECOMMENDED ACTION
The Committee noted that all the recommendations of the intersessional Workshop relevant to completion of the *pre-Implementation assessment* had been met. It therefore **agrees** that the *pre-Implementation assessment* for western North Pacific Bryde's whales is complete and **recommends** that *Implementation* can commence.

The Committee noted that an *Implementation* will normally be completed in two years (IWC, 2005d, p.78) during two intersessional meetings and two Annual Meetings, subject to sufficient resources being available. The necessary steps, and the resources required to complete the *Implementation*, are detailed in Annex D, item 6.1.2.2. In particular, a 'First Intersessional Workshop' (after which no new data may be introduced) needs to be held to develop an appropriate *ISTs* structure and to specify the associated conditioning. The Workshop is planned to take place during 25-29 October 2005 in Tokyo. Financial implications are discussed under Item 21. A Steering Group was appointed (see Annex P(17)).

6.2 Review of information on the North Atlantic fin whale

Last year, the Committee agreed that there were sufficient data to warrant initiation of the *pre-Implementation assessment* for North Atlantic fin whales and recommended to the Commission that the Committee initiate the *pre-Implementation assessment*. The requirements for completion of a *pre-Implementation assessment* are outlined in IWC (2005e, p.86).

6.2.1 Review progress on the development of stock structure hypotheses as part of the pre-Implementation assessment *for North Atlantic fin whales*
SC/57/PFI3 summarised evidence from non-genetic data for stock structure of fin whales in the North Atlantic, based on: mark returns; morphometrics; pollutant levels; biological parameters; acoustic studies; and telemetry.

The Committee **agrees** with the conclusion of SC/57/PFI3 that the non-genetic data indicate a separation between the western, central and eastern North Atlantic. A separate stock hypothesised to occur in the Mediterranean has been confirmed using genetic information (Bérubé *et al.*, 1998).

SC/57/PFI4 presented the results from a genetic analysis of fin whales from the feeding grounds in the North Atlantic based on microsatellite variation. On a macrogeographical scale, the analysis confirmed that the North Atlantic fin whale is genetically structured on the feeding grounds. The genetic divergence of fin whales from different feeding grounds indicates separate breeding units and the low level of genetic divergence observed suggests a recent origin for the stocks.

Annex D, Appendix 4 outlined a set of stock structure hypotheses for North Atlantic fin whales based on inferences from genetic and non-genetic data. The Committee **agrees** that the data support consideration of additional stock structure hypotheses in which the East-Greenland–Iceland area is divided into East-Greenland-West Iceland and East Iceland areas. Further work related to identification and refinement of stock structure hypotheses was identified, *viz*:

(1) the data for each feeding ground should be used to test for departures from random mixing; and
(2) additional genetic data for fin whales found in waters off Canada and the Faroe Islands should be included in the analyses on which stock structure hypotheses are based.

6.2.2 Planning for completion of the pre-Implementation assessment
Issues to be addressed in completing the *pre-Implementation assessment* for North Atlantic fin whales at the Committee's 2006 meeting are detailed in Annex D, item 6.2.2. The Committee established an intersessional Working Group (see Annex P(16)) to progress this work.

The Committee **recommends** that IWC scientists attend the Workshop proposed by the NAMMCO Scientific Committee, given its focus on general scientific issues related to stock structure of fin whales and other non-management related issues such as the development of a final catch series. Financial aspects are discussed under Item 21. The Committee **agrees** that relevant scientists from the NAMMCO Scientific Committee be invited to the 'First Annual Meeting' at which stock structure hypotheses will be discussed further and used as the basis for *ISTs*.

It was noted that a timetable similar to that outlined in Annex D, item 6.1.2.2 for western North Pacific Bryde's whales would be required if the *pre-Implementation assessment* for North Atlantic fin whales is to be completed at the Committee's 2006 meeting, and if the Commission agrees to initiate the *Implementation*. In this regard, other tasks required of the Secretariat computing department may necessitate delaying the start of the *Implementation* until after the Committee's 2007 meeting.

6.3 Work plan

The Committee **agrees** on the following, in priority order:

(1) conduct the 'First Intersessional Workshop' for western North Pacific Bryde's whales; and
(2) finalise the issues related to completing the *pre-Implementation assessment* for North Atlantic fin whales.

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

7.1 Estimation of bycatch based on fisheries data and observer programmes
7.1.1 Review data from FAO
Last year, the Committee recommended that continued collaboration with FAO, particularly on the Inventory of Fisheries database, would be helpful to investigate fishery data that may allow better estimates of large whale bycatch. Northridge reported on intersessional collaboration with FAO. The Inventory of Fisheries is being compiled on a

regional basis and at its present stage will be most relevant for fisheries likely to have a large whale bycatch in the Northeast Atlantic and the Northwest Pacific. However, further work is required to produce the level of detail that would be most useful to the Committee. The Committee welcomed this work and **recommends** that it is continued. Specifically, it **agrees** that Northridge should continue work in collaboration with FAO, with the aim of integrating bycatch records into the Inventory of Fisheries.

It was noted that the information flow should be a two way process, with bycatch records held by the IWC being provided to FAO, and FAO able to assist the Committee by providing detailed information on the nature and scale of fisheries in areas where large whale bycatch might be an issue of concern.

In order to facilitate this, the Committee **agrees** that the IWC should join the FIRMS agreement, and it **recommends** that the Secretary implements this.

7.1.2 Review progress on standardised reporting in progress reports
The Committee reviewed a summary of the national progress reports to assess how well the revised reporting requirements had been adopted. The Committee **agrees** that the revised table provided data in a more useful format than previously. The Committee **encourages** countries who had not been able to submit data in the requested format this year to try to do so in future.

It was agreed that a fuller explanation of the codes that are used to describe the fate of entangled whales and how they were observed would be helpful, and gear codes should be updated periodically, as they are revised by FAO. To this end, a web link to the appropriate codes will be included in the national progress report guidelines for next year, provided a website with such information exists.

The Committee **agrees** that the distinction should be made in national progress reports between those countries that have monitoring schemes, where no records imply a low or zero bycatch rate, and others for which no such schemes exist and thus where the absence of records cannot be taken to imply a low or zero bycatch rate.

7.1.3 Determination of appropriate coverage rates for estimating cetacean bycatch
There had been no new papers presented on this topic this year, but it was noted that this issue was on the agenda of member states of the European Union, as recent legislation required them to make estimates of cetacean bycatch in selected gillnet and pelagic trawl fisheries. This will require some consideration of this topic by those countries and members of the Committee involved in such schemes are requested to report any progress to next year's meeting.

The Committee was reminded that in some areas certain types of fisheries are difficult to monitor using observers and further consideration of this topic is needed.

A preliminary worldwide overview of records of cetacean interactions with longlines was presented to the Committee (SC/57/BC3). Longline fisheries for large pelagic fish are widespread and have expanded in recent years. Documented mortalities of whales include sperm and humpback whales, notably in the South Atlantic and Gulf of Alaska. The Committee looks forward to seeing an updated version of the paper at next year's meeting. It was also suggested that where possible, records of encounters between longlines and whales should include information on whether the whales left with any lines attached, as this has implications for their future survival.

7.2 Estimation of bycatch based on genetic data
7.2.1 Review results from intersessional workshop on the market survey approach
At last year's meeting, the Committee had strongly recommended that the methodological workshop (on the use of market sampling to estimate bycatch) should take place as described in the proposal (IWC, 2005c, p.13). A Steering Group (Berggren, Donovan, Hammond and Zeh) was appointed, who contacted potential invitees to participate in a planning meeting that was to take place during autumn 2004. At that meeting, the intention was that information needs for the Workshop would be reviewed, papers needed to provide background for the workshop would be identified, a list of participants would be finalised and meeting logistics would be arranged. However, it was not possible to find dates when most of the invited participants to the planning meeting were available. The Steering Group therefore decided that the planning meeting and Workshop should be replaced by a two-stage Workshop of which an initial 2-day Workshop would be held immediately before the 2005 Scientific Committee meeting. The primary task of the initial Workshop was to identify information about the markets that would assist in evaluating market sampling approaches and allow a review of their relative precision. It was held 27-28 May 2005 in Ulsan, Republic of Korea (SC/57/Rep4).

The objectives of the two-stage Workshop were:

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

The initial Workshop concluded that market sampling is a potentially useful method to supplement bycatch reporting schemes. It also agreed that bycatch estimates from market surveys would be improved considerably if carried out in conjunction with the use of data from DNA registers on whales entering the market. Whilst the Workshop recognised the political sensitivity of market-related issues in an IWC context, it respectfully requested relevant governments to consider a collaborative effort to investigate these methods as a potentially valuable source of information for management and use in the RMP.

Mae reiterated the position of the Government of Japan that market related issues are a domestic matter and in view of this the contribution from Japan to these discussions will be limited. He noted the complexity of the Japanese market and that the distribution system in Japan is dynamic and constantly changing. In view of these issues of market complexity, and the likely costs involved in obtaining appropriate sample sizes, some members doubted the conclusion of the Workshop that market sampling was a promising approach. Kim noted that, at last year's Commission meeting, Korea had reserved its position on the

decision of holding the Workshop. Accordingly, the Government of Korea was not represented at the initial Workshop. Therefore, some texts in the workshop report (SC/57/Rep4) do not necessarily reflect the views of scientists from the Korean delegation.

Others noted that the discussions at the Workshop drew attention to the ways in which estimates from market surveys could be improved through a collaborative approach using a combination of official statistics, register data and market surveys. If data from DNA registers were available then the statistical precision of estimates would be improved considerably and only a relatively low level of sampling would be required. In addition, market surveys would not need to be conducted continuously, particularly if the estimates were in agreement with the reported figures.

The initial Workshop only considered the first two of objectives (1)-(3). Although the view of some members was that market surveys would not provide reliable estimates of bycatch, the Committee **agrees** that the planned follow-up Workshop would be valuable in order to evaluate this fully. The Committee also **agrees** that such a Workshop should only be held when the Steering Group determines that sufficient progress has been made on addressing the data requirement needs, and on developing simulation frameworks for sensitivity analyses and to test sampling designs prior to the Workshop (financial implications are discussed under Agenda Item 21). The Committee **agrees** to the proposal for a follow-up Workshop as described in Annex J. There are no financial implications for the Workshop itself.

7.2.2 Develop recommendations regarding use of market based approaches in an RMP context
A preliminary analysis of concordance between labelling and genetic identification of whale products on the Japanese market was presented. This had been conducted following a recommendation by the initial Workshop. The Committee welcomed the preliminary analysis and looks forward to further data at next year's meeting. It was noted that the presented breakdown by species of concordance between labels and genetic analysis would allow these data to be incorporated in simulation trials to test the extent to which product selection based on labelling might assist with market survey design. Mae stated that enforcement of food labelling regulations was the responsibility of the Government of Japan. However, the food labelling regulations were primarily designed for consumer protection and thus had not been introduced for the purpose of estimating bycatch.

SC/57/NMP6 provided an estimate of the proportion of J- and O-type common minke whale products purchased on Japanese markets from December 1997 to February 2004, using mixed-stock analyses. This approach was presented as an alternative to the capture-recapture analysis described in SC/57/BC5 (see below), for the purposes of estimating bycatch from market surveys. The authors concluded that if market proportions are also influenced by incidental takes of O-stock common minke whales, as assumed in past RMP simulations, then the estimated total bycatch would have to be several times larger than the scientific hunt to explain the observed market proportions.

In discussion in the Working Group, it was noted that previous analyses had demonstrated that some haplotypes (around 8%) are shared by whales in the Sea of Japan and Pacific Ocean and that the results of statistical tests would

have been affected depending on whether these haplotypes were assumed to be J or O stock. The authors noted that the mixed-stock analysis used in SC/57/NMP6 is not biased by the existence of shared haplotypes but the precision of estimates is affected. Kim reiterated concerns about interpretations of population structure based on market samples where the locality and timing of origin was not known.

SC/57/BC5 used a series of market surveys in Korea to make inferences on the numbers of common minke whales entering the market, based on an updated genetic capture-recapture analysis from last year. This update avoided problems associated with multiple samples of meat from the same shop. The results yielded estimates of total supply for the five-year period 1999-2003 of 679 (SE=241) common minke whales using between-survey recaptures only, and 827 (SE=164) using both within- and between-survey recaptures. Although the standard errors of these estimates were relatively high, the authors noted that estimates of the number of individuals entering the market were significantly higher than the reported bycatch figure for this period.

Kim reiterated his concern over the uncertainty surrounding these estimates and therefore any implications from them.

The Government of Japan has conducted its own market research that started in 1995 when approximately 50 samples were collected. Subsequently, market surveys of around 600 samples a year have been conducted since 1999, including species identification and some individual identification. Mae drew attention to the position of Japan on these issues and noted that Japan would not be prepared to submit information from DNA registers for comparison with market samples. Kim reported that the Government of Korea had also conducted market surveys since 2003, but no decision had yet been made as to what data would be made available.

Some members noted that although market sampling techniques showed potential, further progress was unlikely to be made without the co-operation of national governments with respect to use of their DNA registers. Others referred to the results in SC/57/BC5 that had been obtained without access to such data that the precision of these methods would improve with increased sample sizes. Nevertheless, the Committee agrees that the power of the approach and the efficiency of market surveys would be improved considerably with collaboration with DNA registers. Access to diagnostic DNA registers would also reduce the need to understand market structure, although it is still necessary to understand the different pathways that products from reported and unreported sources might follow.

The Committee **agrees** that all the approaches to market sampling under discussion would be most effective if conducted with collaboration from national governments with respect to data from DNA registers. It respectfully requests such co-operation, although it recognises the political sensitivity of market related issues in an IWC context. The planned follow-up Workshop is intended to allow further discussion of data sharing and collaboration on methodology and all members are encouraged to participate.

7.3 Empirical analysis of the functional relationships between bycatch levels, fishing effort and population abundance
SC/57/NPM7 suggested methodology for the assessment of the J stock of North Pacific common minke whales. An integral component of the approach was the estimation of bycatch for years for which this information is not available. This was based on the assumption that the expectation for bycatch each year was proportional to the product of the population size with an annual index of effort of fixed-gear fisheries in which bycatches occur (effectively that bycatch-per-unit-effort is proportional to population size). The Bayesian structure of the model allowed for variation of bycatch about the level predicted by this model to be taken into account.

Kim presented data on fishing effort of stationary gear which consists of set, fyke and pound nets along the eastern coast of Korea. These data did not include gillnets and account for around 34% of the common minke whale bycatch along the east coast of Korea reported to the IWC.

The Committee notes that there is a need for a better understanding of the nature of bycatch in order to assess the reliability of the assumptions related to bycatch rates such as those used in SC/57/NMP7. This needs to include temporal and spatial information on the distribution of different types of gear as well as data on the seasonal and geographical distribution of bycatch. Soh indicated that the Korean authorities could consider collaboration on this work in a balanced way.

7.4 Information on and methods for estimation of cetacean mortality caused by vessel strikes
SC/57/BC1 presented two case studies of lethal collisions with large container ships involving a Bryde's whale in Ecuador and a sei whale off West Africa. Other information on ship strikes in the southeast Pacific and the eastern tropical Atlantic was reviewed. Unless whales become wrapped around the bow and are inadvertently taken into port, whale collisions with large ships often go unnoticed by crew members. Under-reporting of ship strikes is compounded by the absence of obligatory reporting, a deficiency in awareness of ship strikes and the lack of systematic necropsies of beached whale carcasses. The author noted that detailed examination of carcasses could assist in estimating the probability that a whale struck by a vessel would became draped on the bow.

The Committee agrees on the need to improve awareness of vessel strikes and reporting systems in order to gather more data. Concerns were expressed that in some countries, such as the USA, the penalty system may act as a deterrent to reporting of ship strikes. Matilla noted that the Hawaiian National Marine Sanctuary authorities were investigating systems for anonymous reporting of ship strikes. A recent US workshop on vessel collisions has been held and the report is available[4].

SC/57/WW8 reviewed collisions between whale-watching boats and whales. Collisions that either killed animals or caused serious injuries were more frequent with larger vessels, especially those travelling at speeds higher than 18 knots. In order to assess the risks to whales, information on the extent of the industries and the size and speed of the vessels involved would be helpful. This information could be collected in co-operation with the sub-committee on whalewatching. Many of the reported collisions occurred while whalewatching vessels were in transit and these data could be used to estimate likely collision rates for other vessels of similar size that regularly transit through whale habitats.

As in previous years, the Committee reviewed the information on ship strikes presented in national progress reports. It was noted that for at least one of these reports, the carcass involved had shown no external marks and it was only when it was flensed to the bone that the shattered skull revealed evidence of a collision with a ship. This further emphasised that flensing to the bone is often necessary in order to reveal that a stranded whale has been killed by ship strike. In Korea, a genetic sample of tissue left on the propeller of a vessel involved in a collision had been analysed and found to be from a common minke whale. It was noted that such analysis was a useful method for obtaining data on collisions with vessels.

ACCOBAMS is planning a Workshop on ship strikes, to be held in Monaco in November 2005. One reason for the Workshop had been the recognition of the threat to fin whales in the Mediterranean from vessel strikes. Panigada confirmed that he would be attending the Workshop and that the Workshop would also be addressing the question of how to estimate the number of whales involved in collisions with vessels. He also agreed to present the report of the Workshop to the Committee at next year's meeting. ASCOBANS is also collecting data on high-speed ferries within the region covered by the agreement. Kock agreed to contact ASCOBANS to find out the status of these investigations and report back any relevant information to the Committee.

7.5 Information on and methods for estimation of cetacean mortality caused by other human activities
At the 2004 meeting, the Committee had agreed that consideration of possible mortalities due to acoustic sources should be closely co-ordinated with the Standing Working Group (SWG) on environmental concerns. Although some data on the effect of seismic surveys on cetaceans had been presented at this year's meeting, there were no reports of mortalities.

7.6 Work plan
The work plan agreed by the Working Group on estimation of bycatch and other human-induced mortality is given as Annex J (item 10). The Committee's overall work plan is discussed under Item 19.

8. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT PROCEDURE AND STOCK ASSESSMENT (SEE ANNEX E)
This Item continues to be discussed as a result of Resolution 1994-4 of the Commission (IWC, 1995). The report of the SWG on the Development of an aboriginal whaling management procedure (AWMP) is given as Annex E. The Committee's deliberations, as reported below, are largely a summary of that Annex, and the interested reader is referred to it for a more detailed discussion. Last year (IWC, 2005a), the Committee presented the Commission with its recommended *Gray Whale Strike Limit Algorithm* (*Gray Whale SLA*). The Commission endorsed the *Gray Whale*

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[4] *http://hawaiihumpbackwhale.noaa.gov/special_offerings/ sp_off/Vessel_collision_wkshp.html.*

SLA (IWC, 2005a, pp.10-11), which will now be used to provide management advice on eastern North Pacific gray whales (see Item 9.2). The primary issues at this year's meeting comprised:

(1) all aspects of the management of Greenlandic fisheries for common minke and fin whales;
(2) preparations for an *Implementation Review* for the bowhead whale; and
(3) management advice for the humpback whale fishery of St. Vincent and The Grenadines.

8.1 Greenlandic fisheries and the Greenland Research Programme

The urgent need for a Greenland Research Programme had been first identified in 1998. This is primarily due to the lack of recent abundance estimates and the poor knowledge of stock structure (IWC, 2004c, p.191). The Committee had informed the Commission that it would be extremely difficult, if not impossible, to develop an *SLA* for the Greenlandic fisheries that will satisfy all of the Commission's objectives. This is particularly important in the light of the Committee's grave concern at its inability to provide management advice for these fisheries (e.g. IWC, 2004c, p.191).

8.1.1 Stock structure, range and movement
8.1.1.1 GENETIC INFORMATION
The main questions for both common minke whales and fin whales off West Greenland revolve around how the abundance estimates derived from sightings made during surveys relate to the true number of animals 'available' to the hunters. It has been generally accepted for both species that the animals found off West Greenland probably do not comprise the total stocks (e.g. see review in Donovan, 1991; Born, 1999; IWC, 2000c). However, there is no information on the extent of these total stocks.

The Committee welcomed the report of the simulation studies funded last year (see Annex E, item 2.1.1 for a full discussion of this work). The Committee **agrees** that the currently available data have low power to reject any West Greenland samples as belonging to the putative West Greenland population (Annex E, Appendix 2). The SWG discussions developed into a broader examination as to how genetic studies may help it in its work.

The Committee **agrees** that the most valuable contribution genetic methods can make is if they can provide a lower bound for the size of the West Greenland common minke whale population (or rather the population or populations potentially available to be hunted in West Greenland), which can then be compared with estimates from sightings surveys and lower bounds from population models where total abundance may be estimated from the sex ratio of the hunt (see Annex E, item 3.1). Such genetic estimates would provide independent estimates of abundance (which would be valuable even if only a lower bound can be estimated).

The Committee therefore **recommends** that an assessment of the statistical power of various genetic approaches to estimate abundance be conducted intersessionally. Palsbøll, Skaug and Waples agreed to undertake this for four different approaches (Annex E, table 1) that use genetic data to infer abundance (either census population size or effective population size) given a realistic range of sample sizes, genetic markers and abundance estimates. Details are given in Annex E (Appendix 3) and the financial implications are discussed under Item 21.

The Committee then reviewed the available information on West Greenland fin whales (e.g. see SC/57/PFI4; Bérubé *et al.*, 1998). Although there is a reasonable amount of genetic information available from the North Atlantic, at present it is insufficient to determine whether the animals found off West Greenland comprise the total population or are part of a larger population.

8.1.1.2 CATCH DISTRIBUTIONS
Information on the distribution of catches of fin and common minke whales for the period 1990 to 2004 was reviewed (SC/57/AWMP10). Takes appeared to be clumped in the vicinity of the larger communities, although this was more evident for fin whales, with three major groupings (northern, central and southern), than common minke whales which showed more groups with less clear boundaries. Catches were generally in inshore waters for both species although in the central area fin whales were also caught offshore. For fin whales, there appeared to be more catches early in the year in the northernmost group; for common minke whales, the catch season was shorter further north. Overall there was some indication that the sex ratio of caught common minke whales changed slightly with latitude, with a higher proportion of males further north. Overall, the sex ratio for the common minke whale catch in West Greenland was constant over the period from 1990-2004 at about 76% female[5].

The Committee **agrees** that the results in SC/57/AWMP10 do not suggest marked differences in the sex ratio of the catch along the west coast of Greenland, although there is some evidence that it differs among communities. The question of the use of the sex ratio data in population assessment is discussed further below (see Item 8.2.2).

8.1.2 Abundance and trends
8.1.2.1 METHODS
The Committee received an analysis of the results of the photographic aerial strip-transect surveys carried out in 2002 and 2004 (and the experimental survey carried out in 2003). A considerable amount of time was spent by the SWG in discussing the methods used to read the photographs and analyse the results to arrive at population estimates. These detailed discussions can be found in Annex E (item 2.1.2).

One key feature of the analyses is the determination of the average time animals are visible at the surface. The SWG examined the approach given in SC/57/AWMP1 and modified the analysis as shown in Annex E (Appendix 4). The Committee **agrees** with the revised estimated average time of 6.9 seconds (*CV*=0.052), whilst noticing that this is probably slightly negatively biased.

There was considerable discussion in the SWG about the process used to examine the photographs from both the experimental survey in Faxaflói, Iceland[6] and from the surveys themselves[7] (see Annex E, Appendix 5 and the discussion of SC/57/AWMP2 in that Annex). The

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[5] Sex data first became available in 1955, although in many years there were relatively high proportions of animals of unknown sex recorded. Over the period 1955-2004, the percentage of females in the catch (excluding animals of unknown sex) has almost always been over 60% with an overall (simple) average of about 72% (from data in Appendix 7).
[6] Some 22,000 photographs.
[7] Some 73,700 photographs.

Committee identified a number of issues with the process as described in SC/57/AWMP2 and 3 that it believed must be improved before it could consider the results from the photographic surveys acceptable form a methodological viewpoint. To this end, it developed the protocol for the examination of the photographs given in Annex E, Appendix 5. This is discussed further below.

8.1.2.2 SURVEY RESULTS
SC/57/AWMP3 described the results from an aerial digital photo-based strip-transect survey for marine mammals off West Greenland that was carried out over a total of 4.5 months in the late summers and autumns of 2002 and 2004. About 3.7% of the area was covered by images taken at sea state three or less. Photographs of two common minke whales and seven fin whales were found (other species were also seen). The author presented uncorrected estimates of animals at the surface of 46 (CV=0.74) common minke whales and 250 (CV=0.48) fin whales. He applied corrections for whales missed by observers and for animals not at the surface to arrive at an estimate of 510 (CV=0.75) common minke whales, which is significantly smaller than the revised estimate of 6,390 (CV=0.41) whales in 1993 (Hedley *et al.*, 1997). He corrected the fin whale estimate for animals not at the surface and obtained an estimate of 980 (CV=0.48) whales, which is similar to the estimate of 1,100 (95% CI 520-2,100) whales in 1987-88 (IWC, 1992, pp.595-644).

The Committee did not consider these estimates acceptable for a number of reasons related to both the examination of the photographs and the appropriateness of the correction factors applied.

As noted above, a protocol was developed for examination of the photographs. The Committee noted that whilst following the protocol will give more confidence in the number of whales identified on the images and the estimate of the area covered by the photographs, unless there are appreciably more sightings, in particular of common minke whales, any abundance estimates based on only a few more identified whale images on the photographs would constitute enormous extrapolations and probably be considered unacceptable. It noted that given the different sizes of common minke and fin whales, it believed that the problem of readers missing whales was greater for common minke whales. This is discussed further under Item 8.2.3.2.

The Committee also reviewed the surfacing rate estimate used to correct abundance estimates for West Greenland common minke whales both with respect to photographic and cue-counting surveys. SC/57/AWMP3 had used the value of 53 surfacings hour^{-1} with no associated variance used previously by the Committee and in conformity with corrections previously applied to visual aerial surveys. Details of the review are given in Annex E (item 2.1.2.2 and Appendix 6). The SWG had discussed whether estimates of surfacing rates should be based on data only for the area to which they will be applied. There was general agreement that this was the case, providing sufficient data are available. However, it was noted that when there are few data, there is great value in using comparable data for other areas. In its review, there was considerable discussion as to the appropriate way to quantify uncertainty from quite different studies.

The Committee **recommends** that if possible, the original data on which the preliminary estimate given in Annex E is based (and any other data on surfacing rates for

common minke whales in the Northern Hemisphere) should be obtained and re-analysed to determine the various components of variance and hence the most appropriate measure of variance of surfacing rate to be used when estimating abundance. The SWG had not had time to thoroughly review the basis for the estimated correction factor used in SC/57/AWMP3 for fin whales. The Committee also **recommends** that this be reviewed, updated and re-analysed as possible. An intersessional Working Group under Kingsley was established with a view to providing the SWG with appropriate estimates (including variance) for both species at the next annual meeting.

While the Committee has identified a number of problems with these particular surveys, it **agrees** that if these can be overcome, in principle the photographic strip-transect method has potential value and can avoid several difficulties associated with visual surveys.

8.1.3 Preliminary consideration of management procedures
The Committee was pleased to receive a paper (SC/57/AWMP6) that outlines a multi-stock age- and sex-structured population dynamics model that allows for dispersal among putative populations. This model could form the basis of an operating model to evaluate candidate *SLA*s for common minke whales off West Greenland and hence explicitly models regions other than West Greenland. Further details are given in Annex E (item 2.2). This is somewhat different from SC/57/AWMP4 that has no explicit geographical structure but attempts to estimate the fraction of the West Greenland stock that is found in a larger area than just West Greenland using the sex ratio in the catches.

The Committee **agrees** that these papers will prove valuable in its attempt to develop an *SLA* for the Greenlandic fisheries.

8.2 Annual review of catch data and management advice for common minke and fin whales off Greenland
8.2.1 Catches
SC/57/AWMP4, 5 and 10 presented information on catches and the complete catch history is given in Annex E (Appendix 7). Catches of common minke whales from West Greenland in 2004 were 44 males, 129 females and two of unknown sex (four additional animals were struck and lost). Catches of fin whales were five males and six females (two additional animals were struck and lost). In 2003 the equivalent catches were 58 males, 117 females (seven additional animals struck and lost) for common minke whales and two males, four females (two additional animals were struck and lost) for fin whales.

8.2.2 Assessments
Two Bayesian assessment papers were presented. SC/57/AWMP4 provided a Bayesian assessment for the common minke whale stock of the West Greenland fishery. The primary feature used in this assessment was the fact that the fraction of females in the West Greenland catch has remained around 0.72 since the beginning of the hunt in 1948. This fraction is incompatible with abundance estimates from aerial surveys if West Greenland common minke whales comprise a single stock. More details of the analysis can be found in Annex E (item 3.2). The author estimated an equilibrium abundance of 17,500 (95% CI=13,700-21,800) individuals, a current depletion of 0.92 (95% CI=0.79-0.96), and an *MSYR* of 0.09 (95% CI=0.04-

0.10). He concluded that while there was no evidence that a West Greenland harvest at current levels poses a threat to the overall stock, the proposed assessment will not necessarily identify local depletion in West Greenland.

SC/57/AWMP5 provided a Bayesian assessment for West Greenland fin whales, using the historical catches and three abundance estimates from 1988 to 2003 in an age- and sex-structured population dynamics model. The model assumes density-regulated dynamics, and a population in dynamic equilibrium in 1922. It projects the population from 1922 to 2015 under the influence of the historical catches. Again, details of the analysis can be found in Annex E. The author estimated production in 2005 to be 12 (CI=11-17) and 2005 abundance to be close to equilibrium population size with depletion estimated to be 0.96 (CI=0.43-0.99).

The SWG also examined the results of some preliminary work carried out using a Schaeffer model. The results for common minke whales suggest that the estimates of stock status are highly sensitive to assumptions regarding the *CV* for the 2003 abundance estimate. The results for fin whales suggest that the data are uninformative about key model outputs such as the *MSYR*, current depletion and current replacement yield, and that Bayesian analyses for fin whales are very sensitive to the priors selected for the parameters of the model, particularly that specified for the extent of additional variance.

In reviewing the assessment work, the SWG made the following observations.

(1) The results of the Bayesian analyses are very sensitive to choices of priors, specifically the upper bounds for the priors for *MSYR* and the extent of additional variance for the survey estimates of abundance.
(2) The high values for the extent of additional variance imply that the model assigns little weight to the estimates of abundance. The results are therefore determined primarily by the assumed prior distributions and in the case of SC/57/AWMP4, the sex ratio data.
(3) The realised priors for some model parameters in Bayesian analyses differ substantially from the specified priors owing to the impact of the constraints imposed by the model structure. The low information content of the data implies that these constraints are the key reason why the posteriors for some parameters such as *MSYR* differ from the specified priors.
(4) The approach used in SC/57/AWMP4 to make use of the data on the sex ratio of the catch has the potential to determine a lower bound for the abundance of the total stock (rather than just that component that feeds off West Greenland). However, at present, the fits to the data on sex ratio are poor.
(5) The penalty imposed on equilibrium abundance in SC/57/AWMP4 is highly influential, including on the lower bound of equilibrium abundance and *MSYR*, but the tuning levels are essentially arbitrary.
(6) The production model assessments assume that the estimates of abundance pertain to absolute population size although this assumption is likely to be invalid to some (possibly substantial) extent.
(7) In the case of the fin whale assessment, the fits to the data on 1+ abundance are poor.

The Committee recognised the considerable effort expended by the authors in attempting to provide assessments for common minke and fin whales off West Greenland.

However, it **agrees** that in the light of the observations listed above, none of the preliminary assessments can be used as the basis for management advice. It recalled the difficulty it had last year when it noted that it had advised that in the absence of an agreed abundance estimate for fin whales from the 2004 survey, it would likely recommend that the take of fin whales of West Greenland be reduced or eliminated. Some commented that under such circumstances and given the discussion under the abundance estimates, consideration should be given to suggesting that the fin whale catch be eliminated until an agreed abundance estimate is reached. This was taken into account in the discussion of management advice given below.

The Committee also **agrees** that the sex-ratio data should be incorporated into future attempts at assessments because they can in principle provide information about the lower bound for the total abundance of the stock. However, any assessment based on these data must examine the sensitivity of the results to assumptions associated with their inclusion. An intersessional Working Group (Annex P(5)) was established to develop and undertake appropriate analyses related to the inclusion of sex ratio data in assessments and hence to determining a lower bound for the abundance of the stock as soon as possible. The group should also consider similar issues for fin whales.

The Committee noted that use of such data depends critically on whether hunters are able to correctly determine sex of caught animals. It was informed that although there may be some errors when assigning sex to the catch, estimates of sex ratio by hunters and biologists are similar when comparisons have been made. The Committee **recommends** that if sex ratio data are to be used as the basis of assessments/management advice or for a future *SLA*, genetic methods should be used to confirm sex.

8.2.3 Management advice
8.2.3.1 INTRODUCTION
As it has stated on many occasions, the Committee has never been able to provide satisfactory management advice for either the fin or common minke whales off West Greenland. This reflects the lack of information on stock structure and abundance, and the absence of appropriate assessments. This is the reason the Committee first called for the Greenland Research Programme in 1998.

Despite receiving preliminary estimates of abundance from photographic surveys carried out in 2002 and 2004, the Committee **agrees** that, once again, it is in the deeply unfortunate position of being unable to provide satisfactory management advice on safe catch limits; **it views this as a matter of great concern.** The present uncertainties over the preliminary abundance estimates are such that the Committee does not consider them acceptable estimates. Although it has suggested further work with respect to the data collected on the photographic surveys, it cautions that there is no guarantee that this further work will result in significantly greater values, or, in the case of common minke whales, an agreed estimate. It notes that the Commission has set catch limits for the West Greenland fisheries of up to 175 common minke whales struck in each year for the period 2003-2007 with a provision that up to 15 strikes may be carried over from one year to the next and a catch of up to 19 fin whales for the same period.

8.2.3.2 COMMON MINKE WHALES
Taken at face value, the preliminary (and not accepted) estimate of abundance for common minke whales suggests

that about a 90% decline has occurred since the previous survey in 1993. However, the Committee has considerable doubts over this estimate (see Annex E, item 2.1.2.1) and there are several indications that such a decline has probably not occurred (e.g. the consistently high predominance of females in the catch suggests that the abundance estimate does not represent the total number of animals available to the fishery). Nonetheless, the Committee urges that considerable caution be exercised in setting catch limits for this fishery because it has no scientific basis for providing advice on safe catch limits. It noted that if an Aboriginal Subsistence Whaling Scheme (AWS) (see Item 8.5) was in place, this fishery would be at or near the place where the grace period would begin. This management advice will be re-evaluated next year in the light of the intersessional work recommended.

Given this, the Committee **strongly recommends** that a re-examination of the existing photographs be undertaken as a matter of urgency, according to the protocols given in Annex E, Appendix 5. **In conjunction with this, it strongly recommends** that preparations be made to carry out a cue-counting survey in the summer of 2006 targeted especially at common minke whales, so that if the intersessional group overseeing the re-examination of the photographs concludes that this will not result in an acceptable estimate, a survey can be carried out. The Committee recognises that the prevailing weather conditions in Greenland mean that there is no guarantee that a survey will result in sufficient coverage to allow an abundance estimate to be obtained in any one survey.

The Committee also **strongly recommends** that the sex ratio data be fully investigated *inter alia* to determine whether they can be used to obtain at least a minimum estimate for the total stock and be incorporated into an assessment model (see Item 8.2.2 above).

8.2.3.3 FIN WHALES

In 2004, the Committee had expressed special concern over the absence of an abundance estimate for fin whales since 1987/88 and had advised that in the absence of an agreed abundance estimate for fin whales from the 2004 survey, it would likely recommend that the take of fin whales off West Greenland be reduced or eliminated. This year the Committee had received a preliminary estimate (that was not considered acceptable, see Item 8.1.2.2 and the recommendation for reanalysis of the photographs given above) from the photographic surveys that was not appreciably different from the previously accepted estimate. Despite the fact that the Committee has more confidence in this preliminary estimate than it has for the common minke whale estimate (see above), it is not in a position to provide satisfactory management advice on safe catch limits. It therefore **urges that considerable caution be exercised in setting catch limits for this fishery.** Mindful of its recommendation of 2004 (see above), as interim *ad hoc* advice, the Committee advises that a take of 4-10 animals (approximately 1% of the lower 5th percentile and of the mean of the estimate of abundance) annually was unlikely to harm the stock in the short-term, particularly since this does not take into account the possibility that the fin whale stock extends beyond West Greenland (see Item 8.1). This advice will be re-evaluated next year in the light of the intersessional work recommended.

8.2.3.4 OTHER RESEARCH RECOMMENDATIONS

Last year, the Committee repeated its strong recommendation that samples for genetic analysis be collected from the catch as a matter of high priority and urged the Committee to encourage the Government of Denmark and the Greenland Home Rule authorities to assist with logistical and, if necessary, financial support. The Committee **repeats** its recommendation this year. It was pleased to be informed that 103 common minke whale samples, 8 fin whale samples and 4 samples of unreported species had been collected last year. The Committee **strongly recommends** that these samples be analysed in accordance with the advice of the intersessional Working Group on genetics.

The Committee **reiterates its great concern** at its continued lack of ability to provide management advice on these stocks, with serious implications for both the hunt and for the stocks involved. It **strongly urges** the relevant authorities to provide the necessary funds to allow all of the research recommendations given under Item 8.2 to be carried out. Should the necessary funding not be put in place to allow both (1) a re-examination of the photographs and (2) a cue-counting survey to occur if recommended by the Steering Group, it **agrees** that priority should be given to carrying out the survey.

8.3 Annual review of catch data and management advice for humpback whales off St. Vincent and The Grenadines

In recent years, the Committee has examined the stock structure of humpback whales in the North Atlantic in the context of the fishery of St. Vincent and the Grenadines. It has stated that the most plausible hypothesis is that the whales from St. Vincent and the Grenadines are part of the West Indies breeding population, numbering around 10,750 animals in 1992, but has encouraged the collection of additional data. This year, two papers were received providing more consideration of stock structure in this area.

SC/57/AWMP9 provided an update on a new assessment of North Atlantic humpback whales. A total of 3,615 biopsy samples were collected. The sample processing and data analysis should be completed in time for high-precision estimates of abundance to be available by 2007. The paper also hypothesised that the demographic population structure of this stock is probably complex, with whales from more than one feeding ground perhaps sharing the same winter breeding ground, or separate but uncertain breeding grounds.

The Committee was pleased to receive this report and expresses its continuing support for this programme.

SC/57/AWMP7 reported that one humpback whale landed as St. Vincent and the Grenadines in 1999 was matched to a specific catalogued individual photographed in the Gulf of Maine. This is the first direct stock assignment from this fishery and the most southeasterly sighting of a Gulf of Maine humpback whale. Based on its length, the authors believed that the second animal landed at the same time was probably a calf and, if so, a member of the same population.

The Committee welcomed this paper, noting that this strong additional information to that considered previously, strongly suggests that the animals found off St. Vincent and The Grenadines are part of the West Indies population.

The Committee also welcomed the updated report on catches submitted to the Secretariat. In 2004, there were no whales taken. In February 2005 there was a single male humpback whale taken, measuring 35ft in length.

The Commission has adopted a total block catch limit of 20 for the period 2003-07. The Committee agrees that particularly given the new information presented this year in SC/57/AWMP7, this catch limit will not harm the stock. The Committee also **repeats its recommendations** of previous years that wherever possible photographs and genetic material are collected from the catch. It was pleased to hear that two photographs (one from the 2003 catch and one from the 2005 catch) have been obtained and that arrangements will be made to send the photographs to the North Atlantic catalogue.

8.4 Planning for a bowhead whale *Implementation Review* in 2007

The Committee discussed planning for the 2007 *Implementation Review* for the Bering-Chukchi-Beaufort (B-C-B) Seas bowhead whales (*B. mysticetus*). The purpose of an *Implementation Review* is to determine whether any new information that has become available indicates that the present situation is outside the region of parameter space tested during *SLA* development. If this is the case, additional trials will be developed to test the performance of the *SLA* in this new region. If performance is found to be unacceptable under these new trials, revisions to the *SLA* will be required. In the case of the bowhead whale, a variety of new hypotheses concerning genetic population structure have been developed that have implications for management. Although there is little firm basis yet for assessing the plausibility of these hypotheses (see Item 9.1), they represent an untested region of parameter space. There is no new evidence that any other biological or demographic factors lie outside the region previously tested. The questions regarding stock substructure have stimulated considerable relevant research and analyses are expected to be completed in time for formulating management advice in 2007. Therefore, the Committee **agrees** to aim to complete the *Implementation Review* at the 2007 meeting whilst recognising that this did not preclude delaying completion to 2008 or later if circumstances warranted.

The Committee **agrees** to the following approximate timeline (more details are given in Annex E, item 4).

(1) *First intersessional Workshop*. This meeting will be held in or around March 2006. Its task will be to specify the basic structure and types of simulation trials needed for the *Implementation Review*. This meeting will also initiate discussions on the ranges of parameter values to be tested, but not the specific choices.
(2) *2006 Annual Meeting*. This meeting will review progress on trial design and coding. It seems appropriate that the stock structure discussions should occur in joint sessions of the AWMP and the BRG sub-committees, with this leading to a refinement of the trial structure and parameter value ranges.
(3) *Second intersessional Workshop*. This meeting will be held in or around October 2006. Coding of the trials must be completed before this Workshop. The purpose of this meeting is to review the coding of trials and their behaviour within the agreed parameter ranges. The Workshop will finalise trial structure.

(4) *Data availability*. In accordance with the Committee's Data Availability Agreement (DAA), all data relevant to management advice for the 2007 meeting should normally be submitted 6 months in advance of that meeting (i.e. probably in December 2006). However, given the collaborative nature of the analyses being undertaken, the Committee **agrees** that provided all collaborators concur, consideration should be given to allowing an extension to this deadline should it be required.
(5) *Third intersessional Workshop*. This meeting will be held in or around March 2007. The purpose of the workshop is to select specific parameter values for the designed trials, after confirming that the trial structure and coding revisions are satisfactory. After this meeting, the trials will be run by the Secretariat in advance of the 2007 Annual Meeting.
(6) *2007 Annual Meeting*. The primary task at this meeting will be to assess the relative plausibility of the trials chosen, examine the trial results, and evaluate continued management under the *Bowhead SLA*. If the Committee determines that the completed review indicates unsatisfactory performance of the *Bowhead SLA*, it will develop a workplan for its revision.

This timeline cannot be met without the imposition of certain deadlines. The Committee **agrees** that the trial structure and parameter ranges will be based only on evidence available at or before the 2006 Annual Meeting. Furthermore, the Committee **agrees** that choices for parameter values and trial plausibility judgments shall be based upon only the data available in advance of the 2007 Annual Meeting (see point 4 above). Decisions will be based on evidence that meets these deadlines. If new evidence becomes available subsequent to the applicable deadline, it shall not be used for the present *Implementation Review* unless completion of the *Implementation Review* is postponed to 2008 or later.

The financial implications of this plan are discussed under Item 21.

8.5 Scientific aspects of an Aboriginal Subsistence Whaling Scheme

In 2002, the SWG developed scientific aspects of an AWS intended for use in conjunction with the *Bowhead SLA* (IWC, 2003b, pp.154-5). These proposals were agreed by the Scientific Committee (IWC, 2003a, pp.19-23) and reported to the AWMP sub-committee of the Commission. At the 2003 and 2004 meetings, the Chair of the SWG discussed such matters with interested commissioners and representatives of the hunters. The Commission has not yet adopted the AWS and in particular the USA has expressed some concerns (IWC, 2005a, p.13). There was some discussion of this item by the SWG (Annex E, item 5).

The Committee again **recommends** the scientific components of an AWS to the Commission, noting that it forms an integral part of the long-term use of *SLA*s.

8.6 Work plan

The Committee **agrees** that the items below should be given priority during the intersessional period.

8.6.1 Greenland

(1) The photographs from the 2002 and 2004 surveys should be re-examined and advice be provided

throughout the process (a) on whether a survey should be undertaken in summer 2006 (see below) and (b) to develop an agreed method to obtain acceptable abundance estimates from the data, if possible. An intersessional e-mail group to provide such advice was established (Annex P(3)).

(2) The data on which the estimate of surfacing rate in Annex E, Appendix 4 is based (and any other data on surfacing rates for fin and common minke whales in the Northern Hemisphere) should be obtained and re-analysed to determine the various components of variance and hence the most appropriate measures of variance of surfacing rate when estimating abundance. An intersessional group to co-ordinate this was established (Annex P(4)).

(3) Preparations should be made to carry out a cue-counting survey in summer 2006 (see Item 8.2). A final decision on whether to conduct the survey will be taken by the intersessional group established under (1) above.

(4) The sex ratio data for common minke whales should be fully investigated *inter alia* to determine whether it can be used to obtain at least a minimum estimate for the total stock and be incorporated into an assessment model. An intersessional group to forward this work was established (Annex P(5)). This information should be provided to the intersessional group established under (1).

(5) An assessment of the statistical power of various genetic approaches to estimate abundance (Annex E, Appendix 3) should be completed. This will be carried out by Palsbøll, Skaug and Waples. Financial implications are dealt with under Item 21.

8.6.2 Bowhead whales

To meet the goal of finishing the bowhead *Implementation Review* at the 2007 Annual Meeting, two Workshops will be required (see Item 8.4), one in the forthcoming intersessional period. The USA has offered to host that Workshop in either Seattle or La Jolla in or around March 2006. The Workshop will specify the basic structure and types of simulation trials needed for the *Implementation Review*.

There is also a considerable amount of Secretariat computing work involved (Allison primarily). Given the unknown nature of the final stock structure hypotheses, it is difficult to estimate accurately the amount of Secretariat time required for the *Implementation Review*. This could be up to 15 months for the entire process (i.e. to the end of the 2007 review); it may be up to eight months between the first and second intersessional Workshops. This needs to be taken into account in the overall Committee work plan (see Item 19).

8.6.3 Priority topics for the 2006 meeting

(1) Review progress on the Greenlandic research programme (especially with respect to abundance, stock structure and the use of sex data in assessments) and attempt to provide management advice.

(2) Review progress on and refine design of trial specifications and coding for bowhead whales.

(3) Review information on the St. Vincent and The Grenadines fishery and provide management advice.

The Committee noted that this is a particularly heavy workload for the 2006 Annual Meeting. It notes that unless the SWG on the AWMP has a pre-meeting, it will require considerably more sessions than normally allocated at an annual meeting. This is discussed further under Items 18 and 19.

9. ABORIGINAL SUBSISTENCE WHALING STOCK ASSESSMENTS ON BOWHEAD, RIGHT, AND GRAY WHALES (SEE ANNEX F)

9.1 Bering-Chukchi-Beaufort Seas bowhead whale stock identity

The Committee considered the results of a USA-sponsored Workshop on B-C-B bowhead whale stock structure held in Seattle, February 2005 (Anon., 2005). The Workshop considered five stock structure hypotheses:

(1) the one-stock model presently accepted by the IWC;
(2) one stock with generational gene shift (GGS);
(3) two stocks with temporal segregation;
(4) two stocks with spatial segregation; and
(5) the two-stock Chukchi Circuit (CC) hypothesis.

The latter is a new hypothesis based on inference from Russian sighting and oceanographic data. It assumes a primary population that migrates from the eastern Bering Sea to the Beaufort Sea in spring, returns by a similar route in autumn, and is subject to harvest at Barrow in both seasons, with a second population that leaves the Bering Sea in late May and June and follows the Chukotka coast northward to the northern Chuckchi and western Beaufort Seas. In this hypothetical scenario, the second population would be vulnerable to harvest at Barrow in autumn, but not during spring.

SC/57/BRG10 re-examined the 'Oslo bump', a significant increase in genetic difference between pairs of whales sampled approximately one week apart at the Barrow autumn migration versus those sampled at other time intervals (Jorde *et al.*, 2004). Genetic data from 117 Barrow whales were screened for quality and analysed in generalised additive models. Pair-wise comparisons detected no significant effects in the spring migration. In the autumn migration, there was a significantly elevated genetic difference in pairs of whales taken about a week apart in the hunt.

SC/57/BRG4 carried out an analysis that was parallel to SC/57/BRG10, but adjusted for whale ages in a manner that was argued to be more appropriate. It found a weaker pattern of elevated gene difference in pairs taken about a week apart, which was no longer statistically significant at the 5% level. SC/57/BRG4 also emphasised that the effects of whale ages and spatio-temporal whale positions during migration are highly confounded, making it difficult to isolate the genetic patterns associated with each. The paper concluded that it was premature to reject any major hypotheses until more and better data become available. The importance of additional samples was emphasised, as the detection of the 'Oslo bump' was based on only 54 samples from the autumn migration. Further, genetic structure might be the result of a combination of factors and so not entirely explained by a single proposed hypothesis.

The Committee **agrees** that the 'Oslo bump' appears to be a real feature of the limited available data. However, additional data are necessary to confirm whether this pattern reflects a real characteristic of the B-C-B bowhead population. No single explanation has emerged to explain the effect.

SC/57/BRG19 described the development of a new and expanded panel of microsatellite loci from bowhead whales. The goal of the work was to produce at least 25 loci from bowhead whales that are variable, reliable and can be consistently scored, even in samples that are not of optimal quality. Preliminary assessments of variability suggest that as many as 20 of an initial set of 33 possible loci might be suitable for use.

SC/57/BRG21 reported recent progress on B-C-B Seas bowhead whale stock structure research, as requested by the Scientific Committee during its 2004 meeting (Øien, 2004, pp.23-4). Research was directed towards testing proposed stock structure hypotheses. The Committee expressed its appreciation to the USA for its Seattle Workshop and research programme. However, some concerns were raised as to whether the working schedule would allow for new data to become available for review prior to the 2006 meeting. If there is sufficient evidence against a single stock, then it will be important to identify the implications of that structure so that the new trial structure can assess the potential effects.

The Committee **agrees** that the focus of this extensive work programme should be to provide advice that is of direct relevance to the development, if necessary, of a revised trial structure for testing the *Bowhead SLA*.

SC/57/BRG16 provided an update on recent aerial photographic surveys of bowhead whales for photo-identification and photogrammetry. Surveys were conducted near Point Barrow, Alaska, during the spring migrations of 2003 and 2004. The photographs from these studies will provide a capture-recapture abundance estimate for comparison with the most recent estimate from ice-based counts, as well as more precise estimates of bowhead whale life-history parameters such as survival. A survey near St. Lawrence Island in the Bering Sea in 2005 was designed to photograph bowheads during the second half of the spring migration when most well marked medium- and large-sized whales are seen. The location was chosen to maximise the possibility of photographing whales from a Bering Sea stock that may not migrate past Point Barrow in spring, if such a stock exists.

SC/57/BRG17 described a preliminary characterisation of the external morphology of bowhead whales caught by Alaskan Eskimos. Such external morphometric data may be useful for stock structure investigations.

9.2 Catch data and management advice for the Bering-Chukchi-Beaufort Seas bowhead whale
9.2.1 Catch information
SC/57/BRG15 reported catch information for the 2004 Alaskan subsistence harvest. A total of 43 bowhead whales was struck resulting in 36 animals landed. The efficiency (the ratio of the number landed to the number struck) of the hunt was 84%, which is higher than the mean efficiency over the past 10 years (78%). Of the 36 whales, 13 were males, 22 were females and the sex was not determined for one whale. Of the 22 females, seven were presumably mature (>13.4m in length). Four of these were examined closely. Two were pregnant, one with an 11cm foetus and the other with a 409cm foetus, while the other two were not pregnant.

SC/57/BRG24 reported that one 12m male bowhead whale was taken as part of the Russian subsistence harvest in 2004. The weight of the animal was estimated at 30,400kg. The author confirmed that the length of the whale was exact, but that the weight was estimated from the amount of meat that was distributed. The Committee **recommends** that every effort be made to obtain genetic samples from Russian catches.

9.2.2 Management advice
The Committee **agrees** that the *Bowhead SLA* remains the most appropriate tool for providing management advice for this harvest, at least in the short-term. The results from the *Bowhead SLA* show that no change is needed to the current block quota for 2003-07.

The Committee also repeated last year's recommendation that an *Implementation Review* focusing on stock structure should be conducted with the goal of completing it at the 2007 annual meeting so that management advice at that meeting is based on the best science available then. The *Bowhead SLA* was developed and tested under a single-stock hypothesis. The review will examine the robustness of the *Bowhead SLA* with respect to plausible stock hypotheses via simulation trials. If shown to be necessary, this may result in changes to the *Bowhead SLA* (and see Item 8.4).

9.3 Catch data and management advice for the eastern North Pacific gray whale
9.3.1 Catch information
A total of 110 eastern North Pacific (ENP) gray whales (43 males and 67 females) were harvested by the native people of the Chukotka Autonomous Region in 2004 (SC/57/BRG24). Of the total, one gray whale was lost during towing and six exhibited a strong chemical (iodic) odour. The latter were not used for any purpose and tissue samples have been analysed to determine the cause. Harvested whales ranged in length from 8.0-14.0m (average 10.1m). The weight ranged from 6.0-23.0 tons (average 11.9 tons).

The Makah Indian Tribe was unable to conduct whaling on this stock in 2004 because of domestic litigation. A court ruled in 2004 that the Makah Indian Tribe needs a waiver of the US Marine Mammal Protection Act (MMPA). The Tribe applied for that waiver in February 2005.

SC/57/BRG6 was a preliminary report of the re-analysis of catch data from the Soviet aboriginal fishery of eastern Pacific gray whales from 1980-91. Data for this period have been summarised on an annual basis in previous reports to the Scientific Committee. However, SC/57/BRG6 re-analysed biological and technical parameters based on a large total sample of 520 females, 248 males and 89 foetuses. The Committee welcomed this report and **agrees** that this information should be considered at the next *Implementation Review*.

9.3.2 Management advice
Last year, the Commission endorsed the *Gray Whale SLA* for use in providing management advice. In this meeting, the Committee reaffirmed that the *Gray Whale SLA* remains the most appropriate tool for providing management advice for this harvest. The Secretariat has calculated strike limits for this stock given the agreed abundance estimate and catch history. The results show that no change to the current block quota is needed for 2003-07. An *Implementation Review* is scheduled for 2009.

9.4 Implications of the special pre-meeting on sea ice and whale habitat

SC/57/E13 and SC/57/E5 had been presented in the joint Workshop on high-latitude sea ice environments (SC/57/Rep5). Both papers addressed the potential effect of variability in sea ice cover on B-C-B bowhead whales and are summarised under Item 12.1.

Three important issues were identified in the Workshop:

(1) the effect of loss of sea ice on the census of B-C-B bowhead whales (related to the loss of the shorefast ice platform from which the census is conducted and the potential opening of commercial shipping routes in the Arctic);

(2) the possible importance of sea ice in structuring habitat for bowhead and gray whales either directly or indirectly through potential for competition between gray and bowhead whales and via the potential northward shift of other mysticete species (competition) and killer whales (predation); and

(3) the best way to incorporate large whale research, specifically IWC-related work into the International Polar Year (IPY) and Second International Conference on Arctic Research Planning (ICARPII) programmes (see Item 12.1).

Overall, the Committee was encouraged that there had been no apparent negative effect of global warming on bowhead whales. However, they also found it difficult to predict how bowhead whales might be affected by large-scale oceanographic changes in the future. Several areas of concern were discussed, including thermoregulatory issues and increased exposure to killer whale predation, competition with other species, ship traffic, noise, pollution and fisheries interactions. In addition to potential impacts on the census, a reduction in sea ice would probably affect the logistics of the harvest.

9.5 Catches by non-member countries

There were no catches of bowhead whales in the eastern Canadian Arctic in 2004. The carcass of one juvenile bowhead whale washed ashore near Arctic Bay in 2004, apparently the victim of a killer whale attack (Cosens, pers. comm.).

9.6 Work plan

The following work plan was proposed for the coming year:

(1) review new information on the stock structure of the B-C-B Seas stock of bowhead whales and on the progress of on-going research; and

(2) perform the annual review of catch information and new scientific information for the B-C-B Seas stock of bowhead and ENP stock of gray whales in order to advise the Commission as requested in Schedule Paragraph 13(b)(1) and (2).

10. WHALE STOCKS

10.1 Southern Hemisphere Antarctic minke whales (see Annex G)

10.1.1 Estimate abundance of Antarctic minke whales

10.1.1.1 THE 2004/05 SOWER CRUISE

SC/57/IA1 presented the report of the 2004/05 SOWER cruise. This was the 27th annual Antarctic cruise and represented the start of a new phase of research following the completion of the third circumpolar series of surveys (CPIII). The research region was in Area III (0°-70°E) and lasted 65 days. The Committee expressed its gratitude to the Government of Japan for providing the vessels to conduct the survey. It also thanked the officers and crew of the vessels, the Cruise Leader, Senior Scientist and the other researchers for their efforts to ensure a successful cruise. The main purpose of this cruise was to conduct experiments that address problems encountered with the analysis of or interpretation of previous IWC/SOWER cruises.

One such experiment was presented in SC/57/IA7, which is a report of the collaborative studies with the Japanese icebreaker, *Shirase*. The SOWER vessels surveyed for Antarctic minke whales in the near-ice area (35°-50°E) while the *Shirase* surveyed in the pack ice zone (40°-50°E). The Committee thanked the Government of Japan and the Japanese Antarctic Research Expedition for conducting this study.

If the data from the SOWER and icebreaker cruises are to be used to estimate the proportion of Antarctic minke whales within the ice field that are not accessable to the IWC/SOWER survey vessels, care must be taken to account for the fact that the design and search effort for the two types of vessels were different.

Other experiments conducted on the SOWER cruise included Antarctic minke whale visual dive time trials, trials of the Buckland-Turnock (BT) survey method, trials of adaptive line transect sampling, and addressing effects of the CPII track design on the abundance estimates as compared to the CPIII track design. A direct electronic data acquisition program was also evaluated. The Committee considered that all the experiments had been useful.

Insufficient sea time had been available to properly evaluate the BT mode experiment. However, there was some concern expressed that the high-powered binoculars used for tracking in BT mode were difficult to use. The results from a BT mode experiment is an estimate of $g(0)$ that accounts for animal reactive behaviour, if any, that does not rely on assumptions of surfacing rates and patterns. Given the potential value of the BT mode experiment in assisting in interpreting previous results, the Committee **recommends** that the BT mode experiment be continued.

Practical aspects of the protocol of adaptive sampling were easily implemented but due to time constraints and the low density of animals when conducting these experiments, data collected were too limited to analyse. However, the Committee **agrees** that adaptive sampling is of greater benefit for species that are found in low densities (e.g. blue and fin whales).

Sufficient data had been collected during the dive-time experiments. The Committee **recommends** that these data be coded and analysed intersessionally by an intersessional Working Group (Annex (P14)).

The automatic data entry system was also found to be successful so the Committee **recommends** such a system be more fully developed and tested during the next cruise.

Good coverage was achieved for two-thirds of the study area of the experiment to investigate effects of the CPII track design on the abundance estimates but it is not clear whether this level of coverage is sufficient to try to compare the two designs, particularly given inter-annual variation.

10.1.1.2 RESULTS FROM SIMULATED DATA

Last year, the Committee identified four additional factors that could potentially reflect heterogeneity in the real International Decade of Cetacean Research/SOWER

(IDCR/SOWER) data and should be added to the already existing simulation scenarios. SC/57/IA2 outlined how these factors have been incorporated into the simulated data, which have been provided to the IWC Secretariat. These data were used to examine the robustness of some of the methods under development: the integrated model method by Cooke (2002); and the hazard probability model by Okamura (SC/57/IA4), as well as more established analysis methods, the standard method (SC/57/IA14) and the direct duplicate method (SC/57/IA15). For all these methods, the percentage relative bias of estimated density of whales was small. The integrated model and hazard probability model had the smallest biases; these tended to be positive. The standard and direct duplicate methods had larger biases that were negative. The Committee welcomes these encouraging results.

The highest priority task for next year is to produce estimates of Antarctic minke whale abundance and thus the Committee **agrees** that analysing the standard dataset of the actual IDCR/SOWER data should be given higher priority than analysing further simulated datasets. However, these estimates will need to be assessed on the basis of the performance of the methods obtained from the simulation study. The Committee established an intersessional email correspondence group (Annex P(10)) on analysis methods used to estimate abundance of Antarctic minke whales using IDCR/SOWER data. The group should further develop the list of factors that should be simulated and the combinations of these factors that should be used, taking into account of the high priority allocated to analysing the standard dataset. Factors to consider including in future simulations are: varying the sample sizes, reducing the value of $g(0)$, cue dependent detection functions combined with other factors, and varying amount of effort within the study area that may be correlated with weather conditions. See additional terms of reference for this correspondence group in Item 10.1.1.3.

10.1.1.3 RESULTS FROM CRUISE DATA
The 2003/04 SOWER cruise surveyed the eastern part of Area V including the Ross Sea. SC/57/IA11 presented estimates of Antarctic minke whale abundance using standard IWC methods (Branch and Butterworth, 2001). The mean school sizes in the northern, middle and Ross Sea strata were 1.13 (CV=11.1%), 3.95 (CV=12.2%) and 1.35 (CV=7.0%), respectively. The abundance of Antarctic minke whales was estimated to be 77,120 (CV=30.8%) for closing mode and 101,766 (CV=23.3%) in independent observer (IO) mode. The combined estimate, having corrected for closing mode, was 98,522 (CV=18.9%). An updated estimate of R (the factor used to convert closing mode estimates to pseudo-passing mode) was calculated. This value, including all data from 1998/99, was estimated to be 0.88.

The Committee noted that on the 2003/04 survey the mean school size and sighting rates were higher in the middle stratum than in the Ross Sea southern stratum, which was considered unusual. Several members suggested that the unusual distribution of larger schools could have been related to ice conditions. An examination of satellite derived ice motion was currently being undertaken by Ensor, Matsuoka and others in an attempt to identify the processes involved.

The Committee **recommends** that the relationship between abundance and distribution of Antarctic minke whales and the ice extent be examined using data from the

2002/03 and 2003/04 surveys, and those of JARPA, which covered similar areas.

SC/57/IA16 presented preliminary estimates of abundance for CPI, CPII and CPIII obtained using a slightly modified standard method (Branch and Butterworth, 2001). When results from closing mode and IO mode were combined, the circumpolar abundance estimates were 594,000 (CV=12.8%), 769,000 (CV=9.4%) and 362,000 (CV=8.0%) for CPI, CPII and CPIII respectively. These estimates are negatively biased because some Antarctic minke whales may be north of 60°S, or inside the pack ice during the surveys and because some whales on the trackline were likely to have been missed. After simple extrapolation to account for differences in the latitudes surveyed during each circumpolar set (but not for increasing proportions of 'like minke' sightings), the ratio of the circumpolar estimates was 0.92:1.00:0.39, echoing previous preliminary findings of appreciably lower CPIII estimates. Estimates for each IWC Management Area also had low CPIII:CPII ratios (between 0.17 and 0.62), except for Area VI where the CPIII estimate was higher than in CPII.

SC/57/IA3 examined consistency over time of SOWER environmental covariates. It was clear that the method of determining 'visibility' has changed during CPII/CPIII, and a correction is necessary. Four simple ways were investigated, of which two were considered successful.

To facilitate the estimation of abundance using the CPI to CPIII data in the standard dataset, the Committee **recommends** that the intersessional email correspondence group on analysis methods (see Annex P(10)) assists the analysers (Branch, Bravington, Cooke, and Okamura) by developing what should be presented, what diagnostics are required and to create a set of rules, for example specifying how duplicates should be treated, how to pool the data, and other such data selection decisions. In addition, this group should determine diagnostics to ensure the comparability between DESS and the standard dataset.

10.1.1.4 ADDITIONAL VARIANCE
SC/57/IA5 presented the proposed statistical model for estimating additional variance, which is based on a combination of the methods in Punt *et al.* (1997) and Skaug *et al.* (2004). The performance of the additional variance estimation for IDCR/SOWER type surveys was investigated through simulation studies. The study found that estimates of the amount of random variation may be biased if the area-effects change systematically (and not randomly) between two circumpolar surveys.

The Committee **agrees** that consideration of the residuals over time might be used to assist in detecting spatial and temporal trends and the data from JARPA could possibly also be used to estimate additional variance. It also agrees that SC/57/IA5 was valuable and that the methods should be applied to the abundance estimates that will be presented at next year's meeting.

10.1.1.5 ESTIMATION OF ABUNDANCE USING JARPA DATA
SC/57/IA18 compared abundance estimates of JARPA survey data obtained using standard line transect methods and spatial modelling methods. Several vessels take part in the JARPA survey, where one vessel acts as a dedicated sighting vessel (SV) and the other vessels as sighting and sampling vessels (SSV). Vessels operate in closing mode, thus, in high-density areas effort is reduced. Standard line transect methods may be biased since effort is assumed to be located independent of density. The spatial model makes

no such assumption, but relies on good coverage throughout a study region. Results from four years of survey data in Area V were compared and found to be broadly similar.

It was suggested that combining all surveys together and including year as a factor might produce a more robust model. Concern was expressed that the variance of the sighting rate may be underestimated and that the moving ice edge could cause problems. It was also suggested that if this method was to be used in the future, the spatial model should be applied to simulated data to investigate the model's robustness.

Hakamada *et al.* (2005) investigated the effects of sampling activities, including 'skipping' (not covering the full daily distance planned in high density areas) and the use of closing mode, on abundance estimates when using data collected from SSV and SV. To correct for bias due to under-surveying high-density areas, the method developed by Haw (1991) was used. The consequent corrected abundance estimates averaged about 50,000 for Area IV and about 200,000 for Area V. No statistically significant change in abundance was detected.

In discussion, concern was expressed that the correction factors might change over time in response to variations in whale density and the extent of skipping. The most appropriate method of estimating variance in the sighting rate from the SSV was also discussed, as the SSV vessels surveyed relatively close to each other. The authors responded that they had checked for dependence of the correction factor on density and had not found any significant effect (Hakamada *et al.*, 2005). More details on these and other concerns, and responses to those are provided in Appendices 2 and 3 of Annex H.

10.1.2 Reasons for differences between Antarctic minke abundance estimates from CPII and CPIII
The Committee had planned to update the table on possible hypotheses explaining the differences between abundance estimates from CPII and CPIII (IWC, 2003d). However, there was insufficient time to complete this task. It is expected that updated abundance estimates from CPII and CPIII will be available next year and the Committee agrees to update the table after the abundance estimates become available.

10.1.2.1 IMPLICATIONS OF SEA ICE AND WHALE HABITAT
SC/57/IA6 used a GAM-based spatial model to account for environmental variables when estimating the abundance of Antarctic minke whales within a polynya present in Area II (0ºE-60ºEW). This analysis indicated that there appears to be a more complex response of the Antarctic minke whale distribution to environmental variables than what was believed before (e.g. high concentrations around the ice edge and decreasing towards the north). It was proposed that the oceanographic conditions associated with the Weddell Gyre in Area II could also be influencing the distribution of Antarctic minke whales instead of just sea surface temperature (SST) and sea ice extent as postulated by Kasamatsu *et al.* (1998).

Concerns were expressed about predicting density in a region outside the range of the observed data. The Committee suggested that this work be continued by including other environmental variables, if available, investigating the effects of using environmental variables alone, investigating the fit of the model by comparing the predicted patterns of abundance to the observed patterns of abundance in areas where there are data, considering

combining data from all years to develop the predictive model and developing estimates of variance for the extrapolated abundance estimate. In addition, it was noted that if this method is to be used in the future, its robustness should be investigated by applying it to simulated data. The Committee **encourages** further work on this difficult issue.

10.1.2.2 POPULATION DYNAMIC MODEL METHOD TO ESTIMATE TRENDS AND POSSIBLE DIFFERENCES
10.1.2.2.1 REPORT FROM INTERSESSIONAL WORKING GROUP
At its 2002 meeting and each year after, the Committee established an intersessional Working Group to address issues concerning catch-at-age analyses for Antarctic minke whales in Areas IV and V. Results of work completed so far on the integrated statistical catch-at-age (SCAA) model are in SC/57/IA9 and results from the Adaptive Framework Virtual Population Analysis (ADAPT-VPA) model are in SC/57/IA17 (both discussed later). Two of the outstanding tasks that remained before final results could be obtained were addressed during this Scientific Committee meeting: a set of plausible stock structure hypotheses for Areas IV and V was developed, and a set of environmental time series was identified (details in Appendix 4 of Annex G). That Appendix also lists remaining issues that require consideration and intersessional work.

The Committee **agrees** that having results from both the ADAPT-VPA and integrated SCAA was extremely valuable and encouraged continued work on both approaches. It also **agrees** that the Working Group should continue as an intersessional e-mail group (Annex P(13)). The Committee further **agrees** that a request for data be made under Procedure B of the Data Availability Protocol to allow work identified in Appendix 4 of Annex G to proceed.

10.1.2.2.2 ABUNDANCE ESTIMATES FROM SOWER AND JARPA USED IN POPULATION DYNAMIC MODELS
The intersessional Working Group **agreed** that for this year, abundance estimates by Branch (2003; pers. comm.) be used for the IDCR/SOWER cruises and estimates by Hakamada *et al.* (2005) be used for the JARPA cruises. In the longer term, completion of the population modelling work is dependent upon the finalisation of a set or sets of abundance estimates for both these cruises.

10.1.2.2.3 RESULTS FROM PRELIMINARY ANALYSES
SC/57/IA9 reported on the statistical catch-at-age model, which is a general population dynamics model applied to Antarctic minke whale data from Areas IV and V that allowed for: multiple fleets; age- or length-based selectivity; different shaped selectivity patterns which can change by time, sex and fleet; ageing error; and changes over time in carrying capacity. The reference case analysis indicated a substantial increase in recruitment between 1930 and 1960, then a decrease between 1960 and the mid-1980s and relatively constant recruitment subsequently. Corres-pondingly, abundance increased until around 1970 and then declined. These results are similar to those obtained by Butterworth *et al.* (1999). The estimate of K in 1960 was higher than in 1930 by a factor of 10. K was estimated to have decreased roughly by half between 1960 and 1980.

Sensitivity analyses showed the following: a significantly better fit was achieved when allowing for changes in K over time; selectivity varied with length or age for the JARPA catches; and apparent inconsistencies between the JARPA age composition data and the commercial age-length keys. Problems were encountered if the assumption was made that growth had not changed over

time. Hatanaka commented that growth rate may have changed over time and that the commercial catches were closer to the ice edge, which may have influenced their selectivity.

SC/57/IA17 reported advances in the application of ADAPT-VPA to Antarctic minke whales in Areas IV and V. They had applied the methodology of Butterworth *et al.* (1999) to abundance estimates (from both IDCR/SOWER and JARPA surveys) and catch-at-age data (both commercial and scientific) for Areas IV and V. The primary focus was a joint analysis of the two Areas under the assumption that there was a single stock, with year-to-year variability in how it was distributed. The model was most sensitive to the value of the natural mortality M. This was linked to the IDCR/SOWER survey trends suggesting higher estimates of M, and the JARPA survey trends suggesting lower estimates.

The trends in recruitment and population size in SC/57/IA17 agreed well with the corresponding reference case results in SC/57/IA9. However, some differences between results of the ADAPT-VPA (SC/57/IA17) and the SCAA (SC/57/IA9) were noted. For example, omitting the JARPA abundance data had a large effect in the ADAPT-VPA but not in the SCAA. The difference between the trends indicated by the revised JARPA and IDCR/SOWER abundance estimates for Area IV is clearly of concern. Further, the ADAPT-VPA approach needs to be extended to take account of the differences in selectivity patterns between the Japanese and Russian fleets indicated by SC/57/IA9. In addition, possible differences in selectivity patterns at large ages between JARPA and the commercial catches need to be investigated further.

The authors of SC/57/IA9 commented that their model's estimates of recent trends are dependent upon assumptions about temporal changes in carrying capacity (K) and the relative weight given to different data sources. Thus such models are unlikely to entirely resolve differences between CPII and CPIII.

10.1.2.3 OTHER
SC/57/O21 examined whether predator-prey interactions alone could broadly explain observed population trends of the major species without resorting to environmental change hypotheses. As a first step, a model was developed that included krill, four baleen whale species (blue, fin, humpback and Antarctic minke) and two seal species (Antarctic fur and crabeater). The study inferred that:

(i) species interaction effects alone can explain observed predator abundance trends, although not without some difficulty;

(ii) it was necessary to consider predator species other than baleen whales to explain the observed trends, with crabeater seals being particularly important and in need of improved abundance and trend information;

(iii) the Atlantic/Indian region showed major changes in species abundances, in contrast to the Pacific which was much more stable;

(iv) baleen whales need relatively high growth rates to explain the observed trends; and

(v) the previous estimate of some 150 million tons for the krill surplus (Laws, 1977) may be too high since his calculations omitted density-dependent effects on feeding rates.

The Committee recognised that investigating interactions between species is important and welcomed contributions on this issue. The considerable discussion on the issues related to this model and the interpretation of its results is summarised in Annex G (item 3.3.3). These discussions include: the inclusion of other species in the model; pooling over the two species of krill; incorporating inter-annual changes and a correlation between the level of competition and good and poor krill years; the fit of the data; the effects of setting bounds on the parameters; the interpretation that the crabeater seal box also represents all other krill predators; the effect of assuming a top-down model in contrast to a bottom-up model; and the effect of the restriction of the study area which is only part of the habitat for some species in the model. It was noted that just because one model is consistent with the data, this is not a reason to accept its underlying hypotheses as the only plausible hypothesis. Many other hypotheses may also lead to models that fit the data, including a combination of top-down and bottom-up hypotheses.

The Committee noted that in many regions, assessments of numerous species are starting to be considered within an ecosystem framework. To consider an ecosystem framework for assessments of large whales, topics such as ecosystem models, competition between different large whale species and between large whales and other species must be discussed. The Committee also recognises the need for collaboration with other organisations to ensure that the Committee has the necessary expertise available. The Committee recalled the views of its previous workshop (IWC, 2004g) and **agrees** that ecosystem modelling should be added to the agenda next year and invites members to contribute papers on this issue (and see Item 19).

10.2 In-depth assessment of western North Pacific common minke whales, with a focus on J stock
10.2.1 Report from intersessional Steering Group
SC/57/NPM4 reported the activities of the intersessional steering group that were preparing for an in-depth assessment of western North Pacific common minke whale, with a focus on the J-stock. The Group met at the end of last year's meeting to discuss data availability issues and ways to proceed with the intersessional work (IWC, 2005h). The intersessional work focused on three areas: update of information and data; availability of data under Procedure B; and analyses conducted. Papers resulting from these preparations are discussed in detail in Annex G (item 4) and summarised below.

10.2.2 Distribution and abundance
In response to a request from last year, SC/57/NPM15 investigated the relationship between common minke whale distribution and oceanographic conditions in Korean waters. Data from commercial whaling records and sightings surveys around the Korean Peninsula from March to October during 1977-2004 show that common minke whales occur in areas with an annual mean SST range of 12-20°C. Common minke whale distribution was in the temperature range 13-25°C from March to July in the seas to the south and east of the Korean Peninsula. It was also noted that the abundance of common minke whales may be influenced by the abundance of prey organisms such as anchovy and zooplankton.

The Committee welcomed this review.

SC/57/NPM13 reported an investigation of the distribution and abundance of common minke whales based on catch and effort data from whaling in the waters around the Korean peninsula from the 1960s to the mid 1980s. Abundance indices were generally high from March to June with a peak in May. A lower secondary peak occurred in September. Potential migration paths and relative densities are discussed in detail in Appendix G.

SC/57/NPM3 and SC/57/NPM8 provided provisional abundance estimates of common minke whales from Korean surveys. The Committee welcomed this information along with a cruise report from April-May 2005. These are discussed in detail in Annex G (item 4.2) and the Committee looks forward to receiving revised estimates in the future.

A historical review of changes in the large whale species targeted by hunting off the Korean peninsula was presented. It suggested that the waters off Korea were historically abundant whale habitats as featured in the Bangudae petroglyphs from prehistoric times, various logbooks of foreign whaling vessels that harvested in Korean waters in the 19th century and bycatch data after 1990. Large whale species declined before the ban on whaling.

The Committee thanked the authors for this review and noted the plan to bring a revised version to a future meeting.

SC/57/NPM1 reported the results of a sighting survey in the Sea of Japan in spring 2004. Permission to survey in the Russian Exclusive Economic Zone (EEZ) was not granted so, during 11 May-29 June 2004, the research vessel, *Shonan-maru* No.2, covered the same area as in 2003. Abundance estimates are not yet available.

In discussion, it was noted that the large number of strata included in the survey design may lead to higher variances than are appropriate. Future survey design should aim to maintain equal coverage in the survey blocks so that, if appropriate, data can be pooled over blocks during analyses. This should minimise problems with large variance estimates and provide greater flexibility in analysis.

The Committee noted that the data from Japanese surveys conducted prior to 2002 had not been analysed to provide estimates of abundance. As shown in IWC (2005f, p.225), all these surveys had very low numbers of primary sightings, at least in part due to the timing and the small size of the areas surveyed. From 2002, the number of vessels used on surveys was increased, leading to improved coverage and to data that were sufficient for analysis. The Committee **encourages** that these data be analysed and presented at the next meeting.

10.2.2.1 PLANS FOR FUTURE SURVEYS
SC/57/NPM2 presented a plan for sighting surveys in the North Pacific to be conducted in summer 2005 and spring 2006. Permission to survey in the Russian EEZ to the east of the Kuril Islands and the Kamchatka Peninsula has been granted by the Russian Federation for summer 2005. The last survey in the Russian EEZ east of the Kuril Islands was in 1990; this will be the first time that a dedicated sightings survey has been conducted in the waters east of the Kamchatka Peninsula. Two research vessels will survey from 23 July to 20 September 2005. A survey is also planned in the northern Sea of Japan in spring 2006. Japan will make an application to survey in the Russian EEZ before the acceptance deadline. The survey is planned to be in standard IO passing mode with the priority species being the common minke whale. The tentative dates are 12 May to 30 June 2006.

The Committee thanks the Russian Federation for granting permission to conduct the sighting survey in their waters during 2005 and **requests** that permission is also granted for the 2006 survey. The Committee **encourages** the development of practical ways to investigate movements of animals from the Sea of Japan into the Sea of Okhotsk and North Pacific. The Committee noted that Miyashita, a highly experienced scientist on sighting surveys, would be in charge of the cruises and **agrees** that he should act as the Committee's representative for the purposes of oversight under the RMP.

SC/57/IA21 reported Korean plans to conduct a sightings survey using the vessel *Tamgu* 3, 10 April-29 May 2006, following recommendations from the Committee. Standard one-team IWC methods for conducting sighting surveys will be employed. If circumstances allow, biopsy sampling will be undertaken. The Committee was pleased to see these plans and noted that the timing was appropriate. As only one platform is being used $g(0)$ cannot be estimated. It was suggested that the survey should focus on blocks that have not yet been surveyed or had received little coverage. The Committee noted that Sohn and An, who are experienced in conducting sighting surveys, would be on the cruise and **agrees** that they should act as the Committee's representatives for the purposes of oversight under the RMP.

The Committee noted that it is still in the process of preparing for an in-depth assessment and it **encourages** that all work to generate abundance estimates continue so that it will be in a position as soon as possible to conduct the assessment. In this respect, a number of issues were raised.

Despite the completion of a number of surveys in recent years, the Committee noted the low survey coverage, particularly in sub-areas 6 (50%) and 10 (20%). The Committee **recommends** that future surveys fill these gaps. The Committee also **recommends** that the Commission requests the relevant authorities of the Russian Federation to grant permission for survey vessels to enter EEZ and territorial (coastal) waters. The Committee **encourages** collaboration between Russian, Japanese and Korean scientists to facilitate conducting surveys in as much of these sub-areas as possible. In addition, although the surveys being conducted are providing increasing coverage of the area, some unsurveyed areas are likely to remain and consideration needs to be given as to how such areas will be treated. For example, it is difficult to survey the waters very close to the Korean and Japanese coasts.

A review of the timing of all the surveys is also needed to avoid problems when combining estimates. Consideration will also need to be given as to how the data will be used to estimate trends in abundance.

10.2.3 Stock structure
SC/57/NPM10 updated previous studies of haplotype diversity in the mitochondrial control region using 305 samples from common minke whales bycaught in Korean waters 1998-2005. PCR/direct sequencing data revealed that:

(1) haplotype frequencies showed no difference across the years analysed;
(2) the haplotype diversity and nucleotide diversity were 0.898 and 0.00670, respectively; and
(3) with no pooling there were no significant local differences, whereas using two haplogroup classifications based on single nucleotide partitions, referred

to as A4 and A5, differences were significant. Preliminary results from analyses of genetic diversity using six microsatellite loci from samples from bycaught common minke whales from Korea were also presented. These results show the possibility that there are two or more subpopulations, in accordance with the mitochondrial DNA analyses.

It was noted that care is needed in interpretation of the results of these studies because of the small sample sizes. The F_{ST} values in the microsatellite study seem too small to be significant and application of Bonferroni corrections may show that the results are not actually significant. In addition, the basis and reasons for the definition of groupings A4 and A5 was questioned.

SC/57/NPM5 presented results of genetic investigations into the population structure of western North Pacific common minke whales from coastal waters of Japan and the Republic of Korea based on products purchased on the retail markets between 1999 and 2004, updating analyses presented in Lavery *et al.* (2004). Comparisons between the two market divisions (Japan and Korea) and among the four market/stock divisions (J and O haplogroups within each market) contradicted a number of assumptions about stock structure and incidental takes used in previous RMP *IST*s. The authors concluded that the results support the hypothesis of multiple coastal stocks in the waters of Korea and Japan.

Other members reiterated their previously expressed concerns about the use of market samples to make inferences about stock structure due to the lack of data on the origin of the market purchase (i.e. the date and location of where and when the animal was bycaught). They also referred to methodological problems with the analysis. This and related issues are discussed further in Annex G (item 4.3).

In conclusion, some members of the Committee believed that the results presented at this year's meeting provided evidence of population structuring within J-stock. Others disagreed and believed that it was too early to come to such a conclusion. The Committee **agrees** that further work is required and believes that collaborative studies would be the most productive way to further understanding of stock structure of common minke whales in this area.

The Committee was informed that some collaborative studies between Korea and Japan are ongoing and it **encourages** further collaborative work between Japanese and Korean scientists. The Committee looks forward to the presentation of results from genetic analyses of animals from Korean and Japanese bycatch at next year's meeting.

The Committee also noted that a large difference in the peak of conception for animals in the J- and O-stocks has been shown. This and other non-genetic information will need to be taken into account when considering stock structure.

10.2.4 Biological parameters
SC/57/NPM12 presented an investigation into variations in length and sex ratio by location, using data from 320 common minke whales bycaught in Korean waters from 1998 to 2004. The authors concluded that there is probably some spatio-temporal segregation by length and sex, in that most bycaught animals are small in size but their sex ratio differs by month and year.

The Committee **agrees** that the strongly varying sex ratio by season is indeed suggestive of segregation by sex, and

thus integrating genetics into studies of variation in length and sex by month/year and location would be informative.

SC/57/NPM14 presented a study of age and growth in common minke whales bycaught in Korean waters from April 2002 to May 2004. This is discussed further in Annex G (item 4.4).

10.2.5 Total takes
SC/57/BC5 reported on a mark-recapture estimate of the total number of common minke whales entering the Korean market, regardless of their source. The best estimate was 827 whales (SE=164), which suggests that more animals are entering the market than from recorded bycatch alone. The difference between the total market supply and the recorded bycatch is imprecisely estimated and could be improved by comparing the results with data from DNA registers. Further discussion of this paper and points arising from it are in Annex J.

SC/57/NPM6 provided an estimate of the proportion of J- and O-type common minke whale products purchased on Japanese markets from December 1997 to February 2004, using mixed-stock analyses, to set plausible bounds of total takes over time. This paper is discussed in more detail in Annex J. Based on grouping the market individuals into mtDNA haplogroups as described previously by Baker *et al.* (2000), the proportion of J-stock individuals on the Japanese market was estimated to be 45.5% (SE=4.3%) over the seven-year study. There was no significant difference in this proportion after the 2001 change in regulations controlling the sale of bycatch. A minimum total take of 616 J-stock common minke whales over the seven-year survey period was estimated using the estimated stock proportions and the known Special Permit take of 740 from the O-stock.

Responses to this paper are given under Item 7.2.2.

10.2.6 Assessment methodology
SC/57/NPM7 put forward a Bayesian framework for the assessment of the J-stock of common minke whales. The approach makes use of catch and commercial Catch Per Unit Effort (CPUE) information and, in particular, applies a set net effort-based model to estimate bycatch in years for which these data are not available. Pending finalisation of the actual data that might be used for input, an illustrative application of the approach was provided. The results were shown to be particularly sensitive to the commercial CPUE data used.

The Committee noted that the assessment model would need to be updated with the new data on abundance and total takes and adapted in the future depending on the results of discussions on stock structure. Work is currently being undertaken to provide these new data.

The Committee discussed the use of catch or bycatch per unit effort (CPUE) as an index of abundance for assessment. The Committee **agrees** that actual data on fishing effort from each fishery with significant bycatch should be used, and that these would need to be disaggregated by season, area and gear type. The bycatches themselves should also be disaggregated to the extent possible, such that a Generalised Linear Model (GLM) standardisation of the kind commonly used in the analysis of fishery CPUE data could be applied. The Committee **recommends** that the required data be made available. GLM standardisation is also important for the commercial CPUE data, but in particular disaggregation by area is required, given the shift in effort from the Sea of Japan to the Yellow Sea between

the earlier and later years of the series. The Committee recalled the extensive discussions of the use of CPUE data in earlier years and the potential problems when using this type of data, and **agrees** that the problems identified in the report of the 1987 Workshop on the Use of CPUE Data (IWC, 1989) should be considered before further developing a CPUE-based assessment. It was noted that CPUE series had nevertheless been analysed and effectively used for common minke whales in the Barents Sea using indices for individual vessel.

Estimates of absolute abundance are critical for the in-depth assessment. As recommended in Annex G, item 4.2, future surveys should aim to cover as wide a range as possible to improve coverage. Information on the proportion of animals moving from the Sea of Japan into the Sea of Okhotsk, about which there is great uncertainty, would be very valuable.

The Committee **agrees** that any decision on the most appropriate assessment method should wait until a range of such methods have been evaluated.

10.2.7 Other
In response to a request from the intersessional Steering Group, Kim provided a brief summary of the historical trends in Korean stationary fishing gear. There have been dramatic increases in both the number and the area covered by fishing gears since the early 1990s, but sharp decreases since the early 2000s, due to restructuring of the fisheries industry to reduce fishing effort in Korea. The Committee **welcomes** this information.

10.2.8 Future work
The Committee **agrees** that the material presented at this meeting was a significant advance and thanked Korean scientists in particular, for their hard work during the previous year. However, it was clear that large information gaps still remain. For example, the CPUE data are limited and difficult to interpret, there are large gaps in coverage in sighting surveys that provide estimates of abundance, stock structure is still unclear, and there is no information on bycatch in countries other than Japan and Korea. The Committee recognises that a quantitative assessment may be several years away. However, there was a need to proceed with some urgency, particularly because of the Committee's concern about the effect of bycatch on the status of the J-stock. Some members noted that evidence presented to date showing relatively low abundance and high bycatch had not allayed this concern.

The Committee **recommends** that the work identified in its report continue as expeditiously as possible. The results of the Steering Group's (Annex P(11)) deliberations on a future work plan can be found in Annex G, Appendix 6.

10.3 Southern Hemisphere whale stocks other than Antarctic minke and right whales (see Annex H)
10.3.1 In-depth assessment of Southern Hemisphere humpback whales
The Comprehensive Assessment of Southern Hemisphere humpback whales has been discussed since 1999 (IWC, 2000d). At this meeting, substantial progress has been made and the Committee expects to complete the assessment in 2006.

The Committee had discussed whether to associate the historical feeding stocks of Southern Hemisphere humpback whales (Areas I–VI) with the more recently assigned breeding ground classifications (A-G, X; IWC, 1998a).

Since no consensus on the appropriate association was reached, the Committee **agrees** at present to continue to refer to the feeding grounds by their number and the breeding grounds by their stock letter.

10.3.1.1 REPORT OF THE INTERSESSIONAL GROUP
The Committee received a report from the intersessional group to summarise the state of knowledge of Southern Hemisphere humpback whale stocks (Annex H, Appendix 7). It thanked the group and **recommends** that its work continues until the Comprehensive Assessment of this species is completed. It also **agrees** that the table (SC/57/SH11) with summarised information be published on the Commission's website[8].

10.3.1.2 DISTRIBUTION AND ALLOCATION OF HISTORIC CATCHES
The Committee examined information on humpback whale historic catches in the Southern Ocean during the period following World War II with emphasis on IWC Areas IV, V and VI (SC/57/SH6).

Last year, the Committee proposed that the allocation of historic catches from the Antarctic Peninsula be investigated in light of new information on stock structure (IWC, 2005g, p.244). After some discussion, the Committee agreed that the A/G border in the feeding grounds requires modification. Two scenarios were suggested. The first apportions all catches to the west of 50°W and south of 60°S to breeding stock G, while the second apportions all catches to the west of 50°W and south of 50°S to G (fig. 1 in Annex H). The Committee **agrees** that the 100°W-70°W core area for stock G be extended eastward to 50°W.

The key remaining issue for the catch series is to assign the 1959/60 and 1960/61 catch information presented in SC/57/SH6 to the correct stocks. Currently, they have been allocated based on the proportion of the reported catches. It was suggested that all catches provided in SC/57/SH6 be compared with the IWC database, with resolution of any differences in either catch numbers or area assignments. It is probable that the IWC database requires updating in terms of positional information (at the highest resolution possible) for the 1959/60 and 1960/61 *Slava* and *Sovietskaya Ukraina* catches; the breakdown of these catches into smaller areas will be possible for some, but not all, catches. The likelihood of determining the locations of the 7,177 Soviet catches from the *Slava*, *Sovietskaya Ukrania* and *Sovietskaya Rossia* expeditions for which there are currently no location data requires investigation.

The Committee noted that funding is already available for a meeting of a small group (Annex P(1)) to finalise the incorporation of the Soviet catches into the IWC database. The Committee **recommends** that this meeting take place within the next six months and that the existing group of scientists proposed last year be expanded to include Clapham and Findlay. This meeting should further review and verify the fleet cruise tracks, so that the feasibility of apportioning unknown humpback whale catches on cruise tracks can be assessed. The Committee **recommends** that the humpback whale catch series should be finalised by January 2006 and made available on the IWC website for use in the population dynamics modelling (see Item 10.3.1.4).

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[8] *http://www.iwcoffice.org/commission/sci_com/scmain.htm.*

10.3.1.3 NEW INFORMATION ON ABUNDANCE, RATES OF INCREASE AND STOCK STRUCTURE

10.3.1.3.1 ANTARCTICA

The Committee received a number of papers on this topic. These included the examination of the movements of humpback whales around the Antarctic Peninsula (SC/57/SH2), a genetic analysis of the relationship between two feeding areas (west coast of the Antarctic Peninsula and the Magellan Strait) and breeding stock G (SC/57/SH3), and a study of the relationship of humpback whale density and chlorophyll-a concentration in the Gerlache Strait (SC/57/SH8).

An update on data collection from IDCR/SOWER humpback whale samples from Areas I, II and III was provided to the Committee. A total of 92 samples are available and analysis should be completed and presented by the next annual meeting. The sample sizes that exist for Areas I, II and III are relatively small. If the genetic data contrasting wintering regions and potential corresponding feeding grounds are to be useful for the assessment of Southern Hemisphere humpback whale stocks, it is necessary that biopsy sampling during future Antarctic cruises be given the highest priority. Recognising the complexities and issues of survey design and priorities for cetacean work by the IDCR/SOWER cruises in the Antarctic environment, the Committee **urges** that the collection of tissue biopsy samples from Antarctic humpback whales be given greater priority than at present.

It was noted that a proposal for access to samples collected during IDCR/SOWER cruises from Areas IV, V and VI was approved some time ago. In 2003, it had been agreed that half of all of the IDCR/SOWER samples would be transferred to the Southwest Fisheries Science Center in the USA (IWC, 2004b, p.50), although the samples have not yet been shipped. The Committee **recommends** that priority be given to the transferring of these samples (Zerbini will oversee this process).

A summary of the genetic analyses of 287 humpback whale samples obtained during JARPA surveys at the feeding grounds of Areas IIIE, IV, V and VIW was presented (Pastene *et al.*, 2005). Focus was given to testing the geographical ranges proposed by the Committee for stocks C, D, E and F[9] in the Antarctic feeding grounds (IWC, 2005g, p.236). Results of mtDNA analysis showed that whales in these geographical ranges are genetically differentiated, suggesting some structure of the humpback whales in the feeding grounds. However, analysis based on six microsatellite loci, while exhibiting some degree of genetic heterogeneity, was unable to discriminate among these potential stocks. It was suggested that different degrees of fidelity to breeding areas between females and males could explain such results. Analysis of mtDNA suggests that the historical sector of mixing between stocks D and E at 110-130°E has been occupied more by the D stock in recent years.

Estimates of abundance and rates of increase for humpback whales from JARPA cruises were presented (Matsuoka *et al.*, 2005). There was substantial discussion on issues related to potential sources of bias from JARPA data (Annex H, item 6.3.1), with different views being expressed (Annex H, Appendices 2 and 3). It was noted that the JARPA review is currently scheduled for mid- to late-2006

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[9] According to the sub-committee's decision (Annex H, item 6), these are equivalent to Areas IIIE, IV, V, VIW.

(SC/57/O2). The Committee **agrees** that issues associated with the interpretation of the JARPA data should be considered at the JARPA review meeting. However, it also encourages submissions that will help inform the discussion and consideration in the meantime.

Details on the discussion of these papers are found in Annex H, item 6.3.1. The Committee welcomed them and **recommends** that these studies be continued in the future.

10.3.1.3.2 SOUTH AMERICA

The Committee received two papers from South America. These included the first photographic matching of a humpback whale from Brazil to South Georgia (SC/57/SH1). Information from photo-identification data showed that whales feeding in the Magellan Strait migrate to Ecuador, Costa Rica and Panama with strong site fidelity to the latter locality (SC/57/SH10). Details of these studies can be found in Annex H, item 6.3.2. The Committee welcomed the presentation of these papers and **recommends** that these studies be continued in future years.

10.3.1.3.3 AFRICA

The Committee received SC/57/SH13, which evaluated the significance of the division of breeding stocks between regions in the South Atlantic and Western Indian Ocean (stocks A, B, C and X). As discussed in Annex H (item 6.3.3), the situation is complex and at present no change to the sub-region nomenclature is recommended. There is no value in trying to redesign the boundaries without clear definition and degree of gene flow for the various sub-regions. Based on the total evidence and on the direct observation of dispersal of identified individuals, it seems that in at least some localities gene flow is ongoing across present boundaries. The minimum gene flow that is required between two localities in order to include them within a single management unit has not been established. The Committee welcomed the work presented and **recommends** that these studies be continued in future years.

10.3.1.3.4 OCEANIA

The Committee received three papers under this item. The report of the 6th Annual Meeting of the South Pacific Whale Research Consortium (SC/57/SH9), noted numerous new matches made between existing catalogues in this region, demonstrating a significant degree of interchange between over-wintering grounds. Of particular interest was the discovery of matches between French Polynesia and other areas of the South Pacific: Cook Islands (1), Tonga (5) and New Caledonia (1). A new catalogue from American Samoa provided new matches with French Polynesia, the Cook Islands and Tonga, despite a relatively small number of fluke photos. This further demonstrates the complexity of interchanges between the various populations of humpback whales in the South Pacific region.

The Committee received an updated analysis of the population structure of South Pacific humpback whales and the origin of the eastern Polynesian breeding grounds (Olavarria *et al.*, 2005). The significant geographic differentiation reported supports the recognition of at least five subpopulations (breeding grounds) of humpback whales across the South Pacific, each one corresponding to a specific winter breeding ground. The most isolated humpback whale subpopulation within the South Pacific is found in waters off Colombia. The differentiation of mtDNA diversity between the Indian Ocean breeding ground (Western Australia) and the South Pacific grounds (except with Colombia) was low. The significant

segregation observed among breeding subpopulations is partially consistent with the six IWC Antarctic management stocks, largely corresponding with one or more tropical breeding ground, supporting a further division of breeding stock E at least into two units. The question of the origin of the breeding areas in eastern Polynesia remains unresolved.

SC/57/SH12 presented preliminary new abundance (6,555 ± 389 whales) and rate of increase (10.6 ± 0.5%) estimates for the eastern coast of Australia. The rate of increase agrees with those previously obtained for this population and demonstrates the continuation of a strong post-exploitation recovery. It was noted that there was no expectation that the Committee would accept the estimate but rather that it would provide feedback to the authors of the paper, who would then bring a final estimate to the Committee next year.

Further discussion of these papers is described in detail in Annex H, item 6.3.4. The Committee welcomed these papers and **recommends** that these studies be continued in the future.

10.3.1.4 POPULATION DYNAMICS MODELLING
Four papers were presented under this item. SC/57/SH15 presented a Bayesian assessment of breeding stocks D and E (western and eastern Australia) using a model that allows for mixing on their feeding grounds. The Base Case estimates current abundance relative to the pre-exploitation population size (K) to be 0.46 for stock D and 0.29 for stock E. Projections into the future assuming a zero harvesting scenario show (in terms of the median) near complete recoveries to pristine levels in some 15 years for stock D and some 20 years for the currently more depleted stock E. A posterior distribution for the maximum growth rate parameter r was developed. It was suggested that this prior be used for similar Bayesian assessments of other Southern Hemisphere humpback whale populations for which little or no information on increase rates is available. Two other papers used this prior to assess the status of the stocks B (western Africa), C (eastern Africa), G (western coast of South America) (SC/57/SH16) and A (eastern South America) (SC/57/SH17). Current abundance estimates for breeding stocks A, B and G are low ($0.25K$, $0.09K$ and $0.25K$ respectively), whilst the current abundance estimate for breeding stock C is much further recovered at $0.79K$. Projections under a zero harvesting strategy estimate breeding stock C to be fully recovered by 2020, whilst breeding stocks A, B and G will be fully recovered only by about around 2030. Details on the discussion of these papers are to be found in Annex H, item 6.4.

The Committee noted that while the data available for breeding stocks D and E dominate updates of prior inputs for growth rate in the Bayesian assessment of these populations, this is not the case for breeding stocks A, B, C and G. Estimates of future trends for all four of these and of the current status for B, C and G are heavily dependent on extrapolation of growth rate information for stocks D and E through the use of a posterior distribution from the latter as a prior for the former. This process could be improved by the use of hierarchical meta-analysis for stocks B, C and D, but nevertheless that would be based on as few as two estimates for the growth rate parameter r from stock D and stock E if only other Southern Hemisphere humpback whale populations are taken into account. For this reason, the Committee cautions that estimates given above for stocks B, C and G should not be regarded as very reliable.

SC/57/O21 described a multi-species model based on feeding ground information (from IDCR/SOWER population estimates) for absolute abundance rather than the breeding stock-based estimates used in the models presented above. The model's results suggested that the population growth rate would slow sooner in the future than is suggested by the single species models. Details on the discussion of this paper are to be found in Annex G, item 3.3.3.

The Committee welcomed the presentation of these papers and **suggests** that further work be done to refine the input data for the models and the modelling framework.

10.3.1.5 ANTARCTIC HUMPBACK WHALE CATALOGUE
SC/57/SH7 summarises the progress of the Antarctic Humpback Whale Catalogue (AHWC). During the 2004/5 contract period, the AHWC catalogued 445 photo-identification images representing 315 individual humpback whales, including 50 previously known individuals. These submissions bring the total number of catalogued whales to 2,238. Matches made during the contract period to previously sighted individuals include resightings between the Antarctic Peninsula and Ecuador (7) and Colombia (1); between Ecuador and Colombia (2); between Chile and Ecuador (2); the first documented re-sighting of an individual between Brazil and the Scotia Sea (1); and between Eastern Australia and Antarctic Area V (1). Trans-equatorial migration is confirmed by some of these resightings. It was noted that the website has been revised in accordance with IWC policy, and users may now choose to search a public database or log in as a contributor. It was noted that the IDCR/SOWER cruise was one of the very few contributors of Antarctic photographs outside of the Antarctic Peninsula and the Committee **recommends** continued collection of photographs to establish ties between the feeding and breeding grounds.

The Committee stressed the important contribution the catalogue makes to its work and **recommends** that it be continued. Financial implications are discussed under Item 21.

10.3.2 Assessment of Southern Hemisphere blue whales
10.3.2.1 NEW INFORMATION
A number of papers on blue whales (*B. musculus*) were presented to the Committee. They included reports of projects on blue whales off Southern Chile, where there is increasing research on the species (SC/57/SH5, SC/57/SH14, SC/57/O19). The Committee welcomed the presentation of these papers and **recommends** that these studies be continued.

The Committee considered the report of the intersessional group to summarise the state of knowledge of Southern Hemisphere blue whales. This was in a similar format to the humpback whale summary table referred to under Item 10.3.1.1. It was noted that available information was limited and that continued submission of abundance, trend estimates and stock structure information was welcomed. A number of sources of further information were identified and these have been incorporated into the table. The Committee **recommends** that the work of the intersessional group continue to complete this table.

10.3.3 Work plan
The Committee **agrees** that completion of the Comprehensive Assessment of Southern Hemisphere humpback whales is a high priority and that it should proceed as described in Annex H, item 6.8. This will

include an intersessional Workshop that will be partly funded by the government of Australia (for details see Annex H, Appendix 7[10]) and will focus on:

(1) advancing the Comprehensive Assessment of Southern Hemisphere humpback whales to near completion using the best available data; and
(2) reviewing the abundance, population structure and status of Southern Hemisphere humpback whales breeding populations and their relationship to feeding grounds in the Southern Ocean.

This will facilitate the completion of the assessment by the end of the next annual meeting. The Committee **recommends** that the Workshop take place and thanked the Government of Australia for its offer. Financial implications are discussed under Item 21.

Completion of the Comprehensive Assessment also requires the finalisation of a final catch series for Southern Hemisphere humpback whales. The Committee **recommends** that this work be undertaken at an intersessional meeting in Cambridge.

The Committee **agrees** that the Comprehensive Assessment of blue whales should be initiated in 2006, as previously recommended (IWC, 2005g, p.244). In this regard, Branch will try to:

(1) provide new abundance estimates from recent IDCR/SOWER cruises;
(2) provide an updated catch series split by sub-species and area;
(3) collate positional data from sighting, catch, acoustic sources, and satellite tags;
(4) revise the assessment by Ichihara and Doi (1964) of pygmy blue whales; and
(5) examine the feasibility of using IDCR/SOWER cruises to estimate the proportion of blue whales outside the Antarctic survey region.

Financial implications of the work plan are discussed under Item 21.

10.4 Other small stocks – bowhead, right and gray whales (see Annex F)
10.4.1 Small stocks of bowhead whales
SC/57/BRG11 described molecular genetic relationships among bowhead whales in eastern Canadian Arctic and West Greenlandic waters. The objective of the study was to investigate whether or not the Hudson Bay/Foxe Basin (HB-FB) bowhead whales are genetically distinct from the Baffin Bay/Davis Strait (BB-DS) animals. The ultimate goal will be to provide information for the management of the subsistence harvest of bowhead whales in the eastern Canadian Arctic. On the basis of the microsatellite analyses, Igloolik (HB-FB) samples were significantly differentiated from the Pangnirtung and Disko Bay (BB-DS) samples. Several mechanisms could have contributed to these results, including: geographic partitioning, age and reproductive status segregation, temporal segregation, selective mating strategies/success, or some combination of these factors. The subsequent discussion of SC/57/BRG11 on the relationship between bowhead whale stocks in the Arctic is given in Annex F (item 4.2.1).

SC/57/BRG8 described temporal changes of the genetic structure of the Spitsbergen stock of bowhead whales based on bones collected on raised beaches on Svalbard. The authors were unable to detect any temporal haplotype structure in the historical Svalbard population. In the future, they plan to extend the dataset with 200 additional samples from Svalbard and the Norwegian mainland. Rosenbaum indicated that a plan had been established to merge historical and current data sets from the eastern Canadian Arctic stocks with the data presented in SC/57/BRG8.

10.4.2 North Atlantic right whales
North Atlantic right whales are among the most endangered of all the large whales, with a remaining population of around 300 individuals. The population appears to be in decline, largely due to anthropogenic impacts such as ship collision and entanglement (IWC, 2002d). SC/57/BRG13 summarised recent research and management activities for this species. Reproductive rates have improved substantially in recent years and a total of 27 calves have already been identified in 2005. However, the status of this population continues to be a major concern in light of the high anthropogenic mortality. The Committee **repeats its previous recommendation** on this population (e.g. IWC, 2005c, p.32), i.e. that it is **a matter of absolute urgency** that every effort be made to reduce anthropogenic mortality in this population to zero. There were eight deaths in the past year, including six since November 2004. A precise cause could not be attributed in all cases, but four were known or suspected ship strikes and one was the result of entanglement. The USA has developed a strategy to address ship strikes through new operational measures for the shipping industry and education and outreach programmes.

Although calf counts have been high in recent years, survival rates have not been updated since the 2002 Workshop on right whale survival estimation (Clapham, 2002; IWC, 2003c, p.247). The Committee noted the importance of updated survival estimates and **recommends** that such an analysis be performed.

As noted in previous years, some North Atlantic right whales are only seen on their breeding ground, suggesting that some potential feeding areas remain unidentified.

SC/57/BRG7 described efforts to estimate the age of North Atlantic right whales based on allometric relationships visible in lateral photographs of their heads. Changes in the curvature of the rostrum and the height of the dome were the best predictors of age in the external anatomy of the head of right whales. The accuracy of age prediction decreased with age: it was maximal for calves and minimal for whales older than 8yrs. Mean coefficients of variation of repeated measurements ranged from 0.31 to 4.11%. The Committee commends the authors on this useful study and notes that now the technique has been developed on a group of known-age animals, it can potentially be applied to other right whale populations.

SC/57/BRG20 evaluated the results of Rastogi *et al.* (2004), which explored the impact that Basque whaling had on historical population sizes of North Atlantic right whales and bowhead whales. Both species had been severely hunted and, with the exception of one of the bowhead populations, neither has shown signs of recovery. The topic presented by Rastogi *et al.* (2004) was of considerable importance given that present management of North

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[10] Although the proposal was first presented to the Plenary session, it is included as an Appendix to the Annex at which it was first discussed.

Atlantic right whales is focused on recovery to estimated pre-exploitation population sizes. The Committee considered that SC/57/BRG20 illustrated a number of errors in the work ranging from study assumptions and study design to analysis and interpretation. It concluded that Rastogi *et al.* (2004) have drawn inappropriate conclusions about pre-exploitation and 16th century right whale populations based upon genetic data from a single individual right whale.

The Committee **agrees** that the results of Rastogi *et al.* (2004) should not be used to estimate pre-exploitation size, recovery targets and levels of pre-exploitation genetic diversity for North Atlantic right whales.

10.4.3 Southern Hemisphere right whales
SC/57/BRG2 presented updated estimates of demographic parameters for Southern right whales on the south coast of South Africa. Aerial counts of right whale cow-calf pairs between 1971 and 2003 indicate an annual instantaneous population increase rate of 0.069/year^{-1} over this period. Observed calving intervals ranged from two to 23 years, with a principal mode at three years. The model of Payne *et al.* (1990) produces an estimate for adult female survival rate of 0.990 with a 95% confidence interval of (0.983, 0.997). First year survival rate was estimated as 0.734 (0.518, 0.95). The current population is estimated as some 3,400 animals.

The Committee welcomed the results of this study, which illustrates the great value of long-term monitoring. As it has in previous years, it **recommends** that this extensive programme be continued.

SC/57/BRG12 reviewed published catch data and the sighting distribution of southern right whales in the eastern South Pacific, off the coasts of Chile and Peru. The primary goal was to address a gap in knowledge identified in the 1998 Workshop on the status of right whales (Best *et al.*, 2001). Historical winter catches were primarily near central Chile (30°S), between Coquimbo and Valparaíso. Feeding grounds have not been well established for this population.

SC/57/ProgRep Australia described inshore aerial surveys for southern right whales off southern Australia in the winter and spring of 2004. Two 'short' flights on the southern Western Australia coast and one 'long' flight along the coast into South Australia were performed. The latter was used for the yearly comparison of the 'Australian' population. The number recorded on the 'long' flight in 2004 was not as high as expected given the previous strength of that three-year cohort in 2001. Nevertheless, significant positive increase rates were obtained for 'all' animals and cow-calf pairs in that data series. For cow-calf pairs, the increase rate for the period 1993-2004 was 6.4% (p=0.004) and the 95% CI remained wide (1.71-11.23%). The Committee welcomed this report and **recommends** that this monitoring programme and other long-term monitoring programmes be continued.

SC/57/O5 reported southern right whale sightings during the 2004/05 JARPA survey in Area V. Three individuals were sighted in three groups.

10.4.4 Other small stocks of right whales
SC/57/O3 reported North Pacific right whale sightings during the 2004 JARPN II survey. Four individuals were sighted in two groups, southeast of the Kamchatka Peninsula.

10.4.5 Western North Pacific (WNP) stock of gray whales
SC/57/BRG23 summarised the distribution and abundance of western gray whales off the northeast coast of Sakhalin Island, Russia in 2004. Aerial, vessel and shore-based surveys were carried out by the Russian programme during summer and autumn. There was a higher inshore distribution of gray whales compared to 2003, with sightings in the 'offshore' area having declined from 12 to three animals in aerial surveys, and from 50 to nine animals in vessel-based surveys. In the near-shore Piltun feeding area, the number of sightings increased from 27 to 49 sightings (aerial), from 47 to 63 (vessel-based) and from 70 to 122 (shore-based). The cause of observed gray whale redistribution is unclear but was most likely a reflection of prey availability. The main feeding season lasted two months, from the third 10-day period of July through to the end of September.

SC/57/BRG25 summarised efforts to study benthic communities in the two primary feeding grounds off the northeastern Sakhalin coast. Although some previous preliminary data were available for the benthic fauna at Piltun, the 'offshore' area had not previously been studied. Whales feeding at Piltun were found mainly within a shallow-water benthos complex dominated by amphipods and isopods. Mobile, deposit-feeding amphipods were dominant and distinguished by their eurybiotic nature, short life cycle and high growth rates. The 'offshore' feeding area was characterised by the seston-feeder amphipod, *Ampelisca eschrichti*.

SC/57/BRG9 described Russian efforts to photo-identify western gray whales on the northeastern Sakhalin shelf, 2002-2004. Photo-identification studies were conducted from the vessel *Nevelskoy* in 2002-03 and *Oparin* in 2004. Over the three years, 121 individuals had been identified. There was an apparent increase in the number of large groups in 2004 relative to the previous year.

SC/57/BRG1 presented the 2004 results of the on-going Russia-USA research programme on the western gray whale population summering off northeastern Sakhalin Island. A total of 92 whales (including seven calves and two previously unidentified non-calves) were identified from photographs leading to a 1994-2004 catalogue of 140 photo-identified individuals. Between 1995 and 2004, 23 known reproductive females had been documented. However, over the course of this study six calves had already been weaned by the time they were first encountered. Therefore, if all six of these 'independent' calves had mothers other than the 23 known reproductive females, the maximum number of calf bearing females could be as high as 29 individuals. Genetic samples collected from these whales will be used to determine the identity of the mothers. There are plans to produce and publish a western gray whale photo-identification catalogue (140 animals) before next year's meeting.

SC/57/BRG22 presented an analysis of western gray whale photo-identification data collected in the Piltun feeding ground, Sakhalin, during 1994-2003. This analysis had also been presented to the World Conservation Union (IUCN) independent scientific review panel (ISRP) for western gray whales in 2005 (Reeves *et al.*, 2005), discussion of which is provided below. An individually-based, stage-structured model was fitted to the data, to estimate vital parameters and to project the population forward under different assumptions. The population was estimated at 102 animals aged 1+ in 2004 (90% CI 94-110).

The 1+ survival rate was estimated as 0.97 (0.96-0.98), while the 'yearling' survival rate (i.e. from the first to the second summer of life) was estimated at 0.73 (0.61-0.83). The population is estimated to have been increasing at approximately 3% (90% CI 1-5%) per annum during this period. Projections forward to 2050 indicate that if the current situation continues, the population is very likely to continue to increase as long as there are no additional deaths. However, projections under the assumption of one additional female death per year indicate that the population would decrease and quite likely become extinct by 2050.

To date, Piltun and the 'offshore' area are the only two feeding areas known in the Okhotsk Sea. All photographs of western gray whales found outside of the Sakhalin Island feeding ground have been successfully matched to the animals using the Piltun area.

SC/57/BRG18 described the sighting and ultimate entanglement death, of a juvenile female gray whale in Tokyo Bay. The animal was sighted repeatedly from mid-April until its recovery in a coastal set net on 11 May 2005. This was despite the fact that central and local authorities had given instructions to fisheries operating in the vicinity of Tokyo Bay not to disturb the animal and to try to release it if it became entangled. The whale was 7.81m in length and estimated at 1.5 years and was thought to be a recently weaned animal on its second northbound migration from the wintering ground to the northeast coast of Sakhalin.

SC/57/BRG14 provided an update on the genetic analysis of western gray whales. Western gray whales have been shown to be significantly different from the eastern population using mtDNA analysis and nuclear markers. However, the differentiation between the populations is greater for females than it is for males. This finding, coupled with the high number of mtDNA haplotypes in the western population, especially among males, raises the possibility of low levels of male dispersal from the east into the west.

Sohn summarised the second year of shore-based surveys on western gray whales off the coast of Korea. Five researchers participated in the survey in 2004, with three individuals on watch at all times, rotating through three observation stations. Surveys were conducted 21-30 December 2004, however no gray whales were sighted.

The Committee welcomed the news that the Russia-USA programme has produced a catalogue of individuals identified to date that is near to publication. It noted that the catalogue would be available to all interested parties (contact R.L. Brownell). It **agrees** that the Russian scientists working on photo-identification as part of the oil companies' research work should compare their photographs with those in the catalogue, and that potential new whales should be reviewed by a group of experts (including scientists from both programmes) before being added to the catalogue. After the publication of the catalogue, the Committee **strongly recommends** that researchers from the two programmes work as quickly as possible to share and compare all their photographs, agree on a single catalogue that is updated regularly and collaborate on future data collection and analyses. As has been found elsewhere for other species, the Committee believes that conservation efforts for the western gray whale can be best achieved by collaboration rather than by completely separate photo-identification programmes.

The modelling work in SC/57/BRG22 has emphasised the critically endangered status of this population and in particular the potentially detrimental effect of the death of even one additional female per year. Given this, the Committee **recommends** that every effort be made to ascertain whether the animal that died recently in Tokyo Bay was a previously identified animal. This could be achieved by:

(1) comparison with the photo-identification catalogues; and

(2) comparison with the DNA catalogue held at the Southwest Fisheries Science Center (SWFSC), California on behalf of the Russia-USA programme.

Given the difficulties in standardising microsatellite loci between laboratories, the Committee **recommends** that arrangements be made for a sample from the Tokyo Bay animal to be sent to the genetic archive of the joint Russia-USA programme (i.e. the SWFSC). It **urges** the appropriate CITES authorities to facilitate this.

The Tokyo Bay entanglement illustrated the need for an education campaign for fishermen and others throughout the gray whales' potential range, to provide information on the need for every effort to be made to release incidentally caught whales and how this might best be achieved and the importance of taking photographs and/or collecting a sample from stranded or bycaught whales and providing them to the appropriate authorities. The Committee **urges** relevant Governments to try to implement these ideas.

Similarly, the Committee **recommends** that efforts be made in all of the range states to organise stranding networks, aerial surveys and beach surveys, particularly during the period of the northern migration (animals migrating north alone for the first time are probably the most vulnerable).

Finally, the Committee welcomes and supports the report of the ISRP (Reeves et al., 2005) that had included five members of the IWC Scientific Committee (Brownell, Cooke, Donovan, Moore and Reeves). It commended SEIC[11] for requesting this review and IUCN for facilitating the process. Despite some difficulties, it believes that this process represented an important step forward for western gray whale conservation.

The Committee strongly supports efforts to build upon this in the future and to develop a framework for collaborative research, monitoring and mitigation efforts between oil companies, independent experts, national programmes and authorities and the IWC and other intergovernmental organisations. In this regard, it **strongly urges** that other companies in the area co-operate with this process.

An important addendum to the ISRP report (Reeves et al., 2005) was the need for a comprehensive strategy to save western gray whales. The panel noted that while their review had necessarily focussed on the Sakhalin feeding region in Russian waters, gray whales spend approximately half their time in other waters in eastern Asia (Japan, the Republic of Korea, the Democratic People's Republic of Korea and China). The results from SC/57/BRG22 emphasise the need for mitigation measures for the many potential threats to the western gray whale throughout its range. There are a number of groups that already play a role in discussing and reviewing the population status and management and research needs for this population,

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[11] Sakhalin Energy Investment Corporation, a consortium of companies developing oil and gas reserves in the region.

including the IWC Scientific Committee, the Russian Group for Strategic Planning of Gray Whale Research, the joint Russia-US programme, the IUCN Cetacean Specialist Group and other national programmes that may form the basis for developing a strategy. The importance of involving scientists, authorities and other stakeholders in the range states was recognised. The Committee **recommends** that the IWC plays an active and facilitating role in the process.

10.4.6 Work plan
The work plan for the coming year is to review new information on the WNP stock of gray whales, right whales and the small stocks of bowhead whales.

10.5 Future SOWER cruises (see Annex G)
10.5.1 Report from Intersessional Workshop
Last year, the Committee agreed that the objective of any future programme should be:

> to provide information to allow determination of the status of populations of large whales that feed in the Antarctic waters. The programme will primarily contribute information on abundance and trends in abundance (including of Antarctic minke whales), learning from both the successes of past IDCR-SOWER cruises and the difficulties in interpreting previous results (IWC, 2004b, p.35).

A Workshop (SC/57/Rep1) held in October 2005 continued work on the development of a future SOWER research programme. The Workshop agreed that the long-term goal for a future programme is to provide circumpolar estimates of abundance and trends in abundance for large whales that feed in Antarctic waters. It also agreed that the short term goal for a future programme is to undertake research on priority species including to: (a) undertake experimental surveys to provide information useful in developing optimal survey design and methodology and addressing problems with previous IDCR/SOWER surveys; and (b) provide estimates of abundance for smaller areas (in conjunction with stock structure studies), which will be potentially useful in investigating long term trends.

The Workshop agreed that the following species priorities should be assigned in order from highest to lowest:

(1) Antarctic minke and blue whales;
(2) fin whales;
(3) humpback whales;
(4) sei and right whales; and
(5) sperm whales.

The Workshop recommended that the Scientific Committee should consider its report as a set of guidelines for the development of an initial proposal for a future programme and that Scientific Committee members should provide papers to allow for efficient progress to be made on the development of a proposal for the long term programme.

The Committee **agrees** with the Workshop's long and short term goals for a future programme. In addition, the Committee **recommends** that the sightings surveys, as conducted previously, should not immediately be continued, and that in the short term the goals of the cruises should address questions and problems that have arisen during the previous CP surveys and should investigate different data collection and analysis methodologies that could be used to collect abundance and trend data for the large whale species that feed in Antarctic waters.

10.5.2 Recommendations for future SOWER cruises
10.5.2.1 2005/06 SEASON
For the practical purposes of planning, the Committee assumed that the Japanese Government would continue to provide vessels and assistance at the present level, even though it was recognised that no decision has been taken and that this represents a major investment from the Japanese Government. After evaluating potential experiments to address problems with previous analyses, new methods to collect less biased future data and other data needed to complete assessments of large whales in the Antarctic (Appendix 2 of Annex G), the Committee **agrees** the priority of research for the 2005/06 cruise is as follows (with highest priority assigned to the first item):

(1) Antarctic minke whales: Experiments designed to address problems with analysis and interpretation of CPII and CPIII Antarctic minke whale abundance estimates (BT mode, satellite tagging, collaborative research with icebreaker);
(2) a fin whale survey feasibility study north of 60°S;
(3) humpback biopsy and photo-identification studies; and
(4) continuation of blue whale research.

It was noted that the priority rankings of several experiments were conditional, for example, because of the uncertainty of being able to acquire the necessary equipment such as satellite tags and user-friendly high power binoculars. The research to be completed during the 2005/06 cruise is dependent on the completion of a number of tasks (listed in Appendix 2 of Annex G). The Committee **recommends** that these tasks be completed and the Tokyo planning meeting:

(1) facilitate a full evaluation and possible review of its relative priority ranking; and
(2) finalise the research to be conducted on the 2005/06 cruise.

The Committee **recommends** the IWC/SOWER Steering Group (Annex P(12)) complete the planning of the 2005/06 SOWER cruise.

Morishita stated that due to current budget difficulties, it now should not be assumed that the Japanese Government will be able to continue to provide vessels and assistance at the previous level. A decision will be made later.

10.5.2.2 LONG TERM
There was insufficient time available for the Committee to develop firm long term plans to fulfil the objectives of the SOWER programme. It was noted that feedback from the fin whale feasibility study planned for this year's cruise would provide information useful for the next step of designing a long-term plan for SOWER research. To promote discussion next year, the Committee **recommends** that, time allowing, the Planning Meeting produce an outline of a potential long-term plan and present this to the next year's meeting. In addition, the Committee **recommends** that members also submit proposals on this to next year's Committee meeting. Together these could be used to develop a proposed long-term plan for the SOWER research.

10.6 Other
10.6.1 Report from a non-IWC sponsored workshop on sperm whales
Bannister presented SC/57/IA8, Summary of Report of Cachalot Assessment Research Planning Workshop, Woods

Hole, Massachusetts, USA, 1-3 March, 2005[12]. Thirty six scientists from nine countries had participated. At its 2005 meeting, the Committee had accepted the initiative to begin preparing the background for an eventual in-depth assessment of sperm whales, noting that considerable progress is being made on improving basic knowledge of sperm whales; at that time it looked forward to the report as a useful way of integrating current understanding of the species.

The Workshop had three terms of reference, developed by a Steering Group within the IWC Scientific Committee:

(1) identify and evaluate new methods, identify critical tests of such methods, and describe how these might be conducted, especially using combinations of new methods simultaneously;

(2) identify relevant spatial scales and formulate plans for regional field studies to address key uncertainties relevant to an eventual in-depth assessment; and

(3) develop a research programme that would be necessary and sufficient as the basis for an in-depth assessment of sperm whales, including research coordination and funding mechanisms.

The Workshop's context was set by an overview of Whitehead's global assessment (Whitehead and Planck, 2002). Recent research was reviewed under the headings: population structure and movements, abundance and distribution, life history, population ecology, human interactions, field studies and future work. In addition to developing a systematic list of research topics and priorities, several items were identified as highest priority. These included: developing provisional hypotheses about population structure; obtaining information on female survival rates; improving historical catch data; exploring further the effects of differential exploitation by sex; improving methods to correct abundance survey data to account for bias; and refining population modelling approaches. The need for regular and substantive interaction between modellers and field researchers was emphasised. Three coordinating tasks were identified, including the need for a second Workshop in two years time.

The Commitee thanked the organisers for providing the report, and **agrees** that it should consider sponsoring the second Workshop.

10.6.2 Consideration of proposals for further in-depth assessments

North Pacific sei whales and Southern fin whales were suggested as candidates for future in-depth assessments. North Pacific sei whales were suggested because the IWC has not conducted an in-depth assessment on this species in over 30 years and takes of this species have resumed under JARPN II. Southern fin whales were suggested because they may be an important predator in the Antarctic ecosystem, takes of this species may be resumed (SC/57/O1) under JARPA II and there is some reason to believe that historical assessments may have underestimated the extent of depletion at the time of protection (SC/57/IA13). It was noted that new data on North Pacific sei whales are currently being collected under JARPN II and it is noted that new data on Southern fin whales will be

collected during the 2005/06 SOWER survey. To evaluate which species should be considered for future in-depth assessments, the Committee **recommends** papers be presented at future meetings that discuss the reasons why an in-depth assessment should be conducted and the status of the necessary data (distribution and abundance, stock structure, biological parameters, total takes and assessment methods).

10.6.3 Historic abundance estimation: genetic methods

Last year, the Committee discussed a study by Roman and Palumbi (2003) which used genetic diversity in mtDNA to infer historical levels of abundance of 240,000 humpback, 360,000 fin and 265,000 common minke whales in the North Atlantic. The Committee agreed that these figures, which greatly exceeded previously reported estimates of pre-whaling abundance for at least humpback and fin whales, had considerable uncertainty associated with them and could not be considered reliable estimates of immediate pre-whaling population size. A Working Group listed a series of questions that needed to be addressed in order to resolve this discrepancy (IWC, 2005i) and an intersessional e-mail group was established to continue discussion of this issue.

Although some progress was made on a few of these issues (see below), this has not been sufficient to reconcile the genetic estimates with those from analysis of catch data.

10.6.3.1 GENETIC ISSUES: CORRELATING GENETIC DIVERSITY WITH EFFECTIVE POPULATION SIZE

Palsbøll summarised a report on progress in Palumbi's laboratory in the last year. New analyses of the mitochondrial control region mode of mutation based on multiple models of mutation and new data on baleen whale phylogeny and divergence times had revealed no significant change in their abundance estimates. Estimates of genetic diversity obtained from the cytochrome *b* locus (also in the mitochondrial genome) were compared to the original estimates obtained from mtDNA control region sequences. The cytochrome *b* locus was estimated to evolve about 5-7 times slower than the mtDNA control region, which is consistent with the 5-7 times lower estimates of diversity at this locus. The estimates of abundance are thus similar to that obtained for the mtDNA control region. These data were collected from Antarctic minke whales and may be biased by the large genetic variation in this population and the long branches leading to highly divergent control region lineages. Palumbi's lab is working on a phylogenetic estimate of the control region mutation rate based on overlaying the control region data on the cytochrome *b* genealogy; this should correct for multiple mutations in the mtDNA control region by using the cytochrome *b* sequences as a base line. A limited data set collected from humpback whales detected very low levels of variation among cytochrome *b* sequences compared to the mtDNA control region. The importance of additional cytochrome *b* sequences from humpback whales to make more headway with regard to the discrepancy between common minke and humpback whales was stressed.

Palumbi's laboratory was also collecting data from the mtDNA control region, mtDNA cytochrome *b* and nuclear data (10 loci) in 142 gray whale samples. They were likely to have preliminary estimates ready in the near future. They were undertaking new analyses on non-equilibrium estimates of population fluctuation based on genetic data. The data show long-term increases of population size in

Antarctic minke whales but with no signal of Ice Age fluctuations. The analyses revealed a steady population size in North Atlantic fin whales and population expansion in North Atlantic common minke whales. However, Palsbøll commented that the former conclusion is not reliable given the strong signal of expansion that he and his collaborators have observed in their fin whale data set from this ocean.

Humpback whales appear to have mainly stable population sizes over time but the estimates are highly variable. Palumbi had felt that this might reflect pulses of gene flow rather than pulses of population size. A Bayesian version of this latter analysis will be implemented to obtain confidence limits. There is no evidence of historic population crashes and that the analyses suggest that long-term average population size is lower than recent effective population size, at least in the case of the Antarctic minke whale.

Palsbøll commented that Palumbi's observations that the population expansions were pre-Pleistocene in origin, would mean that Roman and Palumbi's estimates would be, if anything, negatively biased (i.e. there would need to have been even more whales in the North Atlantic to explain the observed level of diversity). This analysis depended critically upon an estimate of mutation rate. If the true rate is significantly higher than that used in Palumbi's analysis (as many people believe), then the resulting estimates would drop sharply.

10.6.3.2 STATISTICAL RELIABILITY OF CATCH RECORDS

SC/57/O7 revisited the problem of estimating the pre-exploitation sizes of the two populations of North Atlantic humpback whales. Several sources of uncertainty in the underlying data and in population models were considered. One factor considered was the uncertainty in the estimated catches of North Atlantic humpback whales given by Smith and Reeves (2003). The sensitivity of the results from the model to this uncertainty was explored by considering extreme scenarios for the historical catches created by considering four sources of uncertainty:

(1) the effect of interpolating landings between years because of incomplete data series;
(2) statistical uncertainty associated with the estimate of barrels of oil per whale;
(3) statistical uncertainty with the ratio of numbers struck but lost; and
(4) the possibility that catch estimates for the years prior to 1850 were grossly underestimated because of limitations in data sources.

Upper bounds on catches considering each of the four factors ranged up to 43,000, and considering all factors simultaneously led to upper bounds of the order of 69,000. This value is 135% of the best estimate of historical catches of 29,000 whales, and implies a notional upper limit on pre-whaling abundance of 80,000, the present abundance plus total catches.

These upper bounds on catches and other uncertainties with the data for these populations were used to estimate pre-whaling abundance using different sets of data and model assumptions. As expected, the pre-whaling abundance estimates for both populations were below the 'notional upper limit'. For all models considered, including those that explored the extreme scenarios of catches, total pre-whaling abundance was still substantially below the estimate of average abundance over evolutionary time scales given by Roman and Palumbi (2003).

10.6.3.3 OTHER ISSUES

There was no reported progress on any of the other issues outlined last year.

The Committee **agrees** that this Working Group should continue during the coming year (see Annex P(32)). It noted that there are a number of new genetic analyses that are being undertaken that *inter alia* will provide considerably better estimates of mutation rate, one of the most critical (and uncertain) factors in the Roman and Palumbi article. It looks forward to receiving this information next year.

10.7 Work plan and budget request

10.7.1 Sub-committee on in-depth assessments

The Committee acknowledged the heavy workload of the sub-committee this year. There was considerable discussion on how best to relieve this workload. It was agreed that the highest priority next year is to try to finalise abundance estimates of Antarctic minke whales from the CPI to CPIII time series. The Committee therefore **agrees** that sufficient time should be allocated to achieve this. Consideration should be given to work on the North Pacific common minke whale in-depth assessment, to occur outside the sub-committee, at least for next year. The best way to achieve this will be discussed by the Convenors after the meeting (and see Item 19).

The priority topics under this Agenda Item will thus be in priority order:

(1) produce agreed abundance estimates of Antarctic minke whales;
(2) continue development of the catch-at-age analyses of the Antarctic minke whales;
(3) continue preparation for an in-depth assessment of WNP common minke whales, with a focus on J stock;
(4) develop recommendations for future SOWER cruises, both for the short- and long-term; and
(5) continue to examine and then attempt to agree on reasons for differences between minke abundance estimates from CPII and CPIII.

Annex G (Appendix 6) details tasks identified to produce estimates of abundance of Antarctic minke whales. Annex G (Appendix 4) details tasks to continue development of the catch-at-age analyses, where the goal is to complete these analyses at the 2007 meeting. The financial implications are discussed under Item 21. Annex G (Appendix 5) details tasks to continue preparations for an in-depth assessment of WNP common minke whales, with a focus on J stock.

11. STOCK DEFINITION (SEE ANNEX I)

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

In 2003, the Committee instigated the TOSSM project (IWC, 2004b, pp.27-8; IWC, 2004f, pp.469-85). The main aim of this project is to develop simulation tools that can be used to examine the performance of current and future genetic population structure techniques. The focus is on management implications, where the genetic techniques are used to suggest management boundaries, which in turn are used to set or subdivide catch limits according to some rule; the performance of different genetic methods is ultimately to be assessed in terms of how well a simulated management regime performs if the suggested boundaries are used. The Committee's experience of studying population structure, e.g. in developing *Implementation*

Simulation Trials (*IST*s) for common minke whales in the North Pacific, has shown that genetic data do not usually provide unequivocal evidence of specific boundaries for use in management. Furthermore, few boundary-placement techniques have been subject to simulation testing. Even those that have, cannot be considered to have undergone the level of extensive simulation testing to incorporate uncertainty that has been a feature of, for example, the IWC's work on the RMP and AWMP. This is perhaps not surprising, given the scope and complexity of developing suitable genetically-specified simulation datasets.

The Committee has identified the following six work modules, each of which has to be completed before the simulation performance testing can actually begin:

  (i)   genetic simulation;
  (ii)   biology and population dynamics;
  (iii) sampling;
  (iv)   catch strategy;
  (v)   adaptation of boundary-settings methods for testing; and
  (vi)   integrating all of the above to allow a complete test to be run.

The chosen vehicle for *Implementation* is the freely-available software RMETASIM developed as a result of the Workshop, which required some modifications to cope with whale-specific life history patterns and with harvesting. By the 2004 meeting, much progress had been made on those modifications and on the detailed specification of the above modules. Three technical priorities were identified last year, and following intersessional work by the TOSSM Core Group (Martien, Tallmon, Tiedemann), all three are expected to be complete by 1 July 2005. This will essentially complete modules (i), (ii), and (iii), at least for the simple demographic archetypes that are to be considered initially. It will then be possible to generate simulated genetic datasets suitable for boundary-setting methods; some further work will be required on (iv)-(vi) before the methods' performance can be tested. Although it was hoped last year that some such datasets would be ready for this year's meeting, delays beyond the Core Group's control have prevented this.

The Committee welcomed the progress made, and thanked the Core Group for their efforts. Future plans for the project are presented under Item 11.4.

11.2 Review of statistical and genetic issues relating to population structure (including DNA quality issues)

A number of methodical papers were discussed (see Annex I). SC/57/SD1 described the initial development of an allele-matching model for analysing population structure, for use when the existence of subpopulations is uncertain and *a priori* assignment of samples to hypothesised subpopulations is problematic. The total genetic correlation is partitioned between a subpopulation component and a covariate-linked component unrelated to population structure. The authors plan to apply the method to B-C-B bowhead whales in the coming year. The Committee noted the promise of the approach, made a variety of methodological suggestions and **strongly encourages** its continued development and application for the 2006 meeting.

SC/57/SD2 presented further results of close-kin analyses, using new data in the North Atlantic common minke whale DNA register. The register was screened for pairs of apparently closely related individuals. The most closely related pairs were then screened at 15 additional microsatellite loci, and these loci were used to test the hypothesised relatedness. Preliminary results showed that the distances between parents and offspring were often large, and that the number of confirmed parent-offspring pairs was higher than expected given the estimated abundance and assumed mortality rate. Further work is required to investigate the statistical significance of this finding, and its sensitivity to demographic assumptions. The Committee noted the power and cost-effectiveness of the approach (expensive extra genotyping is only needed on those animals most likely to be informative) and **strongly encourages** its further development.

SC/57/SD5 reported further investigations into the extent of bias in the Boundary Rank procedure when applied to unevenly-sampled clines. The Committee noted that the TOSSM/RMETASIM framework is approaching the point at which it can be used for testing the full management implications of boundary-setting procedures, and **recommends** that this framework be considered for future simulation tests.

Genetic data quality

At the 2004 meeting, the Committee's discussions on bowhead whales had highlighted a number of issues related to quality of microsatellite data and caveats about its interpretation, ranging from DNA handling issues to e.g. ascertainment bias and mis-scoring, to the implications for population structure analyses. A review was proposed for 2005, and the preparation of a review paper was encouraged. Although work began on this intersessionally, it proved to be too large a task. The Committee noted, however, that several review papers have appeared in recent published literature. Palsbøll offered to compile a list of appropriate references for the 2006 meeting.

11.3 Definition of unit-to-conserve and the implications for management

The point of this item is to allow consideration of various possible definitions of unit-to-conserve, and their corresponding implications for management (see IWC, 2002c, p.49). No papers were received this year, but the Committee received a verbal summary of recent thinking in the academic literature about definitions of 'population'. Two paradigms can be identified: the evolutionary paradigm which is concerned with levels of gene flow, which scales with the *absolute number* of effective migrants per generation; and the ecological paradigm, which is concerned with the *per capita* rate of migration per generation. A number of proposed definitions of 'population' within each paradigm are shown in Annex I but few if any of the definitions are operational, in the sense of providing a quantitative criterion for separating 'populations' in a management context. This emphasises the importance of a process such as TOSSM to bridge the gap between empirical data related to population structure, and management objectives such as avoiding local depletions. Despite the absence of an operational definition of 'population', a number of possible criteria might be used to make the definitions in Annex I quantitative and operational; some suggested criteria may be found in Annex I.

The Committee noted that these or similar criteria might prove valuable in:

(1) adapting existing methods for analysing population structure to TOSSM;
(2) actually applying such methods; and
(3) aiding experimental design and sample size calculations.

From the IWC perspective, there are a wide variety of possible temporal and spatial scales that could be of interest for management. In addition, there are some population structures that are persistent in space and/or time, but that do not correspond to breeding stocks: for example, matrilineal philopatry as exhibited by 'feeding stocks' of humpback whales. The Committee's aim has therefore been to get to a point where it can provide advice to the Commission about likely levels of depletion on a range of different temporal and spatial scales, and for different types of population structure. This has been the principle underlying TOSSM. By experimenting with different criteria during the adaptation of existing methods to TOSSM, the Committee will gain experience about which criteria tie in best with management objectives.

In recent years, new analytical methods (and increases in available data) have allowed for considerable increases in the power for detecting population structure. Given large enough sample sizes and numbers of loci, there is now a realistic possibility for some whale species of detecting significant genetic differences that, while genuine, are actually not important in demographic terms: i.e. where the migration rate is too high to warrant separate management. This is a considerable change from a few years ago, when the available data and methods very typically were not powerful enough to detect a migration rate that is low enough to warrant separate management, but high enough to blur the genetic signal.

High power to detect very weak population structure has another potential downside: care must be taken not to confuse small artefacts (e.g. non-random sampling, family structure, data errors) with a true signal of population differentiation. This emphasises the need for careful attention to experimental design, sampling protocols, and data quality control, as well as the importance of understanding the biology of the target species.

Finally, the Committee noted the importance of regular and repeated communication with population geneticists, to bridge the evident gap between academic methods development and the practical conservation/management issues that the IWC faces.

11.4 Work plan and draft agenda for 2006
11.4.1 Further work on TOSSM
The IWC has extensive experience of complex simulation exercises similar to TOSSM, such as the development of Management Procedures for the RMP and AWMP. To avoid costly back-tracking, it is important to do some 'full runs' early on - that is, to make sure that the entire set of steps can be completed together for a fairly simple scenario - before spending too much attention on polishing individual details. Although some background work is still needed, TOSSM has now reached the 'full run' stage. Once initial 'full run' results are in hand, it will be time to discuss preliminary results with non-IWC developers of population structure methods, who form an essential part of the TOSSM process.

The Committee believes that the most efficient way forward is to hold an intersessional Workshop after completing the background work and some 'full runs'. Preparatory work will include adapting about four existing population structure methods to TOSSM, as well as one or more methods developed by Committee members. The Workshop will also involve non-IWC population geneticists who have developed population structure methods, and will present feedback on preliminary tests of those methods, along with development of further datasets and simulation scenarios. The Workshop objectives are:

(1) present results of preliminary runs using existing adapted methods;
(2) discuss adjustments to the first sets of simulated data;
(3) discuss how to better adapt existing boundary-setting methods;
(4) discuss other boundary-setting methods that might be tested in TOSSM; and
(5) decide on priorities for further simulated datasets (e.g. more complex population archetypes, more realistic genetics, simulation of physical tags).

A date sometime in March 2006 would leave enough time to:

(1) complete the background work beforehand; and
(2) implement some of the Workshop recommendations before the next annual meeting, so that a more useful set of test results can be considered.

Tiedemann offered to host the meeting at the University of Potsdam, including free meeting facilities and the provision of computing power for generating extra datasets during the meeting. The Committee thanked Tiedemann for his offer and **strongly endorses** the proposal for a Workshop. The full proposal is given in Appendix 2 of Annex I, along with a timetable and lead personnel for pre-Workshop preparations. Financial implications are discussed under Item 21.

11.4.2 Draft agenda for 2006
The priority issues for next year's meeting are:

(1) review statistical and genetic issues relating to stock definition;
(2) review progress on TOSSM;
(3) unit-to-conserve; and
(4) review of genetic data quality issues.

12. ENVIRONMENTAL CONCERNS (SEE ANNEX K)

12.1 Sea ice and whale habitat Workshop
As agreed last year, a Workshop entitled 'High Latitude Sea Ice Environments: Effects on Cetacean Abundance, Distribution and Ecology' was held in Ulsan, South Korea from 28-29 May 2005. The aim of the Workshop was to review information on sea ice environments in the Arctic and Antarctic, and to develop means of incorporating sea ice and similar data into analyses and models used by the Scientific Committee in its work.

The report of the Workshop is given as SC/57/Rep5. The Workshop provided an excellent opportunity for scientists who typically work at either pole to meet and exchange information on sea ice variability with respect to whale habitats. The three invited talks provided information on the present understanding of decadal changes and current conditions at both poles. Common themes included:

(1) the extreme variability in sea ice conditions at both poles;
(2) the complexity of both polar ecosystems; and
(3) the great dearth of sea ice data, especially at scales relevant to cetacean habitat assessment, with regard to retrospective and forward-looking investigations.

Research tools are now available that can augment future studies including:

(1) passive acoustic recorders, both short and long-term instruments (i.e. sonobuoys and moored recorders);
(2) satellite telemeters for attachment to cetaceans, augmented with oceanographic instrumentation (e.g. CTDs, fluorometers); and
(3) sea ice analytical tools to provide routine application at the temporal and spatial scale of whale habitats (i.e. days to months; 1 to 1,000s km).

The Committee **recommends** the application of these tools to future cetacean research in the Arctic and Antarctic and **encourages** researchers to continue the collaborative exchanges initiated at the symposium.

The Workshop identified a number of high priority intersessional projects targeted at issues in polar regions. Two Arctic projects were proposed. The first focuses on retrospective analyses of sea ice conditions, using both satellite-derived data and traditional ecological knowledge (TEK) to collate with extant records of B-C-B bowhead and ENP gray whale population dynamics. The second project seeks to investigate health status in both populations with regard to variability in sea ice. The Antarctic projects focus on:

(1) areas of high Antarctic minke whale density;
(2) shelf break position correlation with whale distribution;
(3) data-rich regional comparison of variables affecting distribution;
(4) analysis of Antarctic minke whale distribution and relative proportions inside and outside the pack ice;
(5) integration of historical and recent whale catch/sighting data; and
(6) support for the completion of the Southern Ocean Collaboration Database.

Finally, it was noted that the Integrated Analysis of Circumpolar Ecosystem Dynamics (ICCED) initiative in the Southern Ocean and the International Polar Year (IPY) afford unprecedented opportunities for collaborative multi-disciplinary research in polar regions. The aforementioned tools provide the means to fully integrate cetacean studies into broad-scale programmes of marine ecosystem research in ways not imagined only a few years ago. For these reasons, the Committee **strongly recommends** the integration of cetacean research into these two programmes.

The Committee expressed its deep appreciation to Thiele and Moore for their hard work in organising and convening the Workshop. The Committee **endorses** the findings and recommendations in the report of the Sea Ice Workshop. Financial implications are considered under Item 21.

12.2 Review of the report of the Habitat Degradation Workshop
The Committee was pleased to receive the report (SC/57/Rep2) of the IWC Workshop on Habitat Degradation which was held at the University of Siena, 12-15 November 2004. The Workshop was financed by the Government of Austria, the Environmental Investigation

Agency, ASMS-Ocean Care and the World Wide Fund for Nature.

The main discussion of the Workshop report took place in the SWG on environmental concerns and the reader is referred to Annex K for a more detailed summary of the Workshop. This summary presents the main conclusions of the Workshop and its recommendations.

In its conclusions, the Workshop had stressed the importance of undertaking work relating habitat conditions to cetacean status in the context of conservation and management. It recognised that this is a particularly complex area of study, requiring both theoretical developments in modelling approaches and a commitment to long-term interdisciplinary data collection programmes.

The Workshop noted that the framework it had developed (see fig. 3 of SC/57/Rep2) provided the basis for a long-term approach to investigating the significance of habitat degradation for cetaceans. However, general application of the framework will require a much longer-term view to be taken by management and research bodies. This would eventually result in major improvements in advice to resource managers for conservation and management of cetaceans with respect to predicting the effects of habitat degradation and the effects of many anthropogenic activities, as well as the development of appropriate mitigation measures. The Workshop noted that the continuation of the present *ad hoc* and usually insufficient processes (such as 'Environmental Impact Assessments' based on short-term limited datasets) would be unsatisfactory.

In order to facilitate the development process, the Workshop agreed that the primary focus should be on populations for which it was believed there was the most chance of success, i.e. those for which good information is available on both cetaceans and their habitat over a reasonable time period. The Workshop recognised that overall there are few cetacean populations studied with broad sampling programmes covering sufficiently long time frames.

The Workshop also stressed the value of long-term monitoring of both cetaceans and key aspects of their habitat at appropriate temporal and geographical scales. Baseline data on natural variability in cetacean populations and their habitat are a prerequisite to determining whether anthropogenic changes in the habitat are important to the conservation of cetacean species. Obtaining suitable information on the biotic and abiotic features of habitat will require interdisciplinary efforts and co-operation. It agreed that where possible, collection of cetacean data, as well as data on their environment, should be conducted simultaneously. It also noted that spatial modelling approaches are particularly valuable in integrating data on cetacean distribution and abundance with data on their habitat.

The Workshop also stressed the need to better understand the feeding and reproductive behaviour of cetaceans. With respect to the former, this particularly includes the relationship of cetacean distribution with their prey. As suggested in the report of the SOWER 2000 Workshop (IWC, 2000e, pp.319-46), this will include fine-scale research on feeding strategies and prey selection. It also requires much better knowledge of the distribution, behaviour and abundance of prey species which will require better cooperation with other disciplines, especially physical and biological oceanographers and fisheries scientists.

Newer technologies such as satellite tagging (including environmental sensors), remote sensing and new initiatives for developing ocean-based observing systems (e.g. in the USA and Europe) have the potential to provide broad-based data sets on both cetaceans and their habit.

The Workshop also made a number of recommendations (see item 12.2 of SC/57/Rep2); the key recommendations are summarised below.

The Workshop strongly recommended that effort be put into further consideration of the framework including:

(1) linking of the different types of models, e.g. through data on vital rates;
(2) developing ways to model how stressors affect features of the habitat or individuals directly; and
(3) developing ways in which spatial modelling approaches can better incorporate dynamic variables.

Attention must also be given to trying to determine the relative importance of natural versus anthropogenic environmental changes on the dynamics of cetacean populations.

The Workshop also strongly recommended the continuation (and where necessary, initiation) of long-term studies, both of cetaceans as well as key biotic and abiotic features of the environment. In this regard, the Workshop recognised that this may require a change in emphasis of both management and research agencies. In the present climate there is often reluctance to invest in long-term programmes. The Workshop stressed that the issue of cetaceans and habitat degradation will only be resolved by long-term multidisciplinary datasets. This will also require a change in the way many institutes evaluate scientists. At present, this is often on the basis of the number of publications. It is often a feature of long-term monitoring programmes that they do not result in several publications per year despite the fundamental importance of the work. This may discourage high calibre scientists from committing to such programmes to the detriment of cetacean conservation.

The Workshop also recognised the difficulties in developing (and measuring) suitable indices both of habitat quality and response in cetaceans. It recommended that further work be undertaken in this regard, particularly with respect to:

(1) identifying key features of cetacean habitat;
(2) reviewing methods used to assess cetacean nutritive status in both live and dead specimens, with a view to future standardisation of techniques; and
(3) developing indices of cetacean response to various stressors.

Other recommendations concerned the importance of interdisciplinary research, the development of standard necropsy protocols, the importance of considering the representativeness of information collected via strandings programmes; appropriate long-term preservation of tissues; the use of metadatabases to improve collaborative research and data/information sharing and the development of habitat restoration science and technology.

The Committee thanked Simmonds, the Convenor, and the Workshop participants for their report and **endorses** its conclusions and recommendations. The Committee **agrees** that it will review progress on habitat degradation recommendations in 2008.

There was considerable discussion of aspects of the report in the SWG and this can be found in Annex K (item 7). Issues discussed included: the value of properly archiving older studies and datasets (including searching the grey literature); the choice of case studies to which to apply the framework; the integration of noise into habitat models; the value of strandings schemes; the need for standardised protocols for pathology (particularly with respect to possible acoustic trauma); and the need for 'control' datasets from 'normal strandings' for comparisons to suspected acoustic traumas.

The Committee recognised that pathology should not be examined only in cases where acoustic trauma is suspected. Therefore the Committee **agrees** that management agencies and pathologists should follow equally rigorous, standardised pathology protocols in fresh, natural strandings as they do in atypical mass stranding events when acoustic trauma is suspected, especially in those areas identified as 'controls'.

12.3 Habitat related issues
12.3.1 Steering Group report on POLLUTION 2000+
SC/57/E12 presented an interim report on POLLUTION 2000+. Three papers have now been published (Tornero *et al.*, 2005; Tornero *et al.*, 2004; Wells *et al.*, 2004) and another is in review (Hall *et al.*, in press).

With respect to the bottlenose dolphin sub-project, the Steering Group has made progress on the process of identifying a relatively highly polluted area inhabited by bottlenose dolphins. Unfortunately, sampling bottlenose dolphins in the initially proposed area, the Mediterranean, proved to be impractical in terms of both sample size and costs, after considering the results of a feasibility study. However, samples from bottlenose dolphins from Biscayne Bay, Florida, USA and New Brunswick, Georgia, USA have been collected by US scientists, and the Steering Group will evaluate whether one of these provides a suitable alternative.

Progress on the remaining analyses required under the harbour porpoise sub-project has been very slow due to administrative and logistical issues (e.g. in obtaining permits) that obstructed the shipping of samples from the USA to Europe. Although it seems that these problems have now been overcome, the results from the analyses will not be available until next year.

The Steering Group is also examining the possibility of extending the sample size of harbour porpoise tissues collected under POLLUTION 2000+, by investigating retinoid levels in harbour porpoises from the UK and/or from the northeast Atlantic.

The Steering Group has developed an intersessional workplan to finalise Phase I of the project and report the results to the Committee and the Commission next year. The Steering Group will also evaluate whether it believes Phase II of the project should proceed, and if so, will bring a workplan and associated budget to the Committee for consideration next year.

The Committee **endorses** the POLLUTION 2000+ programme and the intersessional workplan. It **strongly recommends** continuation of the programme and **agrees** that the work of Phase I should be completed by next year's Scientific Committee meeting.

12.3.2 Progress report of the Southern Ocean Collaboration Working Group

The IWC Southern Ocean Collaboration Working Group (IWC SOC) conducted field work and analysis during the intersessional period. The IWC SOC commenced field work with Southern Ocean Global Ecosystem Dynamics (SO-GLOBEC), Commission for the Convention on Antarctic Marine Living Resources (CCAMLR) and other research programmes in 2000, and the benefits from this ecosystem-focused research are now being realised. The field collaboration has given the IWC an important role in the synthesis and analysis phase of these programmes, with IWC SOC members now participating in ecosystem modelling and analysis projects that should improve the understanding of the links between whales and the environment in this region.

Six papers from IWC SOC were presented at this year's meeting, using data from the IWC SOC Database. A spatial analysis of sea ice habitat for whales and seasonal availability of sea ice habitat types was presented in SC/57/E1; SC/57/E2 provided an update of the progress made with the completion of the SOC database; and SC/57/E3 provided a summary of field and analysis work conducted intersessionally, including the group's involvement in the development of the science planning for the Integrated Analysis of Circumpolar Ecosystem Dynamics (ICCED) initiative (long term follow on to SO-GLOBEC) and a number of collaborative analysis projects, including circumpolar modelling and analysis of whale and seabird time series with environmental variables. In addition, SC/57/E4 provided an update on field work carried out under the IWC SOC (international collaboration on multidisciplinary ecosystem research cruises); SC/57/E10 presented a preliminary analysis of whale presence in the Ross Sea from acoustic instruments, one of the first along-track acoustic surveys in sea ice; and SC/57/SH4 provided important new data from year-round acoustic monitoring instruments on seasonal patterns in blue whale distribution off East Antarctica. The Committee welcomed this updated information, and **strongly encourages** continued collaboration in the Southern Ocean. Financial implications are considered under Item 21.

12.3.3 State of the Cetacean Environment Report (SOCER)

SC/57/E8 (SOCER 2005) provided information on issues of environmental concern for the polar regions, as well as globally. The editors noted that the Arctic and Antarctic papers summarised in the SOCER provide evidence for global warming-induced melting of sea ice and oceanographic and ecosystem changes. Pollutant data emphasised that the polar regions are not pristine and the toxicity of some pollutants may even be enhanced in these low-temperature regions. Global issues included growing international concern about effects of noise on marine life, including cetaceans; concerns about potential threats posed by diseases in the marine environment; and changes in the distribution of cetaceans and their prey resulting from global warming. Next year, the Indian Ocean is the SOCER's priority region. The SOCER report can be seen in full in Annex K, Appendix 2.

12.3.4 Arctic issues

The SWG had considered a number of papers on Arctic issues and details of those discussions can be found in Annex K (item 8.4).

Two papers (SC/57/E13 and SC/57/E5) addressed the potential effect of variability in sea ice cover on B-C-B bowhead whales. In the first, a preliminary examination of bowhead whale body condition with reference to sea ice coverage showed a positive correlation of body condition with reduced sea ice, perhaps because a reduction of sea ice enhances feeding opportunities for bowhead whales. In the second, an examination of trends in sea ice cover over 24 years (1979-2002) for four large (~100,000km^2) and 12 small (~10,000km^2) habitats used by bowhead whales revealed significant changes in sea ice cover for three of the large and five of the small areas. This evaluation of sea ice cover at spatial and temporal scales linked to bowhead whale natural history provides a basis for research on specific regions critical to investigation of the effects of climate change on this pagophilic species. However, the biophysical links between reduction in sea ice, primary production and availability of food for bowheads in the Arctic requires investigation.

SC/57/BRG3, in conjunction with Moore (1999), provided provisional results of a passive acoustic monitoring study northeast of Barrow, Alaska. Results indicated that gray whales remained in the western Beaufort Sea through early winter 2004, with calls detected again less than three months later. This unusual occurrence of gray whales in the western Beaufort Sea may indicate a shift in seasonal migration and habitat use that could result in competition between bowhead and gray whales.

Anon. (2005) described coordination of International Research Programmes in the Arctic. The International Polar Year (IPY 2007-2008) and the Second International Conference on Arctic Research Planning (ICARPII) provide unprecedented opportunities for cetacean researchers to collaborate on multi-disciplinary projects in the Arctic. Research plans evolving from these programmes seek to address priority gaps in knowledge from the Arctic Climate Impact Assessment (ACIA) (see also SC/57/Rep5). The Committee **recommends** that the IWC pursue formal ties to these international research programmes, and that participation from their oceanographers and ecologists be encouraged in whale research.

12.3.5 Anthropogenic noise

SC/57/E9 presented the latest in a series of updates on noise pollution and the limitations of mitigation measures, as well as alternative technologies (e.g. marine vibrators instead of airguns). After discussion, the Committee **strongly encourages** producers of high intensity noise (e.g. sonar and seismic operators) to share information on noise source characteristics and to work with cetacean scientists to investigate the impacts of these activities. The Committee was informed of a workshop (entitled 'A Workshop to Identify Potential Impacts and Mitigation Strategies for Offshore Hydrocarbon Industry Activities with Respect to Marine Mammals and Other Marine Fauna in the Gulf of Guinea (Central West Africa)') that will be convened by the Wildlife Conservation Society (WCS) and the hydrocarbon industry. It will take place at the end of June 2005, where data and information about industry activity will be shared, and mitigation strategies will be discussed. One of the reasons this meeting is being convened is because of the extensive oil and gas development in West Africa, potentially overlapping with numerous critical habitats for marine mammals (e.g. the coastal waters of Gabon and the

Gulf of Guinea are important humpback whale breeding, calving, and nursing grounds).

The Committee welcomed this information, **endorses** the workshop and looks forward to receiving its report, which is directly related to next year's work plan.

The SWG also considered SC/57/E16 which examined the use of sound in drive fisheries and whaling operations. SC/57/E16 noted that fishermen in different parts of the world have used sound to herd various species of small cetaceans to mass strand, or into harbours to be killed. This supports the growing body of evidence that anthropogenic noise can affect cetaceans. The paper also reviewed the use of ASDIC (Anti-Submarine Detection Investigation Committee) sound (i.e. sonar) by whalers to hunt large whales (baleen and sperm whales). The reported reaction to ASDIC by baleen whales was consistent with reactions observed by Nowacek *et al.* (2004) when they played a synthetic alerting stimulus to North Atlantic right whales.

The Committee **agrees** that detailed information on acoustic sonars be obtained whenever possible; all sonars do not have the same acoustic characteristics. This holds true for seismic surveys as well. Detail on the type, number and configuration of airguns is needed to evaluate source capabilities and the potential impact on cetaceans.

The Committee noted that mass strandings are often preceded by 'milling' events, where a group of normally pelagic small cetaceans enter shallow water and circle continually or move haphazardly in a tightly packed group. Touhey (2003) reported using the combination of herding with small vessels and acoustic deterrents to prevent milling events from becoming stranding events. It was suggested that this approach be expanded to other regions where 'milling' events are known to occur. In addition, efforts are needed to document such attempts by a scientific team independent of the rescue team. The Committee **agrees** that this work is important and **recommends** that it be expanded.

Following last year's recommendations, a two day pre-meeting Workshop assessing the potential for seismic surveys to impact cetaceans was proposed for next year. The Workshop should review and characterise information on seismic sound sources, attenuation and their effects on cetaceans as well as review relevant case studies and current mitigation and monitoring strategies. A Steering Group was formed (Annex P(18)) and Rosenbaum was appointed as Convenor (Annex K, Appendix 3). The Committee **endorses** the pre-meeting Workshop and **agrees** to the terms of reference.

12.3.6 Other
The SWG also discussed three other habitat-related papers. The first (SC/57/E7) described the use of biopsy samples to investigate the feeding ecology of ENP killer whales; the second (SC/57/E11) reported on predicting concentrations of elements (e.g. mercury, arsenic) in tissues (e.g. liver, kidney) using epidermal samples; and the third (SC/57/E15) presented information on metal concentrations in common minke whales from Korean waters. These are summarised in Annex K (item 9).

12.4 Work plan
12.4.1 SOCER
SOCER will summarise information from publications related to cetacean ecology, life history and other biological and management issues globally and will focus on the Indian Ocean for 2006.

12.4.2 Sea ice
The Committee proposed emphasis on the high priority intersessional projects identified during the Sea Ice Workshop. Financial issues are considered under Item 21.

12.4.2.1 ARCTIC
The Arctic projects focus on:

(1) retrospective analyses of sea ice conditions, using both satellite-derived data and traditional ecological knowledge (TEK) to collate with extant records of B-C-B bowhead and ENP gray whale population dynamics; and
(2) investigation of heath status in B-C-B bowhead and ENP gray whale populations with regard to variability in the extent of sea ice coverage.

12.4.2.2 ANTARCTIC
The Antarctic projects focus on:

(1) areas of high Antarctic minke whale density;
(2) correlation between shelf break position and whale distribution;
(3) data rich regional comparison of variables affecting distribution;
(4) analysis of Antarctic minke whale distribution and relative proportions inside and outside the pack ice;
(5) integrating historical and recent whale catch/sighting data; and
(6) support for the completion of the SOC Database.

12.4.3 Seismic Workshop
The SWG proposed a two-day Workshop in advance of the 2006 Annual Meeting to assess the potential impact of seismic surveys on cetaceans. The rationale, initial terms of reference, draft agenda and suggested invited participants are provided in Annex K, Appendix 3. The Committee **endorses** these plans.

12.4.4 Disease
Last year, the SWG proposed that the topic of disease be the focus of the 2007 meeting. The Committee **agrees** that the focus in 2007 should be the emerging issue of biotoxins produced by harmful algal blooms and their potential impact on cetaceans. Harmful algal blooms have been documented as the cause of numerous mass mortalities in marine mammal populations and have been increasing in frequency and expanding to global geographic distribution. It was noted that ICES is developing plans for a workshop on diseases.

13. SMALL CETACEANS (SEE ANNEX L)

13.1 Review of the status of the finless porpoise (marine populations)
In recent years there has been concern about the status of finless porpoises (*Neophocaena phocaenoides*) with evidence for a localised decline in abundance, fragmentation and degradation of habitat and high bycatch levels.

13.1.1 Distribution and stock structure
Marine populations of the finless porpoise are restricted to shallow, tropical and temperate waters (Annex L, fig. 1). Currently, three subspecies are recognised: *N.p.*

phocaenoides (the tropical marine form, distributed from the Persian/Arabian Gulf eastward to at the least the Taiwan Strait area), *N.p. asiaeorientalis* (the Yangtze River form, which some researchers believe may extend outside the river into estuarine and even marine waters of the East China Sea) and *N.p. sunameri* (the northern temperate marine form, which occurs in waters of Japan, Korea, and northern and central China). There is morphological variation (including variation in dorsal ridge size and shape) amongst the three subspecies, leading some authors to suggest species level differentiation. The subspecies of finless porpoise that occurs in the Yangtze River was reviewed in 2000 (IWC, 2001b, pp.274-5) and was not considered during this meeting.

Geographically localised studies of the distribution, cranial morphology and genetics of finless porpoises have suggested that there are at least five distinct populations in Japanese coastal waters and despite limited coverage and sample sizes, studies elsewhere in the species' range provide evidence for additional populations. The Committee concluded that finless porpoises may exhibit multiple populations over relatively small distances (as occurs off Japan), and that there are likely to be numerous small and vulnerable populations along their coastal range. The Committee **recommends** that genetic and morphometric studies of finless porpoises be conducted to assist in clarifying taxonomy and population structure in the genus *Neophocaena*. The Committee **agrees** that predictive habitat models which recognise potential variability among populations will help to better target resources for field surveys and sample collection. In this regard, the collection of detailed environmental variables during field surveys will be valuable. It further **recommends** that fine-scale surveys be carried out with particular emphasis on targeting effort to areas where the least is known (e.g. the northern rim of the Indian Ocean (including the Arabian/Persian Gulf) and the Indo-Malay Archipelago).

13.1.2 Abundance
The Committee reviewed the results of recent boat-based and aerial line-transect surveys to estimate abundance carried out in five areas, Japan, Korea, Hong Kong, Bangladesh and the Arabian/Persian Gulf. The Committee welcomed estimates from two new areas and noted the apparent decline in abundance in two other areas (Inland Sea of Japan and Persian Gulf). Given certain methodological concerns, the Committee **agrees** that most of the abundance estimates were minimum estimates (see Annex L). The Committee also noted that combined visual and acoustic surveys may result in improved estimates in the future. Given the complexity of the inshore habitat in many parts of this species range and the difficulty in surveying small cetaceans in these areas, the Committee **recommends** that a workshop be carried out to try to develop and standardise survey methodology, including the use of passive acoustics. There is long term merit in training and involving local scientists to conduct studies such as this.

13.1.3 Life history
Information on the life history parameters of finless porpoises derives primarily from stranded and bycaught animals from Japanese and Chinese waters, although new studies have begun in Korea. Growth parameters are generally similar to those of other phocoenids. Males appear to reach longer asymptotic lengths than females. Calving in finless porpoises occurs seasonally and the duration of this period differs between areas. Continued collection of data to allow estimation of life history parameters in other areas, using standardised methodology will allow more rigorous inter-population comparisons. Given the issue of inter-individual variation in reading and interpreting Growth Layer Groups (GLGs) for age determination, the Committee **recommends** that inter-calibration exercises occur between the different researchers working on this species.

13.1.4 Ecology and habitat
Finless porpoises are almost exclusively found in shallow continental shelf waters, particularly nearshore but also in offshore areas if waters depths are sufficiently shallow (i.e. <50m). Habitats include mangrove swamps, estuaries, sheltered bays and open waters with sandy, muddy or rocky bottoms. Some limited evidence indicates that local distribution patterns may be modulated by the occurrence of other small cetacean species in the same area. Finless porpoises consume a wide variety of prey species that include fish, cephalopods and crustaceans (SC/57/SM1, SM3, SM6, SM17), with some evidence of ontogenetic variation. As these porpoises have a range that includes a narrow coastal strip over a long coastline, they are exposed to a wide diversity of anthropogenic activities. Although potential threats have been identified, their impacts at the population level remain unknown. The Committee **encourages** further work to assess the potential impacts of contaminants and other anthropogenic influences on finless porpoises in all parts of their range.

13.1.5 Directed and incidental takes
No large scale commercial hunts for this species have been recorded. Some local hunting has occurred in the past and probably continues to some extent today. Furthermore, a few tens of finless porpoises have been live-captured for public display and research in Japan, China and Thailand.

Incidental mortality is probably substantial throughout the species' range. Catches are known to occur in a broad range of fishing gears including both active (trawls, beach seines) and passive (e.g. gillnets) fishing gear and also as a result of fishing with explosives and (in the Arabian/Persian Gulf) nets set for dugongs (*Dugong dugon*). There is generally little or no bycatch monitoring of these fisheries and coupled with the limited information on the size of their source populations it is difficult to quantify the population level impacts. A recommendation on bycatches is given under Item 13.1.6.

13.1.6 Consideration of status
The finless porpoise is listed as 'data deficient' by the IUCN. The species is in no immediate danger of extinction, but some populations for which the status has been assessed (such as in the Inland Sea of Japan) are apparently declining. Incidental mortality in fisheries is likely to be the biggest source of direct mortality but other anthropogenic influences such as chemical pollution, depletion of prey species and loss of habitat may all have impacts. Throughout most of the species' range, human populations are increasing and becoming more industrialised, suggesting that anthropogenic pressures will continue and intensify. Given the possibility of population structuring over relatively small geographical regions, the Committee **re-iterates its recommendation** that genetic and morphometric studies of finless porpoises be conducted to assist in clarifying taxonomy and population structure. It also noted that the range of this species includes areas that

support intensive coastal gillnet fisheries and that large bycatches have been documented in some fisheries. The Committee **recommends** that the magnitude and effects of such bycatches be investigated as a matter of priority.

The Committee recognises that inadequate information exists on the distribution of this species throughout much of its range and **recommends** that surveys be carried out with particular emphasis on targeting effort to areas where the least is known. The Committee **agrees** that the northern rim of the Indian Ocean (including the Arabian/Persian Gulf) remains an extensive area where our knowledge of the status and biology of finless porpoises is extremely poor.

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

13.2.1 Baiji
The baiji (*Lipotes vexillifer*) is the world's most endangered cetacean. Its range is restricted to the Yangtze River and the population size is believed to number in the low tens of individuals. The Commission has requested that the Government of China report progress on the conservation of the species to the Scientific Committee on an annual basis. No new information was received this year. However, it was noted that an international Workshop on the conservation of the baiji and Yangtze finless porpoise took place in late 2004 in Wuhan, China (workshop report available from *www.baiji.org*). The Workshop operated under the assumption that the Chinese authorities had decided to proceed with capture operations to remove some baiji from the Yangtze River into the ox-bow reserve and/or into a dolphinarium. The Committee was also informed that Yangtze finless porpoises would not be removed either before or after baiji were introduced into the reserve.

The Committee noted the news from the Workshop but also recalled that recommendations made at previous international workshops and those made by the Committee (IWC, 2001c) had not commonly been followed, including the recommendation to remove Yangtze finless porpoises from the Shishou Tian-e-Zhou oxbow semi-natural reserve before introducing baiji into it, because of concerns of inter-species interactions. The Committee did not discuss the pros and cons of *ex situ* versus *in situ* approaches but **agrees** with the conclusion of the Workshop that any captured dolphins should be placed in the oxbow under soft-release (i.e. temporarily monitored in a holding-pen (or pens) prior to their release) conditions. The Committee also **agrees** that the recommendation for a range-wide baiji survey should be implemented as a matter of urgency and any capture efforts be targeted on the most threatened areas while concomitant *in situ* conservation work should be pursued in areas ostensibly subject to lower levels of risk.

13.2.2 Vaquita
The Committee has followed with great interest the progress on conservation efforts on behalf of the vaquita (*Phocoena sinus*), an IUCN listed 'critically endangered' species endemic to the upper Gulf of California, Mexico. Several members of the Committee are members of the International Committee for the Recovery of the Vaquita (CIRVA). This year, the Committee received information on the use of passive acoustics to study habitat use and a brief review of progress on conservation actions recommended in the third report of CIRVA (Rojas-Bracho *et al.*, 2004) presented at last year's meeting, including the establishment of a closed area for gillnetting. The Committee welcomed progress with acoustic research on vaquita distribution and on promotion of the CIRVA recovery plan and noted that results of the acoustic study provide additional evidence of the need for urgent implementation of the plan. The Committee was informed that on 5 June 2005, the President of Mexico stated that it had been agreed to declare the highest vaquita concentration area as a refuge for this species. The Committee wholeheartedly **welcomes** this news and thanked the President of Mexico for this important conservation measure.

13.2.3 Harbour porpoise
The Committee had reviewed the status of harbour porpoises (*P. phocoena*) in the North Atlantic in 1995 and agreed that reported bycatch levels justified concern about sustainability. In 2001, a joint IWC/ASCOBANS Working Group had provided scientific advice to ASCOBANS on a simulation modelling approach that might allow ASCOBANS to develop algorithms to meet their conservation objectives (IWC, 2002c, p.59). The Committee then considered and endorsed an alternative approach for developing a relatively simple, but spatially explicit, model or models with the objective of determining bycatch levels that would allow small cetaceans to recover to, or be maintained at above, 80% of carrying capacity. This approach has now been incorporated as part of the current EU funded SCANS-II (Small Cetaceans of the European Atlantic and North Sea) Project which will advise the European Community and ASCOBANS. The Committee **agrees** that it may be appropriate to re-instate the joint IWC-ASCOBANS Working Group, as suggested by the observer from ASCOBANS, when the results from the modelling work become available. SC/57/SM13 describes a planned project as part of SCANS-II to determine appropriate limits for small cetacean bycatch (concentrating initially on harbour porpoises) in the European Atlantic and North Sea. The Committee **welcomes** this development and looks forward to receiving updates at subsequent meetings.

13.2.4 Humpback dolphin (Sousa *spp.)*
The genus *Sousa* was the subject of an extensive review in 2002 (IWC, 2002c). Jefferson reported that substantial progress had been made on implementing the recommendation for a global study on the systematics of the genus using molecular techniques. The Committee **welcomes** news of a workshop on conservation and research needs in early 2004 and encourages efforts to assess the status of *S. chinensis* in China, Taiwan.

13.2.5 Irrawaddy dolphin
The Committee addressed the status of Irrawaddy dolphins (*Orcaella brevirostris*) in 2000 (IWC, 2001c). It concluded that densities appeared to be low in most areas and that several populations were believed to be seriously depleted and threatened with extirpation, particularly in freshwater areas of their distribution. Subsequently, five geographically isolated populations have been classified in the IUCN Red List as 'critically endangered' due to small population sizes and continuing declines in abundance. In 2000, the Committee recommended that all live captures should cease 'until affected populations have been assessed using accepted scientific practices' (IWC, 2001b, p.266). The Committee noted that the proposal to transfer Irrawaddy

dolphins from CITES Appendix II to Appendix I was approved at the 13th CITES Conference of Parties in October 2004.

The Committee welcomed new information on opportunistic and dedicated surveys in two previously unsurveyed regions – northwest Australia and the mangrove channels of the inner Sundarbans Delta in Bangladesh. It noted that other unknown populations almost certainly exist within the range of the species and **expresses concern** about observations reported in SC/57/SM4 of potentially unsustainable bycatches in a drift gillnet fishery for elasmobranchs.

13.2.6 Other recommendations
The Committee welcomed a preliminary attempt at compiling a global review of interactions between cetaceans and longline fisheries (SC/57/BC3). Although longline fishing has generally been viewed as being benign to cetaceans, a large variety of species have been incidentally hooked or entangled by this fishery. Small and medium sized cetaceans appear to be more vulnerable. The Committee noted that a large number of additional cetacean species and countries could be added to the existing compilation and it **commends** plans by the authors of the paper to conduct a more comprehensive review in the future.

The Scientific Committee has been unable to complete a full assessment of the status of Dall's porpoise (*Phocoenoides dalli*) populations as directed by IWC Resolution 2001-12, in the absence of necessary information. The last reviewed abundance estimates in 1991 for Dall's porpoises affected by the Japanese harpoon fishery were 217,000 (CV=23%) for the Central Okhotsk Sea (*truei*-type) and 226,000 (CV=15%) for the Southern Okhotsk Sea (*dalli*-type). Catch statistics from the Japanese Fisheries Agency website for January-December 2003 were 7,412 individuals for the *dalli*-type and 8,308 individuals for the *truei*-type, which represent 3.4% and 3.7% of the 1991 abundance estimates for both types, respectively. Directed takes of Dall's porpoise have exceeded the Scientific Committee's recommended anthropogenic mortality limit of 2% of abundance (IWC, 2002c, p.58) for over 15 years, and the fishery remains the largest directed hunt for small cetaceans in the world. The Committee **repeats its previous recommendation** that directed takes be reduced to a sustainable level as soon as soon as possible.

13.3 Consideration of revision of IWC cetacean list
The present IWC list of recognised species of cetaceans does not include two very recent changes in cetacean taxonomy, specifically the description of a new beaked whale species (*Mesoplodon perrini* sp. n., Dalebout *et al.*, 2002) and the replacement of *M. bahamondi* (Reyes *et al.*, 1995), on the basis of morphological features of the skull, mandible and teeth and phylogenetic analysis of mtDNA sequences (van Helden *et al.*, 2002) with the senior synonym *M. traversii* (Gray, 1874). The Committee **recommends** that the list (presented in full in Annex L, Appendix 2) be updated as follows:

   (i)   Bahamonde's beaked whale (*M. bahamondi*) (change to *M. traversii*, recognise common name spade-toothed whale); and

   (ii) Perrin's beaked whale (*M. perrini*) (recognise species).

13.4 Takes of small cetaceans
Information on small cetacean catches in 2001-04 is given in Annex L (Appendix 3) and it was noted that the data were incomplete. The Committee **urges** member governments to ensure that complete figures are reported to the Commission in a timely manner. The Committee **recommends** that the bycatch reporting tables for small cetaceans in the Progress Reports include the responsible fishing gear type, as is the case with large whales. The Committee also noted that the species identity of small cetaceans (directed take or bycatch) may be determined by genetic analysis of samples obtained during market surveys. The Committee recognised the potential of this approach to supplement official bycatch reports and agreed on the need to address potential biases of the technique.

An increase in strandings associated with a marked increase in fisheries entanglement of a small population of bottlenose dolphin (estimated to contain 80 individuals based on mark-recapture photo-identification studies) in Rio Grande do Sul, Southern Brazil is of concern, with model predications indicating a likely decline (SC/57/SM8). The Committee **recommends** that the status of this population be assessed as a matter of urgency.

13.5 Work plan
The Committee reviewed its work plan and schedule of priority topics. The work plan for the coming year includes as a priority a review of the status of small cetaceans of the Caribbean and western tropical Atlantic. Full details are given under Item 19 and in Annex L. A minority statement is given in Annex S.

14. WHALEWATCHING (SEE ANNEX M)

14.1 Report of the intersessional Working Group
Based on the work of an intersessional group, a number of definitions were developed to help clarify discussions on whalewatching activities. A glossary of types and categories of whalewatching, recommended by the Committee, is presented in Annex M, Appendix 2.

The intersessional Working Group on further development of precautionary approaches as a science-based framework for management of whalewatching was not convened during the intersessional period. The Committee **agrees** that this issue remains a high priority. Recognising the importance of the Workshop on Science for Sustainable Whalewatching held in South Africa in 2004 and of continued progress in the development of a scientifically based framework for the management of whalewatching, the Committee **agrees** that the report be made available through a link on the IWC website[13].

14.2 Biological impacts of whalewatching on whales
SC/57/WW3 summarised several studies on the impacts of whalewatching activities on cetaceans (Scheidat *et al.*, 2004; Goodwin and Cotton, 2004; Buckstaff, 2004; Orams, 2004; Bejder and Samuels, 2003; Bejder, 2005). The studies are summarised in Annex M, item 6. Parsons agreed to provide a review of relevant papers next year.

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[13] *http://www.iwcoffice.org/conservation/whalewatching.htm.*

SC/57/WW5 reviewed recent key research and considered implications for future whalewatching research and management (Lusseau, 2003; Lusseau, 2004b; Constantine *et al.*, 2003; Constantine *et al.*, 2004; Williams *et al.*, 2002; Erbe, 2002; Bejder and Samuels, 2003). The studies are summarised in Annex M, item 6.

Given the innovative, quantitative methodologies in the papers reviewed, particularly those that examine linkage between short and long-term impacts, the Committee noted that the presence of key invited participants would have greatly enhanced the work of the Committee. The Committee therefore **recommends** that Invited Participants (such as Bejder, Lusseau and Samuels, who were invited but unable to attend this year) with this level of expertise be invited and funded to attend next year's meeting.

SC/57/WW7 described the increase of whalewatching efforts on humpback whales along the Bahia and Espírito Santo State coast, an area encompassing the main breeding ground of this species in Brazil. Edict 117/96 (modified by Edict nº 024-08/02/2002) regulates whalewatching in Brazilian waters. Article nº4 foresees restrictions on whalewatching only inside Marine Protected Areas (MPAs); Article nº5 states that any commercial tour vessel operating inside MPAs where cetaceans regularly occur must provide interpretative information on these animals and their conservation needs to passengers on a permanent basis. Due to the increase in the occurrence of humpback whales along the Bahia State coast outside of the MPAs, the authors suggest the Edict be changed to encompass the full range of the breeding area. The Committee welcomed this report and **supports** the proposal for revised legislation. In addition, the importance of presenting data on impact studies at next year's meeting was noted. Details of the study and discussions are in Annex M, item 6.

A land-based study to assess vessel impacts on Risso's dolphins (*Grampus griseus*) in the Azores, an important feeding, breeding and nursery area for the species, is nearing completion. Results indicated that Risso's dolphins significantly decreased their resting behaviour when the number of boats in the area increased, responding to the presence of boats as soon as they were present in the bay. In addition, their resting period shifted to midday, when the average number of boats in the area was relatively low, possibly adapting to a less favourable situation.

14.3 Review of published whalewatching guidelines and regulations

SC/57/WW2 detailed the present state of whalewatching regulations in Argentina. The first whalewatching regulations for Península Valdés were created in 1984 by adapting laws from other countries and several aspects of the regulations presently are not applicable. In 2004, Instituto de Conservacion de Ballenas/Whale Conservation Institute (ICB/WCI) organised a meeting with whale-watching company owners, boat captains, government officials and researchers to discuss ways to improve the current laws and to minimise the impact on the animals. Participants at the workshop agreed that the process to update the law could take years and proposed to create a Voluntary Code of Conduct that would be in effect for the short term. The Committee **welcomes** this approach to reducing the impacts of whalewatching since it integrates the stakeholders involved in whalewatching activities. Details of the code and discussions are in Annex M, item 7.

SC/57/WW3 presented studies on the effectiveness of whalewatching guidelines and regulations (Lusseau, 2004a; Scarpaci *et al.*, 2003; Scarpaci *et al.*, 2004). The studies are summarised in Annex M, item 7.

SC/57/E8 addressed concerns about tourism in Antarctica. As whalewatching may be an added stressor in the region and treaty nations are interested in developing a regime for tourism management, it was suggested that the Committee consider collecting data on whalewatching activities in the area. The Committee **agrees** that information on whalewatching activities and research conducted from whalewatching vessels in Antarctica should be presented at next year's meeting and that members should actively solicit papers for review.

The compendium on whalewatching guidelines and regulations around the world (Carlson, 2004) is being updated and will be posted on the IWC's website when complete. It was noted that the Instituto de Conservacion de Ballenas/Whale Conservation Institute had translated the compendium to Spanish. The author thanked the group for this enormous and very useful work and suggested that the Spanish version be linked to the IWC website.

14.4 Development of the scientific foundation of whale-watching guidelines

SC/57/WW1 reviewed 48 scientific peer-reviewed and grey literature articles involving impacts of whalewatching on cetaceans, characterised by species, location, methods and potential sources of impact, including vessel distance, speed, direction and noise. The aim of the review was to highlight available research results that could facilitate the development of scientifically based regulations. Results indicate that the majority of cetacean reactions appear to be elicited by the speed and direction of whalewatching vessels and that noise appeared to play an important role. The authors concluded that there is a body of evidence, varying by species and location, that can provide important information about cetacean reactions to whalewatching vessels and guidance for a science-based formulation of new regulations or the revision of current ones. The authors further suggested that areas where extensive whalewatching research has been conducted, in particular those where long-term studies exist, can provide research models for locations looking to develop a whalewatching research programme.

SC/57/WW3 summarised Goodwin and Cotton (2004). The authors suggested that guidelines incorporate speed restrictions and distances between boats and animals due to significant behavioural responses to fast-moving, planning-hulled vessels, but not other categories of boats studied.

It was noted that the majority of authors cited in SC/57/WW5 provided management advice, linking it to their research (Williams *et al.*, 2002; Constantine *et al.*, 2003; Constantine *et al.*, 2004; Lusseau, 2004a; Simmonds, 2004). The studies are summarised and discussed in Annex M, item 8.

In principle, all human activities in proximity to cetaceans will impact the animals. Therefore, it is critical to identify management objectives and then develop a management procedure that links the knowledge base to regulation. This management procedure should include an assessment of risk associated with anthropogenic disturbance in proximity to cetaceans, and describe the relation between level of disturbance and effect on the cetaceans. As a precautionary approach, whalewatching activities should be regulated well within the levels that

have no significant, detrimental effect on cetaceans. The level of whalewatching activities that will be allowed might differ between areas and countries, taking into account *inter alia*, socio-economic conditions, and will reflect the level of risk the respective managers are willing to take.

It was noted that one of the recommendations of the Workshop on Science for Sustainable Whalewatching was to conduct risk assessment analyses. The Committee **agrees** that terms of reference be developed for an intersessional Working Group to correspond on this subject and present a report at next year's meeting (see Annex P(28)).

14.5 Other topics
14.5.1 Review of risk to cetaceans of high-speed whale-watching boats
SC/57/WW8 presented a review of known collisions between whalewatching boats and whales worldwide. Thirty-two records were identified between 1984-2003. Results indicate the need for caution as whalewatching industries increase the use of larger, faster whalewatching boats. However, risks from whalewatching boats may not be substantively higher than any other transiting vessel in the same area. Details of the study are given in Annex M, item 9.1.

The Committee expressed an interest in receiving more information on this issue next year. Based on the evidence presented in SC/57/WW8, the Committee **agrees** to provide the following scientific advice for whalewatching management: whalewatching vessels, as well as other vessels, are at an increased risk of striking a whale within a set distance (2km or 4km) of the sighting of another individual and whales that are struck will often not be sighted prior to the strike. The severity of injury from a strike will increase as a function of the force of the strike. Since a key component of force is the speed at which the animal is struck, reducing speed in the vicinity of a sighted whale is likely to reduce the severity of a strike, and may have the auxiliary benefit of allowing operators increased time to avoid a strike altogether. This may be especially important in cases where relatively large whalewatching boats are used, since their size could also lead to increased force and therefore, injury if a strike were to occur.

14.5.2 Review of potential impacts of 'swim-with' prog-rammes on populations of cetaceans
SC/57/WW3 reviewed studies on swim-with-cetacean tourism (Courbis, 2004; Samuels and Bejder, 2004; Orams, 2004; Scheer *et al.*, 2004). The studies are summarised in Annex M, item 9.2.

SC/57/WW6 presented an update to Rose *et al.* (2003) on the occurrence of swim-with-whale operations world-wide. Fifty-one specific commercial operations were identified, an increase of 43% from 2003. Humpback and dwarf minke whales remained the main species targeted, although swims were also offered with sperm, bowhead and blue whales. There was a decrease from 2003 in the number of web sites that mentioned conservation, human safety and research. The results reported are still only an imprecise estimate for the frequency of this activity as web searches were only conducted in English. The Committee **concurs** with steps recommended by the authors for presentation at the 2007 meeting, with an update next year, including: revising the world-wide review of swim-with-whale programmes; using additional methods; reviewing

published and ongoing studies of swim-with-whale programmes; and identifying data gaps that would be necessary to fill in order to allow an assessment of the effects of such programmes on target individuals and/or populations.

The Committee **agrees** that this work be addressed by an intersessional Working Group (see Annex P(29)).

14.5.3 Other
Mayr and Ritter (2005) reviewed photo-identification research and behavioural observations of rough-toothed dolphins (*Steno bredanensis*) conducted from 2000 to 2003 on board whalewatching vessels off La Gomera (Canary Islands). The dolphins were found to have several distinct features suitable for individual identification. Identification and resighting data indicate a resident population and higher vulnerability towards anthropogenic activities. The study highlights the importance of longitudinal data collection and the value of platforms of opportunity for this type of research.

Published studies, based on data collected on whalewatching vessels, have addressed a wide range of management-relevant topics, including: distribution; stock identity; reproduction and survival rates; abundance; population composition; migratory destinations; behaviour and anthropogenic impacts (Robbins, 2000a). Some of these studies have contributed to the work of the Scientific Committee, such as in the 2001 Comprehensive Assessment of North Atlantic humpback whales. However, logistical and financial limitations can slow the pace at which whalewatching-based research emerges in the published literature (Robbins, 2000b). There also may be areas where useful data could be collected from opportunistic platforms, but no programme is underway.

It was proposed that the sub-committee on whalewatching make a dedicated effort to identify opportunistic sources of cetacean data of potential value to the work of the Scientific Committee. Committee members have detailed knowledge of the locations of whalewatching operations worldwide and so can identify areas, operations and/or data that are potentially relevant to upcoming Scientific Committee needs. Furthermore, members have expertise in the scientific use of opportunistic data sets, which have their own limitations and biases (Robbins, 2000b). The Committee could therefore provide a valuable service by scrutinising existing data collection programmes and archives, providing guidance to data collectors, seeking access to data that might address its scientific needs, and encouraging new data collection in key areas. It was noted that the ultimate value of this work within the whalewatching sub-committee would depend upon close co-ordination with other sub-committees.

The formation of an intersessional Working Group with membership from other relevant sub-committees to examine overlap between whalewatching activities, existing data collection programmes and upcoming Scientific Committee priorities was proposed and a request was made that the sub-committee solicit and review scientific information derived from opportunistic data sources and analytical techniques appropriate to such data. The Committee **agrees** that this would be of value to its work and should be a priority item for next year. It further **establishes** an intersessional Working Group to forward this work (Annex P(27)).

14.6 Work plan
The discussion of the work plan is given in Annex M, item 10. This is taken into account under Item 19.

15. DNA TESTING (SEE ANNEX N)

15.1 Progress on genetic methods for species, stock and individual identification
SC/57/SD3 presented an update on improved methods for DNA extraction and Polymerase Chain Reaction (PCR) amplification from small, old, and degraded tissue samples (including bone and dried soft tissue). Discussion of this can be found in Annex N, item 5.

SC/57/SD4 presented the results of a validation exercise for cetacean species identification using the curated reference dataset of mtDNA control region and cytochrome *b* sequences implemented in the Web-based species identification program, *DNA Surveillance* (Ross *et al.*, 2003) and the non-curated sequences available in the international repository GenBank. The purpose of the exercise was two-fold:

(1) to evaluate the potential for taxonomic mis-identification of sequences in the non-curated collection in GenBank; and
(2) to evaluate the reliability of *DNA Surveillance* to identify cetacean sequences and to recognise non-cetacean sequences.

Overall agreement between GenBank and *DNA Surveillance* in the attribution of species identity was high and there was little evidence that non-cetacean sequences in GenBank have been mislabeled as cetaceans. Discussion of this can be found in Annex N (item 5).

The Committee **agrees** that validation such as that described in SC/57/SD4 should be carried out routinely for cetacean sequences in GenBank and other such repositories and the Committee established an intersessional Working Group to develop and implement a protocol for routine validation for cetacean sequences in GenBank and other repositories. The question arose of what action could be taken when an identification is found to be erroneous, in view of the fact that the database entries are the responsibility of the original submitter. One possible solution suggested was that a new field could be added to the database where a challenge to the identification could be noted.

Kanda summarised a recent paper on the use of single nucleotide polymorphisms (SNPs) as markers in population genetics (Morin *et al.*, 2004). SNPs are genetic variation resulting from single-point mutations that produce single base-pair differences among DNA sequences.

A lengthy discussion on the advantages and disadvantages of SNPs took place in the Working Group and details can be found in Annex N (item 5). It was noted that the relevant issue for DNA registers is the potentiality of this marker for individual identification. The Committee **agrees** that SNPs offer considerable promise for application in the genetics of whale management, in particular because of the ease of standardisation of data across laboratories.

15.2 Collection and archiving of samples from catches and bycatch
A total of 638 and 537 common minke whales were landed in Norway in 2003 and 2004, respectively. Genetic analysis of these samples is in progress.

SC/57/O14 reported that samples of skin and muscle have been collected for 36 common minke whales taken in 2003 and 25 in 2004 in the Icelandic scientific whaling operations.

Regarding collection of samples in Japan, the Committee was informed that for the scientific whaling for the Antarctic (JARPA) programme, samples stored as of April 2005 were: Antarctic minke whale since 1987/88, n=6,794; common minke whale, n=16. For the western North Pacific (JARPN II) programme, samples stored as of December 2004 were: common minke whale since 1994, n=1,097; Bryde's whale since 2000, n=243; sei whale since 2002, n=189, and sperm whale since 2000, n=31. The samples from bycatch stored as of December 2004 were: North Pacific common minke whale, n=403; North Pacific Bryde's whales, n=3; North Pacific right whale, n=1, and North Pacific humpback whale, n=9. Genetic samples were stored for the following stranded whales as of 1 December 2004: North Pacific humpback whale, n=1; North Pacific common minke whale, n=1 and North Pacific fin whale, n=1.

15.3 Reference databases and standards for a diagnostic register of DNA profiles
Skaug reported on the status of the Norwegian register. Genetic analyses on samples of common minke whales landed in 2003 and 2004 have not yet been completed.

Annex N (Appendix 3) provided information on procedures, standards and status for the Japanese register for large whales. All whales taken under special permit in the western North Pacific (up to 2003) and most of those taken in the Antarctic (up to 2003/04) have been incorporated into the register. All bycaught and stranded whales (up to 2004) have been incorporated into the register.

As in the case of Norway, the Japanese register uses three kinds of genetic markers: mtDNA control region sequences for species identification; a set of nuclear DNA markers (microsatellites) for individual identification, and Y chromosome DNA for gender determination. A total of 17 microsatellite loci are used in the case of North Pacific common, Bryde's and sei whales. In the cases of the Antarctic minke whale and North Pacific humpback whales, six loci are used. Since the sex of the animals is determined by experienced researchers, molecular sexing is not conducted for samples taken under JARPA and JARPN II. In the case of bycatches, sex is determined molecularly.

The Committee **agrees** that it is important that a uniform procedure for estimating error rates be used by the several nations with DNA registers and **recommends** that this be done.

The Committee expresses its gratitude to the three nations (Japan, Norway and Iceland) for supplying information on their collections and registers.

15.4 Work plan
The terms of reference for the Working Group for the next year will remain the same as for this year, unless the Commission requests other information in the interim (and see Item 19).

16. SCIENTIFIC PERMITS (SEE ANNEX O)

16.1 Review of results from existing permits

16.1.1 Japan-Antarctic minke whales

SC/57/O5 presented the results of the eighteenth and final year of the JARPA programme. Research was conducted in the western part of the Area VI and Area V over a 92-day period between 7 December 2004 and 8 March 2005. Furthermore, the first co-operative survey with the RV *Kaiyo Maru* was conducted in the Eastern part of Area V. This was a meso-scale survey for the elucidation of the Antarctic marine ecosystem based on recommendations from the JARPA mid-term review meeting in 1997. Details of this cruise were reported in SC/57/O16.

One sighting vessel, three sighting and sampling[14] vessels and one research base ship were engaged in the research. A total of about 4,120 n.miles was covered in the western part of Area VI, and 14,460 n.miles in Area V. The total searching distance of the four research vessels was about 18,700 n.miles, which was similar to the totals in previous JARPA cruises.

Eight large whale species were seen during this cruise. Antarctic minke whales were the most numerous species in the research area overall and were also widely distributed throughout most of the area except for the West-North stratum of Area V. There were numerous sightings of four other species (in decreasing order of occurrence, humpback whales, sperm whales, fin whales and southern bottlenose whales (*Hyperoodon planifrons*)) in the whole research Area except for the East-South stratum in Area V.

The total number of sightings of Antarctic minke whales by the four research vessels was 4,400 individuals in 1,711 schools. Primary sightings of Antarctic minke whales made by the three sighting and sampling vessels amounted to 3,045 individuals in 1,049 schools. A total of 467 schools (consisting of 1,167 animals) was targeted for sampling of one whale from each school. On some occasions the chase was interrupted, e.g. by adverse chasing conditions or animal movements. One whale was struck and lost. A total of 440 individuals were sampled. The rate of success in sampling targeted individuals was therefore 94%.

Mature females dominated the samples in the East-South stratum, whereas mature males dominated the samples in the North strata in Area V and Area VI-W. Pregnant females were most numerous in the East-South stratum where a few immature individuals of both sexes were also sampled. There were 182 individual pregnant females with 182 foetuses in the whole research area.

Two Discovery tags were collected from a mature female that was 8.87m in length. This animal was captured at 72°59'S, 172°12'E on 5 February 2005. The Discovery tags had been attached at 66°16'S, 140°57'E on 4 January 1981 by the IDCR cruise and the visually estimated body length at that time had been 29ft (8.84m).

Particular features of this research cruise were:

(1) the East-South stratum in Area V (Ross Sea) was more extensive than in previous research cruises;
(2) relatively warm SST (1-4°C) was widely distributed in the western part of Area V; and
(3) a cooperative survey with RV *Kaiyo Maru* was conducted in the Eastern part of Area V for the

elucidation of structure and function of the Antarctic marine ecosystem.

The survey indicated that the feeding migrations and segregation pattern of cetaceans were strongly influenced by yearly changes in oceanic environmental conditions such as SST and ice-pack distribution. It was stated that this indicated that long-term monitoring is therefore necessary to elucidate the structure and function of the Antarctic marine ecosystem.

The sampling regime has remained unchanged and the Committee did not enter into any detailed discussion of the results of this survey as the opinions of proponents and critics of this work within the Committee as expressed in previous years' meetings (e.g. see IWC, 2005c, pp.45-6) have remained unchanged.

16.1.2 Japan-North Pacific common minke, Bryde's, sei and sperm whales

SC/57/O3 outlined the offshore component of the 2004 full-scale survey under JARPN II. The objectives of the full-scale research were:

(1) to investigate the feeding ecology of common minke and other whales and to further ecosystem studies, involving studies of prey consumption by cetaceans, prey preferences of cetaceans and ecosystem modelling;
(2) to monitor environmental pollutants; and
(3) to study stock structure, particularly for common minke whales.

Target species were the common minke whale, Bryde's whale, sei whale and sperm whale. The research area covered sub-areas 7, 8 and 9 in the western North Pacific. The survey covered the four whale species as well as their prey. A total of six research vessels were used: one dedicated sighting vessel, three sighting and sampling vessels, one research base vessel and one trawl survey vessel equipped with a scientific echo sounder. A total of 10,695 n.miles was surveyed over a period of 96 days. During that period, 119 common minke, 180 Bryde's, 385 sei and 523 sperm whales were sighted by the sighting and sampling vessels. A total of 100 common minke, 50 Bryde's, 100 sei and 3 sperm whales were sampled. The co-operative survey on ecosystem research was conducted in a part of sub-area 9, 15-17 September. All whales sampled were examined on board the research base vessel. Stomach contents of the common minke whales consisted mainly of Pacific saury (*Cololabis saira*), minimal armhook squid (*Berryteuthis anonychus*) and Japanese anchovy (*Engraulis japonicus*). Bryde's whale stomachs contained mainly Japanese anchovy and Chub mackerel (*Scomber japonicus*). Sei whale stomachs contained mainly Japanese anchovy, copepods and Pacific saury. Dominant prey items in the stomach of three sperm whales were various kinds of mid- and deep-water squid.

The coastal component of the ongoing JARPN II work was described in SC/57/O4. Based on the results of the two-year feasibility study conducted in 2002 and 2003, the coastal component has been revised to be conducted twice a year, with 60 common minke whales being sampled in the spring and autumn seasons respectively. The first of the JARPN II revised coastal surveys was conducted 13 September-31 October 2004, off Kushiro, northeast Japan (i.e. the northern part of sub-area 7), using four small-type

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[14] Under Special Permit research, sampling implies lethal sampling of whales unless otherwise specified.

whale catcher boats, one echo-sounder trawl survey vessel and one dedicated sighting survey vessel. An additional dedicated sighting survey using one small-type whale catcher boat was also attempted. The sampling was conducted in coastal waters within 50 n.miles of the port of Kushiro and all whales sampled were landed at the land station at the port of Kushiro.

During the survey, the total search effort for whale sampling was about 6,920 n.miles (635 hours), 151 schools and 156 individual common minke whales were sighted and 59 whales were sampled. The average body length of the sampled whales was 6.87m (SD=0.80, n=47) for males and 6.00m (SD=1.09, n=12) for females. Dominant prey species found in the forestomach were Japanese anchovy (62.1%) and Pacific saury (31%). The concurrent prey survey revealed the distribution of those prey species in the research area, and the dedicated sighting survey sighted 17 schools (18 individuals) of common minke whales within some 810 n.miles searched. Compared with the results of the 2002 survey off Kushiro, the length frequency of the whales inclined towards larger males, while the species composition of the prey species found in the forestomach was similar.

These results revealed yearly changes in the migration and feeding habits of common minke whales in the coastal waters off Kushiro in the autumn season, and it was suggested that those changes might be related to yearly variation in environmental factors such as the oceanographic conditions or the distribution of prey species. To evaluate the potential for long-term competition between whales and fisheries in the local area and to clarify the role of whales in the marine ecosystem, the proponents stated that further surveys should be conducted on a yearly basis.

The relevance of the reported collection of oocytes from female common minke whales for *in vitro* fertilisation (SC/57/O5) was questioned. The Committee was referred to the work of Prof. Y. Fukui, of the Obihiro University of Agriculture and Veterinary Medicine, who has published several papers in international journals on his work on oocyte development and whale reproduction, some of which are detailed in SC/57/O15.

There remained divided views on the validity of the JARPN II research programme and its results, as expressed in previous years (e.g. see IWC, 2005c, p.46; IWC, 2004d, p.364).

16.1.3 Iceland-North Atlantic common minke whales
The Icelandic Research Programme on common minke whales was reviewed in SC/57/O14. The original plan had called for a sample of 200 common minke whales in the two years after the review by the Committee in June 2003. The programme began in August 2003, with takes of 36 whales that season, followed by 25 in the 2004 season. Progress has therefore been much slower than anticipated. The reasons for this were political rather than scientific, with the Icelandic Ministry of Fisheries deciding the rate of sampling. This should not present a problem in scientific terms, so long as the total expected take of 200 is achieved and the original seasonal and geographical distribution is retained. The present expectation is that 39 whales will be taken in 2005 and the remaining 100 in 2006.

The 2004 season was 3 June-6 July. Three catching boats had been employed with search effort distributed all around Iceland. The 2004 season had taken more females than males (15 out of 25) than in the previous year (13 out of 36). This year seven animals were taken ashore for a full veterinary post mortem examination. Aerial surveys were also conducted during the period April to September 2004 and the resulting maps of survey effort and sightings were shown in SC/57/O14 and SC/57/O8.

Satellite telemetry was attempted on seven animals and data were received from one of these for several months, until 5 December 2004, at which time the animal was off the coast of West Africa (SC/57/O9). A summary of other projects within the overall programme was also given in SC/57/O14. Some members commended the work on satellite telemetry.

In response to questions about the criteria used to select animals for toxicological studies, it was stated that from the animals taken under the Special Permit, five animals had been selected under domestic legislation for marketing purposes. Another 25 animals had been selected over the two years for toxicological studies in order to obtain a representative sample from both sexes and different age classes from the whales taken under Special Permit. Some of these samples needed to be sent abroad for full analysis, and there had been some delays in obtaining the relevant permits.

In order to address the question of how effectively faecal samples collected at sea might be used to study diet, faecal matter was also being collected from the posterior end of the rectum of some common minke whales in order to make comparisons with stomach contents. This might then be compared with results from an International Fund for Animal Welfare (IFAW) project that had collected faeces under a research permit issued by the Icelandic authorities in 2004. The project will shed light on the feasibility of collecting common minke whale faecal samples at sea to study their feeding habits.

Childerhouse welcomed the increase in attention to non-lethal methods. Víkingsson welcomed a proposal from Hatanaka for collaboration with Japanese scientists.

The Committee noted the lower than expected sampling rate. As for the preceding programmes, opinions were divided on other aspects of the work, and reference was made to earlier statements on this programme by proponents and opponents respectively (IWC, 2005c, pp.46-7).

16.1.4 Review report from non-IWC meeting on JARPA results
A JARPA Review Meeting called by the Government of Japan was held at the Institute of Cetacean Research, Tokyo, on 18-20 January 2005, and is summarised in SC/57/O6. The JARPA research objectives and its work tasks were first reviewed. The JARPA survey procedure, the data collected and the results were also reviewed in the light of the JARPA objectives. The meeting agreed that:

(1) JARPA has collected a very large and consistent database over a 16-year period, which provides a basis for time series analyses relating whales to the Antarctic environment and the beginning of an ecosystem approach to the management of whale resources in the region;

(2) JARPA has contributed to the elucidation of biological parameters of Antarctic minke whales, and improved the understanding of the Antarctic marine ecosystem; and

(3) JARPA has revealed the changes that have occurred in the ecosystem since the 1970s suggesting competition among Antarctic minke and other large whales and data

obtained through this monitoring will contribute to the development of ecosystem models, which are necessary for ecosystem-based management of whales.

The review meeting considered that JARPA had made good progress in addressing its objectives, and also agreed that tasks identified in the IWC mid-term review meeting in 1997 (see section 5 of SC/57/O6) had been appropriately addressed.

Some members of the Committee noted that the meeting to review JARPA hosted by Japan had been attended largely by representatives of nations that supported whaling, and thus they questioned the objectivity of this non-IWC review. In response it was noted that the review meeting had been widely made known, and that all members of the Scientific Committee had been invited, although it had been agreed that this review meeting would not be considered an IWC sponsored meeting (IWC, 2005c, p.46).

16.1.5 Preparations for JARPA review
The JARPA Review Planning Steering Group worked intersessionally to prepare for a full review of the JARPA programme by the Scientific Committee when the complete set of results of the 18 year programme is available. It had been agreed that the review would not be limited simply to results relating to Antarctic minke whales, but that research areas not covered in the original plan, and later adopted by JARPA, such as the work on blue and humpback whales, would also be considered. Abundance estimates and sightings survey work are also part of JARPA and need to be considered in full. The Group agreed that this review should be carried out by an Intersessional Working Group to Review Data and Results from Special Permit Research on Minke Whales in the Antarctic. This would be done during an intersessional meeting, most likely in Tokyo in late 2006. Progress in planning for this review was summarised, and a draft Terms of Reference and a draft Agenda were provided as appendices to the progress report (given as Annex O2 to this report).

The Steering Group had agreed on most aspects of the proposed review except for the draft Terms of Reference numbers 3 and 4, and proposed agenda item 9. There was some disagreement over how to address Resolutions made by the Commission with respect to the review, including issues surrounding the utility of lethal or non-lethal methods (proposed agenda items 9.1 and 9.2). It was **agreed** that a group led by Zeh (Annex P(30)) would reconsider this issue by re-examining the Commission's Resolutions in detail.

Noting the differences of opinion between members over interpretation of the Commission's Resolutions, the Committee nevertheless **agrees** that only scientific and not ethical issues should be considered by the review. However, a discussion of the scientific aspects of the respective merits of lethal and non-lethal methodologies was important. In view of the fact that some experts from outside the Scientific Committee would be invited to the review meeting, the Committee **agrees** that some discussion of the respective merits of lethal and non-lethal methodology (proposed agenda items 9.1 and 9.2, and Proposed Terms of Reference 3 and 4) is necessary to allow the Invited Participants to the Review to contribute to this debate. However, the main focus of the review would be on the remaining agenda items, and these more contentious issues would mainly be discussed at the subsequent Scientific Committee meeting by the full Committee. The Committee **accepts** the proposed terms of reference and proposed agenda with this qualification.

16.1.6 Responses to previous Scientific Committee reviews
Childerhouse asked what changes had been made to each of the research programmes as a result of extensive comments received from the Scientific Committee in previous years. In response it was noted that the meso-scale surveys had been added to the JARPA research programme as a direct result of recommendations made at the mid-term review of JARPA in 1997. It was noted, however, that no modifications to the JARPN II work plan had been implemented as a result of any comments or suggestions made by the Committee in previous years. In reply it was stated that all comments on JARPN II research plans had been studied and considered but that few if any were constructive while others were difficult to accommodate.

With regard to Icelandic common minke whale research, it was noted that SC/57/O14 states that no major changes had been made to the original proposal, but that some new non-lethal components had been added in response to Scientific Committee comments made on the original proposal. Specifically, the Committee was informed that additional prey sampling was being conducted by taking samples from the posterior end of the rectum of sampled animals to compare with stomach contents and potentially with faecal samples collected at sea.

Although there is no formal requirement for Special Permit holders to report on what changes have been made to their research plans as a result of any comments or suggestions received from the Scientific Committee, the Committee **agrees** that it would be good practice to do so. This would help to speed up future reviews and would constitute an act of good faith.

16.2 Review of new or continuing proposals
16.2.1 JARPA II
The Plan for the Second Phase of the Japanese Whale Research Programme under Special Permit in the Antarctic (JARPA II) was presented in SC/57/O1.

JARPA was conducted between the 1987/88 and 2004/05 austral summer seasons, under Article VIII of the International Convention for the Regulation of Whaling. The IWC Scientific Committee conducted an interim review of JARPA results in 1997. In January 2005, a non-IWC JARPA review meeting called by the Government of Japan was held.

Based on its stated desire to take into account species-interaction (ecosystem) effects in understanding the dynamics of the baleen whale species in the Antarctic ecosystem, and predicting future trends in their abundance and population structure, the Government of Japan will launch a new comprehensive study under the Second Phase of the Japanese Whale Research Programme under Special Permit in the Antarctic (JARPA II), combining lethal and non-lethal methods, starting from the 2005/06 austral summer season. The first two seasons (2005/06 and 2006/07) will be dedicated to feasibility studies. The practicability and appropriateness of sighting methods in the enlarged area and sampling procedures given the increased sample size and number of species to be sampled, will be examined. Methods for catching, flensing and taking biological measurements of the larger species will be tested. The full-scale JARPA II will start from the 2007/08 season.

It will be a long-term research programme with the following objectives:

(1) monitoring of the Antarctic ecosystem;
(2) modelling competition among whale species and developing future management objectives;
(3) elucidation of temporal and spatial changes in stock structure; and
(4) improving the management procedure for the Antarctic minke whale stocks.

JARPA II will focus on Antarctic minke, humpback and fin whales and possibly other species in the Antarctic ecosystem that are major predators of Antarctic krill. Annual sample sizes for the full-scale research (lethal sampling) are 850 (with 10% allowance) Antarctic minke whales (eastern Indian Ocean and western South Pacific stocks), 50 humpback whales (D and E stocks) and 50 fin whales (Indian Ocean and the western South Pacific stocks). During the feasibility study, a maximum sample of 850±10% Antarctic minke whales and ten fin whales will be sampled in each season. Humpback whales will not be taken during the feasibility study.

The research methods for the JARPA II are basically the same as the previous JARPA with some modifications. The programme also includes non-lethal research techniques such as sighting surveys, biopsy sampling, acoustic surveys for prey species and the collection of oceanographic data.

The research proposal for JARPA II as described in SC/57/O1 was elaborated upon in an audio-visual presentation. In response to subsequent questions of clarification from members of the Committee, it was made clear that there will be six vessels involved in the JARPA II survey. Two of these will be dedicated sighting vessels and these will cover the entire area independently of the sighting and sampling vessels, but their tracklines have not yet been determined. Three of the vessels will be sighting and sampling vessels (the sixth vessel being the research base vessel). In response to a query as to how the same vessels could double the catch rate achieved under JARPA within the same seasonal sampling period, the Committee was informed that in previous seasons about 1,000 schools had been encountered, but that not all schools had been sampled and that whereas previously one animals per school had been taken, the plan for JARPA II was to take two animals per school. It was stated that sampling just one animal might lead to bias, and that sampling two animals per school would therefore be less biased. It was also stated that a larger area would be covered by JARPA II. The objective in JARPA II was to sample sufficient animals to achieve statistically significant results, and this required more animals to be taken.

There are as yet no plans to use trawls to validate acoustic estimates of krill abundance, although the independent meso-scale surveys of the area using another vessel may employ trawls to monitor krill at a later date. None of the vessels used in the JARPA II survey will be ice-breakers, so pack ice areas will be avoided, but some sightings survey work may occur in the marginal ice areas, so long as ice conditions permit the vessels to maintain speeds of 11 knots. This condition will define the ice-edge for these surveys. It is also intended to include sightings data from other expeditions involving ice-breakers working in the pack-ice if these are available. The issue of collaboration with CCAMLR was also brought up, as the removal of 850 Antarctic minke whales might impact ongoing CCAMLR studies of the Antarctic ecosystem, so it was questioned whether or not collaboration with CCAMLR had been sought. It was stated in response that under JARPA, meso-scale surveys had included the participation of a Japanese CCAMLR scientist, and that collaboration with CCAMLR was therefore already happening.

In answer to the question of whether or not an ethical review process had been implemented it was stated that Japanese domestic legislation on animal welfare had recently been updated, and that although there was no formal process in terms of inter-agency consultation, the Fisheries Agency of Japan had considered the JARPA II plan in relation to the revised legislation and no conflict had been found between the planned research and the revised legislation. In response to a question on the issue of humane killing, it was stated that in previous JARPA surveys the time-to-death had been recorded, and that this practice would be continued.

Regarding the rationale for having an allowable error of 10% of the sample size of 850 animals, it was stated that tracklines are set according to previously observed densities, taking account of catchability by area, but it was not always possible to guarantee that the target would be attained.

Following these points of clarification, the proposal was reviewed by the Committee in accordance with the relevant guidelines for reviewing proposals for scientific permits. However a group of 63 members objected to a review of the JARPA II proposal because the Committee has had no opportunity to conduct a formal review of the results of the original JARPA programme; these members submitted a statement to this effect (SC/57/O22). This statement is included in Annex O, Appendix 2. These members further stated that they had substantial concerns about all aspects of the JARPA II proposal, but that it would be inappropriate to provide a detailed critique until after a JARPA review had been conducted by the IWC.

Accordingly, they stated that the lack of comments and criticisms of JARPA II in the Scientific Committee report should in no way be construed as consensus within the Committee regarding the objectives and methodology proposed by the JARPA II programme.

In response to this, the proponents tabled a working paper (Annex O, Appendix 3) that rebutted the assertions of SC/57/O22. Specifically these members stressed that the Scientific Committee was obliged to review the JARPA II proposal, according to paragraph 30 of the Schedule. These members also asserted that Japan was not trying to abandon the RMP, but rather was trying to strengthen it by addressing a multi-species approach. Concerning the lack of peer-reviewed results in international journals, it was stated that there has been a number of publications but that many western journals refuse to publish results from JARPA for ethical reasons. It was also asserted that the proposed sample sizes would not have an adverse impact on the recovery or status of any whale populations.

Following this exchange of views, the Committee continued to review the research plan in accordance with the relevant guidelines, but without the participation of the authors of SC/57/O22.

A. The Proposal
The current relevant guidelines for review are as follows:

1. A statement as to whether the permit proposal adequately specifies the four sets of information required under paragraph 30 of the Schedule (IWC, 1986, p.133).
2. Objective of the research (Schedule Paragraph 30).
3. Number, sex, size and stock of the animals to be taken (Schedule Paragraph 30).

Summary of proposal
The proposal provides the information required under Paragraph 30 of the Schedule.

Comments and discussion
Some members expressed the opinion that the JARPA research programme had made a major contribution to the knowledge of the biology of Antarctic minke whales, and that in the face of changing environmental conditions the value of this work would increase. They stressed the importance of preserving the continuity of the research programme, provided the research does not hamper the development of the stocks. Some other members stressed the importance of JARPA II as an approach towards ecosystem management of the Antarctic.

One member also expressed the view that many of the important results of JARPA have been presented to the Scientific Committee during the past few meetings, and that large parts of the proposed JARPA II have objectives that are virtually independent of the JARPA objectives and results. For these reasons he felt that the Committee has more than sufficient information to conduct a review of the JARPA II research plan. He also stated that it was reasonable to expect a continuation of scientific whaling in Antarctica, because of the need to keep ships and personnel employed with the task, and also the need to maintain markets for the whale meat, which helped to fund the entire programme. In reply it was noted that these logistical and economic considerations should be outside the purview of the Scientific Committee, and that the validity and necessity of such research programmes should be considered on their scientific merits alone.

B. Objectives
The current relevant guidelines for review are as follows:

1. comments on the objectives of the research to be carried out under the proposed scientific permit, including in particular how they might relate to research needs identified by the Scientific Committee (IWC, 1986, p.133);
2. the proposed research is intended and structured accordingly to contribute information essential for rational management of the stock (IWC, 1987, p.25);
3. is required for the purposes of management of the species or stock being researched (IWC, 2000a);
4. the research addresses a question or questions that should be answered in order to conduct the comprehensive assessment or to meet other critically important research needs (IWC, 1988, pp.27-8); and
5. the number, age and sex of whales to be taken are necessary to complete the research and will facilitate the conduct of the comprehensive assessment (IWC, 1987, p.25).

Summary of proposal
The proponents stated that JARPA has revealed evidence that the Antarctic ecosystem is changing and therefore, it is necessary to understand the dynamics of interactions between whale species in order to achieve rational management and sustainable use of whale resources. Based on the results of JARPA, JARPA II was planned with the following four objectives:

(a) monitoring of the Antarctic ecosystem;
(b) modeling competition among whale species and future management objectives;

(c) elucidation of temporal and spatial changes in stock structure; and
(d) improving the management procedure for Antarctic minke whale stocks.

JARPA II will provide information on abundance trends, biological parameters and stock structure, which will contribute to comprehensive/in-depth assessments of Antarctic whale stocks. An ecosystem model will be developed based on data collected under JARPA II, which will contribute to the testing of hypotheses concerning changes in the Antarctic ecosystem as well as the establishment of an ecosystem-based management scheme for whale resources.

Comments and discussion
Responses from the Committee to the listed objectives were limited in view of the opinions expressed in SC/57/O22. Some members stressed the importance of continued monitoring of biological parameters of Antarctic minke whales, not least in the light of global environmental changes, but also to supplement other ongoing research into Antarctic ecosystem dynamics. The failure of several baleen whale stocks to recover was also a matter that required an ecosystem level analysis, and while JARPA represented a significant step in addressing this question, JARPA II would provide a framework for multi-species modelling of the Antarctic marine environment. Other members also stressed the need to develop an ecosystem-based approach to managing the Antarctic marine environment and commended the objectives of JARPA II in this respect.

One member questioned the assumption expressed in SC/57/O1 that the population of Antarctic minke whales had increased after the cessation of whaling on the larger baleen whale species and in response to the depletion of these whale populations, noting that there had been no assessments of Antarctic minke whale stocks in the early 20th century.

C. Methodology
The current relevant guidelines are as follows:

1. 'comments on the methodology of the proposed research and an evaluation of the likelihood that the methodology will lead to achievement of the scientific objectives. These comments may also include evaluation of the methodology in terms of current scientific knowledge' (IWC, 1986, p.133);
2. 'the objectives of the research are not practically and scientifically feasible through non-lethal research techniques' (IWC, 1987, p.25);
3. '. . .whether the information sought could be obtained by non-lethal means' (IWC, 2000a, p.51);
4. 'the research addresses a question or questions that can not be answered by analysis of existing data and/or use of non-lethal research techniques' (IWC, 1988, pp.27-8);
5. 'whales will be killed in a manner consistent with the provisions of Section III of the Schedule, due regard being had to whether there are compelling scientific reasons to the contrary' (IWC, 1987, p.25); and
6. 'the research is likely to yield results leading to reliable answers to the questions being addressed' (IWC, 1988, pp.27-8).

Summary of proposal
The proponents stated that JARPA II will involve both lethal and non-lethal sampling. In general the research methods established by JARPA will be used in JARPA II. Monitoring of food consumption, blubber thickness, and age at maturity are important because these parameters are indicators of food availability and competition for a major food species in the Antarctic, krill. These data cannot be obtained through non-lethal sampling. Age, which can only be obtained by lethal sampling, is essential for detecting

recruitment trends by VPA and for studies of pollution on whales. All whales are taken using explosive grenades. If instantaneous death is not achieved, a suitable secondary method is applied.

Comments and discussion
Again, responses from the Committee were limited. Some members agreed that lethal sampling was the only way to collect the necessary data to achieve the stated research objectives and suggested furthermore that in order to elucidate ecosystem interactions sampling should be expanded to include other krill predators such as penguins and seals. Other members also noted the two-year feasibility phase and suggested that this would be valuable in refining the methodology. They agreed that while some biological data could be collected using non-lethal methods, the overall objectives would require lethal sampling.

Polacheck noted, in relation to guideline C1, and not withstanding the concerns raised in SC/57/O22 concerning the difficulty and validity of reviewing the JARPA II proposal prior to the completion of the review of JARPA, three additional general concerns with methodological aspects of the proposal, as listed below.

(1) The level of details in the proposed survey and sampling designs is insufficient to adequately review the proposal – particularly with respect to the consideration of sample size, the relative effort devoted to sighting activities and the representativeness of coverage and sampling.

(2) Monitoring of the Antarctic ecosystem and testing of hypotheses for changes in whale abundance through ecosystem modelling are two of the stated primary objectives of JARPA II. As noted in the proposal, krill play a central role in the Antarctic ecosystem and is a critical hypothesis underlying the proposal is that 'the carrying capacity of the whale species depends on available biomass of krill'. The abundance of krill is seen as the dominant factor controlling changes in whale abundance. As such, estimation of the abundance of krill, monitoring trends in their abundance and understanding krill dynamics are critical for achieving the above two primary objectives of the proposal and would have been expected to have been a central component in the proposal. However, the proposal appears to recognise this but contains no commitment or specific survey plans for such work.

(3) Monitoring of Antarctic minke whale abundance and biological parameters are a central focus of the proposed research programme. Substantial numbers of Antarctic minke whales appear to occur within the pack ice and the pack-ice is a potentially important habitat for this species. The current Scientific Committee review of Antarctic minke whale abundance and trends has found that lack of information on the abundance of Antarctic minke whales within the pack-ice, possible differential distributions with age and/or sex is an important uncertainty that confounds the interpretation of past research efforts (including those of JARPA). In designing a future research programme, it is critical to learn from the past results. JARPA II contains no plans to survey within the pack-ice, but will simply repeat this past deficiency of previous research. Similarly, as in (2), addressing the question of Antarctic minke whales in the pack-ice through direct monitoring would have been expected to be a central component of the

research if the proposal were serious about achieving its objective. The lack of this will likely compromise the interpretation of the Antarctic minke whale results and the likelihood of the programme achieving its stated objectives.

In response to these criticisms, the proponents of JARPA II stated firstly that the sampling design is still not finalised, but that the same approach as was used in JARPA will be used to lay down the specific tracklines that will be used in JARPA II. Secondly, and with respect to the issue of krill sampling, acoustic survey methods will be used to determine krill abundance, as was the case in JARPA, whilst simultaneously surveying cetacean distribution. Data collected in this way will promote the development of an ecosystem-modelling framework for the Antarctic marine environment. Finally, and with respect to Antarctic minke whales in the pack-ice, data on Antarctic minke whale distribution in the pack-ice have been collected gradually using ice-breakers, and this data collection will continue. Previous pack-ice work under JARPA has shown, for example, that there was a high proportion of mature females in the pack-ice and if enough time is spent collecting such data in future years, then these issues will be investigated.

Polacheck responded that he would still expect both krill sampling and Antarctic minke whale sampling in the pack-ice to be central components of any research projects with the stated objectives of JARPA II, rather than the adjunct exercises they appeared to be from both the proposal and the explanation given. Hatanaka replied that krill abundance estimates would certainly be carried out routinely every year.

D. Effects on stocks
The current relevant guidelines are:

1. a review of the most recent information on the stock or stocks concerned, including information on any exploitation, stock analysis and recommendations by the Scientific Committee to date (including, where appropriate, alternative analyses and conclusions and points of controversy) (IWC, 1986, p.133);

2. an evaluation of the specification in the permit proposal of 'possible effect on conservation of the stock'. As appropriate, the Scientific Committee may carry out its own analysis of the possible effects (IWC, 1986, p.133); and

3. the research can be conducted without adversely affecting the overall status and trends of the stock in question or the success of the comprehensive assessment of such stocks (IWC, 1988, pp.27-8).

Summary of proposal
Based on the most recent information on stock structure and abundance in the Antarctic minke and humpback whale as well historical information in the case of the fin whale, the effect of JARPA II catches on the stocks has been evaluated by the proponents. They reported that the FITTER methodology used for Antarctic minke whales showed no negative effect on the stocks. In the case of humpback whales, they had applied the population dynamics model developed by Johnston and Butterworth (SC/57/SH16). The results showed that the proposed take of 50 animals per year would probably not delay the recovery of stocks to pristine level. The abundance estimate of fin whales does not cover their entire range and therefore is greatly underestimated. The planned sample size of fin whale is less than 1% of the underestimated abundance, and therefore the planned catch was considered by the proponents to have no adverse effect on the stocks.

Comments and discussion

Some members believed that the takes of Antarctic minke whales would not pose any threat to the population. They also asserted that sample sizes of the larger whale species were also small and unlikely to affect the stocks involved. The proposed takes of humpback whales in particular, are well below recruitment levels judging from recent evidence of a population growth of at least 10%. Abundance of fin whales has also increased so that the proposed catches should not have a negative effect on these stocks.

Leaper reminded the Committee that when the effect of research programme time-scales on catch quotas had been addressed at the 2000 meeting, the Scientific Committee had expressed concerns that open-ended special permit programmes initially proposed as feasibility studies had become ongoing programmes. Consequently the Committee **agreed** that when addressing the effects of special permit catches on stocks it would examine such effects as if the takes were ongoing. The continued increase in special permit takes since that time would seem to make that agreement in 2000 (IWC, 2001d, pp.57-8) even more pertinent for the present discussions.

In response, Hakamada pointed out that in Appendix 9 of SC/57/O1, simulation trials had been run in which continued catches at the levels proposed in JARPA II had little effect on the populations of Antarctic minke or humpback whales even when extended for as long as 30 years. However, the duration of the research programme is independent from the period of the research assumed in the trial.

E. Research co-operation
The current relevant guideline is:

1. comments on the adequacy and implications of specific arrangements for participation by scientists of other nations (IWC, 1986, p.133).

The proponents offered the usual invitation for suitably qualified foreign scientists to join the cruises.

16.2.2 JARPN II
Last year a revised JARPN II plan had been submitted, and the research in 2004 had been conducted according to those plans. There were no changes to the current research plans, on which the Committee had divided views. The Committee therefore refers back to previous statements made by proponents and critics of this research programme (IWC, 2003a, pp.66-77; IWC, 2005c, pp.47-9).

16.2.3 Iceland
The initial Icelandic proposal has been changed with respect to the rate of sampling, and this year's sample size has yet to be determined, although the Marine Research Institute's proposal was for 39 common minke whales. Once again, in the absence of any significant change to the planned research, the Committee refers back to previous statements by members (IWC, 2004b, pp.40-7; IWC, 2005c, p.49).

16.3 Proposals to facilitate the review process of scientific permits
Last year, (IWC, 2005c, pp.44-5; Bjørge and DeMaster, 2004) efforts were made to prepare a proposal to the Commission on restructuring the guidelines for scientific permits but no agreement was reached on any proposal for changes. This included a proposal to use independent reviewers, as had been done for the Southern Ocean Sanctuary review. Therefore, the Committee agreed at last year's meeting that, lacking further guidance from the Commission, the Committee would not be able to agree any recommended changes and that this item should be removed from the agenda. Following a short discussion of several aspects of scientific permit whaling the Committee agreed that little had changed regarding the two disparate positions described in last year's Committee Report and the disparate positions described in Annex O (SC/57O22 and Appendix 2). For example, some members again questioned whether the scientific content of the proposal was sufficient to justify taking whales, while others believed it was. When reviewing scientific permit proposals, the Committee recognises the chronic difficulties it faces in separating purely scientific issues from those issues that are more appropriate for discussion in other fora and notably the Commission. However, **it draws to the Commission's attention** the fact that the integral nature of the scientific and non-scientific issues surrounding expanding scientific permit programmes makes it extremely difficult for the review process within the Committee to function effectively, since it wishes to limit its discussions to purely scientific aspects of the proposals.

Nonetheless, two specific proposals were raised concerning the review process.

Holders of special permits provide annual progress reports on the activities conducted under the special permit during the previous year. The Scientific Committee is required to review these reports and provide advice to the Commission. This year, the Committee was required to review reports from two Japanese permits (JARPA and JARPN II), the Icelandic permit and a new permit proposal by Japan (JARPA II). In all cases the scientific merit and value of the programs are highly controversial with entirely polarised views being expressed.

Some members believe that a major problem with the review process in the Scientific Committee is its lack of independence. They pointed at the proponents defending their own reports and proposals, participating in the review of these and in the drafting of the resulting reports. This is in contrast to a process that leads to the review being undertaken by scientists without conflict of interest, and they felt that this has created a scientific deadlock and an ineffective review process within the Committee. They suggested that an external, transparent review of these progress/mid-term/final reports and proposals should take place by submitting these for review to an international body representing independent scientists with marine mammal expertise e.g. the Society of Marine Mammalogy (SMM). The Journal of this Society publishes peer-reviewed scientific reports irrespective of lethal or non-lethal sampling protocols. They believed that by submitting the reports to the board of SMM, the IWC can expect an external independent review of the science of the work conducted under special permits.

Other members doubted that any independent and objective review of such proposals would be possible, as the issue of scientific whaling has polarised opinions in the wider scientific community as well as in the Scientific Committee. It was also noted by some members that a review of scientific permits is a mandated responsibility of the Committee under the Convention, the Schedule, and the Rules of Procedure. Therefore, it did not seem appropriate for the Committee to abrogate this responsibility to another organisation.

A second proposal for an alternate approach to how the Committee reviews scientific permits was to require the

country responsible for the proposal to subsequently submit a revised proposal that incorporates comments received from the Committee. It was also suggested that under this alternative approach, delegates from the country preparing the proposal would not participate in the review. There is no consensus within the Committee for this proposal.

As noted above, some members did not believe it was reasonable to expect a meaningful review by independent experts, given the controversy that exists over lethal sampling in general in the scientific community, and lethal sampling of large whales in particular.

Polacheck suggested in any case, review of the methodological aspects of proposals relative to evaluation of whether the methodology would likely lead to achievement of the scientific objectives (including survey design, lethal and non-lethal sampling methods and sampling sizes) was one component of the review process that should be feasible and for which it would be useful to seek independent review. Walløe commented that in his experience it is impossible to separate validation of methodology from other aspects of the research plan, such as costs, logistics and questions such as lethal versus non-lethal sampling.

The Committee **concludes** that there is no agreement on any of the suggestions raised during the meeting. It **notes** two issues that emerged that might be given further consideration at next year's meeting:

(1) the possibility of an independent and objective review panel; and
(2) the debate over whether or not the proponents of a proposal should participate in a review of their own proposal.

It further **concludes** that any new review process must be consistent with the Convention and with established Rules of Procedure.

17. WHALE SANCTUARIES

The only agenda item related to whale sanctuaries this year was in response to a request from Palazzo and the Government of Brazil to review a proposal to establish a South Atlantic Whale Sanctuary (SAWS) (IWC/57/4).

Palazzo summarised the proposal. It was noted that this document was not prepared *only* for the Scientific Committee. It was written to be discussed in several fora, including *inter alia* the Scientific Committee, the Conservation Committee, and the Commission Plenary. In the author's opinion, the proposal for a South Atlantic Sanctuary has not received proper time or consideration by the Scientific Committee. The Committee's previous reviews are summarised under Item 17.1.

The author stressed that the proposal for a SAWS presented jointly by Argentina, Brazil and South Africa has a very clear stated goal: that of promoting and consolidating a non-lethal management regime for cetacean resources in the area it encompasses. The author pointed out that the most relevant parts of the proposal for review by the Scientific Committee were contained in parts 6 and 7 of the proposal.

The author also noted that the proposed Sanctuary is to serve the stated goal of promoting non-lethal use of whales. The author pointed out that in this context, the proposed Sanctuary should not be judged in relation to the RMP, nor should its establishment be constrained by the possible future existence of RMP-based management regimes in other areas. It was noted that in the author's opinion, the management decisions concerning the best way of appropriating whale resources are not to be dictated globally only on the basis of lethal harvests.

Finally, it was recognised by the author that the Committee was deeply divided about the issue of sanctuaries and its role in cetacean management. Nevertheless, Palazzo noted that this discussion would be a valuable exercise for the Commission as it attempts to craft a way out of the current deadlock in whale management alternatives.

The issue was raised whether coastal range states had been contacted, as it was desirable for their consent before going forward with this proposal. Palazzo stated that they had and noted that while the Convention applies to 'all waters in which whaling is prosecuted' (Article I (2)), the authors of the proposal understand that nothing in the proposal was intended to imply any restrictions to the sovereign rights of coastal States.

17.1 Background information regarding reviews of sanctuary proposals

Proposals similar to IWC/57/4 have been reviewed in the past by the Scientific Committee. A summary of the most recent comprehensive review was published in IWC (2002c, pp. 65-67; 2002e, pp. 404-7). During its annual meeting in 2001, the Committee 'was unable to reach a consensus view'.

At the 2001 meeting of the Commission, the Scientific Committee received further instructions from the Commission regarding reviews of sanctuaries (IWC, 2002c, p.65). The general guidance was that the Committee 'should give primary attention to considering the scientific feasibility of meeting the scientific aspects of the stated objectives, and, if necessary, recommend amendments to the objectives, or changes to the proposal to better meet its objectives.' Specific guidance included *inter alia*:

(1) assess whether the sanctuary distinguishes between species and stocks that are depleted and apparently slow to recover, those that are increasing rapidly, and those that are abundant and not threatened and assess the present and potential threats to whale stocks and their habitats in the area of the proposed sanctuary and how the proposed sanctuary addresses these;
(2) assess the anticipated effects of the proposed sanctuary in terms of:

    (i) improving protection of whales, in breeding areas, feeding grounds, or migratory routes;
    (ii) improving the conservation of breeding sites, migratory routes or feeding grounds; and
    (iii) complementing existing or potential protection;

(3) provide advice on whether the proposed boundaries of the sanctuary are ecologically appropriate;
(4) provide advice on whether the sanctuary addresses the issue of critical habitat and non-critical whale habitat;
(5) evaluate whether the sanctuary may contribute to or impede the conduct of scientific research useful for meeting IWC objectives and facilitate coordinated and integrated research and monitoring programmes; and
(6) provide advice on whether the sanctuary is consistent with the precautionary approach.

At the 2002 meeting of the Scientific Committee 'it was noted that a proposal for a South Atlantic Sanctuary would

be submitted to the Commission this year and that its supporting document remains the same as that presented to the Committee in 2001' (IWC, 2003a, p.81). There was therefore, no substantive discussion of this proposal during the 2002 meeting.

In 2003, the Scientific Committee discussed an evaluation of the SAWS Proposal based on the instructions from the Commission and the review criteria. As in previous years, there was no consensus regarding recommendations to the Commission (IWC, 2004b, p.50). A summary of the perspectives both for and against the proposal to establish a SAWS is reported in Appendices 2 and 3 of Annex P (IWC, 2004e, pp.372-4).

At the 2004 meeting of the Scientific Committee, no review of the SAWS was undertaken. However, the Committee endorsed the recommendations listed below that were to be implemented generically to the review of sanctuary proposals (IWC, 2005c, p.50).

(1) The purpose(s) of the SOS [Southern Ocean Sanctuary] (and other IWC Sanctuaries) should be better articulated through a set of refined overall objectives (e.g. preserving species biodiversity; promoting recovery of depleted stocks; increasing whaling yield). In particular, the relationships between the RMP and the Sanctuary programme should be articulated.
(2) Appropriate performance measures both for Sanctuaries in general, and the SOS in particular, should be developed. These performance measures should link the refined objectives of the SOS with monitoring programmes in the field.
(3) Systematic inventory and research programmes should be established or further developed so as to build the required information base for a Sanctuary management plan and subsequent monitoring programmes.
(4) A Sanctuary management plan should clearly outline the broad strategies and specific actions needed to achieve Sanctuary objectives (e.g. how to protect x% of a given feeding area for stock y).
(5) A monitoring strategy that measures progress toward achieving the Sanctuary objectives should be developed and subsequently implemented. A key component of this monitoring strategy would be the development of tangible indicators to monitor progress.
(6) Review criteria that reflect the goals and objectives of the Sanctuary (as described above) should be established.
(7) The Sanctuary management plan should be refined periodically to account for ecological, oceanographic and possible other changes in an adaptive fashion.

17.2 Instructions from the Commission to the Scientific Committee for reviews of sanctuaries

As noted above, the Scientific Committee undertook a review of the SAWS proposal at its 2003 meeting following the instructions received from the Commission at their 2001 annual meeting (IWC, 2002b, pp.18-9). After some discussion, there was general agreement that the information presented in IWC (2004e, pp.367-374) remained a reasonable summary of the two primary viewpoints of the Scientific Committee regarding this proposal relative to the most recent guidance from the Commission. However, both proponents and opponents agreed to provide additional comments to update the material provided in Borsani *et al.* (2004) and Hatanaka *et al.* (2004). Their summaries are provided below under Items 17.2.1 and 17.2.2.

17.2.1 Proponents section

Committee members supporting the SAWS proposal noted that the issues presented in Borsani *et al.* (2004) are relevant to the current review. In addition to those, it was further noted by these members that the proposal:

(a) addresses threats to cetacean populations other than whaling in the region encompassed by the SAWS, and considers ways of dealing with these in light of current international law and the sovereign rights of coastal States as expressed in The United Nations Convention on the Law of the Sea (UNCLOS) (pp. 11-15 and 23-24 of IWC/57/4);
(b) fully complies with the list of anticipated effects provided in (2) of the Commission instructions in terms of providing adequate protection of whales in breeding areas, feeding grounds and/or migratory routes, as well as the conservation of vital habitats through international coordination and cooperation, and complements effectively the Commission's current management regimes by proposing non-lethal management in the ocean basin level;
(c) is ecologically justifiable as regards the SAWS proposed boundaries (IWC/57/4, pp.6-8; 18-21);
(d) will contribute to the co-ordination and promotion of research as outlined in IWC/57/4 (pp.22-9), by providing for further involvement of the IWC in fostering cooperation; and
(e) is consistent with Principle 15 of the United Nations Conference on Environment and Development (UNCED) 1992 Declaration, the Precautionary Principle, as it strives for attaining the natural carrying capacity levels and promoting use through exclusively non-lethal means (IWC/57/4, p.30).

17.2.2 Opponents section

Committee members opposing the SAWS proposal noted that the evaluation based on the instructions provided by the Commission presented in Hatanaka *et al.* (2004) also applies to the current review. In addition to that evaluation, these members also noted the points listed below.

In the context of the conservation and management of a living resource, a sanctuary means a limited land or sea area where harvesting activities of the resource is prohibited in order to achieve sustainable utilisation of the resource outside the area. This area is expected to provide a 'refuge' for a certain part of the migration, distribution, and/or life stage of the resource so that the resource is not over-harvested. Conservation measures that are totally prohibitive over a large area when the status of stocks allows for sustainable utilisation or when a management regime in effect is sufficiently precautionary can not be scientifically justified and negate the principle of sustainable utilisation.

A whale sanctuary in the South Atlantic is unnecessary for whale conservation given the application of the moratorium on commercial whaling to that area. Further, the proposal undermines almost a decade of work by the Scientific Committee to develop the risk-averse RMP. Once the RMP is implemented, it will only provide safe quotas for abundant stocks meaning that a sanctuary would be unnecessary and contrary to the purpose of the Convention even after the moratorium is no longer in place. The proposal is also contrary to Article V (2) of the International Convention for the Regulation of Whaling (ICRW) since it ignores the fact that the stock status of some of the large whale species is well above exploitable level.

Table 2

Proposed Workshops and pre-meeting meetings for the intersessional period. Financial implications are dealt with under Item 21.

Subject	Agenda item	Venue	Dates	Steering group
Finalise Soviet catch data	3.3.2	Cambridge	Before January 2006	P1
SOWER cruise: planning meeting and future	10.5	Tokyo	Mid-September (5 days)	P12
Bryde's whale *Implementation* workshop	6.1	Tokyo	25-29 October 2005 (5 days)	P15
SH humpback whale assessment workshop	10.3.1	Hobart	Spring 2006 (5 days)	P25
Fin whale stock structure and catch history	6.2	Reykjavík	Spring 2006	n/a
POLLUTION 2000+ workshop	12.3.1	?Boston	Spring 2006	P20
Bowhead *Implementation Review* workshop	8.4	La Jolla or Seattle	March 2006	P2
TOSSM workshop	11.1	Potsdam	March 2006 (5 days)	P9
Seismic pre-meeting	12.4	St Kitts and Nevis	May 2006 (2 days)	P18
Pre-meeting AWMP (early start)	8.1	St Kitts and Nevis	2 days prior to start of meeting	P2
Pre-meeting RMP (early start)	6.3	St Kitts and Nevis	May 2006	n/a

The opponents of the SAWS proposal noted that the conclusions of the external reviewers which highlight major flaws in the IWC's approach to sanctuaries are also applicable to the proposed sanctuary for the South Atlantic. A summary of these conclusions (IWC, 2005c, pp. 49-51; IWC, 2004a; Zacharias *et al.*, 2004) follows:

(1) the SOS and IWC sanctuaries in general are not ecologically justified;

(2) the SOS is based on vague goals and objectives that are difficult to measure;

(3) the SOS lacks a rigorous approach to its design and operation and does not have an effective monitoring framework to determine whether its objectives are being met;

(4) the SOS represents a 'shotgun' approach to conservation, whereby a large area is protected with little apparent rationale for boundary selection and management prescriptions within the sanctuary; and

(5) the SOS is more prohibitive than precautionary.

17.2.3 Recommendations from the Commission for reviews of sanctuaries
In discussion, with respect to the instructions from the Commission to the Committee, there was no agreement within the Committee regarding the proposal to establish a SAWS.

17.3 Recommendations from the 2004 Scientific Committee meeting for reviews of sanctuaries
Regarding the recommended approach for reviewing sanctuary proposals, the Committee agreed to use the seven topics reported in IWC (2005c, p.50) in evaluating the SAWS proposal under this Agenda Item. Summaries of the positions against and for the proposal are provided in Annexes R1 and R2.

18. RESEARCH AND WORKSHOP PROPOSALS AND RESULTS

Table 2 lists the proposed intersessional meetings and Workshops.

18.1 Review results from previously funded research proposals
Results from IWC funded projects are dealt with under the relevant agenda items.

18.2 Review proposals for 2005/2006
No unsolicited research proposals were received.

19. COMMITTEE PRIORITIES AND INITIAL AGENDA FOR THE 2006 MEETING

19.1 Committee priorities for SC/57 (2005)
At this year's Scientific Committee meeting, 13 sub-committees (including standing Working Groups and *ad hoc* Working Groups) were established. As was the case last year, the annual meeting of the Committee was conducted over a 12-day period of which two days were allocated to Plenary. The number of sessions for sub-committee deliberations was therefore limited to 90. This is based on three concurrent sub-committee meetings for each of five work sessions per day, starting at approximately 08:30 and ending typically at 21:30, for a period of six days. At this year's meeting, because of our inability to schedule certain sub-committees opposite other sub-committees we were only able to schedule 85 meetings of sub-committees and Working Groups.

Some members were disappointed that insufficient time in sub-committee meetings was available to adequately discuss certain agenda items or issues, as reflected in some sub-committee reports. However, it was recognised by all members of the Committee that there was insufficient time to fully address all of the issues of relevance to the Commission. Therefore, difficult choices had to be made about which issues to assign priority during the 2005 meeting.

Table 3

Number of sessions by subgroups in 2005.

Sub-committee	Sessions	Sub-committee	Sessions
RMP	6	SM	8
AWMP	5*	SD	4
BRG	7**	SH	8
IA (+SOWER/NPM)	18**	Sanctuaries	2
BC	6*	Scientific Permits	5
E	10**	DNA	2
WW	4	**Total**	**85**

*Had pre-meeting; **had joint pre-meeting.

19.2 Committee priorities for SC/58 (2006)
As in recent years and with the Committee's agreement, the Convenors met after the close of the Committee meeting and drew up the following as the basis of an initial agenda for the 2006 meeting. The same criteria as previous years were taken into account (IWC, 2004b, p.51). The Committee recognises that priorities may have to be reviewed in light of decisions made by the Commission at IWC/57.

As last year, the Convenors agreed a provisional number of sessions per sub-committee. It was agreed that the

number of sessions allocated to each sub-committee will have to be strictly followed, as with only six days for sub-committee meetings there will be a maximum of 90 sessions available. The provisional number of sessions per sub-committee is indicated in Table 3. Items of lower priority on sub-committee agendas will only be discussed as time allows. The Committee **stresses** that papers considering anything other than priority topics will probably not be addressed at next year's meeting.

Based on comments received during Plenary, the Convenors agreed to form an *ad hoc* Working Group under IA to handle discussions related to North Pacific common minke whales. In addition, an *ad hoc* Working Group under Environmental concerns will be formed to handle discussions related to ecosystem modelling (e.g. interspecific competition). At this stage, the Convenors were not aware of the need to create a Working Group to evaluate the scientific merits of any sanctuary proposals at next year's meeting.

In addition, it was agreed that three pre-meeting meetings will be proposed to the Commission for:

(1) AWMP;
(2) RMP; and
(3) E (Seismic Noise Workshop).

The proposal is that AWMP and RMP will share 2 days.

Table 4
Proposed allocation of sessions for 2006.

Sub-committee	Sessions	Sub-committee	Sessions
RMP	11*	SM	9
AWMP	8*	SD	5
BRG	8	SH	7
IA	10	Scientific Permits	3
BC	7	DNA	2
E	6**	North Pacific common minke (NP)	5
WW	6	Ecosystem modeling	3
		Total	**90**

*Plus pre-meeting; **plus workshop.

Revised Management Procedure (RMP)
As last year, this Committee will concentrate on general issues as well as preparations for *Implementation*. The Committee **agrees** on the following priority items (in order).

General issues
Evaluation of the criteria developed to determine whether the conservation performance of a RMP variant is 'acceptable', 'borderline' or 'unacceptable' (Item 5.1.1).

Implementation *process*

(1) 'First Intersessional Workshop' for western North Pacific Bryde's whales; and
(2) finalise the issues related to completing the *pre-Implementation assessment* for North Atlantic fin whales.

Aboriginal Whaling Management Procedure (AWMP)
The Committee **agrees** that the items below should be given priority:

(1) review progress on the Greenlandic research programme (especially with respect to abundance, stock structure and the use of sex data in assessments) and attempt to provide management advice;

(2) review progress on and refine design of trial specifications and coding for B-C-B bowhead whales (will include joint sessions with BRG on stock structure); and
(3) review information on the St. Vincent and The Grenadines fishery and provide management advice.

Bowhead, right and gray whales (BRG)
The Committee **agrees** that the following item will be given highest priority:

(1) review of new information on the stock structure of the B-C-B Seas stock of bowhead whales and on the progress of on-going research (joint meetings with the SWG on the AWMP).

It will also:

(2) perform the annual review of catch information and new scientific information for the B-C-B Seas stock of bowhead and ENP gray whales; and
(3) review new information on the western North Pacific stock of gray whales, right whales and the small stocks of bowhead whales.

In-depth assessment (IA)
The Committee **agrees** that the following item will be given highest priority:

(1) produce agreed abundance estimates of Antarctic minke whales;

followed by (in priority order):

(2) continue development of the catch-at-age analyses of the Antarctic minke whales;
(3) develop recommendations for future SOWER cruises, both for the short- and long-term; and
(4) continue to examine and then attempt to agree on reasons for differences between Antarctic minke abundance estimates from CPII and CPIII.

A separate Working Group will continue preparation for an in-depth assessment of western North Pacific common minke whales, with a focus on J stock.

Estimation of bycatch and other human-induced mortality (BC)
The Committee **agrees** on the following priority items:

(1) further review of information and methods to estimate bycatch based on fisheries data and observer programmes:

(a) continue collaboration with FAO on collation of relevant fisheries data;
(b) progress on joining the FIRMS partnership;
(c) report back on EU bycatch monitoring schemes; and
(d) review modeling to determine observer coverage needed in a fishery to estimate bycatch; and

(2) further consideration of methods to estimate bycatch based on genetic data;

(a) review progress on intersessional work related to market sampling; and
(b) report from Steering Group for follow-up Workshop on the use of market sampling to estimate bycatch.

In addition, the following items may be discussed if time allows (in priority order):

(3) further review information and methods to estimate mortality from ship strikes;

    (a) review results of data collected on vessels relevant to ship strikes;

    (b) review report from planned ACCOBAMS workshop on ship strikes; and

(4) consider methods for estimating additional human induced mortalities (e.g. from acoustic sources and marine debris).

Other Southern Hemisphere whales (SH)
The Committee **agrees** that the following item will be given highest priority:

(1) completion of the Comprehensive Assessment of Southern Hemisphere humpback whales;

    (a) completion of a final catch series; and
    (b) an intersessional Workshop.

It will also:

(2) initiate the Comprehensive Assessment of blue whales to the extent that time allows.

Environmental concerns (E)
The Committee **agrees** that the following items will be given high priority:

(1) two day pre-meeting Workshop to assess the potential for seismic surveys to impact cetaceans; and
(2) Working Group on ecosystem modelling.

The SWG will also receive progress reports on:

    (a) POLLUTION 2000+ (review of final report from Phase 1);
    (b) Southern Ocean Collaboration;
    (c) SOCER: focus on the Indian Ocean;
    (d) Sea ice: Arctic and Antarctic; and
    (e) Diseases: developing plans for a future workshop.

Stock definition (SD)
The Committee **agrees** that the following items will be given priority:

(1) review statistical and genetic issues relating to stock definition; and
(2) review progress on TOSSM (including the intersessional Workshop report).

The following items will be discussed if time allows (in priority order):

(3) unit-to-conserve; and
(4) genetic quality issues and implications for population structure analyses.

Whalewatching (WW)
The Committee agrees that the two priority items will be:

(1) assessing the biological impacts of whalewatching on cetaceans; and
(2) identifying data sources from platforms of opportunity of potential value to the Scientific Committee.

In addition, the following items will be discussed if time allows:

(3) reports from Intersessional Working Groups;
(4) review of potential impacts of 'swim-with-whales' programmes on populations of cetaceans;
(5) review of whalewatching guidelines and regulations; and
(6) review of risks to cetaceans from whalewatching vessel collisions.

Small cetaceans (SM)
The Committee **agrees** that the following item will be given highest priority:

(1) review of small cetaceans of the Caribbean and western tropical Atlantic.

The following items will also be discussed:

(2) progress on previous recommendations; and
(3) takes of small cetaceans.

Scientific permits (SP)
The Committee **agrees** that the following items will be given priority:

(1) review proposals for other procedures for reviewing scientific permits;
(2) review results from existing permits (including plans for the JARPA review); and
(3) review of new or continuing proposals.

DNA
The Committee agrees that the following items (as directed by the Commission) will be given priority:

(1) review genetic methods for species, stock and individual identification;
(2) collect and archive tissue samples from catches and bycatches; and
(3) reference databases and standards for diagnostic DNA registries.

20. DATA PROCESSING AND COMPUTING NEEDS FOR 2005/2006

The Committee identified and agreed the requests for intersessional work by the Secretariat given in Table 5.

Two items (WNP Bryde's whale trials and bowhead whale trials) cannot be specified in any detail until after the two intersessional Workshops (in late October 2006 and March 2006, respectively) so the time listed for these tasks is an estimated maximum. The work in coding the final bowhead trials is not scheduled to be completed until the 2nd intersessional Workshop in October 2006, whereas work resulting from the intersessional workshop for WNP Bryde's whales is required to be completed by the 2006 annual meeting, in order to comply with the agreed timetable for an *Implementation*. It is not expected that there will be conflict, but if there is any, higher priority will be accorded to the Bryde's whale work (which is required first) and urgent consideration should be given to determining ways to ensure that both tasks are completed on time.

Progress will be reviewed by Donovan, Bannister, Punt, Bjørge and Palka.

Table 5
Computing tasks/needs for 2005/6.

Task	Est. time
RMP – General issues	
Work with Punt to evaluate the criteria developed to determine whether the conservation performance of a RMP variant is 'acceptable', 'borderline' or 'unacceptable' (see Item 5.1.1).	<1 month
RMP – Preparations for *Implementation*	
Finish preparation of catch data for western North Pacific Bryde's whales.	<1 month
Work resulting from intersessional workshop for western North Pacific Bryde's whales: write code to implement the *IST*s and do conditioning.	4-6 months[1]
Preparation of catch data for a North Atlantic fin whale *Implementation* (including collaboration with Dorete Bloch).	1 month
Encoding of Faroese data from 1902 on (as supplied by Dorete Bloch).	>6 months
AWMP	
Work resulting from intersessional workshop for the Bowhead *Implementation Review*: write code to implement the final stock structure hypotheses.	Up to 8 months[2]
In-depth assessment	
Validation of the 2004/05 SOWER cruise data and incorporation into the sightings database.	6 months
Southern Hemisphere whale stocks	
Validation of basic individual records from the revised Soviet catch data and documentation of inconsistencies in the data.	6 months
Preparation of summaries of the revised Soviet Southern Hemisphere catch data and work towards creation of an interpolated dataset of missing data (including collaboration with former Soviet scientists at a workshop in Cambridge).	1 month
Finalise the Southern Hemisphere humpback whale catch series (by January 2006).	1 month
Investigate whether the historic blue whale catch data can be amended to distinguish between blue and pygmy blue whales.	1 month
Stock definition	
Development of interface between *CLA* and TOSSM programs (with Punt).	<1 month

[1]This item will not be specified until the intersessional workshop in October 2005 and so a guessed maximum time has been entered. [2]This item will not be specified until the intersessional workshop in March 2006 and so a guessed maximum time has been entered; the work is not scheduled to be completed until the 2nd intersessional workshop scheduled for October 2006.

All other tasks required for the Scientific Committee meeting in 2006 should be completed in timely fashion.

The Scientific Committee will be notified by e-mail when the Southern Hemisphere whale catch series has been finalised.

A Russian minority statement is presented in Annex S.

21. FUNDING REQUIREMENTS FOR 2005/2006

Table 6 summarises the complete list of recommendations for funding made by the Committee. The total required to meet its preferred budget is £409,400. The Committee **recommends** all of these proposed expenditures to the Commission.

However, it understands that the projected amount available for funding is £265,000. It therefore carefully reviewed the full list, taking into account its work plan, priorities and the possibility that some of the work requiring funding could be postponed to a future year or years. Such considerations are difficult and the Committee **stresses** that projects for which it has had to suggest reduced or no funding are still considered important and valuable. Should the Commission be unable to fund the full list of items in Table 6, the Committee **agrees** that the final column given in the table represents a budget that will allow progress to be made by its sub-committees and Working Groups in its priority topics. Progress will not be possible in some important areas, as outlined below and the Committee **requests** that the Commission or individual member governments provide additional funding in these areas. The Committee **strongly recommends** that at a minimum, the Commission accepts its reduced budget of £266,000, noting that this is only £1,000 more than the projected budget.

A summary of each of the items is given below, by sub-committee or standing Working Group. Full details can be found under the relevant Agenda Items and Annexes as given in the table.

(a) Items recommended for funding under the reduced budget
Revised Management Procedure
(1) NORTH PACIFIC BRYDE'S WHALE - INTERSESSIONAL WORKSHOP
The Commission has endorsed the process recommended last year by the Committee with respect to the time schedule if an *Implementation* begins (IWC, 2005e, pp.84-92); this requires two intersessional Workshops and thus another will be required after the 2006 annual meeting. The funding is required to cover the costs of invited participants; Japan has kindly offered to host the Workshop.

(2) NORTH ATLANTIC FIN WHALES - STOCK STRUCTURE
The Committee has outlined a programme to complete the *pre-Implementation* process for fin whales. This was agreed by the Commission last year. The money is required to allow two IWC scientists to participate in a joint workshop with NAMMCO in Reykjavík. The Workshop will not deal with management issues but will focus on the scientific aspects of stock structure and the development of an agreed catch series for North Atlantic fin whales.

Aboriginal Whaling Management Procedure
(3) AWMP DEVELOPERS FUND
The developers fund has been invaluable in the work of the AWMP trials and other essential tasks of the Standing Working Group. It has been agreed as a standing fund by the Commission. The two primary developing tasks facing the SWG are the bowhead whale *Implementation Review* (a requirement of the Committee and Commission) and issues relating to the Greenlandic fisheries. The task facing the SWG with respect to the Greenlandic fisheries is a major one and of high priority to the Committee which has expressed its great concern at its inability to provide management advice on safe catch limits (see Item 8.3, 8.4 and 8.5). The fund is essential to allow progress to be made.

(4) GREENLAND COMMON MINKE WHALES – GENETIC DATA AND ABUNDANCE
The Committee is unable to provide advice on the effects of aboriginal subsistence whaling on the common minke whale stocks off West Greenland. A major problem in terms of its ability to give management advice is that the total geographical area occupied by common minke whales potentially available to be harvested off West Greenland during summer is largely unknown and thus surveys consequently cover an unknown fraction of the range of the stock. Genetic methods may be able to provide a lower bound for the size of the total stock. This study will assess the statistical power of various genetic approaches to estimate abundance. It will be conducted intersessionally and if found to be appropriate, it will develop estimates of sample size and costs for an appropriate study. This would be seen as of very high priority by both the national authorities and the Commission.

In-depth assessments
(5) SOWER CIRCUMPOLAR CRUISE
The Committee and the Commission have both given high priority to obtaining agreed abundance estimates for Antarctic minke whales and for explaining the differences between CPII and CPIII. The proposed plans for this year's survey are directed at experiments to address these problems as well as to conduct a pilot study to determine the best method to collect abundance data for fin whales (north of 60°S, acoustic survey, biopsying), and to continue research on blue whales and particularly humpback whales which are the subject of a comprehensive assessment. The funding is for equipment and participation by international scientists. The vessels are generously provided by the Government of Japan.

(6) FURTHERING ESTIMATION OF ANTARCTIC MINKE WHALE ABUNDANCE
As noted above, the Commission and the Committee have given high priority to obtaining agreed abundance estimates and trends for Antarctic minke whales and for explaining the differences between CPII and CPIII. To maintain the progress expected by the Commission requires that projects (i)-(iv) below are funded. The Committee notes that a considerable amount of in-kind support is included in these projects. Next year the Committee expects to receive abundance estimates from at least the standard method

Table 6

Summary of budget requests for the coming year. The number in parentheses after the short title refers to the number in the discussion below.

		Budget	
	Reference	Requested	Reduced
RMP (Annex D)			
North Pacific Bryde's whales *Implementation*. 1st intersessional workshop (a1).	Item 6.1.1.2	£10,500	£10,000
North Atlantic fin whales. Participate at workshop (a2).	Item 6.2.2	£2,500	£2,000
AWMP (Annex E)			
AWMP developers fund (a3).	Item 8.	£10,000	£8,500
West Greenland common minke whales. Abundance estimation from genetic data (a4).	Item 8.2	£3,500	£3,500
Bowhead whale. Intersessional workshop to prepare for *Implementation Review* (b1).	Item 8.4	£7,700	£0
IA (Annex G)			
Furthering estimation and interpretation of abundance estimates			
SOWER cruise 2005/6 (a5).	Item 10.1.5	£95,900	£80,000
DESS maintenance (a6i).	Item 10.1	£7,500	£7,500
DESS standard analysis method (a6ii).	Item 10.2.3	£6,000	£4,000
Integrated model analysis (a6iii).	Item 10.2.3	£2,000	£2,000
CPII and CPIII explanation: VPA analysis (a6iii).	Item 10.1.2	£6,000	£5,000
CPII and CPIII explanation: catch-at-age analysis (a6iv).	Item 10.1.2	£20,000	£20,000
E (Annex K) – some with IA and BRG			
ICCED science planning and analysis/SO-collaboration. Cruise coordination (a7).	Item 12.3.2	£40,000	£13,000
German SO-GLOBEC, Weddell Sea. IWC participation (a8).	Item 12.3.2	£22,000	£17,500
Deakin University SOC database completion (a9).	Item 12.3	£30,000	£10,000
Whales and shelf break krill distribution (a10).	Item 12.3.2	£2,000	£1,000
Arctic sea ice – population dynamics (a11).	Item 12.1	£30,000	£14,500
Impact on cetaceans from seismic surveys. Workshop (a12).	Item 12.3.5	£6,000	£4,000
Arctic sea ice – body condition and health (b2).	Item 12.1	£20,000	£0
SOCER. Coordination, literature search and editing (b3).	Item 12.3.3	£3,000	£0
SH (Annex H)			
Southern Hemisphere humpback whale. Workshop (a13).	Item 10.3.3	£12,000	£8,000
Southern Hemisphere humpback whale. Code and run population dynamics model (a14).	Item 10.3.1.4	£1,000	£1,000
Southern Hemisphere humpback whale. Finalise catch series (a15).	Item 10.3.1.2	£2,000	£1,000
Cataloguing of Antarctic humpback whales for online access (a16).	Item 10.3.1.5	£5,300	£5,300
Southern Hemisphere blue whales. Initiate Comprehensive Assessment (a17).	Item 10.3.2	£6,000	£3,000
SD (Annex I)			
TOSSM intersessional workshop with non-SC developer of genetic methods (a18).	Item 11.1	£9,000	£8,000
BC (Annex J)			
Co-ordination with FAO (a19).	Item 7.1.1	£2,500	£1,200
Estimation of bycatch. Simulation modelling (a20).	Item 7.2.1	£7,000	£1,000
Estimation of bycatch. Data collection and market pathways (a20).	Item 7.2.1	£5,000	£5,000
Scientific Committee			
Invited participants (a21).		£35,000	£30,000
Total		**£409,400**	**£266,000**

(Branch), the integrated model (Cooke) and the hazard probability method (Okamura). The IWC's DESS is vital to the Committee's work on abundance estimation, both with respect to providing estimates of abundance for past cruises and for future work on the abundance of Antarctic minke whales.

(i) DESS maintenance
(ii) DESS-standard analysis and integrated methods
(iii) and (iv)VPA analysis and catch-at-age analysis
This work has been recommended by the Committee and is essential in furthering the work on exploring the reasons for differences in Antarctic minke whale abundance from CPII and CPIII and working towards an in-depth assessment. The data have been generously been made available by the Institute of Cetacean Research (Tokyo) under the Data Availability Agreement.

Environment (some with IA and BRG)
(7) ICCED SCIENCE PLANNING AND ANALYSIS/SO-GLOBEC COLLABORATION
This work will contribute to high priority analysis outlined in the sea ice Symposium (and see Annex K) and to ongoing collaboration with SO-GLOBEC. Research on Southern Ocean whales and their ecosystem is recommended by IWC Resolutions 1998-3 and 1998-6. Support for this activity complements the considerable in-kind support the IWC receives for the SO collaborative cruises. The Committee recognises that the funds available are less than those requested and **agrees** that allocation of the available funds should be the responsibility of the SOC Steering Group who must inform the Secretariat of their final decision on a spending plan.

(8) ANTARCTIC: GERMAN SO-GLOBEC. IWC PARTICIPATION
This is part of the field work programme previously funded in collaboration with SO-GLOBEC. The money is to fund a team of two observers on two cruises. The work will provide data to further elaborate the relationship between ice and cetaceans. It is the final year of a German Weddell Sea research programme. This work was given high priority at the Committee's recent sea-ice Workshop (SC/57/Rep5).

(9) DEAKIN UNIVERSITY – SOC DATABASE COMPLETION
The SOC database comprises data for all IWC/SO-GLOBEC/CCAMLR and other multidisciplinary survey data and sea-ice data under international collaborative programmes. This work will contribute to high priority analyses, outlined in SC/57/Rep5. The Committee has reluctantly recommended, as necessary, to reduce the funding for this proposal and thus priority should be given to coding data directly relevant to examining the questions related to the proportion of Antarctic minke whales in the pack ice. It is hoped that if external funding cannot be found this year, the remainder of the work can be completed next year.

(10) WHALES AND SHELF BREAK KRILL DISTRIBUTION
This work relates to possible differences between CPII and CPIII of the SOWER cruises. The funds will be used to pay for the travel and subsistence costs of Ensor (SOWER cruise leader) to attend a collaborative meeting to discuss spatial analysis and sea ice conditions on surveys.

 (11) SEA ICE – POPULATION DYNAMICS
This work represents partial funding for one of the high priority Arctic projects identified in the sea ice Workshop. (SC/57/Rep5 and Annex K). It relates to a number of issues

potentially affecting the management and conservation of B-C-B Seas bowhead whales and eastern gray whales. The funds are for a student to work with a sea ice specialist to derive regional (meso-scale) analysis of changes in sea ice since 1979 and undertake projections into the future. This will feed into the project to be undertaken *gratis* by Wade, Punt, Breiwick and Brandon, to incorporate sea ice analyses into the population dynamics record of those two whale populations.

(12) IMPACT ON CETACEANS FROM SEISMIC SURVEYS WORKSHOP
Last year, the SWG on environmental concerns had recommended the holding of a Workshop on seismic exploration (including both industrial and academic activities) at the 2006 meeting. This proposal was developed further this year (Annex K, Appendix 3). It is timely as the hydrocarbon industry is expanding. Accelerating studies to assess potential impacts on cetaceans and examine ways to mitigate known and potential effects is thus particularly important. The funds are required to pay for IPs.

Southern Hemisphere whales (other than Antarctic minke whales)
(13) SH HUMPBACK COMPREHENSIVE ASSESSMENT - WORKSHOP
The Committee has been undertaking a comprehensive assessment of Southern Hemisphere humpback whales for several years and has given priority to its completion. The best way to finalise this work is to hold an intersessional Workshop. The Government of Australia have kindly offered to host this Workshop in Hobart, Australia. The funds are required for IPs (see Annex H, Appendix 7).

(14) SH HUMPBACK WHALE – POPULATION DYNAMICS MODEL
This project involves the coding and use of population dynamics models needed to finalise the Comprehensive Assessment referred to above. This work is essential for the success of the Workshop. The funds are to enable Johnston to complete this work.

(15) SH HUMPBACK WHALE - FINALISE CATCH SERIES
Similarly, the success of the Workshop referred to in (13) above depends on having a final catch series available. The funds will allow a scientist to travel to Cambridge to work with Allison, former Soviet scientists and others, to complete the historical catch data series and extract catches of humpback whales for the Comprehensive Assessment.

(16) ANTARCTIC HUMPBACK WHALE CATALOGUE
The Committee is already committed to funding this project, which represents only a partial cost of running the catalogue and is of great benefit to its in-depth assessment of Southern Hemisphere humpback whales. The work required to *inter alia* make the IWC/SOWER photographs more accessible is being carried out. The funds are mainly required for database management.

Stock definition
(18) TOSSM WORKSHOP
The Committee has noted the importance of stock structure issues to most of its Working Groups and sub-committees. For that reason it funded the first TOSSM workshop. Progress on the first stage of the process, developing simulated populations, has been excellent but for this to be of maximum value to the IWC, the next stage, i.e. the

incorporation of management related issues and the testing of methods to determine boundaries, must be undertaken. It was agreed that the only way to achieve this efficiently and appropriately is to hold another workshop. This will enable progress to be made at the 2006 Annual Meeting. The University of Potsdam has kindly agreed to host the Workshop. The funds are required for Invited Participants (IPs).

Bycatch
(19) CO-ORDINATION WITH FAO
The Committee has recommended that co-operation with FAO be continued with respect to information on fisheries, fishing gear and effort, as part of its work to try and estimate bycatch levels in terms of assessment and RMP related work to determine total removals. As a result of contacts made last year it is clear that increased cooperation can be of great mutual benefit. The collaboration will allow the IWC to become a partner agency in to FIRMS.

(20) ESTIMATION OF BYCATCH
In 2004, the Committee agreed to hold a Workshop to determine whether market sampling based methods can be used to provide adequate estimates of the number of bycaught animals. The initial Workshop was held this year and before deciding when the final Workshop should be held, the Committee identified work that needed to be completed. It was agreed that this year the following should be undertaken: (i) initial work to develop a modelling framework for sensitivity analysis and for testing market sampling design; and (ii) the collection of additional data on markets and market pathways. The initial modelling work will cost £1,000 and the data collection £5,000. After discussion of the results at the next Annual Meeting (2006), guidance on completing the development of a full simulation modelling framework can be given (the costs of completing this development is provisionally estimated at about £6,000 but this will be discussed next year).

Scientific Committee
(21) INVITED PARTICIPANTS FUND
The Committee **draws attention** to the essential contribution made to its work by the funded IPs. The IWC-funded IPs play an essential role in the Committee's work. 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.

(b) Recommended items not included under the reduced budget (but still supported by the Scientific Committee)
(1) BOWHEAD *IMPLEMENTATION REVIEW* - INTERSESSIONAL WORKSHOP
This is a high priority item. The Commission has noted that we will have a bowhead *Implementation Review* in 2007. Due to the oddly named if not oddly derived 'Oslo bump', a major research programme has been initiated on bowhead whale stock identity. This has the potential to initiate a complex modelling exercise to test the performance of the *Bowhead SLA* with alternative stock hypotheses. The purpose of this Workshop is to specify the basic structure and types of simulation trials required. It is integral to the SWG workplan on this agenda item and will form an important contribution to its work at the next annual meeting and beyond. The USA has kindly agreed to host this meeting and it has been allocated no funding because

the USA has also indicated that it will make a donation to the research fund to cover the costs of the necessary IPs. Venue and dates will be determined when more information on progress becomes available but it will probably be in March 2006.

(2) SEA ICE – BOWHEAD WHALE BODY CONDITION AND HEALTH
This was identified as one of the priority items from the Sea Ice Workshop and was endorsed in Annex K. The Committee recognise the value of the work outlined in SC/57/Rep5 and hopes that this project will obtain outside funding.

(3) PREPARATION OF SOCER
The Commission (IWC, 2001a) has encouraged work in this area. A Working Group within the SWG again produced a SOCER this year that forms Appendix 2 of Annex K of the Committee's report. It is aimed at providing a non-technical report of some events and developments in the marine environment relevant to cetaceans to the Commission. The Committee hopes that this work will receive outside funding.

22. WORKING METHODS OF THE COMMITTEE
There was no substantive discussion under this Agenda Item. It was agreed to keep it on the agenda for next year.

23. ELECTION OF OFFICERS
The three-year terms of DeMaster as Chair and Bjørge as Vice-Chair end at the completion of IWC/57. The heads of delegations therefore met according to the new Rules agreed last year (IWC, 2005c, p.59). The Committee was delighted to welcome Bjørge as Chair and Palka as Vice-Chair by consensus.

24. PUBLICATIONS
2004 was another productive year with respect to the IWC's scientific publications and the Journal continues to attract increasing numbers of submissions. This year, in addition to the 500 page supplement, Volume 6 was completed. Volume 6 contained a total of 34 papers involving some 120 authors from 24 countries. Papers have been published on the full variety of subjects considered by the Committee. Donovan thanked the Publications staff for their hard work. In particular, he thanked Clare Last, who was Assistant Editor from the first issue, for her great contribution both to the Journal and to the work of the Scientific Committee. She left the IWC for pastures new in September 2004. The Committee members send her their best wishes for the future. He also welcomed the new Assistant Editor, Jemma Miller, who replaced Clare in January 2005.

Donovan reported that he and Hammond will finalise the third special issue (on development of the Revised Management Procedure) this autumn. With respect to ISI listing, he has been informed that the ISI listing is now complete.

Following discussions last year, the Guide for Authors has been modified as follows:

Welfare and legal policy
When submitting a manuscript for publication, the author(s) must state that all work conforms to the legal requirements of the country in which it was carried out, including those relating to conservation and animal welfare.

Sequence data

Authors submitting papers containing nucleic acid data must provide full primary sequences as Appendices for reviewing purposes. In addition it is expected that new DNA sequences are submitted to GenBank, and accession numbers cross-referenced throughout the text.

Finally, Donovan reiterated the importance of Committee members urging their respective institutes and colleagues to subscribe to the Journal and to submit high quality papers to it. The success of the Journal will be greatly increased as it becomes established in more institutional libraries.

The Committee welcomes this report and **stresses** the vital contribution the Journal makes to the work of the Committee and to the wider issues of the management and conservation of whales.

25. OTHER BUSINESS

On behalf of the Committee, the outgoing Chair expressed deep appreciation to the Government of Korea and the Mayor and people of Ulsan for the exceptional level of support and hospitality extended to the Committee during the meeting. The Committee also thanked the Secretariat for its major contribution to the smooth running of the meeting, as always carried out with great diligence and cheerfulness. The Committee gave DeMaster a standing ovation for his outstanding work as Chair of the Committee. In particular, he was praised for his unflinching efforts to reach consensus on as many issues as possible, his fairness and his great good humour. In reply he noted that he was handing over to an outstanding team in Bjørge and Palka. He also wryly noted that he was the only person to have faced competition in elections for both Chair and Vice-Chair – he hoped this was an 'honour' he alone would always retain!

26. ADOPTION OF REPORT

The report was adopted at 16:47hrs on 10 June 2005. As usual, final editing was carried out by the Convenors after the meeting.

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