Report of the Scientific Committee

The meeting (SC/66b) was held at the Golf Hotel, Bled, Slovenia, from 7-19 June 2016 and was chaired by Caterina Fortuna. The next meeting of the Commission (IWC/66) will take place during October 2016. The list of participants is given as Annex A.

1. INTRODUCTORY ITEMS

1.1 Chair's welcome and opening remarks

Fortuna welcomed the participants to the meeting. She thanked Slovenia and the City of Bled for inviting the Committee back to this beautiful venue, as well as the Slovenian Commissioner, Andrej Bibič, and Mateja Legat, who worked with Mark Tandy of the Secretariat to organise the meeting. Particularly enjoyable was the reception was hosted by the Slovenian government. Finally, she thanked members of the Secretariat, Convenors and Committee members for all their help in preparing her for her first meeting as Chair.

Nina Kodelja, Head of Sector for New Challenges, Slovenian Ministry for Foreign Affairs, welcomed participants and hoped that the beautiful surroundings would provide a constructive environment for work and an enjoyable stay. Slovenia enjoys great biodiversity, values its natural heritage and environmental issues are important to Slovenian foreign policy. Slovenia has been actively engaged in regional cooperation and the promotion of the Mediterranean strategy for sustainable development. Slovenia is also a member of ACCOBAMS. She thanked the participants for attending the meeting and thanked them for their hard work on the conservation of whales.

Marija Markeš, Head of Sector for Nature Conservation, Slovenian Ministry for Environmental and Special Planning, also welcomed participants back to Bled. She noted that the Natura 2000 network covers 37% of Slovenia, protecting over 60 habitat types and 230 species. She stressed the importance of scientific knowledge in shaping government policies on conservation and management. Finally, she hoped participants would be able to find time to experience the natural diversity and beauty of Slovenia for themselves.

Brockington, IWC Executive Secretary, thanked the representatives of Slovenia, for their warm welcome. This year, 2016, is the 70th Anniversary of the IWC and the work of the Scientific Committee has played an important role. The Committee addresses an increasingly broad range of subjects and last year held 10 intersessional expert Workshops. Along with Commission Workshops, the IWC now receives expert input on the full range of issues relevant to cetacean management, research and conservation. This work has also led to increased engagement with other IGOs (see Item 4) and in 2015 in excess of £400,000 in voluntary contributions was received, mainly to progress work originating in the Scientific Committee. Brockington thanked all members of the Scientific Committee for giving their time and knowledge to participate in the meeting, the rest of the Secretariat for their positivity in organising the meeting and Andrej Bibič for his enthusiasm for the IWC and the natural world, which have led to Slovenia hosting the Scientific Committee meeting for a second time.

The Committee then paused for a moment of silence, for Professor Tanaka, who sadly passed away on 13 January 2016 at the age 89. Professor Tanaka made important contributions to fisheries science worldwide. He began his professional career in 1948 and in 1962 he became professor at the Population Dynamics Division of the Ocean Research Institute of the University of Tokyo. Later he was appointed Dean of the Tokyo University of Fisheries. He educated many people who ultimately contributed to fisheries science worldwide and produced a substantial number of scientific publications. With respect to cetaceans, he was member of the board of directors and later one of the scientific advisors of the Institute of Cetacean Research. He participated actively in the work of the Scientific Committee from 1980. One of his major contributions to Committee was during the discussions to the RMP when the Sakuramoto-Tanaka Procedure was one of the five candidate procedures. Professor Tanaka had a warm personality and his combination of academic excellence and great humanity will be missed.

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

The Committee agreed to the meeting procedures and time schedule outlined by the Chair.

1.4 Establishment of sub-committees and Working Groups

The following pre-meetings were held:

(1) the Standing Working Group on Environmental Concerns held a pre-meeting on 'Acoustic Masking and Whale Population Dynamics' from 4-5 June; and
(2) the Working Group on Sanctuaries held a pre-meeting to 'Review the South Atlantic Sanctuary Proposal (SAWS)' from 5-6 June.

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;

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

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

Annex G – Sub-Committee on In-Depth Assessments;

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

Annex I – Working Group on Stock Definition;

Annex J – Working Group on Non-Deliberate Human-Induced Mortality of Cetaceans;

Annex K – Standing Working Group on Environmental Concerns;

Annex L – Working Group to Address Multi-species and Ecosystem Modelling Approaches;

Annex M – Sub-Committee on Small Cetaceans;

Annex N – Sub-Committee on Whalewatching;

Annex O – Working Group on DNA Testing;

Annex Q – Working Group on Sanctuaries;

Annex R – *Ad hoc* Working Group on Guidelines for Photo-Identification Databases;

Annex S – Progress on the Compilation of Agreed Abundance Estimates and Summary of Status;

Annex T - Matters related to discussions of NEWREP-A;

Annex U - Matters related to discussions of the Final Review of JARPN II; and

Annex V – Intersessional email correspondence groups.

1.5 Computing arrangements

Brockington outlined the computing and printing facilities available for delegate use.

1.6 Format of the report

This year the Scientific Committee report contains a new format for recommendations and agreements.

The discussion on the adoption of a better way to deliver our advice and clarify who is the target of each of our deliberations/considerations has been ongoing since the last Commission meeting in 2014. At that time, the Scientific Committee chair, vice chair and Head of Science received a positive feedback from the Commission on the two-year summary document (Kitakado *et al.*, 2016a), which highlighted recommendations that were of most relevance to or directed at the Commission (including its subsidiary bodies). This year, this matter was discussed at the convenors meeting and during the final Plenary in the context of Item 26. It was agreed that this should be done using a consistent template and that they should be understandable even if read alone. Given the lack of time at the meeting, it was impossible to develop a template to be discussed in detail and it was agreed that the task would fall to the Chair and Head of Science. An example and explanation is given below.

Attention: SC, C-A

*The Committee **agrees** that after the meeting and before the Scientific Committee report is published on the IWC website, the Chair and Head of Science should develop a template to highlight advice, agreements and recommendations and identify, in their judgement, the primary intended recipients (of course it is recognised that in a general sense, the whole report provides advice to the Commission). This format is being used as a trial and will reviewed at the next meeting of the Scientific Committee in the light of feedback from the Commission and the Committee. The template is as follows:*

(a) important action items, agreements and recommendations are highlighted by placing them between lines; and

(b) the header of the paragraph provides information on the primary intended recipients in the judgement of the Chair and Head of Science, using the following codes:

S=Secretariat; SC=internal to the Scientific Committee, G=general scientific recommendation; C-A=advice to the Commission; C-R=recommendation to the Commission; CC=relevant to the Commission's Conservation Committee; AWS=relevant to the Commission's Aboriginal Subsistence Whaling sub-committee; CG-A=advice to a Contracting Government or Governments; CG-R=recommendations to a Contracting Government or Governments.

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2. ADOPTION OF AGENDA

The adopted Agenda is given as Annex B. Statements on the Agenda are given as Annex X.

3. REVIEW OF AVAILABLE DATA, DOCUMENTS AND REPORTS

3.1 Documents submitted

The documents available are listed in Annex C. As agreed at the 2012 Annual Meeting, primary papers were only available at the meeting in electronic format (IWC, 2013b, pp 78-79).

3.2 National Progress Reports on research

The National Progress Reports have their origin in Article VIII, Paragraph 3 of the Convention. All member nations are urged by the Commission to provide Progress Reports to the Scientific Committee following the most recent guidelines developed by the Scientific Committee and adopted by the Commission. The report is intended as a concise summary of information available in member countries and where to find more detailed information if required. In addition, the IWC holds a number of specialist databases (including, catches, sightings, ship strikes, images).

As agreed at the 2013 Annual Meeting (IWC, 2014a), all National Progress Reports were submitted electronically through the IWC National Progress Reports data portal. This year 15 countries provided National Progress Reports including data on bycatch, entanglement, ship strikes, direct and indirect takes, sampling, sightings and tracking studies. These countries were: Australia; Croatia; Denmark; France; Germany; Iceland; Italy; Japan; Korea; Mexico; Netherlands; New Zealand; Spain; United Kingdom; and USA.

The Committee again **stresses** that all member states submit National Progress Reports to the IWC through the IWC data portal (*http://portal.iwc.int*); the present contributions represent only 20% of member nations; see the recommendation under Item 7.1.4. An intersessional correspondence group under Double (ICG-1; for members and Terms of Reference see Annex V) has been established to review data submission and National Progress Reports.

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 2015 meeting. In response to a question Allison noted that individual data from the Greenland 2015 season had not yet been received but was expected in the near future.

SC/66b/IA02 compared available track data from Soviet whaling industry reports with information submitted to IWC. This showed that the officially reported data provide a reasonably accurate idea of general whaling effort. However, there were minor discrepancies attributable to differences in precision and sometimes unreported excursions, presumably for the purpose of illegal whaling, that were omitted from the data sent to IWC.

In discussion (see item 11, Annex G), the Russian scientists present stated that at this time they could not comment on the accuracy of this information. In order to clarify this issue and provide a more considered review, they proposed that the authors send their data (including sources, and information on where the original data are stored) for official examination by appropriate Russian governmental authorities (i.e. to the Ministry of Natural Resources, which is the ministry responsible for the participation of Russia in IWC). They also proposed that to facilitate discussion

Table 1
List of data and programs received by the IWC Secretariat since the 2015 meeting.

Date	From	IWC ref.	Details
Catch data from the 2015 and 2015/16 season			
02/06/2016	Norway: N. Øien	E125 Cat2015	Individual data from the Norwegian 2015 commercial catch of minke whales. Access restricted (specified 14/11/00).
02/06/2016	Japan: H. Morita	E125 Cat2015	Individual data from Japan's catch in 2015 in the North Pacific (JARPN II) and 2015/16 in the Antarctic (NEWREP-A).
27/01/2015	Iceland: G. Víkingsson	E125 Cat2015	Individual records of minke and fin whales caught by Iceland 2015.
07/06/2016	USA: R. Suydam	E125 Cat2015	Individual records from USA Alaska aboriginal bowhead hunt 2015.
12/05/2016	Canada: L. Vuckovic	E125 Cat2015	Details of the 2015 Canadian bowhead harvest and notification of the 2016 quota.
Catch data from previous seasons			
16/09/2015	Y. Ivashchenko	E127	Summary data for North Pacific catches by the USSR 1946-73 including catches from the Kuril Islands by land station.
28/08/2015	S. Mizroch	E127 C	Individual catch data from California 1939.
Sightings data			
30/09/2015	Japan: K. Matsuoka	CD100	Data from 2015 POWER sightings cruise.
26/09/2015	Japan: K. Matsuoka	E124	Data and report from JARPNII 2015 sightings cruise (weather, effort, sightings and distance and angle experiment).
30/05/2015	Japan: K. Matsuoka	E124	Data from 2015/16 NEWREP-A dedicated sighting cruise by *Yushin-Maru No.3.*
05/08/2015	Chile: (Embassy)	CD99	Statistics of whale sightings in Chile in 2014.

in the future, any papers that refer to analyses regarding USSR falsifications are provided to the Russian authorities in sufficient time ahead of a meeting to allow review by the Russian Federation, so that their view can be presented at the same meeting as the analysis.

Attention: SC
*The Committee **agrees** that, where it is possible, advance notification to the relevant authorities of papers on catch statistic matters will facilitate its discussions. The authors of SC/66b/IA02 noted that the revised catch data obtained from Soviet whaling industry reports and other Russian sources had been accepted as the data of record by the IWC and incorporated into the IWC catch database. In addition, they volunteered to provide a list of Soviet whaling industry reports to appropriate Russian bodies.*

3.3.2 Progress of data coding projects and computing tasks
Allison reported that Version 6.0 of the catch databases was released in May 2016 and is available on request. She requested information on any sources of data missing from the databases. Work has continued on the entry of catch data into both the IWC individual and summary catch databases, including data received from the 2014 season. Data from the Japanese North Pacific sei whale marking program has been encoded this year and is currently being validated.

Validation of the data from the 2013 and 2014 POWER cruises is complete and work on the 2015 cruise data has begun. This and the DESS database is discussed under Item 11.3.1.

Programing work has concentrated on development, conditioning and running of the *Implementation* trials for North Atlantic common minke and fin whales (see Items 6.1 and 6.2). This and other work is described under the relevant sub-committee items.

4. COOPERATION WITH OTHER ORGANISATIONS

Attention: C-A
*The Committee **stresses** the value of co-operation with other organisations when addressing the range of issues affecting cetacean conservation and management. In addition to the summaries below, co-operation is also discussed where relevant elsewhere in the agenda.*

4.1 African States Bordering the Atlantic Ocean (ATLAFCO)
There was no meeting of the Ministerial Conference of ATLAFCO during the intersessional period.

4.2 Arctic Council
4.2.1 PAME (Protection of the Arctic Marine Environment)
The report of the IWC observer to PAME is given in IWC/66/04. The PAME I-2016 meeting was held from 1-3 February 2016 in Stockholm, Sweden. Donovan reported on the range of Arctic issues being considered by the IWC and noted areas of mutual benefit including spatial mapping and area-based management, Arctic marine shipping (and a best practices information forum), engagement with Arctic communities, climate change and related issues, oil and gas guidelines and ecosystem approaches to management. As noted in its report[1], PAME supported ongoing communication, co-operation and collaboration with IWC.

The Committee thanked Donovan for his report and **agrees** that he should represent the Committee as an observer at the next PAME meeting and Arctic Council meeting.

4.3 Convention on Biological Diversity (CBD)
The Conference of Parties did not meet intersessionally. The next CoP will take place 4-17 December 2016 in Cancun, Mexico.

An expert meeting was convened jointly by CBD and the Global Ocean Initiative 22-24 February 2016 and the report of the IWC observer is given as IWC/66/4(2016)H. Goals of the meeting were to support the development of practical options to further enhance scientific methodologies and approaches on the description of areas meeting the criteria for Ecologically or Biologically Significant Areas (EBSAs) and to share experiences and lessons learned on such methodologies and approaches.

Five key future challenges were identified and examined:
(1) updating and refining individual EBSA descriptions;
(2) categorising EBSAs to better explain them as fixed or dynamic features;
(3) introducing more systematic methods to complement the expert driven process adopted to date;
(4) considering geographical areas and ecological features not considered to date; and

[1]*http://www.pame.is/images/02_Document_Library/Meeting_Reports/2016/PAME_I_2016_Meeting_Report.pdf.*

(5) using EBSA descriptions to influence global ocean research agendas.

The meeting noted that sufficient experience has been gained during a productive five years of EBSA workshops to warrant such reflection. Consistent scientific and technical data gathering has provided workshops with useful baseline information augmented with regional knowledge and supported by national EBSA processes.

Critical for the future application of EBSAs will be how to include new information, for example through the provision of information deriving from the IUCN effort of identifying Important Marine Mammal Areas (IMMAs). Working groups within the meeting considered issues such as making best use of traditional knowledge, and different approaches for incorporating new scientific information.

The Committee thanked Notarbartolo di Sciara for his report and **agrees** that Brockington should represent IWC as an observer at the next CBD meeting.

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

The report of the IWC Observer at the 34th Meeting of the CCAMLR Scientific Committee, held in Hobart, Australia is given as IWC/66/4(2016)F. The main items considered at the CCAMLR meeting of relevance to the IWC included: (1) advances in statistics, assessments, modelling, acoustics and survey methods; (2) harvested species; (3) bycatch; (4) incidental mortality associated with fisheries; spatial management of impacts on the Antarctic ecosystem; (5) illegal fishing; (6) CCAMLR scheme of international scientific observation; and (7) cooperation with other organisations.

A joint IWC-CCAMLR Workshop was held in 2008 (IWC and CCAMLR, 2010a) to review data for Antarctic marine ecosystem models. Over the past two years, IWC SC and SC-CAMLR have begun planning for a second joint Workshop. At SC-CAMLR, the Terms of Reference for a joint SC-CAMLR and IWC SC Workshop were presented. Due to another major workshop happening at the same time, it was necessary to defer for one year and hold the workshop during 2017. Additionally, two days was considered insufficient to address a multi-species model, therefore a proposal is detailed for a larger Workshop in 2018. SC-CAMLR endorsed the Terms of Reference for the workshop.

SC-CAMLR noted a summary of data on marine debris, including entanglement of marine mammals, indicating there was no evidence of trends in the occurrence of marine debris in the CAMLR Convention Area but the data highlighted the continued presence of man-made marine debris in the Convention Area. SC-CAMLR requested that the CCAMLR Secretariat contact other organisations, including IWC to investigate potential collaboration on data collection and analysis of marine debris data.

There were no reported incidental mortalities of marine mammals in CCAMLR fisheries in the 2014/15 season.

SC-CAMLR recognises the emerging importance of marine mammal depredation and a depredation workshop was held 16-18 March in Punta Arenas, Chile. The aims of the workshop were: (1) to investigate sperm whale and killer whale depredation on toothfish longline fisheries, including assessment of the socio-economic and conservation impacts of depredation; (2) investigate the impacts on depredated toothfish in a fisheries management context; and (3) development of mitigation solutions. The SC-CAMLR observer to the workshop, Dr Marta Söffker, will report the results of the workshop to SC-CAMLR in October 2016.

With regards to the current state of the krill-based ecosystem and the krill fishery, SC-CAMLR endorsed the advice of WG-EMM that krill fishing in areas distant from land may not affect land-based predators but could affect pelagic predators such as whales, pack-ice seals, fish and other predators foraging in those areas. Full implementation of krill feedback management requires that CCAMLR is able to estimate the ecosystem effects of fishing. The CCAMLR Ecosystem Monitoring Program currently only includes land-based predators. Detecting ecosystem effects in pelagic areas may require monitoring of krill predators utilising those areas, such as cetaceans, ice seals and fish.

SC-CAMLR noted discussion of Type C killer whales long-distance movements between the southern Ross Sea and subtropical New Zealand waters, their site fidelity and the importance of monitoring their prey, Antarctic toothfish, in McMurdo Sound and Terra Nova Bay.

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

4.5 Convention on the Conservation of Migratory Species (CMS)

4.5.1 Scientific Council

There was no meeting of the Scientific Council during the intersessional period.

4.5.2 Conference of Parties

There was no meeting of the Conference of Parties during the intersessional period. The next meeting will take place 22-28 October 2017 in Manila, Philippines.

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

The report of the IWC observer at the 22nd Meeting of the Advisory Committee to ASCOBANS held 29 September to 1 October 2015 in The Hague, The Netherlands is given as IWC/66/4(2016). Special attention was given to the following subjects.

(1) PCBs. A draft Resolution on PCBs will be developed and Parties are encouraged to support research on the effects on PCBs on small cetaceans to allow assessment at Management Unit level.
(2) Underwater unexploded ordnance. Parties will develop a draft Resolution on underwater unexploded ordnance and ASCOBANS will facilitate information exchange on methods for environmentally friendly removal of underwater unexploded ordnance and on modelling of effects of explosions on small cetaceans.
(3) Managing cumulative impacts on small cetaceans. Parties agreed to develop a draft Resolution on managing cumulative impacts on small cetaceans.
(4) Best practice regarding necropsy and rescue of small cetaceans. ASCOBANS will seek to collaborate with ACCOBAMS, IWC and other organisations. Parties agreed to develop a draft Resolution covering best practice regarding necropsy and rescue and to promote effective stranding networks.
(5) Marine renewables. Parties agreed to develop a draft Resolution on marine renewables.
(6) Marine debris. Facilitate information exchange and liaise with other bodies dealing with this issue; continuing to monitor this topic through its pollution working group; develop standardised protocols on recording marine debris and cooperate as far as possible with IWC.
(7) ASCOBANS will update the Recovery Plan for Baltic Harbour Porpoises (Jastarnia Plan), and

advance the development of a Conservation Plan for Common Dolphins. It agreed the procedure to finalise the submission of ASCOBANS' position on the requirements of legislation to address monitoring and mitigation of small cetacean bycatch.

The Committee thanked Scheidat for her report and **agrees** that she should represent the Committee as an observer at the next ASCOBANS Advisory Committee meeting.

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

The report of the IWC representative to ACCOBAMS is given as IWC/66/04.

The ACCOBAMS Scientific Committee met from 20-22 October in Nice, France. The full report can be downloaded from accobams.org. There is extensive and valuable collaboration between the IWC and ACCOBAMS. Particular topics of interest at the 10th meeting of the ACCOBAMS Scientific Committee related to: abundance, stock structure and status; anthropogenic activities such as ship strikes, bycatch, noise, marine debris, whalewatching and climate change; and species conservation plans. Details of these discussions are considered under the relevant agenda items of this report. Recommendations were developed by the ACCOBAMS Scientific Committee for the forthcoming meeting of parties in November 2016.

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

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

There was no meeting in the intersessional period. The 17th meeting of the Conference of the Parties will take 24 September-5 October 2016 place in Johannesburg, South Africa.

4.7 Food and Agriculture Organisation of the United Nations (FAO)

No observer attended FAO related meeting in the intersessional period. The Committee on Fisheries (COFI) will meet 11-15 July 2016 in Rome, Italy and it is hoped an IWC observer will attend.

4.8 Inter-American Tropical Tuna Commission (IATTC)

No observer attended IATTC meetings in the intersessional period.

4.8.1 Agreement on the International Dolphin Conservation Program (AIDCP)

The report of the IWC observer at the 32nd Meeting of the Parties took held in La Jolla, USA 19-20 October 2015 is given as IWC/66/4(2016)J. AIDCP mandates 100% coverage by observers of fishing trips by purse seiners of carrying capacity greater than 363 metric tons in the Agreement Area (i.e. the eastern Pacific Ocean (EPO)). In 2015, 100% of the trips by these vessels were sampled by independent observers and 633 dolphins were reported killed, a decrease from the previous year. The overall dolphin mortality limit for the international fleet in 2015 was 5,000, and the unreserved portion of 4,900 was allocated to 95 vessels. In 2015, no vessel exceeded its DML. The number of sets on dolphin-associated schools of tuna made by vessels over 363t was 9,375 in 2015. The mortality of dolphins caused by the purse-seine fishery is currently at least 100 times less than that which would be expected to impact the capacity of the dolphin populations in the eastern Pacific to remain at their current levels, as determined by the most recent stock assessment by the US National Marine Fisheries Service (NMFS). Dolphin take by species and stock was not reported.

The focus of the AIDCP is to minimising the reported dolphin mortalities in the fishery. Additionally, it formed a working group to promote and publicise the AIDCP dolphin safe label and education. The working group produced a pamphlet and video. A copy of the pamphlet can be found in IWC/66/4(2016)J and the video can be accessed online at *https://www.iattc.org/AIDCPvideo.*

The increasing trend in sets made on tuna in association with dolphins is a cause for concern among the Parties that believe this practice may have indirect negative effects on dolphin populations. IATTC has been using purse-seine observer data to conduct research on the reliability of indices of relative abundance of dolphins for monitoring dolphin stock status as compared with population dynamics modelling to obtain abundance estimates from these models, which are used to establish the per-stock per-year dolphin mortality caps for the purse-seine fishery. It remains unclear whether indices of relative abundance for dolphins developed from the purse-seine observer data can be used to reliably track the absolute abundance of dolphin populations in the Eastern Pacific Ocean.

The Committee thanked Henry for her report and **agrees** that Balance should represent the Committee as an observer at the next AIDCP meeting.

4.9 International Committee on Marine Mammal Protected Areas (ICMMPA) and its corollary, the IUCN Task Force on Marine Mammal Protected Areas

The report of the observer is given as IWC/66/4(2016) L. Members of this Committee who attended SC/66b in Bled, Slovenia, met to continue preparation for the fourth International Conference on Marine Mammal Protected Areas, which will be hosted by Mexico in Pt. Vallarta, 13-17 November 2016. One of the topics of interest to the IWC includes a workshop, co-convened by the IWC Global Whale Entanglement Response Network, to develop cooperation and a possible MOU between Mexico, the USA and Canada on transboundary whale entanglement events. In addition there will be a progress update on Important Marine Mammal Areas (IMMA). The latter is an initiative of the IUCN's Marine Mammal Protected Areas Task Force, which will be sharing its criteria and results with the IWC for possible management purposes (e.g. identifying overlap with high risk human activities). In particular, identified IMMAs may be of value to the IWC SC and Ship Strike Working Group, as they provide input to the IMO on areas that are of high risk for collisions.

The Committee thanked Rojas-Bracho for his report and **agrees** he should represent the Committee at the ICMMPA/IUCN MMPA Task force meeting.

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

The report of the IWC observer documenting the 2014 activities of ICES is given as IWC/66/4(2016)A. During the year, the ICES Working Group on Marine Mammal Ecology (WGMME) met 9-12 March 2015 in London, UK. New information is available on: (1) distribution and abundance of harbour porpoise available from aerial surveys in the

North Sea; (2) abundance and trends for coastal bottlenose dolphins off Scotland, Wales, Ireland, France, and Spain; (3) sperm whales and short-finned pilot whales in the Canary Islands; and (4) several cetacean species off France, mainland Portugal and Madeira. Additionally, new results on population structure available for harbour porpoise and bottlenose dolphin have been compiled.

A threat matrix was completed for the main marine mammal species in each regional seas area. While fishery bycatch is a significant concern, especially for harbour porpoises, common dolphins and coastal bottlenose dolphins, contaminants are also a major concern, especially for harbour porpoises, killer whales and bottlenose dolphins. Marine mammals have been included in whole ecosystem models and in minimum realistic models, in studies principally focused on trophic relationships, resource competition between fisheries and marine mammals, and consequences for fish stocks. There is the potential to add fishery bycatch mortality of marine mammals to such models**.** Other types of biological interaction (e.g. parasite transmission) have been less well covered. All models have limitations and some kind of validation exercise is essential to confer credibility on the predictions.

The ICES Working Group on Bycatch of Protected Species (WGBYC) met in Copenhagen 2-6 February 2015. Since its inception in 2009, the WG has been collating, storing and summarising annual bycatch and monitoring effort data reported by European member states. This year WGBYC undertook an historical review of Reg. 812. A significant limitation in evaluating the magnitude of bycatch mortality is not having an accurate estimate or census of total fishing effort from relevant European waters. WGBYC continues to develop a bycatch risk assessment with the aim of identifying regions that may pose the greatest threat to non-target species in the absence of reliable data that would be needed to quantify the bycatch of protected, endangered and threatened species in a statistically rigorous manner. Several member states continue to design and test various mitigation methods to minimise bycatch of protected species.

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

4.11 International Maritime Organization (IMO)

The report of the IWC observers documenting the activities of IMO is given as IWC/66/4(2016)I. The IWC SC, Conservation Committee and Commission have all recommended enhanced cooperation with IMO. In addition, it was recommended that a document on the IWC's work on ship strikes be submitted to the IMO Marine Environment Protection Committee (MEPC).

Following these recommendations there was a meeting between the IWC and IMO Secretariat's in January 2016. This resulted in a number of actions including: (1) the IMO and IWC will continue efforts to cooperate on issues of mutual interest; (2) joint follow up with contacts in Sri Lanka regarding addressing the blue whale ship strike issue there; (3) further liaison on marine debris through IMO work in connection with the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP); and (4) updating IMO on the progress on Important Marine Mammal Areas (IMMAs) and discussions in the Scientific Committee on this issue.

A document 'Information on recent outcomes regarding minimising ship strikes to cetaceans' was submitted to MEPC69 in April 2016 (MEPC 60/10/3) (IWC, 2016a). The paper was discussed under the agenda item related to Particularly Sensitive Sea Areas (PSSAs). The paper drew attention to work by the IWC on ship strikes including identification of high risk areas and potential mitigation measures and the collection of data through the IWC ship strike database.

The next MEPC meeting (MEPC 70) is scheduled for 24-28 October 2016. It was agreed that a presentation from IWC at an MEPC meeting could be useful in future but this would have to be requested well in advance and could be most effective when there is a very specific issue that IWC wishes to draw attention to.

The IMO adopted a draft International Code for Ships Operating in Polar Waters (Polar Code) in 2015. This applies to passenger and cargo ships covered by SOLAS and includes environmental provisions cover measures for the prevention of pollution by oil, noxious liquid substances, sewage, and garbage. Provisions relating to non-SOLAS ships, including fishing vessels and pleasure craft will be addressed in the future.

The Committee thanked Ferris and Leaper for their report and **agrees** that they should represent the Committee at the next IMO meeting.

4.12 International Union for the Conservation of Nature (IUCN)

Cooke and Reeves reported on the considerable cooperation with IUCN that had occurred during the past year and this is given as IWC/66/4(2016)G.

The Red List assessments for all cetacean species and selected subpopulations are due to be updated this year. Instead of organising a global workshop for all cetacean species as in the past, smaller workshops will be held addressing different groups of species. Several updates and assessments of small cetacean species and subpopulations were reviewed at a workshop in San Diego in May 2015 and those are still under revision. An online workshop for reviewing the great whale assessments is planned for the end of July 2016. The IUCN Cetacean Specialist Group is preparing updated drafts, in collaboration with the Global Institute of Sustainability at Arizona State University. The current list of all cetacean species and populations that have been assessed for the Red List, and their current Red List classification, is maintained on the Cetacean Specialist Group site[2].

The Western Gray Whale Advisory Panel (WGWAP) met in November 2015 in Moscow where the Panel reviewed *inter alia* the population status, reports of field work, reports of industrial activities conducted in the 2015 season, including three seismic surveys conducted in and near gray whale feeding habitat off Sakhalin. The observation and acoustic data have not yet been analysed to determine whether an effect of the activities on gray whale use of the area can be discerned. A further informal Panel meeting was held at IUCN in May 2016, where the Panel issued a statement of concern about the potential effects on gray whale mothers and calves of an ongoing pier construction project in Piltun Lagoon. The next meeting of WGWAP is scheduled for November 2016 in Moscow. A report of WGWAP activities can be found in Annex F, Appendix 2.

A recent letter from the IUCN Director General and the Chair of the Species Survival Commission to the India Minister of Environment expresses concern about impacts of the National Waterways Act 2016 on Endangered Ganges River dolphins and other riverine species.

[2]*http://www.iucncsg.org/index.php/status-of-the-worlds-cetaceans.*

The top concern at the moment is the status of the vaquita which is now estimated to number only about 60 animals, an apparent decline of over 90% since 1997. Only if the recently adopted fishing controls are strictly enforced, and continued, can there be any hope of saving this Critically Endangered species.

The next World Conservation Congress (IUCN's 4-yearly general meeting) will be held in Honolulu 1-10 September 2016[3]. Among the many side events there are some relevant to cetaceans, including a knowledge café on 'managing maritime traffic in the high seas: exploring the use of IMO conservation tools in Important Marine Mammal Areas (IMMAs)'.

The Committee thanked Cooke and Reeves for their report and **agrees** that they should continue to act as observers to IUCN for the IWC.

4.13 North Atlantic Marine Mammal Commission (NAMMCO)

Scientific Committee

The report of the IWC observer at the 22nd meeting of the NAMMCO Scientific Committee (SC) held in Torshavn, Faroe Islands, 9-12 November 2015 is given as IWC/66/4(2016)M.

Environmental and ecosystem issues were discussed. In the Barents and Norwegian Seas cod abundance has increased and its range has extended northwards. One consequence of this is a new overlap of feeding grounds with minke whales, which have exhibited a decline in body condition in recent years. Competition for food with the increasing cod stock is suggested as a possible explanation. In Icelandic waters changes have occurred in the distribution and abundance of several cetacean species and their prey since regular monitoring began in 1987. A northward shift in minke whale prey is suspected to be the primary cause of the recent shift in distribution of common minke whales away from coastal waters. Continued monitoring of the distribution and abundance of cetaceans is essential for conservation and management of the cetacean populations and as a part of wider studies of ongoing changes in the ecosystem.

A Symposium organised by NAMMCO entitled 'Impacts of Human Disturbance on Arctic Marine Mammals' was held 13-15 October 2015. Concerns were raised at both the Symposium and the SC meeting about a Canadian mining project in the Canadian Arctic, the Mary River Project, which has the prospect of year-round shipping through the heavy pack ice in Baffin Bay. It will have severe consequences for the large numbers of marine mammals using the area in summer and winter, including narwhals, white whales and bowhead whales.

NAMMCOs whale sighting surveys in the Northeast Atlantic in 2015 (NASS2015) included an intensive survey with the purpose of estimating the abundance of pilot whales around the Faroe Islands, an aerial survey of the coastal waters in East Greenland and a ship-based survey around Jan Mayen following methods developed for the Norwegian minke whale surveys. All the surveys were successfully completed and resulted in valuable data useful for abundance estimation of the target species. In addition to these surveys, national surveys in 2015 covered the West Greenland shelf, areas around Iceland and the Norwegian Sea, providing a satisfactory coverage of these waters.

Stock information on the following cetacean species was presented: fin, humpback, common minke, blue, bowhead and white whales and narwhals.

The Committee thanked Haug for his report and **agrees** that he should represent the Committee at the next NAMMCO Scientific Committee meeting.

Council

The report of the IWC observer at the 24th Annual Council meeting of NAMMCO held in Oslo, Norway, 10-11 February 2016 is given as IWC/66/4(2016)E). The following relevant items were discussed.

Marine mammals as food resources. A document relating to this is in preparation.

Conservation and management of marine mammals. Increased shipping activities from a project taking place in important and until now pristine, area for marine mammals in the Arctic. Also there has been a northern shift in Icelandic prey species (see above). Bycatch is also recognised as an important issue to be addressed and so the Bycatch Working Group was re-formed.

Scientific activities. Management advice for cetaceans was reported by the SC to the Council (see above).

Improving hunting methods. An Expert Group meeting was held in November 2015 to assess time to death data in the large whale hunts. Conclusions and recommendations for further improvements were made for different types of operations.

Inspection and observation. NAMMCO has an international observation scheme to monitor whether national legislation and decisions made by the Commission are respected. Observers are appointed to report on hunting activities in member countries. In 2015 two observers carried out the observations on pilot whaling in Faroe Islands no violations were reported to the Secretariat. The effort of the control scheme for the 2016 season is focused on minke whaling in Norway.

The Committee thanked Okazoe for his report and **agrees** that he should represent the Committee at the next NAMMCO Council.

4.14 North Pacific Marine Science Organisation (PICES)

The report of the IWC observer at the annual meeting of PICES held in Qingdao, China, 14-25 October 2015 is given as IWC/66/4(2016)C. A new Activity Plan titled 'The consumption of North Pacific forage species by marine birds and mammals' was discussed. The AP-MBM will synthesise new dietary information and estimate food consumption using new bioenergetics models. It will also synthesise information on prey quality, quantity, composition and distribution to predict their impacts on MBMs. It is expected that the study will take five years to complete.

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

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

The report of the observer documenting the activities of SPAW is given as IWC/66/4(2016)M. The 2015/16 work plan for SPAW includes several cooperative activities with the IWC, including: (1) follow-up ship strikes and entanglements trainings (with IWC); and (2) finalise MoC between UNEP-CAR/RCU and the IWC.

During 2012-14 the IWC partnered with SPAW for two entanglement trainings and a ship strike Workshop. The trainings included participants from Belize, Colombia,

[3] *http://www.iucnworldconservationcongress.org.*

Costa Rica, Dominican Republic, Guadeloupe, Mexico, Panama, Saba, St. Barthelemy, St. Eustatius, St. Lucia, St. Martin, and Tobago. In follow up to those trainings, the IWC provided further training in November/December 2015 in Guadeloupe and Martinique, with participants from Dominica. The IWC and SPAW Secretariats continue discussion of a possible MoC between the two IGOs, part of which may include activities arising from the joint ship strike Workshop.

The Committee thanked Mattila for his report and **agrees** that he or Carlson should represent the Committee as an observer at the next SPAW meeting.

4.16 Pacific Region Environment Programme (SPREP)

The report of the observer documenting the activities of SPREP is given as IWC/66/4(2016)K. After the 2015 SC meeting the IWC Secretariat continued to be actively engaged with the SPREP Secretariat. IWC technical adviser Mattila, represented the IWC at SPREP's annual meeting, 22-24 September in Apia, Samoa. He provided an observer statement in support of SPREP's 'year of the whale' in 2016-17, which outlined areas where the goals of the two organisations overlap. The IWC Secretariat is working with SPREP in order to identify actions that support mutual objectives. In particular, it is looking at continued capacity building for response to entangled large whales.

The Committee **agrees** Mattila should continue represent the Committee at future SPREP activities.

5. GENERAL ASSESSMENT ISSUES WITH A FOCUS ON THOSE RELATED TO THE REVISED MANAGEMENT PROCEDURE (RMP)

5.1 Relationship between $MSYR_{mat}$ and $MSYR_{1+}$: evaluate energetics-based model

In 2013, the Committee recommended that $MSYR_{1+}$=1% be adopted as a pragmatic and precautionary lower bound for use in trials, and that $MSYR_{mat}$=7% be changed to the roughly equivalent $MSYR_{1+}$=4%. The Committee further agreed last year that MSYR=4% would pertain to harvesting of the mature component of the population; this latter specification is consistent with how the trials used by the Committee when evaluating the *CLA* were conducted (IWC, 1992a; 1992b).

The Committee has recognised that much remains to be learnt regarding MSYR. One issue is the relationship between $MSYR_{1+}$ and $MSYR_{mat}$. SC/66b/RMP04 reported progress on using an individual based energetics model (IBM) to examine this relationship for a 'like minke'. Comparing the results with those from the Baleen II model (Punt, 1999) revealed that the ratio between $MSYR_{mat}$ and $MSYR_{1+}$ is higher for the energetics model while the proportion of the 1+ population that is mature is substantially lower. Thus using Baleen II to calculate $MSYR_{mat}$ from $MSYR_{1+}$ leads to a larger value (around 40%) than would be obtained from the energetics model for the same 1+ population size. The results for the 'like minke' dynamics are qualitatively different from previous results based on humpback whales. In the latter, the ratios of $MSYR_{1+}$ to $MSYR_{mat}$ are less than those from the Baleen II model, and they are also more dependent on $MSYR_{1+}$.

Attention: SC
*The Committee **recommends** that the authors of SC/66b/RMP04 submit a paper to next year's meeting documenting how the 'like minke' option was parameterised.*

The relationship between $MSYR_{1+}$ and $MSYR_{mat}$ is consequential to the work of the Committee. When specifying trials, MSYR is defined in terms of the 1+ component of the population because the MSYR review was based on rates of increase from survey estimates of abundance, which tend to be estimates of 1+ abundance. In contrast, selectivity during whaling operations usually pertains to older animals and hence MSYR as it applies to the selected population will determine the performance of RMP variants. The relationship between $MSYR_{1+}$ and $MSYR_{mat}$ will depend on the age-specificity of natural mortality as well as whether density-dependence pertains to the calving/calf survival rate or to natural mortality.

Limited progress had been made in relation to the work plan for this item developed last year, partially due to the associated computational demands. Its work plan for before and during the 2017 Annual Meeting was detailed in Annex D, item 2.4. The proposed two-year work plan is summarised in Table 2. It re-establishes the intersessional working group under de la Mare to take this issue forward (SG-1; see Annex V for members and Terms of Reference).

The Committee **agrees** that the results in SC/66b/RMP04 do not impact the *Implementation Reviews* currently being undertaken for North Atlantic fin and common minke whales, but that future *Implementations* and *Implementation Reviews* should take the results into account during sensitivity tests which explore density-dependence on natural mortality as well as fecundity.

Attention: SC
*The Committee **agrees** that the forthcoming coming* Implementation Review *for the North Pacific Bryde's whales (see Item 25.3) will thus be the first to include sensitivity tests on density dependence in natural mortality and fecundity.*

5.2 Requirements and guidelines for conducting surveys: model based abundance estimates

The Committee's existing Requirements and Guidelines were written for design-based surveys only. The Committee has recognised a need to consider what circumstances might require approval when the survey and analysis are conducted based on spatial modelling or quasi design-based approaches (IWC, 2013c). The Committee had expected to hold a pre-meeting on this topic this year (IWC, 2016i) but the expected software and paper were not yet available.

This year, the Committee received an update on progress by Bravington and colleagues on the work towards developing guidelines and software for developing model-based abundance estimates.

Attention: SC
*The Committee **agrees** that there should be pre-meeting to SC/67a (see Item 25.3), at which a demonstration of the software implementing the model-based analysis approach will take place; it will also test the guidelines for model-based estimation against several test cases. This is relevant to the work of several sub-committees.*

The Committee re-established a Steering Group under Butterworth (SG-2), with members and Terms of Reference given in Annex V.

5.3 Implications of *IST*s for consideration of 'status' and abundance estimates

The Committee is often expected to provide advice on 'status'. There are a number of ways in which the results

Table 2

Work plan for general assessment matters with a focus on the RMP.

Topic	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Evaluate the energetics based model	Continue evaluation: (a) document how the model was parameterised; (b) develop emulator models; (c) conduct simulations of the *CLA* for the model; (d) conduct simulations of the *CLA* for the emulator models.	Review intersessional progress, continue evaluation and consider nature of sensitivity tests.	Continue to evaluate the energetics-based model.	Review intersessional progress.
Model-based abundance estimates	Bravington and colleagues to complete guidelines and develop simple-to-use diagnostic software.	Pre-meeting workshop to: (a) test proposed new guidelines; (b) demonstrate the proposed software.	Depends on outcome of 2017 meeting.	

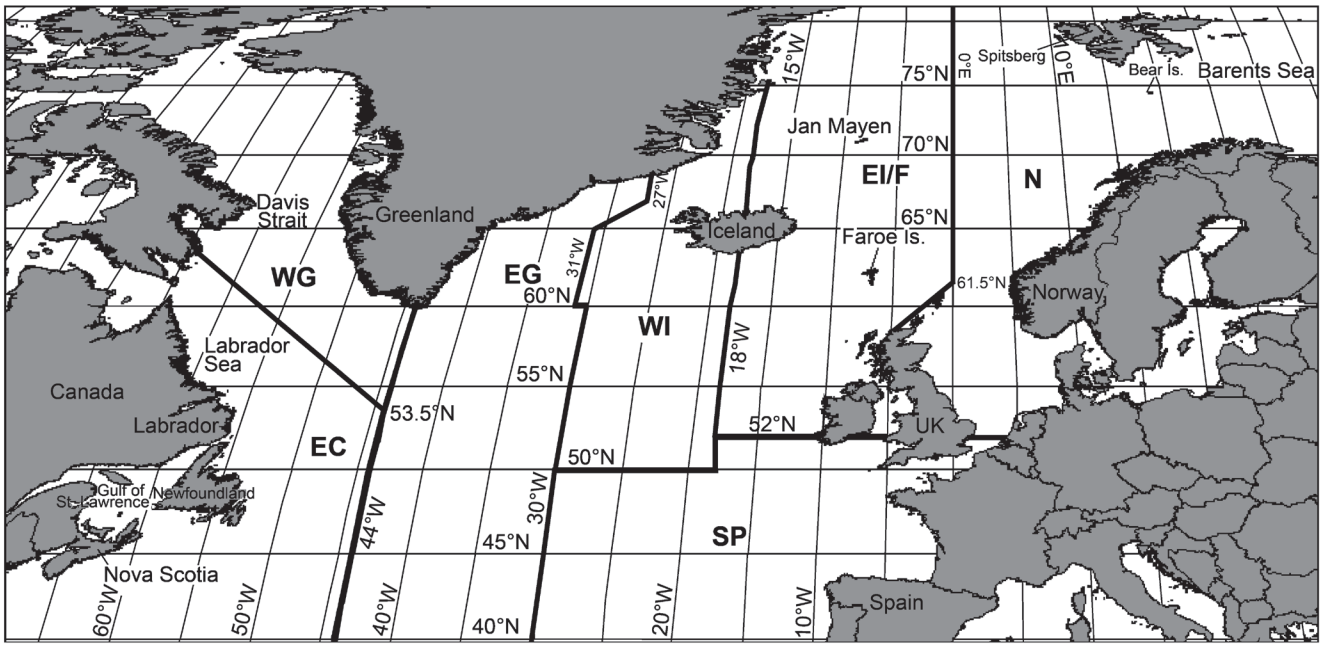

Fig. 1. Map of the North Atlantic showing the sub-areas defined for the North Atlantic fin whales. Sub-areas EG and WI are combined for Hypotheses VII and VIII.

of *Implementation Simulation Trials* (for the RMP and AWMP) could be used to provide such information, e.g. to provide information on the current status of populations using metrics such as current population size, current population size relative to carrying capacity, recent past trends, and expected short-term future trends. There are usually many *Implementation Simulation Trials* for any given *Implementation*, so that metrics of status may need to be given as ranges based on plausible trials rather than as point estimates. The number of stocks in a region often differs among *Implementation Simulation Trials*. Thus, it may be necessary to provide metrics of status for a region or perhaps some smaller areas such as '*Medium Area*'.

Attention: SC
The Committee ***agrees*** *that the issue of developing appropriate metrics of status should be considered at next year's meeting. To ensure progress, the Committee established a Steering Group under Donovan (SG-3) with members and Terms of Reference as in Annex V. This topic will also be included on the agendas of relevant intersessional workshops (see Item 25.3). This is relevant to the work of several sub-committees.*

5.4 Work plan

Details of work to be undertaken both before and during the 2017 Annual Meeting are given in Annex D, item 2.4. The two-year work plan is summarised in Table 2.

6. RMP – *IMPLEMENTATION*-RELATED MATTERS

6.1 North Atlantic fin whales (*Implementation Review*)

6.1.1 Report of intersessional Workshop

The *Implementation Review* process for North Atlantic fin whales began during a pre-meeting at the Committee's 2013 Annual Meeting and continued with a first intersessional workshop in 2014 and a second workshop in 2015. The original *Implementation* was completed in 2009 (IWC, 2010b). The Committee was unable to complete the *Implementation Review* last year and the objective was to complete it this year. To that end an intersessional workshop was held in Copenhagen, in March 2016 (SC/66b/Rep04).

Donovan reported that the main tasks of the 2016 Workshop were to: (1) review the results of the conditioning and finalise the trial specifications (the full final specifications are provided in Annex D, appendix 3); (2) provide recommendations related to plausibility weighting of trials; and (3) take forward work to enable the Committee to complete the *Implementation Review* at the present annual meeting. For further information and definition of terms see the Committee's Requirements and Guidelines (IWC, 2012g).

A considerable part of the Workshop's time was spent undertaking the substantial task of reviewing conditioning results. Satisfactory conditioning was based upon the consideration of three data sources: abundance estimates; *Discovery* mark (tag) data; and age data.

For abundance estimates, discussion focussed on the '1988' surveys for sub-areas EG, WI and EI/F and the 1995 estimate for sub-area EG (see Fig. 1). The Workshop concluded that despite some difficulties, the available information was not sufficient to exclude use of those '1988' and 1995 estimates from the conditioning, although the information was valuable for interpreting whether the fit to the abundance data was acceptable when examining the conditioning results.

Following on from discussions last year (IWC, 2016j), the Workshop considered the appropriate weighting to be given to the tagging data and the role of those data in conditioning. It agreed that the recoveries from sub-area WI allowed for meaningful comparisons across different hypotheses and assumptions, as detailed in Annex D, item 3.1.1.

In summary, after careful consideration the Workshop recommended:

(a) to discontinue consideration of stock structure Hypotheses IV, VII and VIII (see SC/66b/Rep04 for details of these hypotheses) and those involving tag loss, for reasons given in Annex D, item 3.1.1; and
(b) to maintain a downweighting of the age data in the objective function only for those $MSYR_{1+}$=1% scenarios that had at best marginal acceptability under full weighting of the age data.

The Workshop agreed that the fits to the age data, whilst not good, were adequate for conditioning purposes. Concerns over the age data and ways to deal with them are detailed in SC/66b/Rep04, Annex D, item 3.1.1. In reviewing the full set of conditioning results, the Workshop agreed they were acceptable. This was also true for those sensitivity trials for which results were available but it was agreed that review of the remaining trials would be undertaken intersessionally.

The final list of agreed trials is repeated below in Table 3. The final task of the Workshop was to assign plausibility to the trials following Committee's Requirements and Guidelines (IWC, 2012g). The resultant weightings are repeated below in Table 3.

The Committee thanked Donovan for chairing the Workshop and the participants for their work during it and subsequently.

Attention: SC
*The Committee **endorses** the Workshop recommendations on pre-conditioning and trial structure for the North Atlantic fin whale Implementation Review, including the weights assigned provisionally to the North Atlantic fin whale trials (although see Item 6.1.2).*

6.1.2. Completion of Implementation Review

After the Workshop, an error in the way the trials were conditioned was reported and this was rectified. A small group established to review the revised conditioning results (see Annex D, appendices 2 and 3) recommended that two trials be assigned 'low' plausibility because of their poor fits to the tagging and/or ageing data and were dropped from further consideration. The Committee **agrees** with this recommendation. The final set of trials and associated weights is provided in Table 3.

6.1.2.1 REVIEW TRIALS RESULTS

The four-step procedure for defining 'acceptable', 'borderline' and 'unacceptable' performance first agreed by the Committee (IWC, 2007) and encapsulated in the most recent version of the Committee's Requirements and Guidelines (IWC, 2012g) is detailed in Annex D, item 3.1.2 together with a flow chart summarising the decision process to be followed (Annex D, fig. 2).

Table 3

The *Implementation Simulation Trials* for North Atlantic fin whales. All trials assume the following unless otherwise stated: the 'Best' catch series; future surveys will occur in sub-areas EG, WI and EI/F; and $g(0)$ is taken to be equal to 1. MSYR in terms of 1+ on 1% and mature on 4%.

Trial no.	Stock hypothesis	MSYR	No. of stocks	Weight 1%	Weight 4%	Trial description
Baseline						
NF-B1	I	1, 4%	4	M	H	Base case: 4 stocks, separate feeding areas.
NF-B2	II	1, 4%	4	M	H	4 stocks; 'W' and 'E' feed in central sub-areas.
NF-B3	III	1, 4%	4	M	H	4 stocks; 'C1' and 'C3' feed in adjacent sub-areas.
NF-B5	V	1, 4%	4	M	H	4 stocks as in hypothesis I but stock 'S' in adjacent sub-areas.
NF-B6	VI	1, 4%	3	L	H	3 stocks (no 'E' stock).
Other factors						
NF-H2	II	1, 4%	4	M	M	High historical catch series.
NF-H3	III	1, 4%	4	M	M	High historical catch series.
NF-Q3	III	1, 4%	4	M	M	Future WI and EI/F surveys exc. strata S 60°N.
NF-A2	II	1, 4%	4	M	M	Pro-rate abundance data for conditioning.
NF-A3	III	1, 4%	4	M	M	Pro-rate abundance data for conditioning.
NF-U3	III	1, 4%	4	L	M	Selectivity decreases by 4%/year for age 8+; M=0.04.
NF-G2	II	1, 4%	4	M	M	C2 sub-stock enters EG beginning year 1985 (opt. a).
NF-G3	III	1, 4%	4	M	M	C2 sub-stock enters EG beginning year 1985 (opt. a).
NF-F2	II	1, 4%	4	M	M	C2 sub-stock enters EG 1985-2025 (opt. b).
NF-F3	III	1, 4%	4	M	M	C2 sub-stock enters EG 1985-2025 (opt. b).
NF-S3	III	1, 4%	4	M	M	Selectivity estimated for pre and post 2007.
NF-Y1	I	1, 4%	4	M	H	8-year future survey interval.
NF-Y2	II	1, 4%	4	M	H	8-year future survey interval.
NF-Y3	III	1, 4%	4	M	H	8-year future survey interval.
NF-Y5	V	1, 4%	4	M	H	8-year future survey interval.
NF-Y6	VI	1, 4%	3	L	H	8-year future survey interval.
NF-E2	II	1, 4%	4	M	M	Exclude 1987/89 abundance in WI, EG and EI/F.
NF-E3	III	1, 4%	4	M	-	Exclude 1987/89 abundance in WI, EG and EI/F.
NF-D1	I	1%	4	M	-	Dispersal: max bound of 20%.
NF-D3	III	1%	4	M	-	Dispersal: max bound of 20%.
NF-J2	II	1, 4%	4	M	H	Assume $g(0)$ = 0.8 (all estimates).
NF-J3	III	1, 4%	4	M	H	Assume $g(0)$ = 0.8 (all estimates).

The Committee reviewed the results of the *Implementation Simulation Trials* following the 'Requirements and Guidelines' as had been the case during recent *Implementations* and *Implementation Reviews*. The tables and plots used to evaluate the performance statistics for each trial and RMP variant are detailed in Annex D, item 3.1.2.1. The master set of plots and tables is archived by the Secretariat and is available to members of the Scientific Committee on request.

The seven management variants to be considered are listed in Annex D, item 3.1.2.2. Tables 2 and 3 in Annex D summarise the application of the rules for evaluating conservation performance.

Attention: SC
After reviewing the results, the Committee ***agrees*** *that the following variants (1, 4, 5, 6 and 7) are acceptable in terms of conservation performance for North Atlantic fin whales (see Fig. 1 for the sub-areas):*

(1) Sub-area WI is a Small Area*;*
(4) Sub-area WI is a Small Area*. Catch limits will be set based on survey estimates for sub-area WI north of 60°N (both historical and future surveys).*
(5) Sub-areas WI and EG are taken to be Small Areas *and sub-area WI+EG is taken to be a* Combination Area*. The catch limits set for the EG* Small Area *are not taken;*
(6) Sub-areas WI, EI/F and EG are taken to be Small Areas *and sub-area WI+EI/F+EG is taken to be a* Combination Area*. The catch limits set for the EG and EI/F* Small Areas *are not taken.*
(7) Sub-areas WI+EG and EI/F are taken to be Small Areas *and sub-area WI+EI/F+EG is taken to be a* Combination Area*. The catch limits set for the WI+EG* Small Area *are taken in sub-area WI. The catch limit for sub-area EI/F is taken there.*

Of these, variant 7 has the best catch performance.

6.1.3 New information

SC/66b/IA18 provided details of the sixth North Atlantic Sightings Survey (NASS) conducted in June-July 2015, when three vessels surveyed 7,027 n.miles in a large area of the northern North Atlantic during 102 vessel days. The effort was similar to that in earlier NASSs, but for the first time a fully independent double platform observer mode was applied. Details of the area covered, coincident fisheries surveys and plots of the designed and initially planned tracks are given in SC/66b/RMP02.

During the discussion, the Committee considered the value of collecting still images of sightings over video recordings during such cruises, and the potential for this technology to be incorporated into observer binoculars. It expressed interest in learning more about this technology.

Attention: SC
The Committee ***recommends*** *that at the next meeting, the authors of SC/66b/IA18 provide advice on the technology used during these NASS 2015 cruises and its potential for more general use in surveys.*

SC/66b/RMP01 provided abundance estimates for fin whales from the Icelandic and Faroese survey blocks from the NASS 2015 survey. The total corrected estimate for the survey area using all fin whale sightings was 40,788 (CV 0.17; 95% CI 28,476 to 58,423). The estimated densities were higher than estimates from earlier surveys in the area between West Iceland and East Greenland and in the Faroese survey area south of Iceland. These estimates were carefully reviewed (Annex D, item 3.1.3).

Attention: SC, G
The Committee ***endorses*** *the 2015 estimate of fin whale abundance of 40,788 (CV 0.17; 95% CI 28,476 to 58,423) for the surveyed area of the North Atlantic, for use in the CLA (and see Item 23).*

6.1.4 Conclusions

Attention: SC, C-A
As detailed under Item 6.1.2.1, based on the results of the Implementation Simulation Trials*, the Committee* ***agrees*** *that variants 1, 4, 5, 6 and 7 are acceptable in terms of conservation performance. Of those, variant 7 achieves the best performance in terms of catch. The Committee is pleased to state that this completes its I*mplementation Review *of North Atlantic fin whales. The next review will be expected to occur around 2021.*

6.2 North Atlantic common minke whales (*Implementation Review*)

6.2.1 Report of intersessional Workshop

The *Implementation Review* process began with a joint AWMP/RMP Workshop in 2014 followed by a pre-meeting in 2014 and continued with a first intersessional Workshop in 2015 followed by discussions at the 2015 Annual Meeting. In addition, aspects of the work identified at the 2015 Annual Meeting were considered during an AWMP Workshop (SC/66b/Rep03). The Committee was unable to complete the *Implementation Review* last year and the objective was to complete it this year. Progress was made intersessionally and an intersessional Workshop was held in Copenhagen in March 2016 (see SC/66b/Rep05).

Donovan reported that the main tasks of the Workshop were to: (1) review the results of the conditioning and finalise the trial specifications; (2) provide recommendations to the Scientific Committee related to plausibility weighting of trials; and (3) take forward work to enable the Scientific Committee to complete the *Implementation Review* at SC/66b. For further information and definition of terms see the Committee's Requirements and Guidelines (IWC, 2012g).

The Workshop was a technical workshop and much of the time was spent on improving the conditioning results and developing the final list of trials (see SC/66b/Rep03). The final list of agreed trials is repeated here as Table 4.

After considerable work in reviewed the conditioning results, the Workshop agreed that conditioning had been satisfactorily achieved for providing advice on catches by Norway and Iceland, but that aspects of the conditioning for West Greenland would need to be taken into account when developing a *Strike Limit Algorithm* for the West Greenland hunt.

The final important task of the Workshop was to assign plausibility to the trials following the Committee's Requirements and Guidelines (IWC, 2012g). The resultant weightings are also repeated here in Table 4. A work plan was developed to facilitate completion of the *Implementation Review* at SC/66b.

The Committee thanked Donovan for chairing the intersessional Workshop and the participants for their work during it and subsequently, in particular Allison and de Moor.

Attention: SC
*The Committee **endorses** the Workshop recommendations, including the weights assigned provisionally to the North Atlantic common minke whale trials (see Table 4).*

6.2.2 Completion of Implementation Review
Allison reported that, as recommended by the Workshop, she and de Moor had developed a method for setting the variation in spatial distribution to mimic the observed variation (see Annex D, Appendix 4). A small group established to review the revised conditioning results (see Annex D of SC/66b/Rep04 for the full set of conditioning diagnostics) agreed that conditioning had been successfully achieved.

Attention: SC
*The Committee **endorses** the view of the small group that conditioning has been successfully achieved for the North Atlantic common minke whale trials.*

The Committee will follow the its Requirements and Guidelines for *Implementations* (IWC, 2012g) which its used to evaluate the variants for North Atlantic fin whales when interpreting the results of the *Implementation Simulations Trials* for North Atlantic minke whales (see Items 6.1.2.1 and 6.1.2.2). The five management variants to be considered are given in Annex D, item 3.2.2.

6.2.2.1. REVIEW TRIAL RESULTS
The Committee noted that there had been insufficient time to complete the review and interpretation of the extensive trial results during this meeting.

Attention: SC
*The Committee **agrees** that the completion of the review and interpretation of the trial results should be undertaken during a two-day pre-meeting before the planned AWMP Workshop (see Item 25.3).*

6.2.3 New information
SC/66b/RMP02 provided abundance estimates for common minke whales from the NASS 2015 Icelandic/Faroese survey blocks that were further stratified according to the IWC *RMP Implementation* areas. An estimate of perception bias ($g(0)=0.51$) for the combined platforms for minke whales at perpendicular distance 0 was used for the first time to produce abundance estimates from NASS shipboard surveys. The total corrected estimate for the survey area using all minke whale sightings is 36,185 (CV 0.31; 95% CI 19,942 to 65,658). The highest densities were, as in earlier surveys, observed in Icelandic coastal waters, close to the east coast of Greenland, and around the Faroes. Notably, in 2015 no minke whales were seen to the north of Iceland, an area of high density in previous years. However, realised effort in this area was very low in 2015 due to unfavourable weather, which affected the estimate for the coastal Iceland area of 12,710 (CV 0.53; 95% CI 4,498 to 35,912). The estimate is in the low range of recent corrected aerial survey estimates for this area. An aerial survey in this area was unsuccessful in 2015 due to the poor weather conditions. The uncorrected estimate is similar to earlier vessel survey estimates generated for the area, and estimated densities are also similar in most other areas, while the estimated minke whale density around the Faroes has varied considerably.

Attention: SC, G, C-A
*The Committee **endorses** the following 2015 estimates of common minke whale abundance for use in the* CLA *(and see Item 23), corrected for perception bias:*

- *36,185 (CV 0.31; 95% CI 19,942 to 65,658) for the surveyed Icelandic and Faroese blocks, of which*
- *12,710 (CV 0.53; 95% CI 4,498 to 35,912) were found in coastal Icelandic waters.*

*The Committee **recommends** that footnotes be added to its list of agreed abundance estimates (see Item 23) explaining how g(0) should be interpreted (e.g. with respect to perception bias and availability bias), where applicable. This is relevant to the work of several sub-committees.*

SC/66b/RMP03 presented preliminary abundance estimates of common minke whales in Northeast Atlantic areas covered by Norwegian surveys over the two years 2014-15. The areas are RMP *Small Areas* ES (2014), EW (2015) and part of CM (2015). The estimated abundance of 48,232 minke whales is given as point estimates only because the final variance estimation remains uncalculated. A 40% drop in abundance in the Jan Mayen area, observed in the survey cycle 2008-13, as compared to the abundances estimated for the two foregoing survey cycles, seems to have been reversed in 2015. The abundance in 2015 was three times that of 2011 in one major survey block in the Jan Mayen area. Common minke whale abundance attributed to the Norwegian Sea is apparently stable, while in the Svalbard area in 2014 it decreased to 45% of the 2008 abundance, indicating a distributional shift. The authors of SC/66b/RMP03 suggested that understanding the scale of the shifts is important for estimating population abundance.

The Committee discussed issues related to the likely effect of systematic variation of multi-year surveys on estimated variances, which are currently combined using random effects modelling, the effect of differential yearly patterns of re-sighting, and the effect of changing strip half-widths among years.

Attention: SC
*The Committee **recommends** that next year, the authors of SC/66b/RMP03 undertake and present results from analyses addressing the likely effect of systematic variation of multi-year surveys on estimated variance, especially regarding effect strip half-width. Taking this into account, revised abundance estimates should be submitted in due course.*

SC/66b/RMP06 summarised a sighting survey conducted in the eastern Norwegian Sea in the *Small Area* EW and at Jan Mayen within the *Small Area* CM during the summer 2015, the second survey of a six-year programme. The Committee was advised that the next component of the plan is to survey the Barents Sea in 2017 which will require access to Russian EEZ. The Committee **appoints** Øien to provide oversight on its behalf.

Attention: C-R, CG-A
*The Committee **recognises** that without access to Russian waters, survey coverage will be incomplete and abundance estimates compromised. It therefore **recommends** that the Commission request the relevant authorities in Russia to grant permission to a Norwegian vessel to survey the planned areas in Russian EEZ of the Barents Sea in 2017.*

6.2.4 Conclusions and recommendations
The Committee **concludes** that although it was unable to complete the *Implementation Review* at this meeting, with the assistance of the intersessional Workshop (see Item 25.3), it will be able to complete the review at next year's meeting.

Table 4

The *Implementation Simulation Trials* for North Atlantic minke whales. MSYR is in terms of 1+ on 1% and mature on 4%.

Trial no.	Stock hypothesis	MSYR	No. of stocks	Boundaries	Catch sex-ratio for selectivity	Trial weight	Notes
NM01-1	I	1%[1]	3	Baseline	2008-13	M	3 stocks, E and W with sub-stocks.
NM01-4	I	4%[2]	3	Baseline	2008-13	H	3 stocks, E and W with sub-stocks.
NM02-1	II	1%[1]	2	Baseline	2008-13	M	2 stocks, E with sub-stocks.
NM02-4	II	4%[2]	2	Baseline	2008-13	H	2 stocks, E with sub-stocks.
NM03-1	III	1%[1]	1	Baseline	2008-13	M	1 stock.
NM03-4	III	4%[2]	1	Baseline	2008-13	M	1 stock.
NM04-1	IV	1%[1]	2	Baseline	2008-13	M	2 cryptic stocks.
NM04-4	IV	4%[2]	2	Baseline	2008-13	M	2 cryptic stocks.
NM05-1	I	1%[1]	3	Stock C not in ESW	2008-13	M	3 stocks, E and W with sub-stocks.
NM05-4	I	4%[2]	3	Stock C not in ESW	2008-13	M	3 stocks, E and W with sub-stocks.
NM06-1	II	1%[1]	2	Stock C not in ESW	2008-13	M	2 stocks, E with sub-stocks.
NM06-4	II	4%[2]	2	Stock C not in ESW	2008-13	M	2 stocks, E with sub-stocks.
NM07-1	I	1%[1]	3	Baseline	**2002-07**	M	Alternative years to adjust selectivity-at-age.
NM07-4	I	4%[2]	3	Baseline	**2002-07**	M	Alternative years to adjust selectivity-at-age.
NM09-1	I	1%	3	Baseline	2008-13	M	E-2 stock in EN 10%.
NM09-4	I	4%	3	Baseline	2008-13	M	E-2 stock in EN 10%.
NM10-1	I	1%	3	Baseline	2008-13	M	E-2 stock in EN 90%.
NM10-4	I	4%	3	Baseline	2008-13	M	E-2 stock in EN 90%.
NM12-1	I	1%[1]	3	Stock E1 not in ESW	2008-13	M	3 stocks, E and W with sub-stocks.
NM12-4	I	4%[2]	3	Stock E1 not in ESW	2008-13	M	3 stocks, E and W with sub-stocks.
NM13-1	II	1%[1]	2	Stock E1 not in ESW	2008-13	M	2 stocks, E with sub-stocks.
NM13-4	II	4%[2]	2	Stock E1 not in ESW	2008-13	M	2 stocks, E with sub-stocks.
NM01-1v	I	1%[1]	3	Baseline	2008-13	M	CV of future abundance = ½ basecase value.
NM01-4v	I	4%[2]	3	Baseline	2008-13	H	Ditto
NM02-1v	II	1%[1]	2	Baseline	2008-13	M	Ditto
NM02-4v	II	4%[2]	2	Baseline	2008-13	H	Ditto
NM03-1v	III	1%[1]	1	Baseline	2008-13	M	Ditto
NM03-4v	III	4%[2]	1	Baseline	2008-13	M	Ditto
NM04-1v	IV	1%[1]	2	Baseline	2008-13	M	Ditto
NM04-4v	IV	4%[2]	2	Baseline	2008-13	M	Ditto

6.3 North Pacific common minke whales

6.3.1 Review new information

The Committee completed the *Implementation Review* for western North Pacific minke whales in 2013 (IWC, 2014b). However, it acknowledged that work remains to be done on: (1) reviewing the results of proposed 'hybrid' versions of RMP variants to allow evaluation of 'variant with research' should one be requested; (2) reviewing any research proposals related to a candidate 'variant with research'; and (3) agreeing the estimates of abundance for use in actual applications of the RMP. Definition of terms and a summary of the proofs can be found in the Committee's Requirements and Guidelines (IWC, 2012g).

In discussion, Japanese scientists advised that they had decided not to proceed with a 'variant with research' plan. In their view, research results reported from the JARPN II research programme indicated that some of the stock structure hypotheses for the previous *Implementation Simulation Trials* were no longer compatible with the data. Accordingly, they considered those *Implementation Simulation Trials* flawed and in need of revision, so that development of the research plan linked to those *Implementation Simulation Trials* should be put on hold until an *Implementation Review* is conducted, that perhaps leads to different RMP variants requiring such attention.

Attention: SC

*The Committee **agrees** that in the light of this information from Japanese scientists, the consideration of any possible 'variant with research' plan did not need to be included on next year's agenda.*

The Committee also noted discussion of western North Pacific common minke whales stock structure provided in Annex I (item 3.2.2.1), with a focus on the new information and analyses provided to the Expert Panel Workshop on a Final Review of JARPN II and responses to recommendations made by that Panel (see Item 18.2.1). A summary of the detailed technical discussions can be found under Item 12.2. In the context of the present Agenda Item, the context is whether the new information was sufficient to warrant an early *Implementation Review.*

Attention: SC

*In the light of the conclusions on stock structure of western North Pacific common minke whales provided under Item 12.2, the Committee **agrees** that the new information does not change its plans for the timing of the next Implementation Review, which should start in 2018 as anticipated.*

The Committee also considered Hakamada *et al.* (2016) and Hakamada and Matsuoka (2016b), which were originally submitted to the Final Review of the JARPN II Expert Panel (see Item 18.2.1). Hakamada *et al.* (2016) presented abundance estimates of common minke whales found in the JARPN II coastal survey areas (see Annex D, item 3.3.1). The abundance estimates were not for the whole of the stock(s), but rather for small coastal sub-areas that were surveyed. The *Small Area* abundance estimates presented in Table 1 of that paper were not corrected for $g(0)$. The authors noted that an estimate of $g(0)$ for Japanese research boats in the North Pacific was developed by Okamura *et al.* (2010) of 0.798 with a CV of 0.134. This estimate was used in most of the *Implementation Simulation Trials* (e.g. IWC, 2012c, p.113).

Attention: SC, CG-A

*The Committee **recommends** continued development by Japanese scientists of appropriate confidence intervals for g(0) be developed (e.g. using resampling approaches).*

Table 5
Work Plan for RMP *Implementation*-related matters.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
North Atlantic fin whale		Review relevant new information e.g. on survey techniques.		Review any relevant new information.
North Atlantic common minke whale	Review final results of *Implementation Simulation Trials.*	Complete *Implementation Review.*		Review new abundance estimates.
Western North Pacific common minke whale		Review any relevant new information e.g. on $g(0)$ and additional variance.		Prepare for *Implementation Review.*
Western North Pacific Bryde's whale	(a) Conduct 'First' intersessional Workshop (IWC, 2012g); (b) code the resulting trials and condition them.	Undertake work required for 'First' Annual Meeting (IWC, 2012g).	Conduct 'Second' Workshop (IWC, 2012g).	Complete *implementation Review* (IWC, 2012g).

This information will be of value in the expected 2018 Implementation Review *of western North Pacific common minke whales, particularly in the context of also estimating additional variance.*

SC/66b/RMP05 described a survey plan for a 2017 survey in Korean waters. The Committee noted that surveys should be conducted taking the migration patterns of the surveyed animals into account (if these are known). It noted that one block will be surveyed north to south and another south to north. Park was appointed to provide oversight on behalf of the Committee.

6.4 Western North Pacific Bryde's whales

6.4.1 Prepare for 2017 Implementation Review

Regular *Implementation Reviews* are required under the RMP. The Committee is initiating the first *Implementation Review* for North Pacific Bryde's whales since the original *Implementation was* completed in 2007. This *Implementation Review* was originally scheduled for 2013. However, in 2012, the Committee postponed the *Implementation Review* until 2016 to allow additional sightings and genetics data to be available and analysed (IWC, 2013b). The Committee has agreed that this will be a full *Implementation Review* and established a Steering Group under Donovan (SG-4; see Annex V for Terms of Reference and membership) to guide it and to plan for an Intersessional Workshop next year.

6.5 Work plan

Details of work to be undertaken both before and during the 2017 Annual Meeting are given in Annex D, item 3 and summarised in Table 5.

7. NON-DELIBERATE HUMAN-INDUCED MORTALITY OF CETACEANS

The report of the Working Group on Non-deliberate Human-induced Mortality of cetaceans is given as Annex J.

7.1 Bycatch and entanglement

7.1.1 Report of a Workshop on Global Assessment of Large Whale Entanglement and Bycatch Reduction in Fishing and Aquaculture Gear (Portsmouth Workshop)

A Workshop to exchange information on preventing large whale entanglements, co-organised by the New England Aquarium, the Consortium for Wildlife Bycatch Reduction and IWC, was held in May 2016. The Workshop was co-funded by NOAA (US). The Committee **thanks** all those involved in organising the joint Workshop. The full Workshop report was not yet available but sections of the report were discussed. These are discussed below.

7.1.1.1 GEAR MARKING – GOALS AND FEASIBILITY GLOBALLY

Identifying the source of gear that has caused an entanglement is important for developing mitigation measures but has proven to be challenging. In most cases of disentanglement of free swimming whales, the gear that is recovered is just rope. The IWC Secretariat has been providing input to the FAO about the need to consider whale entanglement as it develops schemes to mark gear so that it can be identified to fishery and even individual fishermen/vessels (called 'gear marking'). FAO held a recent technical meeting on gear marking and this will be discussed further at the COFI meeting in July. Relevant questions to assist in developing whale entanglement prevention measures include:

(a) distinguishing vertical line from ground line in pot or trap fisheries;
(b) assessing the relative risk from the different ways and water depths in which gear is set;
(c) evaluating whether sinking ground line reduces risk compared to floating line; and
(d) evaluating effectiveness of gear modifications in reducing entanglement risk.

Attention: SC, S, C-A, G

With respect to the identification of gear to assist in the development of mitigation measures and priorities, the Committee:

(a) ***recommends*** *that* inter alia *as part of its co-operation with FAO, the Secretariat informs the July meeting that to be useful for identifying the origin of gear removed from entangled whales, 'marks' need to be in more than one place on the gear, and preferably either continuous or approximately of the order of a whale's length apart;*

(b) ***notes*** *the detailed gear marking scheme on the US Atlantic coast and* ***agrees*** *that it will be useful to identify other areas where developing regional gear marking schemes might be particularly relevant and feasible (e.g. where there are well-studied populations of whales, manageable fisheries and well-established stranding and entanglement response networks);*

(c) ***agrees*** *that there is a need to develop resources that disentanglement teams can use to find out information about the gear that they find on whales;*

(d) ***agrees*** *that a review of the potential for biological forensic techniques using fouling organisms to identify origin of gear, is worth pursuing, although it is not aware of any studies that had used such techniques, and some challenges were noted; and*

(e) ***recognises*** *the similarities between gear marking with the objective of understanding whale entanglement and issues associated with ALDFG (Abandoned Lost and Discarded Fishing Gear) and* ***agrees*** *that work on this issue will need to be coordinated across the Committee and Commission (and see Item 13.9).*

7.1.1.2 ROLE OF DISENTANGLEMENT EFFORTS IN PREVENTION

As has been stressed many times (IWC, 2012e; 2013e; 2015m), disentanglement is not itself a prevention measure and only a small fraction of the entanglements that occur are likely to be successfully disentangled. However, disentanglement does provide an opportunity to gather information which can assist in developing prevention and mitigation measures.

Attention: SC, CG-R, C-R
*The Committee **recommends** that all data collection opportunities associated with disentanglement efforts are maximised to assist in the development of prevention and mitigation measures (and see Item 7.1.4 below).*

7.1.1.3 ABANDONED, LOST AND DISCARDED FISHING GEAR/MARINE DEBRIS

Attention: C-R, CG-R, C-R
*Given the relatively low proportion of large whale entanglements attributed to ALDFG (although the actual proportion is unknown and difficult to estimate), the Committee **recommends** that:*

(a) large whale entanglement prevention should focus primarily on active gear;
(b) any prevention techniques should try to avoid a higher risk of creating ALDFG; and
(c) recovery of ALDFG should continue.

7.1.2 Progress on scientific aspects of mitigation measures for reducing large whale entanglement risk

SC/66b/HIM06 noted that between 1990 and 2011 the reported entanglement rate of the Western Australian population of humpback whales (Breeding Stock D – see Item 10.2) in gear from the western rock lobster fishery averaged around two per year. However, in 2012 and 2013, reported entanglements jumped to 12 and 17 respectively and this increase was linked to changes in fishery practices. In response, a series of gear modifications were implemented aimed at reducing the amount of rope in the water, eliminating surface rope in waters deeper than 20m and a reduction in float numbers to reduce possible entanglement points. The effectiveness of these measures to reduce entanglement was assessed using incidents reported between 2000 and 2015. The results indicate that substantial (around 60%) risk reduction appears to have been achieved.

In discussion it was noted that the recording of entanglements will continue, and that satellite tagging is also planned in order to determine the extent to which whales may use waters further offshore. Given the size of the population, and its highly transitory migratory behaviour, it is not currently possible to conduct follow up studies of entangled whales. Regional disentanglement teams attempt to retrieve all entangling gear which allows modified gear to be distinguished from unmodified. Currently the primary identifying marks are at the marker buoy, and if this is missing then identification of the gear can be challenging.

Attention: SC, CG-A
*The Committee **welcomes** this report on entanglements in the rock lobster fishery in Western Australia and the mitigation measures implemented. It **encourages** continued monitoring in order to confirm the success of these measures.*

A review of entanglement mitigation measures for reducing the risk to large whales in SC/66b/HIM07 identified rather few measures that have been demonstrated to substantially reduce risk. Keeping static gear out of areas used by whales is the most effective method. If this is not possible then reducing the amount of fishing effort, modifying gear to reduce risk of contact, and modifying gear to reduce the consequences if contact occurs, are the main strategies known to reduce risk.

Attention: SC, C-A
*The Committee **agrees** that the Portsmouth Workshop report and the review provided in SC/66b/HIM07 together will provide a good reference for constructing a summary table of potential mitigation measures, similar to that produced for ship strike mitigation.*

In evaluating effectiveness of mitigation strategies, it was noted that the US Take Reduction Team (TRT) process has documented success when the team's scope and size are appropriate, for example involving just one fishery and one cetacean population (McDonald *et al.*, 2016). The Atlantic Large Whale TRT has broader scope which challenges the team's ability to reach consensus. While this team and the resulting mitigation measures have had limited success as noted in Pace *et al.* (2014), two major gear modification requirements (sinking groundline and reduced number of buoy lines), as well as a comprehensive gear marking scheme, were implemented subsequent to the analysis in Pace *et al.* (2014). Thus, the effectiveness of those measures cannot yet be evaluated.

In consideration of a review identifying data gaps regarding understanding entanglement in active or derelict fishing gear, including inadequate reporting and a general underestimation of welfare concerns (SC/66b/HIM09), the Committee noted that several of the author's recommendations, such as disentanglement response training, were already part of IWC initiatives. It was also noted that discussions with stakeholders and mitigation measures need to take into account both animal welfare and socio-economic impacts.

7.1.3 Estimation of rates of large whale entanglement, risks of entanglement and mortality

SC/66b/HIM01 reported an apparent rise in entanglements of humpback whales in Scottish coastal waters over the period 1992-2016. Despite low densities indicated by sightings surveys and community sighting schemes there were 12 reported entanglements of this species. Almost all of the known entanglements involved creels (pots or traps), or ropes consistent with creels. This suggests that with current fishing practices, Scottish inshore waters could not support a population of humpback whales. The authors also highlighted entanglement concerns for common minke whales which are more abundant but less likely to be reported.

Attention: SC, CG-A
*The Committee noted that the gear modifications involving shorter vertical lines that appeared to have reduced risk in the Australian lobster fishery may also be effective in Scottish waters and **encourages** investigation of this by the authors of SC/66b/HIM01 and local authorities.*

Aerial photographic surveys for bowhead whales conducted near Point Barrow, Alaska, USA in 2011 allowed analyses of scarring (SC/66b/BRG04). Approximately 3% of the whales had scars induced from anthropogenic sources, most of which were from line entanglement. Preliminary results suggest a higher rate of entanglement when photo

quality of just the peduncle region was evaluated. However, the aerial method may only see major scarring, and it was suggested that a more detailed comparison of scarring results from landed animals and aerial photography might be useful to calibrate the aerial methodology.

Analysis of images collected from platforms of opportunity (whalewatching operations) over 15 years in the Strait of Gibraltar indicated fishing gear and ship strikes were likely reasons for most animals with scars (Panigada *et al.*, 2006). In addition, six animals were found dead, either in the water or stranded.

Attention: SC
*The Committee **recommends** that the authors of SC/66b/E13 enter the ship strike data into the IWC database.*

Marine mammal research teams have been working from five locations along the west coast of India collecting sightings and strandings data (SC/66b/SH34). Strandings were dominated by blue and Bryde's whales although identification was sometimes uncertain. Eight of the ten baleen whales stranded along the coast of Maharashtra. The authors note the need for collaboration amongst authorities, scientists and vets to understand the causes and seasonality of mortalities, and a marine mammal research methods workshop was held in February 2016. Regional coordination may encourage further initiatives to collect sighting and stranding data.

Attention: SC, C-A
*The Committee **welcomes** efforts to collect sightings and strandings information off India, **notes** the two recent IWC stranding Workshops and **endorses** a proposal to establish an Expert Panel to advise on strandings (see Item 13.5.2).*

7.1.4 Review information in National Progress Reports and proposals for an entanglement database

In reviewing data from the National Progress Reports, the Committee noted that very few member countries report extensively and consistently on bycatch and entanglement, and this number is decreasing. Given the Committee's and Commission's growing concern with the bycatch and entanglement issue, this trend is troubling, as generally the numbers of reports of bycatch should increase with more focused attention.

Attention: SC, C-A, C-R, S
With respect to its concern at the small number of countries regularly reporting thoroughly on bycatch and entanglement in National Progress Reports, the Committee:

(a) has established an intersessional working group under Double (ICG-2; members and Terms of Reference in Annex V) to consider approaches to streamlining the data requested;
*(b) **recommends** that the list of FAO codes for fishing gear available in National Progress reports be expanded by the Secretariat to include aquaculture facilities;*
(c) highlights the need for entanglement risk from Fish Aggregating Devices (FADs) also needs to be considered by the Committee; and
*(d) **reiterates** to the Commission and Contracting Governments the value of thorough National Progress Reports to the work of the IWC and **recommends** that they make every effort to ensure that such reports are submitted.*

For some years, the IWC has been considering developing and hosting a global entanglement database. The overarching goals of the database would be to identify the species involved, gear type, configuration and origin, whether the entangling materials were in active use or debris, and the geographic region and timing of the entanglement. The ultimate goal would be to use this information to inform mitigation initiatives by the Commission, relevant partner inter-governmental organisations, regional fishery councils or member nations. Noting the difficulties encountered by others in trying to develop global databases, the Committee **agrees** that answering specific questions about bycaught species (especially large whale numbers, fisheries and regions) with any degree of confidence would likely be impossible using historic information. A step by step process is most likely to succeed towards collection of useful information about large whale entanglement through the establishment of an international database.

Attention: SC, S
*As a first priority with respect to establishing a global database, the Committee **recommends** the development of a database for the IWC's Global Whale Entanglement Response Network (GWERN), following an initial suggestion in IWC (2013e, pp. 417-35). This will provide a resource for many of the new network members who do not currently have existing data handling capabilities and it could be designed in such a way that networks with existing databases could export their relevant data. The initial objectives of the database would be:*

(1) to aid existing or newly formed entanglement response networks to collect relevant data, and to act as an archive for those data; and
(2) to gather information and allow analyses that would be helpful to advancing entanglement prevention.

The database will be constructed in a modular fashion beginning with the data currently recommended for collection in GWERN's consensus field data form. The database could be expanded in the future to include other modules and sources of data but to achieve this the initial structure needs to be carefully designed to allow for future expansion.

*The Committee **notes** that there are various proposals within the Committee for the IWC to host a number of different databases (e.g. entanglement, strandings, aquatic bushmeat), when considering the value of these and proposals for development it should be recognised that some of these might be similar in structure, or even be linked.*

7.1.5 Approaches for addressing the bycatch issue in small cetaceans

Small cetaceans are used or have been used as aquatic bushmeat[4] in much of West Africa and Latin America, encompassing at least 34 species (SC/66b/SM01 and SC/66b/SM02). In some cases, while the practice began by using bycaught animals they now include directed catches. These direct catches have potentially expanded to unsustainable levels, for example in Peru and Nigeria, where thousands of animals are intentionally caught every year. The authors explain the difficulties in estimating numbers and the factors involved that make fishermen reluctant to report catches.

[4]Defined in CMS (2016) as products derived from aquatic megafauna (including cetaceans) used for food and non-food purposes, including traditional uses.

In discussion it was noted that much of the information reported came from interviews and that these can be problematic depending on the motivation of the interviewee. Some suggestions for improved approaches were provided (see Annex J, item 7).

In 2013, the Committee considered an estimate of bycatch of harbour porpoises in two coastal gillnet fisheries (for cod and monkfish) in Norway for the period 2006-06. An updated analysis with corrected data was presented in SC/66b/SM03: the revised estimate is 3,541 (CV 0.10) porpoises annually for 2006-08. The bycatch for the entire period 2006-14 was estimated by two methods: model-based approaches and ratio-based approaches. The best model yielded an annual bycatch estimate of 2,946 (CV 0.11) whereas the stratified ratio-based bycatch estimates ranged from 2,317 (CV 0.15) to 3,375 (CV 0.16) porpoises.

In discussion, concern was expressed that this level of bycatch is unsustainable. It was noted that mitigation methods are being explored and that the two net types evaluated are the main types used in Norwegian coastal waters. A preliminary pinger experiment was unsuccessful because the devices did not survive the conditions of the fishery. Once suitable pingers have been identified it is the hope that they can be made mandatory for this fishery. The SCANS-III survey is expected to provide an abundance estimate for some Norwegian waters but the fjords, where porpoises are also found and a significant portion of these fisheries takes place, remain unsurveyed.

Attention: SC, CG-A
*The Committee **welcomes** the effort put into assessing bycatches of harbour porpoises in Norway and the development of mitigation measures. It **looks forward** to receiving further information on progress from Norway.*

A comparison of reported bycatch of Hector's and Māui dolphin, in national progress reports to the IWC and the Department of Conservation database indicated that these reports account for <15% of estimated total bycatch (SC/66b/SM15). In subsequent years, observer coverage in inshore fisheries has been lower, rather than higher, than the 1997-98 observer programme. Bycatch in gillnet fisheries in New Zealand was estimated at 110-150 Hector's and Māui dolphins during 2000-06 (Davies *et al.*, 2008). No estimates are available for bycatch of Hector's and Māui dolphins in trawl fisheries. The authors concluded that there is a need for observer programmes on gillnet and trawling vessels off the west and south coast of the South Island. Dolphin densities in these areas are sufficiently high to expect statistically robust estimates of bycatch if observer coverage is at least 50%. This could include monitoring via on-board video cameras if careful attention is paid to potential sources of bias. The population density of Māui dolphins off the North Island west coast is too low for robust estimates of bycatch to be attainable. Finally, Slooten noted her view that for Māui dolphins the urgent priority is to implement effective protection measures, rather than to engage in further research. This issue is considered further (and recommendations made) under Item 15.3.3.

High levels of bycatch of finless porpoise have been identified in the Yellow Sea, and more than 80% of this is attributed to the dominant stow net fishery in the area (Kim *et al.*, 2013). The fishery currently uses an excluder device for jelly fish in the summer months, the use of which also correlates with much lower finless porpoise bycatch. Since March, 2016 the Cetacean Research Institute, Republic of Korea, has been working with fishers to run trials of several variations of the excluder device, in order to confirm their efficacy for preventing finless porpoise bycatch.

Attention: SC, CG-A
*The Committee **welcomes** the new analysis and the effort put into assessing bycatches of finless porpoises in Korea and the development of mitigation measures. It looks forward to receiving further information on progress with mitigation trials from Korea at next year's meeting.*

The Committee considered two papers that estimated bycatches using strandings data.

The first was by Peltier *et al.* (2016) who described an attempt to estimate total bycatch of common dolphins (*Delphinus delphis*) in the Bay of Biscay and western English Channel from the analysis of long-term stranding data sets. The aim of this work was to compare bycatch estimates of common dolphins provided by observer programmes in French and UK national reports and those inferred from stranding data. Bycatch was estimated from stranding data by correcting numbers according to likely carcass drift and buoyancy. Estimates from strandings suggested from 3,650 [2,250-7,000] to 4,700 [3,850-5,750] dolphins year^{-1}, depending on methodological choices. These estimates are about one order of magnitude higher than figures produced by the compulsory observer programmes. However, it was noted that the results are not directly comparable as the observer programme does not cover all fisheries which potentially produce bycatch identified in the stranding data.

Peltier *et al.* (2016) noted that the main advantage of stranding data is the large spatial and temporal scales encompassed and its potential to document the cumulative effect of all fisheries irrespective of fishing gear, target species and vessel size. The results suggest the need to continually re-assess the sustainability of such removals, to conduct comparative analyses with the findings from the by-catch monitoring programme, and to consider how this approach might be applicable to other study areas.

In discussion, there was discussion of the robustness of the approach and the importance of long term stranding monitoring programs.

In the second paper, a mark-recapture approach was used to estimate past bycatch of the endangered franciscana dolphin from time series of stranded carcasses in southern Brazil (Prado *et al.*, 2013). The authors estimated the probability that a franciscana incidentally killed by the coastal gillnet fisheries would strand (using drift data from a carcass experiment) and used this to back-calculate fishing related mortality from a dataset of carcasses collected between 1979 and 1998. The corrected estimate of franciscana mortality was approximately 10 times higher than previous estimates based solely on stranding data.

In discussion, some concerns were raised about this novel approach, including the need to account for changes in the fishery over time, the possibility that carcasses may be removed from the beach to be used, and the need to consider of other fisheries that operate close to shore in the region.

Attention: SC, G, C-A
*The Committee **recognises** the great importance of obtaining robust estimates total bycatch and bycatch rates to prioritise conservation and management needs with respect to mitigation and prevention efforts and monitoring. The Committee therefore:*

(a) ***notes*** *its previous conclusion that well-designed independent observer programmes are the best way to estimate bycatch;*
(b) ***agrees*** *that there is a need for further development and evaluation of methods using strandings to estimate bycatch, with a case by case exploration of all possible sources of bias and* ***encourages*** *such efforts;*
(c) ***notes*** *the value of long-term stranding schemes and their potential to assist where observer coverage is low or non-existent; and*
(d) ***agrees*** *that studies such as these on monitoring bycatch through stranding data should complement observer programmes and not be seen as potential replacements (the approaches together provide a means of ground-truthing each other).*

The Committee also ***encourages*** *papers on the following topics at future meetings:*

(1) consideration of observer programmes to estimate bycatch including the use of new technologies such as video monitoring and consideration of required observer coverage to obtain robust estimates;
(2) consideration of the role of fisheries data collection schemes in bycatch data collection (e.g. the Data Collection Framework established by the European Commission); and
(3) use of strandings data for quantitative estimation of bycatch including evaluation of different modelling approaches.

7.1.6 Links with CMPs

The Committee **stresses** that the issue of bycatch is serious and extensive and that the IWC cannot fully address it alone. There is a need for greater collaboration with individual nations and other IGOs including FAO, CMS, CCAMLR, ACCOBAMS, ASCOBANS and ICES. Recent international work to mitigate the bycatch of other species (e.g. seabirds, sharks, turtles) might provide useful models of cooperation. It was suggested that the Committee should seek collaboration with other experts who have complementary knowledge (e.g. fisheries managers, fishing gear engineers).

Attention: SC, C-A
The Committee ***stresses*** *that the issue of bycatch is serious and extensive and that the IWC cannot fully address it alone. In addition to improved collaboration, the Committee* ***agrees*** *to establish an intersessional correspondence group under Simmonds (ICG-3; members and Terms of Reference are given in Annex V) to consider the potential development of a topic-based CMP on bycatch and entanglement. This group will take into account relevant ongoing work in the Committee and other relevant international bodies. This will assist in the development of an outline CMP to be considered by the Commission as requested at the joint meeting of the Scientific Committee and Conservation Committee in 2015.*

7.2 Ship strikes

7.2.1 Progress on the global database

The IWC provides funds for two part-time data coordinators for the IWC ship strike database. The activities carried out in the past year include outreach actions and follow-up with potential data providers (SC/66b/HIM02). As of 30 May 2016, the database held a total of 1,151 incidents, with 51 new reports being submitted since May 2015. An increasing number of these arose from the public and scientists working in the field rather than through the efforts of the data coordinators to find cases. Contacts with the ACCOBAMS and the Pelagos Sanctuary Executive Secretariats as well as ASCOBANS and other international organisations have been maintained. The Committee agrees that it is important to address the issue of the backlog of cases in the database that need verifying and the Ship Strike Data Review Group (SSDRG) should continue to classify cases following the categories agreed in 2013.

Attention: SC, S
To address the data entry and review backlog for the IWC ship strikes database, the Committee ***recommends****:*

(a) that the contracts for the IWC ship strike co-ordinators should prioritise the time allocated to data issues rather than outreach, at least for the coming year - they should preview all records, in order to eliminate data deficient and obvious cases, prior to sending them to the ship strikes Data Review Group under Leaper (SG-5; members and Terms of Reference are in Annex V); and
(b) that the SSDRG seek more members with expertise in veterinary diagnosis, biology and practical experience investigating ship strikes at sea and strandings.

The 2014 joint IWC/UNEP-SPAW Workshop on ship strikes (IWC, 2016e) had recommended that the countries of the Wider Caribbean Region and Pacific coast of South America, through the Permanent Commission for the South Pacific, conduct outreach to improve reporting of ship strikes to the IWC database. Reports have not apparently increased from those areas.

Attention: S, CC, C-A
The Committee ***recommends*** *that, if the IWC enters into a proposed MOU with UNEP-SPAW, it should include specific actions (e.g. outreach and reporting) to encourage the reporting of ship strikes from the region.*

7.2.2 Estimating rates of ship strikes, risk of ship strikes and mortality

Collation of Australian vessel strike reports from historical data sources and an exploratory analysis revealed 65 new and previously unreported records which increased Australian records to approximately 17% of worldwide historical reports (SC/66b/HIM05). This does not necessarily reflect the actual proportion of global vessel strikes that have occurred in Australia, as strike data have inherent reporting biases and unknown geographic coverage. However, the additional data collected in this study does challenge the notion that historically Australia has had low numbers of vessel strikes relative to the rest of the world.

Attention: SC, C-A, CG-R, CC
The Committee ***commends*** *the considerable effort put in by Australia with respect to examining ship strikes which had uncovered significant new data. It therefore:*

(a) ***recommends*** *that scientists and authorities from other areas carry out a similar effort that might produce similarly productive results - the IWC Conservation Committee could assist in the encouragement of such studies through its ship strikes working group; and*
(b) ***agrees*** *that this issue should be considered at the forthcoming joint meeting of the Scientific Committee and Conservation Committee.*

A review of co-occurrence of shipping with Arabian Sea humpback whale habitat suggests a need for risk assessment work on humpback whale and ship co-occurrence in Oman, in addition to undertaking a wider spatial assessment of the region to determine other priority areas (SC/66b/HIM10). Off Oman there is a need for a more detailed risk assessment in specified locations. The study also considered some mitigation measures, including preliminary calculations of impacts on shipping schedules and fuel consumption of reduced speed. Results suggest that cost savings to shipping companies might apply and therefore that mitigation might be a realistic expectation. Practical measures to reduce the risk of ship strikes around the Port of Duqm, include consideration of approach channel alignment, vessel speed reduction and an active ship-to-port whale detection, reporting and response system (Baldwin *et al.*, 2015). The possibility of expanding this work to incorporate other ports in the region, which may then act as hubs of information and mitigation, is under investigation. The authors suggested that a study evaluating compliance with the speed recommendations approaching the Port of Duqm would be valuable.

Attention: SC, G
*The Committee **welcomes** work to extrapolate consideration of risk from ship traffic in Oman to a larger region with significant ship traffic. It **agrees** that vessel density expressed in terms of distance travelled per unit area per unit time (e.g. units of $km^{-1}year^{-1}$) is probably a better indicator of risk compared to numbers of vessels per unit area.*

The Committee has previously discussed how consideration of 'near miss' events (close encounters between whales and vessels that do not involve physical contact) might help understand ship strike risk (IWC, 2015j). However, there has been no general definition for such near misses. One study suggested making a distinction between cases where either the vessel or the whale made an avoidance manoeuvre which was assumed to have averted a collision ('near miss') from situations where no such reaction has taken place ('near collision'). The authors suggested a 'near miss' be defined according to the closest point of approach (CPA) between the vessel and the whale expressed as a proportion of the vessel length (possibly using a value of 1.5) and a 'near collision' be defined if the CPA was less than a fixed distance (possibly 50 or 80m). Another study considered just used minimum distance between vessel and whale were used to define a single category of 'near miss'.

It was noted that reporting 'near miss' data is currently an option in the ship strike database. It was suggested that as there are more 'near misses' than actual strikes in most areas, gathering these data could help expand the sample size for certain analyses.

Attention: SC
*Given the variety of issues raised (see Annex J, item 8.3) with respect to the issue of 'near misses', at this time the Committee **recommends** that data on 'near misses' is not included in the ship strike database. Nonetheless, it will review this decision next year, when it is anticipated that a five-year study of near misses in Hawaii will be presented.*

7.2.3 Progress on previous recommendations for identified high risk areas

7.2.3.1 NORTHERN INDIAN OCEAN BLUE WHALES

The Committee has previously identified an area of overlap between high densities of blue whales and the main Indian Ocean shipping route off southern Sri Lanka as posing a particularly high risk of ship strikes. In 2015, it was agreed that the most effective advice on routing options and estimates of the associated risk reduction could be achieved by combining the results of two studies (De Vos *et al.*, 2015; Priyadarshana *et al.*, 2015) which provided complementary information that could be used to evaluate the implications of different potential routing schemes.

Attention: C-A, CC
*The Committee **agrees** that the combined results of these studies is sufficiently consistent to support a proposal to IMO to move the shipping lanes should Sri Lanka so wish. It notes that there will need to be a discussion of the trade-off between reduction in risk versus increased passage distance for shipping before any specific proposals are developed.*

Brownell updated the Committee on an analysis undertaken with De Vos to review all stranding and possible ship strike records from Sri Lanka, which looked at records for over 200 stranded whales. Beyond the records reported in De Vos *et al.* (2013) it had been difficult to attribute ship strike as a definite cause of death to many cases. The Committee **looks forward** to a further report at next year's meeting.

7.2.3.2 HELLENIC TRENCH, GREECE, SPERM WHALES

Ship strikes are recognised as a significant threat to the eastern sub-population of sperm whales in the Mediterranean. The Committee had previously considered an analysis of sperm whale and shipping distribution patterns in the Hellenic Trench, Greece and the potential for small changes in shipping routes to dramatically reduce risk.

Attention: S
*Last year, the Committee had recommended that the Secretariat work with interested parties (including Greece, ACCOBAMS and the shipping industry) and move forward with Greece in order to develop a proposal for routing measures in accordance with IMO guidelines (IWC, 2016q). ACCOBAMS also supports developing a ship routing proposal for this area. The Committee **recommends** that the Secretariat continue to engage on the issue with the Ministry of Mercantile Marine in Greece and ACCOBAMS.*

7.2.3.3 CANARY ISLANDS, SPERM WHALES

In 2015, the Committee endorsed a number of suggestions for reducing risk to sperm whales around the Canary Islands from ship strikes (IWC, 2016r). Ritter reported that members of the Canary Islands Working Group are conducting surveys, evaluating thermal imaging techniques for blow detection and are developing habitat use and risk models. It is hoped that results of these studies will be available next year.

7.2.4 Co-operation with IMO

The IWC has been working towards enhanced cooperation with IMO. This included submission of a document summarising the IWC's work on ship strikes submitted to the IMO Marine Environment Protection Committee (MEPC). The paper drew attention to work by the IWC on ship strikes including identification of high risk areas and potential mitigation measures and the collection of data through the IWC ship strike database. Following discussion, the MEPC noted the information provided by the IWC and encouraged Member Governments to assist in making mariners and authorities aware of the ship strike issue, including reporting any incidents to the IWC Ship Strike Database in order to

Table 6
Work plan for non-deliberate human-induced mortality of cetaceans (HIM).

Topic	Intersessional 2016/17	2017 Annual Meeting (SC/67a)	Intersessional 2017/18	2018 Annual Meeting
Assess entanglement rates, risks and mortality		Review new estimates		Review new estimates
Reporting of entanglements and bycatch in National Progress Reports	Intersessional group to review submission and possible streamlining	Review the information submitted in National Progress Reports and evaluate its adequacy		As 2017
Mitigation measures for preventing large whale entanglement	Consider final Portsmouth report and any advice from IWC/66	Review progress on developing a summary table of measures.		Review progress on mitigation measures
Consideration of CMP for bycatch and disentanglement	Intersessional group to address this and consider advice from IWC/66	Review report of the intersessional group and develop work plan		Finalise draft of CMP?
Global database for disentanglement activities	Secretariat and advisory group to work on development	Review progress on database	Continue development work	Finalise database
Ship Strike Database	Ongoing data entry into and validation of records	Evaluate progress and consider summary for website as well as use for evaluation of risks and mortality	Ongoing data entry and validation	As 2017
Mitigation of ship strikes in high risk areas	Secretariat to maintain dialogue with Sri Lankan and Greek authorities	Review progress towards assessing and mitigating ship strikes in identified high risk areas		As 2017
Co-operation with IMO Secretariat and relevant IMO committees	IWC Secretariat and members of the Committee continue to engage	Review co-operation	Continue to engage	Review co-operation
Estimation of rates of bycatch, risks of, and mortality for small cetaceans.		Further consideration of: (a) observer programmes including technology use and required levels of coverage; (b) role of fisheries data collection schemes); (c) use of strandings data for quantitative estimation of bycatch		Estimation of rates of bycatch, risks of, and mortality for small cetaceans.
Time series on entanglement and ship strikes	Correspondence group to continue work	Review summary table		

improve understanding of the issue and inform mitigation measures. The MEPC also noted that minor routing changes in high risk areas could lead to substantial reduction in strikes and was possibly the best measure of reducing ship strikes.

Attention: SC, S, CG-R
*The Committee **welcomes** the positive engagement of the Secretariat and the Committee with IMO last year. It **recommends** that the Secretariat, relevant members of the Committee and Contracting Governments continue to engage with the IMO Secretariat and relevant IMO committees to bring the work of the IWC to their attention as appropriate.*

7.3 Time series of non-deliberate human induced mortality estimates for use in assessments

An intersessional group (ICG-4 under Double; members and Terms of Reference can be found in Annex V) had made considerable progress in populating a table of 56 large whale populations and had assessed the available sources data to classify: (i) risk of ship strikes and entanglement; and (ii) reports of ship strikes and entanglements including time series where these are available. It had been hoped to complete this table at this year but there are still some key regional experts who need to be approached.

7.4 Work plan

The work plan for topics related to the non-deliberate human-induced mortality of cetaceans is provided in Table 6.

8. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT PROCEDURE

This item continues to be discussed as a result of Resolution 1994-4 of the Commission (IWC, 1995a) which has been strengthened by Resolution 2014-1 (IWC, 2016b). The report of the Standing Working Group (SWG) on the development of an aboriginal whaling management procedure (AWMP) is given as Annex E. The Committee's deliberations, as reported below, are largely a summary of that Annex, and the interested reader is referred to it for a more detailed discussion. The primary issues at this year's meeting comprised: (1) developing *SLA*s (*Strike Limit Algorithms*) and providing management advice for Greenlandic hunts, with focus on fin and common minke whales; (2) providing management advice for the Greenland hunts and the humpback whale hunt of St. Vincent and The Grenadines (see Item 9); and (3) additional work related to the AWS (Aboriginal Subsistence Whaling Management Scheme). Considerable progress on items (1) and (3) was made as a result of an AWMP intersessional Workshop (SC/66b/Rep03) and the AWMP Developers' Fund.

Attention: C-A, G
*The Committee **reiterates** that the approach used by the SWG on the AWMP (and the sub-committee on the RMP) is of broad relevance to the work of the Committee when examining status and the effects of human-related mortality. The modelling framework and approach to dealing with uncertainty is of wide application, for example when assessing the effects of bycatch in fishing gear or ship strikes (see Item 7) and the rangewide assessment of gray whales (Item 9.1.3).*

8.1 Progress on *SLA* development for the Greenland hunts

In Greenland, a multispecies hunt occurs and the expressed need for Greenland is for 670 tonnes of edible products from large whales for West Greenland; this involves catches of common minke, fin, humpback and bowhead whales. The

flexibility among species is important to the hunters and satisfying subsistence need to the greatest extent possible is an important component of management in the light of the agreed IWC objectives. For a number of reasons, primarily related to stock structure issues, development of *SLA*s for some Greenland aboriginal hunts (especially for common minke whales) is more complex than previous *Implementations* for stocks subject to aboriginal subsistence whaling. The Committee endorsed an interim safe approach to setting catch limits for the Greenland hunts in 2008 (IWC, 2009a), noting that this should be considered valid for two blocks i.e. the target will be for agreed and validated *SLA*s, at least by species, for the 2018 Annual Meeting at the latest. This need to complete the work on *SLA*s has been reinforced by Resolution 2014-1 (IWC, 2016b). The Committee has now completed the two of these, for the West Greenland humpback and bowhead whale hunt (IWC, 2015d, p.19).

The Committee has recognised that in a multi-species fishery, hunters would like to have some flexibility across species in terms of meeting the overall need expressed in terms of edible products. It has agreed that the inclusion of such flexibility across a series of interlinked *SLAs* is complex (e.g. IWC, 2011a). The Committee has therefore agreed that this aspect only be considered after single species *SLA*s have been developed and adopted (IWC, 2012b, p.16)

8.1.1 Development of an SLA *for the Greenlandic fin whale hunt*

Based upon a careful review of the available stock structure and other information discussed during the development of trials for the RMP *Implementation Review* for fin whales, the Committee last year (IWC, 2016h) agreed that from a conservation perspective, it was acceptable to try to develop an *SLA* for this hunt on the assumption that the animals off West Greenland comprised a single population represented by the abundance estimates from that area. In doing so, the Committee recognised that this will make achieving need satisfaction more difficult.

NEW INFORMATION (INCLUDING THE REPORT OF THE INTERSESSIONAL WORKSHOP, SC/66b/Rep03)

The intersessional Workshop held in December 2015 (SC/66b/Rep03) built upon the progress previously made (a trial structure had been finalised and conditioning agreed). The Workshop received candidate *SLA*s from two developers. Broadly one class of variants (Witting, 2015) involved a growth rate fraction of a lower percentile of an abundance measure, with a protection level, a 'snap-to-need' feature and a trend modifier. The other class (Brandão and Butterworth, 2015) involved application of a multiplier (a function of the observed trend of the abundance indices and its standard error) to the weighted-average of the abundance estimates and a 'snap-to-need' feature. The variants were based upon various tunings related to conservation performance and need satisfaction.

The Workshop agreed that it would evaluate candidate *SLA*s following a similar approach to that used for the selection of the *SLA*s for West Greenland humpback and bowhead whales (IWC, 2015b; 2016l). Attention focussed on three candidates: (1) *SLA* B (denoted as *SLA* 7 in Brandão and Butterworth (2015); *SLA* L1 (denoted as d05g1 in Witting (2015); and *SLA* L2 (a modification of *SLA* d05g1 in Witting (2015) with parameter *r* set to 0.0135).

In addition, it examined the results for: the *Interim SLA* agreed by the Committee and Commission in 2008 (IWC, 2009a, p.16) for use for up to two quota blocks; catch=zero; and catch=need.

All three of candidate *SLA*s had equivalent conservation performance on the *Evaluation* trials with $MSYR_{1+}$=1%, but *SLA* L1 outperformed *SLA*s B and L2 in terms of need satisfaction (SC/66b/Rep03, table 3). Therefore, the Workshop preferred *SLA* L1. The performances of all three *SLA*s was acceptable for the *Robustness Trials.*

In conclusion, subject to final code checking, the Workshop recommended *SLA* L1 as the best approach amongst those considered for providing long-term management advice for the hunt of fin whales off West Greenland.

The Committee **thanks** the intersessional Workshop for the good progress made.

Subsequent to the Workshop, the recommended final checking revealed some errors in the files associated with the trials related to the CV for the 2005 abundance, the first 'future' year with an abundance estimate and the CV for future surveys. The trials were re-run during the present meeting but inspection of the performance metrics revealed an unexpected sensitivity to the changes made.

CONCLUSIONS AND RECOMMENDATIONS

The Committee **agrees** that the reasons for the sensitivity to what should have been relatively small changes to the specifications of the trials need to be understood before it is possible to recommend an *SLA*, noting that some progress was made in investigating this during the present meeting. It re-established the AWMP Steering Group under Donovan (SG-6; members and Terms of Reference in Annex V) to ensure intersessional progress.

Attention: SC

*The Committee **recommends** that the proposed intersessional Workshop on the development of SLAs for the Greenland hunts (see Item 25.3) should consider as part of its agenda: (a) the reasons for the sensitivity of the values for the performance metrics to small changes to the specifications of the trials; (b) in the light of this, determine whether any changes need to be made with respect to the choice of an SLA. It also **agrees** to change the future survey frequency of fin whale trials to 5, 10 and 15 years instead of 6, 12, and 18 to be consistent with the trial specifications for other SLAs and the ASW discussions on periods between surveys (see Item 4).*

Attention: C-A

*The Committee **advises** the Commission that its intersessional work plan should allow it to recommend a West Greenland fin whales* SLA *at its 2017 Annual Meeting.*

8.1.2 Development of an SLA *for the common minke whale hunt off Greenland*

The development of an *SLA* for the common minke whale hunts off West and East Greenland is the most complex of those required for Greenland. It has been agreed that the basis of the development approach should be the RMP operating models for the entire North Atlantic. Stock structure issues were examined in 2014 by a joint AWMP/RMP Workshop (IWC, 2015a) that resulted in four stock structure hypotheses and a number of associated mixing matrices (see Figs 2, 3 and IWC (2016d). An initial RMP trial structure was developed in 2014 (IWC, 2015b). At a Workshop in January 2015 (IWC, 2016b) and the subsequent annual Scientific Committee meeting (IWC, 2016c), the focus was on conditioning the trials. Although satisfactory conditioning was achieved for many trials, some difficulties remained.

As noted under Item 6.2, the *Implementation Review* of common minke whales in the North Atlantic was not able to be completed this year due to some technical issues that required further investigation.

Attention: SC
*The Committee **reaffirms** the value of the RMP* Implementation Review *to its work to develop an* SLA *for the common minke whale hunts off Greenland. It therefore **recommends** that the proposed AWMP intersessional Workshop on the development of* SLA*s for the Greenland hunts (see Item 25.3) should take place immediately after the two-day intersessional RMP Workshop to complete the RMP* Implementation Review *of common minke whales in the North Atlantic. This will allow the AWMP Workshop to benefit from the results of that review in progressing its work to develop an* SLA *for the common minke whale hunts off Greenland.*

Attention: C-A
*The Committee **advises** the Commission that its intersessional work plan should allow it to recommend an* SLA *for common minke whales off Greenland by its 2018 Annual Meeting, in advance of the Commission's 2018 biennial meeting at which new aboriginal subsistence whaling limits will be considered.*

8.2 Aboriginal Whaling Management Scheme

The Scientific Committee initially recommended (and has subsequently repeated) the scientific aspects of an Aboriginal Whaling Scheme (AWS) in 2003, but this has still not been adopted by the Commission (IWC, 2003) and subsequent years)[5]. Since that time, the Committee has developed several additional *Strike Limit Algorithms*, established its Data Availability Agreement (IWC, 2004a, p.56; 2004b), considered further additional issues such as survey intervals, and developed greater experience with all aspects of the AWMP.

In 2015, the Committee recognised that a key step in developing an AWS proposal broadly acceptable to member countries, hunters and scientists, was the investigation of the performance of an alternative to the 2003 '50% allowance' grace period approach (the 'interim allowance' strategy), for provisionally allocating strikes when an agreed population abundance estimate was overdue (IWC, 2016w). At the present meeting, the Committee also began its consideration of the remaining components of the proposed AWS (see Item 4.2). The Committee notes that the Commission has agreed that the AWS is intended to be a generic and overarching policy that, as far as possible, applies equally to all aboriginal hunting regimes managed by the IWC.

Testing the interim allowance approach

At last year's meeting and during the intersessional Workshop (SC/66b/Rep03), work progressed on running the agreed trials test the 'interim allowance' approach using the *Bowhead SLA*. The Workshop had reiterated that the approach is intended only to be applied in the unlikely event that exceptional unforeseen circumstances delayed obtaining an agreed abundance estimate beyond the end of the second quota block. It should not be interpreted as a routine approach for extending quotas for a third block without a concerted effort to obtain a successful survey prior to then.

The Workshop had also stressed that as soon as it becomes apparent that there is a likelihood that an abundance estimate may not become available in time, researchers should immediately begin to develop alternative approaches to obtaining abundance estimates (or at least indices of abundance) that do not depend on the problematic conditions. It had noted that in the case of B-C-B bowhead whales, alternative methods of obtaining abundance estimates or indices of abundance are already being developed.

After reviewing the trial results, the Workshop had agreed that the approach was suitable for recommending to the Committee with respect to B-C-B bowhead whales. It noted that similar trials should be run for the other existing and candidate *SLA*s.

Conclusions and recommendations

The Committee reviewed the results of the trials considered at the intersessional workshop in the light of possible scenarios that might lead to conservation concerns. It **agrees** that the trials using the *Bowhead SLA* bracket these scenarios.

Attention: SC, C-A, ASW
*The Committee **agrees** that the performance of the 'interim allowance strategy' tested using the* Bowhead SLA *and thus applicable to the B-C-B bowhead whale hunt is acceptable and can be recommended. It **recommends** that the same approach is used to test the strategy for the other hunts with a view to developing, if possible, a single 'interim allowance strategy' by its 2018 meeting as part of an updated ASW proposal. Further, the Committee **agrees** that either immediate updating of* SLA *calculations or waiting until the grace period expires are both acceptable. For the former, the number of strikes taken thus far during the grace period should be subtracted from the updated quota, with the remainder being the strike limit for the rest of the grace period.*

Attention: C-A, ASW
*The Committee **advises** the Commission that its intersessional work plan should allow it to develop, if possible, a single 'interim allowance strategy' for all hunts to the Commission by the 2018 Scientific Committee meeting, in advance of the Commission's 2018 biennial meeting at which new aboriginal subsistence whaling limits will be considered. The strategy has been successfully tested for the B-C-B bowhead whale hunt thus far. The strategy is intended only to be applied in the unlikely event that exceptional unforeseen circumstances delayed obtaining an agreed abundance estimate beyond the end of the second quota block. It should not be interpreted as a routine approach for extending quotas for a third block without a concerted effort to obtain a successful survey prior to then. Other aspects of the ASW are discussed below.*

Other aspects of the AWS

The Committee then began to focus discussions on other aspects of an AWS (Annex E, item 4.2).

The first such issue was 'carryover'. In setting harvest limits for subsistence hunts, the Commission, for many years, has employed the convention of carryover to allow a certain number of previously allocated, but unused, strikes to be added to the current allowed strike limit. This recognises the variability of outcomes in subsistence harvests and provides flexibility to adjust hunting accordingly. It reflects the fact

[5]The original ASW proposal was, in summary, for a grace period of one block during which the block strike limit was halved and the hunters could choose how to allocate the catches by year. If an abundance estimate was agreed during the grace period the *SLA* would be used to calculate a new limit for the block.

Table 7
Two-year work plan for the SWG on the AWMP assuming funding. It is emphasised that work in the second year is dependent on that in year 1.

Intersessional	2017 Annual Meeting	Intersessional	2018 Annual Meeting
Progress work on fin whale *SLA* (Workshop)	Recommend *SLA*		
Progress work on minke whale *SLA* (Workshop)	Review progress and if possible recommend	Continue work (Workshop)	Recommend *SLA*
Progress work on AWS (Workshop)	Develop text to recommend to Commission Prepare for B-C-B bowhead *Implementation Review* Annual provision of management of advice	Continue work if needed	Present final text to Commission Complete B-C-B bowhead *Implementation Review* Annual provision of management of advice

that harsh environmental conditions can lead to failed or reduced harvest levels. In the years following a reduced harvest, communities seek to regain lost food supply through increased hunting effort. The concept of carryover is a beneficial management tool but is not a means of increasing the nominal quota on a consistent basis. Any exceedances allowed by carryover are not intended to continue unabated or indefinitely.

The Committee **agrees** that the concept of carryover (i.e. year-to-year flexibility) is relevant to within blocks and between blocks.

In response to a Commission request, the Committee presented the Commission in 2000 with an illustration regarding block quotas and carryover because the Committee needed guidance as it sought to address these issues. The Commission agreed (IWC, 2001b, p.20):

> '…that blocks of five years with an inter-annual variation of fifty percent were satisfactory in terms of allowing for the likely variability in hunting conditions. It therefore agreed that these values are appropriate for use in trials. It was recognised that this does not commit the Commission to these values in any final aboriginal whaling management procedure.'

The Committee has also agreed that the same 50% allowance could be carried over between the last year of one block and the first year of the next. The rationale for this limitation has not changed: from a scientific perspective, *SLA*s are robust with respect to carryover provisions[6].

The Committee will review and provide advice on carryover provisions before the 2018 Commission meeting, and ideally in 2017. In the meantime, the Committee continues to **endorse** the 50% carryover principle.

Details of the discussions thus far, including initial consideration of potential principles and approaches for dealing with carryover within an AWS, can be found in Annex E (item 4.2 and Appendix 2). The other aspects of the AWS discussed in Appendix 2 included: *Implementation Reviews*, guidelines for surveys, and guidelines for data/sample collection. Generally, these reflect the Scientific Committee's 2003 recommendations. One improvement pertains to the availability of data with reference the Committee's 2004 Data Availability Agreement.

Attention: C-A, ASW
*The Committee **emphasises** that AWS provisions are one of the last major remaining components of a comprehensive indigenous whaling management framework first requested by the Commission in 1994 and developed with an enormous expenditure of scientific effort and resources over the last two decades. The Commission has agreed that the AWS is a key component of this framework. Accordingly, in consultation with the Commission and its ASW sub-committee, as well as hunters and other stakeholders, the Committee intends to develop recommendations (taking into account the potential principles and approaches given in Annex E) for the scientific components and aspects of an AWS. Ideally, the scientific components of the work will be completed during the 2017 Scientific Committee meeting i.e. well in advance of the 2018 Commission meeting when new aboriginal whaling limits are due to be established.*

[6]In 2012, the Committee agreed that there were no significant conservation implications of switching to 6-year blocks (IWC, 2013b, p.22-23).

8.3 Work plan
The AWMP work plan is summarised in Table 7. Budgetary items are considered under Item 25.3.

9. ANNUAL REVIEW OF MANAGEMENT ADVICE
The Committee noted that the Commission had reached agreement on strike limits for Greenland at the 2014 Annual Meeting (IWC, 2015d). In providing this advice, the SWG noted that the Commission had endorsed the *Humpback SLA* in 2014 (IWC, 2015d), and the *WG-Bowhead SLA* had been recommended by the Committee last year (IWC, 2016l). In addition, the Commission had approved the interim safe approach (based on the lower 5th percentile for the most recent estimate of abundance) for providing advice for the Greenland hunts developed by the Committee in 2008 (IWC, 2009a, p.16). It had been agreed that that this interim approach should be considered appropriate for two blocks, i.e. up to the 2018 Annual Meeting. The results of the full simulation exercise being undertaken as part of the development process for *SLA*s for the Greenland hunts has thus far reconfirmed the Committee's original advice with respect to the *Interim SLA*.

The Committee **notes** that when providing management advice on subsistence whale hunts it provides advice in a specific way i.e. it comments only on whether the need request or present limits can be safely met from the perspective of the Commission's conservation objectives. If it or they cannot be safely met, then the Committee provides advice on what strike limit is acceptable from a conservation perspective.

9.1 North Pacific gray whales
9.1.1 Stock structure and movements
SC/66b/DNA04 reported on work to sequence the genome of two western gray whales[7] (WGW) and one eastern gray whale[8] (EGW). A panel of 92 SNPs was developed and applied to a single EGW and 28 WGWs (i.e. ~20% of the WGW population). The next steps for this study will be

[7]i.e. animals that feed regularly off Sakhalin Island.
[8]i.e. animals that migrate between Mexico along the coast of North America and Chukotka.

to include more EGW samples for more critical tests of population structure. A research collaboration is developing with regards to enhancing the SNP panel and increasing the sample sizes.

The overall goal of the project is to use genetics to clarify the population structure of gray whales that summer adjacent to Sakhalin Island – an important component of the IWC's rangewide review (see Item 9.2.3). More biopsy samples from Sakhalin Island are available and will be included in future analysis.

Attention: SC, G, CG-A
*The Committee **recommends** that gray whale samples collected by researchers in other range states in the North Pacific, including Japan and China, be requested by the authors of SC/66b/DNA04 and made available by the relevant researchers for this co-operative study. The Committee **welcomes** information that Japanese scientists are interested in sharing samples upon submission of a formal request (which could be made under the IWC's Data Availability Agreement Procedure B or directly between researchers and the sample holders).*

9.1.2 Other new biological information on eastern North Pacific gray whales

SC/66b/BRG06 reported the results of methods developed for mercury and hormone analyses in EGW for future application to WGW whale skin and blubber biopsies (and see Annex F, item 3.3.1). Liquid chromatography/mass spectroscopy was used simultaneously to detect progesterone, testosterone and hydrocortisone. The Committee welcomes this new information and looks forward to being informed of further progress.

SC/66b/BRG08 reported on the collection of photographic identifications of gray whales in Mechigmensky Bay, Russia Federation in 2013-15, as previously recommended by the Committee (e.g. IWC, 2012d). Over 3,000 photographs were collected. In 2015, two calf-cow pairs were sighted. There were no matches of the 2015 animals with animals photographed in the same area in previous years or with images in the Sakhalin and Kamchatka catalogues. This project resulted in the development of the Chukotka regional photo catalogue, which now includes 41 individuals, and is available online. Future plans include collecting additional photographs of gray whales in feeding areas off Chukotka, the collection and analysis of photographs from gray whales harvested in Chukotka, and comparison of Chukotka photographs with images from catalogues for Baja California, Mexico.

Attention: SC
*The Committee **welcomes** the initiation of this photographic work of gray whales in Chukotka and **recommends** the work continue. In light of the ongoing IWC rangewide review (see Item 9.1.3) and potential conservation and management implications, it **stresses** the value of making the catalogue publically available and **recommends** additional comparison of the Chukotka images with catalogues from the eastern North Pacific including Baja California.*

With respect to genetic samples, the Committee was informed that recently 50-70 harvested whales are sampled each year; samples are now available from more than 100 whales. The importance of samples from this region has been stressed in the context of the rangewide review (e.g. see SC/66b/Rep07). It was noted that despite interest in collaboration between the Russian Federation and the USA, in the past there have been permitting challenges with exchanging samples.

Attention: SC, G, C-A, CG-R
*The Committee **recommends** collaborative genetic analyses of these samples from the Russian Federation with those from elsewhere in the North Pacific. In light of the ongoing IWC rangewide review (see Item 9.1.3) and potential conservation and management implications, the Committee **recommends** that at least those two range states work together to facilitate the exchange and analyses of both genetic and photo-identification data. Reference was also made to the Memorandum of Co-operation on gray whales signed thus far by Japan, the Russian Federation and the USA that may assist in matter.*

SC/66b/BRG10 reported on sampling of harvested gray whales and walruses by Russian scientists. Iron, zinc, copper, arsenic and mercury levels were significantly higher in the liver than other sampled tissues. The concentrations of these heavy metals did not exceed the maximum permitted levels in the Russian Federation.

SC/66b/BRG18 provided an initial report on the 2015 Collaborative Large Whale Survey (CLaWS) conducted by NOAA Fisheries. The survey was conducted from 9 July to 9 November in USA and Canadian waters of the eastern North Pacific between Kodiak Island, Alaska and San Diego, California. The survey had three major research components: (1) assessment of gray whales that summer south of the Aleutian Islands; (2) a dedicated visual line-transect and acoustics survey for North Pacific right whales in the Gulf of Alaska; and (3) photographic and biopsy sampling of gray, blue, humpback, right and fin whales. During the survey, 140 unique gray whales were photo-identified. No right whales were sighted, but four distinct acoustic localisations of calling right whales were recorded.

The Committee **welcomes** this information, noting that the survey provides new information about the region between western Vancouver Island and Kodiak that had not been well-surveyed in the past. It also looks forward to receiving a paper next year on gray whale distribution and numbers using data from a US survey programme (ASAMM) off northern Alaska.

Attention: SC, G
*In light of the ongoing IWC rangewide review of gray whales (see Item 9.1.3) and potential conservation and management implications, the Committee **recommends** that the CLaWS researchers use their data in collaborative research with scientists throughout the North Pacific, especially with respect to photo-identification and genetic analyses.*

SC/66b/BRG19 provided data concerning the overall numbers of gray whales residing in Laguna San Ignacio, Baja California, during the 2016 winter. The numbers were similar to those during the past five winters, except for early departure of single adult whales (i.e., breeding males and females) and low numbers of cow-calf pairs at the end of the season (late-March and early-April). A total of 688 individuals were identified. Researchers in Bahia Magdalena counted the lowest numbers of gray whales since 2012, suggesting a decline in the use of that area by gray whales in 2015 and 2016, coincident with warmer than usual sea surface temperatures. In Bahia Magdalena, 151 individual whales were photo-identified.

SC/66b/BRG20 provided information about the minimum ages of breeding female gray whales in San Ignacio Lagoon. Ages were determined from photographs obtained from 1977-83, 1996-2000 and 2005-16; 16 females and one presumed male with minimum ages ranging from 25 to 46 years were identified. These are the oldest photo-identification data for any living gray whales, and demonstrate the fidelity of some breeding females to Laguna San Ignacio. The Committee noted that Rice and Wolman (1971) reported a female estimated to be 76-77 years old from corpora counts.

In discussion of these two papers it was noted that evidence from elsewhere along the migration route suggested that the northern migration was early in 2015 and 2016. It was also noted that females, that exhibit more site fidelity than males, usually stay in the lagoon longer and are therefore more likely to be photographed. The Committee **welcomes** the information from these two papers that emphasise the value of this long-term study.

Attention: CG-A, SC, G
*The Committee **recommends** that the important long-term monitoring programme in Laguna San Ignacio, Mexico is continued.*

*It also **recommends** that efforts be made to collect and preserve ovaries from stranded and harvested gray whales from throughout the range to allow future analyses of ovarian scars.*

9.1.3 Progress on the rangewide initiative

9.1.3.1 REPORT OF THE RANGEWIDE WORKSHOP

Donovan reported on the third Workshop on the Rangewide Review of the Population Structure and Status of North Pacific Gray Whales, held in La Jolla California from 18-20 April 2016 (SC/66b/Rep07). This was the second technical Workshop with a view to finalising an initial modelling framework for gray whales throughout the North Pacific.

The Workshop's primary focus was to review and build upon the excellent intersessional work undertaken by Punt on the trials agreed last year (IWC, 2016*). These focused on three priority stock structure hypotheses, numbered as at the first Workshop:

(1) Hypothesis 3a. Although two breeding stocks (Western and Eastern) may once have existed, the Western stock is assumed to have been extirpated. Whales show matrilineal fidelity to feeding grounds, and the Eastern stock includes three feeding sub-stocks or feeding aggregations: PCFG, Northern Bering Sea (NBS)/ Southern Chukchi (SCH)-Northern Chukchi-Gulf of Alaska ('Northern') and WFG.
(2) Hypothesis 3e. Identical to hypothesis 3a except that the Western breeding stock is extant and migrates to and feeds off both coasts of Japan and Korea and returns to feed in the northern Okhotsk Sea. All of the whales feeding off Sakhalin overwinter in the eastern North Pacific
(3) Hypothesis 5a. Identical to hypothesis 3a except that the whales feeding off Sakhalin include both whales that are part of the Western stock and remain in the western North Pacific year-round, and whales that are part of the Eastern stock and migrate to the eastern North Pacific.

During discussions at the 2016 Workshop, it was agreed to add the following hypothesis:

(4) Hypothesis 6b. Two breeding stocks – one includes whales from the PCFG and Northern feeding sub-stocks that migrate to Mexico and largely breed with each other, and the other includes all whales that feed off Sakhalin and breed largely with each other whether on the ENP or WNP migratory routes/wintering grounds.

The Workshop reviewed initial results from the simulations and other new information refined the list of trials; the full trial specifications are provided in Annex G of SC/66b/Rep07. The Workshop agreed that the projections would assume that future subsistence whaling by the Makah Tribe would occur during the migratory period and would be based on 'the *SLA* variant with research' (IWC, 2014d) recommended by the Scientific Committee. Other subsistence catches would be based upon the *Gray Whale SLA*.

The Workshop agreed on the format for the presentation of results and an extremely ambitious work plan to try and provide results for consideration at SC/66b.

In concluding his report, Donovan thanked Punt for his tireless computing work and Weller and the Southwest Fisheries Science Center for once again providing excellent facilities.

9.1.3.2 PROGRESS SINCE THE WORKSHOP

Punt summarised progress on modelling work since the Workshop (for more information see Annex F, item 3.1.2). He noted that the 60 model runs based on the stock-structure hypotheses 3a, 3e and 5a and the reference model for stock structure hypothesis 6b have been conditioned; in general, the model fits are adequate, but additional work is required. The Committee thanked Punt for his excellent work in the short time available after the Workshop.

Attention: SC
*The Committee **recommends** that due to the complexity of the subject and the limited amount of time available to fully interpret the results developed intersessionally, there should be a follow-up gray whale Workshop later in 2016 or early 2017 (see Item 25.3). The primary focus of the Workshop will be to interpret model results and evaluate the potential implications for conservation and need satisfaction for each hypothesis. It will also review progress on relevant rangewide recommendations, including those made at this year's meeting for collaborative studies.*

In conclusion, the Committee thanked Punt and Donovan for their work thus far and reappointed them as co-convenors for the next Workshop and for the Steering Group to facilitate progress and organise the Workshop (SG-7; for members and Terms of Reference see Annex V).

9.1.4 Review of recent catch information

SC/66b/BRG22 presented data on aboriginal subsistence whaling in the Russian Federation in 2015 (for details see Annex F, item 3.3.2). Fifteen Chukotka communities were involved in whaling in 2015. A total of 124 gray whales, 49 males and 75 females, were landed in 2015, including one stinky (i.e. inedible) whale; one other animal was struck but lost. The paper also presented information on length, weight, edible products as well as some discussion of need. Tissue sampling occurred for 55 whales.

The Committee **welcomes** this information. There was some discussion on the use of length/weight relationships derived from Rice and Wolman (1971) to estimate weights of landed animals and edible products from summering/ feeding areas. The authors agreed to incorporate uncertainty associated with the fact that the Rice and Wolman data were from migrating whales into any future analyses.

Attention: C-A, ASW
The Committee received SC/66b/BRG15, relating to the aboriginal need for Chukotka. The Committee did not discuss the paper, which is most relevant to Commission discussions. The Committee ***requests*** *that this paper be considered by the Commission's aboriginal subsistence whaling sub-committee at its 2016 meeting.*

In Plenary, the Russian Federation reminded the Committee of its previous request to evaluate the reasons why gray whales may be 'stinky' and the implications for quotas provided by the gray whale *SLA*. Investigation of the factor(s) causing 'stinky' whales was an objective of the Commission's Conservation Committee from 2005 until 2014 when the Commission agreed that was more a matter for the Scientific Committee.

In 2008, the Committee provided some advice to the Commission on how the matter of stinky (i.e. inedible) whales could be addressed within the context of the *SLA* (IWC, 2009b, p.154).

Attention: C-A
The Committee ***advises*** *that from a conservation perspective, it is the number of strikes (i.e. actual or potential removals) that is relevant not whether the whales are inedible. However, it recognises that from a user perspective (and the Russian Federation's), as stinky whales are inedible they do not contribute to meeting need. The Committee notes that there are a number of potential ways to take stinky whales into account using the* Gray Whale SLA *- e.g. the* SLA *could be used to evaluate a proposed increased number of strikes per block based upon either an average of the number of gray whales over recent years or an assumed percentage. How such an allowance may ultimately be expressed in the Schedule is a matter for the Commission. The Committee is willing to assist on any scientific aspects of this issue.*

Given the current rate of hunting, the Russian Federation noted that the quota may be exceeded during the current block quota, especially if stinky whales are considered part of the quota. The Committee appreciated receiving this information and, as noted above, can examine options for taking into account stinky whales, if the Commission should request. The Russian Federation expressed its intention of bringing this information to the Commission for their consideration.

9.1.5 Management advice

Attention: C-A
The Committee ***reiterates*** *that the* Gray Whale SLA *remains the appropriate tool to provide management advice for eastern North Pacific gray whales. It also* ***reiterates*** *that the proposed Makah whaling management plan remains the appropriate tool to provide management advice for hunts in Washington State, USA provided that a research programme monitors the relative probability of harvesting a PCFG whale in the Makah usual and accustomed fishing grounds (IWC, 2014c). The Committee* ***advises*** *that the present block quota will not harm the stock.*

9.2 Bering-Chukchi-Beaufort (B-C-B) Seas stock of bowhead whale

9.2.1 New information

The Committee received updated estimates of abundance and trend for the B-C-B Seas stock of bowhead whales based on the 2011 ice-based visual and acoustic surveys (Givens *et al.*, 2016).

Attention: SC, C-A, G
The Committee ***endorses*** *the 2011 abundance estimate of 16,820 (95% confidence interval of 15,176-18,643) for the B-C-B stock of bowhead whales, with an estimated annual rate of population increase of 3.7% (2.9%-4.6%).*

SC/66b/BRG04 provided an update on the progress of the bowhead aerial photographic-identification programme, which now includes over 21,000 images from 1980 to 2011 (the last such survey occurred in spring 2011). After scoring for photo quality, a total of 465 naturally marked (i.e., scarred) whales were photographically captured in spring 2011. The programme is expected to produce papers on *inter alia* abundance, scarring and calving. The authors noted that without annual surveys more may be learned about calving intervals from analysing stable isotopes and hormones in baleen rather than photo-identification data.

Attention: CG-A
The Committee **recommends** *that the US authorities arrange for photographs be taken of landed bowhead whales for inclusion in the photo-identification catalogue.*

SC/66b/BRG14 presented a possible outline for a bowhead health report to summarise basic health and life-history information.

Attention: SC
The Committee welcomed this and **recommends** *that:*

(a) a bowhead whale health report be generated every other year and presented to the Committee; and
(b) the authors provide information to the Scientific Committee on the protocols used to archive tissue samples for future analysis.

SC/66b/BRG03 provided information to the Committee about plans for the next population survey for B-C-B bowhead whales. A survey is planned for spring 2017, which may be conducted as an ice-based census or as an aerial survey where photos are collected for a mark-recapture estimate. The decision on which approach to use will be determined by several factors including the safety and stability of the shorefast sea ice, funding and other issues.

SC/66b/BRG17 reported on a symposium held in October 2015 by Battelle Memorial Institute and the North Slope Borough of Alaska (NSB) to examine the role of genomics in bowhead whale conservation and management and the ethical aspects of genomic research on bowheads. Further details are provided in Annex F (item 2.1.1).

SC/66b/BRG07 reported on ongoing efforts to build genetic databases for single nucleotide polymorphisms (SNP) and mtDNA for bowhead whales. A SNP panel was designed from transcriptome data plus previously designed SNPs. Samples included 252 B-C-B and 33 Okhotsk individuals. The B-C-B population showed 12 loci deviating from Hardy-Weinberg Equilibrium, while the Okhotsk population showed 2 loci deviating. The F_{ST} value between BCB and Okhotsk was 0.05, a similar value to previous studies using mtDNA and microsatellites. The authors plan to add additional SNPs and explore historical demography.

Attention: SC, G
The Committee welcomed this study to build genetic databases for single nucleotide polymorphisms (SNP) and mtDNA for bowhead whales (SC/66b/BRG07). It ***stresses*** *the importance of including more samples from western Greenland and eastern Canada. It* ***recommends*** *that the authors develop collaborations with Greenlandic (Denmark), Canadian and other researchers.*

9.2.2 New catch information

SC/66b/BRG03rev1 reported on the 2015 hunt for bowhead whales in Alaska. In 2015, 19 female and 20 male bowhead whales were landed out of 49 struck; one calf was accidentally caught and this will be reported as an infraction. The total landed was lower and efficiency (landed/struck) higher than the previous 10-year averages. Information on length and reproductive status was provided (see Annex F, item 2.1.2). Two fresh carcasses were found dead (not due to hunting) and used for human consumption.

In discussion, the Committee was informed that one of the carcasses was assumed to have died from entanglement in crab fishing gear that originated from the Bering Sea and the second may have died from attacks by killer whales or a ship strike.

Attention: SC

*The Committee welcomed information that acoustic monitoring for killer whales off of the coasts of Canada and the United States is ongoing and that a report summarising the results will be available in 2017. The Committee **recommends** that a comparison of the seasonality of both acoustic and visual sightings of killer whales be included.*

9.2.3 Management advice

Attention: C-A

*The Committee **reiterates** that the* Bowhead SLA *continues to be the most appropriate way for the Committee to provide management advice for this population. The Commission adopted catch limits for a six-year block in 2012, i.e., 2013-18. The total number of whales landed shall not exceed 336 and the number of annual strikes shall not exceed 67; however, there is a carryover provision that allows for any unused portion of a strike quota from past years be carried forward to future years provided that no more than 15 strikes be added for any one year. The Committee **advises** that based upon the* Bowhead SLA*, these limits will not harm the stock.*

9.3 Common minke whales off West Greenland

9.3.1 New information (including catch data)

In the 2015 season, 130 common minke whales were landed in West Greenland and three were struck and lost. Of the landed whales, there were 101 females, 26 males and three of unknown sex. Genetic samples were obtained from 95 of these common minke whales in 2015 and the Committee was pleased to note that samples from the West Greenland hunt are included in ongoing genetic analyses of common minke whales in the North Atlantic.

Attention: SC, G, CG-A

*The Committee **encourages** the continued collection of samples of common minke whales landed of West Greenland and the collaborative approach to analyses as witnessed during the joint AWMP/RMP Workshop in 2014 (IWC, 2015c). In particular, it **notes** the importance of comparative analyses with Canadian samples.*

9.3.2 Management advice

Attention: C-A

*The Committee **reiterates** that the agreed interim approach (IWC, 2009c) remains the appropriate tool to provide management advice for common minke whales off West Greenland up to 2018. Using the agreed interim approach and the agreed abundance estimate of 16,100 (CV=0.43) for 2007, the Committee **advises** that an annual strike limit of 164 will not harm the stock.*

9.4 Common minke whales off East Greenland

9.4.1 New information (including catch data)

In the 2015 season, six common minke whales were landed in East Greenland, and none were struck and lost. All of the landed whales were females. The Committee was pleased to note that samples were obtained from all the landed whales, and that samples from the East Greenland hunt are included in ongoing genetic analyses of common minke whales in the North Atlantic.

Attention: SC, G, CG-A

*The Committee **encourages** the continued collection of samples of common minke whales landed of East Greenland and a collaborative approach to analyses (see Item 9.3.1).*

9.4.2 Management advice

Attention: C-A

*The Committee notes that catches of minke whales off East Greenland are believed to come from the large Central stock of minke whales. The most recent strike limit of 12 represents a very small proportion of the Central stock (IWC, 2016k, p.189). The Committee **repeats** its advice that the annual strike limit of 12 will not harm the stock.*

9.5 Fin whales off West Greenland

9.5.1 New information (including catch data)

A total of 10 fin whales (eight females and two males) were landed, and two were struck and lost, off West Greenland during 2015. The Committee was pleased to note that genetic samples were obtained from eight of these, and that the genetic samples of fin whales off West Greenland are analysed together with the genetic samples from the hunt in Iceland.

Attention: SC, G, CG-A

*The Committee **encourages** the continued collection of samples of fin whales landed of West Greenland and a collaborative approach to analyses.*

9.5.2 Management advice

Attention: C-A

*The Committee **reiterates** that the agreed interim approach (IWC, 2009c) remains the appropriate tool to provide management advice for fin whales off West Greenland up to 2018. Using the agreed interim approach and the agreed abundance estimate of 4,500 (95% CI 1,900-10,100) for 2007, the Committee **advises** that an annual strike limit of 19 will not harm the stock.*

9.6 Humpback whales off West Greenland

9.6.1 New information (including catch data)

A total of six (two males and four females) humpback whales were landed, and none were struck and lost, in West Greenland during 2015. The Committee was pleased to learn that genetic samples were obtained from all the landed whales and that Greenland was contributing fluke photographs to the North Atlantic catalogue, both from captured whales and other field studies.

Attention: SC, G, CG-A

*The Committee again **emphasises** the importance of collecting genetic samples and photographs of the flukes from humpback whales landed of West Greenland and a collaborative approach to analyses.*

Table 8
Work plan for Antarctic minke whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Indo-Pacific Antarctic minke whale assessment	Intersessional group develops a draft synthesis	Document reviewed	Finalise document for publication in *JCRM*	Completed

The Committee noted also that 10 humpback whales were observed entangled in fishing gear in West Greenland in 2015, which is considerably more than usual. Of these, one drowned, four were permitted to be killed, and five were of unknown status.

Attention: C-A
*The Committee **notes** that bycaught whales had been included in the scenarios for the development of the* Humpback SLA. *If high levels continued, then this would need to be taken into account in any* Implementation Review *(the next is expected in 2020). The Committee **recognises** the IWC efforts with respect to disentanglement and prevention and **welcomes** the news that the Greenland authorities have committed to IWC disentanglement training that will occur at the end of June 2016.*

9.6.2 Management advice

Attention: C-A
*The Committee **reiterates** that the agreed* Humpback SLA *(IWC, 2015a) remains the appropriate tool to provide management advice for humpback whales off West Greenland. Using this, Committee **advises** that an annual strike limit of 10 will not harm the stock.*

9.7 Bowhead whales off West Greenland

9.7.1 New information (including catch data)

One female bowhead whale was taken in West Greenland in 2015, and a genetic sample was obtained. The Committee **welcomes** the provision of detailed information from Canada on their hunt: one 14m female was taken in Repulse Bay in September 2015 and one animal was struck-and-lost near Hall Beach in the same month.

The Committee was pleased to receive a fully corrected line transect estimate for 2013 of 6,446 (CV: 26%) for all the major summering areas of the population in East Canada, excluding Foxe Basin, Repulse Bay and Lancaster Sound (Doniol-Valcroze *et al.*, 2015). This estimate is good agreement with a new mark-recapture estimate of 7,660 (95% CI: 4,500-11,100) from genetic samples in Canada and West Greenland over the period 2008 to 2012 (Frasier *et al.*, 2015).

The Committee recalled that it had agreed that the mark-recapture estimate of 1,274 (CV=0.12) for 2012 provided the best estimate of abundance for the number of whales visiting West Greenland (IWC, 2015f). The *WG-Bowhead SLA* was developed on the conservative assumption that the number of animals estimated off West Greenland represented the total abundance of animals in West Greenland-Eastern Canada.

The Committee noted that in recent years, Greenland has undertaken a large scale biopsy sampling programme that has produced valuable information on abundance and stock structure.

Attention: SC, G, CG-A
*The Committee **recommends** continuation of this biopsy programme and **encourages** continued collaboration with Canada on genetic and other work related to stock structure and abundance of bowhead whales. It **agrees** that a Canadian scientist involved in the estimation of abundance should be invited to the next Annual Meeting with a view to the Committee endorsing the new abundance estimates.*

9.7.2 Management advice

Attention: C-A
*The Committee **reiterates** that the agreed* WG-Bowhead SLA *(IWC, 2016l) remains the appropriate tool to provide management advice for bowhead whales off West Greenland. Using this, Committee **advises** that an annual strike limit of 2 will not harm the stock.*

9.8 Humpback whales off St Vincent and The Grenadines

9.8.1 New information (including catch data)

The Committee was informed last year that one male humpback whale, 35.8ft long, was caught on 4 April 2015 and that skin and/or blubber samples were collected from this whale that will be analysed in collaboration with the USA. No information has been received this year.

Attention: SC, G, CG-A
*The Committee **strongly encourages** continued tissue sampling and collection of fluke photographs where possible from this region. Data should be shared with the appropriate databases and catalogues for the North Atlantic. It also **encourages** St Vincent and The Grenadines to send a scientist to next year's meeting.*

9.8.2 Management advice

Attention: C-A
*The Committee has agreed that the animals found off St Vincent and The Grenadines are part of the large West Indies breeding population (the last agreed abundance estimate was for 1992/93-11,570 animals, 95%CI 10,290-13,390). The Commission adopted a total block catch limit of 24 for the period 2013-18 for Bequians of St. Vincent and The Grenadines. The Committee repeats its **advice** that this block catch limit will not harm the stock.*

In providing this advice, however, the Committee expresses **concern** that there is no officially agreed abundance estimate from the more recent MONAH programme that took place in 2004 and 2005. The recent NOAA status review (Bettridge *et al.*, 2015) discusses the programme and provides an estimate of 12,312 (95%CI 8,688-15,954) for 2004/05 but references this as 'NMFS, unpublished data'.

Attention: SC, CG-A
*Given its importance to the provision of management advice, the Committee **requests** that the USA (NOAA, NMFS) arranges for the provision of a paper to the next meeting that will allow it to properly review this abundance estimate obtained from MONAH and, if appropriate, adopt it as an estimate suitable for providing management advice.*

10. WHALE STOCKS

10.1 Antarctic minke whales

10.1.1 Consideration of factors that drive Antarctic minke whale distribution

This item was initially addressing possible reasons for the difference between the abundance estimates for CPII (1984/85 to 1990/91) and CPIII (1991/92 to 2003/04).

Attention: SC

*The Committee **agrees** that consideration of the factors that drive Antarctic minke whale distribution is most suited to discussions under spatial and ecosystem modelling. From next year, therefore, this and similar issues will be discussed initially by the Working Group on Ecosystem Modelling.*

10.1.2 Review intersessional progress on ways to report on the Indo-Pacific in-depth assessment

The in-depth assessment of Antarctic minke whales was initiated in the 2001 (IWC, 2002a) and completed for the Indo-Pacific region in 2014 (IWC, 2015g).

Attention: SC

*To finalise and consolidate the assessment of Antarctic minke whales in the Indo-Pacific region, the Committee **recommends** that a single document be produced to synthesise the results – an outline of the document is provided as table 1 in Annex G[9]. To facilitate this work, the Committee has established an intersessional correspondence group under Murase (SG-8; see Annex V for members and Terms of Reference) to facilitate this work.*

10.1.3 The possibility in initiating an in-depth assessment focusing on South Atlantic and Antarctic Peninsula

Last year (IWC, 2016m), the Committee collated a list of data that could be used to initiate an in-depth assessment of the South Atlantic and Antarctic Peninsula region and concluded that, in principle, a statistical catch-at-age-type analysis could be undertaken, if it became a priority.

Attention: SC

*This year, the Committee reviewed the available information in light of its current workload. It **agrees** that starting an assessment of Antarctic minke whales in the South Atlantic and Antarctic Peninsula region is not a priority at this time.*

10.1.4 Work plan

The work plan for Antarctic minke whales is given as Table 8.

10.2 Southern Hemisphere humpback whales

The Committee currently recognises seven humpback whale breeding stocks (BS) in the Southern Hemisphere, labelled A to G (IWC, 1998b), which are connected to feeding grounds in the Antarctic. Breeding stocks in Oceania (E2, E3, F1 and F2) have been collectively called 'BSO'. An additional population that does not migrate to the Antarctic is found in the Arabian Sea and is discussed under Item 10.13 (see Fig. 2). Assessments of Southern Hemisphere humpback whale breeding stocks were completed in 2014 (IWC, 2015h) and results were synthesised in 2015 (IWC, 2016n). During this year's meeting, data gaps still remaining from the 2014 assessment were discussed and prioritised in terms of: (a) their likely impact on population assessment outcomes; and (b) the estimated population status (i.e. recovery level) of each breeding stock (see Item 10.2.3).

10.2.1 Review new information

The Committee received a number of papers providing new information on Southern Hemisphere humpback whales. These are only briefly summarised here; full details can be found in Annex H. This new information will be particularly valuable when the Committee decides to undertake a further in-depth assessment to that completed last year and synthesised under Item 10.2.2.

BREEDING STOCK A

SC/66b/SH02 reports winter sightings of 25 humpback whales and calves during 2012 and 2013 surveys in the waters of Trindade Island and Martim Vaz (20°S, ~1,140km east of Brazil). Regular winter sightings reported (54 confirmed to date) suggest this remote area may be a wintering destination for humpback whales from breeding stock A.

SC/66b/SH04 reported seven cases of humpback whale entanglement in Brazilian waters in 2015, including two juveniles found dead with attached gillnets on the southern coast. They also described a severe skin disorder in a live whale photographed in southeastern Brazil. Bacteriological analyses of stranded individuals from southern Brazil suggest exposure of whales to untreated sewage in the coastal waters of Brazil.

BREEDING STOCKS D/E/F

SC/66b/SH21 reported population growth and absolute abundance estimates for humpback whales from Breeding Stock E1, following an eight-week land-based survey of migrating humpback whales conducted at Point Lookout, east Australia in June and July 2015. The long-term growth of this population was maintained at 11.0% per annum (95% CI 10.6-11.3%), with no evidence that the rate is slowing. Using an updated land-based correction factor for groups available but missed in 2004 and the updated rate of population growth, the estimate for 2015 absolute abundance is 24,545 whales (95% CI 21,631-27,851).

The Committee noted that this estimate was above the 95% probability interval (PI) of the model-predicted abundance calculated during the recent assessment of BSE1 (IWC, 2015h), indicating that the population is growing at a faster rate than was predicted by the assessment models. Furthermore, that assessment predicted a pre-exploitation abundance level of 26,133 (95% PI 21,605-29,033) for BSE1, which is inconsistent with the continued rapid growth of this stock. This could be addressed using an alternative population dynamics framework, set out as a population model priority (see Item 10.2.3).

SC/66b/SH03 presented a study of social segregation patterns in two New Caledonia breeding grounds with dissimilar environmental conditions: a large coastal reef complex (the South Lagoon) and an offshore area with seamounts (the 'Southern Seamounts'). In the South Lagoon, numbers of groups with calves increased throughout the season and were associated with shallow coastal waters. In contrast, no habitat segregation was observed between groups with and without calf in the Southern Seamounts. The proportion of groups with calves appeared higher in the Southern Seamounts (27%) than in the South Lagoon (16%), but those calves seen at the Southern Seamounts are likely to be older than those seen in the South Lagoon based on photographs of dorsal fin unfurling.

[9]Note that this document will include information from the IDCR/SOWER cruises (e.g. with respect to abundance and stock structure) as well as the additional data (e.g. catches, biological parameters) necessary for the assessment.

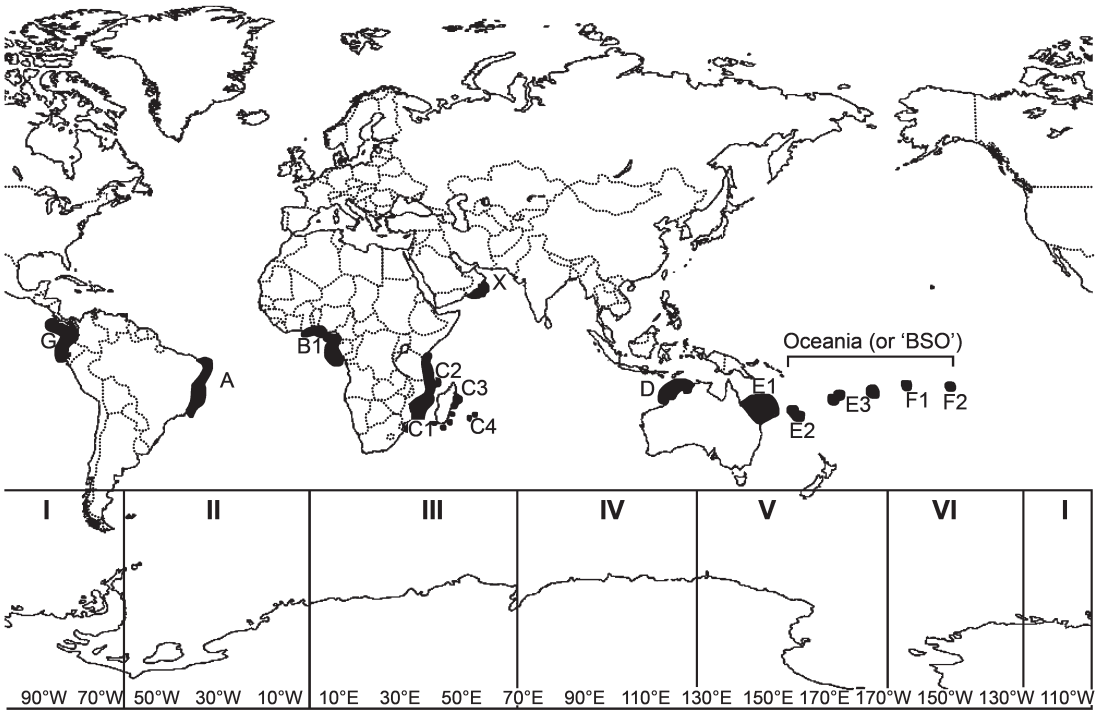

Fig. 2. Southern Hemisphere (and Arabian Sea) Breeding Stocks and sub-stocks.

SC/66b/SH05 reported preliminary results from a research cruise to Raoul Island in the Kermadec Islands (north of New Zealand) late September to mid-October 2015. Satellite tag data showed whales moving southeast, passing offshore to the northeast of New Zealand and travelling into the Southern Ocean over an extremely broad longitudinal swathe (175°E to 80°W, ~3,500km), revealing a variety of migration tracks spanning Antarctic Areas V, VI and I. Photo-identification and genotype matches linked these whales with five Oceania breeding grounds. No matches to mainland New Zealand or east Australia were found.

This provides significant new information on breeding-to-feeding ground migratory links within the Oceania region. These can be used to inform the allocation of high latitude catches to breeding grounds in future population assessments.

BREEDING STOCK G

Herr *et al.* (2016) reported results of an aerial survey off the west Antarctic Peninsula (Bransfield Strait and Drake Passage) in January to March 2013, which was used to calculate local abundance of humpback and fin whales and investigate their distribution in relation to krill species (item 3.2, Annex M). Survey results indicate that fin whales were feeding in an area dominated by *T. macrura*, while humpback whales were found in areas of higher *E. superba* biomass. The survey resulted in an abundance estimate (assuming the $g(0)=1$) for humpback whales in the study area of the Bransfield Strait of 3,024 (95 % CI 944–5,015).

SC/66b/SH24 reported progress on the Antarctic Humpback Whale Catalogue (discussed under Item 11.3.4). The Committee **notes** the importance of this long-term catalogue and **recognises** the value of the legacy and baseline data provided by this catalogue and the substantial body of work and understanding it has generated.

Attention: SC

*Given the completion of the in-depth assessment of Southern Hemisphere humpback whales, the Committee **agrees** that it is timely for the Committee to review and clarify the research questions Antarctic Humpback Whale Catalogue can help to address for future Committee work. It was suggested that future funding be strategically framed in terms of the specific scientific questions that this work can help to address, and which geographic regions are highest priority for photo-identification matching for the Committee. These discussions will proceed via an intersessional correspondence group convened by Zerbini and Olson (ICG-5; for members and Terms of Reference see Annex V).*

*In addition, the Committee **recommends** further intersessional discussion among Happywhale.com (SC/66b/SH06 and Item 11.3.1), IWC-SORP and the Antarctic Humpback Whale Catalogue to clarify relationships with existing catalogues, and to determine the role the Happywhale.com initiative might play within the context of the IWC's use of photo-identification data. An intersessional correspondence group was established under Bell (ICG-6; for members and Terms of Reference see Annex V).*

*Finally, the Committee **notes** the importance of collaborative regional photo-identification catalogues and **recommends** the development of a one-day Workshop to be held just before the biennial meeting of the Latin American Society for Aquatic Mammals (SOLAMAC) in November 2016, aiming to bring together researchers from South America to discuss standardisation and integration of photo-identification catalogues for blue and humpback whales (for details, see Item 25.3 and Annex H item 5.3.1.2). An intersessional Steering Group was established under Zerbini (SG-9; for members and Terms of Reference see Annex V).*

10.2.2 Review intersessional progress on developing an abundance estimate and survey methods for Breeding Stock D

The assessment of the breeding stocks D, E and F was completed in 2014 (IWC, 2015h), but there have been substantial problems obtaining a robust estimate of breeding stock D. Consequently the Committee **agreed** that two elements were important for verifying the outcomes of this assessment: (i) obtaining a minimum bound on the abundance of breeding stock D, as the present value is

Table 9
Work plan for Southern Hemisphere humpback whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Breeding stocks D, E and F	(a) obtain minimum abundance estimate for breeding stock D; and (b) complete mixed stock analysis of low and high latitude areas associated with breeding stocks D, E and F.	(a) determine best survey approach for measuring breeding stock D abundance in the future; and (b) review progress and develop guidance for this issue in the future.	Continue mixed stock modelling work.	Complete modelling and present updated assessment.
Catalogues	(a) discuss links between Antarctic Humpback Whale Catalogue and Committee priorities; (b) build and clarify relationships between humpback whale photo-identification data holders working in the Southern Ocean; and (c) hold workshop to assist regional photo-identification data holders working on breeding stock G.	Review progress in light of priorities and develop future plan with respect to these catalogues.	Continue work in light of recommendations in 2017.	Develop work plan and budget requests in light of priorities.
Future in-depth assessment in 2020				Examine feasibility of new in-depth assessment for 2020 Appendix 2, Annex H.

considered tentative (item 3.2.1.2, IWC (2016n); and (ii) resolving a disparity between the assessment high latitude catch allocations and the high latitude stock mixing proportions suggested by genetic data (item 3.2.1.1, IWC (2016n). It was expected that these analyses would have been completed this year but this was not possible and the work will be concluded intersessionally, followed by repeat population assessment modelling of breeding stocks D, E and F with an updated abundance for breeding stock D (see Item 10.2.4).

Following a Committee recommendation last year, SC/66b/SH18 reviewed published records of mtDNA control region sequences of Southern Hemisphere humpback whales as a first step in developing a validated register of haplotypes for future analyses of interest to the Scientific Committee. A standardised nomenclature was presented for 'internal codes' and *GenBank* codes based on precedent of publication, resolving 223 haplotypes. This dataset and standardised nomenclature provided by the authors is anticipated be lodged with the IWC Secretariat and made available through the IWC website, following the intersessional addition of one further DNA sequence dataset.

10.2.3 Research recommendations for future Southern Hemisphere humpback whale assessments

Attention: SC
This year, the Committee reviewed the gaps and uncertainties remaining after completion of the last in-depth assessment of humpback whales (SC/66b/SH01). It ***endorses:***

(a) the priorities assigned to the unfinished elements, considering their likely impact on current assessment outcomes and the recovery status of each breeding stock (see Annex H, table 1); and
(b) the research plans proposed to obtain better-resolved data for the next set of in-depth assessments (Annex H, appendix 2).

It established two intersessional correspondence groups to assist in this work, one under Jackson (ICG-7) and one under Kelly (ICG-8). For members and Terms of Reference of both groups, see Annex V).

10.2.4 Work plan
The work plan for Southern Hemisphere humpback whales is given in Table 9.

10.3 Southern Hemisphere blue whales

10.3.1 Review new information on Antarctic blue whales
Attard *et al.* (2016) analysed the largest genetic dataset to date for Antarctic blue whales (142 individuals) to assess possible population structure. Bayesian clustering of microsatellite data revealed evidence of three genetic clusters, which occur sympatrically in the Antarctic and may represent three populations. The genetic findings are supported by similar patterns of differentiation using mitochondrial (mtDNA) sequences.

There was extensive discussion about the evidence for multiple populations and interpretation of the reported clustering patterns (item 5.2.1, Annex H). The Committee concluded that the evidence for three populations of Antarctic blue whales is inconclusive and encouraged the exploration of alternative ordination-based methods with higher power to discriminate structure than the methods used in Attard *et al.* (2016). The Committee noted that there is now a substantial body of evidence showing that blue whales travel long migratory distances and can also make long-distance movements across the Southern Ocean. This may explain the limited population structuring seen in these data.

Leroy *et al.* (2016) examined continuous acoustic recordings spanning 2010 to 2015 at multiple locations in the Central and Southern Indian Basin to assess peak periods of presence, seasonality and migration movements of Antarctic blue whales. Songs are detected year-round at each site (except one in the equatorial Indian Ocean), with a highly seasonal distribution which is stable across years but variable between sites. Songs detections at the sub-Antarctic localities are made during autumn and spring, and songs in the tropical locations are detected during winter, suggesting a likely breeding area. Annex 5 of SC/66b/SH10 also reported on acoustic recorders deployed off the west coast of South Africa (34°23'S; 17°36'E) between 2014 and 2015 and recorded Antarctic blue whale songs, with peak call densities in June and July 2015.

SC/66b/SH11 described progress on the Antarctic Blue Whale Catalogue (and see Item 11.3.5.1). There were fifteen inter-annual re-sights of 14 whales, with sighting intervals of 1-12 years, and distances ranging from 19 to 6,650km between sighting locations. The movement of an individual over 6,650km during a six-year period represents the longest movement of an Antarctic blue whale recorded to date.

The Committee received an update on a review of CPIII and post-CPIII sightings data to evaluate their utility for measuring whale trend and abundance. This review is

not complete but the Committee were advised that there is potential for regional model-based abundance estimates for Antarctic blue whales, particularly in areas close to the sea ice boundary in IWC Management Areas III and IV (Donovan, 1991).

Attention: SC
*The Committee **recommends** continuation of the project by Kelly to obtain model-based abundance estimates of Antarctic blue whales for Areas III and IV for consideration at next year's meeting.*

The Committee also received news of a collaborative project with US and Japanese scientists to examine DNA from baleen plates held at the US Smithsonian Institute first brought to the Committee's attention last year (IWC, 2016m, p. 261). The plates are from Japanese whaling in 1946/47 and 1947/48 and efforts are underway to: (a) confirm that DNA can be extracted; and (b) link the plates with the biological data from the factory ships.

Attention: SC
*The Committee **encourages** continuation of this study that will assist with matters related to stock structure and assignment of Antarctic blue whale catches to populations. It looks forward to a progress report from the intersessional correspondence group established under Brownell and Kato (ICG-10; for members and Terms of Reference see Annex V) at next year's meeting.*

10.3.2 Review new information on pygmy blue whale

10.3.2.1 SOUTHERN HEMISPHERE POPULATION STRUCTURE

This year, the Committee reviewed available information on stock structuring of Antarctic and pygmy blue whales using acoustic and genetic data. These discussions are summarised in item 5.1, Annex H. SC/66b/SH35 summarised the available data on pygmy blue whale song types and their distribution across the Southern Hemisphere. Nine song types are associated with pygmy blue whales, some of which have relatively discrete geographical distributions, suggesting potentially distinct populations (Fig. 3). Balcazar *et al.* (2015) investigated the distribution of song types associated with the Indonesia/Australia and the New Zealand populations and discovered an acoustic 'boundary' between the two at the junction of the Indian and Pacific oceans.

In discussion, the Committee noted that song type 9B had an unusual distribution as it has only been recorded close to the equator (off Diego Garcia) over a narrow geographic range, with seasonal movements towards and away from the equator. The possibility that song types 9A and 9B were produced by the same breeding stock (as may be the case for southeast Pacific song types 2A and 2B) was discussed but considered unlikely due to differences in theme structure and frequency characteristics, and the periodic occurrence of both songs in the same locality. Alternatively, it is possible that this song, while characteristic of a blue whale, belongs to another species. However, this song is not similar to the calls of the other two tropical whale species (Bryde's and Omura's whales). The Committee also discussed whether song type 10 recorded in the South Atlantic represents a pygmy blue whale call since past catches and sightings data suggest they occur rarely in this area.

A comparison of these acoustic patterns with the available genetic evidence can be found in Annex H (fig. 3 and appendix 3). Acoustic and genetic data were consistent in finding Chilean blue whales to be distinct from those off New Zealand, the Northern Indian Ocean and from Antarctic blue whales. However, there is no genetic evidence for differentiation between the New Zealand and Indonesia/ Australia blue whales.

In response to a Committee recommendation last year, the Committee **welcomes** SC/66b/SH17 that: (1) established a common nomenclature for Southern Hemisphere pygmy blue whale mtDNA control region haplotypes, and; (2) identified haplotype sequences that have been submitted to GenBank. Eighty-nine unique mtDNA haplotype sequences were identified, and the nomenclature first assigned to each sequence, based on GenBank submission dates, was retained for the library. The construction of this haplotype library, and the identification of submitted sequences that are identical over the consensus region, will facilitate building a combined dataset in the future as needed for assessments of pygmy-type blue whales.

The Committee notes that direct comparisons between acoustics and genetics are difficult because the mode of evolution and transmission of songs is unknown.

On reviewing Fig. 3, six 'acoustic' populations were identified: Antarctic blue whales, Chilean blue whales, and pygmy blue whales from the Northern Indian Ocean, New Zealand, the Indonesia/ Australia region and the southwest Indian Ocean. It was noted that the Chilean blue whale population represents a special case acoustically, because two song types are always co-occurring temporo-spatially, but for the purposes of this assessment the Committee considered it a single population.

Attention: SC, G, S
With respect to improving knowledge of stock structure of pygmy blue whales and Antarctic blue whales and comparing acoustic and other data, the Committee:

(a) ***encourages** further acoustic work, especially on the western side of the Northern Indian Ocean, and including the analysis of acoustic data from Oman;*
(b) ***recommends** the development of an IWC open access acoustic library of identified song types for Antarctic and pygmy blue whales, given the importance of acoustic data for discussions of seasonal distribution and population structuring (see Item 25.3);*
(c) ***recommends** concerted efforts to obtain visual confirmation for three song types (the South Atlantic type 10 (SA), the SW Indian Ocean type 9B (SWI2), and the Solomon Sea type 11 (WTP)),*
(d) ***strongly encourages** biopsy sampling across the Southern Hemisphere in potential overlap regions for existing populations structure hypotheses and off Madagascar and further north in the Indian Ocean;*
(e) ***encourages** sample collectors to submit their samples to the blue whale genetic archive at Southwest Fisheries Science Center (La Jolla, CA), to facilitate broad-scale analyses of blue whale population structure;*
(f) ***requests** the Secretariat to facilitate expediting transfer permits where possible;*
(g) ***agrees** that until more genetic data are available, it will use acoustically defined regions to delineate the pygmy blue whale as distinct populations for assessment.*

An intersessional correspondence group under Širovič (IGC-11; for members and Terms of Reference see Annex V) was established to forward acoustic aspects of this work.

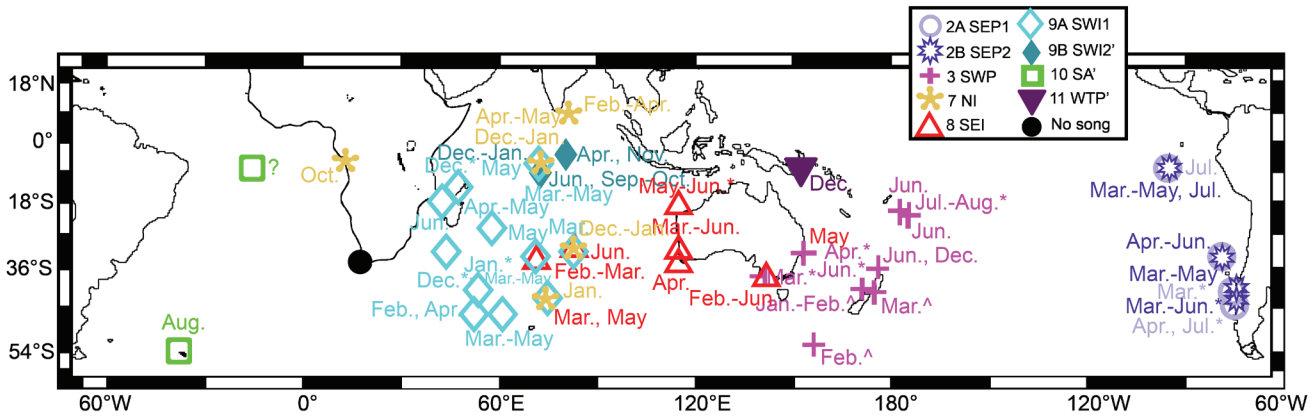

Fig. 3. Locations of non-Antarctic blue whale songs reported for the Southern Hemisphere (between the equator and 60°S) in the literature. Symbols and colours denote song types. Months included for each site indicate peak months of detection. The black dot marks a location where full year of recording exists and no non-Antarctic blue whale songs were recorded.

Preliminary analyses of Southern Hemisphere blue whale catch lengths, catch effort and seasonality of occurrence were presented (Appendix 5, Annex H). Seasonality, depletion levels, and length frequencies all support separate Antarctic, Indonesia/Australia, and Chilean blue whale populations, and are consistent with Antarctic blue whales being caught on both coasts of South Africa (Durban on the east coast, Saldanha Bay on the west coast). The Committee welcomed this work and suggested that it would also be useful to further investigate possible differences between southwestern and southeastern Indian Ocean whales in the catch data.

Attention: SC
*The Committee **recommends** a thorough analysis of the Southern Hemisphere blue whale catch data in the light of proposed population boundaries based upon acoustics to be completed by 2018 (see Item 25.3).*

SC/66b/SH26 presented a progress update from the Southern Hemisphere Blue Whale Catalogue (discussed under Item 11.3.5.2). This year, new Terms of Reference for the IWC Southern Hemisphere Blue Whale Catalogue have been proposed and agreed (see Annex R). These clarify the rights of all catalogue submitters and also require data on the date and location of each photo-identified whale to be provided on upload, in order that assessments of regional population abundance are possible with the data provided by contributors. The Committee's recommendation from last year (IWC, 2016n) to transfer the Southern Hemisphere blue whale catalogue to IWC servers will be completed in 2016.

Attention: SC, S
*The Committee **recommends** that the new Terms of Reference of the Southern Hemisphere Blue Whale Catalogue are circulated to all catalogue contributors by Olson, through the Secretariat.*

10.3.2.2 INDONESIA/AUSTRALIA BLUE WHALES

SC/66b/SH27 reports a comparison of photo-identification data from Perth Canyon (n=209), Geographe Bay (n=40), and the Bonney Upwelling (n=168) in Australia and from around New Zealand (n=14). Within Australia, five matches were found between different areas and years. No matches with New Zealand blue whales were found, but the catalogue size for this area is small.

Attention: SC, G
*The Committee **encourages** Australian and New Zealand scientists to continue their photo-identification efforts and submit their data to the IWC Southern Hemisphere Blue Whale Catalogue in order to develop population estimates for these regions.*

Tripovich *et al.* (2015) reported patterns of Antarctic and Indonesia/Australia blue whale songs off Portland, South Australia (38°33'S, 141°15'E). Antarctic blue whales were detected more frequently from July to October 2009 and June to July 2010, corresponding to the suspected breeding season, while Indonesia/Australia blue whales were recorded more frequently from March to June 2010. In both subspecies, the number of calls varied with time of day; Antarctic blue whale calls were more prevalent in the night to early morning, while Indonesia/Australia blue whale calls were detected more often from midday to early evening, suggesting that the two subspecies might employ different ecological strategies.

The use of sightings data from seismic surveys to understand blue whale habitat use and distribution using was discussed. The Committee noted that these data could provide useful new information on pygmy blue whale distribution and foraging hotspots in a region where their distribution is poorly known. However, they also noted the many challenges of working with such data, including mis-identification of species (sightings are made at a distance and in Australia marine mammal observers do not need specialist training), potential avoidance of seismic vessels by whales and the timings and locations of such surveys in relation to blue whale seasonal distribution.

Attention: SC, S
*The Committee **welcomes** information that the 'Joint Industry Programme' (JIP) is conducting a compilation of marine mammal sightings from their global databases to investigate their value in understanding cetacean distribution. It **requests** that the Secretariat contacts the JIP to request information about the progress of this initiative.*

10.3.2.3 MADAGASCAR BLUE WHALES

SC/66b/SH33 reports detections of song type 9A (Madagascar-type) calls of pygmy blue whales off the northwest Madagascar coast during November and December 2015. This represents the northernmost documentation of

the Madagascar song phrase close to the east African coast. Based on the timing of detections, the authors suggest the blue whales may be migrating south in the Mozambique Channel from a more northern breeding range to feeding grounds to the south, i.e. on the Madagascar Plateau Best *et al.* (2003). Alternatively, the breeding range may extend into the northern Mozambique Channel and detections may represent the tail end of occupancy in the breeding area.

The Committee notes that these whales may be linked to past catches off Somalia (Appendix 5, Annex H). It was noted that foetal lengths in the catches off Somalia are different from those in the Northern Indian Ocean, suggesting separation from this area and a link between Somalia and Madagascar.

Attention: SC, G
*The Committee **recommends** the continuation of this project on calls of pygmy blue whales off Madagascar (Item 25.3). It **encourages** the collection of biopsy samples during this and other local projects (see discussions in Item 10.3.2.1).*

10.3.2.4 NEW ZEALAND BLUE WHALES

SC/66b/SH08 and Olson *et al.* (2015a) report new biological data on blue whales arising from the 2013 IWC-SORP Antarctic Blue Whale Voyage. On this voyage, 38 individuals were photo-identified, two of which were resighted inter-annually in Cook Strait. Torres *et al.* (2015) reported another re-sighted whale: between Hauraki Gulf in November 2010 and the South Taranaki Bight in January 2014. Of the total three re-sighted individuals to date, two of the re-sights have been inter-seasonal (June-March; November-January) suggestive of residency. Blue whales have now been documented in all four seasons, and in 11 months of the year in New Zealand waters. New Zealand type blue whale calls have also been recorded in the winter months in Lau Basin, approximately 1,000km to the north of Raoul Island (Balcazar *et al.*, 2015).

Torres and Klinck (2016) provide a report on their recent field surveys of the Taranaki Bight, New Zealand during January and February, 2016. Five hydrophones were deployed and ~1,500 miles were surveyed, yielding 22 blue whale sightings of 33 individuals. The distribution of whales in this area varied from 2014, likely due to El Niño conditions in 2015.

Two research groups are constructing New Zealand photo-identification catalogues and that there are a number of photographs from New Zealand yet to be uploaded to the Southern Hemisphere blue whale catalogue.

Attention: SC, G, CG-A
*Population abundance of blue whales is currently unknown for the New Zealand region. It is an essential component for conducting a population assessment. The Committee **recommends** that the two catalogues developed by two groups in New Zealand be reconciled through the IWC's Southern Hemisphere blue whale catalogue to enable mark-recapture analysis of regional pygmy blue whale abundance. It **encourages** representatives of New Zealand to facilitate this work.*

10.3.2.5 NORTHERN INDIAN OCEAN BLUE WHALES

Attention: SC, G
Little is known about the distribution and abundance of Northern Indian Ocean blue whales. Two initiatives are underway to improve understanding of pygmy blue whales in this region: (i) initial work identifying photo collections for possible future analyses by Olson, (ii) development of a regional stranding database for large whales which will include information on ship strikes off Sri Lanka by Brownell and Vos. The Committee strongly **encourages** *this work (see Annex H, item 5.3.5).*

10.3.3 Progress on regional pygmy blue whale assessments

Work towards in-depth assessments of Southern Hemisphere pygmy blue whales continues with the Chile/Peruvian and Indonesia/Australia blue whale stocks as highest priority for population assessment. An intersessional correspondence group under Redfern (ICG-12; members and Terms of Reference can be found in Annex V) was set up to continue this work.

Attention: SC, G
*In order to further its assessment work, the Committee **supports** continued and new research efforts in all Southern Hemisphere regions to better understand stock structure of pygmy blue whales, particularly in areas where data are sparse such as the southwestern Indian Ocean and Northern Indian Ocean.*

10.3.3.1 SOUTHEAST PACIFIC BLUE WHALES

Findlay (In press) provided an overview of the 1997/98 IDCR-SOWER Chilean blue whale cruise. These sightings data have been used (Williams *et al.*, 2011) to estimate blue whale abundance over the survey area to be 303 (95% CI 176-625).

SC/66b/SH16 reports on the satellite tagging of seven blue whales on their northern Patagonia feeding grounds off Chile during mid-April 2015. Whales travelled northwest from this location towards the Galapagos Archipelago and to the west of this area. This work provides further evidence of a direct migratory link between the Chiloé/Corcovado feeding region and the Galapagos Archipelago.

In discussion, it was mentioned that a concentration of blue whale sightings was found in the region to the west of the Galapagos Archipelago. To the north, there is a latitudinal gap in records between the Galapagos and the Costa Rica Dome, suggesting potentially three independent sub-stocks of blue whales may be found in the eastern central Pacific, namely: those off Baja California, the Costa Rica Dome and off the Galapagos/Peru/Chile region, in addition to the subspecies of Antarctic blue whales that have been recorded at 8°S west of South America (Stafford *et al.*, 1999)1999.

SC/66b/SH25 reported on the temporal patterns of Chilean blue whale songs recorded between 2003 and 2015 off Juan Fernandez Island (33°S, 78°W). Comparisons with song patterns detected at acoustic stations to the north and south confirm the increasing body of evidence that Chilean blue whales feed in southern cooler waters during the austral summer off the coast of Chile and migrate to tropical waters further north in winter.

Galletti Vernazzani *et al.* (In review) reported on photo-identification surveys conducted in the waters off Isla Grande de Chiloé, southern Chile from 2004-12 and Isla Chañaral, northern Chile in 2012. Open population models estimate that ~550-720 whales were feeding in this region in 2011.

Analysis of these data during the meeting (Appendix 6, Annex H) showed a strong signal of variable availability of transients by year; estimated proportion of residents was 40-45%. The best population estimate for mid-2008 was 450 animals (CV 0.17) or 576 (CV 0.16) for, respectively, an open or a closed population. These estimates are similar in magnitude to the estimates presented by Galletti Vernazzani

Table 10
Work plan for Southern Hemisphere Antarctic and pygmy blue whales.

Species/area	Intersessional	During the 2017 meeting	Inter-sessional	During the 2018 meeting
Antarctic blue whale assessment (Areas III and IV)	Continue work on developing model-based abundance estimates from IDCR/SOWER data.	Review progress on: (a) DNA baleen plate project (see Item 10.3.2.1); (b) model-based abundance estimates; (c) catalogue matches; and (d) stock structure information.		Depends on progress in 2017.
Pygmy blue whale assessments	Monitoring of pygmy blue whales off Madagascar (Item 25.3).	Review progress of research recommend-ations identified under Item 10.3.2.2.		Depends on progress in 2017.
Catalogues and databases	Workshop to assist regional catalogue holders from Chile/Peru to reconcile photo-identification catalogues and allow a rangewide abundance estimate to be developed. Continued work on the Antarctic and Southern Hemisphere blue whale catalogues.	Review progress on activities identified in Appendix 2, Annex H to fill identified gaps.	Develop blue whale song reference library.	Review progress with the reference library.

et al. (In review). However, the Committee noted that the Chiloé area is only part of the feeding ground distribution of Chilean blue whales so it cannot be considered representative of the abundance of the population as a whole.

SC/66b/SH23 reconstructed the population trajectory and recovery status of Chilean blue whales using a Bayesian population dynamics model incorporating multiple data sources. Median pre-exploitation abundance was estimated at 2,100-3,600 whales, with population recovery status varying considerably between two population abundance scenarios but not amongst the differing catch, population bottleneck and population growth rate scenarios. This is discussed under item 5.3.1.2 of Annex H.

Attention: SC, G, CG-A
*In view of the limited data so far available on southeast Pacific region-wide abundance, the Committee **stresses** the need to:*

(a) collect photo-identification data from other areas along the Chilean coast north of Chiloé, particularly areas of blue whale aggregations such as Isla Chañaral; and
(b) reconcile photo-identification catalogues among all survey areas (this is one of the objectives of the proposed Workshop described under Item 25.3).

10.3.4 Work plan
The work plan for Southern Hemisphere Antarctic and pygmy blue whales is shown in Table 10.

10.4 North Pacific blue whales

10.4.1 Review new information
SC/66b/IA12 noted that the variability in tonal calls/songs of the blue whale songs provides a basis for evaluating possible population structure hypotheses. The available song data cannot determine if there are two populations in the central and western Pacific since the two calls there are always detected together. The differences in the Gulf of Alaska call compared to the call in the Southern California Bight may indicate separate populations. The Committee notes although this would have some implications for the recent assessment of Eastern North Pacific blue whales (Monnahan and Branch, 2015). To resolve uncertainties in stock structure, more hydroacoustic deployments, particularly in the Gulf of Alaska and in the western North Pacific off Japan are needed.

Attention: SC, C-A
The Committee **agrees** *that whilst additional work on stock structure of blue whales in the North Pacific is valuable, the new information received does not change the important conclusion of the assessment by Monnahan and Branch (2015) that blue whales in the eastern North Pacific are almost recovered.*

10.4.2 Evaluating the possibility of initiating an assessment and work plan
SC/66b/IA15 concluded that the data are available for an assessment of central and western Pacific (CWP) blue whales: catches, abundance estimates, and stock structure hypotheses. There was considerable discussion as to how best to resolve the outstanding issues to enable an assessment to take place and a number of actions were identified.

Attention: SC, G
*The Committee **recommends** that the following actions be undertaken to facilitate the eventual assessment of North Pacific blue whales in the Central and Western Pacific:*

(1) an analysis of the biopsy samples from IWC-POWER (available upon request of the IWC) as well as from JARPN and JARPN II (samples available using the IWC data availability agreement Procedure B process) for comparison with genetic data from the eastern North Pacific population;
(2) the further collection and comparison of acoustic data from the region;
(3) a review of catch records, particularly around Japan to assess whether blue whales off Japan were depleted; and
(4) a review known Japanese net catches (n=47) prior to 1900 reported to be blue whales.

The assessment will include two stock structure scenarios, one assuming a single CWP stock, and one separating the CWP into two populations, with one including Japan, Korea, and Taiwan, and the other encompassing the area east of 145°W.

The Committee has appointed an intersessional correspondence group under Branch (ICG-13; for members of Terms of Reference see Annex V) to review the available data and determine whether they are available in a suitable format.

10.4.3 Work plan
The work plan for North Pacific blue whales is shown in Table 11.

Table 11
Work plan for North Pacific blue whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
North Pacific blue whale assessment	Review information to examine the feasibility of undertaking an assessment and as appropriate develop a timetable.	Review progress on the research items identified under Item 10.4.2 and the work of the intersessional group, and develop a work plan.	Depends on progress in 2017.	Depends on progress in 2017.

10.5 Distributions of baleen and toothed whales in the Antarctic relative to spatial and environmental covariates
The Committee was pleased to receive a paper relating distribution of baleen whales during CPII and CPIII of IWC IDCR/SOWER, with spatial and environmental covariates, that was prepared for the IWC IDCR/SOWER Special Volume (see item 11.2.1).

Attention: SC
*The Committee **reiterates** (see Item 10.1.1) that in future, papers relating distribution of cetaceans with spatial and environmental covariates be considered by its working group on ecosystem modelling.*

10.6 North Pacific sei whales
The Committee has initiated an in-depth assessment of this population. This year, the data and models to be used were reviewed.

10.6.1 Review new information
10.6.1.1 ABUNDANCE AND DISTRIBUTION
The Committee reviewed the available information on recent and past surveys (see Annex G, item 4).

Attention: SC
*The Committee **looks forward** to receiving consolidated analyses of results from a number of recent and past surveys on North Pacific sei whales at next year's meeting (see item 4.1, Annex H).*

10.6.1.2 CATCH HISTORY
The Committee discussed the difficult issues related to the distinction of sei and Bryde's whales in the Japanese coastal whaling data and how this was dealt with in the Bryde's whale assessment (Allison, 2008).

Examination of a sample of company logbooks in Japan found that the southern/northern sei breakdown differed substantially from the sei/Bryde's breakdown submitted to BIWS. The Committee welcomes the news that a Japanese scientist will encode the logbook data in consultation with the Secretariat to improve accuracy of the sei/Bryde's breakdown. The Committee also discussed extensively the coding of individual Japanese catch records (*ca* 20,000) for the years 1938-52 housed in the library at the Alaska Fisheries Science Center's Marine Mammal Laboratory in Seattle, WA (see Annex G, item 4.2.1).

Attention: SC, S
*The Committee **looks forward** to receiving a paper next year that will re-examine the sei/Bryde's breakdown used for the Bryde's whale Implementation and provide a revised sei and Bryde's whale catch series. It also **agrees** that the 1938-52 Japanese data should be included in the IWC catch database (the logistics of this are being finalised).*

The catches of the former USSR North Pacific fleet have been revised using original data collected by biologists. The revisions resulted in a reduction of the recorded sei whale catches from 11,363 to 7,698, because sei whales had been used as a cover for protected species (Ivashchenko *et al.*, 2013). The revisions have been included in version 6.0 of the IWC catch database released May 2016.

Allison reported that *Discovery* marking data for the North Pacific have now been coded at the Secretariat and details can be found in Annex G (item 4.2.4). The Committee thanks Allison and her staff for the encoding work, and thanks Miyashita and Yoshida for consultation on the data.

Attention: SC, S
*The Committee **recommends** that marking records associated with Bryde's whale recoveries be carefully checked to examine that they were not logged as sei whales at the time.*

10.6.1.3 STOCK STRUCTURE HYPOTHESES
Last year, the Committee agreed to proceed on the basis of two alternative hypotheses: (i) a single stock for the entire North Pacific (Kanda *et al.*, 2015; SC/66b/SD01); and (ii) a 5-stock hypothesis presented in SC/66b/IA20. After much discussion (see item 4.3, Annex G), the Committee **considers** that the evidence for the 5-stock hypothesis is weak. The genetic information was consistent with a single stock in the area covered by the samples. However, it notes that all the samples had been taken from the area of just one of the stocks proposed in SC/66b/IA20, namely the North Pacific pelagic stock.

Attention: SC
*The Committee **agrees** to proceed, in this situation of uncertainty over the stock structure of North Pacific sei whales, with both the single and especially multi-stock alternatives. It **emphasises** that using the boundaries for either hypothesis for modelling purposes should not result in them becoming 'institutionalised'.*

10.6.1.4 STOCK ASSESSMENT MODEL FORMULATION
A modelling framework for fitting the single and multi-stock population hypotheses to the available catch, abundance and marking data was proposed.

Attention: SC
*The Committee **endorses** a modelling framework for the in-depth assessment of North Pacific sei whales (appendix 5, Annex G) and an associated two-year budget request (see Item 25.3).*

10.6.1.5 WORK PLAN
The work plan for North Pacific sei whales is shown in Table 12. The Committee has re-established an intersessional steering group under Cooke (SG-10; see Annex V for members and Terms of Reference) to oversee progress with the assessment.

10.7 North Pacific gray whales
10.7.1 Review new information on whales found in the western North Pacific
SC/66b/BRG16 reported on the migratory movements of photographically identified gray whales in the western North

Table 12
Work plan for North Pacific sei whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
North Pacific sei whale in-depth assessment	Complete identified work on: (a) revisions to catch history; (b) analysis of past sighting data. Conduct initial modelling.	Review progress and finalise modelling requirements to complete assessment.	Undertake additional modelling.	Complete assessment.

Pacific. Coastal waters off Japan were once an important part of the migratory route, but modern day observations are uncommon (fewer than 30 sightings and strandings were documented between 1990 and 2016). Discussion of the timing and position of sightings of a single individual sighted several times off Japan and Sakhalin Island between 2014 and 2016 suggest a wintering area somewhere off Asia and migration to the summer feeding area off the northeastern coast of Sakhalin Island. This information was also discussed in SC/66b/Rep07.

SC/66b/BRG11 reported on the status of conservation and research efforts on western gray whales in Japanese waters in 2015 and early 2016. Three sightings from platforms of opportunity were reported in Tokyo Bay and near the Izu Islands. Based on comparison of photographs, those sightings were all from the same animal. Two stranded females (8.9m and 7.0m) were reported in Wadaura and Arai Beach; the causes of death were unknown. Although one carcass was too badly decomposed for proper examination, no evidence was found to suggest entanglement or ship strike for the other. As a result of the strandings and increased number of sightings of gray whales, the Fisheries Agency of Japan issued a notification to all coastal prefectural governments drawing their attention to the increasing sightings and reminding them of domestic regulations concerning the conservation of gray whales. The visual sightings and the stranded animals represent a total of three individual gray whales that were off the Pacific Coast of Japan in 2015 and early 2016. SC/66b/BRG21 provided additional details about one of the stranded whales.

The Committee **welcomes** information that the authors intend to match photographs of the stranded individuals to other North Pacific catalogues photo-identification catalogues and looks forward to receiving a report of such comparisons, which will assist the rangewide efforts.

The Committee also welcomed information presented in SC/66b/BRG12 on the ongoing (since 1995) Russian Gray Whale Program (formerly called the Russia-US Program) on gray whales summering off northeastern Sakhalin Island, Russia. Photo-identification research in 2015 resulted in the identification of 60 whales, including eight calves (the mothers had all been seen previously off Sakhalin with calves). The updated catalogue now comprises 245 photographically-identified individuals, not all of which can be assumed to be alive.

Attention: SC, G, CG-A
*To better understand the movements of gray whales in the western Pacific and assist rangewide efforts (see Item 9.1.3), the Committee **recommends:***

(a) increased collaborative efforts to compare photos from the whales seen in Japan with other photo-identification catalogues for gray whales in the North Pacific; and
(b) increased efforts to conduct post-mortem analyses with experienced veterinarians.

SC/66b/BRG25 provided an updated population assessment of the Sakhalin feeding aggregation of gray whales, using photo-identification data from the Russian Gray Whale Project. The modelling approach has been discussed previously in the Committee and further details can be found in Annex F (item 3.2.2). The results are being used as part of the rangewide work discussed under Item 9.2.3).

Using the best fitting model, the estimate of population size for aged 1+ (non-calf) animals was 175 (Bayesian 95% credibility intervals 158-193) in 2016. The population had been growing over the previous 10 years (2005-15) at an average rate between 2% and 4% per year. Forward projections of the population model to 2025, assuming no change in the means and variances of demographic parameters, indicate a high probability (>95%) of continued population increase.

The Committee **welcomes** this updated estimate of population size and other parameters for western gray whales and some discussion of new whales identified that were not seen as calves can be found in Annex F.

Attention: SC, G, S
*The Committee **reiterates** previous recommendations for collaborative efforts to reconcile the catalogue of the Russian Gray Whale Program with that of Sakhalin Energy and Exxon Neftegas Limited in order to improve the modelling exercise (IWC, 2014a, p.35) as well as provide additional information on movements of individuals in the Sakhalin area.*

*The Committee also notes that both research groups have undertaken biopsy studies. It **recommends** that: (a) a single reconciled genetic database be developed that is linked to the combined photographic information; and (b) that standardised body condition data be added to the databases. It **encourages** the IWC Secretariat to assist in such efforts with respect to photo-identification and genetic databases. This work will assist in the rangewide assessment and allow further genetic comparisons amongst areas of the gray whale range.*

10.7.2 Conservation advice

Attention: SC, G, C-A, CG-A
*The Committee again acknowledges and welcomes the important work of the IUCN WGWAP as reflected in the updated report provided to this meeting (Annex F, Appendix 2). The work of the WGWAP complements its own work and it **recommends** that the WGWAP continues to be involved in conservation and research efforts for western gray whales. It **endorses** the work and recommendations made by the WGWAP.*

As discussed last year (IWC, 2016i), extensive seismic surveys were conducted in 2015 in the vicinity of Sakhalin Island by Sakhalin Energy and Exxon Neftegas Ltd.

*(a) The Committee **commends** Sakhalin Energy for its collaboration with WGWAP in developing its seismic survey monitoring and mitigation programme (MMP) and for providing information on the conduct of the*

survey and using an IUCN independent observer. It notes that the Committee and the Commission have endorsed (IWC, 2015d) the guidelines for responsible practice of seismic surveys developed in Nowacek et al. *(2013) that was based to some extent on the work of the WGWAP in developing an MMP for Sakhalin Energy's 2010 seismic survey.*

*(b) The Committee notes that it has welcomed past contributions to its work by Exxon (both through participation and the presentation of papers) and **encourages** the presentation of information from Exxon Neftegas Ltd on the MMP and the company's 2015 seismic survey, as well as other relevant activities off Sakhalin.*

*(c) The Committee notes that both the Sakhalin Energy and ENL seismic surveys had large associated acoustic and visual monitoring programmes. Given the exceptional scale of both the seismic surveys and the large monitoring programme, the Committee **recommends** that every effort be made to undertake collaborative analyses involving the full datasets from both companies.*

*The Committee **reiterates** its previously expressed strong concerns regarding disturbances in this area arising from oil, gas and other human activities in this important feeding ground. It notes that while no seismic surveys are expected near Sakhalin in 2016, considerable potentially disruptive activities are associated with the construction of a pier within Piltun Lagoon and the Committee **endorses** both the WGWAP's concern over this activity and its request to the Russian authorities (see Annex F, appendix 2).*

*The Committee notes the common interest in noise-related matters between it and WGWAP. It **recommends** that the WGWAP Noise Task Force and members of the IWC pre-meeting acoustic masking Workshop (SC/66b/Rep10) coordinate efforts to determine how recommendations from the Workshop can be applied to this population.*

*Finally, the Committee **notes** that there has been an increase in the use of salmon set nets in areas used by gray whales near Sakhalin Island (SC/66b/BRG12). The Committee **expresses concern** about the increased risk of entanglement to gray whales and **recommends** that fishing effort be decreased in the primary areas used by western gray whales.*

10.8 Southern Hemisphere right whales

10.8.1 Review of new information

10.8.1.1 SOUTHWEST ATLANTIC

SC/66b/BRG02 reported the 2014-15 update on the mortality event of southern right whales (totalling 65 strandings) at Península Valdés, Argentina that has been the subject of much work by the Committee, including the holding of IWC workshops and actions under the IWC Conservation Management Plan (CMP) e.g. the 2010 and 2014 die-off Workshops, IWC (2011c) and IWC (2016~). More details can be found in Annex F (item 4.1). In summary, the following six hypotheses have been proposed to explain right whale die-offs at Península Valdés:

(1) cow nutritional stress;
(2) exposure to HAB- and/or bacteria-associated biotoxins in:
  (a) the feeding ground resulting in *in utero* exposure of the calf; or
  (b) the calving/nursery ground;
(3) infectious disease (viral, bacterial, protozoal, etc.);
(4) kelp gull parasitism;
(5) density-dependent processes; and
(6) a decline in food availability.

Attention: SC, G, C-A

*The Committee **reiterates** the recommendations on research priorities described in the previous Workshops. In particular, the Committee **recommends** the following (for details see Annex F):*

(a) continuation of the work to understand habitat-use, dispersal and migratory patterns;
(b) gathering of information on both cows and live and recently deceased calves; and
(c) further work to identify different types of nutritional stress and physiological stress.

*The Committee acknowledged the importance of the South Atlantic right whale CMP in this context and **recommends** continued cooperation and collaboration amongst all research groups and stakeholders to build the knowledge needed for answers to this complex situation.*

The Committee received three additional papers on this topic this year and these are discussed in detail in Annex F. McAloose *et al.* (2016) summarised the results of 212 post-mortem examinations of which some 98% were calves-of-the-year. A probable cause of death could be established for only 14 of the strandings including a ship strike, trauma, lacerations and pneumonia. Gull lesions were the most significant gross finding in dead calves. Other possible pathogenic causes have yet to be explored.

Marón *et al.* (2015a) summarised the increase in kelp gull parasitism on southern right whales off the coast of Península Valdés over the last three decades. In discussion, the authors noted that they believe the intensified gull harassment could be compromising calf health and thereby contributing to the high average rate of calf mortality observed in recent years, but it cannot explain the large year-to-year variance in calf deaths since 2000. Previous research indicated that calves and adults change their behaviour in the presence of gulls, but in different ways, with calves engaging in oblique respiration (Fazio *et al.*, 2015) and adults engaging in a variety of resting positions that help them avoid gulls (Rowntree *et al.*, 1998; Sironi *et al.*, 2009).

Wilson *et al.* (2016) investigated the potential involvement of harmful algal blooms (HABs) in deaths since 2005. On average, more calves were found stranded when the abundance of *Pseudo-nitzschia* was above average than when the abundance was at average levels.

Attention: SC, G

*For future work on the potential involvement of harmful algal blooms (HABs) in mass strandings, the Committee **recommends:***

(a) that data from multiple areas be carefully analysed in a single framework to investigate the causes of variation in calf mortality. The natural progression for cohort sizes to stabilise over time (e.g., the dilution of two large cohorts and one small cohort in Argentina (Cooke et al.*, 2015) and the dilution of two small cohorts and one large cohort in South Africa) appears to occur in the absence of environmental factors; therefore, the causes of intervals could be similar across areas; and*
(b) that an updated gull population assessment be conducted (the last assessment was performed in 2008) and that scientists explore if fluctuations in mortality rates correlate with environmental factors such as increased gull abundance and harassment.

SC/66b/BRG13 presented survey data indicating that the Patagonian Shelf probably represents a portion of this species' feeding grounds.

Attention: SC, G
*The Committee welcomed this information on right whale feeding areas on the Patagonian Shelf and **recommends** to the authors of SC/66b/BRG13 that: (a) future surveys allocate effort to areas other than those along the isobaths; and (b) that the results are reported in conjunction with satellite imagery.*

SC/66b/BRG26 presented results from a satellite tagging project (n=12) carried out from Península Valdés between October 2014 and September 2015. Whales appeared to show feeding behaviour (based upon areas of high use, fig.3 of the paper) on the outer Patagonian shelf, (north of about 54°S and between about 57-60°W) and the Scotia Sea (north of around 57°S and between about 28-42°W. Movement patterns showed substantial individual and yearly variation.

Attention: SC, G
*The Committee welcomed this information on feeding behaviour and movement patterns of South Atlantic right whales and **recommends** to the authors and other researchers in the area that priority be placed on the collection of information on identifying prey.*

10.8.1.2 EASTERN SOUTH PACIFIC CMP

SC/66b/BRG24 reviewed the Eastern South Pacific (ESP) southern right whale Conservation Management Plan (CMP) actions taken between 2012 and 2016 and proposed the following short term priority rangewide actions: (a) identification of a breeding area; (b) coordination meetings among stakeholders; (c) increased photo-identification and genetic effort; (d) additional entanglement response Workshops; (e) increased species identification capacity; and (f) advice on whalewatching regulations. The author highlighted the importance of the CMP for facilitating the implementation of actions and enhancing international collaboration, both of which are important for the long-term recovery of the species.

SC/66b/BRG23 reported on a revised version of the CMP submitted by Chile and Peru that included information from Peru, updated information from the species and proposed future actions that should receive priority. This revised CMP highlighted the efforts and commitment of range state countries towards the conservation of southern right whales and reiterated the recommendations from SC/66b/BRG24.

Attention: SC, G, C-A
*The Committee **welcomes** the involvement of Peru in the Eastern South Pacific (ESP) southern right whale CMP, noting that this should improve management and conservation and **endorses** the 2016 revised CMP submitted by Chile and Peru (SC/66b/BRG23). It **reiterates** that anthropogenic mortality be kept to a minimum. The Committee **strongly recommends** that further research plans focus on identifying a breeding area and notes that the use of acoustic devices may be a cost-effective approach for monitoring the presence of the species.*

10.8.1.3 SOUTH AFRICA

Findlay reported on the 2015 annual southern right whale helicopter survey conducted off the southern Cape coast of South Africa (see Annex F, item 4.1) as part of one of the longest monitoring surveys in the world (it began in 1979). Funding limitations reduced the geographical extent of the survey in 2015. The author noted an increase in reports of incidental sightings on the west coast, and recommended that a west coast survey become a component of future research.

Attention: SC, G, C-A, CG-R
*The Committee **is concerned** that the future of this exemplary long-term monitoring programme of right whales in South African waters remains uncertain. The Committee strongly **recommends** the continuation of the survey and as a one-off extraordinary measure has allocated funds to allow the 2016 survey to take place (see Item 25.3).*

*The Committee **requests** the Commission to urge South Africa to do all it can to ensure the long-term future of this vital monitoring programme.*

10.8.1.4 AUSTRALIA

SC/66b/BRG09 summarised the results the 23rd annual aerial survey for southern right whales off coastal southern Australia in winter/spring 2015. The surveys have provided evidence of an increasing population trend of around 6% per year, and a current (at 2014) population size of approximately 2,300 for the 'western' Australian right whale subpopulation, which is assumed to be well below carrying capacity. No trend information is available for the 'eastern' subpopulation of animals.

Attention: SC
*The Committee **welcomes** this information from this valuable long-term monitoring programme for southern right whales off coastal southern Australia and **recommends** that the Australian scientists involve analyse the photographic-identification data from the 'western' Australian sub-population to provide updated estimates of population size and trend.*

10.8.1.5 NEW ZEALAND

Jackson *et al.* (2016) reported a population assessment of the whaling impact and pre-exploitation abundance of southern right whales off New Zealand. The population is now estimated to be at 12% of its pre-exploitation abundance. Absolute abundance of this population in 2009 was 2148 (CV=0.20). Nineteenth century hunting reduced the population to approximately 30-40 mature females between 1914 and 1926. The pre-exploitation abundance estimate of 28,800-47,100 whales in New Zealand represents a large proportion of the pre-exploitation abundance that has previously been estimated for the entire Southern right whale population (60,000-100,000 whales) (IWC, 2001c; 2013d).

Attention: SC
*The Committee **agrees** that at next year's meeting it determines an approach to re-examine the estimates for historical population size of southern right whales in the light of the results presented by Jackson* et al. *(2016).*

10.8.1.6 CONSERVATION ISSUES

Attention: C-A, CG-R, CC
*The Committee **reiterates** the great value of annual surveys and long-term datasets such as those reported above for Argentina, South Africa and Australia for the evaluation of whether conservation actions are working or if new actions are required (see above). It **strongly recommends** that the relevant Governments ensure that these invaluable programmes continue.*

*As noted above, the Committee **welcomes** information on progress towards determining the cause(s) of higher than expected calf mortality of whales calving in waters off Península Valdés and **recommends** that the work continue (see Item 10.8.1). The Committee **recommends** that the*

progress on implementing the CMP for Southern right whales in the southeast Pacific continues (SC/66b/BRG23) continues, particularly with respect to determining a breeding area.

10.9 North Atlantic right whales

The current status of the severely depleted North Atlantic right whale population is unclear. A recent stock assessment indicated a slow, relatively consistent increase in abundance of ~2.5% yr^{-1} over at least the last two decades, 1990-2010 (Waring *et al.*, 2015). However, in recent years (2011 onwards), there has been a change in patterns of right whale habitat use, making it difficult to maintain photo-identification catalogues. In addition, the relatively low numbers of calves reported in recent years, a potential recent decline in abundance, and a possible increase in calving intervals are all causes for concern.

Attention: SC, G, CG-A
*The Committee **recommends** that a comprehensive update on North Atlantic right whales be submitted next year. Ideally, the update would include recent findings from ongoing research on distribution, mortality and calving for all range states including Iceland, as well as information on mitigation measures that are occurring in both US and Canadian waters, including measures proposed to mitigate the potential effects of future geological and geophysical seismic surveys.*

10.10 North Pacific right whales

SC/66b/BRG01 reported the results of a visual and acoustic survey for North Pacific right whales in historical habitats located in the northwestern Gulf of Alaska. There were no sightings although some vocalisations were detected within the Barnabas Trough region on Albatross Bank confirming that this area continues to be an important habitat well into late summer. A single sighting was reported to have occurred off the coast of Washington in 2013.

Attention: SC, G, CG-A
*The Committee **recommends** that data from passive acoustic recorders deployed year-round at multiple sites along the western coast of the USA and Canada be analysed for current and historical use of this area by right whales.*

SC/66b/IA17 reported four schools (five individuals) of right whales in the northern part of the Sea of Okhotsk in 2015 while SC/66b/IA10 reported three schools (four individuals) in the western North Pacific during the 2015 JARPN II dedicated sighting survey (two biopsy samples were obtained). The estimated abundance of right whales in the JARPN II offshore survey area was 1,147 (CV=0.434) in May/June 2011 and 416 (CV=0.653) in July/August of 2008 (Hakamada and Matsuoka, 2016a). Both surveys took place in the same JARPN II area west of 170°E and north of 35°N.

Attention: SC, G
*The Committee **welcomes** new information on North Pacific right whales in the Sea of Okhotsk and **recommends** that scientists from Russia and Japan summarise sightings from the Sea of Okhotsk and in the offshore western Pacific at next year's meeting.*

10.11 North Atlantic bowhead whales

New information for bowhead whales from the Eastern Canada/West Greenland region is discussed under Item 9.7. No new information from other parts of the North Atlantic was received this year.

10.12 Okhotsk Sea bowhead whales

The Committee welcomed information provided on an ongoing research programme in the western part of the Okhotsk Sea that began in 2011 (SC/66b/BRG05). The population appears small and is subject to both anthropogenic (e.g. oil and gas development, climate change) and natural (e.g. killer whale) pressures.

Attention: SC, G
*The Committee **recommends** continuation of these studies of the small population of bowhead whales in the Okhotsk Sea and in particular to obtaining an abundance estimate, comparing information on life history and health with bowhead whales from the Bering-Chukchi-Beaufort Seas stock, examining records to see if there may be other concentrations within the Okhotsk Sea and investigating the possibility of telemetric studies.*

10.13 Arabian Sea humpback whales

10.13.1 Review progress on intersessional work

Updates on the work of the Arabian Sea Whale Network (ASWN) were provided via a regionally distributed Newsletter (SC/66b/SH12) and a summary of progress made against 11 core recommendations endorsed by the Committee last year (IWC, 2016o). Key research needs at this stage include: (1) the design and implementation of a regional online data platform based on Flukebook/Wildbook, using relevant elements of other existing platforms, to store and analyse data in a common format and facilitate regional collaboration on data analyses; (2) a region-wide passive acoustic study to increase understanding of humpback habitat use off the coasts of Iran, Pakistan, India and Sri Lanka; (3) regional training workshops to expand fisheries bycatch observer schemes; (4) using platforms of opportunity to document cetacean sightings; and (5) the analysis of existing genetic samples collected in the region and continued, targeted genetic sampling where possible (and see Item 25.3).

Attention: SC, S, CG-A
*The Committee commends the work of the Arabian Sea Whale Network (ASWN) and **endorses** the ASWN's recommendations for research. The Committee also **recommends** that the IWC Secretariat communicate the Committee's endorsement to the relevant range states.*

10.13.2 Review new information

SC/66b/SH28 reported on field surveys conducted off the southern coast of Oman between February 2014 and December 2015 which included satellite tracking of individuals. That *inter alia* revealed whales ranging within a 1,150km corridor along the southern coast of Oman and northern Yemen, the first trans-boundary movement recorded for this population. Spatial analysis indicated that 35% of location points in the study were within the Gulf of Masirah, habitat that co-occurs with emerging industrial activity and existing artisanal fisheries.

In discussion, it was noted that the satellite tracking study had avoided tagging reproductive females because of concerns about harassment or injury, but resightings of previously tagged animals to date show clean healing and no evidence of infections. The Committee **welcomes** these results.

Attention: SC, G
*The Committee **recommends** that satellite tagging work continues in Oman and includes: (1) tagging of females (since they may exhibit different movement patterns); (2) seasons not included in work to date; and (3) that tagging be considered in other range states if and when areas of continued and regular Arabian Sea humpback whale presence are identified.*

A review of humpback whale co-occurrence with shipping off the coast of Oman was reported in SC/66/HIM10 and discussed under Item 7.2.2. Ship strikes have been identified as one of the potential threats to this small population.

Attention: SC, S, CG-A
*The Committee **commends** the mitigation initiatives currently being undertaken by the Port of Duqm (Oman), which will have bearing on other port developments in the Arabian Sea. It **recommends** that the authors of SC/66/HIM10 and others work to further investigate this issue and to develop measures to mitigate the potential impact of high densities of vessel traffic on this endangered population.*

*The Committee also **recommends** that the IWC Secretariat engage with the relevant port authorities with respect to development of proposed port operating procedures to mitigate ship strikes in the Arabian Sea.*

SC/66b/SH32 reported on long-term acoustic monitoring of Arabian Sea humpback whales off Oman via acoustic recorders in Hallaniyats Bay during 2011/12, and in the Gulf of Masirah during 2012/13. Results suggested *inter alia* that Hallaniyats Bay might serve as a more important habitat for breeding activity than the monitored region of the Gulf of Masirah and that there is a seasonal shift in distribution for at least singing males and likely for the population as a whole.

Attention: SC, G, CG-A
*The Committee **recognises** the importance of acoustic monitoring in providing information about the distribution and behaviour of Arabian Sea humpback whales, **endorses** the continuation of this study off Oman, and **recommends** that efforts be made to collect acoustic data to determine the presence/absence of Arabian Sea humpback whales in other parts of the expected range.*

SC/66b/SH34 summarised baleen whale records from the Indian coast of the Arabian Sea from June 2015 to May 2016 using grey literature, vessel surveys and interviews with fishermen. These reports mention blue and Bryde's whales; many others were not identified to species. A number of strandings were also reported and were discussed under Item 7.1.3.

The Committee **welcomes** this report, which provides useful information from a poorly known geographic region and **commends** the authors for their substantial effort in logistically difficult circumstances. It agreed to re-establish the intersessional correspondence group under Baldwin (ICG-14; see Annex V for members and Terms of Reference).

Attention: SC, G
*The Committee **recommends** the continuance of work to obtain information on whales along the Indian coast (e.g. as in SC/66b/SH34). It **urges** the collection of genetic samples where possible, as the population identity and structuring of many northern Indian Ocean species is unknown.*

*In view of the blue whale sightings reported, the Committee also **encourages** the collection of acoustic data from this region (see above) because this could provide important insights into Northern Indian Ocean (Item 10.3.2.5) blue whale distribution and abundance.*

The Committee received an update on genetic analyses of Arabian Sea humpback whales, which are currently in progress and will be reported at next year's meeting. Of 49 genetic samples collected between 2005 and 2015, three individuals have been confirmed as matches with genetic samples collected between 1999 and 2004. An additional six potential matches between these datasets are currently under review. These data will be analysed to see if a new abundance estimate for the Arabian Sea humpback whale population is possible. Once these analyses have been completed, the three highest priorities for future work include: (1) clarifying taxonomic status of the population; (2) examining relatedness and social structure, including an inbreeding assessment; and (3) an analysis of health status through genetic examination of major histocompatibility complex (MHC) markers.

Attention: SC
*The Committee **recommends** that scientists within the Arabian Sea region arrange for the collection and storage of tissue samples for genetic analyses, either opportunistically from strandings and disentanglements or through targeted biopsy work in range states beyond Oman.*

*The Committee also **recommends** that the existing Oman samples be further analysed to allow definitive determination of taxonomic status, kinship and the extent of possible inbreeding in the population.*

10.13.3 Progress toward the development of a Conservation Management Plan and other conservation initiatives

The Committee noted that progress on a Conservation Management Plan for Endangered Arabian Sea humpback whales has stalled because the IWC had requested endorsement from range states, and this has not yet occurred despite a letter from the IWC Secretariat to the Omani commissioner requesting such endorsement. It was noted that the Arabian Sea Whale Network did not currently include any formal government representation, but that the Network could be used to further a Conservation Management Plan should Oman and others endorse it.

Last year, the Committee recommended the formation of a Technical Advisory Panel (e.g., as established for western gray whales). It was subsequently suggested that this would focus initially on humpback whale conservation in the Gulf of Masirah given the imminent threats to the population in this area. It was felt that this Advisory Panel should be formed at the request of a relevant stakeholder in Oman, and noted that discussions are underway between the IUCN, WWF and the Environment Society of Oman.

Attention: C-A
*Whilst welcoming the new information presented under Item 10.13.2, the Committee **reiterates** its serious concern about its status of the endangered Arabian Sea humpback whale population and the anthropogenic threats it faces. It again **stresses** the value of a regional CMP (and other conservation initiatives), **encourages** range states to explore this possibility and recognises that this issue is also of importance to the IWC's Conservation Committee.*

10.13.4 Work plan
The work plan for Arabian Sea humpback whales is provided as Table 13.

10.14 Sperm whales
10.14.1 Review new information
The Committee considered several papers on sperm whales, including: SC/66b/IA01 relating to falsification of length data in Japanese catches of sperm whales prior to 1972; Alexander *et al.* (2016) on the genetic structure of sperm whales worldwide; and Mizroch and Rice (2013) on the historical distribution and movements of sperm whales in the North Pacific. For more details see Annex G (item 5.1). The Committee notes that the different dispersal and distribution patterns of males and females, together with the complex maternal social structure as well as oceanographic influences on distribution, complicates any assessment of sperm whales.

10.14.2 Evaluate the possibility in initiating an assessment and work plan
SC/66b/IA13 considered the issue of conducting an assessment of North Pacific sperm whales within the California Current region. The authors noted that assessments of sperm whales were challenged by their complex social structure. Despite these challenges, the authors considered the data available for this area was better than elsewhere in the North Pacific.

The Committee appreciates the considerable difficulties that arise in assessing sperm whales (see Annex G, item 5.2). It notes that more than three decades that have elapsed since the Committee's last quantitative assessment of this species (and that this used techniques that are no longer applicable).

Attention: SC, G
*The Committee **agrees** that further attention as to how to assess sperm whales is required and that the matter should be kept under review, with a view towards providing at least broad brush information on population abundance and status, provided that appropriate information was first tabled. It recognises that this may not be suitable for management purposes. The review in SC/66b/IA13 serves as an example of inputs which might be useful in this context. The intersessional correspondence group on sperm whales is reappointed under Brownell (ICG-15; members and Terms of Reference are given in Annex V).*

10.15 Southern Hemisphere fin whales
10.15.1 Initiate discussion on possible assessment of Southern Hemisphere fin whales
Herr *et al.* (2016) summarised the results of a dedicated distance sampling helicopter survey for fin whales around the western Antarctic Peninsula between January and March 2013. During the survey, there were 117 fin whale sightings of 337 individuals. The majority of sightings were reported north of the South Shetland Islands, resulting in a model based abundance estimate of 4,898 (95% CI 2,221-7,575) fin whales. This is a minimum abundance estimate as it does not correct for whales underwater and not available for counting during the survey.

SC/66b/SH22 and SC/66b/SH29 described a line-transect distance sampling survey conducted over ten days in February 2016 around the South Orkney Islands and Elephant Island. There were 61 individuals sighted, providing minimum abundance estimates of 528±362 fin whales around Elephant Island and 796±516 fin whales around the South Orkney Islands.

SC/66b/SH30 outlined a concept for a proposal for a ship-based survey of fin whales around the western Antarctic Peninsula, with a focal area around the South Shetland Islands. The survey would include opportunities for biopsy sampling and photo-identification of fin whales and fin whale call recordings would be obtained using passive acoustic recordings together with behavioural observations. Development of this proposal will occur intersessionally.

The Committee received an update on a review of CPIII and post-CPIII sightings data to evaluate their utility for measuring fin whale trend and abundance. This review is not yet complete and will be provided in a report at next year's meeting. There was also some discussion regarding possible acoustic distinctions population of fin whales between the west and east Antarctic.

Attention: SC
*In order to evaluate whether there is sufficient information to undertake an assessment of Southern Hemisphere fin whales, the Committee established an intersessional correspondence group under Herr (ICG-16; members and Terms of Reference are given in Annex V) to synthesise existing data and other potential data sources that may enable a future assessment of Southern Hemisphere fin whales. To facilitate this work, the Committee **recommends:***

(a) that abundance estimates of fin whales be obtained from the full CPIII set of surveys from IDCR/SOWER, and subsequent surveys - an intersessional correspondence group convened under Kelly (ICG-9; members and Terms of Reference are given in Annex V) was established to facilitate this;
(b) that in light of the growing number of fin whale surveys reported from round the Antarctic, the results of these surveys should be compiled at next year's meeting and evaluated; and
(c) that the available information on Southern Hemisphere fin whale stock structure is examined - an intersessional correspondence group convened under Jackson (ICG-17; members and Terms of Reference are given in Annex V) was established to facilitate this.

10.15.2 Work plan
The work plan for Southern Hemisphere fin whales is provided as Table 14.

10.16 Southern Hemisphere sei whales
SC/66b/SH15 and SC/66b/SH20 reported South Atlantic sei whale sightings at high latitudes (the Antarctic Peninsula during austral summers 2013 to 2016) and low latitudes (the Vitória-Trindade Seamount Chain in Brazil during winters 2011 to 2015), respectively. Most of the high latitude sightings were between 60° and 61°S. Observations of 13 groups of sei whale adults and calves off Trindade Island and Martin Vaz Archipelago suggest this area may be the winter concentration and breeding area for the species in the southwest Atlantic.

Attention: SC
*The Committee **encourages** further work on South Atlantic sei whales around Trindade Island and Martin Vaz Archipelago to understand the nature of this wintering ground. A more specific recommendation with respect to mass strandings of Southern Hemisphere sei whale in Chile can be found under Item 13.5.3.*

Table 13
Work plan for Arabian Sea humpback whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Humpback whales in the northern Indian Ocean including the Arabian Sea	(a) Progress recommendations on scientific work (see Items 10.13.1 and 2); (b) liaise with the Port of Duqm on ship strike mitigation; and (c) work with the Conservation Committee at IWC/66 regarding CMPs	Review progress – also in light of IWC/66. Modify recommendations as necessary.	Continue to progress recommendations	As for 2017.

Table 14
Work plan for Southern Hemisphere fin whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Fin whales in the Southern Hemisphere	(a) Progress recommendations to compile a list of available information for use in a potential assessment.	Review progress and develop work plan.	Continue to progress recommendations.	Potentially begin an assessment should sufficient information be available.

10.17 North Pacific humpback whales

10.17.1 Review new information

The first comprehensive photo-identification and genetic study of humpback whales throughout the North Pacific occurred in 2004-06 during the SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpbacks). A mark-recapture estimate from the SPLASH photo-identification data resulted in an estimated total abundance for the entire North Pacific of 21,808 (CV=0.04) (Barlow *et al.*, 2011). SC/66b/IA21 presented additional analyses of the SPLASH photo-identification data to provide regional estimates of abundance within all sampled winter and summer areas in the North Pacific, as well as estimate migration rates between these areas.

The Committee **commends** the enormous effort this project took and acknowledges these regional estimates will be needed for an in-depth assessment (see below).

SC/66b/IA19 followed on from a preliminary population model presented last year to assess the status of North Pacific humpback whales (SC/66a/IA16). The Committee notes this represented an excellent first step in developing a multi-stock assessment model for North Pacific humpback whales, and welcomes further development of the model for next year's meeting.

SC/66b/O02 reviewed recent visual and acoustic line-transect, biopsy and photo-id surveys on humpback whales in the Mariana Islands in the western North Pacific. The Committee welcomes this new work.

Attention: SC

*The Committee **recommends** that the data from the Mariana Islands are compared with other North Pacific humpback whale catalogues, especially those from Ogasawara and Okinawa This will facilitate their use in an assessment of the North Pacific humpback whales.*

10.17.2 Evaluate the possibility of initiating an assessment and work plan

The available data and information relevant to an assessment for North Pacific humpback whales are summarised in appendix 6, Annex G. The proposed work plan is given as Table 15.

Attention: SC

*After examining the available information, the Committee **agrees** that it is sufficient to initiate an in-depth assessment of North Pacific humpback whales at a pre-meeting prior next year (see Item 25.3). To facilitate preparations for this, an intersessional steering group under Ivaschenko was established (SG-11; members and Terms of Reference are given in Annex V).*

11. INTERNATIONAL COLLABORATIVE CRUISES AND DATABASES

11.1 IWC-POWER cruises in the North Pacific

11.1.1 Review of 2015 cruise

SC/66b/IA09 reported on the 6th annual IWC-POWER (North Pacific Ocean Whale and Ecosystem Research survey, which was successfully conducted from 11 July to 22 August, 2015 in the central North Pacific (north of 20°N, south of 30°N, between 170°E and 160°W) using the Japanese Research Vessel *Yushin-Maru No.3*. Researchers from Japan, USA and UK participated in the survey. The five main objectives and further details of the cruise, including summaries of the sightings made, may be found in Annex G, item 8.1.

The Committee **thanks** the Cruise Leader, researchers, Captain and crew, and the Steering Committee for completing the cruise and the Government of the USA who granted permission for the vessel to survey in their waters, without which this survey would not have been possible. In addition, the Committee thanks the Government of Japan who generously provided the vessel and crew and thanks the IWC Secretariat for providing support. In particularly, the Committee thanks David Mattila from the Secretariat for his entanglement rescue seminar he gave to the crew members before departure.

Attention: SC, C-A

*The Committee **reiterates** to the Commission the great value of the data contributed by all IWC-POWER cruises which cover many regions of the North Pacific not surveyed in recent decades, and so address an important information gap for several large whale species.*

*It **agrees** that the 2015 cruise, as previous cruises, was duly conducted following the requirements and guidelines of the Committee (IWC, 2012f, 509-17). It **looks forward** to receiving abundance estimates arising from these data.*

11.1.2 Mid- and long-term recommendations for the programme

SC/66b/Rep01 presented the report of the TAG (Technical Advisory Group) to the IWC-POWER. The Committee thanks the Government of Japan for hosting the meeting.

Table 15
Work plan for North Pacific humpback whales.

Species/area	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Humpback whales in the Southern Hemisphere	Progress recommendations to prepare for an-in depth assessments including holding a pre-meeting.	Complete assessment if possible, if not develop work plan for completion in 2018.	Depends upon 2017 progress.	Complete assessment if not completed in 2017.

Attention: SC
*The Committee **endorses** the recommendations made by the IWC-POWER Technical Advisory Group, including those relating to:*

(a) further analyses;
(b) improvements to procedures;
(c) validation and archiving of catalogues;
(d) an improved database; and
(e) better awareness of the system for information requests to use IWC-POWER data.

11.1.3 Recommendations for the 2016 to 2019 cruises
SC/66b/Rep02 presented the report of the Planning meeting for the 2016 IWC-POWER cruise that finalised details for the 7th IWC-POWER cruise to be held from 1 July-30 August 2016 on the *Yushin-Maru No. 3*, which is kindly provided by Japan. The proposed plan will cover waters from 170°W to 160°W between 20°N and 30°N.

SC/66b/IA06 outlined the line transect sighting survey cruise plans for the 2017-19 IWC-POWER surveys, that will complete the short term research programme. It is assumed that the research vessel, *Yushin-Maru No.3* (YS3), will be available for the cruises. It is proposed that the 2017-19 surveys be conducted in the Bering Sea, where the POWER cruises have not yet been conducted. Photo-id and biopsy experiments are also planned. The cruises will take place mainly in July and August. The duration of the surveys will be approximately 60 days involving 14 day-transit and 46 days in the research area. The outcome of the surveys will also contribute to the intersessional Workshop to plan for a medium-long term IWC-POWER international programme in the North Pacific. The data and report of this survey will be submitted to the Committee meeting soon after the cruise.

Attention: SC
*The Committee **endorses** the plan to cover the Bering Sea in the period 2017-19 and complete the first phase of the IWC-POWER programme. It thanks the Government of Japan for its generous offer to provide a vessel for at least the 2017 survey.*

With respect to scientific matters, the Committee:

(a) re-appoints the Steering Group for IWC North Pacific Planning appointed last year under Matsuoka (SG-12; for members and Terms of Reference see Annex V) and appoints Matsuoka responsibility for IWC oversight;
*(b) **agrees** that details, including final choice of strata, be finalised at the planning meeting to be held in September 2016 (see Item 25.3);*
*(c) **agrees** that a Russian scientist be invited to the Planning meeting and notes that a Russian scientist will be invited to participate in those cruises taking place in Russian waters;*
*(d) **recommends** that the IWC-POWER steering group and the planning meeting look at required logistics and facilitate implementation of passive acoustic monitoring using sonobuoys kindly provided by the USA, noting that permitting issues (see below) may mean that at least initially the focus of the acoustic work will be in US waters.*

11.1.4 Permits for the 2016-19 cruises

Attention: C-A, CG-A, S
Much of the Bering Sea projected to be covered in 2017-19 is within the EEZs of the Russian Federation or the USA. The USA has facilitated the issuance of permits for several previous IWC-POWER cruises within its waters.

*The Committee notes that this is the first time the IWC-POWER cruises have been planned to enter Russian waters (probably for the 2018 cruise). It **emphasises** the great importance of being able to survey in Russian waters in order to understand the abundance and distribution of the many cetacean species in the Bering Sea and to meet the agreed objectives of the IWC-POWER programme. In order to facilitate the granting of permits, the Committee:*

*(a) **recommends** that permits to enter both US and Russian waters should be requested as soon as possible;*
*(b) **strongly requests** that the Government of the Russian Federation: (1) provides advice on the procedures necessary to obtain permits; and (2) facilitates the granting of permits for work in its waters for this international cruise programme that takes place under the auspices of the IWC; and*
*(c) **recommends** that the IWC Secretariat send a letter of support to the appropriate authorities within the Russian Federation and the USA to encourage collaboration and the granting of the necessary permits.*

11.2 IWC-SOWER cruises: progress on website, publications, analyses
11.2.1 Review progress on IDCR/SOWER commemorative volume
Preparation of the volume continues. Bannister reported that of some 30 items to be covered, 20 are complete or substantially complete. Authors are being encouraged to complete papers and reviews. During September 2016, a two-day editorial Workshop will be held where considerable editorial progress is expected (see Item 25.3). The intersessional Steering Group under Bannister (SG-13; members and Terms of Reference can be found in Annex V) is continuing work.

11.3 Databases and catalogues (and see Annex R)
11.3.1 Sightings - update of IWC-DESS
Validation of the sightings data from the 2013 and 2014 POWER cruises is now complete. Hughes expressed her appreciation to Matsuoka for his assistance in this work. Data from the 2015 cruise has been received by the IWC and the validation process has just begun.

Limited progress was able to be achieved last year on a previous recommendation (and see Item 10.1.2) to develop a new IWC integrated relational database that links the various types of data that are collected for and archived within the IWC and provides upgraded mapping support: sighting, effort, weather and distance sampling and other related data (including data submitted under the Requirements and Guidelines for surveys); photographs; catalogues, biopsies; processed genetic data; processed passive acoustic data; related environmental variable data (e.g. with respect to model-based estimation).

Attention: SC
*The Committee **notes** that a new IWC integrated relational database will be of value to national and regional research groups as well as providing a much-needed replacement for the now old and limited IWC-DESS database. To further the development of the design of the database system, the Committee **re-establishes** an intersessional correspondence group under Palka (ICG-18; members and Terms of Reference in Annex V), to detail the variables already archived, consider other needed variables, and explore the general designs of databases used by other researchers and other large international organisations including FAO and CCAMLR.*

11.3.2 IWC-SOWER and POWER photographic database
Donovan reported that to date, the IWC (Jess Taylor and Donovan) have entered into the IWC photographic database and are working towards completing photo-analysis of the IWC's collection of cruise images. The database now contains 127,837 images from 38 cruises between 1989 and 2015, including those of IWC-IDCR, SOWER and POWER. A total of 43 cetacean species or groups are represented. A total of 277 different keywords have been agreed for allocation by image. A comprehensive manual has been created to standardise processing. During the 2015 POWER cruise, the majority of Lightroom processing was performed on board and weekly reports were generated directly from photographic data. Summary reports can be generated using SQLite to query the database. Donovan and Taylor will publish a paper in the IDCR/SOWER volume describing the Lightroom database in order to raise awareness of this valuable open-access resource and promote cross-collaborative data-sharing.

Attention: SC, S
*The Committee **welcomes** the progress with this valuable IWC photographic database and **agrees** that the Secretariat should continue to work on it, raise awareness of this valuable resource and promote cross-collaborative data-sharing.*

11.3.3 IWC-POWER catalogues
IWC-POWER photo-identification catalogues have been developed for blue, fin, humpback, sei, Bryde's and killer whales. The need to validate and cross-check the catalogues has been recognised and discussed under Item 11.1.2 (and see IWC, 2016g, p.455). Last year, it was reported that there were no blue whale matches to the Cascadia Research Collective catalogue that includes blue whales in nearshore waters along the western coast of North America. Since then, there have been no reported matches to catalogues of blue whales in Mexico or additional new killer whale or humpback whale matches.

Attention: SC, S
*The Committee **welcomes** the progress with the IWC-POWER catalogues and **agrees** that the validation process should be undertaken intersessionally and **requests** that the Secretariat highlights the process for requesting data for this and the genetic samples on their website.*

11.3.4 Humpback whale catalogues
SC/66b/SH24 reported on the Antarctic Humpback Whale Catalogue, which has been maintained (with funding from the IWC) by the College of the Atlantic since 1987. A total of 686 individual humpback whales from Antarctic and Southern Hemisphere waters were catalogued, a growth of more than 27% over the previous year. The total numbers of catalogued whales are now 6,970 (fluke), 414 (left side) and 408 (right side). Notable matches include: the first re-sighting between breeding group A and breeding group C; the first long-distance re-sighting of an individual between Brazil and sub-Antarctic islands between about 54°-55°S, 36°-38°W; several matches between the Antarctic Peninsula and Costa Rica and sightings of five individuals from the Peninsula to Panama; and the movement of an individual between the Peninsula and South Orkney, helping to define the limits of that feeding aggregation.

11.3.5 Blue whale catalogues
11.3.5.1 ANTARCTIC BLUE WHALES
SC/66b/SH11 summarised the recent findings of the Antarctic Blue Whale Catalogue, based on photo-identification data from 1991-2016. The total number of identified whales in the catalogue has reached 416, represented by 315 left sides and 306 right sides. This year, opportunistically collected photos provided a considerable contribution to the Catalogue in number of identifications (17) and because the identifications came from Areas underrepresented in the catalogue, IWC Management Areas I and II. Results of blue whale movement reported in this paper were discussed when this paper was presented to SH sub-committee (see 10.3.1)

11.3.5.2 SOUTHERN HEMISPHERE BLUE WHALE CATALOGUE
SC/66b/SH26 presented advancements of the Southern Hemisphere Blue Whale Catalogue (SHBWC) between June 2015 and May 2016. The SHBWC now includes a total of 1,381 individual blue whale photo-identifications from areas off Antarctica, Chile, Peru, Ecuador-Galapagos, Eastern Tropical Pacific, Australia, Timor L'este, New Zealand, Madagascar and Sri Lanka. In 2015-16, the catalogue increased 30% with the addition of new identifications. Major improvements in the catalogue's software have been implemented and finalised.

SC/66b/SH27 reports results from the SHBWC's comparison of photo-identified whales from Australia and New Zealand regions. Five matches were found between three areas of Australia (Perth Canyon, Geographe Bay, and Bonney Upwelling). The connectivity between these areas supports the hypothesis of one distinct population for Australia. No matches were found between Australia and New Zealand, despite the documented genetic and morphological similarities of these whales (Olson *et al.*, 2015b; Sremba *et al.*, 2015). The sample size from New Zealand is small and the Working Group encouraged New Zealand researchers to contribute their catalogues.

Jackson presented a follow-up on items from 2015 regarding the SHBWC. A new Terms of Reference has been drafted and will be circulated to members of the SHBWC. A Discussion Forum within the online SHBWC has been created and the English user manual has been updated. Plans are underway to migrate the SHBWC onto the IWC server.

11.3.6 Other whale photo-ID catalogues
SC/66b/SH06 reported on a project involving building and operating a web-based marine mammal photo-identification crowd-sourcing platform named Happywhale.com. During the pilot season, the project processed images contributed by citizen scientists, documenting 1,912 sightings containing 23 cetacean species. Individual identification efforts were focused on humpback whales; 126 humpback identifications were matched to existing catalogues in the northeastern North Pacific and off the Antarctic Peninsula. The project shows strong potential to effectively document marine mammal populations in areas such as the Antarctic and high Arctic frequented by wildlife tour vessels but where research cruises are limited.

11.3.7 Guidelines for IWC databases and catalogues
The *ad hoc* Working Group on Guidelines for Photo-identification Databases is developing guidelines in support of the IWC's work conducting cetacean population assessments through photo-identification databases (Annex R). The document will provide guidance for photo-identification catalogues contributing photos and data to the IWC and/or being funded by the IWC. The aim is that catalogues adhere to common standards for photograph subject and quality, data submission and reporting, at a level sufficient to allow the IWC to meet its population assessment goals. SC/66b/DB01 provides the draft of the guidelines that the Working Group reviewed, discussed, and edited. The guidelines (except for possible appendices) are anticipated to be completed intersessionally by an intersessional correspondence group under Olson (ICG-19; for members of Terms of Reference see Annex V) and finalised at next year's meeting.

12. STOCK DEFINITION

This agenda item was established in 2000, and has been handled since then by a Working Group (hereafter SDWG). In 2012, the Terms of Reference for the SDWG were changed to reflect the evolving needs of the Committee. During SC/66b, the SDWG continued to develop guidelines for preparation and analysis of genetic data within the IWC context (see 12.1) and provided the Committee with feedback and recommendations concerning stock structure related methods and analyses presented to other sub-committees (see Item 12.2). The Report of the Working Group is given as Annex I.

12.1 Guidelines for DNA data quality and genetic analyses

Two sets of reference guidelines have been developed and endorsed by the Committee (IWC, 2009d) and form 'living documents' that can be updated as necessary[10]. The first set addresses DNA validation and systematic quality control in genetic studies. Several papers (SC/66b/BRG07, SC/66b/DNA02-DNA04) submitted for review by the Committee this year used data that were produced using next generation sequencing (NGS) approaches. Use of such data to address stock structure questions (as well as forensic issues, see Item 16.2) of importance to the Committee is expected to become increasingly common in the future.

Attention: SC, G
*The Committee **stresses** the importance of its guidelines related to genetic data and analyses, and the need to keep these up to date. It therefore **agrees:***

(a) that the DNA data quality guidelines should be updated to incorporate discussion of data quality measures used for Next Generation Sequencing data. An intersessional working group was established under Tiedemann (ICG-20; for members and Terms of Reference see Annex V) to begin addressing this issue; and
(b) completion by next year's meeting of the as yet unfinished guidelines for the types of statistical analyses of genetic data that are commonly used in IWC contexts, and contains examples of management problems that are regularly faced by the Committee.

12.2 Statistical and genetic issues related to stock definition

The Committee had discussed a number of papers relevant to stock structure discussions in other Committee sub-groups and passed its advice on to them (see Bowhead, right, and gray whales (Annex F), In-Depth Assessments (Annex G), Revised Management Procedure (Annex D), and Other Southern Hemisphere Whale Stocks (Annex H)). Technical comments on these papers are given in Annex I.

During the intersessional period, new information on the stock structure of western North Pacific common minke and Bryde's whales and North Pacific sei whales was presented to and reviewed by an Expert Panel for the final review of the Western North Pacific Japanese Scientific Permit Programme (JARPN II), resulting in a series of recommendations by the Panel (SC/66b/Rep06) and a subsequent response addressing the short-term recommendations by Japanese scientists, hereafter referred to as 'the proponents' (SC/66b/SP01). The sub-committee on the RMP requested that the SDWG evaluate the new information presented on stock structure to advise on the information and analyses presented, including whether or not they are sufficient to warrant a revision of current hypotheses (see Annex I, Appendix 2). Although this request was specific to western North Pacific common minke and Bryde's whales, new information available on the stock structure of North Pacific sei whales that is relevant to the in-depth assessment being undertaken within the sub-committee on in-depth assessments was also reviewed.

Attention: SC, G
*In the case of North Pacific common minke, Bryde's and sei whales, as with several other baleen whale populations assessed by the Committee, the lack of samples from breeding areas makes discriminating between stock structure hypotheses difficult. All of the analysed samples were collected in areas used by feeding and/or migrating whales, and thus could represent a mixture of animals from different breeding stocks. Thus, in addition to longstanding advice to try to locate breeding grounds, the Committee **emphasises** the importance of using methods that do not require a priori stratification of samples (e.g. DAPC, PCA) when analysing these datasets, while noting that the power of such methods to detect weak levels of differentiation needs to be assessed.*

12.2.1 Western North Pacific minke whales
Pastene, representing the JARPN II proponents, presented a summary of this new information to the SDWG (Annex I, Appendix 3); comments expressing the views of some SDWG members are also included in Annex I (Appendices 4 and 5). While most of the new information pertained to the analysis and interpretation of genetic data, consideration

[10]DNA data quality guidelines are available from *https://iwc.int/index.php?cID=60&cType=document*. Genetic data analysis guidelines are anticipated to become available before the 2017 Annual Meeting.

was also given to an analysis of available age data from whales caught during JARPN and JARPN II (Kitakado and Maeda, 2016). While the data collected indicated that all age groups were represented within the coastal (Ow) region, the youngest whales, as well as females under the age of 20, were under-represented in the offshore (Oe) region. Kitakado and Maeda (2016) interpreted this as evidence that Oe was not used by a discrete stock. However, the Committee noted that while such a pattern could be consistent with the interpretation put forward by the proponents, an alternative explanation for this finding is that many adult females with calves may already be north of the catch area when whaling effort begins in this offshore area.

One recommendation of the 2016 Expert Panel was that 'all inferences regarding 'randomness' of observations (e.g. unassigned common minke whales) should be substantiated by a statistical assessment of the presumed randomness' (SC/66b/Rep06, item 4.4.3.2). This recommendation relates to addressing whether or to what extent 'purging' of samples (i.e. removing samples from the dataset prior to analysis) that do not demonstrate strong assignment to either the O or the J stock (based on the Bayesian clustering program STRUCTURE) is appropriate.

Attention: SC
In light of continued uncertainty about the best way to deal with purging of samples that do not demonstrate strong assignment to either the O or the J stock of common minke whales, the Committee ***suggests*** *to the proponents that:*

(a) including the results of analyses conducted on both purged (at various levels) and non-purged samples would be valuable in the future; and
(b) further exploration of the relationship between departures from Hardy Weinberg equilibrium and F_{ST} values for individual microsatellite loci be conducted with the expanded dataset, given that this method may be informative in evaluating hypotheses of mixing.

Preliminary results of an ongoing analysis to identify parent-offspring pairs among sampled North Pacific common minke whales were also presented at the 2016 Expert Panel review (SC/66b/Rep06). This analysis addresses a recommendation by the 2009 Expert Panel to examine the spatial distribution of close kin (IWC, 2010d, p. 420). Of note, the preliminary results included the identification of some putative parent-offspring pairs in which one member of the pair was sampled in the coastal region (Ow) and the other was sampled in the offshore region (Oe). While noting that these results were interesting, the Committee was not able to provide a technical evaluation of the analysis given that no primary paper was provided for review.

Attention: SC
In order to be able to evaluate the preliminary analysis presented, the Committee ***recommends*** *that a paper to examine the spatial distribution of close kin in North Pacific minke whales be submitted by the proponents for review at next year's meeting.*

In the interest of providing advice to the proponents that might be useful as this analysis moves forward, the Committee:

(1) ***emphasises*** *the importance of evaluating the potential for false positive and false negative detections of parent-offspring pairs (see Tiedemann* et al.*, 2014);*
(2) ***encourages*** *the authors to explore different approaches (e.g., software) to conduct kinship-based analyses; and*
(3) ***recommends*** *that the samples be genotyped at additional loci (microsatellites or SNPs) to validate the putative parent-offspring pairs that were identified.*

With respect to the last recommendation, Pastene noted that development of a SNP panel for North Pacific common minke whales is already underway (see discussion of SC/66b/DNA02 in Annex N, item 5) in response to one of the recommendations provided by the 2016 Expert Panel (SC/66b/Rep06, item 4.4.3.1, p.18). In summary, the Committee thanked the proponents for presenting this new information.

Attention: SC
While it **agrees** *these results in SC/66b/DNA02 are important and interesting, the Committee* **notes** *that at this stage further analyses are needed by the proponents before conclusions can be drawn with respect to whether the number of stock structure hypotheses under consideration should be increased, decreased or remain the same (and see Item 6.3.1).*

12.1.2 Western North Pacific Bryde's whales and North Pacific sei whales

New information on the stock structure of western North Pacific Bryde's whales and North Pacific sei whales was also presented to the JARPN II Expert Panel (Pastene *et al.*, 2016a; 2016b). For Bryde's whales, Pastene summarised the results of recent analyses that examine the extent of stock sub-division between the two Bryde's whale sub-areas (sub-areas 1 and 2) as well as within sub-area 1 (eastern and western sectors) using data generated from the expanded dataset incorporating samples collected through 2014. Significant genetic heterogeneity was found between the two sub-areas but was not detected between eastern and western sectors of sub-area 1, although the statistical power of the data to detect structure was estimated to be high.

SC/66b/SD01 represents a response to a recommendation of the 2016 Expert Panel that the presence of multiple stocks within sample partitions should be assessed using ordination-based methods such as STRUCTURE and DAPC (SC/66b/Rep06, item 4.4.3.2). Analysis of the expanded sample set from western North Pacific Bryde's whales using STRUCTURE did not identify heterogeneity either between the two sub-areas (1 and 2) or within sub-area 1. In discussion, the Committee noted that STRUCTURE has little power to detect clusters when F_{ST} is low and only weak levels of differentiation are present. Given the inability of STRUCTURE to detect heterogeneity between sub-areas (which were identified as significantly differentiated in contingency table analysis), the Committee noted that it is plausible that weak but potentially biologically important heterogeneity could exist within sub-area 1, as it would not be detected by STRUCTURE unless it was at a level similar to or greater than that seen between the two sub-areas.

The Committee thanked the proponents for their efforts to address the recommendation of the Expert Panel. It **concludes** that the significant genetic differentiation detected between sub-area 1 and 2 is not consistent with panmixia, although it cautioned that this does not necessarily confirm that the boundary between the two sub-areas is drawn correctly. While the results were not considered to be informative with respect to evaluating the plausibility of hypotheses that include mixing of multiple stocks within areas, it was noted

that if more than two stocks of Bryde's whales are present in the western North Pacific, the level of differentiation between sectors within sub-area 1 must be low as it was not detected in the contingency table analysis. This information is relevant to the forthcoming *Implementation Review* of North Pacific Bryde's whales (see Item 6.4).

Attention: SC
*The Committee **notes** that other ordination-based methods may be better at discriminating clusters than STRUCTURE when stocks are weakly differentiated, although the power of such methods to detect structure when effect size is small has not been tested (and see Item 12.4). However, the Committee **recommends** that the proponents conduct further analyses using alternative ordination-based methods to evaluate their utility in addressing the presence of multiple stocks within sample partitions.*

SC/66b/SD01 also addressed the recommendation by the Expert Panel to conduct ordination-based analysis to further evaluate potential stock structure within North Pacific sei whales. As with western North Pacific Bryde's whales, analysis of the sei whale genetic data using STRUCTURE did not identify heterogeneity. In this case, the STRUCTURE results were consistent with the contingency table analyses presented in Pastene *et al.* (2016a), which did not detect genetic heterogeneity when samples collected in the eastern and western sector of the North Pacific were compared.

In discussion, the Committee noted that all of the sei whale samples analysed were collected within the North Pacific pelagic area. Given this limitation, it is not currently possible to test the validity of the multi-stock hypothesis (as proposed on the basis of mark-recapture data - Mizroch *et al.* (2015) - using genetic analysis. This is discussed further under Item 10.6.

Attention: SC
*The Committee **agrees** that the genetic and mark-recapture data currently available are consistent with a sei whales single stock in the pelagic region of the North Pacific.*

12.3 Terminology appropriate to stock definition, unit-to-conserve, and 'viable' population

Defining and standardising the terminology used to discuss 'stock issues' remains a long standing objective of the SDWG, in order to help the Committee report on these issues according to a common reference of terms (see Appendix 5, IWC (2014e). Recent efforts have focused on difficulties in aligning terms used in the SDWG with those currently being used by the sub-committee on small cetaceans (IWC, 2015i, p.231; 2016p, p.290).

Attention: SC
*Although no new items on standard terminology were discussed this year, the Committee **agrees** to continue the intersessional working group convened by Lang (ICG-21; for members and Terms of Reference see Annex V), which was tasked with: (1) providing a list of stock structure related terms used by the different sub-committees and working groups of the Committee as well as by relevant outside groups (e.g., IUCN); and (2) identifying equivalencies between terms in order to highlight where changes in terminology might be made to improve consistency of usage.*

12.4 Simulation-based approaches to evaluate stock structure, including TOSSM (Testing of Spatial Structure Models)

TOSSM was developed with the intent of testing the performance of genetic analytical methods in a management context using simulated genetic datasets (Martien *et al.*, 2009), and more recently the TOSSM dataset generation model has been used to create simulated datasets to allow the plausibility of different stock structure hypotheses to be tested (e.g. Archer *et al.*, 2010; Lang and Martien, 2012). During last year's meeting, the Committee noted that additional simulation-based tools to evaluate population structure were now available, and it was agreed to expand this item (formerly specific to TOSSM) to include this broader range of tools (IWC, 2016i; Item 11.3).

At SC/66a, it was reported that construction of an R package to guide users through the workflow of implementing simulations in population genetic questions was underway. This package would have some overlap with the functionality of TOSSM but was designed to be user-friendly. This year, it was reported that this new package is near completion and is expected to be available soon. The Committee expressed their appreciation for this effort, which should allow the TOSSM framework to be used by a wider audience, and looks forward to reviewing this work in the future.

Attention: SC
*Given the potential importance of ordination-based methods (e.g., DAPC, PCA) to elucidate structure (e.g. in North Pacific common minke and Bryde's whales) when differentiation between groups is weak, the Committee **encourages** testing of such methods using a simulation-based approach, such as the TOSSM framework.*

12.5 Work plan

The work plan for matters related to stock structure is given as Table 16.

13. ENVIRONMENTAL CONCERNS

The Commission and the Scientific Committee have increasingly taken an interest in the environmental threats to cetaceans. In 1993, the Commission adopted resolutions on research on the environment and whale stocks and on the preservation of the marine environment (IWC, 1996; 1997; 1999a; 1999b; 2001a; 2010a; 2013a; 2016c). As a result, the Committee formalised its work by establishing a Standing Working Group that has met every year subsequently.

13.1 State of the Cetacean Environment Report (SOCER)

The SOCER provides an annual update, as requested by Resolutions 1997-7 (IWC, 1998a) and 1998-5 (IWC, 1999a), on: (1) environmental matters that potentially affect cetaceans; and (2) developments in cetacean populations/species that reflect environmental issues. The 2016 SOCER (Annex K; Appendix 3) focused on polar regions. It underlined that the ongoing and expected changes in the polar seas are so severe that the Antarctic will be subject to one of the largest ecosystem changes on the planet and that the Arctic marine ecosystem will shift to a 'new normal'. Importantly, cetaceans are increasingly being recognised as determinants rather than mere victims of environmental processes: they play a key role in ecosystem function. Additional details are in Annex K, item 6 and Appendix 3. Next year the focus of the SOCER will be on the Indian Ocean.

Table 16
Work plan for matters related to stock structure.

Item	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Guidelines for DNA data quality and genetic analyses	Progress work through intersessional groups.	(a) Update DNA quality guidelines to include discussion of NGS data; and (b) complete genetic analysis guidelines.	Ensure guidelines are placed on the website and consider publication.	Review and update as necessary.
Statistical and genetic issues concerning stock definition		Review papers and provide advice to relevant groups.		As in 2017.
Terminology review and unit-to-conserve	Progress work through intersessional group.	Review progress and update list as necessary.	Depends on 2017.	Depends on 2017.
Simulation tools for spatial structuring (e.g. TOSSM)		Review relevant papers. Develop work plan for specific issues as necessary.	Depends on 2017.	Depends on 2017.

13.2 Chemical pollution

13.2.1 Pollution 2020

The Pollution 2020 intersessional correspondence group under Hall (ICG-22; for members and Terms of Reference see Annex V) has continued to refine the individual-based population model developed under the Pollution 2020 initiative (Hall *et al.*, 2015). The Committee thanks Hall for her continued work on the development of individual-based population models.

Progress was also presented on the contaminant mapping work that has been advancing under this initiative. An online contaminant visualisation and mapping portal is being developed to allow users to explore a database of trends in contaminants (for example blubber concentrations of PCBs, DDTs and PBDEs) in different cetacean species across the world (see figs 1a and 1b in Annex K, item 7.2).

The Committee thanks Hall for her continued efforts on contaminant mapping for cetaceans.

Attention: SC, G, S
*The Committee **reaffirms** the importance of the Pollution 2020 initiative and:*

*(a) **encourages** continued development of tools to help understand the potential effects of single or multiple pollutants and cumulative impacts on individual cetaceans and populations;*
*(b) **recommends** that, as part of the work to refine the individual-based population model, additional contaminants, such as polybrominated diphenyl ethers (PBDEs), are added to the model for evaluation of single and multiple effects and cumulative effects;*
*(c) **agrees** that this contaminant mapping tool is a useful way to visualise and explore temporal and spatial trends;*
*(d) **emphasises** the need to determine a mechanism for collating relevant data, keeping it up to date and ensuring that the data are standardised and quality-assured; and*
*(e) **recommends** that Hall works with the Secretariat on further modifications of the mapping tool.*

Additional details and discussion are in Annex K, item 7.2.

13.2.3 Other chemical pollution

SC/66b/E08 was a revised version of Yasunaga and Fujise (2016b) presented to the JARPN II final review meeting. It was found that main prey items had an effect on total mercury concentrations in common minke whales and yearly changes of total mercury could be affected by changes of their prey items. Total mercury levels of common minke whales, sei whales and Bryde's whales from the western North Pacific were much lower than total mercury toxicological thresholds for terrestrial wildlife mammals and striped dolphins.

SC/66b/E07, a revised version of Yasunaga and Fujise (2016a) found no significant yearly changes of PCBs in common minke whales from the western North Pacific. PCB levels found in each sub area were much lower than PCB toxicological thresholds of marine mammals. See Annex K, item 7.3 for further details and discussion.

SC/66b/BRG06 reported the results of methods development for mercury and steroid hormone analyses for future application to western gray whale skin and blubber biopsies. Significant differences were found in different skin layers for both water and total mercury. Studies that report skin mercury from gray whales (and possibly other species) should specify which layers of the epidermis were analysed.

Information on concentrations of heavy metals in gray whales and walruses from subsistence harvests in the western Bering Sea was presented in SC/66b/BRG10. The biologically active components of iron, zinc and copper had the highest concentrations, but cadmium and mercury had the lowest levels in the tested animal organs. The levels of iron, zinc, copper, arsenic and mercury were significantly higher in the liver of animals. See Annex K, item 7.3 for further details and discussion of this paper.

Murphy *et al.* (2015) reported the results of a study investigating reproductive failure and PCB concentrations in harbour porpoises from the North Sea. Resting mature females had significantly higher mean level of total PCBs than both lactating and pregnant females. Furthermore, a lower pregnancy rate of 50% was estimated for 'healthy' females that died of traumatic causes of death, compared to other populations. Jepson *et al.* (2016) also reported that three species of cetaceans (striped and common bottlenose dolphins, killer whales) from Europe had mean PCB levels that exceeded all known marine mammal PCB toxicity thresholds.

Data on organochlorines in common bottlenose dolphins from the northern Adriatic Sea (Slovenia, 2011-14) found that most animals contained concentrations believed to be high enough to cause physiological effects in marine mammals (Jepson *et al.*, 2016; Kannan *et al.*, 2000).

Attention: SC, G, CG-R
The Committee:

*(a) **expresses concern** at the high concentrations of persistent organic pollutants in northern Adriatic common bottlenose dolphins;*
*(b) **recommends** long-term collaborative monitoring dolphins in the region to follow reproductive history and survivorship of known individuals; and*

(c) ***notes*** *the importance of international collaboration in understanding the health of these populations in the Adriatic Sea.*

Fossi *et al.* (2016a; 2016b) focussed on examining the overlap of fin whale feeding areas and likely exposure to microplastics in the Mediterranean Sea and the Gulf of California. Ingestion of microplastic-contaminated prey may pose a threat to fin whales. See Annex K, item 7.3 for further details and discussion on these two papers.

Attention: SC, G
The Committee welcomes the above information on microplastics and ***emphasises*** *the need for the development and implementation of standardised and quality-assured contaminant data in order to compare data among various studies that examine temporal and geographical trends of pollutants.*

13.3 Oil spill impacts

13.3.1 Progress on Oil Spill Intersessional Working Group

Ylitalo presented potential options for an oil spill workshop proposed at SC/66a. Concern was expressed about the lack of knowledge or consideration of cetaceans when the oil spill response communities are developing response plans and making decisions. Additional details and discussion are in Annex K, item 7.4.

13.3.2 Oil spill impact updates

In SC/66b/E04, the IWC Pollution 2020 individual-based model (SPoC, Hall *et al.*, 2013) was modified to incorporate additional effects of petroleum-associated chemical exposure following an oil spill on a simulated population of bottlenose dolphins. These estimates were then used to investigate the effect of both PCBs and an oil spill on potential population growth rates (λ). This approach allows for cumulative effects of pollutants to be considered.

The Committee received a summary of the findings in the Programmatic Damage Assessment and Restoration Plan[11] for the *Deepwater Horizon* oil spill in 2010. Multiple health issues were detected in dolphins in Barataria Bay, Louisiana during the initial post-spill study period (2011), including poor body condition and moderate to severe lung disease. Concurrent studies focused on dead dolphin retrieval, necropsy, and histopathology in the northern Gulf of Mexico within the oil spill footprint had similar findings.

Injury assessments were then used in models to quantify the injuries to specific stocks of cetaceans as lost dolphin years, maximum population reduction, and years to recovery within 95% of the baseline population. In conclusion, dolphins in Barataria Bay had a maximum reduction in population of 51% and will require 40-50 years for recovery without active, effective restoration. Continued monitoring is essential to understand the long-term health effects and success of restoration; some funds for monitoring and adaptive management have been identified in the restoration budget.

Attention: C-A, CG-A
The Committee ***agrees*** *that there is compelling evidence that oil and dispersants have substantive long-term health impact on cetaceans. Therefore, it:*

(a) ***encourages*** *additional work to evaluate the effectiveness of restoration activities for cetaceans affected in the Deepwater Horizon spill;*

(b) ***emphasises*** *the importance of baseline information for damage assessment and recovery monitoring and* ***recommends*** *collection of high quality baseline data, especially before oil/gas exploration begins or expands, or shipping lanes/ports are developed or increased; and*

(c) ***agrees*** *that an adaptive management framework is essential to provide feedback on the impacts of all of the restoration activities.*

In addition, given the tremendous amount of information obtained on the impacts of oil on cetaceans from the Deepwater Horizon *oil spill and the lack of consideration of cetaceans in oil spill response planning, preparedness and response in many regions, the Committee also* ***recommends*** *that:*

(a) at next year's meeting, it evaluates tools and mechanisms to integrate and inform oil spill response organisations and national and international response plans, of the need for response actions and the assessment of impact of spills and spill response activities related to cetaceans – to facilitate this it has established an intersessional group under Ylitalo (ICG-23; for members and Terms of Reference see Annex V); and

(b) given the increased attention to disaster preparedness through the Arctic Council's Emergency Prevention, Preparedness and Response (EPPR) working group, that IWC member Arctic states on the EPPR Working Group consider cetaceans in planning and preparedness.

Attention: C-R, CG-R
In terms of the general issue of oil spills and cetaceans, the Committee ***re-emphasises*** *the importance of avoiding oil spills and* ***reiterates*** *the importance of the collection of baseline data on location, health status and other measures in areas of higher risks of impacts to cetaceans and* ***recommends*** *that:*

(1) the Commission develops an information resource on risks of oil spills to cetaceans such that:

(a) response organisations can make environmental trade-off decisions based on sound science evaluating the risks and benefits of certain cleanup operations to cetaceans; and

(b) guidance is provided for potential response actions for cetaceans during spill responses – the Committee is willing to assist in the development of such a resource.

(2) Contracting Governments obtain and share information on exposure of and impacts to cetaceans when medium to large spills occur in their waters, to enhance global understanding of risks and impacts to cetacean populations; and

(3) Contracting Governments and industry:

(a) increase efforts on prevention of spills; and

(b) focus research to improve tools to detect exposure and evaluate impacts of oil spills on cetaceans.

13.3.3 Review national, international or regional work on oil spill impacts on cetaceans

NOAA (USA) has developed National Oil Spill Response Guidelines for Marine Mammals[12] and is developing guidelines for natural resource damage assessments of

[11] *http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/.*

[12] *http://www.nmfs.noaa.gov/pr/publications/techmemo/opr52.pdf.*

pinnipeds and cetaceans. As discussed previously, the Global Oiled Wildlife Response System project funded by IPIECA, the global oil and gas industry association for environmental and social issues, should be completed in late 2016. Additional details and discussion are in Annex K, item 8.3.

13.4 Cetacean diseases of concern

13.4.1 Update on website

An update and a demonstration of the Cetacean Diseases of Concern (CDoC) beta website was provided. In 2012, at SC/64, the Cetacean Emerging and Resurging Diseases (CERD) working group proposed to develop a website that provides information on infectious diseases (e.g. viral, bacterial, fungal, parasitic) and non-infectious diseases (i.e. nutritional disorders, environmental conditions, biotoxins).

Attention: SC, S

*The Committee **recognises** the value of the IWC Cetacean Diseases of Concern (CDoC) website and **agrees** that the next steps in its development are for the intersessional group under Rosa (ICG-24; see Annex V for members and Terms of Reference) to work with the Secretariat to design and reformat the site, determine how the mapping effort might be best accomplished and making the website operational as soon as possible.*

See Annex K, item 9.1 for additional details and discussion.

13.4.2 Other health issues in cetaceans

The Strait of Gibraltar includes shipping lanes, commercial and big game fishing, and is a 'hotspot' of PCB contamination. A database with more than 32,000 photos collected on platforms of opportunity over 15 years was analysed for cetaceans with externally visible anomalies (SC/66b/E13). A total of 500 cetaceans was recorded with skin diseases caused by viral, bacterial or fungal pathogens, which the authors consider may reflect immunosuppression due to altered environmental conditions. Interactions between PCB contaminants and disease have been identified in the Strait of Gibraltar.

It was suggested that the photographs might be presented to experts for assistance in determining the potential source of the injuries and scars. Skin disease in free-swimming cetaceans is difficult to diagnose (IWC, 2008b; 2008c).

The Committee **agrees** that future studies on cetaceans in the area should include monitoring (following) animals for health impacts or survivorship and examining skin lesion progression over time. It is important to continue long-term monitoring of these cases in the Strait of Gibraltar and the Committee **encourages** research groups in the area to collaborate on such studies.

Several papers (SC/66b/E06; SC/66b/BRG03; SC/66b/BRG14) describing health monitoring efforts in bowhead whales and other cetaceans from the U.S. Arctic were presented and these are discussed in detail in Annex K, item 9.2.

Lefebvre *et al.* (2016) reported on the prevalence of two harmful algal toxins in marine mammals, including cetaceans, from Alaska. Under the 'new Arctic normal' with rapid declines in sea ice and increasing water temperatures, harmful algal blooms are likely to expand to the northern geographic range. Additional details and discussion can be found in Annex K, item 9.2.

Attention: SC

With respect to health issues and cetaceans, the Committee:

*(a) **recommends** further work on compiling and refining a health monitoring framework for a sentinel or indicator Arctic cetacean species, noting that such work would be useful to the Circumpolar Biodiversity Monitoring Plan (CBMP) marine expert network[13]; and*

*(b) **agrees** to hold a harmful algal bloom-focused session at next year's meeting - an intersessional steering group to facilitate this has been established under Rowles (SG-14; for members and Terms of Reference see Annex V).*

13.5 Strandings and mortality events

13.5.1 Report of the Investigations of Large Mortality Events, Mass Strandings and International Stranding Response Workshop

Rowles provided a summary of the report of the Workshop on Investigations of Large Mortality Events, Mass Strandings and International Stranding Response (SC/66b/Rep09) that was held San Francisco, in December 2015. Of particular focus for the Workshop was to define potential roles that the Commission and the Committee might play in assisting countries with stranding response and investigation.

The participants reviewed case studies on baselines, pathologic investigations and recurring events, including information from various countries in North America, South America, Europe and Japan. The Workshop recommended the following: developing an expert panel that would assist in coordination of emergency response when requested at national or regional levels; providing expertise on operating procedures, diagnostics, and response; supporting capacity building for regional and national networks; supporting a centralised data repository; and reporting unusual cetacean events and responses at annual meetings, and/or a summary of unusual cetacean events reported via the IWC website. See Annex K, item 10.1 for additional details and discussion of this Workshop.

13.5.2 Workshop to Develop Practical Guidance for Handling Cetacean Stranding Events

Simmonds presented a summary of the Workshop to 'Develop Practical Guidance for the Handling of Cetacean Stranding Events' (IWC/66/WKM&WI Rep02). The Workshop aimed to assist the Commission in taking forward relevant actions in the Commission's Welfare Action plan. The Workshop considered a series of case studies illustrating examples of the challenges faced by countries in developing an effective strandings response and discussed the potential role of the Committee in further developing guidelines and protocols for strandings and in acting as a repository for the identification and dissemination of best practise. The Workshop recommended *inter alia* that the Commission establish a framework to provide advice to contracting governments on critical elements to include in the establishment of a national strandings response network.

Attention: SC, S, C-R, CC

*The Committee **draws** the attention of the Commission to the importance of the recommendations that arose out of the strandings Workshops described above (SC/66b/Rep09 and IWC/66/WKM&WI Rep02). In order to effectively progress in stranding response work area and to assume the role envisaged by the Workshops to provide guidance for response and investigations, the Committee:*

[13] *http://www.caff.is/monitoring.*

(a) **recommends** *the establishment of both an Expert Panel (to guide and inform activities) and a Coordinator (to oversee the implementation of activities)[14];*
(b) notes that initial funding will be required for a first Expert Panel meeting and a coordinator and **requests** *the Commission and Member Nations to develop options for additional funding;*
(c) ***agrees*** *to the Terms of Reference provided in Annex K, item 10.2 (noting that the Expert Panel, working with the Committee, may further refine its Terms of Reference to support this work area, whilst taking into account the full recommendations of the two Workshops); and*
(d) ***agrees*** *to establish an intersessional working group under Simeone (SG-15; for members and Terms of Reference see Annex V) to select the Expert Panel, oversee its first meeting (including the development of a proposed budget) and to work with the Secretariat as appropriate.*

13.5.3 Review new information on mass stranding and mass mortality events

In the last 25 years, dolphin morbillivirus (DMV) was deemed to be the cause of two major epidemic outbreaks in the Mediterranean Sea (1990s and 2006-08). Two additional minor mortality events due to this virus were reported in 2011 and 2013 that included bottlenose and striped dolphins, as well as fin whales, with evidence of DMV infection found in more than half of the animals examined (Mazzariol *et al.*, 2016).

The Committee welcomes the update on dolphin morbillivirus and encourages continued studies on the virus in the Mediterranean Sea, North America, and other regions of the world, as well as modelling of the effects of the virus in populations. See Annex K, item 10.3 for additional details and discussion of this paper.

Information was presented on a letter from the Wildlife Health Specialist Group of the International Union for Conservation of Nature (IUCN) to the CITES Secretariat requesting development of a procedure for transboundary transport of diagnostic specimens for disease investigations in emergency situations. The Committee welcomes this information and recommends that member nations evaluate this request and enter into discussions regarding effective ways to assist transboundary sample transport in the face of emergencies (die-off, environmental disasters or disease outbreaks).

In SC/66b/E01, information on an unprecedented mass stranding of sei whales in southern Chile was presented. In 2015, more than 360 dead sei whales washed ashore in the Gulf of Penas in southern Chile. Efforts to determine cause of death were hampered by the remoteness of the location and the state of decomposition of the carcasses. A limited number of partial necropsies detected harmful algal biotoxins in the whales' stomachs; these biotoxins were also in mussel samples collected in the region. However, water samples collected months after the bloom did not contain detectable levels of the harmful algae.

Attention: SC, CG-R
The Committee ***expresses concern*** *about the high numbers of sei whales that died during the 2015 event in Chile and* ***notes*** *that the last sei whale assessment for this management area was in December 1974. The Committee* ***draws this to the attention*** *of Government of Chile and* ***recommends*** *as a matter of some urgency:*

(1) that annual aerial surveys and examination of stranded animals are included in follow-up efforts;
(2) that funds be made available to address the urgent need to investigate sei whales and mortalities in this area; and
(3) if the mortalities continue, increased aerial surveys and carcass marking of whales in this region are conducted.

The Committee ***agrees*** *that it will be pleased to review the scientific components of a programme or plans to address the significant data gaps for this area in order to better understand mortality events. Given the urgency of this matter, the Committee also* ***agrees*** *to allocate up to £3,500 from the Scientific Committee contingency fund 2015-16 to assist in this process should an appropriate proposal be submitted.*

SC/66b/BRG02 presented an update on southern right whale (*Eubalaena australis*) calf mortality for the 2014-15 season (65 strandings). A total of 737 dead whales have been recorded on the Península Valdés calving ground and surrounding areas along the Argentine coast since 2003. Intensified kelp gull harassment at Península Valdés may be compromising calf health and thereby contributing to the high average rate of calf mortality observed in recent years, but it cannot explain the large year-to-year variance in calf deaths since 2000 (Maron *et al.*, 2015b). See Annex K, item 10.3 for further details and discussion.

The Committee commends this consistent, long-term, and thorough investigation in the face of difficult logistics and limited funding (and see Item 10.8).

Attention: SC, CG-A
Investigations of large whale die-offs are extremely challenging. The Committee ***strongly encourages*** *that large whale stranding or mortality events are investigated and that the relevant authorities ensure that efforts (and funding) are made to conduct necropsies and determine cause of death. In addition, the Committee* ***recommends*** *that the Expert Panel (see Annex K, item 10.2) provides guidance for abbreviated necropsies for large whales that may be in remote locations or hard to access for full necropsy.*

13.6 Effects of anthropogenic sound

This agenda item was considered in a joint session with the Sub-Committee on Whalewatching.

A pre-meeting Workshop was held on acoustic masking[15] and whale population dynamics (for details of the discussion and presentations see SC/66b/Rep10) and the Committee endorses the Workshop's recommendations. An update was provided on international efforts to monitor ocean noise levels, including the NOAA Ocean Noise Strategy and European Union efforts to include underwater noise as an indicator of Good Environmental Status under the Marine Strategy Framework Directive. The Committee also reviewed the scientific work needed to make progress on the goal endorsed by the Committee in 2010 (IWC, 2010e) of reducing noise from shipping (i.e. 3dB in 10 years;

[14]See Annex K, item 10.2 and Annex V for additional details and discussion of the Expert Panel's Terms of Reference and aims.

[15]Defined as: the interference of noise with hearing; or, more specifically, both the process and the amount by which the threshold of hearing of one sound is raised by the presence of another.

10dB in 30 years in the 10-300Hz band). An intersessional correspondence group under Moore (ICG-25; members and Terms of Reference can be found in Annex V) is working on this area.

There were three presentations on acoustic masking. Reyes Reyes *et al.* (2016) discussed the potential acoustic masking of clicks and whistles of Commerson's dolphins from high and mid-frequency ship noise in shallow waters off the Argentine Patagonian coast (see Annex N, item 5). Erbe *et al.* (2016) provided a thorough review of acoustic masking in cetaceans.

The Committee also received a review of communication space in cetaceans, whereby each species occupies different acoustic spaces depending on the characteristics and functions of their sounds. This showed how various anthropogenic sounds overlap with those spaces.

The Committee reviewed the Population Consequences of Disturbance (PCoD) framework and explored ways to predict population consequences of acoustic masking to cetaceans. Population viability analyses (PVAs) were also discussed, in particular in relation to the effects of noise on prey and cetaceans.

Attention: C-A, SC, G
With respect to noise issues in general, the Committee:

(a) ***agrees*** *that there is compelling evidence that chronic anthropogenic noise is affecting the marine acoustic environment in many regions and recognised emerging evidence that compromised acoustic habitat can affect some cetacean populations adversely;*
(b) ***agrees*** *that the lack of scientific certainty should not hinder management actions to reduce ocean noise (or indeed other potential threats) and* ***recommends*** *that absence of scientific certainty should not prevent member nations from undertaking management efforts now to keep quiet areas quiet and make noisy areas quieter;*
(c) ***agrees*** *that addressing ocean noise is essential to meet United Nations Sustainable Development targets with respect to reducing pollution and fully protecting 10% of coastal and marine areas;*
(d) ***recommends*** *that the Commission develop a paper for submission to the IMO Marine Environment Protection Committee, providing an update of recent information related to the extent and impacts of underwater noise from shipping;*
(e) ***recommends*** *the continued development of clear and concise statements and compelling audio-visual tools to convey the importance and impact of ocean noise; and*
(f) ***recognises*** *that noise is one of many stressors whale populations face, and* ***recommends*** *mitigation of the most tractable stressors, such as noise, as a way to increase populations' resilience and improve their future prospects in the face of less tractable stressors, such as climate change.*

In consideration of protected areas, the Committee ***recommends*** *that efforts to finalise a process to identify 'Important Marine Mammal Areas' should include integration of information on anthropogenic noise into site selection and management, and where possible, reduce ocean noise levels in identified Important Marine Mammal Areas.*

Attention: G, C-A
With respect to general acoustic work required to address noise issues, the Committee ***recommends*** *that:*

(a) ship source characteristic data be evaluated, for example part of ambient noise measurement studies, to identify the noisiest ships and quantify their relative contribution to overall ocean noise;
(b) ships that contribute disproportionately to ocean noise should be considered a priority for replacement or application of ship-quieting technologies;
(c) further studies on the source-level speed relationship for a range of vessel types are undertaken; and
(d) Automatic Identification System (AIS) and source characteristic data are used to relate shipping density data to estimated loss of acoustic habitat from shipping noise.

The Committee also ***endorses*** *the recommendations of the Workshop on Predicting Sound Fields: Global Soundscape Modelling to inform Management of Cetaceans and Anthropogenic Noise and offered specific technical recommendations about how best to accomplish shared goals with respect to generating reliable soundfield maps (SC/66b/Rep10, table 1).*

Attention: SC, S, G, C-A
Noting cetacean dependence on listening to and producing sounds for their survival, the Committee:

(a) ***recommends*** *increased research and management consideration of the importance of acoustic habitat in cetacean conservation efforts;*
(b) ***recommends*** *the set of research efforts (SC/66b/Rep10, Table 2) be undertaken to better quantify the factors underlying masking in cetaceans and* ***encourages*** *further work on acoustic masking in small cetacean species;*
(c) ***recommends*** *focussed research to quantify the relationship between reduction in acoustic space and reduction in prey intake;*
(d) ***recommends*** *research that explores linkages between masking of sounds and the effect on other life functions than foraging;*
(e) ***recommends*** *efforts to expand both statistical frameworks to predict population consequences of masking;*
(f) ***recommends*** *that the report of the acoustic masking Workshop (SC/66b/Rep10) be conveyed to the Western Gray Whale Advisory Panel Noise Task Force (chaired by Donovan) to support a collaborative approach to noise management (Annex F, item 3.2.3); and*
(g) ***notes*** *that many 'quiet areas' are likely to be found in the less industrialised waters of the Southern Hemisphere and, therefore* ***agrees*** *that efforts are needed to involve more scientists from such areas in the Committee's ongoing work on ocean noise.*

13.6.2 Progress on plans related to stress

Last year, the Committee (IWC, 2016i, p.49) had recommended that plans should be made for a possible Workshop on stress and cetaceans to take place in either 2017 or 2018. This was discussed this year in the light of the available information and the Committee's workload and priorities.

Attention: SC
*The Committee **recognises** the importance of studies on physiological stress (i.e. including responses to noise, but also nutritional stress and other endocrine responses to a changing environment) but **agrees** to consider it as a special focus session in the future when sufficient data become available.*

13.6.3 Review regional, national or international work on ocean noise
The Committee has long recognised the importance of collaborative work on the issue of noise. This year, it received information on the US Government's Ocean Noise Strategy (ONS), which adopts an acoustic habitat approach to the management of underwater noise[16] and on the efforts currently underway by the joint CMS, ASCOBANS and ACCOBAMS Noise Working Group on sensitive areas for offshore exploration activities in the Mediterranean Sea (details can be found in Annex K, item 11.3).

Attention: C-A, CC
In response to information on noise received this year from other organisations, the Committee:

*(a) **welcomes** the US Government's Ocean Noise Strategy and **endorses** its acoustic habitat approach to ocean noise management; and*
*(b) **expresses concern** about the number of problematic areas (with respect to noise) in the Mediterranean and **welcomes** this important work by ACCOBAMS (Maglio* et al.*, 2016); and*
*(c) **notes** that ASCOBANS has developed Guidelines on underwater noise, including effective mitigation guidance for intense noise generating activities[17].*

13.6.4 Effectiveness of marine mammal observers (MMOs) as a mitigation measure
MMOs are frequently regarded as an effective mitigation measure for reducing the risk of injury to marine mammals from seismic surveys, bus as Leaper *et al*. (2015) noted, the effectiveness of such practices has rarely been quantified. Simulation modelling showed that there will be many cases where using MMOs results in minimal risk reduction, but these situations may not always be immediately apparent. The study also indicated that small reductions in source level will generally be a more effective way of reducing injury risk than shut downs in response to cetacean sightings by MMOs. Additional details and discussion are in Annex K, item 11.4.

Attention: C-A, CC
*The Committee **recalls its endorsement** (IWC, 2015d, p.43) of the principles for responsible seismic surveys developed by Nowacek* et al. *(2013) that have also been endorsed by IUCN. With respect to the use of Marine Mammal Observers as a means to mitigate risk of injury from noise sources, the Committee **recommends:***

(a) that, wherever MMOs are proposed as a mitigation measure, the expected risk reduction be quantified; and
(b) increased attention from the seismic survey users towards developing new technologies and operating practices that reduce the source levels required during seismic surveys.

[16]*http://cetsound.noaa.gov.*
[17]*http://www.ascobans.org/en/species/threats/underwater-noise.*

13.6.5 New sources of sound of concern for cetaceans
Smith *et al*. (2016) reviewed small Unmanned Aerial Systems (UAS), also known as drones, and their impacts on marine mammals. These have become more accessible to civilian operators and are quickly being integrated into business and research. Smith *et al.* (2016) noted that more research is needed to understand the full effects of UAS on cetaceans. For further discussion and details on UAS, see Annex K, item 11.5.

Attention: SC, C-A
The Committee **notes** *that there are large data gaps on cetacean responses to UAS/drones but recognises their potential to disturb or even harm marine mammals (e.g. by strike/collision). It recommends:*

(a) that researchers should incorporate consideration of possible impacts (e.g. behavioural reactions) into any proposed UAS study involving cetaceans;
(b) that managers consider recreational use of UAS/drones, as well as commercial or research use, when developing regulations or guidelines for their use around cetaceans; and
(c) that countries without a permitting system for UAS/drones, develop a precautionary permitting system that considers cumulative effects of UAS operations and other means of approach (e.g. by vessel).

13.7 Effects of climate change on cetaceans
SC/66b/E05 reported on a recent survey of published peer-reviewed literature concerning climate change and marine mammals. Overall, the literature has expanded greatly in recent years with a particular emphasis on the Arctic region, and there are a growing number of papers that directly link observed changes in the field to climatic factors, but little has been published about tropical species in general and river dolphins and beaked whales.

Attention: SC
The Committee **agrees** *to continue the intersessional working group under Simmonds (ICG-26; see Annex V for members and Terms of Reference) to develop a strategy to address the potential vulnerability of cetaceans to climate change.*

13.8 Arctic issues
13.8.1 Progress from intersessional group
In March 2014, the Commission held a Workshop on the 'Impacts of Increased Marine Activities on Cetaceans in the Arctic' (Reeves *et al.*, 2016). Four recommendations from this Workshop provided a framework for progress and an intersessional working group presented an update of responsive actions and responsive actions to each recommendation were discussed (see Annex K, item 13.1).

Attention: SC, S
*The Committee **endorses** the following Arctic priority topics to guide future work of the Committee:*

(1) contribute to the development of Arctic disaster response plans to include cetaceans, building on the oil spill response plan, and mutual assistance, working with Arctic Council Working Groups (see Annex K, item 8.3) – this is the highest priority;
(2) provide updates on cetacean species that routinely occur in the Arctic, including 'seasonal' species (e.g. humpback, fin, minke and killer whales), but with a priority on endemic species (i.e. bowhead, beluga, narwhal).

(3) minimise risks to cetaceans related to anthropogenic commercial activities in the Arctic, integrate the work of various sub-committees and working groups within the Committee (e.g. BRG and HIM), as well as of working groups within other bodies, such as the Arctic Council Working Group; and

(4) work with the Secretariat and Committee members to identify colleagues active in Arctic Council Working Groups (e.g. CAFF/CBMP-Marine) and (potentially) the IUCN Cetacean Specialist Group, to increase awareness of Arctic issues and to develop common standards for pan-Arctic monitoring of Arctic-endemic cetacean populations.

*The Committee **welcomes** information that Donovan presented the work of the IWC at a meeting of the Arctic Council's PAME (see Item 4.2.1) and **encourages** ongoing engagement with the Arctic Council on marine mammal and marine biodiversity issues, as well as Arctic disaster response plans.*

The Committee re-established the intersessional correspondence group under Moore (ICG-27; for members and Terms of Reference see Annex V).

13.8.2 Review regional, national or international work on Arctic issues

A short report on national and international activities focused on the Pacific Arctic region was given and this included a description of the Distributed Biological Observatory (DBO) and the Synthesis of Arctic Research (SOAR) programs. The DBO is envisioned as a long-term ocean observatory, providing repeated sampling in biodiversity hotspots across a latitudinal gradient ranging from the northern Bering to the Beaufort Sea[18]. The SOAR program has provided the means for researchers to form cross-disciplinary teams to synthesise analyses and produce peer-reviewed papers; outcomes have included a special issue of *Progress in Oceanography*, with a second special volume of *Deep-Sea Research II* anticipated in 2017[19]. These activities, combined with the anticipated development of an Arctic-focused Marine Mammal Heath Map[20], provide the means to track the role of cetaceans in the Pacific Arctic ecosystem. Further details and discussion are in Annex K, item 13.2.

Attention: SC, G

*The Committee thanks Moore for these updates on Arctic issues and **recommends** the continuation of these integrated studies including evaluation of intrinsic and extrinsic responses.*

13.9 Marine debris[21]

13.9.1 Progress of the intersessional group

Earlier discussions highlighted the desirability of working in collaboration with other intergovernmental bodies (IGOs) and an update on such engagement on marine debris was presented (SC/66b/E12), including the recent contribution made by the IWC to the UN Open Ended Informal Consultative Process on Oceans and the Law of the Sea (SC/66b/E10)[22]. Simmonds (convenor) noted that the intersessional group's main activity had been to provide advice informing this submission. SC/66b/E12 also highlighted the desirability of collaboration with the FAO and COFI, including input to the forthcoming COFI meeting (11-16 July 2016).

Attention: SC, S

*The Committee **welcomes** the progress made on engaging with other bodies on marine debris and thanks the Secretariat for assisting in this international outreach. The Committee:*

*(a) **encourages** further international outreach and collaboration, including with the Global Partnership for Marine Litter and the Global Ghost Gear Initiative;*

*(b) **encourages** the Secretariat to continue to work with the intersessional working group on marine debris under Simmonds (ICG-28; for members and Terms of Reference see Annex V) with respect to strengthening relationships with other international bodies working on this issue;*

*(c) **recommends** that the intersessional working group works with the Secretariat to coordinate Committee input for a statement on gear marking at the forthcoming July UN COFI meeting (and see Item 7.1.1.1).*

13.9.2 New information on marine debris impact on cetaceans

SC/66b/E09 reported information on a mass stranding of 30 sperm whales that stranded along the coasts of the North Sea in 2016. Marine debris was detected in nine whales, with a total of 322 debris items collected. None of the whales died as a result of this ingested debris and it was suggested that much of the ingestion occurred in the North Sea just prior to the stranding. It is noted that there are inherent difficulties in aging floating gear, determining at what stage it might have been ingested, and determining the impacts and time sequence for decomposition of synthetic fibres by stomach acids. Further details and discussion can be found in Annex K, item 14.2.

Attention: SC, G

Noting that more information on this unusual North Sea mass mortality event will be forthcoming following analyses by scientists in the region, the Committee:

*(a) **encourages** the presentation of this material at a future meeting;*

*(b) **encourages** the evaluation for and reporting of debris in gastro-intestinal tracts of all stranded cetaceans so as to assess the species affected, the impacts and types of debris;*

*(c) **recommends** studies on tools and techniques to determine the timing of debris ingestion, whilst recognising the inherent complexities; and*

*(d) **recommends** gear marking, at short intervals along the gear, to aid in identifying gear removed from entangled whales or from the gastrointestinal tract of stranded whales[23].*

13.10 Other habitat-related issues

SC/66b/SM04 provided information on the collapse of a mine tailing dam that occurred in November 2015, which released

[18] *http://www.arctic.noaa.gov/dbo.*
[19] *http://www.arctic.noaa.gov/soar.*
[20] *http://www.nmfs.noaa.gov/pre/health.*
[21] Marine debris may also be referred to as marine litter in other organisation - for the purposes of this report, the term marine debris is used.
[22] See also *http://www.un.org/Depts/los/general_assembly/contributions71.htm.*
[23] Based on the interest in gear marking and method development to identify the origin of gear, and time in water, expressed across the Committee, work on this issue will need to be coordinated (see Annex J, item 6).

at least 34 million cubic metres of water containing iron-mining waste and construction material (including heavy metals) into the Doce River system, Minas Gerais, Brazil, an ecologically important region inhabited by the Guiana (*Sotalia guianensis*) and Franciscana dolphins (*Pontoporia blainvillei*, see Annex L, item 8.6). This catastrophic incident may significantly increase the threat level of the northern Franciscana population. Although mining operations have ceased, there is some continued leakage from the dam which the responsible party is tasked with repairing.

Attention: C-A, G, CG-R
*The Committee **endorses** the activities suggested in SC/66b/SM04 to evaluate the impact of the spill arising from the collapse of a mine tailing dam in Minas Gerais, Brazil, including implementation of:*

(a) passive acoustic monitoring in the mouth of the Doce River to ascertain the presence of cetaceans in the impacted area;
(b) short, medium and long-term monitoring of heavy metal concentrations in key components of the aquatic biota, including invertebrates, fish, turtles, seabirds and cetaceans (in the case of the cetaceans, background information on the burden of heavy metals and the use of biomarkers in tissues should be addressed as reference data); and
(c) an outreach campaign with fishermen and local communities to increase awareness of the potential impacts of the mud on the endangered dolphins.

*The Committee **expresses deep concern** about the amount of contaminated water discharged, the fact that the dam is still leaking contaminated water into the ecosystem and, moreover, that the dam is still vulnerable to additional losses. The Committee:*

*(a) **recommends** that stabilisation of the dam and work to decontaminate and restore this ecosystem should proceed as soon as possible;*
*(b) **agrees** that there is a critical need to learn from disaster situations such as this, to determine how long impacts last, what can be done to prevent such disasters in the future, and how to improve cleanup efforts and promote recovery after disasters; and*
*(c) **agrees** that injury assessment work and lessons learned from the Deepwater Horizon oil spill, should be incorporated into current Franciscana studies and if possible, other regions at risk from similar accidents should be identified and processes set in place to avoid another disaster.*

13.11 Work plan

The work plan for matters related to environmental concerns is given as Table 17.

14. ECOSYSTEM MODELLING

The report of the Working Group on Ecosystem Modelling is given as Annex L. This group was first convened in 2007 (IWC, 2008a). It is tasked with informing the Committee on relevant aspects of the nature and extent of the ecological relationships between whales and the ecosystems in which they live.

Each year, the Working Group reviews new work on a variety of issues falling under three areas:

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

14.1 Review progress on joint IWC-CCAMLR work

14.1.1 Update from CCAMLR's ecosystem monitoring and management programme (WG-EMM) on krill and its dependent predators

Currey presented the relevant items of the Observer's report from CCAMLR (IWC/66/04(2016)Rev1, Appendix F, and see also Item 4.1). With regards to the current state of the krill-based ecosystem and the krill fishery, SC-CAMLR endorsed the advice of WG-EMM that krill fishing in areas distant from land may not affect land-based predators but could affect pelagic predators such as whales, pack-ice seals, fish and other predators foraging in those areas. Full implementation of krill feedback management requires that CCAMLR is able to estimate the ecosystem effects of fishing. The CCAMLR Ecosystem Monitoring Program currently only includes land-based predators. Detecting ecosystem effects in pelagic areas may require monitoring of krill predators utilising those areas, such as cetaceans, ice seals and fish.

14.1.2 Update on planning for joint IWC-CCAMLR Workshop

In 2008, IWC and CCAMLR held a joint Workshop where data holders on krill predators and oceanography came together (IWC and CCAMLR, 2010b). Due to a prior lack of formal channels for communications, objectives and time lines, collaboration was limited. Now a formal proposal is being formed to develop multispecies models and a joint IWC-CCAMLR Workshop has been planned with a two-step approach (see appendix 2, Annex L).

Attention: SC
*The Committee **endorses** a two-step process for collaboration with CCAMLR on multispecies models, beginning with a pre-meeting Workshop before its 2017 annual meeting (see Item 25.3) to review data from 2008, discuss the types of multi-species models to meet the needs of both organisations and develop a work plan for a second Workshop in 2018. The western Antarctic Peninsula will be a focus area for modelling as it is a high priority area for krill management and there are considerable data available. An intersessional steering group under Kitakado and Kawaguchi (SG-17; members and Terms of Reference can be found in Annex V) has been established to take this work forward.*

14.2 Review other issues relevant to ecosystem modelling within the Committee

14.2.1 Individual-based energetic models

SC/66b/EM01 describes a model that uses energetics data in combination with information on feeding behaviour derived from high resolution tags that record individual whale dives and feeding lunges. The aim of the model is to use detailed data on feeding behaviour to develop a function describing the relationship between prey density and the amount of food ingested (the functional response, which is a fundamental component of ecosystem models). The model is designed to be incorporated into the individual-based energetics model (IBEM: De La Mare, 2014) which then allows for the inclusion of spatial foraging behaviour of whales moving between food patches after they are depleted

Table 17
Work plan for matters related to environmental concerns.

Item	Sub item	2017 meeting	2018 meeting
SOCER		Indian Ocean	Mediterranean and Black Seas
Pollution 2020	(a) Continue modelling of contaminants incl. potential addition of PBDEs.	(a) No	(a) Yes
	(b) National and international progress on risk and mitigation for PCBs.	(b) Yes	(b) No
	(c) Data integration and mapping.	(c) Yes	(c) Yes
Oil spill impacts	(a) Development of information resource and communication strategy.	(a) Yes	(a) No
	(b) Update on cetaceans and oil spills.	(b) No	(b) Yes
	(c) Progress on oil spill science, planning and preparedness.	(c) Yes	(c) No
Cumulative impacts	Focus sessions: Methods and techniques for assessing cumulative impacts.	No	Yes
Harmful algal blooms	Focus sessions: Synthesis of current state of science and impacts to cetaceans.	Yes	No
Marine debris	(a) Review intersessional progress and building further liaison with other international bodies (working with the Secretariat) as proves appropriate.	(a) Yes	(a) No
	(b) Planning for future workshop on plastics.	(b) No	(b) Yes
	(c) Other issues.	(c) Yes	(c) No
Diseases of concern	Progress on website and communications.	Yes	No
Strandings and mortality events	(a) Review progress of intersessional steering group, expert panel, and international stranding program development.	(a) Yes	(a) Yes
	(b) New information.	(b) Yes	(b) Yes
Noise	(a) Integrate work with that of WGWAP Noise Task Force.	(a) Yes	(a) No
	(b) Update on national and international ocean noise strategies.	(b) Yes	(b) Yes
	(c) Other issues.	(c) Yes	(c) Yes
Climate change	Planning future projects.	Yes	
Arctic issues	(a) Progress on priority topics.	(a) Yes	(a) Yes
	(b) Collaboration with Arctic Council.	(b) Yes	(b) Yes

by the feeding activities of whales. An example is given using parameters applicable to Antarctic minke whales, which shows a functional response of approximately the type II form (Holling, 1965). This IBEM can be used with multiple species to explore competition between them in when feeding on various forms of krill spatial and depth distributions and densities

The results presented were intended to be illustrative only. There is some discussion of the paper in Annex L (item 2.1).

Attention: SC
*The Committee **looks forward** to receiving further extensions of this individual-based energetic work (SC/66b/EM01) including its application to humpback and blue whales. Additional discussion and a recommendation is provided under Item 5.1.*

14.2.2 Competition among baleen whales: how can we measure and model it?

Modelling the potential for competition and competitive interactions between baleen whales has been one of primary items in the Committee. For models to be accurate, detailed knowledge about the foraging behaviour of individuals within a species is paramount. SC/66b/EM05 reports the use of state-space animal movement models to determine the foraging effort and locations of Antarctic minke whales and humpback whales in the nearshore waters of the western Antarctic Peninsula. This information will help to determine the amount of sympatry in the foraging locations of these two species and the relationship to environmental co-variates (e.g. sea ice).

Differences in the timing, duration and location of area-restricted search (ARS) for each species were found. For example, humpback whales foraged broadly across a large extent of the continental shelf area of the Western Antarctic Peninsula whereas Antarctic minke whale foraging locations were generally located inshore or where sea ice persisted, although spanning a greater spatial extent than for humpback whales. Further details are given in Annex L item 2.2.

The Committee **notes** the proximity of minke whales to sea ice and **notes** the difficulty in obtaining reliable location data in ice. Data from dive linked Limpet tags deployed on minke whales in the Ross Sea and Antarctic Peninsula may help address this and refine definitions of ARS. The Committee also discussed what could be inferred from the study about the relative foraging efficiency of humpback and Antarctic minke whales. It noted that there was relatively limited habitat for the latter and that this could further reduce under climate change. However, it also noted there appeared to be different krill density thresholds for both species based on body size, with Antarctic minke whales able to survive in areas of lower density. The potential for killer whale predation pressure to influence Antarctic minke whale habitat was also noted.

Attention: SC
*The Committee **notes** the modelling approach in SC/66b/EM01 and **agrees** that data presented in SC/66b/EM05 could enable an extension of the modelling work to humpback whales or other baleen whales in the near future. It thanked the authors of the paper and **looks forward** to receiving the next update on the work.*

Herr *et al.* (2016) reported on a helicopter survey for whales conducted concurrently to a krill survey around the western side of the Antarctic Peninsula and analysis on distribution of humpback and fin whales against a suite of environmental variables. Comparisons with whale distribution patterns showed specific relationships; fin whales were largely feeding on *Thysanoessa macrura* during the time of the survey while humpback whales occurred in areas where *Euphausia superba* dominated. Further details are given in Annex L (item 3.2) and under Item 10.15.1.

The Committee noted that this manuscript that reflected a joint effort from different projects on the same expedition. A number of interesting points were raised in the discussion in Annex M, particularly related to fin whales, including suggestions for further analyses. The Committee looks forward to further updates on this work.

14.2.3 Update on body condition analyses for the Antarctic minke whales

SC/66b/EM02 provided arguments for considering a wider suite of analysis methods than have currently been employed for considering trends in minke body condition from JARPA/JARPA II data. A simulation experiment contrasted the behaviour of Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) for model selection in the presence of mild to moderate interactions. Results showed that while AIC reliably recovered simulated trends, BIC can, in some circumstances, oversimplify a model to such an extent that it misrepresents a majority of the data on which the model is based.

Last year, the Committee encouraged scientists from Australia, Japan and Norway to collaborate to develop a set of models that best capture the Committee's previous recommendations regarding body condition of Antarctic minke whales (IWC, 2016s). To facilitate this, the Committee recommended last year that interested scientists submit a request for data through Procedure B of the Data Availability Agreement. It also recommended the data holders to respond to requests favourably. Intersessionally, there was a data request and considerable further communication amongst the requesters, the data holders and the DAG. Unfortunately, by the time of SC/66b, an agreement had not been reached despite a small group meeting of representatives of all parties in February 2016. The parties have continued to work towards an agreement.

Attention: SC, CG-A

*The Committee **recommends** the two-step process detailed under item 2.3.1 of Annex M for building a collaboration among selected Australian, Japanese and Norwegian scientists regarding body condition data from Antarctic minke whales. If good collaboration and communication has occurred during the first step and the results from re-analysis of the body condition data and the review of results its working group on ecosystem modelling encourage additional work, the Committee will recommend the provision of the relevant JARPA II data to the various scientists and ask the data holders to consider such a request favourably.*

The Committee thanks the Australian, Japanese and Norwegian scientists for coming to this agreement, and the DAG Chair, Suydam, for leading the small group's discussions to a successful conclusion. The Committee also discussed the potential value of considering other datasets such as buoyancy information from tagged whales as well as information from remote sensors, and suggested that the scientists collaborating in the analysis consider such data, where appropriate.

14.2.4 Review progress on identifying long-term datasets and relevant environmental variable datasets

There were no specific papers on the effects of long-term environmental variability on whale populations at this meeting. However, the Committee noted that the individual-based energetics model presented in SC/66b/EM01 was relevant to this issue, as was the planning for the joint IWC-CCAMLR Workshop.

Attention: SC

*Recognising the importance of the topic, the Committee **re-establishes** an intersessional steering group under Cooke (ICG-29; members and Terms of Reference can be found in Annex V) to identify long-term datasets suitable for examining the question of the effects of long-term environmental variability on whale populations.*

14.3 Other, if new information is available

14.3.1 Species distribution models (SDMs)

14.3.1.1 REVIEW PROGRESS FOR DEVELOPING GUIDELINES

An intersessional correspondence group was established last year to develop guidelines and recommendations for best modelling practices of species distribution models (SDMs); SC/66b/EM04 reported progress. The group conducted preliminary reviews of machine learning methods which are commonly used as SDMs: maximum entropy model (Maxent), genetic algorithm (GA), support vector machines (SVMs), Bayesian network (BN) and random forest (RF). The results of review, including identification of advantage/disadvantages, applications to cetacean species and software availability, are summarised in Annex M, appendix 3. The intersessional group also considered preliminary framework guidelines for SDMs applied to cetaceans.

The Committee **notes** that methods such as Maxent, that use only 'presence' data make the implicit assumption that survey effort is uniform in space, or at least uniform relative to the marginal distributions of each covariate. This is not the same as making no assumptions about effort. The Committee is aware that there are various views on this point. The Committee thanked authors of SC/66b/EM04 for a comprehensive compilation on the available modelling methods and looks forward to further updates at next year's Committee meeting. The Committee re-established the intersessional correspondence group under Becker and Murase (ICG-30; for members and Terms of Reference see Annex V).

Attention: SC, G

*The Committee **notes** the importance of species distribution models to providing advice on several conservation matters (e.g. identifying potentially high risk areas to anthropogenic threats) and:*

*(a) **recognises** that the uniform effort assumption may be acceptable in some cases, but in general **recommends** that effort be taken into account where possible (effort tends to be better quantified in cetacean datasets than in many other applications, not least because of the focus of the Committee on this aspect over many years); and*

*(b) **endorses** further evaluation of the various modelling approaches based on a common dataset.*

14.3.1.2 REVIEW PROGRESS BY NMFS

Last year, a joint pre-meeting Workshop was held between the IWC and the USA National Marine Fisheries (NMFS), titled 'Towards Ensemble Averaging of Cetacean Distribution Models' (IWC, 2016f). Approaches for model averaging, or ensemble, have been an important topic in statistical science and machine learning as a way to address model uncertainty and to achieve robustness in predictions. The Committee received a progress report on the recommendations from the Workshop and the proposed work plan from the intersessional steering group (SG).

Intersessionally, members of the SG conducted a preliminary ensemble of these models and are currently exploring the results. A number of issues were identified by this exercise, as follows: (a) determining the spatial and temporal resolution of the predictions; (b) determining whether to scale the predictions to a consistent range; (c) identifying external metrics to compare and validate the ensemble; and (d) considering how to assign weights to the different input models.

Table 18
Work plan for ecosystem modelling.

Topic	Intersessional	During the 2017 meeting	Intersessional	During the 2018 meeting
Co-operation with CCAMLR on multispecies modelling	Progress plans and hold a pre-meeting	Review plans for a joint Workshop in 2018	Progress plans and hold a Workshop	Review workshop report and recommendations and develop a work plan
Applications of species distribution models (SDMs) and ensemble averaging	Intersessional group activity	Review progress and determine a work plan	Depends on 2017	Depends on 2017
Effects of long-term environmental variability on whale populations	Intersessional group activity	Review progress and determine a work plan	Depends on 2017	Depends on 2017
Further investigation of individual-based energetics models	Continue development (including meeting recommendation under Item 5.1)	Review progress and determine a work plan	Depends on 2017	Depends on 2017
Modelling of competition among whales		Review new analyses	Depends on 2017	Depends on 2017
Update of information on krill distribution and abundance by NEWREP-A	Conduct a survey in consultation of CCAMLR specialists.	Review results of survey and analysis	Depends on 2017	Depends on 2017

Attention: SC
*The Committee **reiterates** the importance of the ensemble averaging of cetacean distribution models approach and **re-establishes** an intersessional steering group under Redfern (ICG-31; members and Terms of Reference can be found in Annex V) to further advance the recommendations from the 2015 Workshop and to report back at next year's annual meeting.*

14.3.2 Report of krill survey in NEWREP-A
SC/66b/EM03 reported the first NEWREP-A's krill survey by a dedicated whale sighting survey vessel. This krill survey was conducted along the tracklines designed for a cetacean sighting survey in Antarctic Area IV-E during the 2015/16 austral summer season. Acoustic data were recorded continuously for 31 days using a quantitative echosounder (EK80). Net samplings using a small ring net (1m in mouth diameter and 3m length) equipped with LED were carried out to identify species and size compositions of echo signs at 29 stations. Oceanographic observation was also conducted at 29 stations using a CTD. Survey design together with the preliminary krill and oceanographic results obtained in the 2015/16 season will be presented to a CCAMLR specialists' workshop (SC-CAMLR WG-SAM). Feedback from the specialists will be reflected in the planning of the 2016/17 survey.

In discussion, concerns were raised regarding the sampling gear as it was noted that the gear was not particularly well suited for krill sampling. Japanese scientists indicated that they were aware of this issue and were investigating ways to improve this. They had however managed to obtain more samples than expected in the survey, although they believed the size distribution was not representative as the main focus was to obtain species occurrence to compare with the echosounder. Japanese scientists reported that future surveys may include an additional survey vessel, allowing for greater coverage. It was further noted that this survey could provide information on species interactions.

Attention: SC
*The Committee **welcomes** the information on NEWREP-A krill surveys and **encourages** further work on the survey and its design by Japanese scientists in consultation of CCAMLR specialists.*

14.4 Work plan
The work plan related to ecosystem modelling is given as Table 18.

15. SMALL CETACEANS
The report of the Committee on Small Cetaceans is given as Annex M.

15.1 Taxonomic status and population structure of *Tursiops* spp. for the North Atlantic (including the Mediterranean, Black and Caribbean Seas and the Gulf of Mexico) and South Atlantic
In 2014 (IWC, 2015k), it was agreed that the priority topic would be a review of taxonomy and population structure in the genus *Tursiops*, to be conducted in stages over several meetings. The aim was to develop a taxonomy assessment framework for small cetaceans and review available information.

Bottlenose dolphins are among the most widely distributed cetaceans. Factors contributing to taxonomic uncertainty in this genus include a wide distribution across highly variable environments, variability within locally adapted populations, sympatry of various forms in some regions, a lack of specimens from many regions, and differences in research methods and designs (Wang and Yang, 2009). Worldwide, more than 20 different *Tursiops* species have been described historically but only two (*T. truncatus* Montagu 1821 and *T. aduncus* Ehrenberg 1832) are widely recognised.

Last year (IWC, 2015k), the Committee reviewed taxonomy and population structure of bottlenose dolphins (*Tursiops* spp.) in the Indo-West Pacific including China, southern Japan, Taiwan, Australian waters, New Zealand and Oceania, the eastern Bay of Bengal, Bangladesh, and the east coast of Africa from the Red Sea to South Africa. The purpose of the review was to clarify understanding of *Tursiops* taxonomy across the region in general, and in particular the relationship of '*T. australis*' to other taxa.

This year, the Committee reviewed the taxonomy and population structure of bottlenose dolphins (*Tursiops* spp.) in the Atlantic Ocean, Atlantic oceanic islands and the Mediterranean and Black Seas.

Specific objectives of this second phase were to clarify:

(1) taxonomic status of *Tursiops* spp. in the western and eastern North Atlantic regions with particular attention to the near-shore (coastal) and offshore (pelagic) types;
(2) taxonomic status of *Tursiops* spp. in the western South Atlantic considering the different morphotypes reported from this region;
(3) distribution and status of *Tursiops* populations in the eastern South Atlantic and of island-associated *Tursiops* populations in the Atlantic;

(4) identity of the *Tursiops* population(s) in the Mediterranean in relation to the adjacent eastern North Atlantic population; and
(5) taxonomic status of Black Sea bottlenose dolphins currently considered a subspecies, *T. truncatus ponticus.*

The Committee review of available information showed that minimal data are available on the ecology and taxonomic status of *Tursiops* sp. in the eastern South Atlantic, although it is assumed they are all *T. truncatus*. More work in this region is needed. For the eastern North Atlantic, convincing evidence was presented of offshore and coastal ecotypes and of population structure, but mtDNA haplotypes were shared and no differences in external morphology were detected (Louis *et al.*, 2014a; 2014b). A morphometric analysis paired with genetics would improve understanding of *Tursiops* taxonomy in the eastern North Atlantic. Bottlenose dolphins occur around many oceanic islands of the Atlantic Ocean, although limited data are available from many locations. One publication on genetic differentiation between the Azores and Madeira (based on mtDNA control region sequences) found no evidence for population differentiation and the haplotypes found are common in North Atlantic pelagic populations.

Morphological and genetic analyses of samples from the Black Sea, Mediterranean Sea and eastern North Atlantic have been performed (Natoli *et al.*, 2005). *Tursiops* in the Black Sea exhibit strong morphological differences from those in the Mediterranean and elsewhere, and these differences formed the underlying basis for the original subspecies designation. A recent re-analysis of morphology confirmed the distinctiveness of Black Sea bottlenose dolphins, while analysis of mtDNA control region haploytpes revealed shared haplotypes among the Black Sea, Mediterranean and eastern North Atlantic (Viaud-Martinez *et al.*, 2008). Population structure is also seen within the Mediterranean (Natoli *et al.*, 2005) where part of this structure can be explained by differentiation between offshore and inshore populations that matches the difference in oceanographic characteristics between basins (Gaspari *et al.*, 2015).

Two distinct morphotypes of *Tursiops* are present in the western North Atlantic. Morphological and ecological differences have been documented between a smaller coastal form and a larger offshore form (Mead and Potter, 1995). Ongoing genetic analyses have revealed significant genetic differentiation for mtDNA, microsatellites, major histocompatibility complex genes, and amplified fragment length polymorphism (AFLP) markers. The mtDNA control region and mitogenome sequences, AFLP data, and preliminary genomic data yield reciprocally monophyletic clades. These latter suggest a relatively deep divergence time for the coastal morphotype in the western North Atlantic.

The papers reviewed at this meeting indicated that there is significant morphological differentiation in the western South Atlantic between a large coastal form and a smaller offshore form, indicative of subspecies-level differences. The two morphotypes are parapatric along the coast from southern Brazil to northern Argentina. To date, analyses of mtDNA control region sequence data have not found shared haplotypes between the two morphotypes. However, a network analysis did not reveal complete separation of haplotypes corresponding to *a priori* identification of offshore and coastal samples. Further analysis of nuclear data to examine the possibility of introgression between the two forms, as suggested by microsatellite data, is necessary. In Argentina, the frequency of sightings has decreased since the 1980s, the species is now absent from previously inhabited areas, and current estimates indicate that there could be fewer than 200 bottlenose dolphins in Argentina. How the changes in distribution and/or abundance are related to local ecosystem variability is unknown. In addition, reproductive success appears to be depressed.

Attention: SC, CG-A
*The Committee **notes** that Vermeulen and Bräger (2015) had suggested that reproductive problems were having a severe effect on coastal bottlenose dolphins in Argentina, which may number as few as 200 animals. The Committee **recommends** that an updated assessment of these populations is undertaken to obtain a current estimate of status. Such an assessment should include an estimation of the rate of decline and an examination of causal factors with one focus on the apparently reduced reproductive success.*

The Committee discussed a framework for making cetacean subspecies distinctions proposed in an unpublished manuscript (Taylor *et al.*, In review). The paper suggests guidelines for which types of data should be included when formulating a taxonomic argument, and is aimed at promoting consistency when using genetic data to examine taxonomic questions for cetaceans. It also focuses on: (1) the use of the mitochondrial DNA control region for making taxonomic distinctions at subspecies and species levels; and (2) qualitative and quantitative benchmarks for identifying levels of genetic divergence, along the continuum from population to species that correspond to subspecies- and species-level delineation. The authors evaluate possible threshold values that might be used to guide and test taxonomic hypotheses and provides a flow chart that incorporates these quantitative thresholds with qualitative ones to help evaluate cases that fail to meet the divergence or diagnosability threshold criteria.

The proposed guidelines and standards elicited discussion of various issues relevant to the current review of *Tursiops* taxonomy. There has been a shift away from use of mtDNA alone since so many new molecular approaches are now being used. Nevertheless, the use of mtDNA sequences alone is still concordant with current usage by the SMM Committee on Taxonomy (one or two independent lines of evidence for subspecies and species, respectively).

Attention: SC, G
*With respect to cetacean sub-species distinctions, the Committee **agrees** that:*

(a) complementary datasets including genetic markers, morphometrics, demographic analyses, ecological and behavioural data (including acoustics), and discontinuities in distribution provide valuable context for making taxonomic distinctions;
(b) caution should be used when attempting to combine results from some types of markers across laboratories;
(c) that the stepwise approach proposed by Taylor et al. *(In review) is useful for making taxonomic distinctions, bringing in additional markers in order to resolve ambiguities when necessary; and*
(d) that another good approach is to use mtDNA control region sequence data to formulate a taxonomic hypothesis, then identify an appropriate sample design, marker(s) and analytical tool(s) needed to test that hypothesis.

Table 19
Summary of projects recommended to be funded by the Voluntary Fund for Small Cetacean Research, and their Principal Investigator (PI).

PI	Project title
Heinrich	First region-wide estimates of population size and status of endemic Chilean dolphins (*Cephalorhynchus eutropia*) in southern Chile (F).
Lai	Assessment of online information as a tool to improve the documentation of the availability of marine mammals for consumption and other uses in southern China (F).
Weir	Assessing the conservation status of the Atlantic humpback dolphin (*Sousa teuszii*) in the Saloum Delta, Senegal (P).
Sanjurjo	Business model to save vaquita from extinction while improving fishermen livelihoods in the Upper Gulf of California (P).
Khan	Abundance survey for Indus river dolphin (P).
de Castro	Unpacking the catfish-dolphin nexus: The social dimension of river dolphin as bait in the Brazilian Amazon and outlooks for a participatory plan for dolphin-safe piracatinga fishing (IA).
Oremus	Implementing a protocol to monitor the drive hunt of dolphins in Fanalei village, Solomon Islands (IA).

Key: F=full funding, P=partial funding, IA=if additional funding is available.

The Committee noted that this was the second of a proposed three-year evaluations of the taxonomy of bottlenose dolphins and discussed how the review could be completed.

Attention: SC
*The Committee **agrees** that at its next meeting, it will complete its evaluation of bottlenose dolphin taxonomy by covering: (a) the northeast, southeast and northwest Pacific and the Pacific oceanic islands; and (b) any new information from areas covered in 2015 and 2016. It also **agrees** that work will be undertaken by an intersessional group under Natoli (ICG-32; for members and Terms of Reference see Annex V) to prepare for a worldwide comparison of Tursiops taxonomy to be reviewed next year, which may then be further explored at a proposed intersessional workshop to be held in early 2018 (see Item 25.3). This matter should be considered in conjunction with the Working Group on Stock Definition.*

15.2 Report on the Voluntary Fund for Small Cetacean Conservation Research

In 2015, donations to the Voluntary Fund for Small Cetacean Conservation Research totalling £76,089 were received from the Governments of Italy, the Netherlands, Switzerland, and the United Kingdom as well as from Whale and Dolphin Conservation (WDC), WWF International, World Animal Protection, Pro Wildlife and Campaign Whale. The Committee expresses its sincere gratitude for these contributions.

The call for new proposals was circulated to the Scientific Committee and advertised at the end of March 2016 on the IWC web site that also details the review process[24]. The Secretariat received 20 project proposals and the appointed Review Group followed the review process (IWC, 2012a). The Review Group placed a high priority on the relative contribution to important conservation issues made by each project proposal and recommended seven proposals to the Committee for potential funding (see Table 19). The selected projects will be included in the Scientific Committee's budget as given in its report to the Commission under the heading of a specific request to the Voluntary Research Fund for Small Cetaceans.

Attention: SC, S, C-R, CG-A, CC
*The Committee **notes** the great contributions to cetacean conservation the projects funded thus far under the Voluntary Fund for Small Cetacean Conservation Research have made. Following the advice of the Review Group, the Committee **recommends** the seven projects shown in Table 19 for the Commission's consideration for funding.*

*The Committee **agrees** that should sufficient funds be made available, the next call for proposals should occur in 2018. It **requests** that serious efforts be made by the Secretariat and Committee members to build up the fund and **encourages** member nations and NGOs to consider additional contributions.*

15.3 Progress on previous recommendations

The Scientific Committee has increasingly expressed concern and recommended conservation and management measures regarding different Critically Endangered species, subspecies and populations of cetaceans. Such cases include the vaquita, Māui dolphins and the already extinct baiji. The Scientific Committee has repeatedly recommended stringent management measures rather than additional research and has clearly specified the geographical boundaries within which impacts need to be managed or avoided. However, there has often been insufficient or no management response to the recommended protection measures. Instead of implementing effective management actions, efforts have focussed on more research, often leading to merely confirming a severe decline rather than preventing it. For example, in 2013 and 2014, the Scientific Committee was very clear regarding the need to eliminate by-catch immediately and not wait to collect more data for a number of cases considered below. Further research may continue but should not be interpreted as a substitute for management action. All the scientific results underline that the first priority should be to implement immediate management actions to eliminate bycatch, accompanied by research and monitoring to determine the effectiveness of these measures.

15.3.1 Vaquita

CIRVA REPORT

Last year (IWC, 2016u) Rojas-Bracho reviewed developments in vaquita conservation in Mexico and reported on a recent dramatic escalation of illegal fishing and trade of totoaba (*Totoaba macdonaldi*) in the Upper Gulf of California, Mexico. The fishing for totoaba, (a CITES Appendix I croaker species) involves the use of large-mesh gillnets which present a high entanglement risk to vaquitas. The fishery is driven by the high price of totoaba swim bladders in the black markets of China.

The 7th meeting of the International Committee for the Recovery of the Vaquita (CIRVA-7) took place in Ensenada, BC, Mexico, 10-13 May 2016. Previous estimates of vaquita abundance were 567 (95% CI 177-1,073) in 1997 and 245 (95% CI 68-884) in 2008. The estimated total abundance in 2015, based on the combined results of a visual line transect survey and static passive acoustic monitoring, was 59 (95% CI 22-145). This indicates a population decline between 1997 and 2015 of 92% (CI 80%-97%). This is of utmost concern.

[24] *https://iwc.int/sm_fund.*

The passive acoustic method has proven to be the most reliable way to monitor trends in the vaquita population. Jaramillo presented the latest results of this program indicating an average yearly rate of decrease of 0.34 (95% CI: 0.21-0.48). From 2011 to 2015, the vaquita population decreased by 80% (95% CI: 62-93%).

The full text of the CIRVA-7 report (including detailed recommendations) is given in Annex M, appendix 4 [online only]. In conclusion, CIRVA stress that the only measure that will save the vaquita is to make the current two-year partial ban on gillnets permanent and effective throughout the species' range.

Attention: CG-R, C-A

OVERARCHING STATEMENT

Recalling what happened with the Baiji, the members of the Committee are deeply upset that the vaquita could actually become extinct in a very short time. The Committee first became concerned about the status of the vaquita more than 40 years ago (IWC, 1975), and has with increasing severity repeatedly recommended elimination of gillnets to reduce bycatch to zero. The only hope at this stage is that the Mexican government will move quickly and decisively to make the two-year partial gillnet ban permanent before it expires in less than a year (May 2017), and that enforcement is strengthened to the maximum possible extent. ***The choice is simple and stark****: either gillnetting in the Upper Gulf ends or the vaquita will be gone - the second entirely preventable cetacean extinction that the Committee will have witnessed in the last ten years.*

The Committee ***recognises with dismay*** *the critical nature of the situation expressed in the CIRVA-7 report (see Annex M, appendix 4 [online only],* ***strongly endorses and adopts*** *its recommendations and* ***urges*** *their immediate implementation.*

Attention: CG-R, C-A, CC

The Committee ***commends*** *the Government of Mexico for the major actions it has taken to conserve vaquitas through a two-year partial gillnet ban and associated enforcement and the compensation programme to support local fishing communities. The Committee also* ***commends*** *the Government of Mexico for providing substantial support to the visual and acoustic abundance survey that was completed successfully in 2015 and for offering to fund the acoustic monitoring program through 2018. The results of this research confirm a catastrophic decline of some 80% between 2011 and 2015 and an abundance in 2015 of 59.*

The Committee views with alarm the recent escalation of the illegal totoaba fishery and illegal international trade of totoaba swim bladders, which has continued despite the strong enforcement efforts in the Upper Gulf of California. The Committee ***recommends and reiterates*** *that:*

(a) as a matter of utmost urgency, enforcement efforts are strengthened, against both illegal fishing in Mexico and totoaba smuggling out of Mexico and into transit and destination countries;
(b) there is an urgent need to remove active and ghost gillnets from the range of the vaquita - this is an insidious, invisible and existing threat;
(c) the Governments of Mexico and the United States consult closely on the continuing illegal international trade in CITES Appendix I totoaba, noting the opportunity afforded by the CITES Conference of Parties (CoP) later in 2016 to further address the additional losses of the critically endangered vaquita caused by this trade;
(d) the illegal trade is also being progressed through the territories of other nations - it ***calls*** *on those these nations to do everything in their power to interdict it with the goal of enhancing both enforcement and awareness;*
(e) the IWC Executive Secretary send letters to the CITES Secretariat and to appropriate Chinese authorities expressing the Commission's strong concern about the impact of the illegal totoaba trade on the vaquita; and finally that
(f) it is essential to maintain, properly funded, the acoustic monitoring programme as a key action in support of any recovery strategy.

The Committee ***respectfully requests*** *that the Government of Mexico provide a report to SC/67a on further vaquita conservation efforts.*

15.3.2 Yangtze finless porpoise

Recent information was received intersessionally from Wang Ding on *ex situ* conservation efforts for the Critically Endangered Yangtze finless porpoise (*Neophocaena asiaeorientalis asiaeorientalis*). While *ex situ* conservation has been seen as an important strategy for endangered terrestrial animals, it is still controversial for cetaceans. The Tian-E-Zhou Oxbow 'semi-natural reserve' in China is considered to provide seed or source population for future releases when ecological conditions in the porpoises' natural habitat have improved. A census completed in late November 2015 revealed that the population had increased by 108% over the previous five years. Four animals (two male, two female) have been selected to seed a new *ex situ* population in He-Wang-Miao Oxbow.

Attention: CG-R, C-A, CC

Whilst it ***welcomes*** *the positive news of the ex-situ breeding programme, the Committee:*

(a) ***reiterates*** *its previous recommendation that every possible effort be made to protect Yangtze River finless porpoises in their natural riverine and lacustrine habitat; and*
(b) ***recommends*** *that steps be taken to: (1) identify river and lake segments with the highest porpoise concentrations and enforce appropriate, year-round protection measures (including fishing bans); (2) vigorously enforce a basin-wide prohibition of electro-fishing and other fishing activities known to threaten porpoises; (3) vigorously enforce regional and seasonal closures of sand-mining; (4) strengthen pollution control measures; and (5) ensure that before any further modification of the natural flow regime (or other natural features) of the Yangtze ecosystem are allowed to take place, the implications for finless porpoise and other affected species are investigated and taken into account.*

15.3.3 Hector's dolphin

15.3.3.1 REVIEW OF ABUNDANCE ESTIMATES

The Committee agreed at last year's meeting to review the abundance estimates for Hector's dolphins intersessionally (IWC, 2016t, p.365). A formal process was established intersessionally following IWC procedures for such review including the creation of an Intersessional Expert Group (IEG) and an Intersessional Correspondence Group (ICG). The IEG consisted of independent experts who were asked to review the abundance estimates produced by Mackenzie

and Clement (2014a; 2014b; 2016a; 2016b). The ICG was available in an advisory role for the IEG. The IEG report describes this in more detail and can be found in Annex M, appendix 2.

Palka presented a summary of the IEG report. The IEG reviewed the Mackenzie and Clement (2014a; 2014b; 2016a; 2016b) papers which estimated the abundance of Hector's dolphins around the South Island, New Zealand (excluding sounds and harbours) to be 14,849 (CV:11%; 95% CI 11,923-18,492).

The IEG recognised that this study accounted for many difficulties that also affect other small cetacean abundance estimation studies using aerial surveys. It commended the ambitious and often innovative work undertaken by the authors to attempt to deal with all of those issues. After an in-depth review of the survey design, analyses and results, the IEG endorsed the abundance estimates and concluded that the estimates accurately reflected the data, were derived from appropriate data collection and analysis methods, and represented the most current abundance estimate for Hector's dolphins around the South Island. Thus, they believed that it follows that it would be reasonable to use them to inform a management plan. The IEG also considered this study to be a step forward in the development of survey methodology more generally. Full details of the discussion within SM concerning the IEG report can be found in its respective section in Annex M.

The Committee acknowledges and thanks the members of the IEG for their efforts in reviewing the methods used to estimate Hector's dolphin abundance, and for the contributions of members of the ICG to this process.

The Committee encourages further work to consider the suggestions and recommendations in the IEG report on how to improve aerial survey methods generally.

Attention: SC, G, CG-A, CC

*The Committee **notes** the intensive work undertaken since last year to review the aerial survey data and analyses from New Zealand. The Committee **endorses** the abundance estimate for Hector's dolphins around the South Island, New Zealand (excluding sounds and harbours) of 14,849 (CV: 11%; 95% CI 11,923-18,492) and **considers** it reasonable to inform management.*

*The Committee also **encourages** further work to consider the suggestions and recommendations in Annex M, appendix 2 on how to improve aerial survey methods generally.*

15.3.3.2 MĀUI DOLPHIN

SC/66b/SM12 is an annual update on New Zealand's research and management approach on Māui dolphins (*Cephalorhynchus hectori maui*), describing the management measures, data collection and research activities. Further background on the status of Māui dolphins can be found in SC/66b/SM03. The current measures cover threats such as set net, trawl and drift net fishing, seismic surveying, and seabed mining. A programme of ongoing data collection and research is currently underway, including observer coverage for set net and inshore trawl fishery. During the reporting period, there were no observer- or fisher-reported captures in commercial or recreational fisheries, no beach-cast dolphins, and no reported ship strikes.

A Māui dolphin Research Advisory Group comprising researchers, stakeholders and government officials was established by the New Zealand Government in 2014. It developed a Māui dolphin five-year strategy and research plan, and will review progress towards fulfilling the plan each year. For current research, the highest priorities identified are abundance surveys at intervals of not more than five years, investigation of offshore distribution (passive acoustic monitoring) and alongshore distribution in the south of the subspecies range (aerial surveys).

The method chosen to obtain sufficiently precise abundance estimates was genotype mark-recapture based on biopsy sampling. To reduce disturbance to animals, samples are collected in the first year (marking) and second year (re-capture). The following three years no biopsies are taken. The Committee **notes** that one of the main challenges is how to assess trends in this population, and agreed that improvement of existing tools (i.e. power analysis) to reduce uncertainty and minimise the time required to detect population change would be useful.

SC/66b/SM13 reviewed the genetic monitoring of Māui dolphins (Baker *et al.*, 2013; Hamner *et al.*, 2014a; 2014b) and provided an update on boat-based surveys that have collected biopsies in 2015 (40 samples) and 2016 (44 samples). Laboratory analysis is currently underway to complete DNA profiling of the 2016 samples and for matching genotypes to the 2015 samples.

During discussion, the Committee **notes** that the observer coverage over the entire range of Māui dolphins (from Maunganui Bluff to Whanganui in the south, offshore to 20nm and including harbours) was 12.7% for the set net fishery (for vessels >6m length) and 14.6% for the trawl fishery. It was explained by New Zealand that the monitoring goal of the observer coverage is not to quantify bycatch but rather to detect it. Even a single bycatch event would be seen as a threat to the population and would likely lead to immediate review, and possibly revision, of the Threat Management Plan.

Attention: CG-R, C-A, CC

*The Committee **welcomes** the update on research on Māui dolphins provided but noted that no new management actions had been enacted since 2013. Given the information presented this year, the Committee **concludes**, as it has repeatedly in the past, that existing management measures in relation to bycatch mitigation fall short of what has been recommended previously and **expresses continued grave concern** over the status of this small, severely depleted subspecies. The human-caused death of even one individual will increase the extinction risk. The Committee:*

*(a) **re-emphasises** that the critically endangered status of this subspecies and the inherent and irresolvable uncertainty surrounding information on most small populations point to the need for precautionary management;*

*(b) **reiterates its previous recommendation** that highest priority should be assigned to immediate management actions to eliminate bycatch of Māui dolphins including closures of any fisheries within the range of Māui dolphins that are known to pose a risk of bycatch to dolphins (i.e. set net and trawl fisheries); and*

*(c) **notes** that the confirmed current range extends from Maunganui Bluff in the north to Whanganui in the south, offshore to 20 n.miles, and it includes harbours - within this defined area, fishing methods other than set nets and trawling should be used.*

*The Committee again **respectfully urges** the New Zealand Government to commit to specific population increase targets and timelines for Māui dolphin conservation, and again **respectfully requests** that reports be provided annually on progress towards the conservation and recovery goals.*

15.3.4 River dolphins of Amazonia

SC/66b/SM21 reviews the biology of the Araguaian boto, which is restricted to a 1,500km stretch of the Araguaia River, other riverine habitats of the Araguaia-Tocantins Basin and mangrove habitats in the Marajó Bay, Brazil (Siciliano *et al.*, 2016). The Tocantins Basin has been significantly altered over the past few decades by dams, deforestation and the use of Agent Orange and these factors are likely to be detrimental to the long-term population viability. The boto population in the Tocantins Basin is believed to be isolated from the Amazon River population and thus constitutes a distinct population and possibly a separate subspecies or species.

Attention: SC, C-A, CG-A

*The Committee **agrees** that with respect to river dolphins from Amazonia:*

(a) Araguaian botos will be given a higher priority on its agenda; and

*(b) **requests** that Brazilian scientists and authorities from the region provide more information on its status and threats to next year's meeting.*

The Committee has expressed concern in the past about the use of *Inia geoffrensis* and *Sotalia fluviatilis* as bait for the piracatinga (*Calophysus macropterus*) fishery in the Amazon Basin and requested that the Brazil Government provide regular progress reports on its efforts to combat this practice. A five-year moratorium on the fishing and marketing of piracatinga in Brazilian waters started from January 2015. Some enforcement efforts have taken place and others are planned, and Brazilian representatives reported that efforts are also being made to coordinate with Colombia which is the main import market for piracatinga. However, reports have been received (see Annex M) that dolphins continue to be used as bait in the piracatinga fishery in at least one area (Mamiraua Reserve, Brazil) and the incidental dolphin mortality in gillnets continues unchecked.

Attention: CG-A, CC

Given its documented concern about the use of Inia geoffrensis and Sotalia fluviatilis as bait for the piracatinga fishery in the Amazon Basin, the Committee:

*(a) respectfully **requests** the Government of Brazil to provide detailed information to the next meeting on the piracatinga/Inia issue – to assist Brazil an intersessional working group (SG-18 under Zerbini; for members and Terms of Reference see Annex V) has been established to provide guidance on what to include in its next progress report on river dolphins; and*

*(b) **encourages** collaborative efforts among the range states, and requests further information from range countries in addition to Brazil (Bolivia, Colombia, Ecuador, Peru and Venezuela).*

15.3.5 Franciscana

SC/66b/SM05 reports on the 8th workshop for research on and conservation of the franciscana (*Pontoporia blainvillei*). At SC/66a and the joint meeting of the Conservation and Scientific Committees in San Diego, Argentina and Brazil expressed their intention to nominate the franciscana as a candidate for an IWC Conservation Management Plan (CMP). To do this, the Franciscana Consortium organised the 8th workshop held in Sao Francisco do Sul, Brazil, in October 2015. It focussed on these priority actions: (1) monitor abundance, trends and bycatch; (2) mitigate bycatch; (3) develop and implement protected areas; (4) encourage the adoption and implementation of the National Action Plan to Reduce the Interactions of Marine Mammals with Fisheries in Argentina; (5) develop a strategy to increase public awareness of the franciscana; and (6) include the franciscana in bilateral and multilateral discussions. All these actions will be incorporated into the draft CMP.

Attention: C-A, CG-R, CC

*The Committee **endorses** the report provided research on and conservation of the Franciscana (SC/66b/SM05) and **reiterates** that the franciscana is a good candidate to be put forward for the CMP process. It **recommends** that monitoring of bycatch and assessment of the extent and other characteristics of fisheries in the franciscana's range be considered as high priorities.*

15.3.6 Sousa

The genus *Sousa* has been a priority topic of this Committee for some years. The status of *Sousa* species has been reviewed recently by the IUCN and two extensive volumes of work have been published synthesising all information to date. An exercise to measure the progress of previous Committee recommendations relevant to this genus was conducted intersessionally and resulted in an overview of current knowledge gaps. Virtually all previous recommendations related to the genus *Sousa* are still relevant as none have yet been completely fulfilled for details see item 8.6 of Annex M.

Attention: G, C-A, CG-A, CC

Given the lack of progress on its previous recommendations of the genus Sousa*, the Committee **recommends:***

(a) an urgent focus on its previous recommendations which pertain to understanding the conservation status of Sousa teuszii *throughout its known and suspected, range so that protection measures can be implemented;*

(b) that more effort be placed throughout the range of the genus on estimating mortality from by-catch and other anthropogenic sources, and designing and implementing effective mitigation (this will require collaboration between the sub-committee on small cetaceans and the working group on non-deliberate human-induced mortality; and

(c) expansion of the existing network of researchers and NGOs working with Sousa *spp. to include all such entities who might be able to archive samples for genetic analyses and prioritise dedicated research studies in areas at the edges of suspected population ranges to better define population boundaries, structure and connectivity.*

15.3.7 Killer whales

The Committee welcomed the report on Annex 2 of SC/66b/SH10 (pp.23-33) which summarises progress of the IWC-SORP project: 'Distribution, relative abundance, migration patterns and foraging ecology of three ecotypes of killer whales in the Southern Ocean' since SC/66a. The Committee **encourages** continuation of this work.

15.3.8 Harbour porpoises

In order to save the critically endangered harbour porpoise population of the Baltic proper, the Committee has recommended as a matter of urgency that all countries adjoining the Baltic Proper assess and mitigate bycatch and

other anthropogenic mortality, including consideration of cumulative effects throughout the range of the population, by:

(1) implementing independent fishery observer schemes (in compliance with EC regulation 812/2004) and setting in force the JASTARNIA plan developed by ASCOBANS (ASCOBANS, 2009);
(2) monitoring population abundance;
(3) monitoring the health status of the population through stranding networks and necropsies of collected carcasses;
(4) developing and finalising effective management plans for designated Natura 2000 sites in the Baltic Sea and facilitate quick implementation and enforcement;
(5) banning fishing practices associated with a high risk of cetacean bycatch in Natura 2000 sites;
(6) immediately implementing management actions to reduce bycatch (i.e. strictly applying a precautionary approach in the absence of bycatch estimates); and
(7) encouraging, promoting and funding the use of alternative fishing methods throughout the population's range.

The main objective of the Static Acoustic Monitoring of the Baltic Harbour Porpoise (SAMBAH) project was to estimate density, abundance and distribution of the harbour porpoise population in the Baltic Proper (SC/66b/SM22). Details can be found in Annex M. The resulting summer (May-Oct.) abundance estimate of the Baltic Proper population is 497 animals (95% CI 80-2,091), which confirms that this population is critically endangered. International surveys suggest no recovery of the population over the past 22 years, with unsustainable by-catch as the major source of anthropogenic mortality.

Attention: C-A, CG-R, CC
Given its documented concern about the status of the critically endangered Baltic Proper harbour porpoises, the Committee:

(a) ***recognises*** *the great importance of the Static Acoustic Monitoring of the Baltic Harbour Porpoise (SAMBAH) project; and*
(b) ***recommends*** *that range states work to ensure that a follow-up research project on this population is funded; and*
(c) ***reiterates*** *its previous recommendations on conservation actions.*

15.4 Takes of small cetaceans

15.4.1 New information on takes

The Committee received the summary of takes of small cetaceans in 2015 extracted from this year's online National Progress Reports and prepared by Hughes of the IWC Secretariat (see Annex M, Appendix 3).

15.4.1.1 DIRECT TAKES

No direct takes of small cetaceans were reported in the 2016 National Progress Reports. The content of the Japan Progress Report on Small Cetaceans, a public document available from the website of the Fishery Agency of the Government of Japan[25], was summarised in Annex M.

Attention: S, C-A, CG-A
Noting the importance of information on direct takes as one part of understanding status, the Committee ***requests*** *the Commission and the Secretariat to encourage all member countries and IGOs (e.g. NAMMCO) to submit routinely information on direct takes.*

The Committee also ***reiterates*** *its longstanding recommendation that no small cetacean removals (live capture or directed harvest) should be authorised for any population until a complete and up-to-date assessment of sustainability has been completed.*

15.4.1.2 ACCIDENTAL TAKES

The Committee notes that the Terms of Reference for the Working Group on Non-deliberate Human-Induced Mortality (HIM) now include small cetaceans and, as such, some recommendations of the Committee on small cetaceans (SM) pertaining to high incidental catches were dealt with in a joint session of HIM/SM (see Annex J).

15.4.2 Poorly documented hunts of small cetaceans for food, bait or cash

SC/66b/SM01 and SC/66b/SM02 reported on the consumption and use of small cetaceans in West Africa and Latin America. Hunting of small cetaceans for human consumption and other uses (sometimes referred to as 'marine or aquatic bushmeat) constitutes a substantial and immediate threat to some species and populations. While in many cases the practice of consuming cetacean products likely began opportunistically, in some countries it has evolved to include directed catches which are sometimes thought to be at unsustainable levels.

Intersessional work on the issue of poorly documented takes of small cetaceans for food, bait and other uses continues. Two workshops, both in Asia, will have been conducted by the end of 2016. The first will include multiple stakeholders, managers, law enforcement officials, social scientists and ecologists, particularly those who have been involved in terrestrial bushmeat issues. The second will be attended by Southeast Asian regional strandings programme coordinators and marine mammal biologists and focus on exploring a variety of investigative tools which will better define the prevalence of the use and/or trade of small cetaceans for food, bait or other uses. It is intended that detailed work plans will be developed during this second workshop for specific areas in Asia.

Attention: SC, S, CC
With respect to the issue of poorly documented takes of small cetaceans for food, bait and other use, the Committee:

(a) ***notes*** *that the IWC is developing multiple databases across different Committees and working groups and* ***agrees*** *that the possibility of either a database (or dedicated fields within another database) for the 'aquatic bushmeat' issue should be investigated by the convenors and the Secretariat;*
(b) ***recommends*** *that formal liaison on this issue between the IWC and other international bodies, such as CMS and CBD, be pursued by the Secretariat; and*
(c) ***establishes*** *a Steering Group under Porter (SG-19; members and Terms of Reference are in Annex V) to forward this issue.*

15.5 Other

15.5.1 Other scientific information

15.5.1.1 SOUTH ASIAN RIVER DOLPHINS

South Asian river dolphins (*Platanista gangetica*) face serious threats across their range. These include, most

[25] *http://www.jfa.maff.go.jp/j/whale/w_document/pdf/h25.pdf.*

obviously, fishery impacts (bycatch or targeted killing) and altered and declining river flows. Kelkar described recent studies testing the hypothesis that fishery impacts on river dolphins are aggravated by declines in water availability (river flows) in two highly distinct ecological settings: the Ganga River (India) and the Karnali River (Nepal). His initial results suggest that basin-wide flow regimes should be managed to meet ecological needs, including recognition of the link between river dolphin population status and fishing intensity. At the same time that water levels are in the subcontinent historically low (especially in 2015-16), ecologically threatening interventions are underway and more are planned in India. Specifically, the National Waterways Act (2016) calls for the conversion of 111 river reaches into waterways for inland navigation and goods transport (for coal, fuel, bulk cargo, hazardous goods, etc.). This development will involve capital and maintenance dredging and the construction of ports, large embankments, navigation locks and possibly barrages, all of which are likely to have serious implications for dolphins and their habitat. Although populations of the Indus subspecies in Pakistan (*P. gangetica minor*) persist despite a series of barrages there, they are also under potential threat from a recently proposed commercial waterway on the Indus River.

Attention: C-A, CG-A, CC
The Committee ***expresses serious concern*** *for the survival of river dolphins in India given new information presented at this meeting, especially with respect to the National Waterways Act (2016). It therefore:*

(a) ***encourages*** *the Indian Government to ensure greater and more regular scientific representation at Committee meetings; and*
(b) ***agrees*** *that* P. gangetica *(and other river dolphins) will be considered as a potential priority topic at a future meeting;*

The issue of a 'Task Team' for South Asian river dolphins is discussed under Item 15.5.2.

15.5.1.2 ARTISANAL FISHERIES AND CETACEANS IN KUCHING BAY, SARAWAK, EAST MALAYSIA

SC/66b/SM09 provided details of surveys using line-transect and photo-identification methodology that were conducted in Kuching Bay, Sarawak, Malaysia between 2011 and 2013. The aim of this work is to record and quantify the scale and nature of artisanal fishing activity through interview surveys and direct observations. The results indicate strong overlap between the primary fishing areas and the preferred habitats of Irrawaddy dolphin and finless porpoises. Accidental bycatch is prevalent, with the Irrawaddy dolphin being the most commonly caught species. However, the high proportion of attended *vs*. unattended nets, the fishermen's reported positive perception of cetaceans, and their reported willingness to release dolphins from nets give cause for optimism in the potential effectiveness of targeted action with fishermen to reduce cetacean mortality from by-catch. The project was funded by the Voluntary Fund for Small Cetaceans and a full report can be found on the IWC website[26].

The Committee commends this work and hopes to see it further developed to test the effectiveness of the bycatch mitigation measures proposed in the paper.

[26] *https://iwc.int/sm_fund.*

15.5.1.3 GENETIC STRUCTURE OF THE BEAKED WHALE GENUS BERARDIUS IN THE NORTH PACIFIC, WITH GENETIC EVIDENCE FOR A NEW SPECIES

Morin *et al.* (In press) summarise new and previously published information supporting recognition of a new species of beaked whale in the North Pacific. Japanese whalers traditionally recognised two forms of Baird's beaked whales: the common 'slate gray' form and a smaller, rarer 'black' form. This genetic study of samples from across the North Pacific examined individuals of both forms, including eight of the enigmatic 'black' form. The authors found a greater divergence between the two North Pacific forms than exists between them and the most closely related species, Arnoux's beaked whale (*B. arnuxii*), found only in the Southern Ocean. Efforts to formally describe this new species on the basis of genetic and morphological characteristics are underway.

It was noted that the current domestic quota in Japan is set at 60 Baird's beaked whales to be shared among a few small-type whaling villages. Some unknown number of 'black' form individuals could be taken, as has happened in the past.

In discussion, the Japanese delegation reported the following. Japanese whalers have recognised two forms of Baird's beaked whales, the common 'slate gray' form and the smaller 'black' form, at the sea, from their body colour and size. So whalers have not targeted the 'black' form type. Also the National Research Institute of Far Sea Fisheries has collected biological data and samples from landed Baird's beaked whales. No 'black' form whales have been found. If by any chance, a 'black' form whale is caught accidentally, the National Research Institute of Far Sea Fisheries will report this in the Japan progress report on small cetaceans.

15.5.1.4 LAGENORHYNCHUS

Cipriano provided a summary of a workshop to review *Lagenorhynchus* taxonomy and conservation status held at the December 2015 Biennial Conference of the Society for Marine Mammalogy.

Attention: G
The Committee ***encourages*** *taxonomic revision of the genus* Lagenorhynchus*, continued work to clarify the systematics of species currently assigned to* Lagenorhynchus *and close relatives within the genera* Cephalorhynchus *and* Lissodelphis*, and efforts to fill significant data gaps in acoustics and genetics for these species, especially* L. cruciger *and* L. australis*.*

15.5.1.5 SURVEY PROGRAMMES

The objective of the Small Cetaceans in European Atlantic Waters and the North Sea (SCANS-III) project is to estimate abundance for all cetacean species in shelf and oceanic waters of the European Atlantic in summer 2016, using a large-scale multi-national aerial and shipboard survey. Results are expected to be available in 2017. Progress was also reported on the Survey Initiative of the Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), a synoptic survey programme to estimate cetacean density and abundance in the ACCOBAMS area, planned for either 2017 or 2018.

Attention: C-R, CG-R
The Committee ***welcomes*** *news of progress on the ACCOBAMS Survey Initiative. This is a synoptic survey programme to estimate cetacean density and abundance in the ACCOBAMS area, planned for either 2017 or 2018. The Committee* ***recalls*** *that it has previously endorsed this important basinwide survey and* ***reiterates*** *its support.*

Table 20
Summary of the work plan for the Small Cetaceans sub-committee.

Item	Intersessional 2016/17	2017 Annual Meeting (SC/67a)	Intersessional 2017/18	2018 Annual Meeting (SC/67b)
Global *Tursiops* taxonomy	Email correspondence group under Natoli (ICG-32) to synthesise information presented at SC/66a; SC/66b and any new information	Report to Committee	Intersessional Workshop *Tursiops* taxonomy	Report to Committee
Poorly documented takes	Email Steering Group under Porter (SG-19) to plan and conduct southeast Asian Workshop	Report to Committee	Plan and conduct African Workshop	Report to Committee
	Continue work on franciscana and explore other taxa	Report to Committee	Continue work on franciscana and explore other taxa	Report to Committee

15.5.2 Task Teams and Conservation Management Plans for small cetaceans

Simmonds reported on the first year of work by the Small Cetacean Task Team. This process allows for swift intersessional action for particularly threatened populations. Its Terms of Reference can be found in IWC (2015l). A Task Team Steering Committee (TTSC) was formed and a process was initiated for the franciscana, with Zerbini leading the Franciscana Task Team (FTT) for Franciscana Management Area (FMA) I. The TTSC and the FTT were in the process of finalising the project when significant funding became available from within Brazil. The project was paused to allow this opportunity to be explored. The final steps in the process of assessment and endorsement of the FTT will be concluded shortly.

Zerbini provided an update on the Franciscana Task Team, which reviewed research and conservation priorities for franciscanas in FMA I. FMA I was selected by the task team because: (i) the combined estimated abundance of FMA Ia and FMA Ib is the lowest among all FMAs; and (ii) no information on bycatch has become available since the early 2000s.

The task team concluded that the following priority tasks are needed to improve conservation of the species in FMA I: (1) monitor the fisheries and estimate bycatch; (2) assess areas at risk from coastal and offshore development; (3) estimate abundance and trends; and (4) plan for long-term conservation efforts.

During the intersessional period, a Brazilian non-profit organisation, FUNBIO (Fundo Nacional para a Biodiversidade) announced a request for proposals for franciscana research and conservation projects within FMA I. Funds of the order of ~US$2.7 million were allocated for this. Projects addressing some of the tasks listed above were submitted by members of the task team and also by other scientists working on the FMA I population. Because projects addressing fishery-related issues have not been funded to date, the development of studies to monitor the fisheries and to estimate bycatch remain the greatest research priority for this population. A proposal to assess characteristics of the fisheries in FMA Ia and FMA Ib was prepared for the task team as a first step to establish a long-term monitoring plan and estimate bycatch in FMA I. Zerbini warmly thanked the TTSC for its support.

Attention: CG-R, CC
*The Committee **recommends** supporting the fishery characterisation and bycatch monitoring and estimation work identified by the Franciscana Task Team (FTT) for Franciscana Management Area (FMA) I.*

In discussion, the Committee **notes** that several different Task Teams can operate simultaneously, and that lessons learned can be applied successively to future Task Teams. Moreover, Conservation Management Plans (CMPs) and Task Teams can function synergistically, with a clear distinction maintained between the two: CMPs are formal, lasting agreements between governments, while Task Teams are more immediate and informal initiatives led by researchers and other interested individuals.

Attention: SC, C-R, CG-R
*In light of the information received concerning India's recently approved National Waterways Act (see Item 15.5.1.1), the Committee **expresses concern** over the potentially severe impacts of developments pursuant to this Act on the conservation status of South Asian river dolphins. The Committee therefore **agrees:***

*(a) that the situation facing South Asian river dolphins is a matter of **grave concern** and requires immediate attention; and*
(b) that the South Asian river dolphin is a candidate for development of a Task Team, given the ongoing and new threats to the survival of the species.

*The Committee therefore **recommends** that the Steering Committee of the Small Cetacean Task Team initiative (SG-20; see Annex V for members and Terms of Reference) will establish an appropriate team of experts to develop a project description report back on progress to the next year's meeting.*

15.6 Work plan

The sub-committee agreed on a general plan for next year's priority topic: a review of taxonomy of bottlenose dolphins in the remaining areas – northeast Pacific, southeast Pacific, northwest Pacific and oceanic islands, plus any newly available information on *Tursiops* from areas covered in 2015 and 2016.

In addition, intersessional work will be undertaken to prepare for a worldwide comparison of *Tursiops* taxonomy to be reviewed at SC/67a and then further explored at an intersessional workshop in 2017. See Table 20 for details.

In addition, a work plan that takes account of the two-year reporting period to the Commission will be developed and the convenors will notify the sub-committee of details no later than 1 November 2016. For 2017, the agenda will prioritise populations of critical concern that are being immediately impacted by human activities. Input is welcomed concerning populations or issues that might be discussed and whether these are 'new' or previously considered.

16. WHALEWATCHING

The report of the Committee on whalewatching is given as Annex M. Scientific aspects of whalewatching have been discussed formally within the Committee since a Commission Resolution in 1994 (IWC, 1995b). The Commission also has a Standing Working Group on Whalewatching that reports to the Conservation Committee (see Item 15.3).

16.1 Assess the impacts of whalewatching on cetaceans

16.1.1 Norway

SC/66b/WW01 examined the impacts of whalewatching vessels on solitary adult sperm whales off Andenes in northern Norway. Data included information on 'near surface events' (i.e. a dive without fluking) or NSEs, the first time these were studied in relation to whalewatching impacts. Whales were seven times more likely to perform a NSE when whalewatching vessels were present. Additional research will be needed to determine if these short-term reactions are biologically significant.

16.1.2 Argentina

SC/66b/WW07 summarised the current status of southern right whales in San Matías Gulf, Argentina, from data on distribution, abundance and social structure, and described an emerging whalewatching industry. There has been an increase in the number of whales, with a peak in late August-early September, a marked seasonality and a geographic trend, with most of the whales distributed along the northwest area of San Matías Gulf. Since 2012, whalewatching tourism has been developing in San Antonio Bay, with the southern right whale as the target species.

The Committee encourages the continuation of the research into the emerging whalewatching industry in San Matías Gulf, Argentina, and **agrees** that this area might be considered as a focus of the MAWI initiative.

16.1.3 Other

SC/66b/WW05 examined the importance of population characteristics when assessing the effects of disturbance from whalewatching. It was demonstrated that, in the absence of any other form of disturbance, small closed populations were more sensitive to disturbance from whalewatching than large open populations. The results highlight that, while individual response to whalewatching vessels may be the same across populations, the long-term consequences may depend on the population characteristics as well as the intensity of the disturbance.

Attention: SC

*The Committee **recommends** the continuation of modelling work on the importance of population characteristics in assessing the effects of disturbance from whalewatching; this is directly relevant to its work plan.*

See Annex M, Table 1 for details from SC/66b/WW10 regarding research on impacts of whalewatching on cetaceans.

Reyes Reyes *et al.* (2016) presented a study on the potential acoustic masking of Commerson's dolphins from mid- and high-frequency content of ship noise in shallow waters of the Argentine Patagonian coast, where the species is targeted by dolphin-watching and is also exposed to noise from freighters and recreational, fishing and other vessels. This was a rare study of masking on high-frequency specialists. This paper was also presented at the Workshop on Acoustic Masking and Whale Population Dynamics held before SC/66b (SC/66b/Rep10).

Further details and discussion on these papers can be found in Annex M, item 5.

16.2 Review reports from intersessional working groups

16.2.1 Modelling and Assessment of Whalewatching Impacts (MAWI) steering group

New presented an update on the intersessional working group. She clarified that the goal of MAWI is to focus on the overarching themes related to whalewatching impacts and thus potentially provide information to field researchers focused on whalewatching impacts regarding the type of research questions that can be answered and what tools are available to help them analyse their results.

Attention: SC

*The Committee **agrees** to hold a Workshop to define the research questions and hypotheses that will most benefit our understanding of whalewatching impacts (see item 25.2.1; and Annex M, Table 4). The Indian Ocean and the San Matias Gulf in Argentina were identified as possible areas suitable for targeted studies of whalewatching impact. Requests to Committee members regarding possible research sites within their countries could also prove fruitful if additional sites need to be identified. The Committee established a Steering Group under New (SG-21; members and Terms of reference in Annex V) to facilitate this work.*

16.2.2 Swim-with-whale operations

SC/66b/WW02 summarised the results of an initial survey undertaken by the intersessional working group since SC/66a to assess global commercial swim-with-whale (SWW) operations. The survey was distributed to 75 operators in 14 countries, covering all continents except Antarctica. Eleven operators responded in detail. This was insufficient to evaluate these responses statistically; however, the survey results did suggest this industry is growing, largely unregulated and under-studied. A precautionary approach should be taken when making any recommendations in relation to the growth or regulation and management of the SWW industry. Further detailed studies on the industry are needed and planned. An intersessional correspondence group (ICG-33 under Rose; members and Terms of Reference can be found in Annex V) is addressing this.

At SC/65a, guiding principles for responsible whalewatching were endorsed by the Committee (IWC, 2014a, p.54). These principles discourage the further development of swim-with-cetacean programmes and recommend the prohibition of leap-frogging to position swimmers where such programmes occur.

Attention: C-A, CC, S

*The Committee **agrees** that the IWC guiding principles pertaining directly to commercial swim-with-whale (SWW) operations are generally being violated by SWW tourism. The Committee:*

*(a) **agrees** that the guiding principles should be included in the online whalewatching handbook (Annex M, item 7.1) and referenced by the Committee and the Conservation Committee's Standing Working Group on Whalewatching in all relevant forums; and*

*(b) **requests** that the Commission ask the Conservation Committee' Standing Working Group on Whalewatching to work with the Secretariat to collect information from Member States as to the extent of swim-with-whale programmes within their jurisdictions.*

16.2.3 Guiding principles for data collection forms from platforms of opportunity

SC/66b/WW03 presented guiding principles for data collection forms from platforms of opportunity, with *minimum* recommended data, which can be collected by any

operation with basic training, regardless of species, area or available instrumentation, and *desirable* data, which may be feasibly collected in some areas and operations, but would likely require more experience or training.

A revised version, incorporating feedback received during the meeting, will be presented to the Conservation Committee meeting in October 2016. A discussion noted that there were advantages and disadvantages to providing a template data collection form along with the guiding principles.

Attention: CC
*The Committee **recommends** that the Conservation Committee consider including template data collection forms for platforms of opportunity, or links to examples of forms in published papers, when finalising the guiding principles in the whalewatching handbook.*

Further details and discussion of these papers and items are in Annex M, item 6.

16.3 Review progress on the Commission's Five-Year Strategic Plan and joint work with the Conservation Committee

16.3.1 Five-Year Strategic Plan

It was noted that the Five-Year Strategic Plan ends this year (2016). The Strategic Plan will be discussed and reviewed at the Joint Meeting between the Scientific Committee and the Conservation Committee in June 2016 and at the Commission meeting in October 2016, where the roles of and relationship between the two Committees will be more clearly delineated.

Attention: SC, CC
*The Committee **agrees** that there is a need to improve involvement, coordination and definition of roles between the Conservation and Scientific Committees.*

16.3.2 IORA Workshop

SC/66/CC03 is the report of the 'Building sustainable whale and dolphin watching tourism in the Indian Ocean region' Workshop held in Colombo, Sri Lanka from 24-26 February 2016[27]. The Workshop was developed by and delivered in partnership with the Australian Government, the IWC, the Indian Ocean Rim Association (IORA) Secretariat, the Sri Lankan Institute of Policy Studies and Murdoch University's Cetacean Research Unit. Representatives from 16 IORA member states and several Committee members attended. The Workshop's recommendation to establish a network was noted by the IORA Committee of Senior Officials at its meeting on 22-23 May 2016 and will be considered by the IORA Council of Ministers in October 2016.

Attention: SC, S, CC
*The Committee **welcomes** the report of the Workshop on Building Sustainable Whale and Dolphin Watching Tourism in the Indian Ocean Region held in Colombo, Sri Lanka (SC/66/CC03). Many member states of the Indian Ocean Rim Association (IORA) are not Members of the Commission. The Committee **recommends** that the Secretariat remain in contact with IORA to facilitate communication and outreach with these countries. The Committee also **agrees** to make the Indian Ocean the focus of next year's regional review (see Item 15.4) and to set up an intersessional working group under Simmonds (ICG-34; members and Terms of Reference are given in Annex V) to help provide advice to IORA if appropriate and to facilitate communication between IORA and the Conservation Committee.*

16.3.3 Online handbook

In May 2016, a small working group convened in Cambridge to further develop a beta version of the online whalewatching handbook. The handbook has four sections, or portals, providing targeted advice and guidance to different sectors involved in whalewatching. Each portal will have a further two tiers of progressively more detailed information. The beta version of the handbook will be presented to the Commission at IWC/66 in October 2016. The handbook is an on-going project and will continue to be populated with information and updated at regular intervals. In order to progress its development, external funding sources need to be identified.

Attention: SC, C-A, CC
*With respect to the IWC online handbook on whalewatching, the Committee stands ready to provide further advice and comment intersessionally, when the beta version will be ready for review. It **agrees** that it will be valuable for industry representatives to be approached to review and offer input on the beta version and it was noted that a procedure for conducting this industry outreach will be determined. The Committee **draws the attention of the Commission** to:*

(a) the importance of securing funding for a dedicated individual to take the whalewatching handbook to completion (noting that the Secretariat can play a role in examining potential funding sources); and
(b) the need to actively promote the handbook (this could also be a task of the same individual).

16.4 Review whalewatching in the South Pacific

The South Pacific region was not reviewed. The Committee agrees to review whalewatching activities in the Indian Ocean at SC/67a.

16.5 Consider information from platforms of opportunity of potential value to the Scientific Committee

16.5.1 Argentina

SC/66b/WW04 presented an assessment of the underwater viewing platform of a semi-submersible vessel, which operates off Puerto Pirámides, Península Valdés, Argentina, as a platform of opportunity for southern right whale research, including visual health assessments. The vessel behaves similarly to other whalewatching vessels and the close approaches (within 10m) are generally initiated by the whales. However, given the larger underwater profile of this vessel, comparisons of behavioural data collected from both vessel types would help to determine whether the whales behave differently around this vessel.

16.5.2 Data collection systems for platforms of opportunity

SC/66b/WW08 presented details on a mobile web-application, Whale and Dolphin Tracker, which was used by naturalists on whalewatching vessels in the region off Māui, Hawaii, USA. Although the area covered by whalewatching crewmembers using the app was greater than that covered by dedicated researchers or transect surveys, detections of whales were nevertheless higher by the dedicated researcher.

SC/66b/SH06 described Happywhale.com, a web-based marine mammal photo-identification system creating high quality, low-cost whale sighting data while engaging the public. The project sources images from platforms of

[27] *http://www.iora.net/events/whale-dolphintourism/additional-materials.aspx.*

opportunity and provides feedback on whale identities and sighting histories to contributors. Providing feedback to users, such as notifications of individual resights, has been critical to its success, as it promotes contributor effort to improve image quality. The Happywhale.com system has been utilised by several research projects and institutions, including the Norwegian Polar Institute, the Instituto de Conservación de Ballenas in Argentina and Ocean Alliance in the USA.

16.5.3 Other

SC/66b/WW09 compared estimates of humpback whale abundance and density using data collected simultaneously during both systematic and opportunistic surveys. The authors employed a novel use of spatial density surface models that base abundance estimates on the observed relationship between animals and spatial covariates.

Attention: SC

*The Committee **reiterates** that platforms of opportunity have the potential to make valuable contributions to the understanding of cetacean populations, especially in areas where data are lacking. However, **concern was expressed** about the present application of density surface modelling techniques to whalewatching platform data, as this is not currently statistically supported. It is also not possible at this time to generate line transect-based abundance estimates from operating whalewatching vessels. Further consideration of whalewatching vessels as survey platforms for abundance estimates will be coordinated with the IWC Steering Group investigating spatial modelling and quasi design-based approaches for abundance estimates (IWC, 2015e, p.111).*

SC/66b/WW10 summarised Vinding *et al.* (2015), which used whalewatching vessels as platforms of opportunity.

Ritter and Bünte (2016) analysed sightings of bottlenose dolphins and short-finned pilot whales in mixed groups off La Gomera (Canary Islands, Spain), a multi-species cetacean offshore habitat. Sighting data were collected opportunistically and year-round from whalewatching vessels during regular trips from 1995 through 2014. This paper was also presented in the Sub-Committee on Small Cetaceans (see Annex L, item 10.2).

Further details and discussion on these papers can be found in Annex M, item 9.

16.6 Review whalewatching guidelines and regulations

16.6.1 Argentina

SC/66b/WW11 analysed whalewatching in Península Valdés, Patagonia, Argentina, by studying fluctuations in the number of passengers, regulatory changes, biological changes and the socio-economic factors that influence the development of the activity. Changes in abundance and distribution of whales have made following the regulations difficult for vessel captains and crew members report that most captains do not abide by the prohibition on following mothers with neonates before 31 August. Most crews said that there is a need to update these regulations.

The Committee encouraged the submission of additional papers of this nature and thoroughness under this agenda item. It welcomed the planned continued monitoring of the management situation in this region. It was suggested that adaptive management of whalewatching should be considered when local circumstances (e.g. in whale distribution and density) change.

Attention: CC

*The Committee **draws the attention** of the Conservation Committee's Standing Working Group on Whalewatching to:*

(a) issues that may arise from inconsistencies in regulations by region for transboundary populations of whales (best practice should inform consistent regulations across regions; and

(b) research on compliance with whalewatching guidelines and regulations (see SC/66b/WW10 and Annex M, table 2).

16.7 Emerging issues of concern

Smith *et al.* (2016) presented information on the emerging use of drones in the marine habitat, including to view marine mammals. This paper was presented in a joint session with the Standing Working Group on Environmental Concerns and the discussion and resulting recommendations are summarised in Annex K, item 11.5.

16.8 Progress on previous recommendations

SC/66b/WW12 examined the Committee's effectiveness regarding the dissemination of its recommendations and scientific information, via an online survey sent to the MARMAM listserv. Over 60% of respondents (n=57, 25 countries) were aware of the recommendations and activities of the sub-committee and that this information helped inform local whalewatching management (over 30% said that the 'IWC general principles for whalewatching[28]' were specifically referenced. The authors believed that the extent to which the Committee's whalewatching work was influential was likely an underestimate but suggested that there was a need for better outreach and education from the Committee and the Commission to the whalewatching community.

The survey clarified the value of the Committee's work to the wider whalewatching community and highlighted where the Conservation Committee's Standing Working Group on Whalewatching could most productively focus its efforts on addressing management issues. The Committee welcomes the information presented and suggests that future surveys try to expand their scope and reach a broader sample of regions and sectors, particularly government representatives. It was suggested that the next survey be also sent directly to Commissioners, to increase the geographical spread of responses. The Committee also agrees that, while clearly the Committee's work was known among some elements of the whalewatching community, greater effort to communicate the conclusions, results, and recommendations of the Committee to the community is needed. The value of the whalewatching handbook in this effort was emphasised.

16.8.1 Panama

The Committee has made multiple recommendations (IWC, 2014a, p.56; 2015d, p.57) regarding unsustainable dolphin-watching in Bocas del Toro. It was reported that there have been community meetings, and more are planned, towards building a 'dolphin centre' in Bocas del Toro, as discussed at SC/66a (IWC, 2016v, p.395). In addition, the United Nations Development Program is funding three positions related to marine mammal tourism in Panama. Local researchers will continue monitoring the situation. See Annex M, item 12 for additional details and discussion.

[28] *https://iwc.int/wwguidelines#manage.*

Table 21
Work plan for matters related to whalewatching.

Item	Intersessional period/groups	2017 Annual Meeting
Assess impact of whalewatching (priority)		
Intersessional groups	(1) MAWI Working Group (priority); and (2) swim-with-whale group.	Review progress and develop work plan.
Emerging concerns	Encourage submission (e.g. new areas, species, technology).	Review progress and develop work plan.
Regional reviews (Indian Ocean)	Communication with IORA.	Undertake review and decide the region for 2018.
5-year strategic plan and joint work with Conservation Committee		
Handbook	Assist as needed.	Review progress.
Other matters	How best to ensure effective transmission of advice.	Review progress.
Other regular items		
Regulations and guidelines	Upload new compendium.	Review progress including compliance, efficacy.
Progress on recommendations	Encourage new information on progress.	Review progress.
Platform of opportunity data		Review progress.

Attention: SC, CG-R, CC
The Committee has expressed concern on several occasions regarding unsustainable dolphin-watching in Bocas del Toro, Panama. The Committee ***recommends*** *additional research be carried out to confirm whether there has been any progress made in Bocas del Toro, Panama, with results brought to a future meeting. The Committee* ***welcomes*** *information that year-round observation of the dolphin-watching situation, a previously identified research need, is being planned in partnership with a local university.*

16.9 Work plan

An intersessional correspondence group established under Rendell (ICG-35; members and Terms of Reference are in Annex V) on strategic planning will report to the 2017 meeting when the 2018 plan will be decided in light of discussions with the Conservation Committee's working group on whalewatching (see Table 21).

17. DNA TESTING

The report of the Working Group on DNA is given as Annex O. This particular agenda item has been considered since 2000 in response to a Commission Resolution (IWC, 2000).

17.1 Review genetic methods for species, stock and individual identification

SC/66b/DNA01 responded to the recommendation from the JARPN II Final Review Workshop that genotyping error rates should be estimated. The genotyping error rate combined over all loci and all common minke whale samples was low, 0.0044 per reaction or 0.0025 per allele. These rates were similar to the rates estimated for fur seals and lower than the rates estimated for bowhead whales.

Attention: SC
It was confirmed that SC/66b/DNA01 measures the genotyping error in the sense recommended by the data quality guidelines (this type of error estimate measures consistency or 'repeatability' of genotyping). The Committee ***agrees*** *that the work presented in SC/66b/DNA01 addresses this recommendation made by the JARPN II review Workshop appropriately.*

SC/66b/DNA02 informed the Norwegian plan to upgrade the Norwegian Minke Whale DNA Register (NMDR) by genotyping a suite of carefully selected Single Nucleotide Polymorphisms (SNPs) which will still keep the register's primary function of traceability of whale products in Norway and the international market.

Attention: SC, CG-A
The Committee ***welcomes*** *Norway's plan to add SNPs in its register and noted that SNP genotyping should be seen as a complement, not as a replacement of the current microsatellite genotyping. No technical details of the plan were available in SC/66b/DNA02 and, therefore, the Committee* **recommend***s that those details are provided at future meetings so that the Committee can provide technical advice.*

SC/66b/DNA03 reports a pilot study of a Double Digest Restriction site Associated DNA marker (ddRAD) protocol in Blainville's and Cuvier's beaked whales. Four samples from each species were run. The pilot study produced 9.2M quality controlled reads for the Blainville's and 16.4M quality controlled reads for the Cuvier's beaked whales. After loci construction and filtering in program STACKS, this produced 8,143 variable RAD loci for Blainville's and 14,095 variable RAD loci for Cuvier's beaked whales at moderate depths (20x). The data were also analysed using PYRAD to identify loci in common across the two species; this revealed 9,666 loci at 20x depth in common between at least one sample per species.

The study in SC/66b/DNA03 was considered a valuable proof-of-principle by the Committee. The Committee noted, however, that loci were compared across different genera. Therefore, the loci shared across the analysed species may not necessarily be considered orthologous (i.e., homologous and positioned at the same site in the genome).

SC/66b/DNA04 provided the first description of the gray whale genome and characterised a novel SNP panel that includes 88 gene-associated markers, two molecular sexing markers, and two mitochondrial markers. One male and one female western gray whale, and one female eastern gray whale were sequenced. Approximately 22,000 genes, a number similar to other cetacean genomes, were annotated. The gray whale is only the third species of baleen whales to have a genome sequence. SC/66b/DNA04 sequenced the gray whale genome, repeatedly genotyped replicate whale biopsies at 92 SNP loci, then quantified genotyping error rates and variability at each marker. Mitochondrial DNA haplotyping and molecular sexing with SNPs was 100% concordant with conventional assays based on PCR and dideoxy sequencing or electrophoresis. Genotyping error rates, calculated across loci and across replicate samples, were very low (0.021%) and observed heterozygosity was 0.33 averaged over all autosomal markers. This level of variability across loci provides substantial discriminatory power, as evidenced by the genetic documentation of parent/

offspring pairs in the study. The characterisation of the gray whale genome should enable comparative studies of natural selection in cetaceans and the SNP markers should be highly informative for future studies of gray whale population structure, demography and relatedness.

The output of the study was considered valuable for forensic applications in the context of the Committee work. If there is (positive) selection on a SNP, such SNP position is interesting to study divergence, and may serve well as a marker for forensic applications. It is however not applicable for any quantitative measure assuming selective neutrality (as many population parameters do). It was noted that any non-random sampling with regard to close kin (in particular mother/foetus pairs) should be avoided. However, other (random) sampling of close kin simply because of small population size is both unavoidable and acceptable.

It was further noted that availability of genome information is very helpful for SNP development. An alternative to the approach of comparing two full genomes (as used in this study) would be SNP identification by mapping of ddRAD sequences on a single genome.

17.2 Review results of the amendments of sequences deposited in *GenBank*

Last year, the Committee encouraged Cipriano to keep contact with NCBI (National Center for Biotechnology Information) in the intersessional period to make progress on the mechanism for taxonomy updates at the NCBI In particular on the mechanism identified last year to allow annotation of *GenBank* sequences by interested parties, in order to note taxonomic mis-assignment or questions about geographic source of the organism involved (IWC, 2016i, p.71).

Cipriano informed the Committee that although he did not correspond with NCBI during the past intersessional period, there was a new publication (Federhen, 2015) that acknowledged that there are misidentified sequences in *GenBank*, and entries with other annotation problems. The authors suggested the inclusion of 'Sequence from type' which can help to alleviate these problems by providing a backbone of reliably identified sequence data.

Attention: SC, G

The Committee strongly ***recommends*** *that when a new species or sub-species is described, that sequences from the holotype and paratype specimens be archived in* GenBank. *This has been done for the holotypes of* B. omurai, GenBank *Accession No. AB201256 and* Mesoplodon perrini, *Accession No AF441261.*

17.3 Collection and archiving of tissue samples from catches and bycatches

The Committee previously endorsed a new standard format for the updates of national DNA registers to assist with the review of such updates (IWC, 2012b, p.53), and the new format worked well in recent years. This year the update of the DNA registers by Japan, Norway and Iceland were based again on this new format. Details are given in Appendices 2-4 of Annex O for each country, respectively, covering the period up to and including 2015.

The Committee **thanks** the countries involved for providing this information.

17.4 Reference databases and standards for diagnostic DNA registries

Annex O, Appendices 2-4 summarise the status of mtDNA and microsatellite analyses of the stored samples for Japan, Norway and Iceland, respectively. In almost all cases, the great majority of samples have been analysed for at least one of either mtDNA or microsatellite and in most cases both. Work on unanalysed samples is continuing. Details of the exact number of samples collected and analysed are provided in Annex O.

The Committee **appreciated** the efforts of Japan, Norway and Iceland in compiling and providing this detailed information of their registries.

17.5 Work plan

The Terms of Reference for the Working Group will remain the same for the next two years, unless the Commission requests other information in the interim. Members of the Working Group were encouraged to submit papers relating to these Terms of Reference and to propose additional agenda items. Results of the 'amendment' work on sequences deposited in *GenBank* will be reported next year. Next year a comparison of methods for SNP development and assessment will be continued. In addition, the Working Group will examine the technical information relevant to the TORs of the Group, contained in documents presented to other groups and sub-committees.

18. SPECIAL PERMITS

18.1 NEWREP-A

Last year, the Committee reviewed a proposal from Japan for special permit catches of Antarctic minke whales following the process outlined in Annex P (IWC, 2016i, p.71-78), including the holding of an Expert Panel review Workshop (IWC, 2016d). Discussion this year focussed on progress with recommendations made by the Expert Panel and the Committee.

18.1.1 Progress with recommendations from the 2015 Expert Panel and Scientific Committee

The Committee reviewed progress with the 29 recommendations made by the Expert Panel and the Scientific Committee last year (IWC, 2016d; 2016i) and produced a summary table to assist in this work (Table 22). Discussion below focusses upon two of the more complex recommendations, for which small groups were established to consider the technical details (see below). An important component of the work of the small group was to consider SC/66b/SP10 produced by the proponents.

SC/66b/SP10 presented the results of further analyses on the two recommendations provided by the Expert Panel considered by the proponents to be the most important and relevant: Recommendations (1) and (26). In SC/66b/SP10, the proponents provided a full description of the results of additional analyses regarding statistical catch-at-age analysis (SCAA) and RMP performance given catch-at-age (CAA) data and the NEWREP-A sample size. The paper begins with a summary of the work conducted by the proponents' scientists through to the end of SC/66a, as well as the outcomes of discussions at SC/66a, to provide background on the two recommendations and on what analyses had been conducted by that stage (section 2). Sections 3 to 5 explained the additional analyses that have since been conducted in response to the two recommendations as well as associated comments made at SC/66a. Section 3 introduced some preliminary work conducted to provide the underlying minke whale population models to be used in simulation trials. The results were used in Section 4 for a quantitative evaluation of NEWREP-A in terms of improvements of the RMP that are possible if age data are used, which is in response to Recommendation 1 above. Section 5 responded

to Recommendation 26, i.e to pursue the impact of several sources of variation (e.g. over-dispersion in the data and structural heterogeneity) on the statistical power to detect a change in the age at sexual maturity (ASM). Section 6 provided concluding remarks.

Recommendation 1

'Evaluate the level of improvement that might be expected either in the SCAA or in RMP performance by improved precision in biological parameters using simulation studies including updated *Implementation Simulation Trials.*'

Punt introduced the conclusions from the small group discussion (Annex T1) regarding the statistical catch-at-age analysis (SCAA) for Antarctic minke whales. A key feature of the data is a change in age composition over the early years of the fishery. In the SCAA developed by Punt *et al.* (2014), this change is attributed to age-specific natural mortality, and changes over time in selectivity, recruitment deviations and carrying capacity. However, the small group noted that the observed change in age composition could also be due (in whole or in part) to changes over time in natural mortality. The impact of changes in carrying capacity have a lesser impact when MSYR is lower than when MSYR is higher, given the recruitment function in both the Punt *et al.* (2014) SCAA and SC/66b/IA08.

In discussion, it was noted that interpretation of whether improvement to estimates of MSYR could result from application of the SCAA model, is dependent on the penalties on specific parameters (penalisation is a way of restricting model complexity). De la Mare suggested that following on from the small group discussions, the implication of the results in SC/66b/IA08 is that the improvements in the estimates of MSYR and historical abundance trends that might accrue with additional catch-at-age and abundance data collected for a further 12 years under NEWREP-A, are likely to be negligible. Others believed that it was premature to come to this conclusion based on the results in SC/66b/IA08 which is only one way to structure a statistical catch-at-age analysis. Specifically, it was noted that the method in SC/66b/IA08 does not implement the penalties of the method developed in Punt *et al.* (2014), which has been previously accepted by the Committee.

Attention: SC

The Committee ***endorses*** *the recommendations by the small group regarding analyses to be undertaken by the proponents to further explore this issue:*

(1) decrease the effect of the penalties on the recruitment and carrying capacity deviations in the Punt et al. *(2014) SCAA to understand whether these penalties (which are not imposed in SC/66b/IA08) are the main reason for the apparent discrimination ability of the SCAA method; and*

(2) extend the Punt et al. *(2014) SCAA to include density-dependent natural mortality (the Siler model approach in SC/66b/IA08 is one way to account for time-varying natural mortality).*

There was also a brief discussion of the biological implications of the different assumptions regarding mortality parameters.

Punt reported on the results of a small group that had considered the progress made in addressing each of the six recommendations of the Expert Panel that had analytical components (Annex T2), taking into account the analyses presented in SC/66b/SP10. The report of that group is taken into account in Table 22.

Annex T2 had noted that comparing the *CLA* and the modified *CLA* (MCLA) is difficult as they were tuned[29] differently. It recommended that the MCLA needed to be tuned such that the performance (catch or depletion) is the same for the *CLA* and MCLA for a selected 'reference' trial. Subsequently, during the meeting, Kitakado reported the results of trials run implementing this approach (Annex T3). He presented results for a differential effect that aimed to eliminate the effect of different tunings amongst trials. These results compare median average annual catch for trials with especially good recruitment with those with especially poor recruitment (Annex T3, table 2). He noted that the difference in catches for good versus poor recruitment increased when changing from the *CLA* to the MCLA, indicating benefits of including age data.

In discussion, others noted that with the tuning which leads to the same median average annual catch under the *CLA* and MCLA (set at 0.8 for trial Tr1) there was sometimes improvement, sometimes no effect and sometimes a worsening of performance statistics, but unlike for the tuning results presented in SC/66b/SP10 (tuning parameter set at 0.9), there was never an improvement in catch and depletion simultaneously. In response, Kitakado identified two separate issues that need to be distinguished. The first is the role that the age data may play in the argued improvement of the *CLA* when it is adjusted to include age data (the MCLA). Annex T3 (Table 2) was provided to address that point and remove the confounding effect of different catch vs depletion trade-offs when making comparisons. The other issue concerns whether the performance of the MCLA overall reflects an improvement over that of the *CLA*. Table 3 of SC/66b/SP10 was intended as an illustration in support of the general contention that including age data in some MCLA can result in improved performance overall.

In discussion it was suggested that the age data could only improve performance if there was serial correlation in recruitment, with pulses of successful cohorts. It was noted that pulses in recruitment do appear to occur in Antarctic minke whales. Commercial whaling has a different age selectivity pattern to the uniform selectivity expected from JARPA II results. Selectivity of future commercial whaling will affect the way age data are collected. More clarity was needed on what selectivity assumptions had been used in the simulations, although Kitakado responded that age-specific selectivity that differs between future NEWREP-A and commercial catches was accounted for in the analyses reported.

The Committee **notes** that the results from the MCLA proposed in SC/66b/SP10 and Annex T3 were intended only to be illustrative of the fact that the proposed modification has promise. The Committee also **notes** that a key issue is whether a proposed modification of the *CLA* leads to an appreciable improvement in performance over a given set of trials, without sacrificing robustness over a wider set of trials. The original selection of the *CLA* out of a field of competing candidates, was based largely on its robustness and when

[29]'Tuning' of a set of management procedures refers to the process of selecting the values of their parameters so they achieve the same value for some management performance metric (such as average population size), such that the set of management procedures can be compared on other performance metrics. There is a trade-off between the average catch removed from a population and the size of the population relative to carrying capacity, with higher average catches generally corresponding to lower average population sizes, and vice versa. Every management procedure, including the *CLA* and the MCLA, include parameters to achieve a different trade-off between catch and population size. If the parameters of two management procedures are set independently, it may be hard to compare their results.

considering a modification to the *CLA* that incorporates additional information, additional robustness trials will be required to check whether the new procedure is still safe.

De la Mare and Cooke (1993) had already established that the performance of the *CLA* over a given set of trials can, in principle, be improved by using additional information. However, Cooke expressed his views that collection of age data under NEWREP-A had resumed before the development of proposals to test how they might be used in management. He believed that the appropriate sequence would be first to develop the trials to determine the potential for use of different kinds of data, and design the research programme to collect those data shown to be potentially useful. He considered that the trials conducted earlier by the Committee for the application of the RMP to Antarctic minke whales had shown that the main limiting factor was uncertainty over the distribution of stocks. He thought that satellite tracking data, for example, might have a greater potential to improve management performance. He also stressed the need for robustness trials when the additional information is unreliable; for example, when the age data have greater variance than the multinomial distribution that was assumed in the trials presented to this meeting.

Butterworth responded that use of information on recruitment within management procedures was highly desirable. To this end it is clearly evident that age data has the potential to be informative, but the extent to which such data can lead to improvements to a management procedure in specific instances needs to be evaluated on a case by case basis. He recalled discussions at the 1994 Scientific Committee meeting on whether the Committee should adopt a generic or case-specific approach in developing a management procedure when it had been agreed that the approach should be generic for commercial whaling. This had been on the basis that there was insufficient time to develop case specific procedures since the Commission might request catch limits for many stocks imminently. Subsequently, the case-specific approach had been adopted for aboriginal subsistence whaling. He commented that case specific procedures could demonstrate better performance than a generic one, and that this conclusion was generally accepted and applied in the application of management procedures in fisheries worldwide.

Attention: SC

*The Committee **notes** that there is an agreed process for proposing any changes to the CLA (IWC, 2012f). This process had been followed in recent years with respect to the Norwegian proposal to amend the CLA (IWC, 2016i). The Committee **agrees** that a wide set of trials would need to be specified to establish the robustness and potential for improved performance of an MCLA. There is currently no set of trials specific to Antarctic minke whales.*

*Noting the context of these discussions, the Committee **agrees** to establish an Advisory Group to provide advice to the proponents with respect to the mathematical specifications concerning the recommendations made by the Expert Panel and the Committee. The Terms of Reference for the Advisory Group (AG-1, under Bannister) are given in Annex T4 and Annex V.*

Recommendation 26

'Provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this Item.'

The analyses now reasonably account for three of the six aspects that constitute a realistic model (i.e. ageing-reading error, overdispersion in catch composition, recruitment variation). Overall, the approach being taken to address the recommendation is appropriate but further refinements are required.

There are two parts to providing better power analyses for setting sample sizes. The first of these is to choose an appropriate effect size, i.e. for management purposes what change in the ASM50 is it important to detect reliably? This aspect is set out in Recommendation 13 with respect to effect size. Although, no results have yet been presented, the approach outlined by the proponents should be able to address this issue (see Table 22).

The second part relates to Recommendation 26. Some issues have been addressed, but several steps remain to be completed. In particular, the calculations of the extra variance in cohort age at 50% sexual maturity needs to be estimated without omitting some of the data.

Kitakado (Annex T5) responded to concerns raised in Annex T2 regarding the estimate of the variance of the overdispersion estimates in SC/66b/SP10.

Attention: SC

*The Committee **agrees** that the approach taken in Annex T5 was what had been intended and Annex T5 confirmed the concern of the small group that asymptotic estimates of the variances of overdispersion parameters will be unreliable if the estimate is zero. There is now a need for the proponents to apply the approach of Annex T5 to the full data set and not just the censored data set in the original analysis in SC/66b/SP10.*

The Committee **thanks** Kitakado for his work undertaken during the meeting, **recognising** that it illustrated that the recommended further work for the refinement of the analyses is achievable and should be completed.

18.1.2 New information from the 2015 field season

The Chair noted that following recent practice within the Committee, reports of ongoing special permit results were presented for information and brief discussion. However, the main discussion would occur during periodic reviews and lack of comment below should not be taken as either agreement or disagreement with any results presented.

SC/66b/SP05 presented an overview of the first field survey of NEWREP-A conducted in the eastern part of Area IV and whole Area V (south of 60°S, 115°E to 170°W) during the 2015/16 austral summer season. The authors noted that two main objectives of NEWREP-A, *viz.* (i) improvements in the precision of biological and ecological information for the application of the RMP to the Antarctic minke whales; and (ii) investigation of the structure and dynamics of the Antarctic marine ecosystem through building ecosystem models, require data and samples from multidisciplinary surveys. This occurred in 2015/16: (a) biological sampling survey for Antarctic minke whales; (b) a dedicated whale sighting survey based on the IWC guidelines; and (c) krill and oceanographic surveys. For the biological sampling survey, a total of 333 Antarctic minke whales (103 males and 230 females) was taken and biological samples and data, including earplugs for age determination, were obtained from each individual. During the dedicated sighting survey, 141 primary sighting of 425 Antarctic minke whales were made. Following recommendations from the NEWREP-A review Workshop (IWC, 2016d), feasibility-related biopsy and telemetry studies on Antarctic minke whales were started during this survey. The dedicated whale sighting vessel-based krill and oceanographic surveys also commenced as part of this survey, and the results will be presented to the IWC Scientific Committee as well to CCAMLR specialist's

workshops. Whale and environmental data collected from this survey are available for the national (Japan) and international scientific community following established protocols. A summary of the data and samples collected and guidelines for research collaboration and access to the data is available on the web[30]. Details of the survey methods and results are presented in SC/66b/SP07, SC/66b/IA05 and SC/66b/EM03.

SC/66b/SP07 reports the results of biological sampling described above. It also reports the results of the sighting surveys and photo-ID and biopsy sampling of large whales by the sighting sampling vessels (SSVs). Two SSVs and one research base were engaged in the survey for 65 days. A total of 335 primary sightings (915 individuals) of Antarctic minke whales was made. Three blue whales, 9 humpback whales and one killer whale were photo-identified and seven biopsy samples were collected (blue (1), humpback (5) and killer whale (1)).

Attention: SC
In discussion, given comments in previous Expert Panel reports about the value of such information, the Committee ***requests*** *that in the cruise reports prepared by the proponents, they should identify cases where predetermined tracklines could not be followed and explain the rationale behind any changes; this will assist with the review process in the future (see Item 26.3).*

It was also noted that although total fat weight may be the most appropriate measure of body condition, this had only been measured in 5 out of 333 whales. The authors responded that the number of whales that had been weighed was limited by logistic considerations. They noted that blubber samples were taken from all individuals with the intention of investigating the fat content in blubber as an alternative indicator of body condition. Unfortunately, it will not be possible to compare fat content in blubber with historical samples from JARPA/JARPA II because these samples were lost as a result of the tsunami in 2011.

18.1.3 Conclusions and recommendations
The Committee refers to the full consideration of the NEWREP-A proposal that occurred in 2015, including the conclusions and recommendations of the Expert Panel (IWC, 2016d) and the subsequent discussion, conclusions and recommendations within the Committee (IWC, 2016i, p.71-78). The Committee **notes** that these remain valid and this year the focus has been on reviewing the progress made by the proponents with respect to the recommendations made. These are summarised in Table 23.

Some members commented that although the work required to fulfil the Committee's recommendations from last year is still in progress, these tasks remain incomplete and the results thus far have not demonstrated that the NEWREP-A programme requires lethal sampling to achieve its stated objectives. They noted that the Expert Panel had also advised that a short (e.g. 2-3 year) gap in the existing series to complete the recommended further analyses would not have serious consequences for monitoring change. Therefore, in their view, continuation of lethal sampling in the 2016/17 season has not been justified.

Other members commented that the proponents had responded satisfactorily to most of the recommendations of the Expert Panel, noting that some of the suggested further analyses have already been completed, while others are in progress or will be addressed within a reasonable timeframe.

In response to the above comments, Japan stated that after the 2015 Scientific Committee meeting, the proponents had conducted additional analyses indicated by the Scientific Committee. They had assessed that all items pointed out by the Scientific Committee to be conducted prior to the start of NEWREP-A had been completed at a reasonable level, and had decided to implement NEWREP-A. They believe that the current results already demonstrate the utility of age data to improve the performance of *CLA*. While implementing NEWREP-A, the Proponents stated that they will report on further progress on the additional work following the steps specified by the Advisory Group (see Annex T4), which in their opinion go beyond the original scope of Recommendation 1, in view of the use of the collected data in the Committee's future work.

18.2 Final review of JARPN II
The Scientific Committee noted that the JARPN II Special Permit programme was conducted from 2000 to 2016. The Expert Panel and Scientific Committee's review of this programme under Annex P in 2016 was primarily limited to data collected from 2000 to 2013, while preliminary data and analysis from 2014 and 2015 have been provided. The Scientific Committee recalled its recommendations and agreement (IWC, 2016i, p.78) that states:

> 'The Committee recommends […] that the JARPN II review by the Panel and Committee should focus on […] a final review of the programme in accordance with the revised Annex P.'
>
> 'The Committee also agrees that the data for the period up to 2016 shall be available for the review of any new North Pacific proposal submitted by Japan for review in 2017.'

Attention: SC
The Committee ***agrees*** *that the review of a new North Pacific proposal will also include the review of JARPN II with the inclusion of those data (2014 to 2016) that have become available since the final review of JARPN II in SC/66b/Rep06. The review will also assess progress against recommendations made in SC/66b/Rep06.*

18.2.1 Presentation of Expert Panel report (SC/66b/Rep06)
For the JARPN II final review, the selection of the expert panel (hereafter 'the Panel'), chaired by Fortuna, took into account membership of the mid-term review in 2009 for consistency and experience. In addition to the Chair, Head of Science and one member of the SSG, the Panel included three regular members of the Committee, three former members who have not attended for some years, and five non-members of the Committee; one member participated by correspondence only. Expertise in all areas of the research programme was available. The review by the Panel was guided by Terms of Reference for final reviews of Special Permit research proposals developed by the Scientific Committee (referred to as 'Annex P': IWC, 2016{).

The remainder of Item 18.2.1 (including Item 18.2.1.1) is a summary of the main aspects of the Panel's report by its Chair, Fortuna. It is not intended to replace the need to consider the full report (SC/66b/Rep06).

The Panel received a total of 55 primary papers, 37 'for information' papers, 1 observer statement and a response by the proponents to that statement. An important component of the review was to examine progress made by the proponents with response to the recommendations of the 2009 Expert Panel (see Annex D in SC/66b/Rep06).

[30] *http://www.icrwhale.org/NEWREP-AProtocol.html.*

Table 22

NEWREP-A - Summary table of progress with recommendations.

Key for 'Purpose': A: To evaluate contribution of a particular objective or sub-objective of the programme to meet conservation and management needs. B: To evaluate feasibility of particular techniques (whether lethal or non-lethal). C: Relevant to a full evaluation of whether any new lethal sampling is required D: Relevant to issues related to sample size (irrespective of method used to obtain data). E: Relevant to improve existing components of the proposed programme. Note that under 'Suggested timeframe' this was a rough estimate by the Panel and will depend on the amount of time and effort available. A considerable number of the recommendations require analytical work (this includes simulation modelling). Achieving all of these within the timeframe estimated for each individual item will require considerable resources. Those that relate to purposes A, B, C and D are higher priority for completion.

Item	Summary	Purpose	Suggested timeframe	Needs new samples/data? Effort type	Proponents comments on progress (see SC/66b/SP09)	Committee comments on progress
2.1.2 (1)	Evaluate the level of improvement that might be expected either in the SCAA or in RMP performance by improved precision in biological parameters using simulation studies including updated *Implementation Simulation Trials.*	A, C, D	Within 6 months	No, analytical	**Completed to a reasonable level** (see details in Government of Japan, 2016 [SC/66b/SP10]). The RMP/IST-like simulations conducted show that in nearly all cases, the modifications of the RMP's *CLA* to include information from catch-at- age data lead to either or both of catch being increased and low levels of lowest depletion being improved (where necessary) compared to the *CLA*. This also applies given periods of especially low or especially high recruitment to the minke whale populations under consideration.	The proponents have decided to evaluate how the availability of age data can improve management performance rather than assessing the extent to which estimates of management quantities (such as MSYR) can be improved given additional data from NEWREP-A. The RMP/IST-like simulations are conceptually the appropriate way to conduct this evaluation. However, the MCLA needs to be tuned to ensure better comparability with the *CLA* to allow appropriate comparisons to be made (see Item 5.1.1) and the scenarios need to linked more clearly to information from SCAA (i.e. be conditioned on the data). This could be achieved, for example, by assuming that the past changes in carrying capacity and/or growth could occur in the future. An Advisory Group has been established to provide advice with respect to mathematical specifications (see Annex T4). The Committee recognised a range of opinions as to the extent to which this recommendation has been addressed.
3.1.3 (2)	Analyses to distinguish between two stocks with mixing versus isolation by distance.	A, D	Within 3 months	No, analytical	**Already in progress.** Preliminary analyses have been conducted between the ICR and the Tokyo University of Marine Science and Technology (a document with results will be prepared for the 2017 SC meeting). As expected by the proponents, preliminary results showed that the effect size of the stocks in the Antarctic is too low to allow for the methods proposed by the review Workshop to distinguish between the two hypotheses. The proponents consider that the hypothesis of at least two stocks with mixing in the research area is the hypothesis better supported by the genetic and non-genetic data.	The Committee notes that the work will be presented at the 2017 meeting.
3.1.3 (3)	Simulation study to examine how additional sampling could be expected to improve precision and/or reduce bias in estimates of mixing rates.	A, D	Within 3 months	No, analytical	**To be completed in the next 1-2 years.** The original timeframe for this recommendation was for report at the 2016 IWC SC. However, the proponents consider that the work associated with this recommendation has lower priority among the remaining recommendations as this topic is not related to the main objectives of NEWREP-A. The proponents plan to conduct the relevant analyses to be reported to the 2018 IWC SC meeting.	No progress reported although the Committee notes that the work will be presented at the 2018 meeting.
3.1.3.1 (4)	Comprehensive biopsy sampling feasibility study.	B, C, D, E	1-2 field seasons	Yes, field effort	**Already in progress.** The original recommendation involved several elements as follows: (i) involve people with expertise in successfully biopsy sampling of common minke whales in the North Atlantic; (ii) mimic the sampling strategy developed for lethal sampling (e.g. when dealing with schools >2); (iii) record information on time taken, sea state, swell, etc. to enable a plausible measure of the effort required to be developed; and (iv) consider the amount of tissue required (for each analysis and in total). Feasibility biopsy sampling started in the 2015/16 austral summer season following the presentation and discussion of the dedicated sighting survey research plan in IWC SC 2015 (Government of Japan, 2015).	SC/66b/IA04 summarised the research plan for the 2016/17 survey, including the biopsy feasibility study. SC/66b/IA05 reported preliminary results on biopsy sampling obtained during the 2015/16 NEWREP-A survey.

Item	Summary	Purpose	Suggested timeframe	Needs new samples/data? Effort type	Proponents comments on progress (see SC/66b/SP09)	Committee comments on progress
					Before starting the feasibility study, consultation with experienced Japanese and Norwegian (e.g. Lars Kleivane) colleagues took place. A total of nine biopsy trials (of a total of 10 planned) was conducted on single schools. The relevant information suggested by the review workshop was obtained for each biopsy trial. Details of the feasibility trials and preliminary evaluation are presented in Isoda *et al*. (2016) [SC/66b/IA05]).	
3.1.5 (5)	Comprehensive telemetry feasibility study.	B, E	2-3 field seasons	Yes, field effort	**Already in progress.** The review workshop recommended that the proponents undertake this work in collaboration with research groups with experience in such work, rather than try to develop techniques on their own, and that this applies to field methods as well as tag types. Feasibility studies on telemetry started during the 2015/16 austral summer season following the presentation and discussion of the dedicated sighting survey research plan in IWC SC 2015 (Government of Japan, 2015). Before starting the feasibility study consultation took place with experienced Japanese and Norwegian (e.g. Lars Kleivane) colleagues. The focus in the first feasibility study was on the attachment system. A total of 16 trials for satellite tagging was conducted. Seven satellite tags and three dummy tags were attached to whales. The satellite tags successfully transmitted the locations of the whales for different period of time, with a maximum of about three weeks. Effort, Beaufort seastate data as well information on the schools were collected in each trial. Details of the feasibility study and a preliminary evaluation are presented in Isoda *et al*. (2016) [SC/66b/IA05]).	SC/66b/IA04 summarised the research plan for the 2016/17 survey, including the telemetry feasibility study. SC/66b/IA05 reported preliminary results on tagging obtained during the 2015/16 NEWREP-A survey.
3.2.2 (6)	Estimate $g(0)$for all species.	E	Throughout	Yes, field effort then analytical	**Already in progress.** Survey design and protocols with both the IO and closing modes were implemented during the dedicated sighting surveys in Area IV in 2014/15 and 2015/16 austral summer seasons (see details in Matsuoka *et al*., 2016 [SC/66b/SP05], and Isoda *et al*., 2016 [SC/66b/IA05]). Data collected are under analysis. This will allow the estimation of $g(0)$ for large whales.	SC/66b/IA04 summarised the research plan for the 2016/17 survey, which includes the estimation of $g(0)$ for large whale species (using the IWC-SOWER approach). The proposed field plan was approved by the Committee.
3.2.2 (7)	(1) Review survey design and methods taking into account: (a) analysis of IWC IDCR/ SOWER cruises; (b) spatial modelling developments; (c) experience of previous multi-disciplinary surveys; (d) JARPA II review recommend-ations; (e) the possibility of focussed surveys on specific issues in some years; (f) whales within the ice; and (g) updated power analyses of the effects of survey interval and estimation of trend. (2) Work closely with the IWC SC before finalising survey approaches. (3) Ensure that future survey plans submitted to the SC follow fully the guidelines for such survey plans, including incorporating proposed track lines.	E	Within 6 months then throughout	Yes, analytical then field effort then analytical	**Already in progress.** The research plan for the dedicated sighting survey in the austral summer season 2015/16 was presented and endorsed by the 2015 IWC SC (Government of Japan, 2015). The research plan for the dedicated sighting survey in the austral summer season 2016/17 is presented to the 2016 IWC SC in Hakamada *et al*. (2016) [SC/66b/IA04]. The research plan for the multidisciplinary survey takes the results and experience obtained on the 2015/16 survey into consideration.	The Committee approved the proposal in SC/66b/IA04.

Item	Summary	Purpose	Suggested timeframe	Needs new samples/data? Effort type	Proponents comments on progress (see SC/66b/SP09)	Committee comments on progress
3.3.3 (8)	Examine feasibility of using DNA methylation ageing technique with Antarctic minke whales using good quality earplugs, testing against geographical areas and different time periods and using several laboratories.	B, C, D	Within 1 year	No, laboratory then analytical[1]	**Already in progress.** After technical consultation with one of the authors of Polanowski *et al.* (2014)[1] it was confirmed that genes and position of age-related DNA methylation sites in the Antarctic minke whale were almost homologous to those in the humpback whales. Feasibility studies based on two approaches, direct sequencing method and pyrosequencing methods, are being conducted in collaboration with the Laboratory of Biology of the Azabu University School of Veterinary Medicine and Graduate School of Veterinary Medicine (former method)[2] and Riken Genesis Co. (latter methods)[3]. Work based on the two approaches started with the analyses of the same 14 DNA samples of Antarctic minke whales for which earplug readings were considered excellent. This will allow the comparison of results between two different approaches and laboratories.	The Committee was informed that this work has started in collaboration with other research institutions. Results will be presented in 2018.
3.4.3.1 (9)	Examine use of hormones in blubber to detect sexual maturity.	B, C, D	Within 2 years	No, laboratory[1]	**Already in progress.** The idea here is to estimate reproductive status in female Antarctic minke whales, using the concentrations of progesterone in blubber, with appropriate accuracy. To this end, 100 immature, 20 non-pregnant mature (10 with corpus luteum and 10 without corpus luteum) and 100 pregnant female whales sampled by JARPAII 2010/11-2013/14 will be analyzed by ELISA assay, using Crocodile mini-workstation (Titertek-Berthold). The study will be conducted in consultation with specialists of the Obihiro University of Agriculture and Veterinary Medicine, and foreign colleagues who have conducted similar studies in the past.	The Committee was informed that this work has started in collaboration with other research institutions. Results will be presented in 2018.
3.4.3.1 (10)	Evaluate the effect on SCAA of assuming 'resting' females are immature females.	A, C, D	Within 6 months	No, analytical	**To be completed in the next 1-2 years.** The proponents will complete this evaluation when conducting additional *IST*-like simulation studies to further validate the improved performance of RMP in the context of recommendation 1*.	No methods or results presented at this meeting but see discussion under Recommendation 1.
3.4.3.2 (11)	Update SCAA with respect to density- dependence following Punt *et al.* (2014), and stock mixing based on existing data.	A, C, D	Within 3 months	No, analytical	**Completed** (Government of Japan, 2015). The density-dependence had already been incorporated (the panel comment reflected a misunderstanding). Sensitivity to an extreme alternative boundary was tested and found to make little difference to combined abundance trends. Hence this recommendation is considered to have been addressed, though mixing issues may be considered further when the proponents conduct additional *IST*-like simulation studies to further validate the improved performance of RMP in the context of recommendation 1*.	The SCAA has been updated using the density-dependence function suggested by the Panel – task complete. However, the SCAA has yet to be updated to include the data on stock mixing and to estimate mixing rates (rather than changing the assumed fixed boundary in the SCAA). Punt advised that this recommendation was not intended by the Panel to be related to RMP/*IST* testing, but rather to the structure of the SCAA.
3.4.3.2 (12)	Identify more fully the data to be used to inform the time-varying natural mortality in the SCAA and analyse existing data to determine the feasibility and accuracy of obtaining such estimates.	A, C, D	Within 6 months	No, analytical	**To be completed in the next 1-2 years.** The proponents will complete this identification when conducting additional *IST*-like simulation studies to further validate the improved performance of RMP in the context of recommendation 1*.	No results nor methods presented but see discussion under Recommendation 1. The Siler model in SC/66b/IA08 is one way to account for time-varying natural mortality.
3.4.3.2 (13)	Develop metrics to evaluate the benefits of including time varying ASM data in the SCAA.	A, C, D	Within 3 months	No, analytical	**Already in progress.** The proponents have shown the impact of time varying ASM on the results of the SCAA (IWC, 2016|, pp.415-22). The integration of time varying ASM into ISTs will take place when the proponents conduct additional *IST*-like simulation studies to further validate the improved performance of RMP in the context of recommendation 1*.	The approach outlined by the proponents should be able to address the recommendation – it would involve imposing time-trends in ASM and evaluating the impacts on performance measures when catch limits are set using the CLA (after NEWREP-A is completed). The analyses to address this recommendation could be used to select an effect size which could then have formed the basis for a power analysis to determine sample size.

Item	Summary	Purpose	Suggested timeframe	Needs new samples/data? Effort type	Proponents comments on progress (see SC/66b/SP09)	Committee comments on progress
3.6.2.1 (14)	Consider the adoption of this multibeam sonar in krill surveys.	E	Within 6 months	No, logistical	**To be addressed.** Careful consideration will be given before the first dedicated krill survey (CCAMLR-type survey) tentatively scheduled for the 2018/19 austral summer season.	The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists.
3.6.2.3 (15)	Trial the ship and echosounder system(s) in Japan well before going to the Antarctic to determine the likely effective acoustic sampling range and potential for detecting krill for multiple frequencies over the required survey depth. Conduct for both annual and broad-scale survey vessels.	B, E	Within 1 year for annual surveys	Yes, logistical, field effort, analytical	**Completed.** Calibration of the echosounder system (EK80) was conducted in Japan before the start of 2015/16 NEWREP-A. Details of this work are provided in Wada *et al.* (2016) [SC/66b/EM03].	This work was completed before the start of the first whale sighting-based krill survey and results were presented in SC/66b/EM03. The Ecosystem Modelling working group encouraged further work on the survey in consultation with CCAMLR specialists.
3.6.2.5 (16)	In the years (two out of 12) when both NEWREP-A and CCAMLR-type surveys are conducted, try to survey the same transects by both vessels in near synchrony.	E	Within programme	No, logistical	**To be addressed.** Tentatively the first dedicated krill survey (CCAMLR-type survey) will be conducted in the 2018/19 austral summer season. Research plans will be presented to CCAMLR's EMM workshops in 2017 and 2018, and to the IWC SC Annual Meetings in 2017 and 2018. This recommendation will be considered in the research plan. The research plan will be adjusted in the light of these recommendations from these meetings.	The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists.
3.6.2.6 (17)	Conduct full analysis of statistical power to detect changes in krill abundance from proposed techniques.	A, E	Within 6 months	No, analytical	**To be addressed.** This has been deferred until planned discussions with CCAMLR experts have taken place.	The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists.
3.6.2.7 (18)	Develop more detailed plans to consider whether comparisons between stomach contents and proposed krill survey data are feasible and if so, how they can be done.	A, B, C	Within 3 months	No, logistical	**To be addressed.** This has been deferred until the planned discussions with CCAMLR experts have taken place.	The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists.
3.7.2 (19)	Ensure that sufficient time is allocated for adequate net sampling, based an analysis of previous net sampling data (e.g. BROKE/BROKE West data).	E	Within programme	No, logistical, analytical	**To be addressed.** Tentatively the first dedicated krill survey (CCAMLR-type survey) will be conducted in the 2018/19 austral summer season. Research plans will be presented to CCAMLR's EMM workshops in 2017 and 2018, and to the IWC SC annual meetings in 2017 and 2018. This recommendation will be considered in the research plan. The research plan will be adjusted in the light of the recommendations from these meetings.	The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists.
3.8.2 (20)	Give careful consideration to scale and design of oceanographic sampling, taking into account BROKE/BROKE West data.	E	Within programme	No, logistical, analytical	**To be addressed.** Tentatively the first dedicated krill survey (CCAMLR-type survey) will be conducted in the 2018/19 austral summer season. Research plans will be presented to CCAMLR's EMM workshops in 2017 and 2018, and to the IWC SC annual meetings in 2017 and 2018. This recommendation will be considered in the research plan. The research plan will be adjusted in the light of the recommendations from these meetings.	The Committee was informed that this recommendation will be addressed in consultation with CCAMLR specialists.
3.9.3.1 (21)	Compare overlap in diet amongst fin and Antarctic minke whales using stable isotopes in skin, with concurrent analyses of krill samples to obtain stable isotope baselines.	E	Throughout programme	Yes, field effort, analytical	**Already in progress.** This study involves two steps: the first is stable isotope analyses of the prey species (krill) samples to ensure the correct determination of stable isotope baselines; and the second is stable isotope analyses of skin samples of Antarctic minke whales and of biopsy samples of fin and humpback whales. At this juncture, the stable isotope analyses of four krill samples have already been conducted, and 16 skin samples of Antarctic minke whale were used in a feasibility study[4]. This study will be carried out in collaboration with the Laboratory of Marine Ecosystem Change Analysis, Field Science Center for Northern Biosphere, Hokkaido University[5].	The Committee was informed that this work was started in collaboration with other research institutions. Final results will be presented to the mid-term review.

Item	Summary	Purpose	Suggested timeframe	Needs new samples/data? Effort type	Proponents comments on progress (see SC/66b/SP09)	Committee comments on progress
3.9.3.1 (22)	Develop a more powerful approach to estimating energy intake (requirements) using a bio-energetics model; evaluate non-lethal methods for obtaining a time series of tuning data for such models.	A, B, D	Within 6 months	No, analytical	**To be completed in the next 1-2 years.** Biopsy samples which might be used for the tuning of bioenergetics model have already been collected. The next step (i.e. estimation of energy intake) is a huge task and thus needs careful consideration	The Committee was informed that this work will be completed in 1-2 years.
3.9.3.1 (23)	Investigate stable isotopes along edge of baleen plates to see if this provides insights into duration of time on feeding grounds.	B	Within 6 months	No (if existing samples), laboratory	**Already in progress.** Study to be conducted initially using baleen plates of Antarctic minke whale collected during the JARPAII. As a first step, stable carbon and nitrogen isotope ratios will be determined along edge of the baleen plates of 10-20 Antarctic minke whales. Each baleen plate will be examined at around 20 places following Mitani *et al.* (2006). This work is being carried out in collaboration with the Laboratory of Marine Ecosystem Change Analysis, Field Science Center for Northern Biosphere, Hokkaido University[5].	The Committee was informed that this work has been started in collaboration with other research institutions. Final results will be presented at the 2018 Annual meeting.
3.9.3.3 (24)	Use 'non-lethal' techniques on all animals; develop 'condition indices'; work to develop non-lethal techniques for total consumption.	E	Within programme	To be determined after relevant analyses related to A-D are completed	**To be addressed.** This needs careful consideration. More time is required for the discussions to plan the details of such an exercise to take place.	No new information.
3.11.2 (25)	Provide an improved outline of the proposed ecosystem and multispecies model structures and provide a data gap analysis.	E	Within 3 months	No, analytical	**To be completed by 2017.** An update of the Mori- Butterworth Antarctic ecosystem model, taking JARPA and JARPA II data into account, is well advanced by a University student for a post-graduate thesis. The decision has been made to await the results from this work to provide further basis upon which to improve the outline provided previously.	The Committee notes that the work will be presented at the 2017 meeting.
4.2.1 (26)	Provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this Item.	D	Within 3 months	No, analytical	**Completed to a reasonable level** (see details in Government of Japan (2015) [SC/66b/SP10]). The proponents conducted re-analyses and the results indicate that the point estimate of the cohort random effect is zero. The results therefore do not lead to any strong reason to change the sample size. Consequently the proponents have concluded that the reasonableness of the proposed sample size (333) has now been adequately demonstrated.	The analyses now reasonably account for three of the six aspects that constitute a realistic model (i.e. ageing-reading error, overdispersion in catch composition, recruitment variation). Overall, the approach being taken to address the recommendation is appropriate but some further refinements are required. • SC/66b/SP10 restricts the data used to fit the models to ages 4-13 and 1980-87 and 1992-99. All of the data should be used to estimate the amount of extra- age, -cohort and -year variation rather than restricting the analysis to a subset of years and ages. Doing this also avoids the need to simulate the process of excluding some cohorts and ages when analysing future (simulated) age data. • The estimates in SC/66b/SP10 of the variance of cohort random effects and extra-binomial variation (i.e. overdispersion) are zero, which makes these asymptotic estimates potentially questionable. Use a method (such as likelihood profile or the R package *blme*) to better quantify the uncertainty of these variances and develop probability distributions for them. Annex T5 provides an example of a likelihood for the overdispersion parameter, confirming that the asymptotic estimate of variance is too small. The simulations to evaluate power should then sample from these distributions.

Item	Summary	Purpose	Suggested timeframe	Needs new samples/data? Effort type	Proponents comments on progress (see SC/66b/SP09)	Committee comments on progress
						• The current analyses do not attempt to specifically quantify the effects of year-to-year sampling variation, which reflects the impact of, for example, the locations of sampling (for examples, in some years in regions where mature animals predominate) although overdispersion arisng from this sort of heterogeneity was considered to some extent in SC/66b/SP10 in beta-binomial model. • Though challenging, simultaneous estimation of random effects of year and cohort can be explored using the type of model used to estimate cohort random variation in SC/66b/SP10.
5.2 (27)	Provide additional analyses on effect of catches upon the stocks for comparison with those presented.	E	Within 3 months	No, analytical	The proponents see no real need to implement this recommendation, and request the IWC SC to provide convincing reasons as to why addressing this recommendation is necessary for NEWREP-A. The proponents make this comment in the light of the Expert Panel agreement that the conclusion that catches of the order of 333 every 2nd year will not harm the stocks is very likely robust to the analytical method applied.	The Committee notes the rationale for the additional work provided in the Panel report and agrees with that position.
7.2 (28)	Improve mechanisms for co-operative research.	E	Within 3 months	No, logistical	**Already in progress.** The proponents have already posted a formal protocol for outside scientists to express interest, on the website of the ICR (in English): *http://www.icrwhale.org/NEWREP-AProtocol.html*.	The Committee noted the protocol placed upon the ICR website.
8.2 (29)	Provide information on programme management, personnel and logistic resources.	E	Throughout programme	No, logistical	**Already in progress.** Relevant information is provided to the IWC SC in an annual progress reports in response to the SC's comments and suggestions (see Appendix 1).	SC/66b/SP09, Appendix 1 contains a progress report on management, personnel and logistic resources.

[1]Also link to biopsy feasibility study (Item 3.1.3.1). E-mail communication with Dr. S. Jarman, Australia, dated 15 December 2015.
[2]This method is being used in a master thesis study titled: 'Feasibility study of Antarctic minke whale aging based on DNA methylation by direct sequencing method' by Risa Shimizu (Azabu University, Kanagawa Prefecture).
[3]ICR-Riken Genesis Co. research collaboration under ICR Contract No. ICR-78-4, May 2016.
[4]ICR-Japan Chemical Analysis Center. Research contract No. 27P10, Mach 2016.
[5]ICR-Hokkaido University research collaboration under ICR Contract No. ICR-76-47, April 2016.
*As described in the sub-section 4.4 of SC/66b/SP10, the proponents believe that the response required for recommendation 1 has been provided. Building upon this, the proponents are aware that, for the purpose of justifying the adoption by the Committee of a modified *CLA* with age data (MCLA) for Antarctic minke whales in preference to the existing *CLA*, further work would need to be specified by and then undertaken through the Committee. This would involve both refinement of the MCLA developed here and its testing under a more extensive set of trials/OMs, and such further work would desirably be pursued in the future. However, in line with the Committee's customary practice, a pre-requisite for this further work, is for the Committee to provide a pre-specified set of agreed trials (the proponents, if contributing to such further work, should not be expected to invest considerable time in developing and running further trials, only to be informed later by the Committee that they would have wanted different trials run). Accordingly, the proponents look forward to the Committee agreeing on the specifications of an extension to the trials undertaken here (or at least, more immediately, on a process to develop those specifications in the Committee), so that work can continue in the Scientific Committee with the aim of ultimately adopting a MCLA making use of age data which would be suitable for implementation for setting catch limits for Antarctic minke whales.

The primary objective of the Expert Panel Workshop for this final review was to review the scientific aspects of the JARPN II programme in the light of the stated programme objectives. In particular, the Panel was to:

(1) assess the extent of the programme's scientific output;
(2) assess the degree to which the programme coordinated its activities with related research projects;
(3) evaluate other contributions to important research and information needs outside the original set of objectives; and
(4) evaluate how well the objectives of the research were met, and the extent to which results have led to demonstrated improvements in the conservation and management of whales and/or other marine living resources.

The Panel noted that this 'final' review was somewhat unusual in that the field component of the JARPN II programme was not expected to finish until 2016 (SC/66b/Rep06, p.3). The Panel's general comments and recommendations on: (a) timing; (b) the nature of final reports; (c) the work being undertaken from 2014-16 to compare lethal and non-lethal techniques; and (d) ways to improve consideration of progress with recommendations are given under Item 11.1 of SC/66b/Rep06. Moreover, Annex G of SC/66b/Rep06 contains some suggestions for potential guidelines for an integrated final report from a special permit programme.

With respect to JARPN II's scientific output, the Panel noted that the programme thus far had results in 31 peer-reviewed papers related to the programmes primary objectives and 30 arising from ancillary studies that contributed to research not related to the primary objectives. It had also produced a large number of IWC papers that had contributed to Scientific Committee work on the RMP and in-depth assessments. The Panel strongly encouraged the submissions of further analyses to peer-reviewed journals.

The Panel welcomed much improved collaboration with other research projects compared to 2009 (most of which was within Japan). It encouraged additional collaboration with respect to any future analyses of the data.

In terms of evaluating the extent to which the results met the objectives of the programme and have improved conservation and management, the Panel considered this in two stages. The first was to examine how well they had met sub-objectives developed by the proponents after 2009 that had been finalised in 2014. The Panel's views are summarised in Table 10 of SC/66b/Rep06. The second stage was to review how well the proponents had met their three main objectives (noting the timing issue raised under Item 11.1 of SC/66b/Rep06) and to consider how the work had contributed to conservation and management. The Panels views are given below (apart from with respect to the sperm whale component which it agreed had produced little of scientific value).

18.2.1.1 EXPERT PANEL CONCLUSIONS WITH RESPECT TO ANNEX P

Before considering the specific items of the review outlined in Annex P, the Panel drew attention to a number of important general matters that affected its review (SC/66b/Rep06, Item 11.1).

TIMING

The Panel (SC/66b/Rep06, item 11.1.1) commented that as the closing of the JARPN II programme reflected a political decision related to the Government of Japan's response to the International Court of Justice decision regarding JARPA II, rather than a scientific evaluation that the JARPN II programme had attained its objectives or sub-objectives. In fact, this 'final review' of JARPN II is occurring before the formal completion of the programme in 2016, although the sample sizes and priorities for the period 2014-16 were revised by the Government of Japan (Fisheries Agency of Japan, 2016).

Annex P envisions final reviews taking place within three years of the finish of a programme to reflect the fact that sufficient time needs to be given to the proponents to develop a comprehensive and integrated final report. It is clear from the discussion and recommendations that despite the hard work of the scientists, resulting in a large number of working papers, that the analyses would have benefitted from considerably more time. Similarly, more time would have enabled the scientists to produce an integrated final report. The Panel **recommended** that the Scientific Committee considers including a guideline in Annex P either relating to the minimum time after completion of a programme that a final review can take place or establishing a small review group to determine whether the materials presented for a final review are in a sufficient state for a workshop to take place (this may also be worth considering for new and periodic reviews).

In addition, the fact that: (a) the programme was completed early for political rather than scientific reasons; and (b) there were no formal intermediate targets by timeline, meant that it was difficult for the Panel to properly assess the results of the programme against the original objectives.

THE NATURE OF 'FINAL REPORTS'

Annex P does not provide guidelines for the scope and structure of final reports. However, the Panel's experience in undertaking this review shows that formal guidance is necessary. The Panel **recommended** that Annex P should be revised to include such guidelines and offers the following comments to assist in that process.

The Panel's task was made considerably more difficult because the methods, analyses and conclusions were found within a very large number of documents of varying levels of completeness and quality. The Panel also noted that some documents (e.g., Fisheries Agency of Japan, 2016, and part of section 4.3 of Tamura *et al.*, 2016a) included information or discussion beyond the Terms of Reference for this final scientific review. Although the proponents produced a good brief overall summary document (Tamura *et al.*, 2016a), it contained insufficient detail to allow a proper review and details of sampling design, strategy, field protocols, analytical methods and conclusions. For this, the Panel members had not only to examine over 90 working papers and documents, but also references to other unpublished sources (e.g. IWC papers) over the JARPN II period. This lack of integration, at least by objective, appears to be a function of the timing of the review (see item 11.1.1, SC/66b/Rep06) but it is not an efficient way to work and can make it rather difficult for the Panel (and especially members from outside the IWC system) to conduct a thorough review. A suggested outline for an integrated final report (and associated materials) was provided as Annex G of SC/66b/Rep06.

LETHAL AND NON-LETHAL TECHNIQUES

Under item 11.1.3 of SC/66b/Rep06, the Panel commented that although formally outside the scope of this review whose focus is on the period up to 2013, Japan has modified and reprioritised the JARPN II programme until it is officially completed in 2016 (see item 3.4 in SC/66b/Rep06). One aspect of this, related to the addition of an

objective to compare lethal and non-lethal techniques, was in line with the recommendation from the 2009. This topic is central to many issues raised in Annex P for reviews of new and ongoing permits and the difficulties in addressing the issue have been raised by all of the expert Panels thus far. In this light, the Panel **highlighted** the second part of the recommendation given under item 3.4.2.2 of SC/66b/Rep06 that the proponents provide a single document to the 2016 Annual Meeting that provides the field and analytical protocols for the comparison of using lethal and non-lethal techniques for each key parameter, taking into account the advice provided in 2009.

REVIEW OF PROGRESS OF RECOMMENDATIONS

One important component of this review was an examination of the response of proponents to the recommendations of the 2009 review. In addition, the Panel also notes that the 2009 Panel had stated that given the extra work it had requested of the proponents on certain key matters (including with respect to assessing the effects of catches on some of the stocks) it had not been able to complete its review. The 2009 Panel had requested the Scientific Committee to consider 'the most appropriate way that this review is completed'.

The Panel **recognised** that the Scientific Committee has agreed that it is not necessary to review in detail the results of ongoing permits every year. However, it believes that the regular and final reviews (and potentially reviews of new permit proposals) would be facilitated by a short (just a paragraph or two) biennial update by proponents as to progress with each of the recommendations after their initial response in the Annual Meeting following the review Workshop; this should also benefit the proponents' work.

The Panel **recommended** that the Scientific Committee should consider a mechanism (e.g. revision to Annex P) to provide for such a brief annual review of progress with recommendations. It also **reiterated** the request of the 2009 Panel that the Scientific Committee develops a mechanism to allow for the completion of expert Panel reviews if a Panel states that its review is incomplete until further information/analyses is provided.

ASSESSMENT OF THE PROGRAMME'S SCIENTIFIC OUTPUT GIVEN THE STATED OBJECTIVES AND LENGTH OF THE PROGRAMME

The Panel referred to its earlier comments regarding the timing of the final review and the reasons for the timing of the close of the programme; this also affects to some extent its ability to assess the programme's scientific output given the stated objectives and length of the programme (item 11.2, SC/66b/Rep06). It was clear from the review that: (a) considerable scientific work has been undertaken and that the output has been accepted in peer-reviewed journals and has influenced the work of the IWC Scientific Committee; but also that (b) a much greater emphasis should have been put on improved analyses and modelling - that would increase considerably the value of the scientific output of the existing data collected. The Panel therefore strongly **encouraged** the proponents to follow the recommendations provided in its report and submit further work to peer-reviewed scientific journals.

CONSIDERATION OF THE LEVEL OF CO-ORDINATION WITH OTHER RELEVANT RESEARCH PROJECTS

The Panel **welcomed** the much-improved collaboration with other research projects compared to that in 2009 (item 11.2, SC/66b/Rep06). It **noted** that most of that co-operation occurred within Japanese institutes (academic and governmental). This is perhaps not surprising for the coastal components which are within Japanese waters but it encourages additional co-operation with scientists from other research projects that address similar issues but for other regions with respect to any further analyses that are to be undertaken.

EVALUATION OF HOW WELL THE MOST RECENT STATED SUB-OBJECTIVES HAVE BEEN MET AND THE EXTENT TO WHICH THE RESULTS HAVE IMPROVED CONSERVATION AND MANAGEMENT

The Panels' view of how well the recently developed sub-objectives have been met is given in Table 10 in SC/66b/Rep06. The overall Panel evaluation of the work presented against the original objectives, and comments on the extent to which the work has contributed to conservation and management is provided in the text below (item 11.3.2, SC/66b/Rep06) by objective.

OBJECTIVE 1: FEEDING ECOLOGY AND ECOSYSTEM STUDIES

The ultimate goal of this objective was to provide multispecies management advice. As noted by the 2009 Panel, this was an extremely ambitious task and one likely to take many years. The level of field and laboratory work has been impressive and the examination of uncertainty with respect to the prey consumption and prey preferences has been greatly improved since 2009 although analytical improvements can still be made. However, the question of the effects of sampling design (see item 3.4.2 in SC/66b/Rep06) requires further consideration and, primarily as a result of a lack of allocated resources (despite the 2009 Panel recommendation), the modelling work remains preliminary.

Even allowing for the complexity of the issue, there are examples of Minimum Realistic Models/Models of Intermediate Complexity for Ecosystem Assessment (MRM/MICE models) that that can be parameterised by fitting to data which are used to provide input to tactical assessment models and there are better developed food web and extended single species models; with additional resources, progress could (and should) have been made in the development of intermediate model types. The Panel **concluded** that at this stage of development, the modelling results are not suitable for addressing strategic management questions. Ecosystem models such as Ecopath with Ecosim, Atlantis, and other large complex models which are difficult to parameterise by fitting to data are not suitable for tactical management anywhere in the world at present and probably far into the future. Single species models with predation and multispecies (MICE) models could be used to provide tactical advice in the future. At present, at least, the results have not led to improved conservation and management of cetaceans or of other marine living resources or the ecosystem.

OBJECTIVE 2: MONITORING ENVIRONMENTAL POLLUTANTS IN CETACEANS AND THE MARINE ECOSYSTEM

This objective related to monitoring pollutants in the environment and cetaceans including: (a) pattern of accumulation in cetaceans; (b) bioaccumulation through the food chain; and (c) the relationship between pollutants and cetacean health. The Panel **noted** that the achievement of this objective was hampered considerably by the loss of samples as a result of the tsunami. It also acknowledges the efforts made to follow the recommendations of the 2009 Panel. The level of field and laboratory work has been good and understanding of chemical pollutants and cetaceans off Japan has been greatly improved. However, the Panel **concluded** that only partial progress has been made towards addressing the objectives and more effort needs to be put on improved analyses and interpretation of results. This is especially true in terms of the relationship of pollutants

and cetacean health, which is most relevant to improved conservation and management of cetaceans. It is not clear from the papers presented if (and if so how) the work undertaken has contributed to the conservation of other marine resources or the ecosystem.

OBJECTIVE 3: STOCK STRUCTURE OF LARGE WHALES

The broad objectives simply related to the stock structure of large whales (common minke whales, sei whales, Bryde's whales and sperm whales), although this was clarified at the 2009 Panel Workshop to be primarily related to developing or narrowing the number of hypotheses to be considered by the IWC Scientific Committee in its work related to the RMP and in-depth assessments. The level of field, laboratory and analytical work has been impressive, as was the effort put into responding to the 2009 Panel recommendations. The Panel did make some recommendations for improved analyses, particularly related to power and the ability to distinguish amongst weakly-differentiated populations. The Panel **concluded** that the stock structure component of JARPN II has made, and will continue to make, important contributions to the conservation and management of cetaceans by providing fundamental data and analyses for the RMP *Implementation Reviews* of common minke whales and Bryde's whales, and the in-depth assessment of sei whales.

In general, the Panel **recognised** the extensive field and laboratory components of the programme but was **concerned** that this was not matched by the analytical effort. To this end, the Panel made almost 40 recommendations for improved analyses, of which around 15 could be achieved in the short-term (see Annex E of SC/66b/Rep06).

18.2.2 Proponents response to Expert Panel report including new/revised analyses

18.2.2.1 THE PERIOD UP TO 2013

As noted earlier, the primary focus of the Panel's review was for the period up to 2013. The proponents' response to the Panel's report was provided in SC/66b/SP01. In general, the proponents' concluded that in their view the Workshop report represented a fair and balanced evaluation of the work conducted under JARPN II. They stated that the Expert Panel had welcomed the scientific contributions of JARPN/JARPN II, while at the same time, identifying areas where further work was required and provided. The proponents believed that the suggestions and recommendations, if correctly implemented, would contribute to improving the scientific contribution of JARPN II.

SC/66b/SP01 summarised the proponents' response to the recommendations in the Panel report and their views were taken into account in the development of Table 24, which is the Committee's overall evaluation of the progress with respect to each of the Panel's recommendations (see below).

18.2.2.2 THE PERIOD 2014-16

Only one of the Expert Panel's recommendations (with two components) was relevant to the period 2014-16 (Recommendation 3 in Table 24): the first part related to providing a document with a clearer rationale for the changes in sample size and the possible effect on meeting objectives, while the second related to the provision of field and analytical protocols for comparing lethal and non-lethal techniques by key parameters.

With respect to the former, the proponents' believed that they had provided sufficient information. With respect to the latter, SC/66b/SP08 reported the field and analytical protocols for the comparison of using lethal and non-lethal techniques under the JARPN II, with preliminary application to biopsy and faecal sampling. The study was planned to be conducted in three years (2014-16) in the coastal water off Sanriku and Kushiro, and in offshore waters. The primary objectives are to determine: (1) whether a tissue and other samples can be obtained by non-lethal methods; (2) whether enough samples for statistical analysis can be obtained by non-lethal methods; (3) whether samples obtained by non-lethal methods can produce comparable scientific information to that obtained from lethal sampling method; and (4) whether the cost for obtaining the sample/producing scientific information is reasonable. Preliminary results based on data obtained in 2014 and 2015, suggested that sampling efficiency for faeces was very low, and also that the estimation based on DNA analysis are unreliable as the prey species identified by the DNA analysis of large intestine differed from the species found in the stomach contents. As for biopsy sampling, the samples could be obtained from free ranging animals although sampling efficiency differed by species. This study will be continued by using data obtained in 2016.

The Committee's discussion of this paper is found under Item 18.2.3.2.

18.2.3 Evaluation of proponent's response to recommendations of Expert Panel report

18.2.3.1 THE PERIOD UP TO 2013

In addition to the consideration of the overview provided in SC/66b/SP01, technical aspects of specific papers (either submitted to the Expert Panel meeting or produced in response to recommendations from that meeting) were discussed initially in the relevant sub-groups and are considered elsewhere in this report under the relevant agenda items related to inter alia stock structure (Item 12), abundance estimates (Items 6 and 10.12), chemical pollutants (Item 13.2) and feeding ecology/modelling (Item 14). These discussions were taken into account when the Committee developed its view of the responses of the proponents to the recommendations in the Expert Panel report that can be found in Table 24.

Discussion of the response to Recommendation 1 regarding realised versus actual sampling deand sign and the implications of this for analyses was discussed within the plenary sessions devoted to Special Permits and is summarised below.

In SC/66b/SP04, the proponents provided further information on sampling design of JARPN II in response to part of the recommendation by the Expert Panel. At the planning stage, tracklines for the offshore component were designed to cover a wide range of the survey area. However, when the actual surveys were conducted, some tracklines were cancelled or new tracklines were designed in accordance with seasonal changes of whale distribution influenced by the oceanographic structure and severe weather conditions. The samples were collected from wide longitudinal range of the research area during six year's survey periods (2002-07 and 2008-13). As a result, samples collected during JARPN II surveys should represent the distribution of each whale species in the research area at least during the respective six years' periods. Estimation of total amount of prey consumption, which is a main objective of JARPN II, was conducted in each sub-area and season (early and late). Sexual maturity composition was estimated in each sub-area and season, and total amount of prey consumption was estimated by extrapolating these data to total number of whales migrating to research area (Tamura *et al*., 2016b). Representativeness of samples

among the whales migrating to the research area would be secured by this analytical method. At the coastal component, small-type whaling catcher boats used as sampling vessels are not suitable for bad weather conditions, as (Kishiro *et al*., 2016) noted. All animals encountered were targeted for sampling, except cow-calf pairs. The authors consider that this will ensure the representativeness of animals migrating into the research area: sampling design did not significantly affect data analysis. It was also recognised that sea bottom topography is not uniform in the research area, especially off Kushiro. Further considerations on how to conduct more detailed analyses considering topographical features, should be made.

The Committee thanked the authors for the paper and there was considerable discussion. Suggestions were made by some members of the Committee to improve the clarity of the information presented including captions that better explain the different line-types and a more clear indication of how the sampling scheme changed over the surveys. As part of a revised paper, it was suggested that a table that:

(a) lists each estimated parameter/quantity;
(b) states whether it can be estimated by design-based versus model-based methods; and
(c) notes the papers that have applied each method;

would assist with assessing the consequences of the sampling occurring at locations in addition to the intended tracklines.

The proponents noted in SC/66b/SP04 that some tracklines of the offshore component of JARPN II were cancelled, or new tracklines were designed, to cover the actual distribution of the whales predicted by the oceanographic structures at that time. In addition, some 'Special Monitoring Surveys' (SMS) were conducted in areas where the abundance of whales targeted was expected to be high. It was noted that this strategy could introduce bias compared to design-based survey strategies with fixed pre-determined tracklines. In principle, all the data could be used with a model-based estimation approach, but that approach would need to be clearly explained to allow evaluation.

In the context of a design-based analysis, the pooling of data that had been done between tracklines and subsequent SMS may not be appropriate. The Committee **notes** that:

(a) analyses which disaggregate the data between those collected on pre-determined tracklines and those from the SMS approach are required;
(b) if the separate results in relation to each quantity being sampled are consistent then there may be a case for pooling the data, at least in a point estimate context, although variance estimates would be more challenging; and
(c) the impact of the trackline coverage on the precision of estimated quantities should be examined.

The evaluation of whether pooling data is appropriate will influence consideration of the sample sizes necessary to achieve the stated objectives with regards to precision.

With respect to the coastal component of JARPN II, the Committee **notes** that the sampling approach is such that there is a sampling bias with greater coverage closest to the port compared to the overall survey area. Analyses should be undertaken (e.g. design-based estimation) to make allowance for non-random sampling of the region.

There was also some discussion on the question of ageing techniques, partially in the light of the progress reported in reading earplugs presented by the proponents and discussed by the Expert Panel (see SC/66b/Rep06, item 9.1.2) where work is underway, but largely in the context of comparison with other non-lethal techniques. For that reason, the discussion is included under Item 18.2.3.2.

The Committee's summary of its views on the proponents' response are summarised in Table 23.

18.2.3.2 THE PERIOD 2014-16

The primary discussion of this item within the Committee focussed on SC/66b/SP08 (a summary of the paper is given under Item 18.2.2.2). With respect to the authors' comments on the difficulties encountered in collecting faecal samples, it was noted that the information that can be gained from certain non-lethal and lethal techniques (e.g. stomach content data, DNA analyses of faeces and biochemical analyses of biopsy samples) are not necessarily directly comparable. Some commented that consideration of any comparison should focus on whether relevant comparable information can be obtained in terms of the objectives of the study, rather than only on whether the two methods produce the same information. The value of examining stomach contents to understand the relative species composition and age composition of the prey species was raised, as was the use of DNA methods to estimate the proportions of prey species. These issues were also discussed in the Expert Panel's report (SC/66b/Rep06).

Suggestions were also made with respect to the presentation of results from the biopsy sampling studies (e.g. time budget data including post sampling handling time for both biopsy dart samples and killed animals). The authors noted that these were preliminary results and a more detailed analysis would be presented after the 2016 season, although they cautioned that samples size thus far was low. These issues were also discussed in the Expert Panel's report (SC/66b/Rep06). Some members noted that the experiments reported in SC/66b/SP08 should allow better comparison of lethal and non-lethal means for obtaining certain data in the future and encouraged further continuation of these studies.

A related matter was the consideration of various techniques for ageing whales, including the new approach for earplugs presented at the Expert Panel Review (SC/66b/Rep06, item 9.2), which for common minke whales in the western North Pacific had increased the readability of earplugs from <10% to >40%. Discussion within the Committee focussed on the use of DNA methylation techniques from biopsy samples (e.g. for humpback whales - Polanowski *et al.* (2014). Although there has been some discussion of the relative accuracy of this approach compared to earplug readings (Kitakado, 2016a), it was noted that before reaching conclusions on relative utility, the following factors require further consideration: (a) an increase in the number of CpG sites may increase the resolution for skin to a sufficient level; (b) correlation between chronological age and methylation profile varies a great deal among different tissues, e.g. see Horvath (2013) - in addition to skin, biopsy samples typically include connective tissue and the lipid filled fat cells and these tissues should also be investigated, e.g. see Arner *et al.* (2015); (c) there is a need to better understand the 'stressors' (e.g. sunlight) that may affect the calibration of the methylation approach; (d) the question of what comprises 'error' and how to take this into account is important for whatever technique is used. It was noted that the point raised above concerning the adequacy of any technique in terms of the objectives of the study was also relevant here. In response, the proponents noted that some work using methylation techniques was being undertaken as part of the NEWREP-A programme and that in light of this discussion the number of tissue examined would be increased.

Table 23

A summary of the Committee's evaluation of progress made by the proponents in responding to the report of the Expert Panel. These are arranged by topic. The Agenda Items refer to the relevant section of the Expert Panel's report and the suggested timelines are those made by the Panel.

Sampling design and areas (Item 3.4.2.1): suggested by 2016 Annual Meeting		**Progress by 2016 meeting**
(1)	A new paper that in addition to the information on sightings, it should document, for each year and season: (a) the predetermined tracklines for sampling and the rationale for those lines; and (b) the actual coverage of those tracklines and the rationale for any decisions taken to deviate from the predetermined lines including the rationale for any new lines developed. It should also address the issue of whether the actual sampling that occurred can be said to be representative of: (a) the animals in the surveyed area; and (b) those in the biological population(s) and discuss the extent to which this may affect those objectives/parameters/ analyses for which this is or may be important.	(1) The proponents responded in SC/66b/SP04. The Committee discussed this at some length (see Item 18.2.3.1). Suggestions were made to improve the manuscript and to better evaluate the appropriateness of the pooling of data. This requires analyses that disaggregate the data collected according to the two different sampling strategies. This may allow pooling of data but the precision of estimated quantities, and hence required sample sizes, should also be examined.
(2)	Papers using data from the inshore component must fully address the implications of the logistical rather than scientific sampling design.	Issues related to the sample representativeness and the effect of this are **partially** addressed. (2) Partially addressed in SC/66b/SP04 but further analyses required to make allowance for non-random sampling
Sample size (Item 3.4.2.2): suggested by 2016 Annual Meeting		
(3)	A new paper should be developed that: (a) provides a clearer rationale for the changes in sample sizes initiated in 2014 and any implications for meeting the original objectives of the programme; and (b) provides the field and analytical protocols for the comparison of using lethal and non-lethal techniques for each key parameter taking into account the advice provided in 2009.	(3a) The proponents provided some information in SC/66b/SP01. The Committee noted that this largely referred to information already available to the Panel and Committee and noted that further information, especially with respect to the implications for meeting the original objectives would be helpful. (3b) The proponents presented the field and analytical protocols in SC/66b/SP08. Committee advice on presentation of results and analyses in a final report by is given under Item 18.2.3.2.
Stock structure (Item 4.4.3): some short- and some medium-term		
(4)	**By 2016 Annual Meeting or 2017 at latest** All inferences regarding 'randomness' of observations (e.g. satellite tracks, mitochondrial DNA haplotypes and unassigned common minke whales) should be substantiated by a statistical assessment of the presumed randomness.	(4) SC/66b/SP01 indicates this will be addressed and proposes two approaches. (5) In progress (see discussion in Annex I). (6) SC/66b/DNA01 fully addresses this (see Annex N).
(5)	The presence of multiple stocks within sample partitions should be assessed (employing, e.g. STRUCTURE and DAPC).	
(6)	More explicit information on quality checks be provided in each study as well as study-specific estimates or genotyping and DNA sequencing error rates.	
(7)	**2-3 years after the 2016 Annual Meeting** To facilitate more definitive discrimination between single and multiple stock hypotheses, undertake work to determine the demographic dispersal rates among areas at which whales in different areas can be managed as a single stock. Identifying 'critical' dispersal rates by specific case and the corresponding levels of genetic divergence, should enable such discrimination. The approach of Van der Zee and Punt (2014) is commended. This will allow the development of a working definition of a 'stock'.	The proponents noted that work had begun to address (7), (9) and (10). They propose use of kinship analyses to address (8). Progress is discussed further in Annex I.
(8)	Analytical approaches should be applied that do not assume mutation-drift-migration equilibrium (Hey, 2010).	
(9)	Serious consideration should be given to using genome-wide SNP genotyping approaches, such as RAD sequencing and GBS (Elshire *et al.*, 2011; Miller *et al.*, 2007). This will increase the data per sample thereby improving the accuracy and precision of genetic parameter estimates and facilitate additional analyses (Hey and Machado, 2003; Robinson *et al.*, 2014).	
(10)	A focused satellite tagging programme should be developed to greatly increase sample size to assess individual migration in the context of stock structure hypotheses more thoroughly.	
Feeding ecology and ecosystem studies – Oceanography (Item 5.4.3.1): within 2 years		
(11)	Chl-*a* concentration should be examined as a potential proxy for the food environment for whales.	Used in some analyses already and discussed in SC/66b/SP01.

(12)	Oceanographic monitoring is required to compare with prey species distribution and abundance in the new 'decadal regime'.	The proponents agreed – this is long-term monitoring.
Feeding ecology and ecosystem studies – Distribution (Item 5.4.3.2): 2016 Annual Meeting		
(13)	With respect to papers Murase *et al.* (2016) [SC/F16/JR07], Murase *et al.* (2014) [SC/F16/JR08], Matsuoka *et al.* (2016) [SC/F16/JR09], Sasaki *et al.* (2013) [SC/F16/JR10] and Tamura *et al.* (2016c) [SC/F16/JR16], develop revised versions that: (a) include statistical summaries on model fit (R^2 and % deviance explained) and model comparison and spatial covariate selection (e.g. AIC, GCV scores); (b) avoid extrapolation of the regression models outside to data-poor areas or areas lacking coverage (especially when combining food consumption with sightings data); and (c) include variance plots of the fitted prediction surfaces in order to address precision and data sparseness.	(13a) The proponents provided statistical summaries relating to model fits in papers Murase *et al.* (2016) [SC/F16/JR07], Murase *et al.* (2014) [SC/F16/JR08], Sasaki *et al.* (2013) [SC/F16/JR10] and Tamura *et al.* (2016c) [SC/F16/JR16], but not in Matsuoka *et al.* (2016) [SC/F16/JR09]. (13b, 13c) No information received.
Feeding ecology and ecosystem studies – Distribution (Item 5.4.3.2): 2-3 years after 2016		
(14)	Considerable effort be put into the methodological improvement of the spatial modelling in the various analysis related with the objectives on distribution of large whales and oceanography. A particular focus must be on the combination of survey data from the different years to make them more comparable in terms of distribution (and abundance) over time; use of data from other sources (e.g. the IWC POWER programme). This work is not only valuable in itself but is essential for a better parameterisation of ecosystem models.	(14) The proponents agreed and will undertake in light of guidelines to be developed by the Scientific Committee in 2017 (see Annex D). Will also include additional data.
(15)	Additional effort be placed on fulfilling the 2009 recommendation with respect to the photo-identification data to contribute to the understanding of large scale movements and whale distribution within and outside the JARPN II survey area for several species.	(15) The proponents agreed that consideration will be given to sharing photo-ID data.
(16)	Explore methods to account for sampling differences between areas and years to obtain measures of short- and long-term variation and trends and estimates the extent of additional variance due to changes over time in spatial distribution (essential for modelling efforts, for example, in food consumption models and ecosystem models).	(16) The proponents agreed and expect to achieve this within the timeframe.
(17)	Compare results from the design-based estimates of abundance with those of model-based estimates to potentially address problems of unequal sampling coverage between surveys and to potentially account for additional sources or causes of variability.	(17) The proponents agreed and expect to achieve this within the timeframe and in line with the IWC guidelines discussed under (14) above.
Feeding ecology and ecosystem studies - Field and laboratory studies (Item 6.4.3):		
(18)	**By 2016 meeting or 2017 at the latest** The sampling distribution for the parameters should be used in the assessment of the uncertainty associated with the estimation of consumption.	(18) Proponents agreed and will complete by 2017.
(19)	Clarification should be provided on how density and diet consumption have been extrapolated outside the areas and months covered during the surveys and diet studies.	(19) Response provided in SC/66b/SP04 and discussed.
(20)	**2-3 years after the 2016 Annual Meeting** All sources of uncertainty should be quantified and an evaluation of which parameters contribute the most to uncertainty be conducted and taken into account in the analyses and modelling.	(20-23) The proponents agree.
(21)	The studies on allometric relationships should be developed further to refine the range of suitable allometric-energy intake/consumption relationships.	**The proponents** will complete the work within the timeframe.
(22)	The analyses of diet composition should consider the effect of seasonal changes in energy density of the various prey species.	
(23)	Stable isotope analysis of whale tissues and their prey should be introduced not only into the assessment of diet, but also to statistically evaluate overlap in distribution and trophic niche between baleen whale species.	With respect to (23) a study has begun with Hokkaido University.
Feeding ecology and ecosystem studies – Ecosystem modelling (Item 7.4.3)		
(25)	**2-3 years after the 2016 Annual Meeting** Generic recommendations identified by the 2009 Panel remain.	(25) The proponents agree.
(26)	Establish clear objectives on the ultimate use of the models to make further progress (e.g. better understanding ecosystem linkages, delivering advice for fishery management) – ecosystem models are not suitable for tactical management.	(26) The proponents agree.
(27)	Use models in concert e.g. use food web modelling to establish key predation linkages for extended single-species or multispecies models. In such a way the suite of available modelling tools can be used to integrate available knowledge.	(27) The proponents agree.
(28)	Use stable isotopes to provide information on long term feeding patterns and inform models about trophic relationships between whales and their prey (see also Item 6.4).	(28) The proponents agree in broad terms but note the use in modelling may be limited.

(29)	**Within 2 years of the 2016 Annual Meeting** With respect to the EwE modelling: (a) evaluate data quality for each input parameter (the 'pedigree': e.g. Gaichas *et al.* (2015) to characterise uncertainty in model inputs; (b) further evaluate PREBAL and other diagnostics; (c) present more clearly and evaluate further the estimated vulnerabilities and other fit diagnostics (including sensitivity analysis using ranges of consumption estimates).	(29) The proponents agree and will undertake analyses within the time frame but note some limitations with EE in the western North Pacific situation.
Feeding ecology and ecosystem studies – Ecosystem modelling (Item 7.4.3)		
(30)	**Within 2-3 years of the 2016 Annual Meeting** With respect to extended single-species modelling: (a) ensure that the majority of predation mortality is captured; (b) carry out additional diagnostics: (1) examine the fits to: (i) fishery-independent survey data; (ii) proportion information; and (iii) trends in fishing mortality; (2) use posterior predictive checks to evaluate Bayesian model. (c) provide thorough justification for the current spatial boundaries of the model and the use of fishery CPUE as an index of abundance. (d) focus the model fitting on the fishery-independent survey if CPUE not considered likely to index abundance; (e) examine sensitivity to alternative plausible functional forms of the feeding relationship; and (f) explore the causes of the implausible posteriors (e.g. Kitakado *et al.* (2016b) [SC/F16/JR29] by changing the weights assigned to the data sources and fitting the model.	(30) The proponents broadly agree with all components of this recommendation but identify some difficulties with lack of data for item (e).
Monitoring environmental pollutants in cetaceans and marine ecosystem (Item 8.4.3)		
(31)	**2016 Annual Meeting or 2017 at the latest** To improve the statistical analyses based on clear and well-formulated hypotheses.	(31) Addressed in SC/66b/E07 and SC/66b/E08, although additional consultation with statisticians would be beneficial.
(32)	Recalculate OC concentrations as values on a lipid weight basis, and Hg concentrations on a dry weight basis.	(32) The proponents elucidate some difficulties to address this recommendation due to e.g. loss of samples by tsunami ensued the 2011.
(33)	Explore trends in pollutant concentrations using generalized additive models (GAMs) or other non-linear approaches, in addition to the linear models.	(33) Addressed in SC/66b/E07 and SC/66b/E08.
(34)	Evaluate the pollutant concentrations found in comparison with data from previous studies conducted in comparable species and available in the literature.	(34) More discussion on comparisons with previously published studies were included in SC/66b/E07 and SC/66b/E08.
Monitoring environmental pollutants in cetaceans and marine ecosystem (Item 8.4.3)		
(35)	**2-3 years after the 2016 Annual Meeting** Since body length is a poor proxy for age, particularly in sexually mature whales, incorporate age data into the multivariate analysis of pollutant concentrations as soon as they become available.	(35) The proponents agree and will undertake work.
(36)	To include stable isotope values in the analyses to investigate the bioaccumulation process of pollutants through the food chain.	(36) The proponents agree and will undertake work.
(37)	To assess more widely the risk that these chemical pollutants present to the populations' abundance or distribution.	(37) The proponents agree but for long-term. They note no health risk from OCs or Hg thus far.
Ageing (Item 9.1.2): Within 2 years of the 2016 Annual Meeting		
(38)	To investigate into whether there is any relationship between age or sex and readability that may affect the representativeness of the earplugs that can be read.	(38) The proponents agree and work is underway. Some additional discussion of ageing methods is provided under Item 18.3.2.2.
(39)	To age as many of the existing samples as possible and to incorporate age where appropriate in updated analyses (e.g. see the recommendations on pollutant studies).	(39) Work is underway.
Recommendations to the Scientific Committee on process (Item 11)		
(40)	The Panel recommends that the Scientific Committee considers: (a) including a guideline either relating to the minimum time after completion of a programme that a final review can take place or establishing a small review group to determine whether the materials available are for a review Workshop; (b) adopt guidelines for an integrated final report by the proponents. (c) to consider a mechanism for proponents to provide a short biennial update on progress with recommendations. (d) develop a mechanism to allow for the completion of expert Panel reviews if a Panel states that its review is incomplete until further information/analyses is provided.	(40) These matters are considered by the Scientific Committee - see Item 26.3.

Table 24
Overview of how well the proponents have met their stated sub-objectives within the overall objectives of JARPN II.

Objective/sub-objective	Panel evaluation	Comments (references to Item numbers are to SC/66b/Rep06)
Objective 1: Feeding ecology and ecosystem studies		
Sub-objective 1.1: Investigate the oceanographic conditions that are relevant for the understanding of prey species' distribution and abundance in the research area.	Partial	Although some work has been done, additional work is needed to investigate more appropriate explanatory variables (see Item 5.4).
Sub-objective 1.2: To investigate the distribution pattern of baleen whales in the research area and the possible factors affecting such pattern.	Good	Good progress has been made with this sub-objective in what is a developing field of spatial and habitat modelling. However, more work is required to try to integrate the information from different seasons and other surveys within and outside the research area (see Item 5.4.2).
Sub-objective 1.3: To estimate abundance of baleen and sperm whales using JARPN II sighting data and standard IWC SC methodology.	Very good	Abundance estimates were presented using design-based methods. Effort now needs to be put into exploring methods for determining trends and comparison with model-based estimates.
Sub-objective 1.4: To estimate the prey consumption by baleen whales using JARPN II data and samples, and taking into account the uncertainties identified at the 2009 JARPN II review.	Good	Good progress was made with incorporating many aspects of the uncertainty identified in 2009, although some additional sources were identified (see Table 6) and improved methods to quantify the uncertainty have been recommended (see Item 6.4.2). The potential impact of sampling design requires evaluation (see Item 3.4).
Sub-objective 1.5: To evaluate the feeding impact by whales on fisheries resources using JARPN II data and samples, and information from commercial fisheries and other research sources in coastal areas.	Progress made	Some progress has been made but the problems with model development (see sub-objective 1.10 in this table) and aspects of uncertainty mean that the proponents are not able to identify the feeding impact by whales in a robust way (see Item 6.4.2).
Sub-objective 1.6: To estimate prey abundance using JARPN II data, complemented with information available from other sources.	Sufficient	This work has been achieved, at least to inform initial modelling efforts. Additional work to estimate the uncertainty of extrapolating prey abundance outside the surveyed blocks/seasons would be useful (see Item 6.4).
Sub-objective 1.7: To investigate the prey preference of whales in offshore areas, using JARPN II data and samples.	Progress made	Prey preference studies have been undertaken based upon stomach content data and prey abundance information but further work is required to address issues of seasonality, uncertainty and sample design.
Sub-objective 1.8: To investigate feeding habits of baleen and toothed whale species in the research area, and the environmental factors involved in determining such habits.	Progress made	Some work was completed on trends in prey by species and feeding differences by habitat but additional analyses are required before firm conclusions can be reached. Work began using time depth recorders but sample size is small.
Sub-objective 1.9: To investigate the yearly trend in body condition of baleen whales using JARPN II data and samples.	Partial	In addition to the need analyse to further examine power, the question of sampling design also needs to be addressed.
Sub-objective 1.10: To develop several ecosystem models, in both coastal and offshore areas, using JARPN II data and samples as input. Output of the models are likely to provide information on: (i) the ecosystem structure; (ii) effects of prey availability and consumption on the population dynamics of common minke and sei whales with consideration of levels of energy intakes; and (iii) predation impacts of common minke whale consumption of sandlance stock off Sanriku.	Progress made	Although progress has been made in some areas, insufficient resources have been allocated to this component of the programme. Although two models have been developed they are preliminary and a planned minimum realistic model is not complete. As such the modelling efforts are not suitable to provide management advice or characterize effects of prey on whale dynamics or impacts of whales on fisheries (see Item 7.4).
Objective 2: Monitoring environmental pollutants in cetaceans and the marine ecosystem		
Sub-objective 2.1: To investigate pattern of accumulation of pollutants in cetaceans and their food items.	Partial	Aspects of this issue have been addressed and the Panel recognized the difficulties caused by the loss of samples in the tsunami. However, some central aspects were not addressed or analyses were incomplete as discussed under Item 8.4.
Sub-objective 2.2: To investigate the bioaccumulation process of pollutants through the food chain.	Not achieved	This was not properly addressed and would require *inter alia* integration with stable isotope analyses (see Item 8.4).
Sub-objective 2.3: To investigate the relationship between chemical pollutants and cetacean health.	Partial	Some work was presented (e.g. regarding thyroid cancer and CYP450 induction) but there was little attempt to use comparative studies and consider possible population level effects.
Objective 3: Stock structure of large whales		
Sub-objective 3.1: Monitoring of the spatial and temporal distribution of J stock on both west and east coasts of Japan using genetics and non-genetics approaches, and all sources of samples available e.g. JARPN, JARPN II and by-catches.	Good	This work was thorough and contributed to the RMP *Implementation Review.*
Sub-objective 3.2: Using genetic and non-genetic data from JARPN and JARPNII, investigate whether or not the sub-division of the O stock into OW and OE is plausible. The genetic analysis should include those approaches mentioned in Table 1 as providing support for the existence of the OW (e.g. PCA analyses).	Good	This work was thorough and contributed to the RMP *Implementation Review.*
Sub-objective 3.3: To investigate the plausibility of: (i) stock sub-division within Sub-area 1 as proposed under Hypothesis 4; and (ii) sub-division between Sub-areas 1 and 2 as proposed under Hypotheses 2 and 3, using all genetic samples available from different sources till 2014, and different genetic markers including satellite tracking.	Partial	This work will contribute to the forthcoming RMP *Implementation Review* but additional analyses are recommended to assist in understanding the power of the results obtained and the telemetry programme, whilst showing that it is possible, has as yet only a very small sample size (2).
Sub-objective 3.4: To investigate the plausibility of a single stock of sei whale in the pelagic regions of the North Pacific ('North Pacific pelagic'), using all genetic samples available from different sources till 2014, and different genetic markers.	Partial	This work will contribute to the forthcoming in-depth assessment but additional analyses are recommended to assist in understanding the power of the results obtained, although it is recognised that past experience may show that the power is low.

18.2.4 New information from the 2015 field season

SC/66b/SP02 reported the preliminary results of the offshore (sub-areas 7, 8 and 9) cruise of the JARPN II from 11 June to 24 August 2015. Four research vessels were used: two sighting/sampling vessels (SSVs), one research base vessel and three dedicated sighting vessels (SVs). A total of 90 sei and 25 Bryde's whale were caught and biological samples were collected from each of these. In July and August, sei whales fed mainly on Japanese sardine followed by mackerels, copepods and krill in sub-areas 8 and 9. Bryde's whales fed mainly on North Pacific krill species in sub-areas 7 and 8. Two dedicated sighting surveys were carried out from 23 April to 6 June (2,660 n.miles) and 9 June to 1 August in sub-areas 7, 8 and 9 (2,726 n.miles).

SC/66b/SP03 outlined the preliminary results of the coastal component (off Kushiro) of JARPN II from 5 September to 22 October 2015. Four small-type whaling catcher boats were used and 51 common minke whales (34 males and 17 females) were caught and biological samples were obtained from all animals. Sightings data were also collected. The dominant prey species was the Japanese sardine (51.0%). Japanese anchovy, which was one of the major prey species in the previous surveys off Kushiro, was not found during the present survey. This change may reflect environmental changes, as suggested by the previous 2012-14 surveys. Attempts to collect faecal samples were unsuccessful as were attempts to obtain biopsy samples.

SC/66b/SP06 outlined the preliminary results of the coastal component (off Sanriku) of JARPN II from 10 April to 26 May 2015. Four small-type whaling catcher boats were used and 19 common minke whales (10 males and 9 females) were caught and biological samples were obtained from all animals. The dominant prey species was krill (44.4%). A prey species survey was conducted in parallel and in the same time period as the main survey. A comparison of the prey species survey with the stomach contents suggested that the distribution of the common minke whales in Sanriku region was related to sand lance distribution. A biopsy sampling trial was unsuccessful.

18.2.4 Committee conclusions and recommendations

General comments by three Committee members can be found in Annex U1 with a response by the proponents being given in Annex U2. These comments were not discussed. The Committee's conclusions with respect to the Terms of Reference relevant for final reviews in Annex P (IWC, 2016{, pp.412-13) are given below.

Attention: C-A

*The Committee **agrees** with the broad conclusions reached by the Expert Panel in SC/66b/Rep06 (and see Item 18.2.1.1). With respect to the items referenced in Annex P, the Committee **concurs** with the following conclusions as summarised below.*

*(1) With respect to the assessment of the programme's scientific output given the stated objectives and length of the programme, the Panel had noted difficulties associated with the reasons for the timing of the close of the programme but had noted that: (a) considerable scientific work has been undertaken and that the output has been accepted in peer-reviewed journals and has influenced the work of the IWC Scientific Committee; but also that (b) a much greater emphasis should have been put on improved analyses and modelling - that would increase considerably the value of the scientific output of the existing data collected. The Committee therefore **encourages** the proponents to follow the recommendations provided in its report and that of the Expert Panel and submit further work to peer-reviewed scientific journals.*

*(2) With respect to the level of co-ordination with other relevant research projects, as had the Expert Panel, the Committee **welcomes** the much-improved collaboration with other research projects compared to that in 2009. It **notes** that most of that co-operation occurred within Japanese institutes (academic and governmental). This is perhaps not surprising for the coastal components which are within Japanese waters but it encourages additional co-operation with scientists from other research projects that address similar issues but for other regions with respect to any further analyses of the existing data.*

*(3) Finally, with respect to how the proponents had met their sub-objectives under the main objectives (see Item 18.2.1), the Committee **agrees** with the Expert Panel's views and advice as summarised in Table 23.*

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19. WHALE SANCTUARIES

At last year's meeting, the Scientific Committee (SC) agreed on a process to complete the review of the South Atlantic Whale Sanctuary (SAWS) proposal and the decadal review of the Southern Ocean Sanctuary (SOS) (IWC, 2016w). This process established that the Committee would review the scientific objectives of the SAWS proposal and the SOS by the end of its 2016 annual meeting. This process also established that a joint Workshop of the SC and the Conservation Committee would be held after the SC's annual meeting to complete the reviews. The SC also agreed that external experts would be invited to attend the pre-meeting, a Workshop and the SC meeting in order to assist the SC with the reviews.

The SC completed the reviews at the present meeting. Details of the evaluation of the scientific aspects of the SAWS proposal and the SOS are given, respectively, in SC/66b/Rep08 and in Annex Q. In reviewing the SOS and the SAWS proposal, the Committee recognised that within the IWC there are different positions regarding whales and whaling (IWC, 2002b). Some member states regard whales as a natural resource that could be harvested as long as that harvest is sustainable. Others are committed to protect whales from extractive use irrespective of their stock status. These differences may invoke different interpretations of the definition of 'conservation'. Sanctuary proponents clarified that in their view Sanctuaries are based on the position of total protection of whales. In order to concentrate on scientific and technical aspects of the Sanctuaries, discussions of the SAWS proposal and the SOS were made without prejudice to the positions of the various participants and the Governments. Nothing in this report should be interpreted as changes by Governments of their basic positions. In addition, it was pointed out that a Schedule amendment can only introduce a ban on whaling as a management measure. Sanctuaries cannot address certain threats, as these will not be mitigated by a ban on whaling.

19.1 Review of the South Atlantic Sanctuary proposal

19.1.1 Report of the Workshop

The SAWS proposal was reviewed during a Workshop held in Bled, Slovenia, on 5 and 6 June 2016. The review was performed according to the Terms of Reference developed by the Scientific Committee at last year's meeting (IWC, 2016z). Details are given in SC/66b/Rep08.

19.1.2 Committee conclusions and recommendations

Attention: C-A, CC
Upon review of the SAWS Proposal and its management plan, the Committee:

(1) commends the proponents for their efforts to develop a comprehensive proposal and **agrees** *it represents an impressive amount of work;*
(2) provides suggestions to better articulate the performance measures (SC/66b/Rep08), but ***agrees*** *that, in general, the information provided in the proposal was comprehensive;*
(3) notes that this is the first IWC Sanctuary proposal to provide a management plan and further notes that the proponents made an effort to address the recommendations put forward by the Committee in previous reviews of sanctuaries and sanctuary proposals, e.g. (IWC, 2005c);
(4) ***agrees*** *that the management plan outlined in the SAWS proposal generally outlines broad strategies and actions needed to achieve the sanctuary's objectives;*
(5) ***agrees*** *that the management plan presents a number of performance measures that would be used to measure progress against objectives, but emphasises that the management plan as it stands should be seen as a proposal of intent;*
(6) ***agrees*** *that if the SAWS proposal was approved by the Commission, a more detailed process to implement the management plan would need to be established as a first priority;*
(7) ***recommends*** *that should the SAWS proposal be approved, implementation of the management plan be developed with the active and close involvement of the Scientific Committee;*
(8) ***agrees*** *that a Sanctuary such as the SAWS has, in principle, the potential to encourage collaboration and to facilitate development of coordinated scientific research and monitoring programs relevant to meet IWC management and conservation goals;*
(9) ***agrees*** *that an adequate review of the scientific aspect of the SAWS proposal had been performed and that a new review of its scientific aspects by the Scientific Committee, should these aspects be slightly revised by the proponents in line with suggestions made in the report, would not be needed.*

19.2 Decadal review of the Southern Ocean Sanctuary

19.2.1 Review of new information

The SOS was established by the Commission in 1994 under the provision that it would receive decadal reviews. The first review was performed in 2004 (IWC, 2005c; Zacharias *et al.*, 2006). At the conclusion of this review, the Committee presented recommendations that would allow the review of the SOS objectives once they were refined (IWC, 2005b, p.50), Item 17.1). These recommendations were endorsed by the Commission at their 2004 meeting (IWC, 2005a).

In 2015, the Conservation Committee proposed refined objectives of the SOS, which were agreed by the Commission (IWC, 2016x). The present review of the SOS was performed by the Committee taking into consideration these objectives, previous recommendations from the Committee to review the SOS and the Terms of Reference agreed by the Commission (IWC, 2016y). Details of this review are provided in Annex Q.

19.2.2 Committee conclusions and recommendations

The Committee provides the following advice with respect to the Terms of Reference agreed by the Commission:

19.2.2.1. ADVICE ON STATUS, TRENDS AND POTENTIAL THREATS TO WHALES IN THE SOS

Advice on the status and trends of whales and potential threats in the SOS were provided in a report prepared by the Scientific Committee to the 2014 Commission meeting (IWC/65/CC08). This report has been updated and is given as Appendix 2 of Annex Q. Information on abundance and trends of whale stocks in the SOS is also given in Table 2 of Annex Q.

19.2.2.2 ADVICE ON THE PRESENT AND POTENTIAL THREATS TO WHALE POPULATIONS AND HABITATS IN THE AREA OF THE SANCTUARY SOS AND THE COMPLEMENTARY INDIAN OCEAN SANCTUARY (IOS) AND HOW THE SANCTUARIES ADDRESS THESE

The Committee notes that the most important potential threats in the IOS are those identified in Appendix 2 of Annex Q (climate change, fishery interactions, shipping, oil gas and mining exploration and exploitation and pollution). The primary anthropogenic and other environmental factors likely to affect whales in the SOS are those due to krill fisheries and climate change (including ocean acidification). However, the Committee did not carry out a quantitative assessment of these threats or how they are addressed within the Sanctuaries (and see item 19.2.2.3).

19.2.2.3 ADVICE ON WHETHER THE SOS IS CONSISTENT WITH OTHER MEASURES TO PROTECT WHALES FROM ANTHROPOGENIC AND OTHER ENVIRONMENTAL FACTORS

Narrowly speaking the SOS can only protect whales from commercial whaling. The primary anthropogenic and other environmental factors likely to affect whales in the SOS are those due to krill fisheries and climate change (including ocean acidification).

The Committee **notes** that human induced threats are likely to be much lower in the SOS than the adjacent IOS, given the much lower levels of ship traffic and human activity. This is one of the reasons why the SOS was chosen as a Sanctuary. With other threats being much lower than elsewhere, the recovery of whale stocks was likely to be relatively rapid.

Attention: C-A, CC
The Committee ***agrees*** *that the SOS is not inconsistent with other measures to protect whales from anthropogenic and other environmental factors, (e.g. measures established by the Commission for the Conservation of Antarctic Marine Living Resources, CCAMLR).*

19.2.2.4 ADVICE ON THE EFFECTS OF THE SANCTUARY AND THE COMPLEMENTARY INDIAN OCEAN SANCTUARY IN TERMS OF: (A) THE PROTECTION OF WHALES IN BREEDING AREAS, FEEDING GROUNDS, AND/OR MIGRATORY ROUTES; AND (B) INTERNATIONAL AGREEMENTS CONCERNING BIODIVERSITY AND CONSERVATION OF NATURE

19.2.2.4.1 THE PROTECTION OF WHALES IN BREEDING AREAS, FEEDING GROUNDS, AND/OR MIGRATORY ROUTES

The combined SOS and IOS provide complete protection from any future commercial whaling by IWC member nations for the populations of baleen whales that breed in the Indian Ocean. Although whaling has occurred in feeding areas under special permit, this has not been on a scale that would substantially undermine the objectives of the SOS.

In addition, while the evaluation of the effectiveness of the Sanctuaries can be carried out for these collectively, individual evaluation is also needed. Simulation studies have suggested that partial Sanctuaries, covering only some stocks, constitute an improved approach to estimation of some parameters that are important for management, compared to full exploitation or all-encompassing Sanctuaries (Rademeyer and Butterworth, 2004).

19.2.2.4.2 INTERNATIONAL AGREEMENTS CONCERNING BIO-DIVERSITY AND CONSERVATION OF NATURE.

The UN 1992 Convention on Biological Diversity (CBD) notes that 'the fundamental requirement for the conservation of biological diversity is the *in-situ* conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings'. The Convention defines 'Biological diversity' as 'the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems'. The SOS is consistent with the CBD.

Attention: C-A, CC

*The Committee **notes** that the effectiveness of the SOS and adjacent IWC Sanctuaries will be enhanced by cooperation with other international organisations such as the CCAMLR and the International Maritime Organisation (IMO).*

19.2.2.5 ADVICE ON WHETHER THE SANCTUARY ALLOWS FOR THE CONDUCT OF SCIENTIFIC RESEARCH USEFUL FOR MEETING IWC OBJECTIVES OR COORDINATED INTEGRATED RESEARCH AND MONITORING PROGRAMMES ACROSS THE RANGE OF ISSUES OF GLOBAL RELEVANCE

The SOS has allowed for the conduct of scientific research useful for meeting general IWC objectives. Many of the projects outlined in Appendix II of SC/66b/SAN01 represent long-term, coordinated, integrated, international research programmes involving collaborators from multiple IWC member countries. A common aim of many of these projects is to assess trends in whale abundance and distribution, and monitor species recovery although some of them are not associated with the objectives of SOS but with other objectives such as resumption of commercial whaling.

The ongoing research coordinated by the Southern Ocean Research Partnership (IWC-SORP) in the Southern Hemisphere demonstrates that there is expertise within the Scientific Committee to generate effective, multi-national research programs capable of producing information relevant to the IWC within the SOS.

Attention: C-A, CC

*The Committee **agrees** that a Sanctuary such as the SOS has, in principle, the potential to encourage collaboration and to facilitate development of coordinated scientific research and monitoring programs. However, it is not possible to fully evaluate whether the collaborative projects that have been undertaken would have occurred without the Sanctuary designation.*

19.2.2.6 ADVICE ON WHETHER THE SANCTUARY IS CONSISTENT WITH THE PRECAUTIONARY APPROACH

The precautionary approach, as defined in Principle 15 of the 1992 Rio Declaration states that 'In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.' At the time of the adoption of the SOS, the state of science in relation to whale conservation was clearly uncertain. Although progress has been made over the last 20 years, many of the earlier uncertainties remain, while new uncertainties have arisen due to the potential impacts of anthropogenic and other environmental factors. Consequently, the SOS, and the concepts underlying a Sanctuary, have been and remain consistent with the precautionary principle. The concept of the precautionary approach is commonly invoked in the literature to justify the establishment of marine reserves and marine protected areas, particularly in cases where fisheries management strategies are said to have failed. It was noted however, that in many cases, 'failure' of fisheries management strategies has been a result of their not having been properly implemented.

It was suggested that a possible approach to evaluate the consistency of the SOS with the precautionary approach is to assess how it applies to each individual threat within the Sanctuary, and if it could be properly implemented. This, however, would not allow for suitable assessment of the cumulative effect of threats in combination. The resilience (ability to recover from depletion) of a stock could be reduced if it is subject to multiple sources of impact. In this sense, it was pointed out that the establishment of a Sanctuary will improve resilience if it contributes to reducing the impact of one or multiple threats to a stock.

19.2.2.7 GENERAL RECOMMENDATIONS

At the completion of the review of scientific aspects of the SOS, the Committee **agreed** to a set of consolidated recommendations, which took into consideration those made at the 2004 SOS review (IWC, 2005c) and the discussions during this meeting (Table 1, Annex Q).

Attention: C-A, CC

*The Committee **reiterates** the need to develop a management plan for the Sanctuary. Therefore, the Committee **recommends and advises**:*

(1) Performance measures: Each SOS objective should be linked to appropriate performance measures and to field monitoring programmes that allow performance evaluation. The Committee is willing to advise the Commission on appropriate performance measures in relation to the scientific objectives of the SOS (and monitoring approaches for these). Some of these can draw on existing mechanisms, e.g. the In-Depth assessment process.

(2) Management Plan: The Committee advises the Commission of the need to develop a Management Plan for the Sanctuary and of its willingness to assist in the scientific component of this process. This assistance may include collating information on relevant recent Scientific Committee activities and the output from existing research programmes and likely output from future programmes. The Plan should clearly outline: (a) the broad strategies and specific actions needed to achieve Sanctuary objectives; (b) performance measures; (c) a monitoring strategy; (d) a co-ordinated research programme; and (e) review criteria and a regular review mechanism.

(3) Funding: The development and implementation of a management plan will require explicit funding. The Scientific Committee suggests that the Commission investigates whether this plan could be developed and at least in part funded under the framework of an area-based Conservation Management Plan.

(4) Review: Once a management plan has been developed, it should be reviewed and refined periodically to account for ecological, oceanographic and possible other changes in an adaptive fashion. This should take account of progress on how to account for such changes (e.g. relationship between whale distributions and

environmental/oceanographic conditions). The review criteria should be linked to performance measures and should reflect the goals and objectives of the SOS. These could be based on the 2014 Terms of Reference (IWC, 2005c).

(5) Process: To assist future reviews, the Committee suggests that it would be valuable for the Commission to develop a guidance document including pro formas. Such a guidance document could, for example, explicitly state the information expected, the need for accompanying background documents and the review processes for new proposals or reviews of existing sanctuaries. If requested by the Commission, development of such a document could be undertaken by the Scientific Committee in conjunction with the Conservation Committee.

*The Committee **strongly requests** the Commission to consider these recommendations well in advance of the next review of the SOS.*

*The Committee **acknowledges** the assistance provided by the external reviewers, Gerber, Grant and Reilly, during the review of the SOS (and the SAWS proposal) and **agrees** that, in future reviews, external experts should be invited to conduct the review with, not independent of, members of the Scientific Committee.*

20. SOUTHERN OCEAN RESEARCH PARTNERSHIP

The Southern Ocean Research Partnership (IWC-SORP) was proposed to the IWC in 2008 with the aim of developing a multi-lateral, non-lethal scientific research programme that would improve the coordinated and cooperative delivery of science to the IWC. Currently, there are 11 member countries in the Partnership: Argentina, Australia, Brazil, Chile, France, Germany, Italy, New Zealand, Norway, South Africa and the United States. IWC-SORP is an open Partnership and new members are warmly welcome. There are currently five ongoing IWC-SORP Projects.

(1) 'The Antarctic Blue Whale Project'.
(2) A project on the 'Distribution, relative abundance, migration patterns and foraging ecology of three ecotypes of killer whales in the Southern Ocean'.
(3) The 'Foraging ecology and predatorprey interactions between baleen whales and krill' project.
(4) A project on the 'Distribution and extent of mixing of Southern Hemisphere humpback whale populations around Antarctica?' focused initially on east Australia and Oceania.
(5) The 'Acoustic trends in abundance, distribution, and seasonal presence of Antarctic blue whales and fin whales in the Southern Ocean' project.

Bell presented the IWC-SORP Annual Report 2015/16 on the continued progress of its five ongoing research projects since last year (SC/66b/SH10). This progress includes the production of 12 peer-reviewed scientific papers in 2015/16, bringing the total number of peer-reviewed publications related to IWC-SORP produced since the start of the initiative to 85. In addition, 88 IWC-SORP related papers have been submitted to the Scientific Committee, 17 of them this year. Fieldtrips to a variety of places in the South Pacific have taken place in the past year; thousands of images for photo-identification have been collected, satellite tags have been deployed on two killer whales, four Antarctic minke whale and 48 humpback whales; biopsy samples have been collected from four killer whales, five Antarctic minke whales and 270 humpback whales; and hundreds of hours of acoustic recordings have been made. More information can be found at: *http://www.marinemammals.gov.au/sorp.*

A brief report on expenditure of Scientific Committee contribution of funds toward coordination of the Southern Ocean Research Partnership (IWC-SORP) 2014-16 was also given. Full details on expenditure against this contribution since 1 July 2014 are given in SC/66b/SH09. At its 65th annual meeting (IWC/65), the IWC approved a contribution of £13,000 GBP toward the salary of an IWC-SORP coordinator for the period 2014/15 and 2015/16. The contribution of these funds toward the salary of the incumbent coordinator, Bell, was subsequently approved by the IWC-SORP Scientific Steering Committee under Bell (SG-22; members and Terms of Reference can be found in Annex V). The payment has been made in full to the IWC-SORP Secretariat, based at the Australian Antarctic Division, Kingston, Tasmania.

Matters related to funding are dealt with under Item 26.

21. IWC LIST OF RECOGNISED SPECIES

Brownell recalled that the Committee on Taxonomy, chaired by Bill Perrin, produced the first list of marine mammal species and subspecies in 2010 for the Society for Marine Mammalogy. Since that time the IWC's Scientific Committee has followed the SMM list of current recognised cetacean species and the common English names. The IWC list is only maintained at the species level, but the Committee frequently uses subspecies names in various reviews or assessments.

Attention: SC, S, C-A

*The Committee **agrees** to:*

(a) continue to follow the SMM list of recognised species names as revisions are made[31]; and
(b) delete two species from the IWC list: (1) Delphinus capensis *long-beaked common dolphin (Cunha* et al.*, 2015); and (2)* Inia boliviensis *Bolivian bufeo (Gravena* et al.*, 2014);*
(c) add two species to the IWC list: (1) Sousa sahulensis *Australian humpback dolphin (Jefferson and Rosenbaum, 2014); and (2)* Mesoplodon hotaula *Deraniyagala's beaked whale (Dalebout* et al.*, 2014); and*
(d) request the Secretariat to update the IWC website accordingly.

Details regarding these revisions can be found on the on the SMM website as noted above, or in the papers cited.

22. CONSERVATION MANAGEMENT PLANS

22.1 Progress with scientific aspects of existing CMPs

Progress on existing CMPs can be found under the following items:

(1) western gray whales (Item 9.1.3 and Annex F);
(2) southwest Atlantic right whales (Item 10.8.1.1 and Annex F); and
(3) eastern South Pacific right whales (Item 10.8.1.2, 10.8.1.6 and Annex F).

[31]The SMM list was last updated in May 2016 and can be found at *http://www.marinespecies.org/cetacea* (Perrin, 2016).

22.2 Progress with assisting development of new CMPs

With respect to possible new CMPs, the Committee referred to its earlier discussion of potential large whale candidates (IWC, 2014a, pp.62-3) and small cetaceans (IWC, 2015d, p.69).

Consideration of a possible CMP for Arabian humpback whales is considered under Item 10.13.3 and Annex H. The discussion of a potential franciscana CMP can be found under Item 15.3.5 and Annex M. Consideration of a potential CMP on entanglement and bycatch is considered under Item 7.1.7. The relationship between CMPs and the work of the Small Cetaceans Task Force is discussed under Item 15.5.2.

23. COMPILATION OF AGREED ABUNDANCE ESTIMATES AND SUMMARY OF STATUS

Allison reported that this year she had concentrated on compiling details of new abundance estimates discussed in sub-committees together with information on the category (i.e. whether the estimate is acceptable for use in in-depth assessments, an underestimate or provides a general indication of abundance, etc.), the evaluation extent and other data as detailed in IWC (2014f, pp.416-7). She had checked the sources of the estimates and added a history showing whether values have been updated or a wrong value published in the past. Work has begun to extend the list to other species and stocks and a summary of progress on this extensive task is given as Annex S. The intersessional correspondence group on abundance estimates under Butterworth (ICG-36; for members and Terms of Reference see Annex V) was re-established to advise on this work.

At the end of the present meeting, the Convenors discussed how best to formally agree the status of all estimates and to set up a procedure to ensure that estimates and their status are evaluated and recorded in a consistent way in the future amongst all sub-groups. These discussions will continue during the year and one possibility is that next year, an Abundance Estimate Working Group will be established to review all new estimates submitted to the Committee.

The question of the provision of information on status is considered under Item 5.3 and in Annexes D and E. This will be a priority topic at next year's meeting.

24. COMMITTEE PRIORITIES AND INITIAL AGENDAS FOR THE 2017 AND 2018 MEETINGS

Potential two-year work plans are provided under the relevant agenda items throughout this report and in the reports of the various sub-groups (Annexes D to R).

Attention: SC, C-A

*Given the high workload of the Committee and the biennial Commission meetings, the Chair **noted** that she would work with the Convenors to develop a more targeted two-year work plan that will be presented to the Commission for discussion at its 2016 biennial meeting, based upon the potential plans but designed to produce more efficient meetings and to provide the Commission with consolidated advice over two years, in light of Commission priorities.*

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25. SCIENTIFIC COMMITTEE BUDGET FOR THE BIENNUM 2017-18

25.1 Status of previously funded research and Workshop proposals

25.1.1 Funded proposals for the current biennium 2015-16

Table 25 summarises the status of the work funded by the Committee last year. The vast majority have been completed, but several remain ongoing. The projects all contributed considerably to the work of the Committee and the Committee thanked all of those involved.

25.1.2 Funded proposals in previous years still ongoing

A number of projects from previous years are still ongoing (see Table 25). These are all still of great value to the Committee and should be completed before the 2017 SC meeting. Details of all ongoing projects can be found in SC/66b/O03.

25.2 Funding requirements for the biennium 2017-18, including data processing and computing needs

As in 2014, the Committee has developed a two-year budget, based on the proposed work plans. The process given in Annex S (IWC, 2016}) was applied, with extensive discussion carried out in each of the sub-committees and Working Groups to establish priorities among the presented proposals. Only one proposal was rejected for funding during these discussions (*Investigation of large-scale habitat use and distribution patterns of pygmy blue whales around New Zealand and Australia using pre-existing seismic survey observation data*), which was not considered a priority for the Committee work plan. The savings from 2016, some self-reductions and adjustments between years allowed inclusion of all funding proposals for 2017 and 2018 in the new budget request of £315,800 per year.

Table 26 shows the Committee budget requests for the biennium for each of the proposed priority activity whereas Table 29 shows of the distribution of funds across sub-committees and working groups according to their budget requests. A summary on each of the proposed funded activities is given under Items 25.2.1-25.2.6.

Table 27 summarises the Committee budget requests for the 2017-18 period under general categories of budget (i.e. meeting/Workshops, modelling/computing, research, databases/catalogues, reports and follow-up from recommendations).

The Committee **thanks** the Convenors (and especially the Vice-Chair) for their hard work in developing the proposed draft budget tables and for the explanatory text.

Attention: C-A

*The Committee **notes** that some working groups (i.e. SD, DNA, SAN) did not make any request for funds (except for IP participation). It also **stresses** that amounts required can and do greatly vary between biennia in different sub-committees and working groups due to different levels of need for funds to advance in the Committee's work plan and related priorities.*

*The Committee **recommends** the budget in Table 26 to the Commission.*

25.2.1 Meetings/Workshops (see Table 29)

SC INVITED PARTICIPANTS

Invited participants (IPs) are a vital component of the working of the IWC's Scientific Committee. IPs contribute in many ways including as sub-committees and Working Groups Convenors, co-Convenor and rapporteurs, subject area experts and Convenors of intersessional groups. All sub-committees and Working Groups benefit from this budget item. Savings from 2016 will be added to the funding request for 2017 to bring the total to £76,000. This year under this budget item 49 scientists from Australia, Brazil, Canada, Chile, France, Germany, India, Italy, Japan, Mexico, the Netherlands, Norway, Oman, Slovenia, South Africa, Switzerland, USA and UK were supported.

Table 25
Progress on Workshop and Research Proposals agreed last year (IWC, 2016i, pp.83-86), see Table 29.

SC/65b RP no.	Title	Relevance
AWMP01	AWMP Workshop to develop *SLAs* for the Greenland hunts	Completed (SC/66b/Rep03)
AWMP02	AWMP developers fund	Completed; (Annex E)
BRG01	Development of a sex- and age-structured population dynamics model for North Pacific gray whales	Ongoing
BRG03	Workshop to forward the modelling process to understand the status of gray whales across the North Pacific	Completed (SC/66b/Rep07)
BRG03(2)	Technical drafting group for CMP	Completed (Annex G)
E01	State of the Cetacean Environment Report (SOCER)	Completed (SC/66b/E02)
E02	POLLUTION 2020	Completed (SC/66b/E03, SC/66b/E04)
E02b	Contaminant status, trends and risk assessments in cetaceans	Completed (SC/66b/E03, SC/66b/E04)
E04	Masking and ship noise	Completed (SC/66b/Rep10)
E08	Large mortality events and strandings Workshop	Completed (SC/66b/Rep09)
EM01	Using baleen whale tag data to inform ecosystem models	Completed (SC/66b/EM05)
EM02	CCAMLR-IWC Workshop on the development and application of multi-species models to the Antarctic marine ecosystem	Planning in progress (Annex L)
HIM01	Ship Strikes Database Coordinator	Completed (SC/66b/HIM02)
HIM02	Preventing the entanglement of whales in fishing gear	Completed (Annex J)
IA01	IWC-POWER cruise 2016	Completed (SC/66b/Rep01; SC/66b/Rep02; SC/66b/IA09)
IA02	Assessment modelling for in-depth assessments of Antarctic minke and North Pacific sei whales	Ongoing (Annex D)
RMP01	Testing proposed new guidelines for evaluating spatial model-based and design-based abundance estimates	Ongoing (Annex D)
RMP02	Evaluating abundance estimates: diagnostics and testing	Ongoing (Annex D)
RMP03	Workshops to further progress on the *Implementation Reviews* for the North Atlantic minke and fin whales	Completed (SC/66b/Rep04; SC/66b/Rep05; Annex D, Annex E)
RMP04	Evaluation of density dependence parameters for inclusion in RMP testing based on energetics modelling	Completed (SC/66b/EM04)
RMP06	Essential computing support to the Secretariat for RMP	Completed (SC/66b/Rep04; SC/66b/Rep05; Annex D, Annex E)
SH01	Synthesis of the results of the comprehensive assessment of Southern Hemisphere humpback whales	Completed (SC/66b/SH01)
SH02	Modelling support for Southern Hemisphere humpback whales	Ongoing (Annex H)
SH03	Research Contract 16, Antarctic Humpback Whale Catalogue	Complete (SC/66b/SH24)
SH04	Southern Hemisphere Blue Whale Catalogue	Completed (SC/66b/SH26)
SH06	Priority tasks to support regional conservation effort of Arabian Sea humpback whales	Completed (SC/66b/SH32)
SP01	Workshop for periodic review of JARPN II	Completed (SC/66b/Rep06)
WW01	Emerging whalewatching industry in Oman	Ongoing (Annex N)
SAN	Pre-meeting to review SAWS	Completed (SC/66b/Rep08)
SAN	SC participation in joint SC/CC Workshop on Sanctuaries	To be completed June 2016
	Invited Participants	Completed

SH09, WORKSHOP ON INTEGRATION OF EASTERN SOUTH AND CENTRAL PACIFIC BLUE, HUMPBACK, AND FIN WHALE PHOTO-ID- CATALOGUES

A one-day Workshop will be organised prior to the upcoming Latin American Marine Mammal Meeting. The focus will be integrating photo-identification catalogues of eastern South and Central Pacific blue, humpback and fin whales in order to produce information relevant for the Committee's assessment of Southern Hemisphere whales.

IA01, PRE-MEETING FOR AN IN-DEPTH ASSESSMENT OF NORTH PACIFIC HUMPBACKS

A pre-meeting on the North Pacific humpback whale assessment will be held prior to the 2017 SC meeting.

EM01, TWO JOINT IWC-SC AND SC-CCAMLR WORKSHOPS

Two joint meetings of the scientific committees of CCAMLR and the IWC are proposed for 2017 and 2018 to foster collaboration between the ecosystem modelling working groups of both Commissions responsible for managing whales and marine living resources in the Southern Ocean. The Workshop will establish plans for data collection and analysis towards the development of multi-species/ecosystem models of pertinence to the objectives of both Commissions. The Workshop in 2017 will need a total of £16,000, but due to savings from 2016 the funding request for 2017 is £5,500.

AWMP-RMP01, AWMP/RMP WORKSHOP

The SWG on AWMP will hold a joint Workshop with RMP in the 2016/17 period to complete the North Atlantic common minke whale RMP *Implementation Review* (the first two days). Immediately following, the AWMP will hold a Workshop with a focus on developing *SLA*s for the Greenland hunts (common minke and fin whales) and work on the AWS.

AWMP01, AWMP WORKSHOP

The SWG on AWMP will hold a Workshop in 2017/18 to complete the work on an *SLA* for the Greenlandic common minke whale hunts and ASW (if not completed in 2016/17).

BRG02, FOURTH WORKSHOP ON THE RANGEWIDE REVIEW OF POPULATION STRUCTURE AND STATUS OF NORTH PACIFIC GRAY WHALES

This work is a continuation of the process set in place by the Committee in 2014. This technical Workshop will allow compilation and review of the results of the simulation trials previously agreed by the Committee. It is anticipated that this will be the final Workshop and will allow the Committee to conclude its review but as with all simulation work, this will depend upon the results. It will include a small component of time for Punt to undertake computing work necessary for the Workshop.

WW01, INTERSESSIONAL WORKSHOP-DATA GAPS AND MODELLING REQUIREMENTS FOR ASSESSING THE IMPACTS OF WHALEWATCHING

The extent to which whalewatching impacts cetacean populations in the long-term remains uncertain. This Workshop will build a cohesive and coordinated approach for data collection and the development of models to assess the possible impacts of whalewatching by engaging experts from outside of the current membership of the WW sub-committee.

Table 26

Summary of budget requests for the 2017-18 period. For explanation and details of each project see text.

RP no.	Title	Relevance to sub-committees/ working groups	2017 (£)	2018 (£)
Meeting/Workshop				
SC01	Invited Participants - SC/67a and SC/67b	SC	45,000[1]	76,000
SH09	Workshop on integration of eastern south and central Pacific blue, humpback, and fin whale photo catalogues	SH	4,600	0
IA01	Pre-meeting for an in-depth assessment of North Pacific humpback whales	IA	6,000	
EM01	Two joint SC-CAMLR and IWC-SC Workshops	EM	5,500[2]	16,000
AWMP-RMP01	AWMP/RMP joint intersessional Workshop	AWMP, RMP	8,000[3]	0
AWMP01	AWMP intersessional Workshop	AWMP	0	10,000
BRG02	Fourth Workshop on the rangewide review of population structure and status of North Pacific gray whales	BRG, AWMP E, CMP	9,500	0
BRG04	Satellite tagging best practices Workshop	BRG, SH, E	15,000	0
WW01	Intersessional Workshop: data gaps and modelling requirements for assessing the impacts of whalewatching	WW	10,000	11,500
RMP01	Intersessional Workshops - *Implementation Review* of North Pacific Bryde's whales	RMP	10,000	10,000
SP01	Review of a special permit proposal for Japan's new whale research program in the Western North Pacific	SP, IA, SD, RMP, EM, E	23,000[4]	
E05	Cumulative impacts - pre-meeting or intersessional meeting	E		10,000
E03	HAB focus/pre-meeting	E	12,000	
SM01	Intersessional Workshop: resolving *Tursiops* taxonomy	SM, SD	0	8,500
Modelling/computing				
SH07	Defining blue whale population boundaries and estimating associated historical catches, using catch data in the Southern Hemisphere and northern Indian Ocean	SH	0	9,500
AWMP02	AWMP developers fund	AWMP	200	2,000
SH10	Modelling analyses for future assessments of Southern Hemisphere humpback populations	SH	2,000	2,500
IA02	Assessment modelling for an in-depth assessment of North Pacific sei whales	IA	2,500	2,500
E02	Pollution 2020: contaminants, data integration and mapping	E, SM, BRG	0	4,000
RMP02	Essential computing support to the Secretariat for RMP	RMP	2,000	10,000
Research				
~~BRG01~~	~~Aerial photographic survey of southern right whales on the southern Cape nursery ground in South Africa~~	~~BRG~~	~~20,000~~	~~0~~
BRG05	Tracking southern right whales through the southwest Atlantic	BRG	11,000	0
BRG03	Passive acoustic monitoring of the eastern South Pacific southern right whales, improving CMP outputs	BRG	14,500	14,500
SH03a	Northern Indian Ocean humpback subspecies determination-genetics	SH	0	7,500
SH05	Acoustic monitoring of 'pygmy' blue whales in the Mozambique Channel off the northwest coast of Madagascar	SH	11,500	0
IA03	IWC-POWER cruise	IA	36,000	36,000
Databases/catalogues				
SH01	Antarctic Humpback Whale Photo Catalogue	SH	15,000	0
SH02	Southern Hemisphere Blue Whale Catalogue	SH	17,500	15,500
SH03b	Data archiving tool for northern Indian Ocean humpback whales	SH	10,000	0
SH08	Development of a permanent blue whale song reference library	SH	0	4,000
HIM01	Ship Strike Database Coordinator	HIM	10,000	10,000
HIM02	Design and construction of an initial global entanglement database	HIM	8,000	0
E01	Cetacean diseases of concern	E	4,000	2,000
Report				
E04	SOCER (State of the Cetacean Environment Report)	E	3,000	4,000
Follow-up from recommendations				
SC02	Follow-up from recommendations relevant to the work of all groups	SC	*20,000*	49,800
Total request			**£315,800**	**£315,800**

Notes: [1]£76,000 was the expected financial need for 2017 but savings from 2016 allowed for the reduced budget of £45,000; [2]£16,000 was the expected financial need for 2017 but savings from 2016 allowed for the reduced budget of £5,500; [3]the AWMP and RMP intersessional Workshops are held jointly to reduce the cost of invited participants that are common to both meetings; [4]some delegations expressed some reservation over the use of funds for this Workshop; the Chair clarified that these funds are exclusively used to cover the costs of the independent panel experts.

Table 27

Summary of budget requests for the 2017-18 period. General budget items.

General budget item	Relevance to sub-committees and working groups	2017 (£)	2018 (£)
Meeting/Workshop	SC, SH, IA, EM, AWMP, RMP, BRG, CMP, E, WW, SP, SM, SD	148,600	142,000
Modelling/computing	SH, AWMP, IA, E, SM, BRG, RMP,	6,700	30,500
Research	BRG, SH, IA	93,000	58,000
Database/catalogues	SH, HIM, E, SC	64,500	31,500
Report	E	3,000	4,000
Follow-up from recommendations	SC	0	49,800
Total request		**315,800**	**315,800**

Table 28

Summary of the distribution of funds across sub-committees and working groups according to their budget requests for 2017 and 2018.

Sub-committees and working groups	2017 (£)		2018 (£)		Total (£)	
Scientific Committee (SC), all sub-committee and working groups (IPs and follow-up)	45.000	14%	125.800	40%	*170.800*	27%
Scientific Permits (SP), SC Plenary topic	23.000	7%	0	0%	*23.000*	4%
Sub-committee on Bowhead, Right and Gray Whales (BRG)	70.000	22%	14.500	5%	*84.500*	13%
Sub-committee on Other Southern Hemisphere Stocks (SH)	60.600	19%	39.000	12%	*99.600*	16%
Sub-committee on In-depth Assessments (IA)	44.500	14%	38.500	12%	*83.000*	13%
Standing Working Group on Aboriginal Whaling Management Procedure (AWMP)	4.200	1%	12.000	4%	*16.200*	3%
Sub-committee on Revised Management Procedure (RMP)	16.000	5%	20.000	6%	*36.000*	6%
Standing Working Group on Environmental Concerns (E)	19.000	6%	20.000	6%	*39.000*	6%
Working Group to address Ecosystem Modelling Approaches (EM)	5.500	2%	16.000	5%	*21.500*	3%
Working Group on Non-deliberate Human Induced Mortality of Cetaceans (HIM)	18.000	6%	10.000	3%	*28.000*	4%
Working Group on Stock Definition (SD)	0	0%	0	0%	0	0%
Working Group on DNA (DNA)	0	0%	0	0%	0	0%
Sub-committee on Whalewatching (WW)	10.000	3%	11.500	4%	*21.500*	3%
Standing Sub-committee on Small Cetaceans (SM)	0	0%	8.500	3%	*8.500*	1%
Working Group to Review Sanctuaries Proposals (SAN)	0	0%	0	0%	0	0%
Total	**315.800**		**315.800**		**631.600**	

Note: SD, DNA, SAN did not make any request for funds except than for IPs participation to their meetings.

Table 29

Workshop proposals agreed during this meeting (TBD: to be decided).

Title	Relevance	Date	Venue
AWMP Workshop to develop *SLAs* for the Greenland hunts and consider AWS	AWMP	December 2016	Copenhagen
AWMP Workshop to develop *SLA* for the Greenlandic common minke whale hunts and ASW	AWMP	2017/18	Copenhagen
North Atlantic common minke whale RMP *Implementation Review*	RMP	December 2016	Copenhagen
Two Workshops on *Implementation Review*, North Pacific Bryde's whales	RMP	2016/17; 2017/18	TBD
Pre-meeting for an in-depth assessment of North Pacific humpback whales	IA	Pre-meeting 2017	Bled
Two joint SC-CAMLR and IWC-SC Workshops	EM	Pre-meeting 2017; TBD	Bled, Hobart
Fourth Workshop on the rangewide review of population structure and status of North Pacific gray whales.	BRG, AWMP E, CMP	Spring 2017	TBD
IWC-POWER planning and Technical Advisory Group meetings	IA, BRG, RMP	September 2016; October 2017	Tokyo
Satellite tagging best practices Workshop (joint with ONR)	BRG, SH, E	TBD	TBD
Workshop on integration of eastern south and central Pacific blue, humpback, and fin whale photo catalogues	SH	November 2016	Valparaíso
Intersessional Workshop - data gaps and modelling requirements for assessing the impacts of whalewatching	WW	2017/18	?Maui
Review of a special permit proposal for Japan's new whale research programme in the western North Pacific	SP, IA, SD, RMP, EM, E	Tokyo	Jan/Feb 2017
Cumulative impacts session	E	?Pre-meeting 2018	TBD
Harmful algal blooms and biotoxins - focused Environmental Concerns session	E	?Pre-meeting 2017	?Bled
Intersessional Workshop: resolving *Tursiops* taxonomy	SM, SD	2017/18	TBD

RMP01, INTERSESSIONAL WORKSHOPS: *IMPLEMENTATION REVIEW*, NORTH PACIFIC BRYDE'S WHALES

This Workshop is essential in order for the Committee to conduct a full *Implementation Review* for the North Pacific Bryde's whales. Conducting *Implementation Reviews* are a required activity under the Committee's Requirements and Guidelines for the RMP.

BRG04, WORKSHOP ON CETACEAN TAG DEVELOPMENT, TAG IMPACT ASSESSMENT AND TAGGING BEST PRACTICES

This project is a collaboration with the US Office of Naval Research to co-organise and fund a Workshop to evaluate and provide recommendations related to cetacean tag development, tag impacts and best practices.

SP01, REVIEW OF A SPECIAL PERMIT PROPOSAL FOR JAPAN'S NEW WHALE RESEARCH PROGRAMME IN THE WESTERN NORTH PACIFIC

In accordance with the provisions for the review process stipulated in the Annex P, Japan will submit a new proposal for a Scientific Permit for the western North Pacific to the chair of the Scientific Committee no later than six months, likely in October/November 2016, before the 2017 Annual Meeting of the Scientific Committee. The proposal needs to be reviewed by a small specialist Workshop with a limited but adequate number of invited experts. The Workshop should be organised at least 100 days, likely in January or February, before the Annual Meeting in 2017. Results of the Workshop would be reviewed by the SC during the 2017 Annual Meeting and the resulting recommendations would be considered prior to finalisation of the proposal.

E03, HARMFUL ALGAL BLOOMS (HABS) PRE-MEETING OR FOCUS AT ANNUAL MEETING

This proposal will bring IPs to a pre-meeting or focused session at the 2017 meeting of the SC. IPs will provide expertise for assessing the risks, potential impacts and future research directions associated with HABs and biotoxins exposure in cetaceans.

E05, CUMULATIVE IMPACTS PRE-MEETING OR INTERSESSIONAL

This proposal will bring IPs to a pre-meeting or focused session at the 2018 meeting of the SC. IPs will provide expertise on assessing the cumulative effects from multiple stressors on cetaceans. An intersessional Steering Group under Hall (SG-16; member and Terms of Reference can be found in Annex V) is developing this proposal.

SM/SD, INTERSESSIONAL WORKSHOP, RESOLVING *TURSIOPS* TAXONOMY

Tursiops taxonomy is unresolved, and considered a sufficiently important issue to merit focused attention of the SM sub-committee at the 2015 and 2016 meetings of the SC. This proposal would continue that work at the 2017 meeting. Following this review, information will be synthesised to develop general interpretations and practical applications for taxonomic classification for this genus, evidence for taxonomic status in regional populations and identification of important areas for further research.

25.2.2 Modelling/computing

SH07, DEFINING BLUE WHALE POPULATION BOUNDARIES AND ESTIMATING ASSOCIATED HISTORICAL CATCHES, USING CATCH DATA IN THE SOUTHERN HEMISPHERE AND NORTHERN INDIAN OCEAN

Data on blue whales taken during commercial whaling throughout the Southern Hemisphere and the northern Indian Ocean, contain valuable information on population structure. This proposal will analyse catches in all regions and land stations to delimit population structure using the 2016 IWC databases.

AWMP02, DEVELOPERS FUND

The developers fund has been invaluable in the work of *SLA* development and related essential tasks of the SWG. It has been agreed as a standing fund by the Commission. It has been proved to be of great value in ensuring progress throughout the *SLA* development period for the Alaskan and Chukotkan hunts as well as recent work on the PCFG and Greenlandic hunts, including the completion of the *Humpback SLA* in 2015. The primary development tasks now facing the Committee are for the remaining Greenlandic fisheries.

SH10, MODELLING ANALYSES FOR FUTURE ASSESSMENTS OF SOUTHERN HEMISPHERE HUMPBACK WHALES

The purpose of the proposal is to address specific needs identified by the SH sub-committee including: power analysis for future surveys, development of age-sex, population dynamics, and mixed-stocks models and inclusion of pre-1900 catches.

IA02, ASSESSMENT MODELING FOR AN IN-DEPTH ASSESSMENT-NORTH PACIFIC SEI WHALES

The project involves developing and utilising population dynamics models as required to progress the in-depth assessment for North Pacific sei whales.

E02, POLLUTION 2020: CONTAMINANTS, DATA INTEGRATION AND MAPPING

Following the focus session on the global status and tends in persistent organic pollutants (POPs) in key cetacean species, it was recognised that a web application to enable researchers to visualise and interrogate datasets would be valuable. This tool would: display data on the rate of change in POP concentrations blubber in key cetacean species and identify regions where POPs remain of concern.

RMP02, ESSENTIAL COMPUTING SUPPORT TO THE SECRETARIAT FOR RMP

Regular *Implementation Reviews* are required under the RMP. An *Implementation Review* is underway for the North Pacific Brydes whales, and more will follow. The Committee has developed a complex trials structure for *Implementation Reviews*. A key task of this process is to develop and validate the code for simulation trials. Secretariat staff alone cannot handle this complete process themselves, so computing support is needed.

25.2.3 Research

BRG01, AERIAL PHOTOGRAPHIC SURVEY OF SOUTHERN RIGHT WHALES (EUBALAENA AUSTRALIS) ON THE SOUTHERN CAPE NURSERY GROUND IN SOUTH AFRICA, A PROPOSAL REQUEST FOR FUNDING OF THE 2016-17 SURVEY

The South African southern right whale population has been annually surveyed since 1979 resulting in a long term index of population size. Continuing this long-term data series is vital. This proposal seeks funding to conduct the survey in 2016/17. It is not expected that the IWC will continue to provide funding for this monitoring but **recommends** that the South African government ensure that funding is made available to support this important long-term programme.

BRG05, TRACKING SOUTHERN RIGHT WHALES THROUGH THE SOUTHWEST ATLANTIC: A PROPOSAL TO IDENTIFY MOVEMENTS, MIGRATORY ROUTES AND FEEDING GROUNDS

Location-only satellite tags will be purchased for deployment in Southern right whales near Península Valdés, Argentina, in 2016. Satellite tracking has been recommended as priority work to help address hypotheses to explain the high rates of calf mortality. Two tagging seasons have been successful and funding has been secured for another season. Only a small number of tags (3) are available to date. This proposal will add another five tags.

BRG03, PASSIVE ACOUSTIC MONITORING OF THE EASTERN SOUTH PACIFIC SOUTHERN RIGHT WHALE, A KEY TO IMPROVE CONSERVATION MANAGEMENT PLAN OUTPUTS

In 2012, the IWC adopted a CMP for South Pacific southern right whales. Only few opportunistic sightings have been recorded but the location of the breeding ground is unknown. Passive acoustic monitoring is likely the most cost-effective way to investigate the seasonal distribution along the coasts of Chile and Peru. This information is crucial to facilitate the implementation of CMP long-term monitoring programme.

SH03A, CREATION OF A REGIONAL DATA ARCHIVAL AND ANALYSIS TOOL AND EXTENDED GENETIC ANALYSIS FOR CONSERVATION OF ARABIAN SEA WHALE POPULATIONS (RUNNING TITLE: NORTHERN INDIAN OCEAN HUMPBACK SUBSPECIES DETERMINATION-GENETICS)

This project will conduct an in-depth analysis of the genetics of 92 Arabian Sea humpback whales sampled off Oman between 2000 and 2015. Analysis will determine the population's taxonomic status, kinship, social structure and degree of inbreeding.

SH05, ACOUSTIC MONITORING OF 'PYGMY' BLUE WHALES IN THE MOZAMBIQUE CHANNEL OFF THE NORTHWEST COAST OF MADAGASCAR

The project will use Passive Acoustic Monitoring to document the presence and seasonality of 'pygmy' blue whales off the northwest coast of Madagascar. The work will involve a complete year of acoustic monitoring in areas that have previously detected blue whales. This project will add to our understanding of blue whale occurrence, movements and habitat utilisation in this region and also collect data on other key species, including humpback, minke, Omura's and sperm whales.

IA03, IWC-POWER CRUISE

The Committee has strongly advocated the development of an international medium- to long-term research programme involving sighting surveys to provide information for assessment, conservation and management of cetaceans in the North Pacific, including areas that have not been surveyed for decades. Objectives have been developed for the overall plan and requested funding will allow for

the continuing work of the initial phase and progress on developing the medium-term phase. The amount of money is extremely small when seen in the context of Japan providing the vessel and associated costs for two years as it has in the past. The IWC contribution is for: (1) IWC researchers and equipment; (2) to allow the Committee's Technical Advisory Group to meet to review the multi-year results thus far and develop the plans for the next phase of POWER based on the results obtained from Phase I; and (3) to enable analyses to be completed prior to the 2017 Annual Meeting.

25.2.4 Databases/catalogues

SH01, ANTARCTIC HUMPBACK WHALE PHOTO CATALOGUE

The Antarctic Humpback Whale Catalogue is an international collaboration investigating movement patterns of humpback whales in the Southern Ocean and corresponding lower latitude waters. This proposal requests continue funding for the College of the Atlantic, who has maintained the catalogue since 1987 in part with past funding from the IWC since 1988. The project will support maintenance and expansion of the catalogue, improve the accessibility and organisation of the database and allow for comparisons between all of the major regions used by Southern Hemisphere humpback whales to provide information on movement patterns within and between regions.

SH02, SOUTHERN HEMISPHERE BLUE WHALE CATALOGUE

The Southern Hemisphere Blue Whale Catalogue is an international collaboration to facilitate cross-regional comparison of blue whale photo-identifications catalogues. To date the catalogue contains images of almost 1,400 individual blue whales. The request for funding will allow for comparisons of photos among different regions, which will improve the understanding of basic questions relating to blue whale population boundaries, migratory routes, visual health assessments and modeling abundance estimates. The results will contribute to the IWC Southern Hemisphere blue whale assessments.

SH03B, DATA ARCHIVING TOOL FOR NORTHERN INDIAN OCEAN HUMPBACK WHALES

This proposal focuses on improving understanding and conservation of whales in the Arabian Sea through the development of a regional open source online data archiving platform and through. This project will provide valuable sources of information for comprehensive assessments of Southern Hemisphere humpback whale stocks.

SH08, DEVELOPMENT OF A PERMANENT BLUE WHALE SONG REFERENCE LIBRARY

Funding will be used to develop a permanent blue whale song reference library. The work will include development of a metadata standard for data submission and data use agreements. This library will facilitate research on blue whale acoustics, as well as have potential to provide information on geographic occurrence, habitat use, and baseline song types.

HIM01, SHIP STRIKE DATABASE COORDINATOR

The ongoing development of the IWC ship strike database requires data gathering, communication with potential data providers and data/database management. This project will provide support for expanding and maintaining the database.

HIM02, DESIGN AND CONSTRUCTION OF AN INITIAL GLOBAL ENTANGLEMENT DATABASE

The overarching goals of the proposed database would be to identify the species entangled, gear type, configuration and origin, whether the entangling materials were in active use or debris, and the geographic region and timing of the entanglement. The ultimate goal would be to use this information to inform mitigation initiatives by the Commission, relevant partner inter-governmental organisations, regional fishery councils or member Nations. This database will be designed and built for use by the members of the IWC Global Whale Entanglement Response Network. It would supplement rather than duplicate national databases.

E01, CETACEAN DISEASES OF CONCERN (CDOC)

This project will continue and expand a website to provide an information tool for cetacean diseases (infectious and non-infectious diseases as well as lesions or findings). Work will include the design, development, content management, implementation, and maintenance of the CDoC website.

25.2.5 Reports

E04, STATE OF CETACEAN ENVIRONMENT REPORT (SOCER)

SOCER is a long-standing effort to provide information to Commissioners and Committee members on key current global developments that are affecting the cetacean environment. Focus will be on Indian Ocean and Mediterranean Sea for 2017 and 2018, respectively, including a section on issues of global concern. Funds are for salaries, library services, and printing.

25.2.6 General items

SCIENTIFIC COMMITTEE FOLLOW UP FROM WORKSHOP RECOMMENDATIONS

This is a budgetary line necessary in the second year (2018) of the Scientific Committee biennial budget to accommodate additional work that is generated by meetings, Workshops and projects funded and concluded in the first year (2017). This budgetary line can also accommodate new project proposals generated during the 2017 Scientific Committee meeting.

25.2.7 Small Cetacean Research Fund

Table 30 summaries the result of the 2016 call for proposal selection process, indicating projects endorsed for funding and two additional project that should be funded if funding become available after this meeting. See agenda Item 15.2 for all details on the Voluntary Fund for Small Cetacean Conservation Research.

26. WORKING METHODS OF THE COMMITTEE

26.1 Rules of Procedure of the Scientific Committee

As is its usual practice, the Scientific Committee reviewed its Rules of Procedure (RoP). Matters related to RoPs on Invited Participants and funding mechanisms for the IWC-SORP were brought to the Committee's attention.

26.1.1 Invited participants

The Chair reported briefly on an issue with the current Rules of Procedure on Invited Participants that could potentially lead to misinterpretation and difficulties. In particular, there is a contradiction between Rules A6b and A6h. The Committee was informed that the Chair and the Secretariat have identified a simple fix that will be discussed with the Finance and Administration Committee which should solve this issue.

26.1.2 IWC Southern Ocean Research Partnership

The current process for the allocation of funds from the IWC Southern Ocean Research Partnership (IWC-SORP) Research Fund is given in Annex R (IWC, 2011b). This needed a revision to align it with other IWC Scientific

Table 30
Summary of budget requests for the Voluntary Small Cetaceans Research Fund: 2016 call for proposals (see Item 15.2).

Principal Investigator	Species	Project duration (months)	Total budget request (£)	Funding type	Suggested amount (£)
Heinrich	*Cephalorhynchus eutropia*	25	19,920	F	19,920
Weir	*Sousa teuszii*	17	13,635	P	7,000
Sanjurjo	*Vaquita*	12	20,000	P	10,000
Khan, Haishu	*Indus river dolphin*	11	19,160	P	10,000
Lai	Various species	12	5,050	F	5,050
de Castro	*I. geoffrensis; S. fluviatilis*	18	17,307	AF	
Oremus	Various species	23	19,814	AF	
Total			**114,886**		**51,970**

Key: F=fully funded; P=partially funded, AF=awaiting funding.

Committee procedures for reviewing funding proposals. Moreover, a forthcoming generous voluntary contribution from Australia required an interim procedure to handle a portion of that funding according to the donor's request.

26.1.2.1 PROPOSED UPDATE TO THE FUNDING MECHANISM FOR ALLOCATION OF FUNDS FROM THE IWC-SORP RESEARCH FUND

At IWC/62, the Commission approved IWC-SORP's 'Funding mechanism for allocation of funds from the IWC-SORP Research Fund' (IWC, 2011b)[32]. At SC/66b the IWC-SORP Scientific Steering Committee (IWC-SORP SSC) recommended updating this Annex to guarantee consistency with other IWC Scientific Committee procedures for reviewing project proposals (i.e. Small Cetaceans Research Voluntary Fund and Scientific Committee General Fund). After a brief discussion, the Committee **endorses** the revised Annex W.

26.1.2.2 INTERIM PROCEDURE FOR THE ALLOCATION OF A VOLUNTARY CONTRIBUTION TO THE IWC-SORP RESEARCH FUND

Australia announced to the Committee that it would soon make a substantial voluntary contribution[33] to the IWC-SORP Research Fund. Australia requested that 20% of these funds be allocated to IWC-SORP related projects before the start of the 2016/17 austral field season to facilitate research in the Southern Ocean this austral summer. The Committee **sincerely thanks** Australian for its extremely generous contribution to the IWC-SORP Research Fund.

Given the timing of the voluntary contribution, it was not possible for the IWC-SORP SSC to issue a call for proposals, and subsequently review the proposals in time to make a recommendation to the Committee at this meeting (SC/66b), as per usual Scientific Committee processes. Therefore, the IWC-SORP SSC proposed the following interim process for 2016/17.

(1) IWC-SORP Secretariat will put out a call for proposals, as soon as possible.
(2) The proposals will be assessed by the IWC-SORP SSC according to the principles laid out in Item 1.2 of the revised Annex W and the funding criteria outlined below.
(3) The proposals, a summary of their evaluation and the proposed budget associated with successful applications will be submitted for consideration by the Commission in October 2016 (IWC/66).
(4) Subject to the views of the Commission, the IWC Secretariat will develop funding agreements with the successful proponents in accordance with existing Scientific Committee procedures.
(5) Successful proponents will provide project reports to the next meeting of the Scientific Committee (SC/67a).

This interim call for proposals will only consider proposals related to the five IWC-SORP projects that have already been endorsed by this Committee and Commission. The IWC-SORP SSC therefore proposed the following funding criteria for the 2016/17 interim process, specifically encouraging proposals related to the:

(1) determination of diet/foraging ecology, age, length, pregnancy and maturity of whales;
(2) improvement of the efficiency of satellite tagging and biopsying of small Antarctic whales;
(3) development of bio-energetic and ecological models – including information on the abundance and distribution of whales derived from historical commercial whaling data;
(4) development of techniques to locate and study rare whales (e.g., acoustic or remote sensing), as well as determination of long-term population recovery trends in rare whales;
(5) links between whale breeding and feeding grounds; and
(6) movement and distribution of whale populations.

Moreover:

(1) applicants are strongly encouraged to seek co-funding and/or in-kind support, and preference may be given to projects demonstrating such an arrangement;
(2) applicants are strongly encouraged to submit collaborative proposals;
(3) applicants will be bound by IWC-SORP data availability protocols;
(4) applicants will be bound by Scientific Committee conflict of interest procedures;
(5) institutes receiving funding are responsible for obtaining ethics approval and relevant permits. Documentation demonstrating this should be provided with their application; and
(6) applicants must use the Scientific Committee pro forma for new project proposals.

Attention: SC, C-A

*The Committee **endorses** this interim process, and its associated funding criteria, which provides sufficient scientific oversight and probity to meet Australia's request and to facilitate Southern Ocean research this austral summer.*

The IWC-SORP SSC will also seek guidance from the Commission on how best to seek Commission endorsement for any proposed expenditure during the Commission's 2017/18 intersessional period.

Should a suitable process be identified by Commission, a call for new proposals will be issued prior to SC/67a. The proposals will then be reviewed by the IWC-SORP SSC and their recommendations will be presented to the Scientific Committee. The proposed expenditure would then be allocated according to the process specified by the Commission.

[32] *https://archive.iwc.int/pages/search.php?search=%21collection29&k=.*
[33] The decision on this funding was made by the Australian Government before entering caretaker mode for the coming election.

*The Committee also **agrees** with this interim process on how best to seek the Commission's endorsement on any further proposed expenditure during the 2017/18 intersessional period.*

26.2 Biennial reporting and related matters

The Chair noted her comments about rationalising the agenda in light of the two-year Commission cycle (see Item 24). She explained that as in 2014, the Chair, Vice-Chair and the Head of Science will produce a two-year overview of the Committee's two reports (SC/66a and SC/66b) for the Commission meeting in October. The development of the new template (see Item 1.6) will assist in this matter.

26.3 Additional proposals for revisions to Annex P in the light of the 2015 trial of the amended Annex P

Last year (IWC, 2016i, p.71), the Committee agreed on a revised 'Annex P' in the light of Commission Resolution 2014-5 (IWC, 2016{). It had also noted that it may make additional practical suggestions on the process at this year's meeting (IWC, 2016i, p.83).

The first Expert Panel meeting carried out under the revised Annex P that took into account Resolution 2014-5 was for the Final Review of the JARPN II programme (SC/66b/Rep06). However, the Expert Panel to review NEWREP-A that met in February 2015, also took into account the Resolution 2014-5, although it had not yet been formally addressed by the Committee (IWC, 2016d).

At the present meeting, discussion took place on proposed possible improvements to the procedure and whether or not these could be incorporated formally into Annex P. The following aspects were taken into consideration: (a) the experience gained from the Expert Panel reviews on the NEWREP-A (a review of new proposal) and on the JARPN II (a final review); and (b) matters connected with the Commission's two-year cycle.

With respect to the latter, the Committee recognised that certain aspects of that discussion, especially those with any legal component, should be handled by the Commission, not this Committee.

With respect to both Expert Panel reviews, a general theme was that there were areas in which the work of the Panels could have been improved by better guidance being provided to proponents upon the nature and the format of the information provided. For example, the Expert Panel to review NEWREP-A had noted that although better information on timelines and targets was provided during the meeting, the original proposal had included only limited information on these (IWC, 2016d, p.534). Similarly, as noted in the previous reviews, an important component of reviewing a new proposal is having an understanding of project management, personnel and logistics (IWC, 2016d, p.534). The Chair also noted that to avoid the situation that arose after the Expert Panel Workshop to review NEWREP-A, all participants at the JARPN II final review had been asked to sign a confidentiality agreement regarding disclosing the outcome of the review process before the final report was made publicly available.

With respect to periodic and final reviews, the experience of the most recent Expert Panel held in February 2016 is pertinent. That Panel had provided comments on several general issues upon which it had recommended that the Scientific Committee should initiate improvements. These concerned:

(a) providing 'guideline in Annex P either relating to the minimum time after completion of a programme that a final review can take place (at present, Annex P states that 'Final reviews shall normally take place no longer than three years after the final take under Special Permits) or establishing a small review group to determine whether the materials presented for a final review are in a sufficient state for a Workshop to take place' (SC/66b/Rep06, p.46);
(b) provide guidelines for the scope and structure of final reports (the Panel provided a suggested outline for an integrated final report and associated materials as Annex G to its report) to streamline the Panel's review thorough examination over a large number of documents (SC/66b/Rep06, p.46);
(c) that a brief annual review of progress with recommendations is initiated (this has been undertaken this year) (SC/66b/Rep06, p.47); and
(d) based upon a request from the Expert Panel for JARPN II periodic review in 2009 (IWC, 2010c) that the Scientific Committee develops a mechanism to allow for the completion of the Expert Panel reviews if the Panel states that its review is incomplete until further information/analyses is provided (SC/66b/Rep06, p.47).

The Committee took these issues into consideration in its discussions at this meeting, where it was noted that a similar approach was used by CCAMLR with respected to proposals for protected areas. As an initial step to addressing items (a) and (b) and after much discussion, the Committee agreed to an approach whereby a checklist is provided to the proponents to complete and send to the Chair of the Scientific Committee confirming whether or not they have included the information on the agreed elements for either a new proposal or a periodic/final review (based upon Annex P and the two most recent Expert Panel Reports). It was agreed that this would be a self-checklist and that it was not intended that the Chair (or other group) would review the materials presented for a final review to decide if the Workshop should take place. The need or otherwise for a quality control step will be considered after initial experience of this approach.

Attention: SC, C-A
*Given these discussions, the Committee **agrees** that Annex P be amended to incorporate the following:*

(a) text in the relevant places referring to use of the self-checklist for new proposals and for periodic and final reviews, primarily:

'In order to ensure that any proposal provides information on each of the items needed for review by the Expert Panel, the Proponent will perform a self-assessment using the appropriate checklist provided in Appendix 2. A completed checklist will be attached to the proposal.'

(b) inclusion of a checklist for new proposals (there was insufficient time to develop a checklist for periodic or final reviews or to finalise guidelines for periodic or final reports – these will be considered next year);
(c) insertion of text in the relevant places regarding signing of a confidentiality agreement by Panel members and observers:

'All [members of the Panel]/[observers] shall sign a written agreement of confidentiality on the discussion and outcome of the review. The confidentiality agreement will terminate when the Report of the Expert Panel is received by the Scientific Committee and it becomes public (about 60 days after the Workshop).'

*A fully revised version of Annex P incorporating these changes is given as Annex P and the Committee **recommends** this to the Commission. The need or otherwise for a quality control step will be considered after initial experience of this approach.*

The Committee also discussed suggestions to:

(a) increase the participation of Scientific Committee observers at the open session of Expert Panel Workshops in order to improve transparency, accessibility, and promote wider engagement;
(b) align the Scientific Committee review process with that of the Commission's biennial cycle; and
(c) consideration of instituting a peer review process before the Expert Panel meets.

Only a short summary of some of the ideas and comments made is provided here, in order to assist the work of an intersessional working group to consider the issues and for further discussion at next year's meeting (see below). There was support by some members for addressing both (a) and (b) by holding the five-day Expert Panel immediately before the Scientific Committee meeting started but with the Panel report not being made available until a reasonable time (e.g. one month) after the Scientific Committee meeting. This would reduce travel costs for the Committee members who wished to attend as observers, and improve access and transparency, potentially allowing more to attend the open sessions (although it would add to subsistence costs and time away).

Others identified some difficulties with this idea including that it might: (a) overlap with the Committee's pre-meetings; (b) lose the present advantage of proponents being able to: (i) bring in more experts and/or bring them only on those days that the topic pertaining to their expertise is being presented; and (ii) to respond quickly to Panel requests for additional analyses or information; and (c) create an additional burden for those members of the Expert Panel who were also members of the Scientific Committee (e.g. the Chair and Head of Science) in light of their preparations for the Scientific Committee meeting and the need to prepare the reports of the Expert Panel and Scientific Committee in a timely way. A concern was expressed by Japan that having a large number of observers might also alter the focus of the Expert Panel or affect its independence, which was one of the original intentions of setting up Annex P with an expert panel. However, others noted that this had not been a problem thus far and that observer participation was important.

An associated suggestion to this briefly considered was that the two-day's worth of dedicated open sessions (presentations by the proponents or observers and questions by the Panel members and observers) could be held immediately prior to the Scientific Committee meeting. This could either be in advance of, or follow, the Expert Panel Workshop.

An alternative approach might be to make the 'open' morning sessions available via live streaming (and recording to allow for time zone differences) whilst still maintaining the present observer arrangements for individuals to attend in person if they wish - this would allow Scientific Committee members to observe proceedings without needing to travel to the Workshop. It was also noted that the use of live-streaming and video-conferencing could potentially be used to overcome some of the logistical challenges associated with moving the expert panel to the beginning of the Scientific Committee.

Some members commented that the present approach had worked well and provided thorough and balanced scientific reviews unlike the situation before the development of Annex P. They noted that the instigation of a peer-review process seemed unnecessary given that was already in effect part of the Panel's remit.

With respect to the alignment of the review process to the biennial Commission meetings (enabling the Commission to comment on new proposals before permits were issued), the Committee noted that it would be technically possible to develop such a system but that it also recognised that this may involve issues beyond its competence that would require Commission discussion and advice.

Attention: SC, C-A
*The Committee **recognises** the sensitivity and complexity of issues related to special permits and the Annex P process, noting the establishment and updating of Annex P within the Committee has always be by consensus. Given the number of views expressed ranging from no changes to a number of options on timing and process, the Committee:*

*(a) **agrees** to establish an intersessional correspondence group under Fortuna (ICG-37; for members and Terms of Reference see Annex V) to consider the need or otherwise to additionally modify Annex P in the light of the recommendations and suggestions made by previous Expert Panels and the discussions reflected in the Committee's considerations this year;*
*(b) **draws the issue** of alignment of the Annex P process with the Commission's two-year cycle to the attention of the Commission but **agrees** to wait for Commission advice before considering this issue further; and*
(c) suggests that, as a trial, the option of providing a webcast of the open sessions of the next Expert Panel meeting be explored by the Secretariat and the hosts.

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27. ELECTION OF OFFICERS

The Committee was delighted to hear that Fortuna and Suydam will continue in office after an excellent first year.

28. PUBLICATIONS

Donovan reported on matters related to the *Journal* which is online and free access as reported last year. He congratulated his team who had completed the very large supplement (609pp. compared to the first supplement of 281pp.). As anticipated, the backlog of papers for the regular issues had built up due to maternity leave but he was delighted to say that Jessica Peers had now returned and the team was working extremely hard to reduce this over the year. A number of new procedures are being developed to streamline the process and publicise the *Journal* and the assistance of Committee members in submitting high quality manuscripts, promptly participating in the review process and contributing to the Editorial Board is much appreciated.

Attention: SC, C-A
*The Committee **thanks** the Editorial team for their tremendous work during a difficult year. It **strongly reaffirms** the important role that the Journal plays in its work and in presenting it to the broader scientific community. It confirms its view that the Journal should be adequately resourced.*

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29. OTHER BUSINESS

The Secretariat reaffirmed its commitment to using recycled paper to the maximum extent possible and recycling plastics (e.g. badges). It also confirmed that it is looking into technical aids for people with difficulties in communication or mobility and investigate the possibility of arranging for crèche facilities at Committee meetings.

30. ADOPTION OF REPORT

The Committee adopted the report at 17:47 on 19 June 2016. It was left for the Head of Science and the Chair to complete those sections that could not be finalised during the meeting due to lack of time.

The Scientific Committee thanked the Chair for her fair handling of the meeting and for all thoughts and efforts put on developing this year's work programme. The Chair thanked all members of the Scientific Committee for their positive attitude and tireless cooperation. She particularly thanked all convenors, co-convenors and rapporteurs for their dedication and for donating their time to the IWC before and during the Annual meeting; and the vice Chair, the Head of Science and the Secretariat staff for their precious assistance and good temper. She finally reiterated her thanks to the Slovenian Government and to the Hotel staff for the excellent facilities, which also contributed to the success of the meeting.

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