

Report of the Scientific Committee

Bled, Slovenia, 24 April-6 May 2018

**This report is presented as it was at SC/67b.
There may be further editorial changes (e.g. updated references, tables, figures)
made before publication.**

**International Whaling Commission
Bled, Slovenia, 2018**

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The meeting (SC/67b) was held at the Rikli Balance Hotel, Bled, Slovenia, from 24 April-06 May 2018 and was chaired by Caterina Fortuna. The next meeting of the Commission (IWC/67) will take place 4-14 September 2018. The list of participants is given as Annex A (about one-third of the Contracting Governments were represented by delegates).

1. INTRODUCTORY ITEMS

1.1 Chair's welcome and opening remarks

Fortuna welcomed the participants to the meeting. Although the meeting was not officially hosted by the Slovenian Government, she thanked it for welcoming them back and noted how pleased the Scientific Committee was to be once again in such a beautiful place. She thanked the IWC Secretariat staff for their hard work during the intersessional period, particularly Mark Tandy for organising the meeting under time pressure Stella Duff and Andrea Cooke for their assistance with meeting documents and Greg Donovan for all his support intersessionally. She thanked Sava Hotels for providing the meeting facilities and her Slovenian colleagues for helping meeting arrangements run smoothly. Fortuna also thanked the vice-Chair Robert Suydam, the Convenors (including those of intersessional groups) and Committee members for all their hard work since the last meeting.

Rebecca Lent, the new IWC Executive Secretary, welcomed participants to the meeting. She noted this was her first IWC meeting, but already knew of its excellent global reputation and looked forward to attending many sessions. She noted her pleasure at joining the IWC at such an exciting time, with a busy year of meetings and several new initiatives. Two new coordinators have joined the Secretariat as part of the IWC work programmes endorsed by the Commission in 2016: Marguerite Tarzia as bycatch coordinator; and Karen Stockin as strandings coordinator. They will lead the Commission's work in these areas and will provide valuable input into the Scientific Committee's work.

Lent noted that the external "The IWC review – final report" (<https://archive.iwc.int/?r=6890>) undertaken as part of the IWC's Governance Review has recently become available and she noted that the Commission would welcome comments on it from the Scientific Committee, and that in particular, the Commission's Operational Effectiveness Working Group will take into consideration the comments from the Scientific Committee in making its recommendations to the Finance and Administration Committee; that Committee will then make recommendations to the Commission, which will determine the next steps in the governance review. Budget Management has become more challenging in recent years and there is much work to do to make sure the workplan of the Commission and all its subsidiary bodies is affordable going forward and into the long term. Finally, she thanked Scientific Committee members for their scientific input over the next two weeks and wished everyone a successful meeting.

The Committee was saddened to learn of the death of four scientists connected with the Scientific Committee:

- (1) Greg Kaufman, a member of the Committee since 2006 and an active member of the sub-committee on whale watching and the Whale watching Working Group of the Conservation Committee;
- (2) Doug Coughran, who although he did not attend Scientific Committee meetings, was a participant in numerous IWC workshops on entanglement and stranding response and was a charter member of both the IWC's entanglement and stranding expert (advisory) groups;
- (3) Dale Rice, who although he has not attended IWC meetings in recent years, first represented the USA on the Scientific Committee as far back as 1960; and
- (4) John Reynolds, who although not a member of the Scientific Committee, was a mentor to many Committee members.

The Committee paused in silence and respect for these scientists who had contributed directly and indirectly to the Committee's work and to whale conservation and management. Short obituaries can be found in Annex AA.

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 'Cumulative Effects' from 22-23 April; and
- (2) the sub-committee on Whale Watching held a pre-meeting on the IWC's 'Five Year Strategic Plan for Whale Watching' from 22-23 April.

Several 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 In-Depth Assessments;
 Annex G – Sub-Committee on Other Northern Hemisphere Whale Stocks
 Annex H – Sub-Committee on Other Southern Hemisphere Whale Stocks;
 Annex I – Working Group on Stock Definition and DNA testing;
 Annex J – Sub-Committee on Non-Deliberate Human-Induced Mortality of Cetaceans;
 Annex K – Sub-Committee on Environmental Concerns;
 Annex L – Standing Working Group on Ecosystem Modelling;
 Annex M – Sub-Committee on Small Cetaceans;
 Annex N – Sub-Committee on Whale Watching;
 Annex O – Sub-Committee on Conservation Management Plans;
 Annex P – Revised ‘Annex P’;
 Annex Q – Standing Working Group on Abundance Estimates, Stock Status and International Cruises;
 Annex R – *Ad hoc* working Group on Sanctuaries;
 Annex S – *Ad hoc* Working Group on Photo-ID;
 Annex T – Ad hoc Group on Global databases and repositories
 Annex U – Statements on Special Permit discussions
 Annex V – IWC-SORP – Southern Ocean Research Partnership
 Annex W – Updated Rules of Procedure
 Annex X – Comments on the ‘Governance Review’
 Annex Y – Intersessional groups
 Annex Z – Minority Statements on the Agenda

1.5 Computing arrangements

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

2. ADOPTION OF AGENDA

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

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, 2013a, 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 to provide (1) a concise summary of information available in member countries and (2) advice on where to find more detailed information if required. In addition, the IWC holds several specialist databases (including, catches, sightings, ship strikes, images – see Item 23).

As agreed at the 2013 Annual Meeting (IWC, 2014), all National Progress Reports were submitted electronically through the IWC National Progress Reports data portal. Encouragingly, 18 countries (Argentina, Australia, Brazil, Croatia, Denmark, France, Germany, Iceland, Italy, Japan, Korea, Mexico, New Zealand, Netherlands, Norway, Spain, UK and USA) submitted reports this year compared to 12 last year. Information was provided on bycatch, entanglement, ship strikes, direct and indirect takes, sampling, sightings and tracking studies.

Nearly all the recommendations identified by the Committee in 2017 (IWC, 2018c) have been implemented although further guidance is required on the appropriate level of aggregation for some records (e.g. strandings) to simplify and accelerate data entry without losing valuable resolution.

Although data entry this year was hampered due to problems with the IWC server, this generic issue has already been resolved by the IWC Secretariat. Several suggestions for improvements, including the removal of default values, can be See Annex T for full details.

Attention: C, CG, S, SC

*Despite the technical issues of the portal, the eighteen Progress Reports submitted to SC67b was an improvement on the twelve submitted to SC67a. Nevertheless, this represents a small proportion of IWC member nations. The Committee **reiterates** that National Progress Reports are required under the Convention and they represent a useful tool and **recommends** that Contracting Governments to submit them annually through the IWC data portal (<http://portal.iwc.int>).*

*National Progress Reports include records of reported bycatch and ship strikes. The Committee **agrees** that the data collected in these reports are not intended to replace in-depth studies and they should be considered and used with great caution. However, it also **agrees** the reports have value because much of these data would not otherwise be available and the reporting process can assist in supporting national compilation of cetacean data.*

*To address in part several of the issues and challenges described above the Committee **agrees** to:*

- (1) develop a strategy with the Scientific Committee Chair and Secretariat to raise awareness of National Progress Reports and promote reporting by member nations;*
 - (2) produce a short summary explaining the utility of National Progress Reports and suggest including this text in the circular to member nations calling for data submission;*
 - (3) request the Secretariat to issue the first call for data submission in February and repeat the call a few weeks prior to the start of the SC meeting;*
 - (4) develop text acknowledging the likely limitations of the reported data (subsequently this text will be included in all reports and data downloads;*
 - (5) further explore approaches (using R markdown) to produce PDF- formatted national reports.*
- This work will be conducted by the GDR Steering Group intersessionally (see Annex Y).*

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 2017 meeting.

Table 1
List of data and programs received by the IWC Secretariat since the 2017 meeting.

Date	From	IWC ref.	Details
18/05/2017	St Vincent&G: J. Cruickshank-Howard	E128 Cat2016	Information from St Vincent and the Grenadines aboriginal hunt 2016-17
3-10 7/2017	S. Kromann and Y. Ivashchenko	E127 C	Individual catch data for Taiyo Gyogyo, Japan in 1943-44. Copy of data held at NMML Seattle
16/08/2017	Y. Ivashchenko	E127	Extra details of N. Pacific sei whale catches by the USSR 1963-71
16/02/2018	Japan: K. Matsuoka	CD103	2017 POWER sightings cruise data (except photographs)
16/02/2018	Japan: K. Matsuoka	CD104	2017 ICR North Pacific dedicated sighting survey data.
04/04/2018	Canada: S. Reinhart	E130 Cat2017	Details of the Canadian bowhead harvest for the 2015-7 seasons and some information on the 2018 quota
11/04/2018	Japan: K. Matsuoka	E131	Data from the 2017-18 NEWREP-A dedicated sighting survey
18/04/2018	Iceland: G. Vikingsson	E130 Cat2017	Individual records of minke whales caught by Iceland 2017 [there was no fin whale catch]
18/04/2018	Norway: N. Øien	E130 Cat2017	Individual minke records from the Norwegian 2017 commercial catch. Access restricted (specified 14-11-00).
19/04/2018	USA: R. Suydam	E130 Cat2017	Individual records from USA Alaska aboriginal bowhead hunt 2017
20/04/2018	Japan: H.Morita	E130 Cat2017	Individual data for Japan's catch in 2017 in the N. Pacific (JARPN II) & 2017/8 in the Antarctic. (pdf format)

3.3.2 Progress of data coding projects and computing tasks

On behalf of Allison, Donovan reported that the 2017 catches and Japan coastal records in 1943-44 (data from NMML Seattle) have been added to the database. The changes agreed at the 2017 meeting, in particular to split out the catches taken *en route* to and from the Antarctic whaling grounds, have been implemented. Work on computing tasks with respect to work on the AWMP, RMP and in-depth assessments is reported under the relevant agenda items.

4. COOPERATION WITH OTHER ORGANISATIONS

Attention: C-A

*The Committee **stresses** the value of cooperation 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 PAME II-2017 meeting was held in Helsinki, Finland from 18-20 September 2017. No IWC observer attended the meeting. The Committee agrees that if possible an IWC observer should attend the next meeting of PAME.

4.3 Convention on Biological Diversity (CBD)

There was no meeting of the Conference of Parties during the intersessional period. The next meeting will take place 10-22 November 2018. The Committee agrees that if possible an IWC observer should attend the next meeting of CBD.

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

The 36th Meeting of the CCAMLR Scientific Committee was held 16 - 20 Oct 2017 October 2016 in Hobart, Australia. Although no IWC observer attended the meeting, co-operation with CCAMLR remains an important component of the IWC's work and is discussed further under Item 16.1.

4.5 Convention on the Conservation of Migratory Species (CMS)

4.5.1 Scientific Council

The Second Meeting of the Sessional Committee of the Scientific Council was held 10- 13 July 2017 in Bonn, Germany. No IWC observer attended the meeting.

4.5.2 Conference of Parties

The Conference of Parties met 23-28 October 2017 in Manila, Philippines. No IWC observer attended the meeting.

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

The report of the observer to ASCOBANS is given as SC/67b/COMM01E. The following key activities have occurred since the last IWC Scientific Committee meeting:

- (1) first Joint Meeting of the 13th Meeting of the Jastarnia Group (Baltic Sea harbour porpoises) and the 6th Meeting of the North Sea Group;
- (2) best-practice workshop on 'Fostering Inter-regional Cooperation on Underwater Noise Monitoring and Impact Assessments in waters around Europe, within the context of the European Marine Strategy Framework Directive';
- (3) 23rd Meeting of the Advisory Committee; and
- (4) 14th Meeting of the Jastarnia Group.

The key ongoing ASCOBANS activities are:

- (1) work on the three harbour porpoise Action Plans (Baltic, Belt and North Seas)- in place since February 2018;
- (2) web-accessed database on marine mammal stranding and necropsy in preparation (ZSL/IOZ leading), 2018-2020;
- (3) preparation of an action plan for common dolphins; and
- (4) implementing a change in the national reporting cycle from annual (on all topics) to a four-year cycle (selected topics each year) - the intention is that all the key ASCOBANS working groups and meetings align their agendas to home in on these issues in the respective years of reporting (e.g. covering 2017 in 2018).

The Action Points at the last Advisory Committee meeting included:

- (1) preparing a discussion on prey depletion and changes in prey quality on the agenda of the 24th Meeting of the Advisory Committee;
- (2) co-organisation of a workshop with ACCOBAMS on strandings and marine debris (the report has been made to the Scientific Committee);
- (3) future focuses will include the white-beaked dolphin and the white-sided dolphin.
- (4) a draft Action Plan for the Common Dolphin is due to be presented at the 24th Advisory Committee Meeting.

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

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

MEETING OF PARTIES

There was no Meeting of the Parties (MoP) to ACCOBAMS during the intersessional period. Donovan will represent the Committee as an observer at the next ACCOBAMS MoP.

SCIENTIFIC COMMITTEE

There was no meeting of the ACCOBAMS Scientific Committee during the intersessional period. Donovan will represent the Committee at the next ACCOBAMS Scientific Committee meeting.

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

No relevant meetings of CITES have taken place during the intersessional period.

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

There was no meeting of The Committee on Fisheries (COFI) during the intersessional period. The next meeting will take place in Rome, Italy 9-13 July 2018.

4.8 Inter-American Tropical Tuna Commission (IATTC)

The 92nd meeting of the Inter-American Tropical Tuna Commission (IATTC) was held in Mexico City, Mexico 24-28 July 2017. No observer attended IATTC meetings in the intersessional period.

4.8.1 Agreement on the International Dolphin Conservation Program (AIDCP)

No observer attended IADCP meetings in the intersessional period.

4.9 International Committee on Marine Mammal Protected Areas (ICMMPA)

There was no meeting of ICMMPA task force during the intersessional period. The 5th International Conference will be held from 8- 12 April 2019 in Greece. It will evaluate progress in meeting the ICMMPA's long-standing goal of bringing the MMPA community closer together. A primary goal is to focus on the challenges ahead towards achieving effective place-based protection and management for marine mammals. It will build on previous initiatives to advance our understanding of science, management, and effective biodiversity conservation in protected areas. It will also provide updates on plans for the worldwide Important Marine Mammal Area (IMMA) initiative (*marinemammalhabitat.org*). Rojas-Bracho will represent the Committee at this meeting.

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

The report of the IWC observer documenting the 2017 activities of ICES is given as SC/67b/COMM01A. The ICES Working Group on Marine Mammal Ecology (WGMME) reported on recent information on status of, and threats to, marine mammal populations and briefly reviewed current knowledge of effects of plastics and underwater noise. Criteria for assessment of abundance trends in offshore cetaceans in the context of the Marine Strategy Framework Directive (MSFD) were reviewed, modifying the proposed indicator (previously based solely on the rate of decline) to make specific reference to baseline values. The group also considered the outcomes of the 2016 SCANS III survey¹. All three SCANS surveys have arisen from individual projects. WGMME recommended that the surveys be co-organised and coordinated by Member States as part of their routine monitoring and that the frequency is increased to once every six years to match the MSFD reporting cycle.

A Workshop on Predator-prey Interactions between Grey Seals and other marine mammals (WKPIGS) focused on predatory behaviour of grey seals towards other grey seals, harbour seals and harbour porpoises in European waters. The workshop aimed to consolidate pathological indicators of grey seal predation events, collate data on the prevalence and distribution and discuss methods to aid in detection of predation events and potential population level consequences of reported incidences. Cases of predation on harbour porpoises peaked in spring months. Reported incidence has increased over the last decade although it is not known if this represents a true increase in prevalence, an increase in seal numbers or an increase in effort/reporting.

Highlights from the 2017 ICES Working Group on Bycatch of Protected Species (WGBYC) included: review of ongoing bycatch mitigation research projects; presentations on interdisciplinary bycatch monitoring programs in the US Northwest Atlantic northeast region; collaborations with other ICES working groups; positive advancements on WGBYC database development working jointly with the ICES Data Centre; and progress on summarising bycatch for the Baltic Sea and Bay of Biscay/Iberia fisheries overviews.

Four cetacean species were reported as bycatch from the 2015 member state reports (common dolphins, white-beaked dolphin, bottlenose dolphin, and harbour porpoise). The WGBYC continues to highlight the inconsistent submission and content of annual reports provided by some member states and the shortcomings to accurately reflect the full magnitude of cetacean bycatch in European fisheries. WGBYC is preparing for the transition away from regular member state reports as the primary source of data on bycatch of cetaceans over to data coming through the ICES regional database.

¹ <https://synergy.st-andrews.ac.uk/scans3/>

The 2017 ICES Annual Science Conference (ASC) had no sessions devoted entirely to marine mammals. Nevertheless, some sessions had marine mammals included as an integral part - the most relevant sessions were: 'microbes to mammals: metabarcoding of the marine pelagic assemblage' and 'from iconic to overlooked species: how (electronic) tags improve our understanding of marine ecosystems and their inhabitants'.

More information is available from the ICES website www.ices.dk.

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 Organisation (IMO)

The report of the observer is given as SC/67b/COMM01D. At IWC66, the Commission endorsed recommendations of the IWC Conservation and Scientific Committees for continued engagement with the IMO, including submission of a paper to the IMO Marine Environment Protection Committee (MEPC) providing an update of recent information related to the extent and impacts of underwater noise from shipping. This paper was written by an intersessional group appointed at SC67a and submitted to the IMO MEPC 72 meeting 9-13 April 2018 (MEPC 72/Inf.9).

The ship strike section of the IWC website now contains a list of the measures that have been put in place globally through IMO or national regulations, to reduce ship strike risks to whales. These include Traffic Separation Schemes, Areas to be Avoided, Recommended Routes, voluntary and mandatory speed restrictions. New measures relevant to ship strikes include three recommendatory areas to be avoided (ATBA) encompassing King Island, Nunivak Island, and St. Lawrence Island in the Bering Sea proposed by the United States (NCSR 5/3/8). The proposal noted that King Island is a biologically important site to the gray whale, while St. Lawrence Island's ATBA would provide protection to bowhead whales, gray whales, and humpback whales. These areas were recommended for adoption (with a reduced size for the St. Lawrence ATBA) by the IMO Navigation, Communications and Search and Rescue sub-committee NCSR 5 in February 2018.

Members of the IWC Scientific Committee have attended IMO meetings in order to discuss how best to provide information on populations of marine mammals relevant to the marine mammal avoidance provisions of the IMO Polar Code. This is discussed further under Item 14.3.

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)

The report of the observers to IUCN is given as SC/67b/COMM01G. The IUCN Marine Mammal Protected Areas Task Force (<https://www.marinemammalhabitat.org>) held its 3rd regional workshop in Malaysia in March 2018 to identify, describe and map candidate areas for inclusion in the Important Marine Mammal Area (IMMA) e-Atlas (marinemammalhabitat.org/imma-eatlas). The 46 candidate IMMAs proposed by the workshop are currently undergoing independent review.

Cetaceans entries on the Red List are in the process of being updated. The first batch of updates covering 19 taxa was published on redlist.org in December 2017 and is summarised at iucn-csg.org/index.php/page/3. Most of the remaining mysticete species assessments and some subpopulation assessments, as well as around 10 more new assessments of small and medium-sized odontocetes, have been submitted for publication in the next Red List update in June 2018. Most of the remaining taxa are in the pipeline for publication in late 2018.

IUCN continues to convene the Western Gray Whale Advisory Panel (WGWAP), which provides advice to Sakhalin Energy Investment Company (SEIC) and other parties, especially on the mitigation of industrial and other impacts on the gray whales that feed each summer off Sakhalin Island, Russia. Details of the Panel's recent work are given in Annex O, Appendix 3.

Regular news items on activities by members of the IUCN SSC Cetacean Specialist Group are posted on the CSG website, www.iucn-csg.org.

4.13 North Atlantic Marine Mammal Commission (NAMMCO)

Scientific Committee

The report of the IWC observer at the 24th meeting of the NAMMCO Scientific Committee (NAMMCO-SC) is given as SC/67b/COMM01B. The NAMMCO-SC discussed a current joint project, 'Exploring marine mammal consumption relative to fisheries removal in the Nordic and the Barents Seas'. Preliminary results suggest that marine mammal consume around 15 million tons \pm 50% of prey per year, predominantly targeting low and mid trophic level species (zooplankton and small pelagic fish). Fisheries remove around 4.3 million tons per year, targeting mid and top trophic levels (small pelagic fish and larger demersal and pelagic fish).

The NAMMCO By-Catch Working Group (BYCWG) met in May 2017. Methods used for collection of data and by-catch estimation were reviewed, and both the WG and the SC recommended methodological improvements to be implemented both in the data collection and the analysis before the bycatch estimates could be endorsed. Greenland is an atypical case because marine mammals that are caught, either directly or indirectly, are assumed to be reported as direct

catch (with large whales being the exception where bycatch is reported as such). The primary concern is to ensure that any bycatch is included in the total number of removals to be used in population assessments.

The NAMMCO SC noted and appreciated that the IWC *Implementation Reviews* for North Atlantic fin whales and North Atlantic common minke whales are completed. The NAMMCO SC provided advice on sustainable catch levels for these species in Icelandic waters (from 2018-2025) based upon application of the RMP. The NAMMCO SC also recommended that the *SLAs* that are developed in the IWC SC be used for advice for large whales in Greenland and provided advice on strike limits for West Greenland humpback whales for the 2019-24.

The NAMMCO SC received the results from an updated global review of monodontids and provided updated assessments and advice for white whales and narwhals in Greenland and Canada. It also received a new abundance estimate for bottlenose whales from the Faroese component of the 2007 T-NASS survey that was analysed together with data on deep diving species from the SCANS-II and CODA surveys. Sightings were mainly from the Faroese survey block.

Increased research on harbour porpoises in Norway is being driven by the concerns regarding bycatch. Bycaught harbour porpoises were collected in 2016 and 2017 by Norway for biological sampling, and a food-web model is being developed for the Vestfjord area close to Lofoten to study the role of the species in this area. An abundance estimate is now available from the SCANS-III survey which was extended from 62°N to include Vestfjorden, an area with high bycatch. Preliminary investigations using this new abundance estimate suggest that bycatch levels are within PBR.

NAMMCO's 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 Isles, 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. The next NASS survey should be in 2022-23. The NAMMCO SC strongly recommended that an attempt be made to conduct again a trans-Atlantic coordinated survey and charged the NAMMCO Secretariat to explore what are the present plans and how much flexibility they encompass.

Council

The report of the IWC observer at the 26th Annual Council meeting of NAMMCO held in Tromsø, Norway 7-8 March 2018 is given as SC/67b/COMM01C. Relevant items discussed at the Council meeting include the following:

- (1) A newly established working group on bycatch, entanglements and live strandings has started its work and will gather information on the matter from other organisations and develop recommendations for NAMMCO. The focus is animal welfare associated to non-hunting related activities, and how NAMMCO can best contribute to addressing significant adverse impacts of by-catch, entanglement and live strandings on marine mammals; and
- (2) The report of the Global Review of Monodontids (white whales and narwhals) reviewed the conservation status, threats, and data gaps for all stocks globally. The last review was in 1999.

The Committee thanked Moronuki for his report.

4.14 North Pacific Marine Science Organisation (PICES)

The report of the IWC observer at 2017 annual meeting of PICES is given as SC/67b/COMM01F.

The marine birds and mammals section (S-MBM) focussed on 'seasonal and climatic influences on prey consumption by marine birds, mammals and predatory fishes'. Presentations were made on (1) significance of seasonal changes in prey consumption on energy budgets and ecosystem dynamics; (2) effects of changes in water temperature and other climatic variables on food requirements; (3) relationships between dietary shifts and population trends; (4) limits of plasticity in prey selection; and (5) how prey consumption of birds, mammals and predatory fishes is affected by the recent extreme climatic events. Overall, the collection of presented studies in this session contributed to the efforts of the S-MBM to estimate prey consumption of birds and mammals. They provided new methods to estimate prey consumption of marine mammals and gave insights into the existing databases of diets and population estimates that can be used to further this effort.

For 2018, the S-MBM will focus on 'diets, consumption and abundance of marine birds and mammals in the North Pacific'. Since the 2016 workshop, work on the agreed upon databases to estimate prey consumption has been initiated and will continue to be added to over the coming 12 months in anticipation of the 2018 workshop, when invited experts will review the compiled information. This process should result in near-complete databases of diets, abundances and energy requirements of marine birds and mammals in the North Pacific.

The 2018 annual meeting of the PICES will be held in Yokohama, Japan 25 October-4 November 2018. 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 (SPA) of the Cartagena Convention for the Wider Caribbean

No observer attended SPAW meetings in the intersessional period.

4.16 Pacific Region Environment Programme (SPREP)

No observer attended SPREP meetings in the intersessional period.

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

Several assessment topics apply not only to the Revised Management Procedure (RMP), but to the work of the Scientific Committee as whole. This item focuses on general assessment issues, such as: (1) the relationship between $MSYR_{mat}$ and $MSYR_{1+}$; (2) implications of RMP and AWMP simulation trials for consideration of ‘status’; and (3) matters of relevance to special permits that involve RMP considerations including effects of catches upon stocks.

5.1 Evaluate the energetics-based model and the relationship between $MSYR_{1+}$ and $MSYR_{mat}$

$MSYR$ is a key parameter in the *Implementation Simulation Trials* used to evaluate the conservation and catch performance of alternative RMP variants for specific species and regions. In recent years, the Committee has been reviewing progress on an individual based energetics model (IBEM) to provide insights into the relationship between $MSYR_{1+}$ and $MSYR_{mat}$. Two papers on the IBEM were reviewed by the Committee in SC/67b.

SC/67b/EM07 outlined enhancements to the IBEM since the last meeting. This included the ability to explicitly model the effects of feeding while on migration, which can have effects on the yield curve as well as $MSYR$ and $MSYL$. The Committee discussed (Annex D, Item 2.1) several ways in which this model can potentially enhance understanding of the relationship between biological processes and $MSYR$.

SC/67/RMP01 reported on trials using the IBEM within the standard RMP testing framework. The results were consistent with the behaviour of the RMP *CLA* observed in less complex population models and will also provide a point of comparison for the emulator model for the IBEM currently under development. The Committee has previously agreed that a fully-developed emulator model could form the basis for future *Implementation Simulation Trials*.

Attention: SC

*The Committee **agrees** that work continue to develop an emulator model; assess whether it is possible to represent the trajectories from the IBEM using an emulator model; compare the yield curves from the IBEM with those from the emulator model; and develop guidelines for how to use an emulator model as the basis for a multi-stock, multi-area population dynamics model and how such a model could be conditioned given available data.*

5.2 Implications of ISTs for consideration of species’ and populations’ status

Last year, the Committee recommended that a set of *Implementation Simulation Trials* should be summarised using three statistics to provide information on status (IWC, 2018d). The Committee was advised that intersessional tasks toward that goal could not be completed prior to SC/67b due to computing workloads.

Attention: SC

*The Committee **agrees** that Allison should modify the control programs used for Implementation Simulation Trials to report the three measures of status agreed last year (IWC, 2018d). The RMP sub-committee, in conjunction with the Working Group on ASI, will review outcomes of the analyses at SC/68a. Punt and Donovan will develop draft updates to the Guidelines for Implementations and Implementation Reviews to reflect decisions on evaluation status of stocks for consideration at SC68a.*

5.3 General consideration of how to evaluate the effect of special permit catches on stocks and levels of information needed to show improved management performance

5.3.1 General issues

The Committee developed general guidelines on the levels of information needed to show improved management improvement, for proposals that identify this as an objective (Annex D; appendix 2). The guidelines are intended to assist proponents in proposal preparation and to facilitate the review process. It was stressed that these were guidelines not requirements. Proponents might request the establishment of an Advisory Group to provide comment on intersessional work, but this is not mandatory. An Advisory Group may most benefit nations which have not previously developed proposals or may be lacking analysts familiar with the modelling approaches commonly applied at the IWC.

Attention: SC

*The Committee **agrees** that the general guidelines on the levels of information needed to show improved management improvement, for proposals that identify this as an objective (Annex D; appendix 2), should be included as an Appendix to the Scientific Committee handbook.*

5.3.2 Specific issues

SC/67b/RMP03 provided draft specifications for RMP/IST type simulations to evaluate management procedures based on modified *CLAs* that use information on recruitment inferred from age data from Antarctic minke whales. This work originally arose from discussions of NEWREP-A and Recommendation 1 of the Panel Review of that proposal (and see Item 19). The Committee noted that SC/67b/RMP03 was a work-in-progress, and that several features of the operating models would need to be extended before final conclusions could be drawn. The author of SC/67b/RMP03 plans to continue this work and received several suggestions from the Committee to carry those efforts forward (Annex D, Item 2.3).

5.4 Work plan 2019-20

Details of work to be undertaken both before and during the 2019 Annual Meeting are given in Table 2.

Table 2

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

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Item 5.1: Conduct work to evaluate the energetics-based model and hence the relationship between MSYR ₁₊ and MSYR _{mat}	(a) Continue to assess whether it is possible to represent the trajectories from the IBEM using the emulator model (Annex Y); (b) Compare the yield curves from the IBEM with those from the emulator model (Annex Y); and (c) Develop guidelines for how to use an emulator model as the basis for a multi-stock, multi-area population dynamics model and how such a model could be conditioned given available data (Annex Y).	Continue to work to evaluate the energetics-based model and hence the relationship between MSYR ₁₊ and MSYR _{mat}	Conduct follow-up analyses	Continue to work to evaluate the energetics-based model and hence the relationship between MSYR ₁₊ and MSYR _{mat}
Item 5.2: Implications of ISTs, for consideration of status	(a) Modify the control programs used for <i>Implementation Simulation Trials</i> to report the three measures of status (Allison) (b) Draft updates to the Guidelines for <i>Implementations</i> and <i>Implementation Reviews</i> to reflect decisions on evaluation status of stocks (Punt and Donovan)	Review the results of the projections Review the draft guidelines		
Item 5.3: levels of information needed to show improved management performance		Review progress implementing the suggested changes to the specifications of the model in SC/67b/RMP03 and any results.		

6. RMP – IMPLEMENTATION-RELATED MATTERS (RMP)

This agenda item includes the details of ongoing *Implementation Reviews* and preparation for new *Implementation Reviews*. For discussions related to the stock structure and abundance of these stocks, see also Items 11 and 12.

6.1 Completion of the *Implementation Review* of western North Pacific Bryde's whales

6.1.1 Report of the intersessional Workshop

The second intersessional Workshop on western North Pacific Bryde's whales was held in Tokyo from 14-16 February 2018 (SC/67b/Rep02). The objective was to facilitate completion of the *Implementation Review*. Much of the Workshop focussed on completing the final trial specifications, especially confirming the mixing matrices, updating the abundance estimates for the new sub-areas and confirming future sighting survey plans and whaling options. The Workshop reviewed preliminary conditioning results and agreed that they were satisfactory. It developed a workplan to try to ensure completion of the *Review* at SC/67b.

The Committee noted that the intersessional workshop had led to considerable progress towards completing the *Implementation Review*. It thanked Donovan for chairing the meeting, the Government of Japan for providing excellent facilities and all the participants for their contributions to the development of trial specifications and workplan.

The code and specifications for *Implementation Simulation Trials* were updated following the intersessional Workshop.

Attention: SC

*The Committee **agrees** to the updated trial specifications for the Implementation Review of western North Pacific Bryde's whales. These specifications are provided in Annex D, Appendix 3. It also **agrees** that conditioning has been achieved satisfactorily.*

6.1.2 Conclusions and recommendations

Once the trial specifications and conditioning had been agreed, the next step was to conduct projections under alternative RMP variants and survey plans. There was insufficient time during the meeting to complete all of the required projections and to check the associated calculations. Consequently, the remaining work will be completed intersessionally and reviewed and summarised by a Steering Group (Annex Y). This will occur well before SC/68a so that Japan has sufficient time to consider the results (e.g. with regard to its preferred survey options), prior to final conclusions being drawn. The Committee expects that this work can be completed before the end of 2018, but if complications arise conducting the projections, an extra day should be added to the 'First Intersessional Workshop for the western North Pacific minke whales' (see Item 6.2) to address outstanding issues.

Attention: SC

*The Committee **agrees** that the Implementation Review of western North Pacific Bryde's whales will be completed at SC/68a. Outstanding tasks will be completed intersessionally and the results reviewed and summarised by a Steering Group (Annex Y). This will occur well prior to SC/68a, and if complications arise then an extra day should be added to the First Intersessional Workshop for the western North Pacific minke whales (see Item 6.2) to address those issues.*

6.2 Start of the *Implementation Review* of western North Pacific common minke whales

6.2.1 Report of the intersessional Workshop

Donovan summarised the report of the preparatory Workshop for the Western North Pacific common minke whale *Implementation Review* (SC/67b/Rep05). Last year, the Committee recognised that the most difficult aspect of the last *Implementation Review* had been selecting, modelling and assigning plausibility to stock structure hypotheses. The objective of this Workshop was to begin to review work undertaken since the last *Implementation Review* and to develop, if necessary and possible, consensus advice on further analyses that will assist in the forthcoming *Implementation Review*. Stock structure discussions on common minke whales are detailed in Annex I, item 4.2.

This past lack of agreement with respect to the plausibility of existing stock structure hypotheses has, in part, revolved around how genetic analyses can be used to assign whales as part of the 'J' versus 'O' stocks. While some whales assign strongly to one of the two groups based on genetic data, the assignment of others is dependent on the assignment probability deemed sufficient to assign stock affinity. At the intersessional workshop (SC/67b/Rep05), the results of new stock structure-related analyses were reviewed by an advisory panel, and two recommendations were made with regard to additional genetic analyses needed to better understand stock structure. One of the recommended analyses involved evaluating the consistency of individual assignment probabilities when additional loci were genotyped. Progress with respect to that recommendation is discussed below.

The Workshop was also provided with an update to SC/67a/SCSP/13 that used information on the trend over time in the J:O stock ratio for common minke whale bycatches around Japan to draw various inferences, in particular about the value of the MSYR. The Workshop agreed that J:O stock ratios in bycatch will require attention when formulating stock distribution assumptions for the process of conditioning *ISTs* in the coming *Implementation Review* and made some recommendations on how this could be achieved.

The Committee noted that the intersessional Workshop was held in an excellent spirit of co-operation among the participants and led to identification of additional data sets and analyses that should be taken forward. The Committee thanked Donovan for chairing the meeting, the Government of Japan for providing excellent facilities and all the participants for their contributions to progress the *Implementation Review*.

6.2.2 Progress since the intersessional Workshop

SC67b/SDDNA06 presented the results of the recommended analysis from the Workshop (see Item 6.2.1) and the Committee confirmed that the workshop's recommendation for this analysis had been properly completed.

Attention: SC

The Committee reviewed new results of genetic analyses that were recommended at the intersessional workshop (SC/67b/Rep05) to better evaluate the use of genetic data to assign stock affinity in North Pacific common minke whales. The Committee:

- (1) **agrees** that future analyses should incorporate a range of assignment thresholds to encompass uncertainty;
- (2) **supports** the additional genetic analyses described in Annex I Appendix 5 relating to the second recommendation of the intersessional workshop and agrees that they should be performed prior to the next intersessional workshop; and
- (3) **encourages** the inclusion of non-genetic biological data to inform stock structure where possible.

SC/67b/RMP/02 aimed at suggesting a plausible range for $MSYR_{1+}$ for the western North Pacific common minke whales, and the relative plausibility of two stock structure hypotheses. The Committee thanked Kitakado for the updated analysis, which implemented some of the recommendations from the intersessional Workshop. Details of this paper and associated discussion can be found in Appendix D, Item 3.2.2. The Committee also discussed the analysis of genetic data conducted since the intersessional workshop (Annex I, Item 4.5).

Attention: SC, CG-A

The Committee **agrees** that:

- (a) it is necessary to update the mixing matrices in the trial specifications to be more consistent with observed genetic and bycatch data, also taking into account sensitivity to alternative methods of genetic assignment to stock;
- (b) whether it is possible to use the bycatch data to assign plausibility ranks to $MSYR_{1+}$ values and stock structure hypotheses depends on assumptions regarding trends in fishing effort spatially and temporally; and
- (c) trials would need to consider different assumptions regarding the use of J:O bycatch ratios, including that these data do not provide information on $MSYR_{1+}$ and the plausibility of stock structure hypotheses because of possible differential distributional changes by stock.

The Committee therefore **agrees** that scientists from Japan and Korea should provide data on the amount, location and timing (seasonal and annual) of fishing effort and bycatch to the First Intersessional Workshop (see item 6.2.3).

6.2.3 Preparation for the First Intersessional Workshop

The Committee began preparations for the First Intersessional Workshop on the *Implementation Review* of western North Pacific common minke whales. It re-established the Steering Group (Annex Y) to organise this Workshop.

In accordance with the Committee's 'Requirements and Guidelines for Implementations and Implementation Reviews' (IWC, 2012b), the primary objectives of the First Intersessional Workshop will be to: (a) consider plausible hypotheses and eliminate any hypotheses that are inconsistent with the data; (b) examine more detailed information in expected whaling operations, including options or suggested modifications to the pattern of those operations; (c) review the small geographical areas ('sub-areas') that will be used in specifying the stock structure hypotheses and operational pattern; and (d) specify the data and methods for conditioning the trials that will be carried out before the next annual meeting. An initial annotated agenda for the Workshop, highlighting the associated data and analysis requirements can be found in Annex D, appendix 5.

6.3 Workplan 2019-20

Details of work to be undertaken both before and during the 2019 Annual Meeting are given in Table 3.

Table 3

Work plan for RMP (*Implementation-related matters*)

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Item 6.1: Western North Pacific Bryde's whales	Finalise the projections and the application of the criteria for evaluating which RMP variants are acceptable, borderline, and unacceptable	Complete the <i>Implementation Review</i>		
Item 6.2: Western North Pacific minke whales	(a) conduct the First Intersessional Workshop; (b) code the resulting trials and condition the trials	Conduct the work required for the First Annual Meeting	Conduct the Second Intersessional Workshop	Conduct the work required for the Second Annual Meeting

7. ABORIGINAL SUBSISTENCE WHALING MANAGEMENT PROCEDURE (AWMP)

This item continues to be discussed as a result of Resolution 1994-4 of the Commission (IWC, 1995), which has been strengthened by Resolution 2014-1 (IWC, 2016a). 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) finalising the development of *SLAs (Strike Limit Algorithms)* for Greenlandic hunts, with a focus on fin and common minke whales; (2) finalising the work on the scientific components of the AWS (Aboriginal Subsistence Whaling Management Scheme); (4) completion of the *Implementation Review* for Bering-Chukchi-Beaufort Seas stock of bowhead whales; and (3) providing management advice for aboriginal hunts (see Item 8).

Considerable progress on items (1) and (2) was made because of intense intersessional work including two workshops in Copenhagen in October 2017 and March 2018, as well as a small technical meeting in December 2018 at OSPAR headquarters in London.

7.1. SLA development for the Greenland hunts

7.1.1 Fin whales

SC/67b/Rep06 incorporated the discussions of the two intersessional Workshops and the small working group meeting. Considerable progress was made in relation to (a) updated abundance estimates; (b) finalisation of the trial structure; (c) review and approval of conditioning; and (d) initial consideration of new *Strike Limit Algorithms (SLAs)* and results.

The Committee thanked Donovan, the Workshop chair and the participants for the excellent progress made.

The final trial specifications for the West Greenland fin whales are provided in Annex E (Appendix 2).

Table 4 below summarises the main factors considered in the *Evaluation Trials*. The most influential involve different stock structure hypotheses, different productivity rates (MSYR) and different 'need' envelopes (need envelopes incorporate scenarios where need remains constant at the present level for 100 years (termed A), where it increases linearly to twice the present level over the 100-year simulation period (termed B) and where it increases linearly to three times the present level over the 100-year period (termed C)).

Table 4
Summary of the key factors considered in the fin whale trials

Factor
Stock structure hypotheses
Mixing matrices
MSYR rate
Survey bias
Need envelope

7.1.1.1 CANDIDATE SLAS

The Committee received two papers with candidate *SLAs*, SC/67b/AWMP13 and SC/67b/AWMP15. The general properties of the three *SLAs* presented in SC/67b/AWMP13 involve taking an inverse variance weighted average of the last three estimates as an estimate of abundance and calculating the strike limit as a growth rate fraction of a lower percentile of the abundance (conditional on a trend modifier), a snap to need feature and a protection level. The three variants relate to how they are 'tuned' (the trade-off balance between conservation and need).

The three *SLAs* presented in SC/67b/AWMP15 are based on a weighted-average interim *SLA* which uses all abundance estimates, but where the earlier ones are down-weighted. An adjustment to the multiplier of the abundance estimate in the interim *SLA* is applied which depends on the trend of the abundance indices. The three variants relate to how they are 'tuned' (the trade-off balance between conservation and need).

7.1.1.2 REVIEW FINAL RESULTS AND PERFORMANCE

In total, seven potential *SLAs* (which include the 'Interim' *SLA* – a modified version of the *Interim SLA* used to provide advice previously by the Committee until the final *SLAs* had been developed) were considered. The full range of conservation and need statistics were reviewed for the *Evaluation Trials*², noting that the initial focus is on meeting the Commission's conservation objectives. Those candidate *SLAs* that meet these are then evaluated on their ability to meet need satisfaction. In summary, conservation performance is deemed satisfactory if either the population is not at MSYL but it is increasing towards it or the population is above MSYL (in which case it may be increasing or decreasing towards MSYL). These concepts are captured in the 'D1' and 'D10' statistics (defined fully in Annex E, table 2) and can be visualised in bivariate plots given in Annex E.

The Committee agreed that the proposed *SLAs* had performed satisfactorily on the joint conservation statistics for the A and B (but not for the C) need envelopes for all trials. The focus was then to evaluate the need satisfaction performance over 20 and 100 years and consider stability in catch levels. This performance was captured by examining three statistics:

² The Committee also examines the results of *Robustness Trials* to ensure that the *SLA* does not exhibit unusual behaviour in more extreme trials.

N9(20) the average need satisfaction over the first 20 years, N9(100) the average need satisfaction over the 100 years and N12 the mean down step statistic (these are also defined fully in Annex E, table 2). They can be visualised in ‘Zeh’ plots (e.g. see Annex E).

Given the present incorporation into the trial structure of two widely different stock structure hypotheses (‘influx’ and ‘partial’- see Annex E, appendix 2) to explain the variability of the abundance estimates, the need satisfaction over 20 years was given more weight in the evaluation as it is likely that future *Implementation Reviews* may be able to remove one or other scenario.

After an examination of the full range of results, there was no obvious ‘winner’ between two of the *SLAs* (one from each developer). Depending on the trials considered, and which statistic was examined, they performed slightly differently but their performance overall was equivalent.

Following an approach originally adopted during the development of the *Bowhead SLA*, it was decided that an *SLA* which sets the strike limit to the average of the values obtained by the two *SLAs*³ would be preferable, providing performance was as good or better than either individual *SLA*; no ‘snap to need’ for the averaged *SLA* has been applied. The results of the ‘combined *SLA*’ are summarised in Annex E, appendix 3⁴.

7.1.1.3 CONCLUSIONS AND RECOMMENDATIONS

The management advice developed using this *SLA* is given under Item 8. 6.

Attention: C-A, SC

*The Committee **draws attention** to the extensive work undertaken over recent years to develop an SLA for the West Greenland hunt for fin whales. In concluding this work, the Committee:*

- (1) **agrees** that the combined SLA (which sets the strike limit to the average of the values obtained by the two best SLAs considered) performed satisfactorily in terms of conservation performance and was to be preferred over the individual SLAs in terms of need satisfaction;*
- (2) **recommends** that this ‘WG-Fin SLA’ be used to provide management advice to the Commission on the subsistence hunt for West Greenland fin whales (provided the need request falls within need scenarios A and B);*
- (3) **expresses** its great thanks to the developers, Brandão and Witting for the vast amount of work put into the development process and to Allison and Punt for their extensive work developing the operating models and running the trials; and*
- (4) **agrees** that one focus of the next Implementation Review will be to examine further stock structure in relation to the two hypotheses being considered at present, and especially the ‘influx’ model which was developed in the context of low abundance estimates in some years, rather than being based upon genetic information.*

7.1.2 Common minke whales (Greenland)

SC/67b/Rep06 incorporated the discussions of the two intersessional Workshops and a small working group meeting. Considerable progress was made in relation to (a) updated abundance estimates; (b) finalisation of the trial structure; (c) conditioning; and (d) initial consideration of new *Strike Limit Algorithms (SLAs)* and results.

The Committee thanked Donovan, the Workshop chair and the participants for the excellent progress made.

The final trial specifications for the West Greenland common minke whales are provided in Annex E (appendix 4).

Table 5 below summarises the main factors considered in the *Evaluation Trials* for common minke whales. The most influential involve different stock structure hypotheses, different productivity rates (MSYR) and different ‘need’ envelopes (see discussion under Item 7.1.1), where it increases linearly to twice the present level over the 100-year simulation period (termed B) and where it increases linearly to three times the present level over the 100-year period (termed C).

Considerable work was undertaken to finalise the list of trials, to ensure that the mixing matrices were correctly specified and to complete and agree conditioning. The final trial specifications are provided in Annex E, Appendix 4.

Table 5

Summary of the key factors considered in the common minke whale trials

Factor
Stock structure hypotheses
Mixing matrices
MSYR rate
Survey bias
Need envelope

³ tuned to a D10 of 0.8 for the influx trial F34-1B

⁴ Final validation and archiving of results will be undertaken by Allison in Cambridge.

7.1.2.1 CANDIDATE SLAS

SC/67b/AWMP14 developed a candidate *SLA* for common minke whales off West Greenland similar to that used for fin whales in SC/67b/AWMP13. It operates on an inverse variance weighed average of the last three abundance estimates. The strike limit is calculated as a growth rate fraction of a lower percentile of the abundance measure, conditional on a ‘snap to need’ feature, and a protection level. It does not include a trend modifier.

It was tuned to have a 5th percentile of D10 of 0.80 for need envelope A for the most difficult *Evaluation Trial* (trial M04-1A – see Annex E, appendix 4), where there are two sub-stocks in the western North Atlantic in which the mixing between the Central and the Western stock, and mixing between the putative western sub-stocks, is minimal, and where the MSYR is 1%).

7.1.2.2 CONSIDERATION OF RESULTS

Conditioning of the *Evaluation Trials* was completed satisfactorily and a summary of the results of the is provided in Annex E (appendix 5⁵). Annex E, fig. 3 provides the bivariate plot.

In determining satisfactory conservation and need performance when evaluating *SLAs*, the Committee considers the full range of results across all the *Evaluation Trials*, not simply the worst-case scenarios. Conservation performance was satisfactory for all but the most extreme trial (trial M04-1A) where it was slightly below for the lower 5th percentile. This trial had low MSYR and two W-stocks; it had been originally considered in the context of investigating potential problems for the hunt to simulate possible local depletion in the hunting area rather than for conservation reasons. Genetic stock structure in the entire North Atlantic is subtle such that even an hypothesis of almost complete panmixia is not rejected by most of the analyses and thus differentiation among ‘C’ and ‘W’ is very low. This is even more true for substructure within the W stock (if, indeed, there is any). Given that trials are conservative in so far as they overrate isolation among stocks, and the very subtle differentiation among stocks and sub-stocks in the North Atlantic, a single trial (which implements two fully separate W sub-stocks, for which there is little evidence) not meeting the D1/D10 criteria is not of conservation concern.

The SWG (Annex E, item 2.2.3) had noted that given the unforeseen situation with Secretariat computing, there had been insufficient time for it to consider the results of the *Robustness Trials* during its meeting. Such trials are not needed to determine an *SLA* but are examined to ensure that the selected *SLA* has no unforeseen properties in extreme trials. These were subsequently run prior to the plenary discussions and the results showed no unexpected properties.

7.1.2.3 CONCLUSIONS AND RECOMMENDATIONS

The management advice developed using the *WG-common minke SLA* is provided under Item 8.5.

Attention: C-A, SC

*The Committee **draws attention** to the extensive work undertaken over recent years to develop an SLA for the West Greenland hunt for common minke whales. In concluding this work, the Committee:*

- (1) **agrees** that the tested SLA which performed satisfactorily in terms of conservation performance;*
- (2) **agrees** that this ‘WG-Common minke SLA’ be used to provide management advice to the Commission on the subsistence hunt for West Greenland common minke whales provided the need request falls within need scenario A (i.e. does not exceed 164 annually);*
- (3) **expresses** its great thanks to the developers, Brandão and Witting for the vast amount of work put into the development process and to Allison and Punt for their extensive work developing the operating models and running the trials; and*
- (4) **agrees** that one focus of the next Implementation Review will be to examine further stock structure in relation to the two hypotheses being considered at present, should be consideration of the results of analyses of genetic data using additional samples from Canada (as well as the additional samples that will become available from West Greenland and Iceland); and*
- (5) **agrees** to establish an intersessional advisory group (Annex Y) to facilitate issues relating to samples.*

7.1.3 North Pacific gray whales (Makah whaling)

7.1.3.1 MANAGEMENT PLAN PROPOSED BY THE U.S. FOR MAKAH WHALING

The Makah Indian Tribe has requested that the U.S. National Marine Fisheries Service (NMFS) authorise a tribal hunt for Eastern North Pacific (ENP) gray whales in the coastal portion of its ‘usual and accustomed fishing area’ in Washington State. The Tribe intends to hunt gray whales from the ENP population, which currently numbers approximately 27,000 animals (Durban *et al.*, 2017). However, at certain times of the year there is a possibility that the hunt may take animals from the PCFG (Pacific Coast Feeding Group) and/or the WNFG (Western North Pacific Feeding Group). In an updated management plan – known as the Makah Management Plan (the Committee had approved an earlier plan for this hunt in 2012 (IWC, 2013), NMFS has taken measures to restrict the number of PCFG whales that are struck or landed in a given 10-year period and to avoid, to the extent possible, striking or killing a WNFG gray whale. The Government of the USA requested the Committee to test this plan to ensure that it meets IWC conservation objectives.

⁵ Final validation and archiving of results will be undertaken by Allison in Cambridge.

This task was begun at the Fifth Rangewide Workshop on the Status of North Pacific Gray Whales (SC/67b/Rep07) from 28-31 March 2018. The major focus of the Workshop related to finalising the specifications for modelling, to enable results to be available for SC67b including incorporation of the Makah Management Plan (SC/67b/Rep07, Annex E, appendix 1) into the modelling framework. The factors taken into account in the trials are given in Table 6.

Table 6

Summary of the main factors considered in the Makah gray whale trials

Factor	
Model fitting related	Projection-related
Stock hypothesis	Additional catch off Sakhalin
MSYR	Catastrophic events
Mixing rate	Northern need in final year
Immigration into the PCFG	Struck and lost rate
Bycatches and ship strikes	Future effort
Pulse migrations into the PCFG	Factors related to obtaining and matching photographs

At the present meeting, the focus was on the conservation performance of the Makah Management Plan. Performance was evaluated in the same manner as described for the evaluation of the *SLAs* for West Greenland fin and common minke whales (see Items 6.1 and 6.2). The results can be found in Annex E (appendix 6). The only scenarios under which the plan might not perform adequately were considered to have low plausibility (e.g. a bycatch mortality of ~ 20 PCFG whales per year). Annex E, fig. 4 shows the bivariate plot.

7.1.3.2 CONCLUSIONS AND RECOMMENDATIONS

The management advice relating to the Makah Management Plan is provided under Item 8.2.

Attention: C-A, SC

The Committee reviewed a US Management Plan for a Makah hunt of gray whales off Washington State (the Committee had evaluated a previous plan in 2011 - IWC, 2011; 2012), using the modelling framework developed for its rangewide review of gray whales (SC/67b/Rep07). In conclusion, the Committee:

- (1) **agrees** that the performance of the Management Plan was adequate to meet the Commission's conservation objectives for the Pacific Coast Feeding Group, Western Feeding Group and Northern Feeding Group gray whales;*
- (2) **notes** that the proposed management plan is dependent on photo-identification studies to estimate PCFG abundance and the mixing proportions of PCFG whales available to the hunt (and to bycatch in its range);*
- (3) **stresses** that its conclusions are dependent on the assumption that these studies will continue in the future; and*
- (4) **expresses its great thanks** to Punt, Brandon and Allison for their excellent work in developing and validating the testing framework and running the trials.*

7.1.4 Conclusions on AWMP work

The Chair of the SWG on the AWMP, Donovan, noted that this meeting represented the end of a long journey – with the adoption of the two new *SLAs*, the SWG and the Committee has completed the development tasks it had been assigned by the Commission, originally in Resolution 1994-1. It was an immense task but a great pleasure to work with such dedicated and talented people. He thanked all of the scientists who have made such a wonderful contribution to this work over the years and especially Geof Givens, Kjartan Magnússon (sadly no longer with us), Eva Dereksdóttir, Lars Witting, Anabela Brandão, Doug Butterworth, Cherry Allison and André Punt – the SWG has, in his view, achieved ground-breaking work over the last two decades in a spirit of great collaboration and co-operation, even when there were disagreements, as inevitably there were. He also thanked the hunters and their representatives who had made major contributions in terms of not only data provision but also advice on the AWS (see Item 7.2). The Committee **concurred** that this was an excellent example of what the Scientific Committee could achieve with international collaboration. Finally, they **thanked** Donovan for his dedicated, good humoured and impartial leading of such a major piece of complex work over such a long period - this work has been central to the Committee's role in providing the best scientific advice to the Commission on aboriginal subsistence whaling hunts, bringing together conservation needs and the needs of the hunters.

7.2 Aboriginal Whaling Scheme (AWS)

7.2.1 Introduction

The Scientific Committee's Aboriginal Whaling Management Procedure (AWMP) applies stock-specific *Strike Limit Algorithms* (*SLAs*) to provide advice on aboriginal subsistence whaling (ASW) strike/catch limits.

ASW management (as part of an AWS, the aboriginal whaling scheme) incorporates several components, several of which have a scientific component:

- (1) *Strike Limit Algorithms* (case-specific) used to provide advice on safe catch/strike limits;

- (2) operational rules (generic to the extent possible) including carryover provisions, block quotas and interim relief allocations;
- (3) Guidelines for *Implementation Reviews*; and
- (4) Guidelines for data and analysis (e.g. guidelines for surveys, other data needs).

Considerable work on updating the AWS since the version presented (but not accepted by) to the Commission in 2002 (IWC, 2003) was undertaken by an intersessional correspondence group (SC/67b/AWMP 21) and at the intersessional workshops (SC/67b/Rep04).

7.2.2 Carryover request from the Governments of USA and Denmark/Greenland

The Governments of USA and Denmark/Greenland (SC/67b/Rep06, Annex F, appendix) had requested advice at the March intersessional Workshop on the conservation implications of carryover provisions allowed for a carryover provision that allowed use of unused strikes from the previous three blocks, provided that the number used in any year did not exceed 50% of the annual strike limit.

This request was tested on the two SLAs available for stocks hunted by the USA and Greenland at the time of the Workshop i.e. the *Bowhead SLA* (applicable to the Bering-Chukchi-Beaufort Seas stock) and the *WG-Humpback SLA* (applicable to West Greenland).

Three types of options were examined:

- (1) baseline case - all strikes taken annually (i.e. no need for carryover);
- (2) 'frontload' case - strikes taken as quickly as possible within block (+50% limit annually until the block limit is reached); and
- (3) Two alternative scenarios where carryover strikes are accrued for one or three blocks, followed by a period of carryover usage subject to the +50% limit.

The three-block scenario considered in (3) served as a direct test of the provision described in the request of USA and Denmark/Greenland.

Attention: CG-A

The Committee received a request from the USA and Denmark/Greenland (SC/67b/Rep06, Annex F, appendix) on the conservation implications of carryover provisions that

'...allow for the carry forward of unused strikes from the previous three blocks, subject to the limitation that the number of such carryover strikes used in any year does not exceed 50% of the annual strike limit'.

The Committee reviewed the request using its simulation frameworks and the two SLAs available for stocks hunted by the USA and Greenland available at the time of the Workshop i.e. the Bowhead SLA (applicable to the Bering-Chukchi-Beaufort Seas stock) and the WG-Humpback SLA (applicable to West Greenland) and

- (1) **agrees** that a carryover provision for up to 3-blocks meets Commission's conservation objectives; and*
- (2) **reiterates** its previous advice, applicable for all SLAs, that interannual variation of 50% within a block with the same allowance from the last year of one block to the first year of the next is acceptable; and*
- (3) **agrees** to evaluate the above request for the other Greenland SLAs at the 2019 Committee meeting.*

7.2.3 Review proposed updates to the AWS

The proposed update to the previous AWS is provided in Annex E, appendix 8. It has sections on carryover, block quotas, interim relief allocation (and see Annex E, appendix 7), *Implementation Reviews* and guidelines for surveys and data.

7.2.4 Conclusions and recommendations

Attention: C-R

*The Committee has been working for some years to update the scientific components of an Aboriginal Whaling Scheme. It has completed this work and **recommends** the AWS provided in Annex E, appendix 8 to the Commission. It has sections on carryover, block quotas, interim relief allocation (and see Annex E, appendix 7), *Implementation Reviews* and guidelines for surveys and data. It **notes** that the Commission's AWS may include additional, non-scientific provisions.*

7.3 Implementation Review of BCB bowhead whales

According to the Committee's guidelines, the primary objectives of an *Implementation Review* are to:

- (1) review the available information (including biological data, abundance estimates and data relevant to stock structure issues) to ascertain whether the present situation is as expected (i.e. within the space tested during the development of a *Strike Limit Algorithm (SLA)*) and determine whether new simulation trials are required to ensure that the *SLA* still meets the Commission's objectives; and
- (2) to review information required for the *SLA*, i.e. catch data and, when available at the time of the *Review*, new abundance estimates (note that this can also occur outside an *Implementation Review* at an Annual Meeting).

The *Bowhead SLA* was adopted in 2002 (IWC, 2003, p.158) and there was an extensive *Implementation Review* completed in 2007 (IWC, 2008a, p.124) with a major focus on stock structure including three intersessional workshops. That included consideration of additional trials investigating management implications of assuming additional population structure even though these were considered of low plausibility. The Committee concluded that the *Bowhead SLA* remained the best tool to provide management advice. The next *Implementation Review* was completed in 2012 (IWC, 2013b, p.147); that concluded that there was no need to develop additional trials to those evaluated during the previous *Implementation Review* (IWC, 2008c).

The primary review was undertaken by the SWG on the AWMP (Annex E, Item 4) but the review benefitted from discussions within two other groups, SD-DNA (Annex I, Item X) and ASI (Annex Q, Item Y).

7.3.1 Stock structure: review new information

A full discussion of the work on stock structure can be found in Annex E (item 4.1) and Annex I. New information considered included genetic analyses (SC/67b/SDDNA 01) and telemetry results (SC/67b/AWMP04). SC/67b/SDDNA01 provided information on genetic analyses using samples from the BCB, Canadian and Okhotsk Sea stocks of bowhead whales. Within the BCB stock, no significant differences were identified in temporal or spatial comparisons, and age-related structure was not detected in comparisons between groups of large (old) versus small (young) whales. While comparisons of the BCB stock with the Okhotsk Sea stock revealed significant differences, there were only small, and in most cases statistically insignificant, differences between BCB and Canadian stocks. While this pattern could be related to historical connectivity between the two stocks, it could also, or additionally, be driven by some degree of contemporary gene flow.

Attention: SC

With respect to stock structure, considering the multiple lines of evidence, the Committee:

- (1) **agrees** that BCB bowheads comprise a single population, with no signs of substructure;
- (2) **agrees** that there was no need to consider any new SLA trials regarding stock structure, since the trials conducted in 2002 and 2007 already covered all plausible stock structure hypotheses;
- (3) **welcomes** the telemetry information provided, thanks the hunters involved for their skill and assistance;
- (4) **encourages** additional telemetry efforts; and
- (5) **agrees** with the suggestions for future genetic studies in the Arctic provided under Item 11.

7.3.2 Abundance estimates: review new information

A new abundance estimate (SC/67b/AWMP) has been accepted for the year 2011 from a long-term photo-id capture-recapture study (27,133, CV=0.217; 95% CI from 17,809 to 41,337) that it has been agreed is suitable for providing management advice and for use in the *SLA* (Annex Q). The previously accepted, completely independent, 2011 abundance estimate from the ice-based survey (Givens *et al.*, 2016) is also acceptable for use in the *SLA* and has already been used in that regard (16,820, CV=0.052; 95% CI 15,176 to 18,643).

There are thus two independent estimates for the same year considered suitable for use in the *SLA* and this is considered under Item 8.3.

The Committee also discussed plans for future surveys (SC/67b/AWMP 12 and AWMP 16) in Annex Q (item 3.1.1.1). These plans are in accord with the AWS Guidelines that 'plans for undertaking a survey/census should be submitted to the Scientific Committee in advance of their being carried out, although prior approval by the Committee is not required.

7.3.3 Biological parameters: review new information

New and extensive information on biological parameters was received as discussed Annex E (item 4.3). These covered such matters: length at sexual maturity and pregnancy rate from hunted animals (SC/67b/AWMP 07); the potential use of samples from baleen plates to examine hormone cycles and pregnancy; and information on calves from aerial surveys (SC/67b/AWMP03).

Attention: SC

With respect to biological parameter information, the Committee:

- (1) **welcomes** the extensive information presented;
- (2) **encourages** the continued collection of such data from the hunt;
- (3) **encourages** the work on the baleen plate analyses to examine hormone levels and pregnancy;
- (4) **encourages** continued aerial surveys under the ASAMM surveys and any future collaboration involving life history data from the harvest; and
- (5) **agrees** that the information presented does not suggest the need to consider any new SLA trials regarding stock structure.

7.3.4 Removals: review new information

The Committee received updated information about the 2017 harvest (SC/67b/AWMP 05) and long-term removals (SC/67b/AWMP 06). In 2017, 57 bowhead whales were struck resulting in 50 animals landed. The total landed for the hunt in 2017 was higher than the average over the past 10 years (2007-2016 mean of landed =41.7; SD=6.7). Efficiency (number landed / number struck) in 2017 was 88%, which was also higher than the average for the past 10 years (mean of efficiency=75.2%; SD=6.5%).

The Committee also received SC/67b/AWMP06 that provided a summary of bowhead whale catches in Alaska between 1974 and 2016. The authors pointed to the excellent cooperation and contribution of the whale hunters from the 11 villages that are members of the Alaska Eskimo Whaling Commission (AEWC). This information is discussed in Annex E (item 4.4).

From 2013 to 2017, four bowhead whales (2 females and 2 males) were harvested near Chukotka, mainly in Anadyr Bay (SC/67b/AWMP20). The average length was 14.5m (minimum 13.0m, maximum 17.0m). Although the portion of the annual strike limit allocated to Russia under their bilateral agreement with the USA is 5 animals, the actual annual take is usually only 1-2 whales per year, and this has been the case since at least 2004.

The Committee thanked the authors of the provision of this information, noting that catch and strike data are used in the SLA calculations (see Item 8.3).

7.3.5 Other anthropogenic threats and health: review new information

The Committee received extensive information related to threats and health ranging from entanglement, predation and health (body condition, pathology and parasite loads). The discussion of this can be found in Annex E (item 4.5).

Attention: SC

With respect to threats and health to the BCB bowhead whales, the Committee:

- (1) **welcomes** the extensive information presented;*
- (2) **agrees** that whilst the present level of unintentional human induced mortality is too low to require new Implementation trials or incorporation into the SLA calculations, the situation should continue to be monitored and evaluated at the next Implementation Review;*
- (3) **agrees** that the health analyses give no cause for concern with respect to the continued application of the Bowhead SLA; and*
- (4) **encourages** that the excellent work on health-related issues continues.*

7.3.6 Conclusions and recommendations (and, if needed, workplan to complete Review)

Attention: SC

*With respect to the Implementation review of BCB bowhead whales, the Committee **concludes** that:*

- (1) the Implementation Review has been satisfactorily completed; and*
 - (2) the range of hypotheses and parameter space already tested in Bowhead SLA trials was sufficient and therefore the Bowhead SLA remains the best way to provide management advice for this stock;*
- In addition, it **thinks** the US scientists for the extremely hard work that they have put into providing comprehensive papers to facilitate this review.*

8. STOCKS SUBJECT TO ABORIGINAL SUBSISTENCE WHALING (NEW INFORMATION AND MANAGEMENT ADVICE)

The Committee noted that the Commission will be setting new catch/strike limits for at its 2018 biennial meeting in Brazil. It had received written or verbal requests for limits to be considered for each hunt as discussed below.

Attention: C-A

A general request had been received from the USA and Denmark (SC/67b/Rep06, annex F, appendix) for advice on whether there would be a conservation issue if there was a one-time 7-year block followed by a return to 6-year blocks to address logistical issues related to the Commission.

*The Committee **agrees** there are no conservation issues associated with this suggestion (and see the block quota section of the ASW in Annex E, appendix 8).*

8.1 Eastern Canada/West Greenland bowhead whales

8.1.1 New abundance information

Last year, the Committee had recommended that Canadian scientists attend the Committee to present the results of their work on abundance. It was very pleased that Doniol-Valcroze from Department of Fisheries and Oceans Canada, and the primary author of the paper on the 2013 aerial survey abundance estimate, was present at the meeting.

The Committee accepted, for the provision of management advice and use in an *SLA* (see Annex Q for details), the fully corrected abundance estimate (Doniol-Valcroze *et al.*, 2015) from a 2013 aerial survey of 6,446 bowheads (CV=0.26, 95% CI 3,722-11,200). The survey covered the major summering area for the Eastern Canada/West Greenland (EC/WG) stock.

The Committee recalled that the *WG-Bowhead SLA* had been developed on the conservative assumption that the abundance estimates for the West Greenland area alone (1,274 whales in 2012 (CV=0.12)) represented the abundance of the whole stock, as it believed that it was not possible to assume that a non-member country would continue with regular surveys. Doniol-Valcroze advised the Committee that the present management strategy of Canada does involve obtaining regular abundance estimates. The Committee noted it would be pleased to receive such estimates from Canada being presented to the Committee in the future.

Attention: SC

The Committee greatly appreciated the presence of a Canadian scientist at its meeting. The Committee:

- (1) **welcomes** the provision of the abundance estimate for the Eastern Canada/West Greenland stock and (see Item 8.1.2) the regular provision of information on catch data by Canada;*
- (2) **welcomes** the attendance of Canadian scientists at its meetings;*
- (3) **agrees** that consideration of how to incorporate abundance estimates from Canada should be one focus of the next Implementation Review for this stock;*
- (4) **notes** the regular collaboration of Canadian and Greenlandic scientists on other matters such as genetic sampling (inter alia for mark-recapture abundance estimation); and*
- (5) **encourages** further collaboration between Canada, Greenland and the USA for the study of bowhead whales across their range and the presentation of these results at future Committee meetings.*

8.1.2 New catch information

SC/67B/AWMP/10 provided an update of recent Canadian takes made in the Inuit subsistence harvest of the EC-WG bowhead whale stock. In the eastern Canadian Arctic, the maximum allowed take is 7 bowhead whales per year according to domestic policy, with no carry-over of unused takes between years. Since 2015, 5 strikes were taken and 4 bowhead whales were successfully landed (1 in 2015, 2 in 2016 and 1 in 2017). Witting reported that West Greenland hunters struck no bowheads in 2017. There was one 14.7m whale that died from entanglement in crab gear.

The Committee notes that the reported number of strikes was within the parameter space that was tested for the *WG-Bowhead SLA*, and encourages the continued collection of genetic samples from harvested whales.

8.1.3 Management advice

Attention: C-A

SC/67b/AWMP19 reported Greenland's plans for requesting aboriginal whaling provisions at IWC67 and no changes were requested for bowhead whales. The Committee therefore:

- (1) **agrees** that the *WG-Bowhead SLA* remains the best available way to provide management advice for the Greenland hunt;*
- (2) **notes** that this *SLA* had been developed under the conservative assumption that the number of bowhead whales estimated off West Greenland represented the total abundance between West Greenland and Eastern Canada;*
- (3) based on the agreed 2012 estimate of abundance for West Greenland (1,274, CV=0.12), the catch of one whale in Canada in 2017, and using the agreed *WG-Bowhead SLA*, **agrees** that an annual strike limit of two whales will not harm the stock and meets the Commissions conservation objectives; and*
- (4) although the Committee has not yet had time to examine the request from the US/Denmark (SC/67b/Rep06, annex F, appendix) for the *WG-Bowhead SLA*, **reiterates** its advice, applicable for all *SLAs*, that interannual variation of 50% within a block with the same allowance from the last year of one block to the first year of the next, is acceptable.*

8.2 North Pacific gray whales

8.2.1 New information (including catch data)

The Committee received considerable new information on the hunt off Chukotka as discussed in Annex E (item 5.2). In 2017, a total of 119 gray whales were struck in 2017 (37 males and 82 females). No whales were struck and lost, and no stinky (inedible) gray whales were taken. Similar whaling methods were employed as in recent years and the overall efficiency of the hunt was almost same as in 2016.

In advance of the gray whale *Implementation Review* that is scheduled to begin in 2019, the Committee reviewed new information regarding the stock structure of gray whales in the North Pacific (SC67b/SDDNA02 and SC67b/SDDNA03) – for details see Annex I. The results were based on whole genome sequence data from three individuals (one sampled off Barrow, Alaska and two sampled off Sakhalin Island, Russia) and SNP genotype data generated from larger sample sets representing whales sampled off Sakhalin and in the Mexican lagoons.

Attention: SC

*In reviewing the results of new genetic analyses of gray whales in the North Pacific, the Committee **agrees** that the genetic and photographic data for this species be combined to better assess stock structure-related questions. Given the potential for genomic data to aid in better evaluating the stock structure hypotheses currently under consideration for North Pacific gray whales, the Committee **encourages** the continuation of work to produce additional genomic data from sampled gray whales.*

8.2.2 Management advice

Attention: C-A

The Russian Federation (SC/67b/AWMP/17) had requested advice on the following provision:

‘For the seven years 2019, 2020, 2021, 2022, 2023, 2024 and 2025, the number of gray whales taken in accordance with this subparagraph shall not exceed 980 (i.e. 140 per annum on average) provided that the number of gray whales taken in any one of the years 2019, 2020, 2021, 2022, 2023, 2024 and 2025 shall not exceed 140.’

The Committee therefore:

- (1) **agrees** that the Gray Whale SLA remains the best available way to provide management advice for the gray whale hunts;*
- (2) **advises** that an average annual strike limit of 140 whales will not harm the stock and meets the Commission’s conservation objectives;*
- (3) **notes** that its previous advice that the interannual variation of 50% within a block with the same allowance from the last year of one block to the first year of the next remains acceptable;*
- (4) **advises** that the Makah Management Plan (see Item 2.3) also is in accord with the Commission’s management objectives.*

8.3 Bering-Chukchi-Beaufort Seas bowhead whales

8.3.1 New information

New information (on abundance and catches) was considered as part of the *Implementation Review* discussed under Item 7.3.

The USA had indicated that it was proposing no changes to the present catch/strike limits although it may suggest changes to its carryover request in light of the advice received by the Committee as discussed at the intersessional workshop (SC/67b/Rep06).

The Committee noted that there are now two independent estimates of abundance for this stock in 2011 (see Item 7.3.1). Recognising the need to formally consider the general question of how best to combine estimates in such cases as part of the workplan in the next biennium, the Committee noted that if they are combined as a weighted average by the inverse of their variances, there is little difference (it is slightly higher) between the combined estimate and that from the ice-based census estimate; the ice-based approach has been the method used for the other estimates used in the *SLA*. Therefore, the ice-based census estimate for 2011 (16,820, CV=0.052; 95% CI 15,176 to 18,643) is considered the most recent estimate of abundance for use in the *Bowhead SLA* this year.

8.3.2 Management advice

Attention: C-A

The USA indicated that it requested advice on the existing catch/strike limits. The Committee therefore:

- (1) **agrees** that the Bowhead Whale SLA remains the best available way to provide management advice for this stock;*
- (2) **advises** that a continuation of the present average annual strike limit of 67 whales will not harm the stock and meets the Commission’s conservation objectives; and*
- (3) **advises** that provisions allowing for the carry forward of unused strikes from the previous three blocks, subject to the limitation that the number of such carryover strikes used in any year does not exceed 50% of the annual strike limit, has no conservation implications (see SC/67b/Rep04).*

8.4 Common minke whales off East Greenland

8.4.1 New information on catches

In the 2017 season, nine common minke whales (3 males and 6 females) were landed in East Greenland, and one was struck and lost. Genetic samples were obtained from 8 of the landed whales. One common minke whale died from entanglement in fishing gear.

8.4.1 New information on abundance

The Committee endorsed the 2015 aerial survey abundance estimate of 2,762 (CV=0.47; 95%CI 1,160-6,574). This is only a small part of the wider Western and Central stocks from which catches may occur.

8.4.2 Management advice

Attention: C-A

SC/67b/AWMP19 reported Greenland's plans for requesting aboriginal whaling provisions at IWC67. It requested advice on an annual take of 20 animals (it had previously been 12). It had also requested advice on any conservation implications of a 12-month hunting season for common minke whales.

The Committee therefore:

- (1) **notes** that in the past its advice for the East Greenland hunt had been based upon the fact that the catch was a small proportion of the number of animals in the Central Stock;
- (2) **notes** the process to develop an SLA for common minke whales off West Greenland resulted in a simulation framework that produces a considerably more rigorous way to provide advice for this hunt than before, by taking into account stock structure issues;
- (3) **notes** that the results of the simulation trials that incorporated a continuing catch of 20 whales from East Greenland gave rise to no conservation concerns;
- (4) **notes** that the 2015 aerial survey abundance estimate of 2,762 (CV=0.47; 95%CI 1,160-6,574) is only a small part of the wider western and central stocks;
- (5) **advises** that a continuation of the present average annual strike limit of 20 whales will not harm the stock and meets the Commission's conservation objectives;
- (6) **advises** that changing the length of the season to 12 months had no conservation implications; and
- (7) **agrees** that an SLA should be developed for this hunt in the future; and
- (8) **encourages** the continued collection of samples for collaborative genetic analyses (and see Item 7.1.2.3).

8.5 Common minke whales off West Greenland

8.5.1 New information on catches

In the 2017 season, 129 common minke whales were landed in West Greenland and four were struck and lost. Of the landed whales, there were 95 females, 33 males and one of unknown sex. Genetic samples were obtained from 104 whales, and the Committee was pleased to note that samples were already part of the data used in the genetic analyses of common minke whales in the North Atlantic. The Committee **encourages** the continued collection of samples and the collaborative approach of the genetic analysis.

8.5.2 New information on abundance

The Committee endorsed the 2015 aerial survey abundance estimate of 5,095 (CV0.46; 95%CI 2,171-11,961) as discussed in Annex Q.

8.5.3 Management advice

Attention: C-A

SC/67b/AWMP19 reported Greenland's plans for requesting aboriginal whaling provisions at IWC67. It requested advice on annual strikes of 164 animals (i.e. no change). It had also requested advice on any conservation implications of a 12-month hunting season for common minke whales.

The Committee therefore:

- (1) **agrees** that the WG-Common minke SLA is the best available way to provide management advice for this stock under need scenario A;
- (2) **advises** that a continuation of the present average annual strike limit of 164 whales will not harm the stock and meets the Commission's conservation objectives;
- (3) although the Committee has not yet had time to examine the request from the US/Denmark (SC/67b/Rep06, annex F, appendix) for this SLA, **reiterates** its previous advice, applicable for all SLAs, that interannual variation of 50% within a block with the same allowance from the last year of one block to the first year of the next is acceptable;
- (4) **advises** that changing the length of the season to 12 months had no conservation implications; and
- (5) **encourages** the continued collection of samples for collaborative genetic analyses (and see Item 7.1.2.3).

8.6 Fin whales off West Greenland

SC/67b/AWMP19 reported Greenland's plans for requesting aboriginal whaling provisions at IWC67. It requested advice on annual strikes of 19 animals (i.e. no change).

8.6.1 New information on the catch

A total of seven fin whales (5 females and 2 males) was landed, and one was struck and lost, off West Greenland during 2017. The Committee was pleased to note that genetic samples were obtained from five of these, and that the genetic samples are analysed together with the genetic samples from the hunt in Iceland.

8.6.2 New information on abundance

The Committee endorsed the 2015 aerial survey abundance estimate of 2,215 (CV=0.41; 95%CI 1,017-4,823) for use in providing management advice and in the SLA as discussed in Annex Q (Item Y).

8.6.3 Management advice

Attention: C-A

SC/67b/AWMP19 reported Greenland's plans for requesting aboriginal whaling provisions at IWC67. It requested advice on annual strikes of 19 animals (i.e. no change). It also requested advice on whether there were any conservation implications of removing length limits (while retaining the prohibitions relating to calves).

The Committee therefore:

- (1) **agrees** that the WG-Fin SLA is the best available way to provide management advice for this stock;
- (2) **advises** that a continuation of the present average annual strike limit of 19 whales will not harm the stock and meets the Commission's conservation objectives; and
- (3) although the Committee has not yet had time to examine the request from the US/Denmark (SC/67b/Rep06, annex F, appendix) for this SLA, **reiterates** its advice, applicable for all SLAs, that interannual variation of 50% within a block with the same allowance from the last year of one block to the first year of the next is acceptable;
- (4) **advises** that removing the length limits had no conservation implications; and
- (5) **encourages** the continued collection of samples for collaborative genetic analyses (and see Item 7.1.1.3).

8.7 Humpback whales off West Greenland

8.7.1 New information on catches

A total of two (both female) humpback whales were landed and none were struck and lost in West Greenland during 2017. Genetic samples were obtained from all the landed whales. The importance of collecting genetic samples and photographs of the flukes from these whales is emphasised.

Five humpback whales were observed entangled in fishing gear in West Greenland in 2017. Of these, one died, two became free and one was successfully disentangled by a disentanglement team. The remaining animal was alive and still entangled when it was last sighted.

Inclusion of bycaught whales had been incorporated into the scenarios for the development of the *Humpback SLA*. If high levels continued, then this will need to be taken into account in any *Implementation Review*. The Committee noted the IWC efforts with respect to disentanglement and prevention and welcomed the news that the Greenland authorities requested IWC disentanglement training that took place in 2016 and that they successfully disentangled one humpback whale.

8.7.2 New information on abundance

The Committee endorsed the 2015 aerial survey abundance estimate of 993 (CV=0.46; 95%CI 434-2,272) as discussed in Annex Q (Item Y) for use in the provision of management advice and in the SLA.

8.7.3 Management advice

Attention: C-A

SC/67b/AWMP19 reported Greenland's plans for requesting aboriginal whaling provisions at IWC67. It requested advice on annual strikes of 10 animals (i.e. no change).

The Committee therefore:

- (1) **agrees** that the WG-Humpback SLA is the best available way to provide management advice for this stock;
- (2) **advises** that a continuation of the present average annual strike limit of 10 whales will not harm the stock and meets the Commission's conservation objectives;
- (3) **advises** that that provisions allowing for the carry forward of unused strikes from the previous three blocks, subject to the limitation that the number of such carryover strikes used in any year does not exceed 50% of the annual strike limit' has no conservation implications (see SC/67b/Rep04); and
- (4) **encourages** the continued collection of samples and photographs for collaborative analyses.

8.8 Humpback whales off St. Vincent and The Grenadines

The alternate Commissioner for St Vincent and the Grenadines advised that no change to the present limits were envisaged.

8.8.1 New information on catch

It was reported that one humpback whale was struck and landed in 2017 by St. Vincent and The Grenadines.

8.8.2 New information on abundance

Last year, the Committee had requested that the USA provide a new abundance estimate for the western North Atlantic based upon the available NOAA data. A progress report on this work was provided with a focus on information on abundance estimates generated by the MONAH study, conducted in 2004 and 2005 on Silver Bank (a breeding ground in the West Indies) and in the Gulf of Maine feeding ground. The best estimate around 12,300, similar to the Committee endorsed best estimate from the YONAH project from 1992/93, which was 10,400 (8,000, 13,600). The lack of strong population growth was unexpected given information on rates of increase from some other areas of the North Atlantic, and may reflect either a true rate of increase, unidentified sampling bias, and/or the idea that Silver Bank as a habitat has reached maximum capacity. It is not clear whether the MONAH estimate is representative of the entire population, nor the extent to which the full estimate can be applied to the southeastern Caribbean in the context of the St Vincent hunt. However, four animals from the Gulf of Maine have been linked to animals seen in the southeastern Caribbean (including one that was caught in the hunt).

The Committee also noted several endorsed recent abundance estimates of humpback whales in parts of the North Atlantic including: 993 (95% CI: 434-2,272) in West Greenland in 2015; 4,223 (95% CI: 1,845-9,666) in East Greenland in 2015; and 12,879 (95% CI 5,074; 26,455) in the Iceland-Faroes region in 2007.

It has now been nearly two decades since the IWC has done an In-Depth Assessment on North Atlantic humpback whales. The Committee **agrees** that it would be a valuable exercise to perform a North Atlantic Rangewide review of humpback whales, similar in scope to the Rangewide Review for North Pacific gray whales and taking into account recent work on stock structure including that of Stevick *et al.* (2018).

8.8.3 Management advice

Attention: C-A

The alternate Commissioner for St Vincent and the Grenadines advised that no change to the present limits were envisaged. The Committee therefore:

- (1) **notes** that it does not have an approved abundance estimate for western North Atlantic since that in 1992;*
- (2) **notes** that in accord with the advice provided in the AWS (see Annex E, Appendix 8), it therefore considered the available evidence to see if was sufficient to provide safe management advice;*
- (3) **advises** that, given the information above on recent abundance in the North Atlantic combined with the size of the requested catch/strikes (an average of four annually), continuation of the present limits will not harm the stock;*

*The Committee also **reiterates** its previous advice that:*

- (1) the status and disposition of genetic samples collected from past harvested whales be determined and reported next year;*
- (2) photographs for photo-id (where possible) and genetic samples are collected from all whales landed in future hunts; and that*
- (3) the USA (NOAA, NMFS) provides an abundance estimate from the MONAH data as soon as possible for the Committee.*

8.9 Workplan 2019-20

Table 7 summarises the work plan for work related to aboriginal subsistence whaling. The Committee also established an Intersessional Correspondence Group to work on ASW related issues (Annex Y).

Table 7

Work plan for matters related to aboriginal subsistence whaling

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
(1) Annual review of catch/strike limits		Carry out		Carry out
(2) Implementation Review		Gray whales based upon rangewide review		West Greenland humpback whales
(3) SLAs		Consider development of an SLA for the hunt of common minke whales off East Greenland based on operational models developed for the West Greenland hunt		Adopt SLA if it is decided one is necessary
(5) Interim relief allowance testing	Run trials for gray whale hunts	Review results	Run trials for West Greenland common minke whales and fin whales	Review results
(6) Carryover (US/Denmark request)	Run trials for remaining Greenland hunts (West Greenland common minke whales, bowhead whales and fin whales)	Review results		

9. WHALE STOCKS NOT SUBJECT TO DIRECTED TAKES

9.1 In-depth Assessments

Donovan gave a presentation explaining a streamlined procedure whereby the Committee, via its sub-groups, can undertake Comprehensive Assessment (traditionally the first time an assessment is undertaken for a particular species/ocean basin) or an in-depth assessment (assessments subsequent to a comprehensive assessment). This can be found as SC/67B/GEN04 and is summarised in Fig. 1. The objective is to provide a consistent approach (including methods) that initially focusses on ensuring that sufficient data are available to undertake an assessment (the pre-assessment approach that will normally be undertaken at annual meetings) and then follows this with a concentrated effort (ideally two workshops and two annual meetings, with no new data) to complete the assessment. The objective is to provide Commission with robust information on present status. This involves identifying:

- (1) if populations are recovering, recovered or if there is cause for concern;
- (2) factors that may be or are affecting status so that conservation and management needs can be determined; and
- (3) information gaps and ways to address these in order to reduce uncertainty at the next assessment.

9.1.1 Comprehensive Assessment of North Pacific humpback whales

Work towards a Comprehensive Assessment of North Pacific humpback whales began in 2016, and included an intersessional workshop held in April 2017 (IWC, 2018b). After the 2017 Committee meeting, an intersessional steering group continued preparing the input data and assessment model (IA/67b/IA03). The assessment model is a simplified age-aggregated model of the breeding and feeding grounds. The development of the input data (stock structure, abundance, catches, and life history parameters) continued during the year but given the slower than initially expected progress, particularly with respect to narrowing down the number of stock structure hypotheses, the steering group had agreed that it was premature to hold the anticipated workshop prior to SC67b.

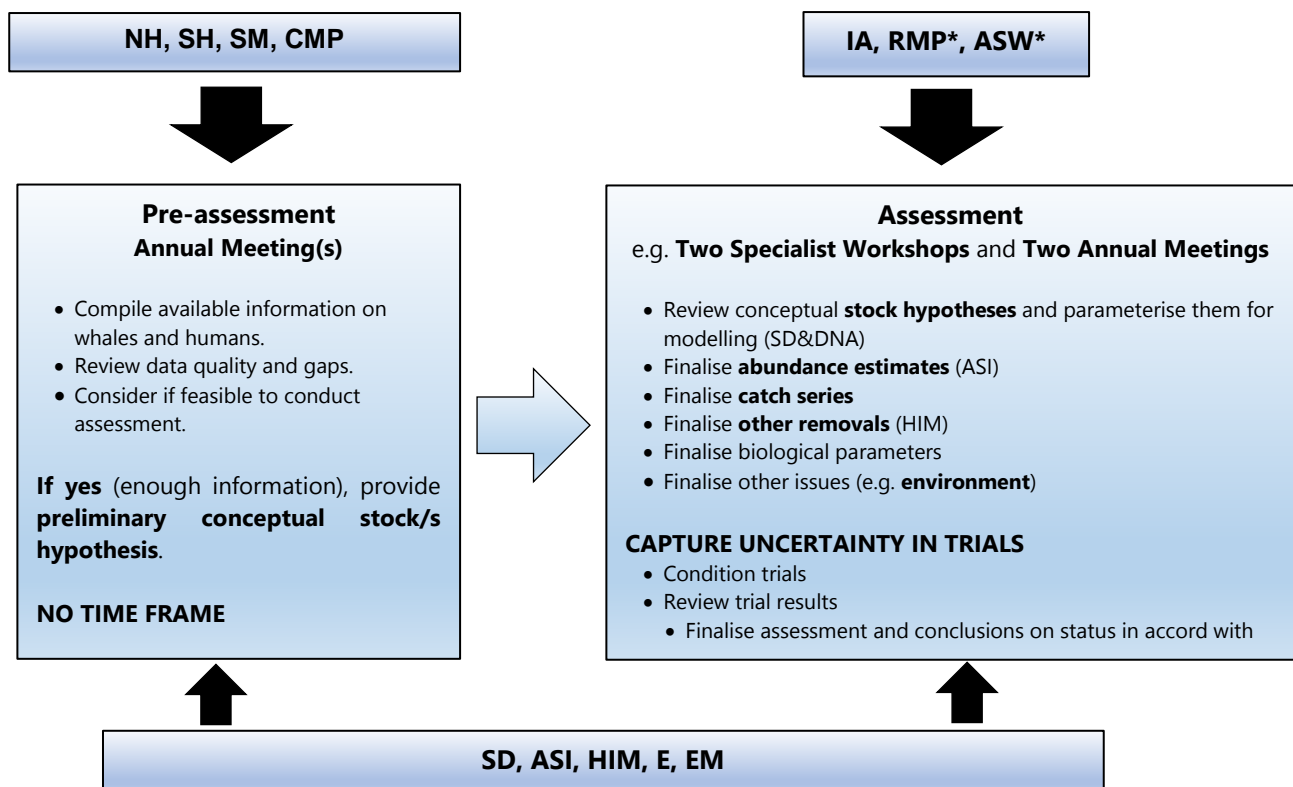


Fig. 1. Schematic of the approach to conduct assessments within the Scientific Committee. Acronyms refer to sub-groups. Normally the final assessment will take place in the sub-committee on in-depth assessments but for stocks subject to direct catches it may occur in the context of the RMP or AWMP sub-groups as appropriate.

Work continued at this meeting and the detailed discussions can be found in Annex F (item 4). The subdivisions of the North Pacific humpback whale feeding and breeding grounds in Annex F (fig. 1) are broadly consistent with existing data; identified uncertainties will be addressed in the assessment by evaluating four scenarios with different numbers of feeding and breeding grounds. This work will be greatly assisted by undertaking comparisons of humpback whale photographs from the Pacific obtained after the conclusion of the photographic component of the SPLASH (Structure of Populations, Levels of Abundance and Status of Humpback Whales) programme in 2005 (e.g. see Calambokidis *et al.*, 2008).

The general underlying structure of the assessment model has been developed but before the model can be run the input data (e.g. catches and abundance estimates) need to be updated and allocated for each stock structure hypotheses and mixing matrices developed and parameterised.

Attention: SC, G

*The Committee is undertaking a Comprehensive Assessment of North Pacific humpback whales. To complete this assessment the Committee **agrees** that:*

(1) a large-scale matching effort of post-2005 photo-identifications should be undertaken (see Annex F, item 4 for methods); and

(2) this matching effort will (a) help clarify the connections among the feeding/breeding areas within the North Pacific; and (b) assist in developing updated abundance estimates where appropriate.

*The Committee **stresses** that to obtain the most robust assessment and thus conservation advice, all available data should be included in the matching effort. Therefore, the Committee **strongly encourages** all catalogue holders to participate in this exercise, after the appropriate data sharing agreements are made.*

*The Committee also **welcomes** the provision of new abundance estimates (e.g. those from the IWC-POWER surveys and from local areas in Japan), noting that they will also need to be adjusted for the various stock structure hypotheses.*

*The Committee **agrees** that the next assessment workshop should take place at a time prior to SC68b when the intersessional Steering Group (Annex Y) decides sufficient progress has been made.*

9.1.2 Comprehensive Assessment of North Pacific sei whales

The Committee began what was called an in-depth assessment of North Pacific sei whales in 2015 (IWC, 2016c) but, in keeping with the discussion under Item 9.1 will now be termed a Comprehensive Assessment for consistency. Work has focussed since then on finalising the stock structure hypotheses (two have been agreed for use in the assessment - a single-stock hypothesis and a five-stock hypothesis), developing an appropriate population model and finalising the model inputs in accordance with these hypotheses (including catches, mark-recovery locations, abundance estimates, estimates of mixing between sub-areas, and life history parameters).

Considerable progress was made with this work intersessionally and at this meeting as discussed in Annex H, item 3.

Attention SC, G

*The Scientific Committee intends to complete the Comprehensive Assessment of North Pacific sei whales within the next biennial period. It notes the progress made at this meeting with respect to stock structure, abundance estimates, marking data, catch history, life history parameters and the assessment model. To complete this work, the Committee **agrees** to:*

(a) the work undertaken to finalise input data for the assessment (Annex F, appendices 2-7);

(b) support the modelling work identified in Annex F; and

(c) re-establish the intersessional steering group to oversee the assessment.

*In addition, the Committee **encourages** telemetry work in waters outside the 'pelagic' sub-area to assist in quantifying the movement patterns of animals.*

9.1.3 In-depth Assessment of Indo-Pacific Antarctic minke whales

An intersessional correspondence group under Murase completed its task to finalise a document synthesising the results of the 2001 - 2014 in-depth assessment of an eastern Indian stock (I-stock) and a western South Pacific stock (P-stock) of Antarctic minke whales distributed between 35°E and 145°W.

The Committee **commends** the authors for completing this paper and submitting it to the *Journal of Cetacean Research and Management*. As the paper has just entered the review process, the intersessional correspondence group (Annex X) has been re-established to see the paper through to publication.

9.1.4 Workplan 2019-20

The work plan for Comprehensive and in-depth assessments for the next biennium is provided in Table 8.

Table 8
Work plan for in-depth assessments

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting (SC/68b)
In-depth Assessment of Indo-Pacific Antarctic minke whales	Complete review of paper submitted for publication	-	-	-
Comprehensive Assessment of North Pacific sei whales	Re-establish the ISG (Annex Y) to further data preparation and development of the assessment model	Review progress of intersessional work and continue the assessment	Finalise preparation of assessment	Review progress of intersessional work and finalise the assessment
Comprehensive Assessment of North Pacific humpback whales	Re-establish the ISG (Annex Y) to further data preparation, development of the assessment model and hold a Workshop	Review progress of intersessional work and continue the assessment	Finalise /continue preparation of assessment	Review progress of intersessional work and continue/finalise the assessment

9.2 Evaluation for potential new Comprehensive or In-Depth Assessments

9.2.1 North Pacific blue whales

The Committee welcomed the report of an intersessional group that had been determining the data that are available on items required to carry out a Comprehensive Assessment of blue whales in the North Pacific. The status of the eastern North Pacific population is well known and a stock assessment was reviewed and accepted by the Committee in 2016 (Monnahan and Branch, 2015). However, information from the central and western North Pacific is sparser. Information presented at this meeting concerned stock structure, catch history, biological parameters, photo-identification, Discovery marks and sighting surveys. Details can be found in Annex G (item 6.1).

Several papers and datasets were discussed including: the use of blue whale sounds to identify stocks; morphological data; genetic data; sightings data (SC/67b/IA02; SC/67b/SCSP06; SC/67b/SCSP07; SC/67b/NH08).

Attention: SC

*The Committee **agrees** the following priorities to progress the pre-assessment:*

- (1) obtain abundance estimates from the IWC-POWER surveys;*
- (2) obtain abundance estimates from the JARPN and JARPNII surveys;*
- (3) analyse and compare genetic samples from ENP, IWC-POWER and ICR biopsy samples to determine stock structure throughout the North Pacific;*
- (4) compare photo-identification data from POWER, JARPN/JARPNII and other ENP catalogues;*
- (5) Review new acoustic locations and information and conduct fine-scale analysis of song features for central Pacific blue whale calls, with particular focus on calls around Japan;*
- (6) Obtain better life history parameters (especially age at sexual maturity and calving interval) from the Cascadia Research Collective, the Mingan Island Cetacean Study Research Station and the CICIMAR-IPN photo-ID dataset;*

*With respect to (3), the Committee **requests** the collection of about 20 biopsy samples if possible during the NEWREP-NP surveys in the western North Pacific to improve the power to evaluate stock structure and **encourages** genetic analysis of the existing Japanese samples.*

*With respect to (5), the Committee **requests** a reanalysis of recordings from the Northern Mariana Islands (Saipan and Tinian) collected by the Pacific Islands Fisheries Science Center to look for the presence or absence of the new song type recorded from Japan. It also **encourages** passive acoustic data collection during surveys (e.g. IWC-POWER, university/training cruises) from the region of high blue whale density southeast of the Kamchatka Peninsula to determine the song type produced by animals in that region.*

*The Committee **agrees** that the intersessional correspondence group continue to review data needed for an assessment of North Pacific blue whales be reappointed under Branch (Annex Y).*

9.2.2 Non-Antarctic Southern Hemisphere blue whales

9.2.2.1 SOUTHERN HEMISPHERE POPULATION STRUCTURE

The Committee is currently preparing for a Comprehensive Assessment of pygmy blue whales. For this reason, it continues to gather information on population structure (see Item 3.1, IWC, 2018a). This year, the web-based pygmy blue whale song library funded by the IWC will be launched (SC/67b/SH12). This will enable researchers to compare their acoustic recordings with validated song archetypes and greatly assist the determination of Southern Hemisphere blue whale distribution patterns and stock structure. Photo-ID and genetic evidence support the idea that each distinct pygmy blue whale song represents a geographically and genetically distinct population of pygmy blue whales around the Southern Hemisphere. A full description of the discussion of the use of songs in this pre-assessment is given in Annex H (item 3.1), including comparison with genetic and photo-identification data. The Committee also received information

from whale bones and notes that further analysis of blue whale bones from old whaling land stations will be helpful to establish the past distribution of these stocks.

Assessments require catches to be allocated to populations and in 2016 the Committee funded an examination of regional catches to assign them to each putative population (Item 5.1, IWC, 2017a). The results of this work are provided in SC/67b/SH23 and discussed in Annex H (item 3.1). Total pygmy blue whale catches were estimated at 12,184 with totals for each population of 1,228 (Northern Indian Ocean), 6,889 (South West Indian Ocean), 3,646 (South East Indian Ocean) and 421 (South West Pacific Ocean).

The Committee also discussed an intersessional effort to identify and standardise genetic markers used in Southern Hemisphere blue whale research (only four loci were common across all research laboratories) and received a progress report (SC/67b/PH04) on matching within the Southern Hemisphere Blue Whale Catalogue, which has been supported by funding from the Committee (Item 10.2.2, IWC, 2017a). This helps understanding of blue whale movements between regions, and allows estimation of regional abundance. The catalogue is currently being migrated to IWC servers (and see Item 23.2.3.2).

Attention: SC, G

In order to progress its work towards an assessment of pygmy blue whales, the Committee:

- (1) **agrees** that further work is needed to identify high and base case catch scenarios for pygmy blue whales;*
- (2) **encourages** deployment of more acoustic recorders in the southern Indian Ocean;*
- (3) **agrees** that further population modelling is needed to assess pygmy blue whale populations;*
- (4) **strongly encourages** blue whale research groups to publish the metadata associated with their sequences in order that levels of sample overlap can be established and datasets compared;*
- (5) **agrees** that the Southern Hemisphere Blue Whale Catalogue should be continued to help understand blue whale movements, with a priority focus on matching photographs within regions to measure regional abundance of pygmy blue whales.*

9.2.2.2 INDONESIA/AUSTRALIA BLUE WHALES

The Australian blue whale photo-ID catalogue data have now nearly all been uploaded and matched within the Southern Hemisphere Blue Whale Catalogue, at which point quality control analysis can begin. This will allow the potential for using these data for mark recapture abundance estimation to be assessed. The Scientific Committee was informed that mark-resighting data from the Perth Canyon (Australia) will be analysed intersessionally, to provide a new estimate of Australian blue whale abundance which assist in a future assessment of this population.

Attention: SC, G

*The Committee **encourages** analysis to provide an estimate of Australian blue whale abundance using mark-resighting data.*

9.2.2.3 MADAGASCAR BLUE WHALES

The Committee was informed that passive acoustic monitoring of blue whales in the Mozambique Channel detected both South West Indian Ocean (SWIO) and Antarctic blue whale song types, as well as fin and Antarctic minke whales (SC/67b/SH14). In addition, SC/67b/SH24 reported an unidentified blue whale song off Oman. A full discussion of the results of these papers can be found in Annex I (item 3.3.2).

This new information means that the blue whale catch allocations for the Indian Ocean, currently only ascribed to a single 'NIO' population in the Northern Indian Ocean, will need revision to take this new acoustic pattern into account.

Attention: SC, G

The Committee notes that the distribution and population isolation of blue whales is poorly understood in the northern and western Indian Ocean. The Committee therefore:

- (1) **strongly encourages** further acoustic work in the western Indian Ocean and Arabian sea to better understand the distribution, seasonality and overlap of blue whale calls;*
- (2) **strongly encourages** the collection and analysis of available tissue samples for analysis of genetic population structure in this region to assist with characterising these populations; and*
- (3) **agrees** that catch allocations of blue whales be revised to include the new blue whale song in the northwest Indian Ocean as a potential distinct 'stock'.*

9.2.2.4 NEW ZEALAND BLUE WHALES

Three papers were presented on blue whales off New Zealand (see Annex H, item 3.3.4 for a full discussion).

SC/67b/SH09 reported a recent study of blue whale movement and habitat use in the Taranaki region of New Zealand in which two animals were tagged. However, due to the small sample size and La Niña conditions, it is uncertain how representative these movements are for blue whales in New Zealand waters.

SC/67b/SH05 summarised a multi-disciplinary study included acoustics, genetics and photo-identification in the same area, and provided a conservative estimate of blue whale population abundance (see Annex Q, item 3.1.1.9), to consider if this estimate can be used in the upcoming regional assessments of pygmy blue whales. SC/67b/SH04 reported projects underway to assist regional conservation management, including a description of fine-scale habitat use during summer months in the South Taranaki Bight, and response to local acoustic disturbance.

Attention: SC, G

With respect to information on blue whales off New Zealand, the Committee:

- (1) welcomes the work being undertaken to understand abundance and connectivity, which will contribute towards the pygmy blue whale population assessments; and*
- (2) agrees that New Zealand photo-identifications should be combined with others within the Southern Hemisphere Blue Whale Catalogue to provide the fullest possible assessment of regional abundance and connectivity*

9.2.2.5 SOUTHEAST PACIFIC BLUE WHALES

The Committee received two papers relevant to blue whales off Chile and the full discussion can be found in Annex H (item 3.3.1). SC/67b/SH03 presented a morphometric analysis of Chilean blue whales which reinforces the argument that Chilean blue whales should be considered a separate sub-species from the Antarctic and pygmy forms. (Bedrinana-Romano *et al.*, 2018) reported distribution modelling of blue whales using Chilean Northern Patagonia waters. Preliminary delimitations of possible blue whale conservation areas in this region overlap with highly used vessel navigation routes and areas allocated for aquaculture. The Committee was also informed that predictions of southeast Pacific blue whale habitat following Redfern *et al.*, (2017) will be completed intersessionally.

Attention: SC, G

In view of the recent identification of movements of Chilean blue whales into the South Atlantic and ongoing questions about the distribution of this population, the Committee:

- (1) encourages further satellite tracking and surveys (including collection of photo-ID and genetic data) to assess the population limits, habitat use and abundance and sub-species identity of blue whales in Chile;*
- (2) encourages compilation of morphometric data available for northeast Pacific blue whales and comparison with Chilean data, to assess morphological differentiation of these whales in the eastern Pacific and evaluate sub-species identity; and*
- (3) welcomes plans for further photo-ID catalogue matching within this region to assist with regional abundance estimation.*

9.2.2.6 WORK PLAN

The work plan for all Southern Hemisphere blue whales is given in Table 9.

9.2.3 Antarctic blue whales (Areas III and IV)

Undertaking a regional population assessment of Antarctic blue whales is challenging due to the scarcity of whales and logistical challenges. The Committee received new information this year on sightings, abundance and genetic studies.

SC/67b/SH08 presents a preliminary estimate of abundance (the first using photo-ID data) and this is discussed in Annex Q (see item 3.1.19) where suggestions were made to refine the analyses. Reports from two 2017/18 NEWREP-A summer cruises included sightings of blue whales and information on biopsy sampling (SC/67b/SP08 and SC/67b/ASI07). An IWC-SORP Southern Ocean blue whale-focussed cruise is planned for January to March 2019 (140°E-175°W), which intends to describe krill swarms in relation to blue whale density and distribution (SC/67b/SH07).

With respect to genetic work, IWC-SORP funded work on blue whale bones to compare past and current genetic diversity levels is reported in SC/67b/SH02 and discussed in Annex I (item 4.4.2). The Committee was also updated about ongoing work to analyse a collection of 1,626 baleen plates (roughly 50:50 blue and fin whales) from the Japanese whaling in the 1940s and held at the Smithsonian Natural History Museum, USA. A pilot study has established that mitochondrial DNA can be sequenced from these plates. Further analyses including of stable isotope and hormone levels are planned for these samples.

Attention: SC, G

The Committee welcomes the progress being made towards being able to undertake an in-depth assessment of Antarctic blue whales. The Committee:

- (1) encourages further work to update the abundance estimate for Antarctic blue whales following Committee recommendations;*

(2) **strongly encourages** continued opportunistic photo-ID data collection in the Antarctic to assist with developing estimates of population abundance for this subspecies; and
 (3) **encourages** continued collection and analysis of bone and baleen from historical Antarctic commercial whaling samples and sites to evaluate loss of genetic diversity and shifts in population structure.

9.2.3.1 WORK PLAN

The work plan for all Southern Hemisphere blue whales is given in Table 9.

Table 9.

Workplan for Southern Hemisphere Antarctic and pygmy blue whales

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Antarctic blue whales				
Catalogue matching	Catalogue matching of photo-IDs (Annex Y)	Report	Catalogue matching (opportunistic collected photos)	Report
Abundance estimation	Mark recapture modelling work to update SC/67b/SH08 Annex Y	Report		
Photo-ID outreach material	Create photo-ID information booklets for distribution via IAATO operators	Report		
SH non-Antarctic blue whales				
Population assessment	Improve catch separation model, explore alternative catch allocation models (Annex Y)	Report	Population assessment. Analyse minimum and extrapolated recovery status of all populations for which abundance is available	Report
Catalogue matching	Catalogue matching of photo-IDs within southeast and central east Pacific (Annex Y)	Report	Catalogue matching (opportunistic photos from citizen scientists and collaborators) if funds are available	Report
Blue whale song library	Finish implementation of blue whale song library (Annex Y)	Report		
Australian abundance estimate	Analyse Perth Canyon abundance using mark recapture data (Annex Y)	Report		

9.2.4 Southern Hemisphere fin whales

9.2.4.1 POPULATION STRUCTURE

As part of its pre-assessment work, the Committee is gathering information on Southern Hemisphere fin whales in order to: (1) clarify the subspecies status of these whales (currently two Southern Hemisphere subspecies are recognized, Committee on Taxonomy, 2017); and (2) measure population differentiation around the Southern Hemisphere to establish whether any distinct populations exist.

A summary of available data on Southern Hemisphere fin whale structure was presented in SC/67b/SH15 and is discussed in detail in Annex H (item 4.1). The only evidence for any structure comes from acoustics. A genetic study from the southeast Pacific (SC/67b/SH13) found high local diversity in Chile, with no significant differentiation from the other Southern Hemisphere datasets. The Committee noted however that genetic differentiation can be difficult to detect when diversity levels are high and genetic differentiation is low (see Annex H, item 4.1).

Attention: SC, G, S

Knowledge of population structure is essential to future efforts to assess Southern Hemisphere fin whales. To determine the differentiation and potential sub-species structure among fin whales the Committee:

- (1) **agrees** that analysis of concurrently collected acoustic recordings of fin whales, to assess song variation around the Southern Hemisphere, is a priority;
- (2) **agrees** that a review of all Discovery mark data published on fin whales to assess population connectivity patterns should be carried out; and

- (3) **requests** that the Secretariat provide a letter of support for a study examining the evidence for *B. physalus patachonica*, which requires access to the holotype for this species from the Bernardino Rivadavia Natural Sciences Museum in Buenos Aires.

The Committee also **encourages**:

- (1) analysis of fin whale distribution and geographic aggregations using all available catches;
- (2) strategic biopsy sampling and analysis to measure the genetic differentiation of fin whales around the Southern Hemisphere;
- (3) further biopsy sampling and sequencing of multiple nuclear loci to establish Chilean fin whale differentiation patterns, with co-collection of photo-IDs and body length measurements to establish population identity;
- (4) satellite telemetry to discern seasonal movements; and
- (5) photo-identification to understand site fidelity and residency patterns and linkages between high- and low-latitude grounds.

9.2.4.2 DISTRIBUTION AND ABUNDANCE

The Committee welcomed a review of the available metadata on Southern Hemisphere fin whales (SC/67b/SH19), compiling data from dedicated and opportunistic surveys, moored acoustic recorders, sonobuoy surveys, photo-identifications, satellite tagging and biopsy sampling. The Committee also welcomed a summary of recent work by the Brazilian Antarctic Program to conduct dedicated fin whale research using sighting surveys, photo-ID, biopsy sampling and telemetry.

Reports from two 2017/18 NEWREP-A summer cruises included sightings of fin whales and information on biopsy sampling (SC/67b/SP08 and SC/67b/ASI07). A new abundance estimate for fin whales using sightings data from the third IDCR-SOWER circumpolar survey is expected to be available for review at next year's meeting.

SC/67b/14 provided information on the presence of fin whales in the Mozambique Channel and a new lower-latitude song. Details of the discussions can be found in Annex H (item 4.2).

The Committee was also informed that an analysis has suggested that Antarctic fin whales are sufficiently well marked to enable to use in photo-ID projects (SC/67b/PH01) and this is discussed in Annex S (item 4.1).

Attention: SC, G, CG-A

With respect to obtaining information on the distribution, movements and abundance of Southern Hemisphere fin whales for use in a future assessment, the Committee:

- (1) **encourages** a meta-analysis of the Antarctic Peninsula and Scotia Sea sightings data, to measure recent fin whale distribution, density and habitat use;
- (2) **strongly encourages** continued work by the Brazilian Antarctic Program towards the understanding of fin whale population structure, movements and habitat use
- (3) **agrees** that a new abundance estimate for fin whales from the IWC IDCR/SOWER programme should be presented for review at next year's meeting,
- (4) **welcomes** news that fin whales can be used in photo-ID studies, and **encourages** further photo-ID data collection at high latitudes.

9.2.4.3 WORK PLAN

The work plan for Southern Hemisphere fin whales is given in Table 10.

Table 10

Work plan for Southern Hemisphere fin whales

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Fin whale acoustic structure	Review fin whale call patterns across Southern Hemisphere, investigate call variation (Annex Y)	Report	Complete review of fin whale call patterns (Annex Y)	Report
Discovery marks	Review available Discovery mark data on fin whales (Pastene and Jackson)	Report		
Catch maps	Update fin whale catch model to include Soviet catch data (de la Mare)	Report		

9.2.5 North Atlantic sei whales

The Committee welcomed information on two separate habitat-based density modelling efforts, using visual survey data to produce seasonal abundance estimates for sei whales from the purported ‘Nova Scotia’ stock, ranging from Nova Scotia to the southeastern USA (SC/67b/NH07). There was also some consideration of passive acoustic and strandings data from the US eastern seaboard. No new data are available from around Iceland or Norway, partially due to difference in timing between surveys and species’ arrival in regional waters. This information was discussed in Annex G (item 6.2). An intersessional correspondence group (Annex Y) will compile additional information this species in the North Atlantic and the Committee looks forward to a further update on reanalysis of historical data, particularly related to stock structure and strandings, next year.

9.2.6 North Atlantic right whales

Since 2016, the Committee has recommended a comprehensive update on North Atlantic right whales. SC/67b/NH05 summarised the information on the status of the North Atlantic right whale. This population has been slowly declining since 2010 and the abundance at the end of 2015 was estimated to be around 460 individuals (Pace *et al.*, 2017⁶). Of particular concern is the lower annual survival rate of females than males and poor recent calving (five in 2016/17 and none so far in the 2017/18 calving season). The observed number of dead whales in 2017 was 17 whales, several showing signs of death from fishing gear or blunt force trauma. These clearly represent minimum numbers and there was some discussion as to whether it was possible to scale minimum observed mortalities to an overall estimate but several confounding factors preventing this were identified (see Annex F, item 6.3 and Annex J, item 2.1.2).

Due to the increased 2017 Canadian interactions in the Gulf of St. Lawrence, on 19 April 2018 the Government of Canada implemented mitigation measures to reduce future interactions (DFO, 2018), including: closing a large part of the Gulf of St. Lawrence snow crab fishery on 30 June; creating a dynamic 15-day fishing closure; introducing a 10 knot speed restriction when any single right whale sighting in any area is detected; putting in place mandatory gear marking and reporting of any lost gear; minimising the allowable amount of floating line at surface; and using vessel monitoring systems that reports the boats position every 5 minutes.

A substantial increase in collaboration and data sharing between the US and Canada has occurred as a result of these mortalities.

Attention: C-A, CC

The Committee reiterates its serious concern over the status of the western North Atlantic stock of right whales as it is probably the only viable population of this species, for which entanglements and ship strikes have long been identified as key threats.

This year, the Committee:

- (1) **recognises** that entanglements have now replaced ship strikes as the primary cause of deaths (Kraus et al. 2016);*
- (2) **reiterates** its recommendation for the USA to submit a comprehensive update on the status of North Atlantic right whales (IWC, 2017:40) including an update of the Pace et al. abundance estimate, prior to the 2019 meeting;*
- (3) **stresses** that this update will allow time for explanations or additional analyses to be undertaken before the proposed 2019 Workshop on the Comparative Biology, Health, Status and Future of North Atlantic Right Whales: Insights from Comparative with other Balaenid Populations (including bowheads);*
- (4) **encourages** updates from the US Large Whale Take Reduction Team (ALWTRT) on progress of the Whale Safe Rope and Gear Marking Feasibility Subgroups; and*
- (5) **requests** that the Commission asks the IWC Executive Secretary to write to the U.S. National Marine Fisheries Service (NMFS) and the Canadian Department of Fisheries and Oceans, informing them of the Committee’s serious concerns over the declining population trend of this species, and stressing that, **as a matter of absolute urgency**, every effort be made to reduce human induced mortality in the population to zero.*

9.2.7 North Pacific right whales

The Committee received a report of a dead right whale caught in a set net off Izu, Japan in 2018 (SC/67b/NH06) – the first in a set net since one in Korea in 2015 (Kim *et al.*, 2015).

The Committee welcomed information on a single sighting off Hokkaido (and a biopsy sample) from a Japanese national cruise (SC/67b/ASI10). It also welcomed information on North Pacific right whales from the visual, acoustic and biopsy sampling components of the 2017 IWC-POWER cruise in the eastern part of the Bering Sea. A total of 9 schools and 18 individuals (including 2 duplicate schools of 3 individuals) of right whales were sighted with photo-identification of 12 individuals and biopsy samples from 3 individuals. Discussion of these sightings can be found in Annex G (item 6.4).

In response to a recommendation made last year (IWC, 2018c), US and Japanese scientists presented the results of new genetic analyses of right whales in the North Pacific. Comparison of whales sampled in the eastern and western North Pacific revealed statistically significant differentiation based on mtDNA data, supporting presumed separation of the two stocks based on gaps in the spatial distribution of sightings (and also see discussion in Annex I, item 4.3).

⁶ Any revised estimate from the Pace *et al.* 2017 paper will be reviewed by the ASI sub-committee during SC68a.

Attention: SC

*The results of new genetic analyses support the recognition of separate stocks of right whales in the eastern and western North Pacific. Given the importance of this work and the precarious situation of this species, especially in the eastern North Pacific, the Committee **encourages** the publication of this information as soon as possible.*

9.2.8 Workplan 2019-20

The Committee agreed to the two-year workplan in Table 11.

9.3 New information and workplan for other northern stocks (NH)

9.3.1 North Pacific fin whales

The Committee received new information on studies of North Pacific fin whales. New sightings of fin whales were reported in the papers (SC/67b/ASI12, SC/67b/ASI10, SC/67b/SCSP06) during the POWER cruise in the Bering Sea and the two surveys in the western North Pacific (Areas 7, 8 & 9). Over 260 schools found, many individuals were photo-identified and biopsy samples were obtained from 28 whales.

9.3.2 Omura's whale

The Committee welcomed the new information on this species (SC/67b/NH09) from the west coast of Madagascar, supporting the current understanding that the population is resident and non-migratory with strong site fidelity. Likely threats to the Madagascar population include entanglement in local fisheries, impacts from oil and gas exploration, and most imminent the risk of coastal water contamination from a recently initiated mining operation for Rare Earth Elements. Future work should include a long-term latitudinal study that incorporates multiple methodologies to investigate all aspects of the species biology and conservation threats to the population.

Kim and colleagues reported on the first confirmed documentation of Omura's whale in the waters of South Korea. Two of six large baleen whales bycaught were confirmed by genetic analysis to be Omura's whale. This bycatch reinforces the concept that this coastal species is vulnerable to anthropogenic impacts, especially entanglement in fishing gear.

Attention: SC, G

The Committee notes that little information is available to assess the status of Omura's whale. The Committee:

- (1) **recognises** the significant contribution the research efforts off Madagascar have made to the understanding of this species and **encourages** this work to be continued and expanded into the future; and*
- (2) **encourages** identification of study sites that are suitable for long-term comparative study on Omura's whales in other parts of its range (e.g. New Caledonia, Komodo Islands, Indonesia, and the Bohol Sea, Philippines).*

Table 11

Workplan for other Northern Hemisphere stocks

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
North Pacific blue whales	Data collection and review with focus on catches and stock structure	Review especially stock structure	Develop proposal for stock structure	Agree stock structure hypotheses
North Atlantic sei whales	Review distribution, strandings, sightings and stock structure	Review new information for assessment	Develop proposal for stock structure	Agree stock structure hypotheses
North Atlantic right whales		Review status and mortality data		Review status and mortality data
North Pacific right whales		Review new information for assessment		Review new information for assessment
North Atlantic humpback whales		Consider information for new assessment		Develop plans for new assessment
Gulf of Mexico Bryde's whale		Review new information on mortality		Review new information on mortality
All other stocks		Review new information		

9.3.3 North Atlantic Bryde's whales

SC/67b/ASI01 presented sightings collected during recent coastal surveys off Guinea, Sierra Leone and Liberia in March 2018. During this survey, two groups of five individual Bryde's whales were observed.

The Committee welcomed this information and **encourages** future surveys in this region.

9.3.4 North Atlantic blue whales

The Committee welcomed new information from the USA on blue whales in the North Atlantic including recent sightings, serious injuries or mortalities, seasonal occurrence based on acoustics. Lesage *et al.* (2018) provides an extensive summary of recent data collected in Canadian waters. This is discussed in Annex G (item 7.6) where it was noted that multiple new datasets (including from passive acoustic monitoring) have been recently collected and may provide more information on blue whale distribution in North Atlantic waters

Attention: SC, G

The Committee notes that there has been a recent increase in information available on North Atlantic blue whales. The Committee:

- (1) **draws attention to** the lack of data on interchange between blue whales in the eastern and western North Atlantic and **recommends** that U.S., Canadian and Icelandic colleagues conduct a new comparison of blue whale photo-identification catalogues and present this information at SC/68a; and*
- (2) **encourages** Canadian colleagues to generate a new population abundance estimate as soon as feasible, and looks forward to updates on new passive acoustic and visual sightings data SC/68a.*

9.3.5 North Atlantic humpback whales

The Committee received new information (NOAA, 2018b) on humpback mortalities along the US coast (vessel strikes and entanglements were noted as the primary causes of anthropogenic mortality). An 'Unusual Mortality Event' was declared by the USA for humpback whales in April 2017. This is discussed further in Annex G (item 7.7). New abundance estimates for parts of the North Atlantic are discussed in Annex Q (item 3.1.1.3) and presented in Item 12.1. Consideration of the need for a new in-depth assessment of North Pacific humpback whales is given in Annex E (item 5.8.2) and Item 8.7.3.

9.3.6 North Atlantic bowhead whales not subject to aboriginal subsistence whaling

No new information was available to the Committee.

9.3.7 North Pacific bowhead whales not subject to aboriginal subsistence whaling

No new information was available to the Committee.

9.3.8 North Pacific sperm whales

Three papers (SC/67b/ASI10,12 and SC/67b/SCSP06) provided new information of sperm whale occurrence and distribution was collected during 2017 in the western North Pacific, eastern Bering Sea. An intersessional correspondence group to examine possible ways to assess sperm whales has been reappointed (Annex Y)

9.3.9 Gulf of Mexico Bryde's whales

9.3.9.1 NEW INFORMATION

The Committee received an update on activities related to monitoring and new research plans for the critically endangered Gulf of Mexico sub-species of Bryde's whale. The Southeast Fisheries Science Center undertook a shipboard survey in the northern Gulf of Mexico in 2017, including known habitat of the Gulf of Mexico Bryde's whale. Passive acoustic data were collected in historic habitat of the central and western Gulf from June 2016 to June 2017. The In the USA, there is legislation that provides funds to restore and protect ecosystems of the Gulf of Mexico following the Deepwater Horizon oil spill (2010); this work will include research on the Gulf of Mexico Bryde's whale.

Attention: SC, G

*The Committee **agrees** that the NOAA scientists working with this sub-species should present results from shipboard and acoustic data analyses to the IWC at the 2019 Scientific Committee meeting and looks forward to receiving a report from the Workshop held in conjunction with the initiation of research associated with funds to restore and protect ecosystems of the Gulf of Mexico following the Deepwater Horizon oil spill.*

*The Committee also **encourages** U.S. and Mexican scientists to collaborate in efforts to determine whether any of these whales occur in Mexican waters (e.g. Bay of Campeche) where a major oil spill of three million barrels occurred in 1979. This should include consideration of the use of passive acoustics as well as visual surveys focusing on areas of habitat similar to that found in the core known range in the north-eastern Gulf. It was further noted that passive acoustic data or specimen records from the northern coast of Cuba would be useful to determine potential occurrence of this subspecies in that region.*

9.3.9.2 CONSERVATION ADVICE

Attention: CG-R, S

*The small population size, known human related mortality, restricted range and low genetic diversity place the Gulf of Mexico sub-species of Bryde's whale (added to the Critically Endangered category of the IUCN Red List in 2017) at significant risk of extinction. The Committee **reiterates** its previous **recommendations** that US authorities:*

(1) make full and immediate use of available legal and regulatory instruments to provide the greatest possible level of protection to these whales and their habitat;
 ensure that seismic surveys and associated activities that degrade acoustic habitat are excluded from the region of the eastern Gulf of Mexico inhabited by these whales, including an appropriate geographic buffer against acoustic impacts from activities in the Central Planning Area and active leases in the Eastern Planning Area;
 (2) characterise the degree of overlap between the whales' currently known preferred habitat and ship traffic, and immediately implement appropriate measures to reduce the risk of ship strikes (e.g. re-routing, speed restrictions);
 (3) based on the known distribution of these whales and overlap with certain fisheries, improve understanding of potential for interaction with fishing gear, and expand and implement appropriate measures, such as area closures, to reduce the risk of entanglement throughout their range;
 (4) develop and implement restoration projects (with funds from the Deepwater Horizon oil spill settlement) for these whales and their habitat as a priority and ensure that a robust monitoring and adaptive management plan is in place to evaluate the effectiveness of all restoration efforts;
 (5) design and conduct research programmes (sighting surveys, acoustic monitoring, genetic mark-recapture, photoidentification if feasible, satellite tagging if feasible, health studies if feasible) to further investigate these whales' distribution, movements, habitat use, health, survival and fecundity - this should include efforts to better document the whales' total geographic range and to document causes of mortality through necropsies when carcasses are reported; and
 (6) ensure that information about core known habitat and movements in the Gulf of Mexico is transmitted to the U.S. Coast Guard, shipping industry trade organizations, and Gulf of Mexico port authorities (e.g. in Tampa, Florida) for their consideration to mitigate ship-strike risk.

In addition, the Committee **reiterates** its recommendation that the IWC Secretariat (i) communicate the above concerns and recommendations to range state authorities and (b) specifically explore in collaboration with the International Maritime Organization the feasibility of providing internationally recognized forms of protection to these whales (e.g. designation of an Area to be Avoided) that would reduce the risk of ship strike and help mitigate degradation of acoustic habitat by ship noise.

9.3.10 Other stocks - Northern Indian Ocean sperm whales

No new information was available to the Committee.

9.3.11 Workplan 2019-20

The Committee agreed to the two-year workplan in Table 11.

9.4 New information and workplan for other Southern stocks

9.4.1 Southern Hemisphere humpback whales

9.4.2.1 BREEDING STOCK D

The assessment of the Breeding Stocks D (West Australia), E1 (East Australia) and Oceania was completed in 2014 (IWC, 2015a), but there were substantial associated problems in obtaining a reliable estimate of absolute abundance for Breeding Stock D. See Annex H (IWC, 2017a; 2018a) for a detailed discussion of these issues. Last year (IWC, 2018c), the Committee had agreed that efforts should focus on designing and implementing a new 'survey' (perhaps using new approaches such as drones), and recommended that prior to implementation, an assessment of the feasibility of such a 'survey', focusing in particular on the study conducted by du Fresne *et al.*, (2014), is conducted.

Attention: SC, G, CG-R

The Committee **agrees** that obtaining a reliable estimate of absolute abundance for humpback whale Breeding Stock D (west Australia) is a priority for any future in-depth assessment. The Committee **reiterates** its recommendation that an evaluation of abundance survey feasibility be carried out for this population, focusing in particular on the study conducted by du Fresne *et al.* (2014), with a view to implementing a new survey of this population in the future.

9.4.2.2 WORK PLAN

The work plan for Southern Hemisphere humpback whales is given in Table 12.

Table 12.
Work plan for Southern Hemisphere humpback whales

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Survey feasibility	Reanalyse pilot study to assess feasibility of future West Australia surveys (Kelly)	Receive report		

9.4.3 Southern Hemisphere right whales not the subject of CMPs

The Committee would like to progress regional population assessments for southern right whales (Item 10.8.1.5, IWC, 2017b) This requires a good understanding of population structure, abundance, trend and past exploitation levels. It was agreed that Australia should be the highest priority region for the next assessment (Item 9, IWC, 2018a).

9.4.3.1 SOUTH AFRICA

SC/67a/SH01 provided the results of the 2017 survey of southern right whales flown along the coast of South Africa, part of a long-term monitoring programme since 1979. Since 2015 there has been a marked decline in the presence of unaccompanied adults and cow-calf pairs for unknown reasons (see discussion in Annex S, item 5.1.3). Photo-ID analyses indicated an increasing occurrence of apparent 4- and 5-year calving intervals since 2014. SC/67b/SH22 applied a life history model to photo-ID data collected from 1979 to 2017. They showed that a model variant which allows the probability of a resting female remaining in the resting phase (rather than having a calf) to vary through time provided a better fit to the data than a time-invariant model. They calculate an annual population growth rate of 6.5% and measure first year survival at 0.852, with subsequent annual survival of 0.988.

Attention: SC, G, C-A, CG-A

*The Committee is **concerned** that the future of the exemplary long-term monitoring programme of right whales in South African waters remains uncertain. The Committee therefore **reiterates** that it:*

- (1) **strongly recommends** continuation of the survey;*
- (2) **requests** the Commission to urge South Africa to do all it can to ensure the long-term future of this vital monitoring programme; and*
- (3) **encourages** South African scientists to investigate the offshore movements and locations of southern right whales with future surveys.*

9.4.3.2 AUSTRALIA

The Committee was informed about the latest of a series of aerial surveys conducted in South and West Australia in 2017. The 2017 counts were the highest yet in the series and an exponential increase of ~6% per year remains a good description of the data. Funding has been obtained for the next three years of surveys. The Committee was also informed about: (a) a 26-year cliff-top study conducted at the Head of the Great Australian Bight (south Australia) on right whale population trends and identifications (Charlton *et al.*, In prep); and (b) an aerial survey in southeast Australia where small numbers of whales have been sighted (Watson *et al.*, 2015). Right whales in southeast Australia are genetically and geographically distinct from the large population in south/southwest Australia (e.g., Carroll *et al.*, In press).

The Committee was advised that the Australian Government has recently allocated funds towards a two-year project that will provide an abundance estimate for Australia's two southern right whale populations. It will investigate life history characteristics as well as connectivity between breeding areas on the eastern, southern and western coasts of Australia.

Attention: SC, G, CC, CG-A

*The Committee **recognises** the value of the Australian long-term right whale monitoring programmes to understand right whale population trends and dynamics, and **recommends** that this monitoring continues.*

*In regard to right whales in southeast Australia, the Committee **reiterates** concerns expressed in 2017 that abundance remains low despite this area having been a significant historic calving ground. The Committee therefore:*

- (1) **recommends** an assessment of the likely effects of fish farms and other developments in hindering population recovery in this region; and*
- (2) **encourages** further work to estimate the abundance of the southeast Australia population.*

9.4.3.3 NEW ZEALAND

The Committee welcomed information that surveys will be conducted in the Auckland Islands in 2020/21 to estimate abundance (updating the last estimate from 2009), to assess trend and population age structure, as well as changes in genetic diversity of right whales using this calving ground.

9.4.3.4 FEEDING GROUNDS

The Committee welcomed the results of a visual and acoustic survey of southern right whales off South Georgia/Islands (SC/67b/SH20). SC/67b/SH06 used genotypic markers to assess re-sight rates and sex ratios from biopsy samples ($n=157$) collected during 14 summer surveys in Antarctic Area IV. A preliminary abundance estimate was calculated using these data and further mark recapture analyses will be conducted intersessionally to provide an abundance estimate for review at next year's meeting. To further investigate linkages it was suggested that these high latitude data be compared the western Australia stock to investigate what population component is using this high latitude area.

Attention: SC

The Committee **encourages** further mark recapture analysis of the genotype data of the 14-year dataset collected in the high latitudes of Area IV, to estimate the abundance of southern right whales in this feeding area and **agrees** that this will be considered at next year's meeting.

9.4.3.5 PROGRESS TOWARDS POPULATION ASSESSMENT

This year, the Committee reviewed newly available information on population structuring of southern right whales around the Southern Hemisphere (Carroll *et al.*, In press) which further confirms the genetic differentiation of regional calving grounds off Argentina, South Africa, New Zealand and Australia, showing limited migratory movements between these areas (see Annex H, item 5.1.).

The Committee was provided with updates on trends and distribution for calving grounds off South Africa and off south and southwest Australia. Recent published data on population size and trend for calving grounds across the Southern Hemisphere were summarised in Annex H (table 2); this will be reviewed at next year's meeting. Given the trends in abundance and calving rates reported this year (Items 9.4.3.1 and 9.4.3.2), integration of these analyses in a common modelling framework was suggested as a useful way to evaluate common patterns and changes in demography and investigate the relative importance of environmental drivers in determining these patterns.

Another important aspect of population assessment is to update the pre-modern catch series for southern right whales, to better reflect patterns of regional exploitation. The Committee was informed that substantial new data are available on offshore whaling patterns and extent, particularly from American and British voyage logbooks (see Annex H, item 5.2.), which are likely to increase regional catch estimates and provide revised estimates of the numbers of whales struck but lost at sea by the different fisheries.

Attention: SC, G

To better understand patterns of right whale population dynamics around the Southern Hemisphere, and further the work on updated assessments, the Committee:

- (1) **agrees** that analysis of three southern right whale calving grounds (Head of the Bight and southwest Australia, southwest Atlantic and south Africa) should be undertaken using the same life-history model, to estimate regional demographic parameters and investigate commonalities in the population dynamics of these populations; and
- (2) **supports** the compilation of new data on pre-modern right whale catches, and the organisation of a workshop to investigate regional right whale catches and rates of whales struck but lost by fisheries, in order to proceed toward regional population assessments.

9.4.3.6 WORK PLAN AND BUDGET REQUESTS FOR 2019-2020

The work plan for southern right whales not the subject of a CMP is given in Table 13.

Table 13.

Workplan for southern right whales that are not the subject of a CMP

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Southern right whales	Examine southern right whale demographic parameters across multiple calving grounds using a common modelling framework	Review progress		Complete comparison
Southern right whales	Plan right whale catch series workshop	Progress update	Organise catch series workshop	Workshop report

10. STOCKS THAT ARE OR HAVE BEEN SUGGESTED TO BE THE SUBJECT OF CONSERVATION MANAGEMENT PLANS (CMPs)

10.1 Stocks with existing CMPs

This item covers stocks (with a focus on progress with scientific work and information) that are either: (1) the subject of existing CMPs; or (2) are high priority candidates for a CMP. It also considers stocks that have previously been considered as potential CMPs, recognising that the Commission has stressed the need for Range States to support any IWC CMPs.

10.1.1 SE Pacific southern right whales

10.1.1.1 NEW INFORMATION

The Committee received information on advances with respect to sightings (SC/67b/CMP20) and acoustic monitoring (SC/67b/CMP08; SC/67b/CMP18) of the critically endangered population of SE Pacific southern right whales. This information is discussed in detail in Annex O (item 2.1.1). Four confirmed observations were made off Chile in 2017

(three opportunistic sightings and one entangled carcass) and there was another, as yet unconfirmed sighting involving adults and calves. Analysis to date of acoustic data collected off the southwestern tip of Isla de Chiloe in 2012 has provided valuable new information about call parameters and patterns.

10.1.1.2 PROGRESS WITH THE CMP

The Committee received information on progress in implementing priority actions of the CMP (SC/67b/CMP20) as discussed in Annex O (item 2.1.1.2).

This progress includes:

- (1) deployment of Passive Acoustic Monitoring (PAM) devices along the coast of Chile and Peru (SC/67b/CMP18) in two locations that will also be used as the focus of educational and capacity-building activities in communities near the monitoring sites;
- (2) additional capacity-building and awareness efforts (including posters, press releases and social media) including advice on how fishermen and the public can provide information to the national sighting network; and
- (3) additional training towards increasing the capacity of range states to respond to entanglements.

Attention: SC, CC

*The Committee **reiterates** the importance of the CMP for the conservation of this critically endangered population of southern right whales in the southeastern Pacific, **welcomes** the progress being made in its implementation by Chile and Peru. It therefore:*

*(1) **commends** the scientific work and international co-operation being undertaken for the PAM project and looks forward to receiving the results of the acoustic studies such that future sighting surveys will be more informed and baseline information on the location of breeding grounds will be available; and*

*(2) **advises** that satellite imagery be explored as an additional means to inform the design of sighting surveys because it is likely that line-transect surveys would not successfully identify whales in some areas even if they were present.*

10.1.2 Southwestern Atlantic southern right whales

10.1.2.1 NEW INFORMATION

The Committee was pleased to receive a considerable amount of new information on the southwest Atlantic population of southern right whales; this is fully discussed in Annex O (item 2.1.2.1).

With respect to abundance, SC/67b/CMP/05 suggested that although the population has continued to increase, the rate may have been slowing, perhaps as a consequence of changes in distribution due to density-dependence processes (SC/67b/CMP02).

The Committee has for some time been focussing on the die off at Peninsula Valdes (e.g. IWC, 2011; 2015) and the excellent work of the Southern Right Whale Health Monitoring Program. New and updated information was presented this year on strandings and investigations related to health including examination of levels of stress hormones in baleen and kelp gull attacks (SC/67b/CMP04) and nutritional condition (SC/67b/CMP03). This work is ongoing.

Information was received on telemetry studies (one animal in 2016 and 8 in 2017) as part of an ongoing long-term study to understand the migratory routes and destinations of southern right whales wintering off the coast of Argentina (SC/67b/CMP17). Tracks reveal that these animals are found across a vast extent of the South Atlantic and each season visit multiple potential feeding areas.

The Committee also received the report of a land-based survey of whales near Miramar on the southwest coast of the Buenos Aires Province, Argentina, where there has been a recent expansion of right whales into the region where they have been seen from May to October with peaks in August and September (SC/67b/CMP21).

Attention: SC, G

*The Committee **reiterates** the importance of continued monitoring of the southwestern Atlantic population of southern right whales and research into threats that it may face. The Committee therefore:*

*(1) **commends** the work being undertaken on understanding the mortality events and **encourages** its continuation;*

*(2) **encourages** the researchers working on stress hormones in baleen to increase their sample size, consider suggestions for additional studies provided in Annex O (item 2.1.2.1) and present a full report to the Committee when it becomes available;*

*(3) **commends** the telemetry work, **encourages** its expansion and draws attention to additional analyses that could be addressed using the telemetry data suggested in Annex O (item 2.1.2.1).*

10.1.2.2 PROGRESS WITH THE CMP

The overall objective of the southern right whale CMP is to protect their habitat and minimise anthropogenic threats to maximise the likelihood that the population will recover to healthy levels and recolonise its historical range. The Committee was pleased to receive information on progress with the actions of the CMP from Argentina (SC/67b/CMP14),

including the work described under Item 10.1.2.2, and Brazil (Annex O, appendix 2). Work in Brazil includes long-term monitoring via sightings and strandings networks, mitigation of entanglements and the development of a management plan for whalewatching (see Annex O, item 2.1.2.2).

Attention: SC, CC

*The Committee **reiterates** the importance of the CMP for the conservation of the southwestern Atlantic population of southern right whales. The Committee therefore:*

- (1) **welcomes** the progress being made in the implementation of the CMP reported by Argentina and Brazil and supports its continuation;*
- (2) **encourages** the continued co-operation and collaboration amongst range states towards implementing the CMP and addressing mortality events in this population; and*
- (3) recognising the report of a ship-struck southwestern Atlantic southern right whale in the range of the southeastern Pacific (Estrecho de Magallanes), **encourages** co-operation with those involved in the southeastern Pacific CMP to facilitate a regional assessment; and*
- (4) **encourages** the research work identified under Item 10.1.2.1.*

10.1.3 North Pacific gray whales

10.1.3.1 RANGEWIDE ASSESSMENT

Donovan summarised the report of the Fifth Rangewide Workshop on the Status of North Pacific Gray Whales (SC/67b/Rep07) held at the Granite Canyon Laboratory, California of the Southwest Fisheries Science Center from 28-31 March 2018. The primary tasks of the workshop were to (a) review the results of the modelling work identified at the fourth rangewide workshop (IWC, 2018a) and the 2017 Scientific Committee meeting (IWC, 2018b), (b) examine the new proposed Makah Management Plan (submitted by the USA – given as Annex E, Appendix 1) for gray whaling off Washington state and (c) to update as possible, and develop a workplan for, updating the scientific components of the Conservation Management Plan (CMP) for western gray whales.

A full discussion of the workshop can be found in Annex O (item 2.1.3.1). The Workshop finalised its work on (a) prioritising stock structure hypotheses, (b) finalising inputs for the modelling work especially related to bycatch; and (c) incorporating the Makah Management Plan (SC/67b/Rep07, Annex E, Appendix 1) into the modelling framework.

Two stock structure hypotheses (3a and 5a) were given priority whilst others were used in sensitivity tests. In summary, Hypothesis 3a assumes that whilst two breeding stocks (Western and Eastern) may once have existed, the Western breeding stock is extirpated. Whales show matrilineal fidelity to feeding grounds, and the Eastern breeding stock includes three feeding aggregations: Pacific Coast Feeding Group (PCFG), Northern Feeding Group (NFG), and the Western Feeding Group. Hypothesis 5a assumes that both breeding stocks are extant and that the Western breeding stock feeds off both coasts of Japan and Korea and in the northern Okhotsk Sea west of the Kamchatka Peninsula. Whales feeding off Sakhalin include both whales that are part of the extant Western breeding stock and remain in the western North Pacific year-round, and whales that are part of the Eastern breeding stock and migrate between Sakhalin and the eastern North Pacific.

In discussion of the report and intersessional progress, the Committee thanked Donovan, Punt and the participants for the progress made, approved the conditioning results developed after the workshop, noted the preliminary results from the modelling and agreed a strategy for obtaining conservation advice (see recommendation below under Item 10.3). The management implications of the results for the Makah Management Plan are found under Item 7.1.3.

10.1.3.2 REGIONAL STUDIES

The Committee was pleased to receive recent information from long-term studies in the breeding lagoons of Mexico (SC/67b/CMP09) as discussed in Annex O (item 2.1.3.1.1).

The Committee received several updates on work undertaken in the Russian Federation (see Annex O, item 2.1.3.2). It welcomed the annual update of activities from the IUCN Western Gray Whale Advisory Panel (see Annex O, appendix 3) which highlighted work to develop a monitoring and mitigation plan for a 2018 seismic survey being undertaken near the feeding grounds off Sakhalin Island, Russia and issues related to fishing gear. SC/67b/CMP07 updated findings from the long-term monitoring programme carried out by the Russian Gray Whale Project off Sakhalin Island, Russia. The research programme run in the same area by two oil companies was presented in SC/67b/ASI04 and discussed in Annex S (item 4.2).

The recent status of conservation and research on gray whales in Japan was reported in SC/67b/CMP12. During May 2017–April 2018, no anthropogenic mortalities were reported from the adjacent waters off Japan, while two opportunistic sightings of gray whales were made near Aogashima Island in May 2017 and February 2018.

Finally, SC/67b/CMP11 reported on the possible occurrence of a gray whale off the east coast of Korea; work is continuing to try to confirm the species identification; if confirmed it will be the first record in these waters in over 40 years.

Attention: CG-R, SC, G

The Committee **reiterates** the importance of long-term monitoring of gray whales, **recommends** that range states support such work and **welcomes** the information provided this year. In particular, the Committee:

- (1) **commends** the work in the breeding lagoons and urges its continuation;
- (2) **encourages** an additional calf-count survey for Punta Banda to address apparent differences in numbers of calves observed in the lagoons with counts from California;
- (3) **reiterates its concern** at the risk of whales becoming entangled in gear placed by the salmon trap-net fishery off Sakhalin Island, recognises that disentanglement training has occurred but **recommends** that measures to be taken to reduce risk;
- (4) **encourages** continued genetic analyses to assist in stock structure discussions especially related to a western breeding stock;
- (5) **welcomes** the continued provision of information from Japan and **encourages** researchers to continue to collect as much information on sightings as possible, including, if feasible, attempting to obtain biopsy samples; and
- (6) **welcomes** the information from Korea and the willingness of researchers to investigate sightings from social media as a form of 'citizen science', which can be especially valuable for areas where occurrence is very rare animals in areas with little to no information on critically endangered species.

10.1.3.3 PROGRESS WITH THE CMP

As noted above, one of the objectives of the fifth rangewide workshop was to progress work with updating the scientific components of the original IWC/IUCN CMP in the light of the results of the rangewide review. Although some work was undertaken, there was insufficient time at the workshop to complete this although a workplan to achieve it was suggested (see SC/67b/Rep07). The Committee concurred with this view and this is incorporated into the workplan below.

Another important component of the CMP effort is the need for a stakeholder workshop (tentatively forecast to occur in 2019) to finalise the CMP and develop a strategy for its implementation. The plan is for a workshop, co-sponsored by IWC, IUCN and the signatories to the Memorandum of Cooperation, to: (1) review and updating of the CMP; (2) establishing a stakeholder Steering Group to monitor CMP implementation, (3) arrange for a coordinator of the CMP and (4) establish a work plan and consider funding mechanisms to implement the actions of the plan.

Attention: C-A, CG-R, CC, SC

The Committee **reiterates** the importance of the CMP for the conservation of western gray whales. The Committee therefore:

- (1) **recognises** the tremendous work undertaken in the rangewide assessment and the value of the modelling framework developed;
- (2) **agrees** that the next part of the process is to develop conservation-related questions and to use the framework to address these with a view to examining results at SC68a;
- (3) **agrees** that a small group meeting (see Item 27) attended by at least the national co-ordinators of the Memorandum of Co-operation on gray whales, Reeves, Punt and Donovan be held to: (a) draft an update to the CMP; and (b) identify conservation-related questions to be addressed by the modelling framework and to present results at SC68a;
- (4) **requests** those signatories to the Memorandum of Co-operation on western gray whales who have not yet named a national co-ordinator to do so promptly; and
- (5) **supports** the holding of a stakeholder workshop in 2019 co-sponsored by the IWC, IUCN and the states that have signed the Memorandum of Co-operation and **welcomes** the valuable assistance of IUCN in organising the workshop.

10.1.4 Franciscana

10.1.4.1 NEW INFORMATION

The Committee received valuable new information on franciscana at this meeting related to fisheries and bycatch from five localities in North Espírito Santo State, Brazil (SC/67b/SM30) – bycatches of Guiana dolphins was also reported. Additional information was presented assessing fisheries that operate in Fisheries Management Area (FMA) Ib for their compliance with Brazilian ordinance (IN) 12 (e.g. with respect to gill-net regulations and no-take zones) and risk of bycatch (SC/67b/SM05) – compliance was limited and enforcement poor. Both projects were funded by the IWC Small Cetacean Fund and the Government of Italy. This information is discussed in Annex O (item 2.1.4.1) and a related recommendation is given under Item 10.4.2.2.

10.1.4.2 PROGRESS WITH THE CMP

The overall objective of the CMP, submitted by Argentina, Brazil and Uruguay (IWC/66/CC11) and adopted in 2016, is to protect franciscana habitat and minimise anthropogenic threats, especially bycatch. It includes seven high priority actions, ranging from public awareness and capacity building through research to mitigation. Coordination with Uruguay to implement the CMP in this area will be initiated during a workshop that will take place in May 2018 with the main stakeholders (SC/67b/CMP16). The CMP is funded by the IWC CMP Voluntary Funds and the World Wildlife Fund.

Attention: CG-R

The Committee **emphasises** the importance of the CMP for the conservation of franciscana in the waters of Argentina, Uruguay and Brazil. The Committee therefore:

- (1) **stresses** the value of the actions included in the CMP towards future assessments of the status of franciscana, which is imperative for determining the effectiveness of conservation efforts;
- (2) **recommends** that research be undertaken to estimate the abundance of franciscana dolphin off Buenos Aires province, Argentina; and
- (3) **recommends** that additional research be undertaken to determine the effectiveness of management measures, such as that described in SC/67b/SM05 for other ports (e.g. Macaé, Tamoios (Cabo Frio) and Armação dos Búzios – the fishery in Tamoios coincides with a high diversity of marine megafauna).

The Committee established an intersessional correspondence group that will help co-ordinate the presentation of CMP projects for this species across sub-committees at SC/68a (Annex Y).

10.2 Progress with identified priorities

10.2.1 Humpback whales in the northern Indian Ocean including the Arabian Sea

10.2.1.1 NEW INFORMATION

The Committee received several papers that improved knowledge of Arabian Sea humpback whales and a full discussion can be found in Annex O (item 2.2.1). It welcomed the information on the progress of work being undertaken by the Arabian Sea Whale Network (ASWN) formed in 2015 (SC/67b/CMP10). The ASWN is an informal collaboration of researchers, consultants and conservation and governmental organisations interested in the conservation of whales in the Northern Indian Ocean. A primary goal of the ASWN is to promote and foster research and collaboration in previously unsurveyed parts of the Arabian Sea humpback whales' suspected range, as well as in Oman where surveys have been conducted since 2000. Work has focused on collecting data on whale distribution and status (including through increased awareness and an observer programme – described in SC/67b/CMP15)), the introduction and implementation of a regional online data platform (SC/67b/PH03) and providing updates on research activities in Oman, India, Pakistan and Sri Lanka (SC/67b/INFO07). Two marine protected areas have been established in Pakistan (Astola Island and Indus Canyon).

Madhusudhana *et al.* (2018) reported on and compared humpback whale songs recorded off India, Oman, Reunion Island and Comoros Islands in the southwest Indian Ocean. The results highlighted (a) the distinct nature of the Arabian Sea population and (b) that SW Indian Ocean whales may move into the Arabian Sea more commonly than previously thought.

SC/67b/CMP13 reported on a humpback whale tagged off Oman that moved to the southern tip of India and back again - the first recorded movement of a whale across the Arabian Sea. Four additional satellite tags were deployed where the whales remained over the continental shelf of central and southern Oman.

Attention: G, SC

The Committee **welcomes** the new information from the region on this critically endangered population and **commends** the researchers for their initiatives and collaborative efforts. In light of the information presented, the Committee:

- (1) **encourages** the collection of genetic information which would be helpful for identifying stock structures within the area;
- (2) **recommends** future use of unoccupied aerial systems to (i) measure whale health, (ii) develop long-term health metrics, (iii) compare body condition to stock C in the Southern Hemisphere, which is the presumed 'source' population for whales in the Arabian Sea and (iv) assess for evidence of anthropogenic threats;
- (3) **commends** the use of fishing crew as observers and **advises** that the crew-based observer programme continue, recognising that it is not clear if the timing of the sightings reflects the seasonal distribution of whales or the seasonal nature of fishing effort and **encourages** future research to tease apart timing of the distributions using targeted surveys;
- (4) **advises** that capacity building for local scientists be continued such that surveys can be deployed in suspected areas of humpback whale distribution and data can be gathered for future assessments;
- (5) **advises** the continuation of monitoring songs of Arabian Sea humpback whales and that additional data sets be acquired comparison purposes, particularly from the southwest Indian Ocean, if they exist, to further (i) detect the movement of southwestern Indian Ocean animals in Boreal winter, (ii) document potential diffusion of southwestern Indian Ocean song, (iii) provide a long-term data set for the comparison of songs across Oman, Pakistan and India to assess continuity of whales in the Arabian Sea and (iv) evaluate the unprecedented temporal stasis of song in the Arabian Sea; and
- (6) **agrees** that an intersessional correspondence group (Annex Y) be formed to review the methods used for the preliminary estimates of abundance, in order to increase their robustness by taking into account the non-random survey approach that violates some key assumptions of mark-recapture models.

10.2.1.2 PROGRESS WITH INTERNATIONAL CO-OPERATION AND REGIONAL MEASURES SUCH AS CMPS

A Concerted Action for Arabian Sea humpback whales under the Convention on Migratory Species (CMS; SC/67b/INFO06) was drafted and passed with wide support from Arabian Sea range states at the CMS COP in October 2017. It is hoped that this Concerted Action can be implemented in conjunction with a CMP as a means to translate current research and conservation efforts and plans into concrete, government-supported conservation measures in Arabian Sea humpback whale range states.

Attention: C-A, S

*The Committee **reiterates** its serious concern about the status of the endangered Arabian Sea humpback whale population and the anthropogenic threats it faces. It therefore:*

- (1) **commends** efforts to develop the Concerted Action under the CMS, noting that it covers many of the elements required for a CMP;*
- (2) **stresses** the value of regional initiatives and **encourages** range states to explore future sources of collaboration; and*
- (3) **encourages** continued efforts between range states and Secretariats to work toward a joint CMS-IWC CMP.*

10.2.2 Mediterranean fin whales

The ACCOBAMS Meeting of Parties has endorsed the development of a CMP, ideally jointly with the IWC, for fin whales in the Mediterranean Sea. A small group will meet in the summer of 2018 to draft an outline for a CMP that can be presented at SC/68a. ACCOBAMS is also considering the development of CMPs for other species in the region.

10.2.3 South American River Dolphins

Advice was sought regarding the development of a CMP for South American river dolphins, which currently have several actions plans endorsed by various range states.

Attention: CG-A

*The Committee **advises** that the applicable range states work towards developing a draft CMP for presentation at SC/68a.*

10.3 Workplan 2019-20

The workplan on matters related to stocks that are or might be the subject of CMPs is given as Table 14.

Table 14
Summary of the work plan on conservation management plans.

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Southeast Pacific right whales		Review progress with scientific aspects of the CMP		Review progress with scientific aspects of the CMP
Southwestern Atlantic right whales		Review progress with scientific aspects of the CMP		Review progress with scientific aspects of the CMP
Gray whales	Hold workshop on scientific aspects of CMP and use of modelling framework.	Review results and provide advice on scientific aspects of CMP	Stakeholder workshop	Review scientific aspects of results of stakeholder workshop
Franciscana		Pre-assessment for in-depth review		Continue pre-assessment and develop plan for in-depth assessment
Humpback whales in Northern Indian Ocean	Intersessional email group (Annex Y) on abundance estimates	Review new information and progress towards CMP		Review new information and progress towards CMP
Mediterranean fin whales	Develop outline draft	Review draft and progress towards CMP		Review progress towards CMP
South American river dolphins		Review new information and progress towards CMP		Review new information and progress towards CMP

11. STOCK DEFINITION AND DNA TESTING

This agenda item merges two previously separate sub-groups, the Working Group on Stock Definition and the Working Group on DNA. During SC67b, the Stock Definition and DNA Testing Working Group assessed genetic methods used for species, stock and individual identification, including matters associated with the maintenance of DNA registers (see 11.1); continued to develop and update guidelines for preparation and analysis of genetic data within the IWC context (see 11.2); and provided the Committee with feedback and recommendations concerning stock structure related methods

and analyses (see 11.4), including those relevant to other sub-committees (see 11.3). The Report of the Working Group is given as Annex I.

11.1 DNA testing

This item has been considered since 2000 in response to a Commission Resolution (IWC, 2000).

11.1.1 Genetic methods for species, stocks and individual identification

The Committee received two papers relating to the use of genetic methods for species, stock and individual identification. The first paper (Carroll *et al.*, 2018) provided a review of how technological advances, particularly those associated with the development of high throughput sequencing (HTS) technology, can aid in genetic monitoring. Of particular interest to the Committee was discussion of targeted capture approaches that allow for microsatellite genotyping via HTS (e.g. De Barba *et al.*, 2017). Much of the past genetic work has relied on generating microsatellite datasets, including the work to maintain DNA registries of bycaught or direct catches (see Items 11.1.2 and 11.1.3). These ‘legacy’ datasets may include microsatellite genotypes for thousands of individuals. While technical challenges exist, microsatellite genotyping via HTS could ‘bridge the gap’ by maintaining the utility of these legacy datasets while also taking advantage of the newer HTS approaches.

The second paper (Baker *et al.*, In press) presented the results of a study confirming the potential to detect environmental DNA (eDNA) in seawater collected from the wake of killer whales. This is a new approach for detecting and identifying cetacean species, including those that may be elusive to study using other methods. Although eDNA has been more broadly used to detect the occurrence of species in an area (i.e. DNA barcoding), it could provide sequence data useful for stock-level identifications of cetaceans under certain circumstances (e.g., when a single animal is present). It was noted, however, that its utility in addressing questions requiring individual identification via multi-locus genotyping is, at least currently, limited for scenarios in which the water sample could contain DNA from multiple individuals.

Attention: SC

*The Committee **welcomes** the opportunity to review papers that take advantage of technological advances to improve the ability to detect and identify species, stocks, and individual cetaceans. It **encourages** the submission of similar papers in the future and recognises the relevance of these techniques to the Committee’s work.*

11.1.2 ‘Amendments’ of sequences deposited in GenBank

While *GenBank*⁷ is an important scientific resource, it is an uncurated database of DNA sequences and thus contains sequences that are misidentified or have other annotation problems. While retaining the ‘raw data’ represented in *GenBank* is valuable, less-experienced users may be unaware that additional sequence validation may be needed when incorporating *GenBank* sequences into a study. The Committee has agreed (IWC, 2018c, p. 228) that its revised DNA quality guidelines will contain a section discussing the precautions that should be taken when including *GenBank* sequences in a study. This text has been drafted and will be incorporated into the revised guidelines (see Item 11.2).

11.1.3 Collection and archiving of tissue samples from catches and bycatches and

11.1.4 Reference databases and standards for diagnostic DNA registries

The Committee previously endorsed a new standard format for the updates of national DNA registers to assist with the review of such updates (IWC, 2012a, p. 53), and the new format has 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 Annex I (appendices 2-4) for each country, covering the period up to and including 2017. Almost all samples in the three registries have been analysed for microsatellites, and work on unanalysed samples is continuing. Almost all samples in the registries of Japan and Iceland have also been analysed for mtDNA.

During last year’s discussion of the Norwegian minke whale DNA register (IWC, 2018c, p. 228-229), the Committee was informed that mtDNA analysis on Norwegian samples had been discontinued and that microsatellite typing would eventually be replaced by SNP analysis. The Committee had expressed concern regarding the comparability of the DNA registers in the future. This year, the Committee noted that Norway had discontinued mtDNA typing of samples and substituted it with SNP genotyping.

Attention: CG-A

*The Committee **expresses appreciation** to Japan, Norway and Iceland for providing updates to their DNA registries using the standard format agreed in 2011 and providing the detailed information contained in their DNA registries.*

11.2 Guidelines and methods for genetic studies and DNA data quality

Two sets of guidelines have been developed for reference in the Committee’s discussions of stock structure. The most recent version of the guidelines for genetic data analyses are in press with the Commission’s *Journal of Cetacean*

⁷ <https://www.ncbi.nlm.nih.gov/genbank/>

Research & Management. The DNA data quality guidelines address DNA validation and systematic quality control in genetic studies, and are currently available as a ‘living document’ on the IWC website⁸. In recent years, it has become common for the Committee to review papers using data derived from Next Generation Sequencing (NGS) approaches, including SNPs, to address stock structure questions (see Item 11.3).

Attention: SC

*The Committee **emphasises** the importance of keeping its guidelines related to genetic data quality and analyses up to date. It therefore:*

- (1) **reiterates** the need to update these guidelines to incorporate the discussion of data quality measures used for Next Generation Sequencing data; and*
- (2) **agrees** to continue the intersessional correspondence group (Annex Y) to review revised sections of the DNA data quality guidelines that apply to data generated from next generation sequencing platforms, including SNPs and whole genome sequencing, with the goal of posting an updated version of the guidelines on the website next year.*

11.3 Provide advice on stock structure to other sub-groups

The Working Group on Stock Definition and DNA also has the task of discussing high-priority stock related papers from other sub-committees and working groups to provide them with stock structure related feedback and recommendations. These discussions often refer to the genetic analysis guidelines and genetic data quality documents.

The discussions (see Annex I for details) are summarised under the relevant stock agenda items in this report. Two, more general issues arose from discussions of Southern Hemisphere stocks and North Atlantic common minke whales. These are considered below.

11.3.1. Southern Hemisphere whale stocks and use of samples

The Committee reviewed the results of genetic analyses of Southern Hemisphere whale stocks, including Southern Hemisphere blue, fin, right and sei whales. These results highlighted the value of existing collections of tissue samples to address stock structure questions.

Attention: SC

*In reviewing the results of stock structure analyses of Southern Hemisphere whale stocks, the Committee expresses **concern** regarding the depletion of tissue samples in existing collections (including those collected during the IWC SOWER surveys, although the Steering Group does take this into account when reviewing requests). Given recent advances in high throughput sequencing technology, the Committee **agrees** that an intersessional correspondence group (Annex Y) should be formed to provide recommendations on genomic approaches to maximise the utility of these samples for future studies.*

11.3.2. North Atlantic common minke whales

The Committee reviewed the results of genetic analyses pertaining to the stock structure of North Atlantic minke whales (SC/67b/Rep06). The analyses presented involved the use of a new approach to evaluate stock mixing proportions by (1) identifying a ‘reference’ year in which mixing of stocks was considered low based on a lack of heterogeneity in genetic characteristics estimated for each area, and (2) using principal component analysis of the genetic data to assign stock affinities in the non-reference years based on proximity to mean values in the reference year.

Attention: SC, C-A

The Committee reviewed the use of a new approach that used ordination analyses of genetic data to assign stock mixing proportions. Recognising that this new approach requires making certain assumptions about the data, the Committee:

- (1) **agrees** that the inference of mixing rates was informative for AWMP/RMP simulation trials in the absence of empirical data; and*
- (2) **encourages** the attempt to use genetic data to estimate mixing rates in the context of other IWC-related tasks.*

11.4 New statistical and genetic issues relating to stock definition

11.4.1. Simulation tools for spatial structuring

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 (Archer *et al.*, 2010; Lang and Martien, 2012). The Working Group noted that while TOSSM has been particularly valuable in

⁸ <http://iwc.int/scientific-committee-handbook#ten>

informing the interpretation of results of stock structure related analyses, it has not been broadly used within the IWC Scientific Committee for this purpose.

In recent years, a wide-range of software packages have become available for producing simulated datasets that can be used for statistical inference and/or validating statistical methods (Hoban, 2014, and see ; IWC, 2017c p.44), and in 2016 the Committee agreed to expand this item (formerly specific to TOSSM) to include a broader range of tools (IWC, 2016c p.44).

Attention: SC

*The Committee noted that while simulation-based approaches have been particularly valuable in informing the interpretation of results of stock structure-related analyses, they have not been broadly utilized within the Committee for this purpose. The Committee **agrees**:*

- (1) to continue an intersessional review via an email correspondence group (Annex Y) of the available simulation tools and their potential utility to the Committee; and*
- (2) to consider bringing in invited expertise to present an overview of the applicability of such approaches in order to expedite progress on this agenda item.*

11.4.2. Terminology

Defining and standardising the terminology used to discuss ‘stock issues’ remains a long-standing objective of the Working Group, in order to help the Committee report on these issues according to a common reference of terms (IWC, 2014 p.287-8). At SC67b, the status of the existing draft glossary on key terms related to stock definition was revisited.

Attention: SC

*The Committee **agrees** to establish an intersessional correspondence group (Annex Y) to revisit terminology with specific reference to the implications of inferred stock structure in other sub-committees, particularly those that deal with large whale assessments, and suggest revisions where appropriate for consideration at SC68a.*

11.4.3. Close-kin mark-recapture

An overview of the close-kin mark-recapture (CKMR) approach (Bravington *et al.*, 2016) was presented to the Committee last year (IWC, 2018c p.40). CKMR uses multi-locus genotyping to find close relatives among tissue samples from dead and/or live animals; the number of kin-pairs found, and their pattern in time and space, can be embedded in a statistical mark-recapture framework to infer absolute abundance, parameters like survival rate, and stock structure. No papers applying the CKMR approach were reviewed by Committee this year, although the value of integrating data from epigenetic aging (see 11.4.4) into CKMR was noted.

Attention: SC, G

*Given that close-kin mark-recapture has multiple applications that fall within the Committee’s scope of work, the Committee **encourages** the submission of papers using this approach in the future.*

11.4.4. Epigenetic ageing

Information on estimated age of individuals can be used in many aspects of the Committee’s work, including (1) discriminating between the parent and offspring among genetically identified parent-offspring pairs, which can inform both assessment of stock structure as well as genetic mark-recapture estimates of abundance (e.g. CKMR); and (2) integrating age information into the population modelling exercises integral to assessment work (e.g. on RMP implementation). Recently, epigenetic (DNA-methylation) ageing has been successfully used to estimate age in humpback whales (Polanowski *et al.*, 2014). This year, the Committee invited Jarman, the lead scientist on the humpback whale work, to give an overview presentation to the Committee. This session was organised as a special evening session in order to enable participation across sub-committees and Working Groups. He covered issues specific to age estimation in cetaceans, including how DNA methylation-based age estimation are likely to perform in cetaceans and what current and near-future prospects there are for this class of methods (see Annex I, item 5.5).

The Committee also reviewed the results of a study to evaluate the feasibility of using the DNA-methylation technique to estimate age in Antarctic minke whales (SC/67b/SDDNA04). This study was initiated in response to a recommendation made during the Expert Panel review of the NEWREP-A proposal (SC66A/REP06, p17). DNA-methylation rates were examined for seven methylation sites (CpG sites) within three genes, and regressions of each CpG methylation site against age determined by earplug were conducted. When all sites were incorporated, the assay predicted age from skin samples with a standard deviation of about 8.9 years. While some sites showed age-related effects, others did not show such correlation. Thus, using only those loci that appear to have an age-related effect might reveal a stronger relationship between methylation rates and age.

During the discussion (Annex I, item 5.5) it was noted that the humpback whale age assay, which used the same sites, reports a precision of 2.99 years, measured as the average of the absolute values of the differences between known and estimated ages (Polanowski *et al.*, 2014). During the presentation, the precision as measured by the standard deviation for absolute age prediction was reported as 4.8 years. That was a preliminary study demonstrating the fundamental feasibility of this approach, and is not as accurate or precise as tests developed for humans and mice based on analysis of many more CpG sites. While precision is expected to improve with the inclusion of more CpG sites, the maximum precision possible for any DNA methylation-based age estimator is likely limited by the imperfect relationship between chronological age and biological age. To date, that precision has ranged from 3.9% in humpback whales (Polanowski *et al.*, 2014 assuming a 95-year lifespan), to 3.2% of lifespan in humans (e.g. Horvath, 2013) and 1.7% of lifespan in mice (Stubbs *et al.*, 2017). These observations indicate that the SD and 95% CI for age estimation described in Polanowski *et al.* (2014) and in SC67b/SDDNA04 could be substantially improved before an inherent limit is reached. These precision estimates adhere to age determination in individual specimens. Hence, averaged age estimates over cohort will improve over larger sample sizes and may be more precise.

The Committee noted that the implications of this upper limit on precision in estimating age for individuals would need to be evaluated in the context of the specific application for which the age data were being used. For example, although additional precision is helpful, CKMR studies may be informed by relatively crude estimates of age allowing the parent to be discriminated from the offspring (i.e. ordinal age).

Attention: SC

The Committee welcomed the results of the study to evaluate the feasibility of using epigenetic techniques to estimate age in Antarctic minke whales and agrees:

- (1) that the current set of loci did not provide sufficient precision for use in the population dynamics modelling exercise recommended for NEWREP-A; and*
- (2) that identification of additional sites with an age-related DNA-methylation pattern is encouraged, as it would likely allow more precise estimates of age to be made in the future; and*
- (3) given that there is an upper limit to the degree of precision that can be achieved using this technique, the utility of epigenetic age estimation to the Committee should be further evaluated by the sub-committees concerned with regard to the degree of precision needed for the specific application of interest.*

11.5 Workplan 2019-20

The details of the workplan are given in Table 15.

Table 15

Workplan on topics related to genetics.

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
3.1 DNA quality guidelines	Intersessional group (Annex Y) to review recent revisions to the DNA quality guidelines that pertain to data produced using NGS approaches.	Report and finalise updated guidelines		
4.4.2 Recommendations to avoid sample depletion	Intersessional email group to provide recommendations on genomic approaches to maximize the utility of tissue samples that are in danger of becoming depleted in the future.	Report and provide advice		
4.5 North Pacific minke whale stock structure	Perform genetic analyses detailed in Appendix 5; report results at intersessional workshop on the North Pacific minke whale IR.	Review results and provide advice		
5.1 Simulations	Intersessional email group to review software packages and evaluate utility to the Committee.	Report	Continue as needed	Report (if needed)
5.3 Terminology	Intersessional email group to continue discussions of the use of stock structure-related terms within the Committee.	Report	Continue as needed	Report (if needed)

12. CETACEAN ABUNDANCE ESTIMATES, STOCK STATUS

The Committee received new information from the Standing Working Group on Abundance Estimates, Status and International Cruises (ASI) that had been established (IWC, 2017c, p. 94) to formally review and agree on the status of the abundance estimates submitted to the Scientific Committee across all of the Committee's sub-committees and working groups. It also assists the Committee and the Secretariat in developing a biennial document reporting to the Commission on the abundance and status of whale stocks.

12.1 Summary of abundance estimates and update of IWC consolidated table

Appendix 3 of Annex Q provides detailed information about abundance estimates agreed by the Committee, including estimates received prior to and during 2017, as well as ones evaluated this year. The Secretariat maintains a consolidated table.

Broadly, cetacean abundance estimates are usually obtained in one of three ways. Line transect surveys require observers on ships or aircraft to detect animals while the observers are traveling on paths traversing the survey area. Statistical methods are used to estimate how many animals were not seen, usually by evaluating how detection deteriorates as sighting distance increases and by extrapolating to survey areas beyond visual detection distance. Mark-recapture studies require multiple attempts to 'capture' individuals that are mixing between attempts. For cetaceans, individual animals are usually identified - and hence 'captured' - on the basis of matching photographs of whale markings, or by genetic analysis of biopsy samples of live animals. Statistical methods are used to estimate how many animals were never captured, based on information about the probability of capture, which is inferred from instances when the animal was sometimes captured and sometimes not. Population model based abundance estimates use information from a variety of sources to build a mathematical model of how a population changes over time. Important data and parameters in such models include survival rates, productivity rates, and previous abundance estimates. By fitting (and possibly projecting) this model, an estimate of current abundance is achieved.

Many sophisticated abundance estimation methods are hybrids or extensions of these basic approaches.

This year, the Committee **endorses** the following:

- (1) a photo-id mark-recapture estimate of 2011 abundance for Bering-Chukchi-Beaufort Seas bowhead whales;
- (2) an aerial line transect estimate of 2013 abundance of East Canada / West Greenland bowhead whales;
- (3) aerial line transect estimates of 2015 abundance of East Greenland and West Greenland North Atlantic humpback whales;
- (4) ship-based line transect abundance estimates of North Atlantic humpback whales in Iceland/Faroe Islands in 2007 and 2015;
- (5) aerial line transect abundance estimates of East Greenland (2015) and West Greenland (2007 and 2015) North Atlantic minke whales;
- (6) ship-based line transect abundance estimates of North Pacific Bryde's whales for several areas and time periods;
- (7) aerial line transect abundance estimates of East Greenland (2015) and West Greenland (2005, 2007 and 2015) North Atlantic fin whales; and
- (8) genetic mark-recapture abundance estimates for Maui's dolphins in New Zealand for several years.

Table 16 summarises key information about the **agreed** abundance estimates. Full details are given in Annex Q (item 3 and appendix 3).

Attention: SC, S, C-A

Abundance estimates are a key parameter in determining status. The Committee:

- (1) **endorses** the new abundance estimates presented in Annex Q, Appendix 3 for inclusion in the IWC Table of Accepted Abundance Estimates;*
- (2) **agrees** that they should be incorporated into that table and uploaded to the IWC website; and*
- (3) **agrees** that the table should continue to be updated intersessionally by the Steering Group (Annex Y).*

12.2 Process to review abundance estimates

Abundance estimates are needed to assess the status of cetacean populations and are used extensively by the Committee, including for providing management advice. These estimates are often computed by standard, but technically advanced methods. In addition, because of the high scientific standards found within the Committee's work, it is not uncommon for the Committee to receive estimates of abundance computed using novel methods and non-standard software/code. The review of these estimates can be complex and time consuming. At last year's meeting, the Committee noted that adequate time is needed to review abundance estimates and agreed that a process to facilitate the review of these estimates be developed (IWC, 2018c). In addition, the Committee noted that reviews would benefit if minimum requirements for the presentation of abundance estimates are established.

Table 16

Abundance estimates, CVs and 95% confidence intervals for estimates agreed at the 2018 meeting.

Whale and Region	Year	Estimate	CV	95% Confidence Interval
North Pacific Bryde's whales				
Area 1W	1995	12,149	0.41	5,579-26,454
	2000	6,894	0.47	2,872-16,549
	2011	25,158	0.38	12,202-51,872
Area 1E	1995	15,695	0.42	7,079-34,801
	2000	19,200	0.56	6,929-53,204
	2011	9,315	0.33	4,957-17-505
Area 2	1995	4,340	0.45	1,876-10,039
	2000	6,083	0.61	2,030-18,229
	2014	6,491	0.36	3,254-12,950
North Atlantic common minke whales				
East Greenland	2015	2,762	0.47	1,160-6,574
West Greenland	2007	9,066	0.39	4,333-18,973
	2015	5,095	0.46	2,171-11,961
North Atlantic fin whales				
East Greenland	2015	6,440	0.26	3,901-10,632
West Greenland	2005	9,800	0.62	3,228-29,751
	2007	15,957	0.72	4,531-56,202
	2015	2,215	0.41	1,017-4,823
North Atlantic humpback whales				
East Greenland	2015	4,223	0.44	1,845-9,666
West Greenland	2015	993	0.44	434-2272
Iceland/Faroe Islands	2007	18,105	0.43	7,226-45,360
	2015	10,031	0.36	4,962-20,278
Bowhead whales				
Bering-Chukchi-Beaufort Seas	2011	27,133	0.22	17,809-41,377
East Canada / West Greenland	2013	6,446	0.26	3,722-11,200
Gray whales				
Western North Pacific	1995	74	0.05	66-81
	2015	200	0.03	187-211
Maui's dolphin				
North Island, New Zealand	2016	57	n/a	44-75

This year, the Committee developed a process to improve the review of abundance estimates, including a prioritisation of the estimates according to the timeline they need to be used by the Committee. This process is described in detail in Annex Q, item 2.1. In addition, minimum requirements to present abundance estimates for review by the Committee were established. Details are given in item 2.2 of Annex Q.

The Committee noted that validation may be needed before estimates computed using novel methods and non-standard software are used to provide management advice (Annex Q, item 2.3). The Committee also noted the need to consider how estimates of abundance from population models are reviewed before they are included in the Table of Accepted Abundance Estimates (Annex Q, item 2.4).

Attention: SC, S

*The Committee **reiterates** the importance of using high quality, fully reviewed abundance estimates for its work. To achieve this the Committee **agrees**:*

- (1) to adopt the process to improve the review of abundance estimates given in Annex Q (item 2.1);*
- (2) the minimum requirements for the presentation of estimates for review by the Committee given in Annex Q (item 2.2);*
- (3) to host a pre-meeting before next year's meeting (SC68a) to develop (a) a process to validate abundance estimates computed with non-standard methods, noting the value of simulated datasets in this process; (b) a process to review estimates of abundance computed with population models is needed.*

12.3 Methodological issues

12.3.1 Model-based abundance estimates (and amendments to RMP guidelines)

The Committee noted that there was a need for RMP guidelines to be modified in order to incorporate spatial modelling approaches to estimate abundance.

Attention: SC

*The Committee noted that whilst much progress has been made with respect to considering model-based estimates (IWC, 2016c), the 'Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme' need to be modified. The Committee **agrees** that an intersessional steering group (Annex Y) will develop instructions and select a candidate to modify the Guidelines.*

12.3.2 Review new survey techniques/equipment

The Committee received information on the use of unmanned aircraft vehicles (UAVs) to improve estimation of abundance of river dolphins in the Amazon. Details are provided in Annex Q, item 5.

Attention: SC, G

*The Committee **looks forward** to receiving information on new survey technologies used to improve estimates of abundance of cetaceans.*

12.4 Consideration of the status of stocks

The Committee noted that further consideration on how to report status of cetacean stocks is needed.

Attention: SC

*The Committee **recognises** the need to further consider how to report status of stocks to the Commission in a consistent manner and **agrees** to address this topic at a pre-meeting to be held prior to next year's SC meeting (SC68A).*

12.5 Workplan 2019-20

The Committee **agrees** to the workplan given in Table 167

Table 17

Workplan on abundance estimates and status.

Topic	Intersessional 2018-19	SC68a	Intersessional 2019-20	SC68b
Review of Abundance Estimates	Review estimates identified at SC67B (New Zealand Blue Whales, Arabian Sea humpback whales) – Annex Y	Review intersessional progress and estimates available at SC68A	Review estimates identified at SC68A	Review intersessional progress and estimates available at SC68A
Upload the estimates accepted at the annual meeting to the IWC website and continue to update the IWC Abundance Table	Update the table with estimates accepted at SC67B (Annex Y)		Update the table with estimates accepted at SC67B	
Review and provide advice on plans for future surveys		Receive, review and provide feedback to research plans to conduct abundance estimates		Receive, review and provide feedback to research plans to conduct abundance estimates
Pre-meeting to consider: (a) validation of non-standard software and methods, (b) estimates of abundance computed from population models and (c) Status of populations	Meeting Preparation	Review of progress		
Amend the RMP Guidelines to consider abundance estimates computed with model-based methods.	Identify a candidate to update the RMP Guidelines (Annex Y)	Review an updated document of the Guidelines		
Develop simulation software to evaluate methods for abundance estimates		Review Progress		

13. BYCATCH AND ENTANGLEMENTS

13.1 Review new estimates of entanglement rates, risks and mortality (large whales)

The Committee received three papers relating to the bycatch of large whales. SC/67b/HIM03 provided information on stranded humpback whales stranded along the southeastern coast of Brazil in 2016 and 2017 including records of entanglements over the São Paulo coast. SC/67b/HIM09 focussed on ten baleen whale populations for which bycatch appears to be a component of substantial conservation problems and the authors categorised priorities for action. SC/67b/AWMP08 provided information on Bering-Chukchi-Beaufort Seas stock of bowhead whales. Discussion can be found in Annex J (item 2.1).

13.2 Reporting of entanglements and bycatch in National progress reports

Reports of large whale bycatch are summarised in Annex J (item 2.4) and the issue of partial reporting discussed. Issues related to reporting and progress reports is given under Item 3.2.

13.3 Mitigation measures for preventing large whale entanglement

Mattila, the IWC's technical advisor for reducing unintended human impacts, reported on relevant activities under the entanglement initiative. Details can be found in Annex J (item 2.5). Since last year's meeting, IWC entanglement trainings have been conducted in Sakhalin (Russia), Arica (Chile), Sortland (Norway) and Bahía Solan (Colombia). This brings the total number of trainees in this initiative to 1,130 from 27 countries. In addition, two apprentices were hosted this year, one from Chile and one from Oman. Mattila also presented the IWC's work with entanglement in two workshops at the Society for Marine Mammalogy Biennial conference (2017). The Committee thanked Mattila for his exemplary work in coordinating the Global Whale Entanglement Response Network.

13.4 Review proposal for global entanglement database

The Committee considered progress with the development of a dedicated entanglement database. This will be considered further at the June 2018 meeting of the Global Whale Entanglement Response Network (see Annex J, item 2.3).

13.5 Estimation of rates of bycatch, risks of, and mortality for small cetaceans

13.5.1 Small cetacean bycatches in Peru

The Committee received a report (SC/67b/HIM01) summarising monitoring efforts of beach-cast cetaceans in 11 locations along the Peruvian coast from 2000-2017. Full discussion can be found in Annex J (item 2.1.2) that showed clear evidence of continued high bycatch rates and some intentional takes. Burmeister's porpoises accounted for 66% of the specimens and the low proportion (25%) of dusky dolphins contrasted with 1985-1990 statistics, when dusky dolphins accounted for three quarters of all cetacean captures. This reiterated prior concerns (Van Waerebeek, 1994) about a persistent long-term trend of a significant decline in prevalence of Peruvian dusky dolphin in catch and stranding records.

The observed high mortality levels in Burmeister's porpoise are a serious concern, and action is needed to avoid the same critical situation as with the closely related vaquita. Burmeister's porpoise is already included in a preliminary list for potential Conservation Management Plan development (Genov *et al.*, 2015), and dusky dolphin could potentially also be included. The Committee reiterated recommendations from 2008 regarding bycatch monitoring programmes and mitigation efforts in these fisheries (IWC, 2009, p. 323).

Attention: C-A, CC

*The Committee **draws the attention** of the Commission to its **serious concern** over the high mortality levels from bycatches in Peru and especially those of the Burmeister's porpoise and dusky dolphin. It **stresses** that action is needed to avoid the same critical situation for Burmeister's porpoise as with the closely related vaquita. In this regard the Committee:*

- (1) **reiterates** its advice (IWC, 2009, p. 323) on bycatch monitoring and mitigation in these fisheries;*
- (2) **reiterates** that the Burmeister's porpoise is a potential candidate for a Conservation Management plan;*
- (3) **highlights** opportunities to focus on the bycatch of small cetaceans in Peru through the new IWC Bycatch Mitigation Initiative and **recommends** that they are considered as a potential pilot project; and*
- (4) **offers its assistance** to the Government of Peru; and*
- (5) **requests** that the Commission, through the Secretariat, transmits the Committee's concern and offer of assistance to the Government of Peru.*

13.5.2 Franciscana bycatch in Brazil

Considerable information was provided on the Santos Basin Beach Monitoring Project required by the Brazilian authorities for licensing oil and gas production and transport (see Annex J, item 2.1.2). This provided information *inter alia* on stranded franciscana. From October 2015 to September 2017, 1,123 carcasses were recorded stranded in the area and interactions with fishing gear was reported for over 85% of necropsied individuals with signs of human activities.

Attention: CG-A

*The Committee **draws attention** to the fact that the franciscana remains under strong pressure from human activities, especially bycatch, in Brazilian waters despite fishing net regulations established by the government. The Committee:*

- (1) **advises** that the existing regulation on gillnets, implemented in 2012, is either not being effectively enforced or is not effective in reducing bycatch; and therefore*
- (2) **recommends** the need for this to be investigated further by the Brazilian authorities.*

13.5.3 Estimating bycatch from strandings data

Estimates of common dolphin mortality in the Bay of Biscay based on strandings data (Peltier *et al.*, 2016) had been discussed at SC67a. SC/67B/HIM/05 and SC/67B/HIM/08 provided further analyses related to using stranding data to make inferences about small cetacean mortality. An intersessional group was established at SC67a to provide advice on consistent ways to estimate bycatch across both large and small cetaceans, and specifically, to review the methods applied in Peltier *et al.* (2016) focused on small cetaceans. Discussion of the report of the intersessional group and some additional related papers (SC/67b/HIM05 and SC/67b/HIM08) can be found in Annex J (item 2.1.2).

In discussion of other ways to estimate bycatch, the Committee noted that Bartholomew *et al.* (2018) had concluded that Remote Electronic Monitoring can provide a time- and cost-effective method to monitor target catch in small-scale fisheries and can be used to overcome some of the challenges of observer coverage. This requires consideration by the Committee.

Attention: CG-A, SC, G

With respect to methods for obtaining bycatch estimates the Committee:

- (1) **agrees** with the recommendations of its intersessional group regarding (a) uncertainties in bycatch estimates derived from strandings; (b) the use of bycatch estimates derived from strandings; and (c) assessing whether strandings can identify gaps in observer coverage;
- (2) **notes** the importance of observer programmes, including electronic monitoring, and the limitations of stranding information for determining the type of fishing gear implicated in a bycatch event, or in determining reliable bycatch estimates;
- (3) **recognises** that in small scale fisheries (a) observer programmes are particularly complicated, given the small size of vessels and (b) electronic monitoring may not capture the animals falling from the net during hauling
- (4) **advises** that a robust evaluation of the effectiveness of bycatch mitigation measures requires a combination of monitoring measures, including well-designed and effectively implemented observer programmes, electronic monitoring and stranding programmes;
- (5) **advises** that the above advice is relevant to the situation of the franciscana in Brazil; and
- (6) **agrees** that given the increased use of Remote Electronic Monitoring techniques and the rapid development of camera and associated electronic technology, these techniques should be a focus topic at SC68a.

13.6 Scientific aspects of mitigation measures

13.6.1 The IWC Bycatch Mitigation Initiative

The Committee considered the outcomes of an assessment on the potential work areas for the new IWC Bycatch Mitigation Initiative (SC/67b/HIM12). This resulted in several recommendations for the Committee in relation to potential work areas, including:

- (1) identification of priority fisheries/sites/species/populations to be considered for pilot projects based on conservation need and the establishment of bycatch baselines for relevant cetacean populations where mitigation is to be trialled;
- (2) leading in communicating the need for increased research on mitigation measures/management approaches for cetaceans to the broader scientific community;
- (3) annually reviewing mitigation measure tables;
- (4) providing technical assistance to the coordinator and the expert panel in the development of scientific trials/monitoring programmes to evaluate mitigation measures; and
- (5) collaborating with researchers identifying fishing effort using vessel monitoring and tracking systems and assessing bycatch risk, with a focus on small scale fisheries.

With respect to the identification of priorities, five criteria for the selection of pilot projects were identified:

- (1) urgency of conservation situation driven by bycatch or concern over situations with little or no data on bycatch, but suspected overlap between high risk fishing gears and vulnerable cetacean species;
- (2) enabling conditions necessary for success;
- (3) scope for IWC to contribute (e.g. enhanced international cooperation);
- (4) ability to monitor effectiveness of mitigation actions; and
- (5) potential for the project to contribute to mitigation of bycatch in other areas.

A list of information sources (including SOCER) was created at the meeting to assist Tarzia, the new BMI coordinator, to identify potential projects, after which she will consult with the expert panel to apply the above criteria, including contact with any of the governments involved, to select the projects for review by the initiative's Standing Working Group which can be presented to the Commission. The Committee suggested that identified fisheries in the Republic of Congo, Peru, Ecuador, Pakistan and India appear to fulfil many of the criteria and are locations where past or present IWC work is being carried out which is relevant to bycatch.

Attention: C-R, SC, CC

The Committee discussed the strategic assessment of the Bycatch Mitigation Initiative (BMI) and the role of the Committee. The Committee:

- (1) **welcomes** the progress made thus far under the BMI, including the Strategic Assessment;
- (2) **thanks** Tarzia for the excellent work she has carried out since her appointment as co-ordinator;
- (3) **agrees** to incorporate in its workplan the five work areas listed in its report under Item 13.6.1 and also consideration of 'rapid bycatch and risk assessment' tools;
- (4) **agrees** to the criteria listed in its report under Item 13.6.1 when identifying priority fisheries/sites/species/populations; and
- (5) **recommends** to the Commission that the BMI continues and is supported, including the provision of ongoing support for the BMI coordinator.

13.6.2 Collaboration with FAO

FAO held an Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations in March 2018 which had been attended by several members of the Committee. The workshop report contained a review of mitigation measures and a decision tree providing guidance on choosing a bycatch mitigation pathway. The IWC Executive Secretary and BMI Coordinator will attend the FAO Committee on Fisheries (COFI) meeting in July 2018 where the report will be reviewed.

Attention: C-R, S

The Committee **welcomes** the efforts of the FAO to consider cetacean bycatch and **recommends** that the IWC Secretariat continues to collaborate with the FAO on this issue.

13.7 New information on cetacean bycatch in the Western, Central and Northern Indian Ocean

Last year (IWC, 2018c, p. 46), the Committee had recommended that in light of the scope and scale of cetacean bycatch in the Western, Central and Northern Indian Ocean and the considerable data gaps associated with intensive and extensive gillnet fisheries, the topic be included in the work plan for this meeting and the Secretariat establish communications on the issue with the Indian Ocean Tuna Commission (IOTC). SC/67B/HIM/07 provided updated information on this topic, as discussed in Annex J (item 2.7). The IWC's Executive Secretary provided an update on engagement with the IOTC, including a recent teleconference with the IOTC Executive Secretary.

Attention: C-A, CC, SC

With respect to bycatches of cetaceans in the Indian Ocean, the Committee:

- (1) **reiterates** its willingness to collaborate with the IOTC on this issue; and
- (2) **encourages** the Secretariat to continue to work with the IOTC Secretariat.

13.8 Workplan 2019-20

The Committee's workplan on bycatch and entanglement is given in Table 18.

14. SHIP STRIKES

14.1 Review estimates of rates of ship strikes, risk of ship strikes and mortality

The Committee received information on a pilot study to better characterise ship strikes in Southeastern Alaska (see Annex J, item 3.1) and looks forward to further updates on this work.

14.1.1 Review progress on ship strike database

The IWC continues to develop a global database of ship strike incidents as discussed in Annex J (item 3.1.1). The primary task is ongoing review of previously reported records by two data coordinators in conjunction with a data review group (SC/67b/HIM11). It is expected that the review process for all historical records will be completed in the next biennium.

Attention: C-R, S

The Committee **reiterates** the importance of the global ship strikes database to its work. It therefore:

- (1) **welcomes** the work undertaken thus far;
- (2) **recommends** the continuation of this work including (a) that of the co-ordinators and Data Review Group on the review of historical records and (b) the Secretariat on upload tools.

Table 18
Workplan on bycatch and entanglement related issues.

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Bycatch Mitigation Initiative		Review aspects relevant to Committee and respond to requests for advice		Review aspects relevant to Committee and respond to requests for advice
Rates and risks		Review new estimates of entanglement rates, risks and mortality		Review new estimates of entanglement rates, risks and mortality
Mitigation		Review new information on mitigation		
Inferences from strandings	Consider new information and issues that need to be addressed at SC68a	Review new information		
Rapid risk assessment		Consideration of 'rapid risk assessment' tools and outputs		
Electronic monitoring		Consideration of remote electronic monitoring and vessel tracking		
Mitigation measures tables		Develop table of mitigation measures for small cetaceans and update table for large whales from 2017 if needed.		
Global disentanglement database	Discussion at GWERN workshop	Review Progress	Advance database development if considered feasible	Review Progress
Collaboration with FAO	Secretariat attend COFI meeting	Review FAO outputs on bycatch	Continue collaboration	Continue to review
Encouraging innovative research on mitigation	BMI through existing networks, at conferences, workshops and with students – all members of Committee with relevant expertise	Review progress		

14.2 Mitigation of ship strikes in high risk areas

The Pelagos Sanctuary in the Mediterranean is a recognised high risk area for ship strikes to fin and sperm whales. In France, the REPCET reporting system became mandatory on 1 July 2017 for French passenger, cargo vessels (SC/67b/HIM04). As discussed in Annex J (item 3.2.1), 'alerting' systems such as REPCET require a trained observer and a subsequent avoidance action of some sort by the vessel in order to be considered as a mitigation tool.

The Committee had previously agreed that the available data supported a proposal to IMO to move the shipping lanes off the southern coast of Sri Lanka to reduce the risks of ship strikes to Northern Indian Ocean blue whales. In 2017, major shipping organisations represented at IMO also wrote to the Sri Lankan government requesting the routing change to reduce ship strike risks and improve maritime safety. So far, there has been no response from Sri Lanka.

The Hellenic Trench west of Greece is also an identified high risk area for sperm whales and in 2015 (IWC, 2016d), the Committee recommended that interested parties (including Greece, ACCOBAMS and the shipping industry) move forward with Greece in order to develop a proposal for routing measures.

The IUCN Marine Mammal Protected Areas Task Force process for identifying Important Marine Mammal Areas (IMMAs) may assist in identifying high risk areas for ship strikes. The Committee and the IWC's Ship Strike Standing Working Group have previously encouraged cooperation on this between the IUCN Task Force and the IWC.

Attention: C-A, CC, SC, G

The Committee has continued its work on identifying high risk areas for ship strikes and potential mitigation measures. In this regard the Committee:

- (1) **recommends** continued work to develop and evaluate mitigation measures, such as speed restrictions, that might be associated with the designation of a Particularly Sensitive Sea Area (PSSA) in the Pelagos Sanctuary area;*
- (2) **reiterates** its previous recommendations on the importance of evaluating the efficacy of the REPCET system for reducing the risk of ship strikes;*
- (3) **requests** the Commission, via the Secretariat, to remind the authorities in Sri Lanka of its previous offer of assistance from the IWC on this issue;*
- (4) **requests** the Commission via the Secretariat, to follow up on previous correspondence on the ship strike risks to sperm whales off Greece;*
- (5) **agrees** to support a workshop to evaluate how the data and process used to identify IMMAs can assist the IWC to identify areas of high risk for ship strikes; and*
- (6) **agrees** to continue ongoing IWC engagement with the process to identify IMMAs, including consideration of their utility to address other threats.*

14.3 Co-operation with IMO Secretariat and relevant IMO committees

The Committee has long recognised the importance of co-operation with IMO on matters related to shipping including ship strikes.

Attention: C-R, S

The Scientific Committee reiterates the importance of cooperation with IMO and:

- (1) welcomes the ongoing co-operation the Secretariat has maintained with IMO and its Secretariat on ship strike issues, including meetings during IMO MEPC 72; and*
(2) recommends that this dialogue continue.

14.4 Work Plan

The Committee's work plan on matters related to ship strikes is given as Table 19.

Table 19
Workplan on matters related to ship strikes

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Rates and risks		Review estimates of rates of ship strikes, risk of ship strikes and mortality		Review estimates of rates of ship strikes, risk of ship strikes and mortality
Mitigation		Review new information on mitigation		
Advice on routing measures related to ship strike risk	Provide advice as required (Annex Y)	Review advice	Provide advice as required (Annex Y)	Review advice
Follow up on previous contacts offering IWC assistance regarding high risk areas	Secretariat to contact Sri Lanka and Greek authorities	Review progress on identified high risk areas in IWC Ship Strike Strategic Plan		
Continued co-operation with IMO	Secretariat to maintain dialogue with IMO Secretariat. Attend relevant IMO meetings.	Review cooperation		
Ship strike database	Continue ongoing data entry into Ship Strike Database and validation of records	Review progress against specific deliverables and time line	Continue ongoing data entry into Ship Strike Database and validation of records	Review progress against specific deliverables and time line
Provision of AIS data	Secretariat to develop MOU with Marine Traffic for provision of data	Consider best way to handle requests for data through the MOU		
Use of IMMAs to identify high risk areas for ship strikes	Hold workshop to evaluate how the data and process used to identify IMMAs can assist the IWC to identify areas of high risk for ship strikes.	Review workshop report		

15. ENVIRONMENTAL CONCERNS

The Commission and the Scientific Committee have increasingly taken an interest in the environmental threats to cetaceans. In 1993, the Commission adopted a resolution on research on the environment and whale stocks and on the preservation of the marine environment, IWC Resolution 1993-12 (e.g. IWC, 1996; 1997; 1998; 1999; 2010). As a result, the Committee formalised its work by establishing a Standing Working Group that has met every year subsequently. This year, it has been established as a sub-committee and its report can be found in Annex K.

15.1 Pollution 2020

15.1.1 Review on intersessional progress on the Pollution 2020 initiative

The individual based model to investigate the effects of pollutants on cetacean populations (SPOC) has been finalised. A peer-reviewed paper detailing the model and applying it to a number of case studies has been published in *Environmental Pollution* (Hall *et al.*, 2018) and the model's R code is available through the repository associated with the paper. The web-based, user-friendly version is now available through the Sea Mammal Research Unit, University of St Andrews server (<http://www.smru.st-andrews.ac.uk/reports/>) and a link will be added to the IWC webpages on the Chemical Pollution page. There are new data on the combined effects of persistent organic pollutants (POPs) on the immune system of killer whales (Desforges *et al.*, 2017) and this will be integrated into the model in the next year.

As noted in Annex K (item 2.1), the contaminant mapping tool will be completed next year, with the inclusion of the data on the concentrations of mercury in cetacean tissues by time and region. This online resource that will be made available through the IWC website and will be updated with new information identified in the SOCER annual reviews.

Research to estimate how long it is likely to take for POPs in the blubber of cetaceans to observably decline, following a reduction in environmental levels, will be completed next year.

Attention: SC

*The Committee **agrees** that the Pollution 2020 initiative should be completed and presented at SC/68a. It also **encourages** a paper to be presented at SC/68a summarising the potential mitigation measures for reducing exposure of cetaceans to polychlorinated biphenyls (PCBs) in particular and persistent organic pollutants (POPs) in general.*

15.1.2 Report on mercury in cetaceans

The impact of mercury exposure is still an issue of concern for cetaceans. SC/67b/E08, reviewed mercury in cetaceans, in response to Commission Resolution 2016-4, 'Resolution on Minamata Convention'. The paper (see discussion in Annex K, item 2.2) highlights continued global exposure and potential effect of mercury on cetaceans. Although cetaceans have a unique detoxifying mechanism which may protect them from the health effects of organic mercury, the resulting mercuric-selenide complexes may cause adverse effects in individuals experiencing other physiological and metabolic challenges. Research into identifying the toxic thresholds for mercury in cetaceans is still required.

The Committee also received several papers presenting information on mercury in cetaceans including river dolphins (SC/67b/E06), humpback whales (SC/67b/E09) and gray whales off Chukotka (SC/67b/E03). The Committee highlighted the need for standardisation in reporting units. It also discussed preferred tissues for mercury analyses. Discussion of these papers can be found in Annex K (item 2.2)

Attention: SC, CG-R

The Committee continued to work on mercury in cetaceans in response to Resolution 2016-4. It therefore:

- (1) **encourages** the continued provision of information on mercury and cetaceans;*
- (2) **encourages** researchers presenting such information to report concentrations on both wet and dry weight bases; and*
- (3) **recommends** that Contracting Governments support the continued monitoring of mercury in cetaceans, as this is required in order to assess the medium- and long-term impact of the Minamata Convention.*

15.1.3 Impact of heavy fuel oils on cetaceans

There is a paucity of information on the impacts of heavy fuel oils on cetacean health (Annex K, item 2.3). However, some new information comparing the occurrence of cancer and elevated PAH levels in St Lawrence Estuary white whales with similar cancers in the local human population, was highlighted. In addition, behavioural changes in white whales in the White Sea following exposure to oil have been observed.

Attention: CG-A, SC, G

The Committee:

- (a) **reiterates** the need to estimate the risk and impact of oil spills, particularly to cetaceans in the Arctic;*
- (b) **notes** that heavy fuel oil could pose an environmental threat in many regions due to its high viscosity and chemical composition;*
- (c) **notes** that heavy fuel oil poses a special threat in the Arctic due to difficulties in recovery and potential impacts of some recovery measures (e.g. dispersant use and in situ burning); and*
- (d) **encourages** the collection of baseline data for cetaceans, including standardisation of measures.*

15.1.4 Other pollution issues

Understanding the effects of oil dispersants and dispersed oil on cetaceans is a gap in our current knowledge. To address this need, the Coastal Response Research Center (CRRC) in the USA has co-ordinated a discussion among scientists with dispersant research expertise, as well as those with Arctic expertise, to determine the state-of-science regarding dispersants or dispersed oil, as it applies to Arctic waters. The Committee looks forward to the publication of the final report.

Attention: CG-A, SC, G

*The Committee **draws attention to** the lack of data the effects of oil dispersants and dispersed oil on cetaceans. It therefore:*

- (1) **encourages** Contracting Governments to support research on the effects of dispersants or dispersed oil to the Arctic and other ecosystems; and
- (2) **requests** that the results of such research be brought forward to future meetings of the Scientific Committee.

15.2 Cumulative effects

The Committee welcomed the summary of the Cumulative Effects Workshop (see Annex K, item 3) and looked forward to receiving the report. Overall, the Workshop found that there is considerable uncertainty in addressing this topic and thus in developing assessments and management advice.

The Scientific Committee also received a report on a workshop entitled ‘Towards understanding the overlap of selected threats and Important Marine Mammal Areas (IMMAs) across the Mediterranean Sea’, which was held jointly by the IUCN Joint Species Survival Commission/World Commission on Protected Areas (SSC/WCPA) Marine Mammal Protected Areas Task Force (the ‘Task Force’) and by the Agreement on Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS). The workshop provided the opportunity to support the ongoing effort to map specific threats to cetaceans in the ACCOBAMS area by overlaying the Mediterranean IMMAs with the available area-explicit information on shipping and seismic surveys, thereby giving preliminary indications of new Cetacean Critical Habitats in the ACCOBAMS area and facilitating the implementation of conservation actions at the regional level.

Attention: SC, G

The Committee **recognises** the importance of understanding cumulative effects of threats on populations of cetaceans, as well as its complexity. It therefore:

- (1) **concurs** with the Cumulative Effects Workshop recommendations (see Annex K, item 3) to improve our knowledge and enable quantitative assessments;
- (2) **highlights** the recommendation that consideration needs to be given to ‘developing a widely applicable approach for providing precautionary advice for populations in which cumulative effects are of concern’;
- (3) **agrees** to establish cumulative effects as a standing item on its agenda;
- (4) **notes** the work on Important Marine Mammal Areas (IMMAs) and **encourages** additional efforts to identify the relevant threats in these, in order assist with the management of cumulative effects;
- (5) **endorses** the results of the recent IUCN/ACCOBAMS workshop entitled ‘Towards understanding the overlap of selected threats and Important Marine Mammal Areas (IMMAs) across the Mediterranean Sea’;
- (6) **encourages** that such an effort – aimed at overlaying different sources of threat and pressure on existing Important Marine Mammal Areas (IMMAs) – be continued and carried out in more detail in the other marine regions where IMMAs have already been identified; and
- (7) **offers** its assistance in such assessments.

15.3 Strandings and mortality events

15.3.1 Update on the IWC Strandings Initiative

The IWC strandings initiative was agreed by the Commission at its 2016 meeting (IWC, 2017d) and details can be found in Annex K (item 4.1). It noted that the rescue and welfare aspects of live strandings will be addressed by the Strandings Initiative but that this aspect is not within the purview of the Committee.

Attention: C-R, S, SC

The Committee **reiterates** the importance of the IWC Strandings Initiative. It therefore:

- (1) **welcomes** the excellent progress that has been made in the Strandings Initiative and the appointment of Sandro Mazzariol (Italy) as the Chair of the Strandings Expert Panel and Karen Stockin (New Zealand) as the Stranding Coordinator;
- (2) **recommends** that the Commission (a) endorses the Strandings Initiative governance structure in Annex K (appendix 2) and (b) endorses the continuation of the Strandings Coordinator position for another two years (until IWC68) subject to available funding and requests the Secretariat make the necessary arrangements;
- (3) **recommends** that the Strandings Initiative Steering Committee and Expert Panel, with the support of the Secretariat, should explore the best ways to gather information on strandings events and what basic data about these events should be recorded, focussing on what is useful for the Committee and the Commission;
- (4) **agrees** that a phased approach to this, starting with an initial pilot project, will assist in this endeavour; and
- (5) **agrees** that criteria for allocating funds for emergency responses should be developed by the Steering Committee and the Expert Panel and should be presented to the Committee at SC/68a.

15.3.2 New information on unusual mortality events

Cetacean morbillivirus continues to be a major disease issue for cetaceans and a cause of unusual mortality events in dolphins in and around the Atlantic. Focus this year was on an outbreak of cetacean morbillivirus in the South Atlantic Ocean (SC/67b/E14) that is discussed in Annex K (item 4.2).

Attention: CG-R, SC

The Committee **commends** the impressive rapid and comprehensive response to the cetacean morbillivirus outbreak in Brazilian Guiana dolphins. It therefore:

- (1) **encourages** further work on the longer-term impact of the outbreak and the investigation of the occurrence and impact of this disease in cetaceans across different geographical areas;
- (2) **draws attention to** the large number of animals that died during the outbreak (particularly mature females) and the historical high levels of human impacts affecting Guiana dolphins in Rio de Janeiro state, such as bycatch, chemical and noise pollution;
- (3) **recommends** that immediate actions should be taken to protect affected populations in order to increase the chances of population recoveries;
- (4) **draws attention to** the increase in Guiana dolphin deaths reported in Sao Paulo and Espirito Santo states in the weeks following the onset of the cetacean morbillivirus outbreak in Rio de Janeiro; and
- (5) **encourages** the monitoring of the virus presence in neighbouring coastal dolphin populations, particularly species and populations in which immunosuppressive conditions or cumulative threats are identified.

15.4 Noise

The Committee welcomed an update on international efforts addressing anthropogenic noise and their impacts on cetaceans, particularly regarding the appropriate assessment and protection of acoustic habitat quality as discussed in Annex K (item 5), and commended IWC engagement with organisations such as IMO and the UN.

Guidelines developed by the Convention on Migratory Species (CMS) Secretariat, also on behalf of the ASCOBANS and ACCOBAMS Secretariats, for Environmental Impact Assessments for noise-generating offshore industries were presented to the Scientific Committee. These guidelines had been endorsed through CMS Resolution 12.14 on Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species, and provide a pathway to implementing the Best Available Techniques (BAT) and Best Environmental Practice (BEP).

The Committee also considered the results of a study utilising modelling approaches to evaluate relative levels of communication masking for four baleen whale species in the Stellwagen Bank National Marine Sanctuary, in Massachusetts Bay, USA Cholewiak *et al.* (In press).

Attention: SC, G, CG-A

Recalling its previous recommendations on noise and the importance of addressing its impacts on cetaceans, the Committee:

- (1) **welcomes** and **draws attention** to the Convention on Migratory Species Family Guidelines on Environmental Impact Assessments for Marine Noise-Generating Activities (<https://www.cms.int/en/guidelines/cms-family-guidelines-EIAs-marine-noise>), noting that these guidelines will help improve global standards for environmental impact assessments;
- (2) **recommends** that levels of anthropogenic noise and its effects on marine species be explicitly considered in the management of marine protected areas;
- (3) **welcomes** the information received on using marine soundscape planning strategies to reduce interference between hydroacoustic instrumentation (e.g. echosounders and airgun arrays) and marine mammals, and **encourages** work to further develop this approach;
- (4) **recognises** the commonalities identified among the concurrent efforts of multiple international bodies to develop national guidance on noise strategies, and **encourages** continuing efforts to identify synergies and develop priorities for actions to reduce exposure of cetaceans to anthropogenic noise;
- (5) **welcomes** the work on modelling cetacean communication space, and **encourages** scientists engaged in the development of modelling techniques that address multiple anthropogenic impacts, such as noise and entanglement in fishing gear to bring these forward to the Scientific Committee;
- (6) **agrees** that a pre-meeting on noise be organised for SC/68b and that an intersessional steering group be convened (Annex Y) to develop the agenda for that pre-meeting.

15.5 State of the Cetacean Environment Report – SOCER

The Scientific Committee **thinks** the editors of the State of the Cetacean Environment Report (SOCER) for their work and commended them on compiling this information on the Mediterranean and Black Seas. Next year's region will be the Atlantic Ocean. The Scientific Committee would welcome input from the members for information on this region. A 5-year global compendium is being produced in cooperation with the Secretariat that will receive a dedicated webpage on the IWC website in time for presentation to the 2018 Commission meeting.

15.6 Update on other standing topics

15.6.1 Marine debris[litter]

The Committee received and discussed a number of papers relating to several aspects of marine debris as discussed under Annex K (item 7.1). Exposure to marine debris and microplastics in cetaceans is now widespread and common. However the impacts on cetacean health and populations is not fully understood.

Attention: C-A, SC

*The Committee **draws attention** to the fact that marine debris remains a threat, and that in particular, exposure to plastics (including microplastics) is a rapidly emerging area of concern. It therefore:*

*(1) **agrees** that an intersessional workshop on Marine Debris should take place, preferably to coincide with the World Conference on the Biology of Marine Mammals in Barcelona in December 2019.*

15.6.2 Climate change

Climate change was highlighted at SC/67a as being an overarching issue that is important to various topics, and that where relevant its impact should be discussed in conjunction with that topic (see discussion in Annex K, item 7.2). Notwithstanding that, the Committee may want to initiate a specific activity related to climate change in future (see intersessional correspondence group in Annex Y).

Attention: C-A, CG-A, SC

*The Committee **draws attention** to the fact that climate change remains a threat that interacts with other threats and stressors impacting cetacean populations.*

15.6.3 Cetacean diseases of concern

Monitoring health and disease agents in large whales in the Arctic is continuing to provide important information on changing patterns in prevalence, environmental status, and potential impacts. In addition, morbillivirus and Brucella continue to be important pathogens causing disease and increased mortality in cetaceans in the Atlantic.

Remote methods for assessing health and condition using visual and aerial photography (e.g. SC/67b/CMP13), is a major rapidly developing field, due to the widespread availability and reduced cost of unmanned aerial vehicles (UAVs). Standardisation efforts (e.g. see Annex S) for measuring body condition using UAVs for photogrammetry, and for collecting blow samples, should progress to ensure this useful tool can provide comparable data across studies, taking into account the differences between the various platforms available. Cross-validation with current methods for assessing body condition from visual health assessments is essential.

Attention: SC

*The Committee **agrees** to hold a focussed session next year (SC/68a) on our current understanding of the pathology and epidemiology of morbillivirus and Brucella and the potential for identifying and understanding the cumulative effects of exposure to other immunosuppressive stressors in cetaceans.*

15.7 Progress on previous recommendations

15.7.1 Pollution

The SC/67a recommendations were to (a) make the effect of contaminants on cetacean populations (SPOC) model available to the public; (b) review mercury in cetaceans; and (c) include new data into the contaminant mapping tool. These have all been completed.

15.7.2 Cumulative effects

As recommended last year, a workshop on understanding the cumulative effects of multiple stressors was held as a pre-meeting to SC/67b.

15.7.3 Diseases of concern

The Committee noted that the content on the Cetacean Diseases of Concern (CDoC) website will now be utilised and merged with the Strandings Initiative for the development of their training and outreach materials.

Whilst the recommended quarterly CDoC updates remain of interest to the Committee, a means of progressing this on a voluntary basis has not yet been identified although efforts to find such assistance are ongoing.

15.7.4 Strandings

The Strandings Initiative has progressed as recommended at SC/67a and a full progress report can be found in Annex K, Appendix 2.

15.7.5 Noise

In response to a previous recommendation, that Committee has received the recently developed seismic survey guidelines by the New Zealand government, a link to the technical working group reports created during the NZ seismic guidelines review is now available (<http://www.doc.govt.nz/our-work/seismic-surveys-code-of-conduct/work-of-the-technical-working-groups/>). However, these guidelines have not yet been discussed by the Committee.

As recommended and noted earlier under Item 15.5, the intersessional group assisted in the development of a summary of the IWC recommendations relevant to shipping noise for presentation to the International Maritime Organization's Marine Environment Protection Committee in 2018.

15.7.6 Thanks

The Committee would like to thank Teri Rowles for her exceptional support and hard work as Chair of the sub-committee on environmental concerns over recent years. Her extensive knowledge, expertise and guidance has been most appreciated and will be missed.

15.8 Workplan 2019-20

The Committee's workplan on environmental concerns is given as Table 20.

Table 20

Work plan for matters related to environmental concerns (for more details see Annex K, Appendix 4).

Item	SC68a	SC68b
Pollution 2020 (including oil spills)	If new information	Primary topic (including oil spills and mercury), summary report to Commission
Cetacean diseases of concern (incl. HAB toxins)	Primary topic	Primary topic
Strandings	If new information	Primary topic
Noise		Noise focus session
Marine litter	Pre-meeting on litter and plastics focus session	If new information
Cumulative impacts	If new information	If new information
Emerging issues	If new information	If new information
SOCER	Receive report	Receive report
Climate change	Over-arching topic	Over-arching topic

16. ECOSYSTEM MODELLING

The report of the Working Group on Ecosystem Modelling is given as Annex L. This group was first convened in 2007 (IWC, 2008b). 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, that 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.

16.1 Cooperation with CCAMLR on multi-species modelling

The Committee has been considering plans for joint workshops with CCAMLR on ecosystem modelling for some time (e.g. see IWC, 2017c, p.56), although this has not yet happened, the Committee remains interested.

Attention: SC

*The Committee **reiterates** its interest in holding joint workshops with CCAMLR. It **agrees**:*

- (1) that a two-year delay in the occurrence of the workshop will provide the opportunity to pursue and complete the relevant work with input from CCAMLR as needed; and*
- (2) that collaboration between SC-IWC/SC CCAMLR should be on going, and that the revised plan for the workshops (IWC, 2018e) be implemented.*

16.2 Applications of species distribution models (SDMs) and ensemble averaging

The Committee had agreed in 2015 to review the application of species distribution modelling (SDM) and associated techniques as they pertain to the goals of the Committee and to develop good practice guidelines and recommendations. While the review has occurred (IWC, 2016b), there has been no significant progress in the intersessional correspondence group set up to develop the guidelines.

Attention: SC

The Committee **reiterates** the importance of developing good practice guidelines and recommendations for species distribution modelling and **agrees** that this should be pursued by an intersessional correspondence group (Annex Y) with a view to reviewing and adopting guidelines within the next biennium.

16.3 MODELLING OF COMPETITION AMONG WHALES

16.3.1 Individual-based energetic models

Enhancements to an individual-based energetics model (IBEM) were presented to the Committee (SC/67b/EM07). These included the explicit modelling of feeding on migration, individual dives and searching for prey schools. Results showed that carrying capacity and productivity were sensitive to the level of food available during migration, making it important that ecosystem models to cover the entire migratory range of the species. This is an important contribution to the determination of species' function response, which can play a pivotal role in ecosystem modelling. This approach is also discussed under Item 5.1.

16.3.2 Modelling of relationship between whales and prey

The Committee reviewed three papers relevant to modelling of the relationships between whales and prey, SC/67b/EM04, SC/67b/EM06 and de la Mare *et al.* (*in press*). The discussion of these can be found in Annex L (item 3.2).

16.3.3 Modelling of competition among baleen whales

The Committee noted that multi-species individual based energetic models (IBEM) such as those described under Items 16.3.1 and 16.3.2 could be used to model direct and indirect competition of different whale species in the same environment, and that relevant modelling work was nearing completion.

16.3.4 Stable isotope analyses

The Committee received preliminary results of the analysis of stable carbon ($\delta^{13}\text{C}$) and nitrogen isotope ratios ($\delta^{15}\text{N}$) on samples from the edge of baleen plates in Antarctic minke whales (SC/67b/SP09). The details can be found in Annex L (item 3.5).

16.4 Standing topics

16.4.1 Effects of long-term environmental variability on whale populations

How long-term environmental variability might affect stock assessments is of particular interest to the Committee. Given the need for a literature review on the subject to facilitate discussions, an intersessional correspondence group (Annex Y) has been established.

16.4.2 Update on body condition analyses for the Antarctic minke whales

For several years, the Committee has been discussing whether there has been a statistically significant (5% level) decline in the blubber thickness and fat weight of Antarctic minke whales over the course of the JARPA surveys. In 2014, the Committee had agreed that there had been such a decline (IWC, 2015b). Since then, scientists from Australia, Japan and Norway have presented a series of models both supporting and challenging this conclusion. There has been collaboration over this period and significant development in the types of models used. In addition, there have been in-depth discussions regarding the proper handling of data, the explanatory variables to be included in the analysis and the appropriateness of various statistical methods.

New analyses were presented this year and detailed discussions can be found in Annex L, item 2. This year the debate focused on three points; (1) the use of a new variable of primary interest (the 'accumulated blubber thickness in each feeding season); (2) the use of FIC and (3) the appropriate handling of the data.

Attention: SC, G

The Committee has been discussing whether there has been a statistically significant (5% level) decline in the blubber thickness and fat weight of Antarctic minke whales over the course of the JARPA surveys for several years. In conclusion, the Committee **agrees**:

- (1) that, for the data set considered as a whole, all approaches result in point estimates reflecting a decline when fit to a linear trend in time;
- (2) however, the extent of the decline estimated differs amongst the methods, and is not statistically significant at the 5% level for all approaches;
- (3) for some approaches, when the data are disaggregated by gender and/or area, some point estimates of trend are not negative;
- (4) there are some indications of temporal variation that is more complex than linear.

In addition, the Committee:

- (1) **encourages** the authors to publish the results of their study in peer-reviewed journals; and
- (2) **agrees** that this matter will not be considered during the forthcoming biennium.

In discussion of the above, Norwegian scientists stated that since an error in parts of the Australian scientists' calculations has recently been acknowledged by them, and parts of the Australian scientists' conclusion and appendix had recently been withdrawn, the overall position regarding the blubber thickness and fat weight analyses now became as follows. There are no new analyses from the Australian scientists on the five response variables which have been considered and discussed in the Committee from 2011 to 2017. The results presented this year by the Norwegian scientists (SC/67b/EM02), which took into account some of the queries from the Australian scientists from last year, confirmed results presented by the Norwegian scientists earlier. Thus, the conclusions by the Committee in 2014 and 2017 on these variables remain valid. For this meeting the Australian scientists had presented analyses related to a new difficult dependent variable 'increase in blubber thickness during summer feeding in Antarctic waters' estimated from the blubber thickness at position BT11. The conclusion above about variables with a non-significant decline now pertains to the new variables only (points (2) and (3) above). The Norwegian scientists' position is that the conclusion drawn above was heavily influenced by the results of the calculations subsequently withdrawn, so that parts of those conclusion are no longer valid.

In response, the Australian scientists stated that results of some calculations carried out earlier were withdrawn because of a previously unidentified problem with a standard statistical package failing to converge on a solution without giving an error message. Subsequent collaborative checking with the Norwegian scientists led to the discovery of this problem. Withdrawing this calculation (which the Australian scientists had carried out to illustrate a property of the Norwegian scientists' methods) had no effect on the main results which the Australian scientists had presented in SC/67b/EM03. Nor did this retraction affect the results of analyses the Australian scientists had presented in 2017 showing non-significant trends in fat weight and blubber thickness (De La Mare *et al.*, 2017a; 2017b). The Australian scientists held the view that the assertion by the Norwegian scientists that "There are no new analyses from the Australian scientists on the five response variables which have been considered and discussed in the SC from 2011 to 2017" was not correct; the Australian scientists had provided full results of fitting models to BT11 in SC/67b/EM03. The main results in SC/67b/EM03 were based on differences between early- and late-season predictions from models with BT11 as the dependent variable. This difference was a simple measure of feeding in Antarctica. The earlier conclusion should not be materially affected by withdrawing the Australian scientists' compromised demonstration in relation to the Norwegian scientists' methods.

16.4.3 Review the information on krill distribution and abundance by NEWREP-A

The Committee received the results of the krill and oceanographic surveys during the third NEWREP-A survey in Area V-E and VI-W (SC/67b/EM05). Discussion of this information can be found in Annex L (item 6.1).

16.4.4 Ecosystem functioning

Resolution 2016-3 tasked the Committee with investigating the contribution of cetaceans to ecosystem functions. Last year, the Committee noted that its focus would be on scientific aspects of the issue and it established an intersessional correspondence group to progress this work. Progress made by that group, including development of a final terms of reference, can be found in Annex L, item 6.2. The Committee notes that the Conservation Committee will focus on the conservation and social science aspects of this issue.

It was noted that there is broad interest in understanding the role of cetaceans in ecosystem functions, and that the Committee's expertise relates to the scientific aspects of the issue. Given the broad international interest, it is suggested that the Committee work in collaboration with interested parties (e.g. CMS, CCAMLR, SCAR and SCOR) to share information and avoid the duplication of work.

C-A, CC, SC

*Commission Resolution 2016-3 tasked the Committee with investigating the contribution of cetaceans to ecosystem functions. The Committee notes that the Conservation Committee will focus on the conservation and social science aspects of this issue. In responding to the Resolution 2016-3, the Committee **advises** the Commission that with respect to the scientific aspects on the contribution of cetaceans to ecosystem functioning:*

- (1) it is unlikely that the ultimate goal of reliably determining the contribution of cetaceans to ecosystem functioning could be achieved in under a decade, given the complexity of the issue and the data gaps; and*
- (2) a more immediate and achievable goal is the carrying out of a gap analysis to identify knowledge gaps and to develop a plan to address them.*

*To further this work, the Committee **agrees**:*

- (1) to hold a workshop to (a) define short- and medium-term objectives to be addressed and (b) to identify what further research is required in order to begin initial modelling of the contribution of cetaceans to ecosystem function; and*
- (2) that the Secretariat in conjunction with the Steering Group (Annex Y) should contact CMS to determine their interest in participating in such a workshop.*

16.6 Workplan 2019-20

The Committee's work plan on ecosystem modelling is provided in Table 21.

Japan referred to its statement on the adoption of the Agenda (Annex Z) and considered that several of the items for the proposed workshop (Item 16.4.4 and Item (7) in Table 1) are outside the competence of IWC. Therefore, it cannot support the proposed workshop or associated funding from the Committee's budget.

Table 21

Summary of the two-year work plan on matters related to ecosystem modelling

Item	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting (SC/68b)
(1) Ecosystem modelling in the Antarctic Ocean	Continue further analyses.	Review results of further analyses	Continue further analyses.	Review results of further analyses
(2) Application of species distribution models (SDMs)	Intersessional group activity (Annex Y)	Review progress		
(3) Effect of long-term environmental variability on whale populations	Continue further analyses. Intersessional group activity (Annex Y)	Review results of further analyses. Review progress	Continue further analyses	Review results of further analyses
(4) Further investigation of individual-based energetic models	Continue further analyses	Review results of further analyses	Continue further analyses	Review results of further analyses
(5) Modelling of competition among whales	Continue further analyses	Review results of further analyses	Continue further analyses	Review results of further analyses
(6) Update of any exercises on krill distribution and abundance	Conduct NEWREP-A krill survey and an international cooperative krill survey. Conduct simulation analyses to resolve issues on survey design.	Review results of survey and analyses.	Conduct NEWREP-A krill survey. Conduct analysis of data taken by the international survey.	Review results of survey and analyses.
(7) Cetaceans & Ecosystem Functioning: a gap analysis workshop or pre-meeting	Review relevant scientific studies before the workshop in addition to preparation of workshop (Annex Y).	Review outcomes of workshop and develop clear work plans with priorities.	Continue analyses	Review results of analyses.

17. SMALL CETACEANS

The report of the Committee on Small Cetaceans is given as Annex M.

17.1 Overview of taxonomy, distribution and abundance for *Inia* and *Sotalia*

In this assessment, two species and two sub species of dolphins were considered, some of which have several common names. In addition, a new species has been proposed but has not yet been recognised (Table 22).

Table 22

Summary of names used in the description of *Inia* and *Sotalia*

Scientific name	Common Name
<i>Inia geoffrensis</i>	boto, Amazon River dolphin
<i>I. g. boliviensis</i>	Bolivian bufeo
<i>I. g. geoffrensis</i>	Common boto
<i>I. araguaensis</i>	Araguaian boto
(proposed species)	(from the Tocantins and Araguaia basins)
<i>Sotalia fluviatilis</i>	tucuxi, delphin gris, bufeo negro
<i>Sotalia guianensis</i>	Guiana Dolphin

The river and estuarine dolphins of South America are subject to various threats from habitat degradation, competition with fisheries, bycatch and direct exploitation. A major threat to river dolphins in South America is population fragmentation, altered habitat productivity and regulation of natural river flow as a result of dam construction. The cumulative impacts from this type of infrastructure at the macrobasin scale exacerbate the threats to river dolphins and their habitat in the Amazon and Orinoco basins. It was estimated that more than 50% of the range of Araguaian *Inia* is affected by damming.

Two genera were discussed in depth, *Inia* and *Sotalia*, from the vast and convoluted systems within the Amazon, Orinoco, Tocantins and Araguaia River basins. In the case of *Sotalia*, two species are recognised: *Sotalia guianensis* (marine) and *Sotalia fluviatilis*, (freshwater) in the Amazon basin. *S. guianensis* in the Orinoco basin likely represents an independent population unit as it is isolated from other coastal populations. Two intersessional workshops have been proposed that aim to elucidate the status of *S. guianensis* and it is that divisions within this genus will be clearer on the completion of this work in 2020. The taxonomy of *Inia* has a complex history and at this time, one species and two sub species are

recognised: *Inia geoffrensis*, the Amazon river dolphin, *I. g. boliviensis*, the Bolivian bufeo, and *I. g. geoffrensis*, the common boto. There is a third putative subspecies, *I. g. humboldtiana*, in the Orinoco basin of Venezuela and Colombia. The information currently available suggests that *I. g. boliviensis* should be elevated to species level and that *I. g. humboldtiana* should be recognised. Another new species, *I. araguaensis*, has been proposed for the dolphins that inhabit the Tocantins and Araguaia basins of central Brazil as this area is geologically and hydrologically separate from the Amazon basin.

Attention: SC, G

Given the incomplete resolution of Inia taxonomy, the importance of clarifying and solidifying recognition (or elevation to species) of the Inia subspecies found in different river basins, the possibility that in such complex habitats localised specialisation is likely, and the need to focus attention on the conservation of demographically independent populations, the Committee encourages support for efforts to resolve Inia spp. taxonomy in light of the significant and diverse threats affecting the populations inhabiting the Amazon-Orinoco-Tocantins/Araguaia drainages.

17.1.1 Inia

For *Inia*, there are estimates of abundance for some rivers, however, there is little information on population trends. It was suggested that new technologies, such as Unmanned Aerial Vehicles (UAV), may help to better refine population survey techniques. From telemetry studies and two long term studies some information on population parameters is available. In particular, the Committee commends an ongoing telemetry study as it begins to address some of the most important scientific questions concerning *Inia* ecology, habitat use, behaviour and, particularly movements.

In addition, and central to IUCN assessments, a generation time for *Inia* has been calculated as 24.8 years from a long-term mark and recapture study. Given the estimated rate of population decline, this equates to a loss of 82% per generation and in excess of 99% over three generations. Such values are well above the threshold for a Red List assessment of a species as Critically Endangered. Concern was also expressed at the high rate of mortality of <1 year calves in one study site, where examined carcasses show evidence of both deliberate killing and net entanglement.

The information presented on population parameters were based on direct observations in a very small geographic area of the Amazon and therefore, a very small proportion of the total range of *I. geoffrensis*. As such, extrapolation to the whole region would be unwarranted, nonetheless these results and their implications for population decline are alarming.

Attention: CG-A, G

The Committee draws attention to declines in Inia numbers documented in two study areas and the lack of abundance surveys in most parts of its range. The Committee therefore encourages the collection of data, calculation of abundance estimates and undertaking of analyses to estimate population trends for Inia throughout its range, for use in assessments of the status of the species, subspecies, and regionally isolated populations.

17.1.2 Sotalia

Sotalia fluviatilis, known as tucuxi (Brazil) delphín gris (Colombia) or bufeo negro (Peru and Ecuador) is restricted to the Amazon basin in Ecuador, Peru, Colombia and Brazil and has a more limited distribution than *Inia*. *Sotalia guianensis*, the Guiana dolphin, occurs mainly in nearshore and estuarine waters of the Atlantic from southern Brazil, along the coast of Central America, to Nicaragua and possibly Honduras. Small populations in Lake Maracaibo and in the lower reaches of the Orinoco River, Venezuela, were highlighted as being heavily impacted.

In the Mamirauá Reserve, Brazil, the population of *S. fluviatilis*, has shown a precipitous decline in abundance over a 22-year study period. Using the average observed decline of 7.4% per year, and, from literature, a generation time estimate of 15.6 years, the Mamirauá population trend equates to a 97% reduction over 3 generations, qualifying this population as Critically Endangered under IUCN Red List criteria. Unlike *Inia*, which is heavily exploited for use as bait in the piractananga fishery, the primary driver of the decline in *Sotalia* in this region is gillnet entanglement.

17.1.3 Threats shared by dolphins in the Amazon and Orinoco River systems and Lake Maracaibo

Throughout the range of both genera, illegal hunting was highlighted as a transnational problem, making it difficult to create and enforce effective conservation measures. This issue is severe for *Inia* throughout its range and, for *Sotalia* in the Orinoco River and particularly in Lake Maracaibo, Venezuela.

Attention: C-A, G, CC

The Committee draws attention to the serious situation reported for Lake Maracaibo in Venezuela, where both directed takes and oil pollution are thought to be having serious impacts on populations of S. guianensis. The Committee therefore recommends that NGOs and researchers focus on documenting the threats to Sotalia and work with local communities to mitigate the impacts on these dolphin populations.

In addition to direct exploitation, there are numerous other threats to both species throughout their habitat in South America: the recent increase in deforestation affects their prey species, as there is no deposition of seeds and fruits into the rivers to support productivity and sustain fish stocks; hydropower developments and channel dredging affects flows regimes, the connectivity of rivers, the migrations of fish and can fragment dolphin populations, as has already occurred in the Tocantins River basin; heavy metals, such as mercury, have been measured in high concentrations in dolphin tissues; negative interactions with fisheries, in addition to directed takes for use as bait and food, also include bycatch, deliberate poisoning and 'control' killing.

Attention: CG-A, G, CC

The Committee **draws attention to** the multiple threats associated with development, habitat degradation and fragmentation, and pollutants facing river dolphins in the Amazon, Orinoco and Tocantins basins. It therefore:

- (1) **advises** the Brazilian, Bolivian and Peruvian Governments, as they carry out their reviews of proposed construction of new dams for hydroelectric energy production, to explicitly consider the potential impacts on river dolphins (e.g. isolation, loss of genetic diversity, habitat degradation);
- (2) **discourages** water pumping in the Araguaia-Tocantins river basin for agricultural use as such a practice causes dramatic decreases in water levels in rivers, thereby increasing the probability that dolphin populations will be extirpated;
- (3) **encourages** range states of the Amazon basin and its tributaries to support and carry out baseline research into the impacts of the development of commercial waterways in the Amazon (hydrovias) and their potential impacts on dolphin populations and habitats, including but not limited to the ecological impacts of dredging, noise pollution, channelisation by embankments, altered sediment suspension and transfer, and changes in turbidity, light, oxygen availability and primary productivity, and (b) work to minimize or at least mitigate these impacts;
- (4) **encourages** (a) a review of the status of dolphins trapped within dammed stretches of the Tocantins and Madeira rivers and (b) evaluation of possible relocation (translocation) of animals when environmental conditions create a high likelihood that they cannot continue to survive in this severely compromised habitat; and
- (5) **encourages** the review of the effects and the scale of contaminant and heavy metal (e.g. mercury) pollution on river dolphins in key areas of the Amazon (Japura/Caquetá, Içá/Putumayo, in Brazil and Colombia) and Orinoco (Venezuela) basins.

17.2 *Tursiops* populations occurring in estuarine areas in southern Brazil

Discussion focused on two populations of Lahille's bottlenose dolphins (*Tursiops truncatus gephyreus*) in Patos Lagoon Estuary (PLE) and Laguna (LGN), Brazil. Both have been the focus of long-term ecological studies that provide a good source of information on the conservation status of the subspecies. Mark-recapture studies indicate year-round residency and permanent emigration is unlikely. Population sizes are small (85 dolphins in PLE and 60 in LGN) with low to moderate genetic diversity (mtDNA and nuclear DNA variation) in both areas. Pollutant analyses indicated moderate levels of persistent organic pollutants (POPs). Of additional concern is a chronic dermal infection which is apparent in 14% of the LGN population, which may be related to pollution but this is not clear. The greatest threat to both populations is bycatch in artisanal gillnet fisheries. Whilst there is no clear evidence of a negative trend in abundance, there is a high probability of population decline in the near future, given the small population, the high degree of residency and the continuing mortality as a consequence of IUU (illegal, unreported, unregulated) fishing and other human activities in these areas.

In Santa Catarina, Paraná, and São Paulo provinces, Brazil, north of LGN and PLE, a total of 119 bottlenose dolphins (sub species unknown) and 442 Guiana dolphins were recorded stranded over 2 years. There was strong evidence that entanglement was indicated as the cause of death for bottlenose dolphins. The Committee was informed that the Brazilian Government is looking into this issue and is seeking ways to improve legislative effectiveness in protecting dolphins and other threatened species in these locations.

Attention: SC, CG-R

The Committee **draws the attention of** the range states (Argentina, Brazil, Uruguay) to its conservation concerns over the entire sub-species of Lahille's bottlenose dolphins (*T. t. gephyreus*) given their relatively small population sizes and constricted ranges, the high levels of bycatch and the high incidence of individuals with chronic dermatitis. The Committee therefore recommends:

- (1) immediate action to reduce the level of bycatch in the southern Brazil populations;
- (2) continued monitoring and photo-identification work on the populations throughout the subspecies' range to refine survival estimates and to assess trends in abundance and the prevalence and etiology of the chronic skin infections; and
- (3) that the conservation status of the subspecies be prioritised for assessment in the future.

17.4 Franciscana CMP

In 2016, the IWC created a Conservation Management Plan (CMP) for the franciscana – see Item 10.1.4. In 2019, a review will be presented to the Committee. The review will be jointly conducted by the SM and CMP sub-committees and will include input from other relevant sub-committees.

17.5 Report of the 2018 *Tursiops* Taxonomy Workshop

In 2014 (IWC, 2015b) it was agreed that the Committee would undertake a review of taxonomy and population structure in the genus *Tursiops*, over several meetings. Understanding whether there is any consistency in the derivation of various local forms across the range, and to which taxonomic or population unit(s) they belong, has been challenging, and the taxonomy of the various forms is still unresolved. An additional aim of this exercise was to develop a widely applicable taxonomy assessment framework for small cetaceans. The review process concluded with an intersessional workshop, held in La Jolla in January 2018.

The 3-year review and workshop brought together researchers and experts from around the world to discuss this topic, motivated focussed research, and promoted new collaborations. Results from studies presented at previous meetings (2015-2017) and at the workshop itself were compiled and formed the basis for evaluation of taxonomic and population distinction issues in each geographic region.

Attention: SC, G

*Having reviewed the extensive information included in the 2015-2017 review and 2018 workshop for evaluation of *Tursiops* species, subspecies and population distinctions, the Committee **draws attention to** the need for *Tursiops* research in the areas identified as data deficient (the African coast of the eastern Atlantic, southern and eastern Mediterranean Sea, eastern South Pacific, Pacific coast north of California and off the Mexican mainland, Central American coast of the eastern North Pacific, Central American Atlantic and Caribbean Sea and Atlantic coast of northern and north-eastern Brazil, eastern Australia and in the western Pacific the islands of Micronesia, Melanesia, Polynesia, the Philippines and Vietnam). The Committee therefore **encourages**:*

- (1) collection of additional data, including morphometrics, and high-resolution genetic analyses (e.g. ddRAD which may also be useful in other areas where there are similar questions requiring high-resolution analysis), to better characterise divergence between coastal and offshore forms in the western South Atlantic Ocean, to help confirm whether subspecies or species classification is more appropriate for *T. t. gephyreus*;*
- (2) further investigation of *T. aduncus* lineages in the Indian Ocean and western South Pacific to assess potential subspecies recognition, extending the geographic coverage to include eastern Africa, the region between Pakistan and Indonesia, and the region between Australia and China;*
- (3) continued study of the genetics and morphology of southern Australia bottlenose dolphins with the "*T. australis*" mtDNA lineage, in the context of both *T. truncatus* and *T. aduncus*;*
- (4) examination of the level of male-mediated gene flow between the coastal and offshore forms in the western North Atlantic to determine whether the coastal form should be elevated to species or subspecies status;*
- (5) more comprehensive morphometric analyses comparing *T. truncatus* in the Mediterranean, Black Sea, and eastern Atlantic to integrate with genetic data and evaluate whether any regions in addition to the Black Sea (*T. t. ponticus*) harbour a taxonomic unit above the level of population;*
- (6) comprehensive morphometric analyses of coastal and offshore *T. truncatus* in the eastern North Atlantic and comparison to those from the western North Atlantic to better evaluate potential regional differences;*
- (7) morphometric analyses of Gulf of California coastal and offshore dolphins relative to those from California and the eastern tropical Pacific, with a particular focus on the level of divergence of coastal dolphins in the upper Gulf of California to other areas; and*
- (8) the collection of additional genetic and morphological data throughout the eastern South Pacific and further studies to investigate coastal versus offshore forms throughout the region, including coastal and offshore waters from Central America to Mexico, and if possible around the southern tip of South America to Argentina.*

*The Committee also **agrees** to continue compilation of specimen, study, and researcher details, and concentrated effort to improve our understanding of *Tursiops* in data-deficient areas.*

*Finally, after reviewing the 2018 *Tursiops* Taxonomy Workshop's evaluation of the support provided for taxonomic (subspecies, species) and population-level distinctions proposed in the publications reviewed, the subcommittee **concludes** that:*

- (1) the current taxonomy provided for *Tursiops* by the Society for Marine Mammalogy's Committee on Taxonomy is well supported by morphological and molecular genetic data, as well as ecological and distributional data; and*
- (2) discordance in currently available results from morphometric analyses and across different genetic markers of the recently described '*T. australis*' from southern Australia calls into question its validity at this time.*

In addition to the information and recommendations on *Tursiops*, the Committee noted that the review provided an opportunity to formulate some generic conclusions on taxonomic issues related to small cetaceans.

Attention: SC, G

After reviewing the development and use of a strategy for objective evaluation of species, subspecies, and population-level distinctions by the 2018 Tursiops Taxonomy Workshop, the Committee:

- (1) **agrees** with the strategy implemented at the workshop for the evaluation of species, subspecies and population level distinctions;
- (2) **encourages** use of the criteria and guidelines in Reeves et al. (2004) for the assessment of species-level taxonomy, in Taylor et al. (2017) for subspecies-level taxonomy, and in Martien et al. (2015) for Demographically Independent Populations; and
- (3) **concludes** that future taxonomic questions should be examined within an appropriately wide and inclusive geographic context and that multiple lines of evidence are necessary when positing taxonomic changes.

The Committee applauded Natoli, Rosel and Cipriano for their considerable work and organisational skills during this effort.

17.6 Poorly documented takes for food, bait or cash and changing pattern of use

17.6.1 Intersessional Workshop on the use of Small Cetaceans for Food and Non-Food Purposes in South America

The poorly documented take of small cetaceans for use as wildmeat has been assigned as a priority topic. An ICG (and see Annex Y) has been tasked with the development of a toolbox of techniques that could guide and co-ordinate research into this topic, and as such a series of workshops were proposed to fulfil this task. The second of these workshops focused on South America and incorporated a detailed review of the use of Amazon river dolphins as bait in the piracatinga fishery, which, in turn, fed into the priority topic of the 2018 meeting.

Information was summarised for all countries, except Guyana and Suriname, and it was recognised that products from small cetaceans have been used throughout the region for both food and non-food purposes. This type of use is referred to as 'aquatic wildmeat'. The usefulness of various tools and techniques was discussed, including data gathering techniques and forensic investigation. A database, comprising more than 3000 references, was used to map existing knowledge and understand data gaps. A framework was also established that had the purpose of standardised future data collection. The workshop participants populated a database from which regional patterns were mapped. Areas that were highlighted as a cause of conservation concern were; Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Peru and Venezuela.

The take of Amazon river dolphins as bait in the piracatinga fishery was also reviewed. All range countries of *Inia* and *Sotalia* have laws in place to protect dolphins and prohibit intentional killing. Fishing for piracatinga is banned in Brazil and its trade is prohibited in Colombia, due to its impact on river dolphins and other wildlife. The practice of using dolphins as bait has recently expanded to Peru, Bolivia and Venezuela, following the imposition of restrictions in Brazil, however, no other range country has developed specific legislative or regulatory action, beyond the general protection of river dolphins, in response to the emergence of this practice.

The workshop concluded that some species and population required urgent attention both due to the extent of their use as wildmeat and from other threats.

17.6.1.1 SCIENTIFIC CONCLUSIONS AND RECOMMENDATIONS

Attention: SC, G, CG-A

*The Committee **endorses** the scientific conclusions and recommendations from the recent intersessional workshop on the use of Small Cetaceans for Food and Non-Food Purposes in South America aimed at improving regional knowledge and conservation research. In particular, the Committee:*

- (1) **agrees** that potential divisions within the genus *Inia* should be evaluated and genetic conservation units established;
- (2) **agrees** that an evaluation of historical data on river dolphins should be undertaken to better understand other threats (e.g., from bycatch), to provide further insights into current trends;
- (3) **encourages** the use of new technologies, such as drones and satellite telemetry, to establish trends, habitat use and dispersion patterns of *Inia* within Amazon River Basin and
- (4) **encourages** new efforts to improve regional research capacity.

*The Committee **draws attention** to the evidence showing that several small cetacean species and/or populations are being negatively impacted by their use as wildmeat in South America, and therefore **recommends** that abundance and distribution surveys, in tandem with investigation into the magnitude of aquatic wildmeat use, be conducted on these species. Appropriate survey designs should be implemented that consider the statistical power required to detect trends and the resultant data should then be used to estimate the impact of deliberate take for wildmeat on the following populations:*

- (1) Boto in Purus and Japurá rivers, Brazil, and Içá/Putumayo river in both Brazil and Colombia, using previously established standardised methods (studies should also be expanded into other areas where take for bait may be a cause for concern);
- (2) Chilean dolphin in Chile;
- (3) Burmeister's porpoises in both Chile and Peru, noting that current evidence suggests that the Peruvian population is distinct;
- (4) Dusky dolphins in Peru, noting that evidence shows that landings of this species has decreased and populations may have been heavily impacted;
- (5) Guiana dolphins and other small cetaceans in Amapá, Pará, Maranhão, Piauí, Ceará, Espírito Santo, São Paulo and Paraná, in Brazil, where there is a documented use of bycatch for wildmeat purposes;
- (6) Bottlenose dolphins and pantropical spotted dolphins in Bahia Solano, Colombia, noting that deliberate takes for a long line fishery is ongoing;
- (7) Tucuxi throughout its range, in Brazil, Colombia, Ecuador, as it shares most of the same threats as *Inia geoffrensis*, and may also be used as bait in the piracatinga fishery; and
- (8) Guiana dolphin (*Sotalia guianensis*) in Lake Maracaibo in Venezuela, noting that deliberate take for food is ongoing.

The Committee also **draws attention to** the Boto dolphins that have been isolated within the dam system of the Tocantins and Maderia Rivers in Brazil. Given the confined condition of the dolphins' habitat, the Committee **agrees** that the status of these dolphins be evaluated, to include abundance, genetic, habitat, prey availability assessments, with a view to developing a translocation protocol, including under what circumstances such a protocol should be enacted.

Finally, given the concerns over the extensive habitat modification that will result from the Mega Project 'Arco Minero del Orinoco', a large scale mining operation proposed along the river and watershed of Venezuela, the Committee **recommends** that population sizes and trends of both *Inia geoffrensis* and *Sotalia guianensis*, in the Orinoco River basin, be monitored before and during this project.

17.6.1.2 CONSERVATION AND MANAGEMENT ISSUES

Attention: CG-R, S, CC

The Committee **draws attention to** the management recommendations within the Report of the Workshop on the Use of Small Cetaceans for Food and Non-Food Purposes in South America, in particular, the need to have a regionally co-ordinated fisheries management plan for the Amazon River basin and a regional strategy for the conservation of river dolphins. Given continued concern over the use of dolphins as bait in the piracatinga fishery, the Committee:

- (1) **commends** the Government of Brazil on its swift action in declaring a moratorium on the piracatinga fishery and respectfully requests that it maintains the moratorium to allow sufficient time to evaluate the effectiveness of protective measures and ensure the necessary protection of river dolphins;
- (2) **reiterates** previous recommendation of the IWC Scientific Committee that range states (Bolivia, Brazil, Colombia, Peru and Venezuela) engage in a co-ordinated effort to strengthen legislative, enforcement, management and scientific efforts to ensure protection of the Amazon River dolphins;
- (3) **encourages** range state authorities to work together and exchange information on the movement of piracatinga products across international borders; and
- (4) **requests** that progress reports be submitted to the Scientific and Conservation Committees.
- (5) **recommends** that the Commission asks the IWC Secretariat to send a letter to the Buenos Aires Group highlighting the issue of dolphins being used as bait in the piracatinga fishery and requesting joint efforts to enhance enforcement on wildlife and trade laws.

17.6.2 Wildmeat Database

In 2016 (IWC, 2017) an intersessional group was established to work with the IWC Global Database Repositories Convenor, to develop an overarching aim for any future cetacean wildmeat database and identify the specific questions that such a database might address. The results of this work were presented, including a research agenda the formulation of key questions that could be addressed through the development and analysis of an aquatic wildmeat database. The Aquatic Wildmeat Database, developed independently of the IWC, was presented again and the Committee was updated on its improvements made following suggestions made last year. The future value of this data repository was highlighted and this and related issues will be considered intersessionally (see Annex Y).

The work of the Steering Group (see Annex Y) will continue and a third workshop, focusing on Africa, will be conducted intersessionally. The framework for an IWC Wildmeat database established at the workshop in South America will be further refined and will be used at the forthcoming workshop.

17.7 Small cetacean task team

The Scientific Committee continues to support the Task Team Initiative and the latest Task Team, for the South Asia River Dolphin, is in the process of being established with Dipani Sutaria and Nachiket Kelkar nominated as co-conveners. The task team currently comprises 14 members with representation from Bangladesh, India, Nepal and Cambodia and includes university associated researchers and NGOs (WWF and the Wildlife Institute of India).

*Under its Task Team Initiative (e.g. IWC, 2016), the Committee **strongly supports** the work of a Task Team for the South Asia River Dolphin and **agrees** that its first meeting which will occur before the 2019 meeting, if sufficient funding is available.*

17.8 Progress on previous recommendations

17.8.1 Vaquita

The Report of the Tenth Meeting of the International Recovery Team for Vaquita (CIRVA-10) was summarised and the results of the acoustic monitoring program for vaquitas were presented (SC/67b/SM01). This shows a continued decline in vaquita detections with no change in the trend since the last report in 2016. A brief review of the VaquitaCPR project was presented. This initiative, conducted in October and November 2017, aimed to capture vaquitas and bring them into human care. Ninety experts from nine countries were involved, including researchers experienced in the capture and handling of harbour porpoises, animal care professional, and veterinarians. Two vaquitas were successfully captured (an immature female [V01F] and an adult female [V02F]). In both cases, medical and behavioural evaluations were conducted to determine the suitability of the animals for transport to the floating pen or shore-based facility. Through the whole process the animals' health was continuously monitored by a team of experienced marine mammal veterinarians. The first vaquita caught (V01F) was in good condition initially, but did not acclimate to either the vaquita care centre pool or to the sea-pen facility, and the vaquita was released. V02F was also considered to be in good condition for transport to the sea-pen, however, after initially showing signs of adapting to the facility, the animal stopped swimming and an emergency release was initiated. The release was unsuccessful and the vaquita was quickly recaptured for administration of emergency care. Following three hours of emergency response, the animal went into cardiac arrest and did not respond to resuscitation attempts. Analyses of tissues and material obtained from VH02 is ongoing and a full report on VaquitaCPR will be reported at SC68A.

The survival of the vaquita depends on gillnet-free habitat and efforts to remove gillnets, both derelict and active, have increased dramatically in the last three years, particularly, during the ongoing 2017-18 totoaba season. The net removal programme demonstrates that illegal totoaba gillnets are still routinely set in great numbers in vaquita habitat. Despite enhanced enforcement efforts, there is a continued failure to prevent illegal fishing. CIRVA have stated that immediate action is needed to improve the situation through implementation of a series of recommendations. In particular, CIRVA recommended that the Government of Mexico establish an enhanced enforcement area, extending the boundaries of the existing vaquita refuge.

Attention: SC, CC, CG-R

The Committee has stressed for many years that the vaquita population is at a critically low level, and the most recent evidence demonstrates that the cause of the decline – use of illegal large-mesh gillnets – continues, making extinction in the wild increasingly likely; *the long-term decline in the vaquita reported previously has continued in 2017*. The Committee yet again **re-emphasises the serious concerns** it has raised on the status of the vaquita, and in particular its recommendations of the past two Committee meetings. Whilst again **commending** the Government of Mexico for its attention and response to the CIRVA findings and recommendations, the Committee:

*(1) respectfully **requests** that reports continue to be provided annually to the IWC Scientific Committee on actions and progress towards saving the vaquita;*

*(2) **strongly endorses** the recommendations of CIRVA10 that:*

(a) the CIRVA10 acoustic monitoring programme, critical for evaluating the effectiveness of conservation actions, be continued as in previous years to provide an annual empirical estimate of population trend;

(b) all Mexican enforcement agencies increase their efforts on land and in water immediately and continue this enhanced enforcement programme for the duration of the period of illegal totoaba fishing (at least until June 2018) to eliminate all setting of gillnets in the range of the vaquita;

(c) emergency regulations be promulgated immediately to strengthen the current gillnet ban and enhance enforcement and prosecution by:

- (i) eliminating all fishing permits for transient fishermen and limiting fishing access to only those fishermen who can demonstrate residency in the fishing villages;*
- (ii) confiscating any vessel that does not have the appropriate vessel identification, permits, and the required vessel monitoring system;*
- (iii) requiring vessel inspection for each fishing trip at the point of departure and landing;*
- (iv) prohibiting the sale or possession of gillnets on land and at sea within the area of the current gillnet ban and on adjacent lands within a specified distance of the coastline.*
- (v) requiring that all gillnets be surrendered or confiscated and destroyed.*

- (vi) *eliminating the exemptions for all gillnet fisheries, including the curvina and sierra fisheries.*
- (d) *efforts to remove gillnets from vaquita habitat be continued and enhanced and the numbers and locations of new nets recovered be published monthly;*
- (e) *the number of inspections, interdictions, arrests, sentences, and other enforcement actions be published monthly, together with information on observed levels of illegal activities obtained from intelligence operations, for example from drones;*
- (f) *successful prosecution and subsequent penalties be sufficient to deter illegal fishing; and*
- (g) *development of gillnet-free fisheries be enhanced and linkages to incentivise the conversion of the fleet to gillnet-free operations be strengthened.*

17.8.2 Yangtze finless porpoise

A rangewide survey of Yangtze finless porpoises (*Neophocaena asiaeorientalis asiaeorientalis*) was conducted in 2017, giving a preliminary abundance of around 1,000 individuals. This indicates that the rapid decline observed between 2006 and 2012 has now slowed, and that numbers may even be increasing in some areas. Nevertheless, the Critically Endangered status of this species remains unchanged. The survey results were encouraging and regarded as a possible indication that *in situ* conservation of Yangtze finless porpoises is feasible, given the marked increase of the number of individuals in Dongting and Poyang Lakes. For the population to make a sustained recovery in both numbers and range, current measures directed towards improving the habitat in the Yangtze River as well as the Dongting and Poyang Lakes must be continued and expanded. The Government of China was commended for the efforts undertaken to improve the YFP habitat. Nevertheless, concern remain over threats such as vessel strikes, bycatch, underwater noise and bridge construction. In addition, the planned construction of a dam across the channel connecting Poyang Lake to the river is an additional concern.

Attention: SC, CG-R

Given the extensive and pervasive nature of the threats facing the Yangtze finless porpoise population, the Committee:

- (1) **commends** the efforts of the Government of China to improve its habitat; and
- (2) **reiterates** that the primary conservation actions should focus on (a) restoring and maintaining suitable habitat throughout the Yangtze River and associated lakes, including the maintenance of a network of *in situ* reserves and (b) ensuring that genetic diversity is preserved and that harmful human activities are limited.

17.8.3 Maui Dolphin

The Government of New Zealand reported that its review of management measures is scheduled for later this year. An update was provided on observer coverage of the set net fishery in Taranaki and the trawl fisheries adjacent to existing closure areas (95.5%, and 88.3%, respectively). Outside of this target coverage area, an additional 114 trawl fishing days were observed. No captures of Māui dolphins were reported by observers or fishermen in commercial fisheries in the 12-month reporting period to 31 March 2018. A species-specific, spatially explicit, multi-threat risk assessment is being developed for Māui and Hector's dolphins, the results of which will inform an updated Threat Management Plan later in 2018.

Attention: SC, CG-R, CC

The Committee notes that no new management action regarding the Māui dolphin has been enacted since 2013. It therefore 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 would increase the extinction risk. In addition, the Committee:

- (1) **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;
- (2) **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);
- (3) **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;
- (4) **welcomes** the update on Maui dolphins provided and looks forward to receiving the species-specific, spatially explicit, multi-threat risk assessment in 2019.
- (5) **respectfully encourages** the New Zealand Government to commit to specific population increase targets and timelines for Māui dolphin conservation,
- (6) **respectfully requests** that reports be provided on progress towards the conservation and recovery goals as updates become available.

17.8.4 Cruise report from North Western Africa

For the third year, survey results were reported from cruises conducted in north western Africa waters. Fourteen schools comprising some five species and totalling 433 individuals were sighted, including bottlenose dolphins, both pantropical and Atlantic spotted dolphins and, spinner dolphins. This area is poorly surveyed and the continuation of this work was encouraged. The Committee **suggests** that a more substantive analysis of the data from all surveys be conducted and reported back next year, particularly as SC68A priority topic will be on African small cetacean species.

17.8.5 Monodontids Workshop Report

NAMMCO hosted a workshop and produced a Global Review of Monodontids. Researchers and subsistence hunters from across the Arctic and subarctic participated. Several IWC scientists also participated, including Litovka, Reeves, and Suydam. The report⁹, summarises what is known about the status of 12 stocks of narwhals and 22 stocks of white whales. There may be more stocks than this as information on stock structure is incomplete for some areas. The summary information and identification of threats and concerns within the report will be helpful in prioritising future research. Some stocks are doing well, but conservation actions are desperately needed for some others. The IUCN Red List status and documentation for both species was updated to Least Concern in December 2017 and that the information summarised in the NAMMCO review was very useful for those assessments.

Attention: C-A

*The Committee **welcomes** the report of the NAMMCO workshop reviewing the monodontids⁹. It **draws attention to** the recommendations contained in the report and **encourages** their implementation, particularly those pertaining to the stocks of greatest concern.*

17.9 Takes of small cetaceans

17.9.1 New information on takes

The Committee received the summary of takes of small cetaceans in 2016–17 extracted from the online National Progress Reports and prepared by the IWC Secretariat, in addition to information obtained online.

No direct takes of small cetaceans were reported in the 2017 National Progress Reports. The Committee **notes** that it would be helpful if the Secretariat encouraged all member countries and IGOs (e.g. NAMMCO) to submit information on direct takes as a routine procedure.

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 Japan¹⁰, was summarised. It was noted that catch statistics in the Japan Progress Report on small cetacean cover catches in the calendar year, that is, from 1 January to 31 December, following the guidelines for IWC National Progress Report, while the catch quota of small cetacean fisheries are set seasonally. Thus, in some cases, the calendar yearly catch may exceed the seasonal (yearly) catch in appearance, but in such cases, the actual seasonal catch is aligned with the allocated catch quota. The Committee noted that the catch of 1,057 Dall's porpoises in the hand harpoon hunt was significantly lower than previously recorded reported and below the quota. It was stated that this is a result of the destruction of the community that conducts this hunt, rather than a change in the cetacean population, following the earthquake and tsunami of 2011.

17.9.2. Live captures

The Pacific Scientific Research Institute of Fisheries and Oceanography (TINRO) will consider a quota of 13 killer whales for 2018 and a public hearing was held on 3 May 2018 to make comments on this plan. This proposed new quota considers killer whales in the Sea of Okhotsk as one population, which is estimated to have an abundance of over 3,000 individuals. This number is considered minimal as only 50% of the sea was surveyed. In addition, the information available to the Russian Government on colour and fin patterns, feeding behaviour and distribution do not allow clear identification of different ecotypes, and that all genetic samples analysed to date belong to a single population. It was noted that most published information on Okhotsk Sea killer whale abundance and stock structure is in Russian-language literature, or as part of internal documentation.

Attention: C-A, CG-A

With respect to live captures, and specifically the capture of killer whales from the Sea of Okhotsk, the Committee:

- (1) **reiterates** its long-standing recommendation that no small cetacean removals (live capture or directed harvest) should be authorised until a full assessment has been made of their sustainability;*
- (2) **notes** that this is especially important for killer whales because populations are generally small and have strong social bonds and removals have unknown effects on their demographic structure; and*
- (3) **reiterates** its concern that removals of killer whales are occurring from the Okhotsk Sea population.*

⁹https://nammco.no/wp-content/uploads/2018/05/report-global-review-of-monodontids-nammco-2018_after-erratum-060518_with-appendices_2.pdf

¹⁰ http://www.jfa.maff.go.jp/j/whale/w_document/attach/pdf/index-9.pdf

In light of the verbal report received at this meeting that Russian authorities intend to proceed to consider limits of allowable live-capture removals of killer whales in the Sea of Okhotsk on the basis that there is no stock structure and there are no ecotype differences between the populations in this region, the Committee:

- (1) **encourages** more extensive effort to examine these issues; and
- (2) **requests** that relevant analyses be provided for the Scientific Committee's consideration at its next meeting.

17.10 Status of the voluntary fund for small cetacean conservation research

In 2017, donations for the Voluntary Fund for Small Cetacean Conservation Research totalling £13,122 were received from the Government of Italy. At the end of the financial year 2017, this brought the total of the fund to £81,077.

The Committee **expresses its sincere gratitude** for Italy's contributions and notes that these funds support critical conservation research projects of direct relevance to the work of the Committee.

Five projects were offered funding in 2016 and were implemented in 2017. One of the projects has since been withdrawn and one project, the Indus river dolphin abundance survey, was completed and reported on in 2017. The remaining three projects, on the 'Chilean Dolphin' in Chile, the 'Use of small cetaceans as wildmeat in China' and the 'Development of a business model for sustainable fisheries in the Upper Gulf of California, Mexico', are all near completion and will be reported on fully next year. Updates are available on the IWC website.

17.11 Work plan and budget requests

17.11.1 Priority topics for 2019 to 2024

The sub-committee on Small Cetaceans discussed ongoing priorities and will continue the development of these intersessionally; however, given the location of the meeting it is likely that the focus will be on African species or areas during 2019-20. Other potential priorities identified in discussions were *Inia* (e.g. taxonomy), *Sotalia guianensis*, *Phocoena phocoena*, *Delphinus delphis*, southern hemisphere beaked whales, *Steno bredanensis*, Northwest Pacific *Orcinus orca* and 'the Caribbean'.

17.11.2 Work plan for 2019 – 2020

The workplan on issues related to small cetaceans is given in Table 23.

Table 23
Work plan on small cetaceans

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Franciscana CMP	ICG (Annex Y) to co-ordinate outcomes of CMP across sub-committees	Report	ICG (Annex Y) to synthesis actions from 2019 SC report and develop a work plan	Report
Wildmeat	ICG (Annex Y) to plan and conduct African Workshop.	Report	ICG (Annex Y) group to summarise workshop series and develop future work plan.	Report
Small Cetacean Task Team	Intersessional Workshop on South Asian river dolphins.	Report	Act on recommendations from 2018/19 River dolphin workshop.	Report
Sotalia	SG (Annex Y) to plan and conduct workshop #1 (at SOLOMAC)	Report	SG (Annex Y) to plan and conduct workshop #2	Report

18. WHALE WATCHING¹¹

The report of the sub-committee on whale watching is given as Annex N.

18.1 Assess the impacts of whale watching and swim-with-whale operations on cetaceans

18.1.1 Review progress of Modelling and Assessment of Whale Watching Impacts (MAWI)

Modelling and Assessment of Whale Watching Impacts (MAWI) has been on the Committee's agenda for several years. In April 2018, an intersessional workshop was held to identify the key research questions for understanding the potential impacts of whale watching on cetaceans (SC/67b/Rep03). A number of issues were highlighted, including: (a) the need to better understand the impact of recreational whale watching vessels as compared to commercial vessels; (b) the importance of looking at the potential impact of whale watching at short-term (e.g., behaviour change), mid-term (e.g., shift in habitat use) and long-term (e.g., population dynamics) time scales; (c) the use of existing and new data to explore the mid- and long-term impacts, as opposed to replicating short-term studies; and (d) the importance of building scientific capacity in the locations where the research would take place. More information can be found in Annex N, item 2.1.

¹¹ In response to a request from the Chair of the Whale Watching Working Group of the Conservation Committee, we have changed our past practice of treating whalewatching as a single word to the use of two words.

Attention: SC, C-R

The Modelling and Assessment of Whale Watching Impacts (MAWI) initiative held a workshop in Italy in April 2018, in conjunction with the 32nd European Cetacean Society conference.

The Committee **endorses** the following recommendations from this workshop:

- (1) the incorporation of both social and natural sciences to better understand whale watching impacts;
- (2) the development of a Strategic Framework, supported by a Decision Tree, to aid in the prioritisation of policy and research choices;
- (3) the development of toolkits and resources that can be accessed globally; and
- (4) the standardisation of data collection.

The Committee also **agrees** that a third MAWI workshop be held intersessionally, ideally just before or after the 2nd World Marine Mammal Science Conference in 2019, in Barcelona, with the following objectives:

- (1) to determine in detail which data should be collected to best answer the natural and social science research questions developed in SC/67b/Rep03;
- (2) to identify the best locations for conducting research projects that address these questions; and
- (3) to continue to develop modelling approaches for assessing the long-term impacts of whale watching on cetacean populations (using data on short- and mid-term impacts).

18.1.2 Review specific papers assessing impacts

The Committee received several papers regarding impacts to cetaceans from whale watching activities. Those papers included (1) efforts to assess stress hormones in baleen of southern right whale calves, (2) 'solitary sociable' cetaceans, (3) land-based observations in the Canary Islands to assess and mitigate potential impacts of whale watching vessels on cetaceans, (4) a Whale Welfare Assessment Tool (also presented and discussed in Plenary) and (5) the 15th year of a summary of papers published in the previous year related to a better understanding of impacts, mitigation and compliance to regulations. Additional details on these papers and projects can be found in Annex N, item 2.2.

Attention: SC, CG-A

The term 'solitary sociable dolphin' or cetacean is usually taken to apply to cetaceans that have little or no contact with conspecifics and who regularly closely approach humans, often including touch, social, sexual and play behaviours (Wilke et al., 2005). Given that solitary sociable cetaceans often end up in circumstances where they are harmed and killed and that they may come to present a threat to human swimmers, the Committee:

- (1) **agrees** to continue intersessionally to monitor the phenomenon of solitary sociable cetaceans as part of its work;
- (2) **advises** that, where these animals occur, research be conducted to determine whether the emergence of harmful behaviours either to the animal or to people can be reversed; and
- (3) **advises** local authorities and other concerned parties to keep people away from them in order not to encourage behaviour that may prove harmful to the animal or swimmers.

In addition, the Committee **agrees** that the Whale Welfare Assessment Tool (currently being developed at the Royal Veterinary College, University of London, in the context of the IWC Whale Killing Methods and Welfare Issues Action Plan), for which a hypothetical whale watching case study was trialled (Annex N, item 2.2), be applied to real-world whale watching situations. The southern resident killer whales in Washington, USA and the bottlenose dolphins in Bocas del Toro, Panama were proposed. These two populations are subject to intense whale watching pressure and may be suffering welfare and health impacts related to this pressure. Both locations have data relevant to the assessment tool and therefore seem ideal as pilot projects for its application.

18.1.3 Consider documented emerging areas of concern (e.g., habituation, new areas/species, new technologies, in-water interactions) and how to assess them

The Committee received several papers about emerging areas of concern regarding whale watching, including (1) human-induced behavioural changes, (2) impacts from recreational in-water interactions with cetaceans and (3) purposeful and inadvertent feeding by humans.

The Secretariat for the Convention of Migratory Species (CMS) submitted several documents to SC/67b including a global review of in-water interactions with aquatic mammals. That review had resulted in a CMS resolution that encouraged Parties to facilitate research allowing for an assessment of the long-term effects and biological significance of disturbances from 'swim-with-marine-mammal' programmes. The topic of swimming with cetaceans is also addressed under Item 18.6.

The Committee received reports about several studies to assess the impacts and compliance with regulations of commercial 'swim-with-whale' operations in Australia. The discussion of this issue can be found in Annex N, item 2.3.

Attention: SC, CC, S

The Committee **agrees** that the habituation intersessional correspondence group, now named human-induced behavioural changes of concern, should continue (see Annex N, table 3).

Given the substantial effort the Convention on Migratory Species (CMS) Secretariat has made in preparing several documents for the Committee to consider this year, the Committee:

- (1) **recommends** a continuation and an expansion of this exemplary collaboration between the IWC and CMS Secretariats and their various committees;
- (2) **endorses** the intention of CMS to work with the IWC Scientific Committee on guidelines for in-water interactions with aquatic mammals and **offers** to provide the scientific underpinning for these guidelines;
- (3) **agrees** that the Committee's intersessional correspondence group on swim-with-whales work intersessionally with the CMS Aquatic Mammals Working Group to develop draft guidelines; and
- (4) **offers** to review draft guidelines when they are ready, with a view to **agreeing** a joint product of the IWC and CMS and hosted by both websites as a global resource.

See also Item 18.6 for additional recommendations related to swimming with cetaceans.

18.2. Consider information from platforms of opportunity of potential value to the Scientific Committee

The Committee received examples of several platforms of opportunity where data have been collected concerning habitat use, behaviour, changes in distribution and potential risks from shipping for multiple different species in several different areas. Of particular interest was Peninsula Valdés, Argentina, where approximately 460,000 photographs have been taken from whale watching boats and provided to researchers from the Instituto de Conservación de Ballenas and Ocean Alliance (SC/67b/WW04). See Annex N, item 3.

The Committee offered numerous suggestions as to how to handle the large number of images and **encourages** the researchers to network with other researchers around the world, particularly humpback whale researchers dealing with similarly large numbers of photographs and multiple catalogues, to improve the processing time of the photographs.

18.3 Whale watching in east Africa and the wider Indian Ocean

A proposal for Concerted Action for Arabian Sea humpback whales was passed by CMS with strong support from range states. This was discussed in Annex N, item 4.

Attention: CC, S, CG-A

Noting the Committee's discussions over several years on the status of the Arabian Sea humpback whales (see Item 10.2.1), the Committee:

- (1) **welcomes** the CMS proposal for Concerted Action for Arabian Sea humpback whales;
- (2) **notes** that humpback whales are the target of one emerging whale watching operation in the south of Oman and **highlights** the likelihood that the population could become the target of future whale watching activities;
- (3) **emphasises** the need for regulators and scientists to work with the industry to ensure that whale watching does not add to the many other pressures on this small, isolated, non-migratory and endangered population.

The Committee therefore:

- (1) **recommends** that building capacity to conduct needed research and to ensure consistent training of whale watching operators be a high priority for Omani authorities and other parties working on the recovery of the endangered Arabian Sea humpback whale population;
- (2) **notes** that boat operators for cetacean watching operations appear to turn over at a high rate in this area, and **recommends** that training workshops should be regularly offered and conducted;
- (3) **welcomes** the offer from the Pacific Whale Foundation to help organise and conduct another training workshop, but **recommends** a more comprehensive plan be implemented by the Omani authorities, working with the IWC and other interested parties, to build local capacity for such training; and
- (4) **agrees** to retain a review of whale watching in east Africa and the wider Indian Ocean region in its work plan (see Annex N, table 4) and to conduct an intersessional review of whale watching in these areas, to be presented at SC/68a.

18.4 Review Whale Watching Strategic Plan (2018-2024) and joint work with the Conservation Committee

18.4.1 Review and provide recommendations on the draft Strategic Plan

At SC/67a, the Conservation Committee's SWG on Whale Watching requested the Scientific Committee to review a draft of the next iteration of the IWC's Strategic Plan (2018-2024) on Whale Watching (see SC/67b/WW02). This was accomplished primarily during a SC/67b pre-meeting and then further discussed in Annex N (item 5 and appendix 2).

Attention: CC

The Committee **draws the attention** of the Conservation Committee's Standing Working Group on Whale Watching (SWG) to Annex N, appendix 2, which provides a full set of comments on the draft Strategic Plan (2018-2024) on Whale Watching. The most important comments and recommendations from the appendix are highlighted below:

(1) The addition of an Action 1.5: Develop a communications strategy to actively promote IWC whale watching resources (e.g., the Handbook, reports and training opportunities), with approaches tailored to target key audiences. These audiences include the public and whale watching managers, researchers, operators, and on-board naturalists. Communication actions could include preparing publicly accessible summaries of IWC whale watching reports, improving the whale watching pages on the IWC website (which is already underway with the new Whale Watching Handbook, see Item 18.5), and promoting resources on social media, at key meetings and via press releases to industry bodies and trade publications. The implementation of this action could be coordinated intersessionally via the Secretariat. A joint intersessional working group, which includes key Secretariat staff, could develop a communications strategy for consideration at IWC/67 (the Brazil Plenary meeting) and/or the joint session of the CC/SC at SC/68a.

(2) The replacement of the actions of Objective 2 in the draft Strategic Plan with the following:

- a) Action 2.1 – Continue the Modelling and Assessment of Whale Watching Impacts (MAWI) initiative, to develop tools and methodologies to assist researchers and managers in their efforts to assess potential impacts of whale watching on cetaceans and to mitigate them. This initiative is ongoing and could focus on:
 - i) Investigating modelling methods to link short- (e.g., behavioural reactions) and medium-term (e.g., changes in population distribution) responses with potential impacts from whale watching to long-term (i.e., >10 to 20 years) consequences (e.g., vital rates).
 - ii) Establishing standard data collection methodologies, including from platforms of opportunity.
 - iii) Identifying key locations for whale watching research projects and programmes, taking into consideration logistics, capacity and management urgency;
- b) Action 2.2 – Develop a long-term integrated research programme to better understand the potential impacts of whale watching on the demographic parameters of cetacean populations. Seek to:
 - i) Investigate whether there is a causal relationship between whale watching exposure and the survival and vital rates of exposed cetacean individuals and populations;
 - ii) Understand the mechanisms involved in causal effects, if they exist, in order to define a framework for improved management;
- c) Action 2.3 – Develop processes and mechanisms for whale watching activities to collect and provide scientifically robust and useful data to researchers and research programmes; and
- d) Action 2.4 – Develop an approach (e.g., hold an intersessional workshop; establish a joint intersessional working group) to integrate social and ecological scientific research within the IWC to inform whale watching management and promote potential benefits. This is a coordinated action between the SWG and the sub-committee.

In particular, Action 2.2 will require a dedicated person to guide and coordinate the development and implementation of a research programme or plan. The best option would be for the SWG to contract with someone, full- or part-time, to carry out this task, whilst recognising the budgetary concerns. Therefore, the Committee **recommends** that the search for funding for this and all other actions in the Strategic Plan be focused, broad-ranging, and innovative. An alternative, if budgetary issues are prohibitive, is to have the research programme developed intersessionally by an intersessional correspondence group or the convenor and co-convenor of the Committee's sub-committee on whale watching.

Lastly, the Committee **reiterates** its previous recommendation to improve the coordination between the SWG and the Committee's sub-committee on whale watching in the development and implementation of a Strategic Plan on Whale Watching. This year's 21 April pre-meeting to review the draft Strategic Plan was intended to improve coordination and provided an opportunity to contribute to the draft Strategic Plan but it did not completely achieve the goal of coordination, as a limited number of SWG members were able to attend the pre-meeting.

18.4.2 Develop procedures to provide scientific advice as requested in the plan (including the online handbook) and make the Committee more effective at providing information to the Commission

The revised Actions 2.1-2.4 in Item 18.4.1 outline how the sub-committee on whale watching will collect information needed to inform the Conservation Committee's SWG on Whale Watching. Procedures for providing this advice will be discussed and determined cooperatively with the Conservation Committee, during the joint meeting immediately after SC/67b and intersessionally through the intersessional correspondence group (see Annex N, table 3,).

18.5 Whale watching handbook

18.5.1 Review and provide comments on the IWC's Whale Watching Handbook

The Whale Watching Handbook (Handbook) was presented. Before being made available to the public it will also be translated into French and Spanish with support from CMS. Annex N (item 6) provides additional comments and suggestions for fine-tuning and improving the already-admirable Handbook.

Attention: CG-R, SC, S, CC, C-R

The Committee **welcomes** the presentation of the online Whale Watching Handbook and **agrees** that it is comprehensive, scientifically substantive, user-friendly and well designed.

To ensure the IWC Whale Watching Handbook comes to the attention of the international whale watching community, including managers, operators and the public, the Committee **recommends** that all Contracting Governments provide a link to the Handbook on the relevant agency pages of their own government websites once the Handbook goes 'live'.

The Committee also **recommends** that the Conservation Committee and the Commission develop a plan for identifying and securing long-term funding for the further development (e.g., translations into additional languages, writing additional case studies or country profiles) and the ongoing maintenance (e.g., periodic reviews of content) of the IWC Whale Watching Handbook. The Handbook must be updated regularly to remain a vibrant, living document.

18.6 Review reports from intersessional correspondence groups

The Committee received information from the intersessional correspondence groups (ICG) of swim-with-whale operations and communication with IORA. Annex N provides details of (1) the discussion related to the intersessional work of the ICG on swim-with-whale operations (item 7.1) and (2) the discussion related to the intersessional work of the ICG on IORA communication (item 7.2).

Attention: S, SC, CC, CG-A, CG-R

Regarding swim-with-cetacean operations, the Committee:

(1) **agrees** that the intersessional correspondence group on swim-with-whale operations (Annex N, table 3) should continue;

(2) **draws attention** to guiding principles for whale watching, including in-water interactions, that are being or have been developed by various regional bodies, such as the Convention on Migratory Species and UNEP in the Wider Caribbean (see Annex N, item 2.3 and UNEP-CEP, 2012), that advise that swimming with cetaceans be discouraged where it is not already established; and

(3) **recommends** that, in jurisdictions where swim-with-cetacean activities have not been occurring or are just starting, this practice be prohibited until there is scientific evidence that supports allowing it, noting that the risks to both humans and cetaceans are substantial if operators are inexperienced and not following any relevant guidelines; and

The Committee also **welcomes** the increased communications between IORA and the IWC over the past year. The IORA Sustainable Whale and Dolphin Watching Tourism Network was established and Australia will convene the Network in its first year of operation and will produce a biannual newsletter. Consequently, the Committee:

(1) **agrees** that the intersessional correspondence group on communication with IORA (Annex Y) should continue; and

(2) **encourages** greater engagement between the IWC and IORA on whale watching, beyond the exchanges amongst the intersessional correspondence group (Annex N, table 3).

18.7 Review progress on scientific recommendations

18.7.1 Global influence of recommendations

The Committee received information about the influence of previous recommendations in numerous countries. Details can be found in Annex N, item 8.1.

18.7.2 Tracking progress on previous recommendations

The sub-committee on whale watching reviewed 27 of its recommendations and agreed statements from the past two years. Of those, 15 were completed or partially completed, nine are on-going, and three have not yet been addressed. Annex N, item 8.2, provides details about those recommendations and agreed statements. There is also ongoing work to update and finalise the terms of reference for the sub-committee on whale watching.

18.7.3 Update on dolphin watching in Bocas del Toro, Panama

Concern continues about the number of dolphins from the small population in Bocas del Toro, Panama that are found dead. Nine deaths in 2016 and 2017 are known to have occurred, five of them confirmed boat strikes. These losses are unsustainable. Research to better understand impacts on the population includes measuring stress hormones in biopsy samples and acoustic monitoring. A regulatory update to strengthen management of whale and dolphin watching in Panama, including Bocas del Toro, was released in October 2017, with the support of the Ministry of Environment.

Attention: SC, C, CG Panama

The Committee **reiterates** its grave concern regarding the intense and uncontrolled dolphin watching in Bocas del Toro, Panama. This concern has been expressed and reiterated for several years due to continuing mortalities, including from vessel strikes, in this small population (probably fewer than 100 animals). In this regard, the Committee:

(1) **welcomes** the ongoing research to monitor this dolphin population and the impacts it is facing from dolphin watching;

(2) **reiterates** its welcome of Panama's increased responsiveness to protect the local dolphin population by minimising negative impacts from dolphin watching (IWC, 2018a) and **welcomes** the regulatory update, supported by the Ministry of Environment, which is meant to lead to stronger management of whale and dolphin watching in Panama, including Bocas del Toro; and

(3) **expresses serious concern** at the number of deaths reported in 2016 and 2017 and **recommends** action from the Government of Panama as a matter of urgency, including the immediate and committed implementation of the updated regulations.

18.8. Work plan and budget requests for 2019-2020

18.8.1 Work plan for 2019-2020

The work plan for matter related to whalewatching is shown in Table 24.

Table 24

Summary of the work plan for matters related to whale watching. Many of these items have intersessional correspondence groups (ICG) or intersessional advisory groups (IAG). Those groups will work intersessionally and provide updates at SC/68a (see Annex X)

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Assessing impacts	-	Papers to be presented	-	Papers to be presented
Third MAWI workshop	Workshop planning	Receive update on planning	Workshop (Annex Y)	Report
Update IWC whale watching guidelines and principles	Revise guidelines and principles	Review	Continue if needed	Receive update
Indian Ocean review	ICG (Annex Y)	Papers to be presented	-	-
East Africa review	Work to prepare review	Paper to be presented	-	-
Intersessional correspondence groups	See Annex Y	Receive reports	See Annex Y	Receive reports
Joint meeting with Conservation Committee Standing Working Group on Whale Watching (SWG) to discuss incorporation of social science in joint work streams	Meeting planning	Receive update	Meeting planning	Joint meeting with SWG
IWC Whale Watching Handbook	-	Receive updates	-	Receive updates

19. SPECIAL PERMITS

19.1 General considerations on improving the evaluation process

This issue is considered as part of the process to revise 'Annex P' (see discussion in Item 28.3).

19.2 NEWREP-A

Summaries of NEWREP-A papers are given in Annex U1.

19.2.1 Report on ongoing research

In plenary, the Committee received and briefly discussed four papers on ongoing work – as indicated below, some of these were discussed more fully in sub-groups.

SC/67b/SP08 presented the results of the third biological field survey of NEWREP-A during the 2017/18 austral summer season. In discussion, it was noted that the high apparent pregnancy rate (95.3%; 122 of 128 mature females) of Antarctic minke whales was consistent with previous results (e.g. from JARPA and JARPA II).

SC/67b/ASI07 presented a summary of results of the NEWREP-A dedicated sighting survey during the 2017/18 austral summer season whilst SC/67b/ASI11 presented the research plan for the next systematic vessel-based sighting survey in the Antarctic under NEWREP-A 2018/19. The new NEWREP-A 2018/19 sighting survey plan has been endorsed by the Committee; Annex Q (item 4.2) provides more details on both these papers.

SC/67b/EM05 presented results of the krill and oceanographic surveys undertaken during the third NEWREP-A survey in Area V-E and VI-W (see Annex L, item 6.1 for details).

19.2.2 Update on previous recommendations

19.1.2.1 AGE DATA AND RMP/IST (RECOMMENDATION 1)

SC/67b/RMP03 provided updated draft specifications for an RMP/IST type simulation exercise to evaluate management procedures based on modified catch limit algorithms that use information on recruitment inferred from age data from Antarctic minke whales. Details and discussion are given in Annex D, section 2.3.2.

Attention: S

*The Committee **agrees** that methods currently used or proposed to be used in the Committee that use age data should (as necessary) be investigated to evaluate the relationship between their results and the accuracy and precision of the age data that they use where this is pertinent to the results of import from these methods. The Committee **agrees** to include this as an agenda item for next year's meeting.*

19.1.2.2 BIOPSY SAMPLING AND TELEMETRY FEASIBILITY STUDIES (RECOMMENDATIONS 4 AND 5)

SC/67b/SP04 summarised the results of a feasibility study on biopsy sampling and satellite tagging of Antarctic minke whales under NEWREP-A. The authors concluded that in the context of the NEWREP-A objectives, (a) the efficiency of biopsy sampling is much lower than that of lethal sampling for Antarctic minke whales and (b) that the amount of tissue derived from biopsy samples is insufficient to conduct the suite of biomarkers targeted by NEWREP-A. They therefore concluded that biopsy sampling was not a feasible approach to fulfil the objectives of NEWREP-A.

This paper prompted considerable discussion in the Committee, both with respect to ‘efficiency’ of the method and the amount of material required.

One issue raised was that there was the need for better clarification of terminology used in the paper (e.g. ‘sampling’ versus ‘killing’) in order, for example, to interpret properly the conclusion that biopsy sampling took approximately three times longer than lethal sampling. It was not clear, for example, whether the median times for biopsy and lethal sampling provided were truly comparable because of the lack of information on when the time for these methods started and ended. In particular, handling time for lethal sampling appeared to not be included in the total time calculations.

The authors responded that in SC/67b/SP04 ‘the efficiency’ of sampling techniques was defined as ‘Success Proportion’ rather than ‘Time of Experiment’ because ‘Success Proportion’ represents a better indicator of the efficiency. To fulfil the purposes of NEWREP-A, random sampling is required in which generally only one animal from a school is sampled. Notwithstanding this clarification, they provided definitions of ‘Time of Experiment’ (see details in Yasunaga *et al.* in Annex U2).

Another issue raised was that the NEWREP-A review workshop (ref) had suggested ‘involving people with expertise in successfully biopsy sampling common minke whales in the North Atlantic’, meaning collaborating in the field with experienced foreign experts. However, Table 2 of SC/67b/SP04 showed an ongoing decline in success proportion (number of biopsy samples / number of targeted whales which were chased for sampling by the SSVs) between 2015/2016 and 2017/2018 rather than the increase one would expect with increasing experience. The authors responded that they had consulted with foreign scientists although they were not on the vessels, that they used experienced marksmen and that the decline was an artefact of weather and sea state conditions under which samples were collected. However, the counter-comment was made that in authors’ analyses, the best model did not include “weather conditions” as a significant factor.

In response the authors provided results of a GLM analysis based on the binomial distribution assumption to examine the differences in success proportion in the biopsy sampling experiment using research seasons as explanatory variables. The coefficients for each year were not significant, suggesting that the differences of success proportions among the seasons are not statistically significant and consequently provide no evidence that shooters’ efficiency has decreased significantly over the three research seasons (see details in Yasunaga *et al.* in Annex U2).

Some Committee members (see Clapham *et al.* I, in Annex U2) disagreed with the authors’ conclusion that the study revealed that biopsy sampling was not feasible for the NEWREP-A programme. Rather, they believed that it showed that it was both feasible and appropriate. They also disagreed that the amount of tissue obtained was insufficient, citing the large number of research programmes that successfully use biopsy samples to fulfil research objectives including using a single sample for a variety of biomarkers (e.g. stable isotopes, fatty acids, hormones, genetics).

In response, the authors agreed that the amount of epidermal tissue collected by biopsy sampling is enough for the requirement of genetic, epigenetic and stable isotope analyses. However, they stressed that the amount of adipose tissue collected by biopsy sampling was not large enough to measure progesterone, lipid content and fatty acid in the context of the objectives of NEWREP-A (see details in Yasunaga *et al.* in Annex U2).

In their closing comments, the authors stated that in response to the recommendation of the Expert Panel, dedicated experiments for biopsy sampling of Antarctic minke whales had been carried out which had generated the results presented at this meeting and from which the authors had drawn their conclusions. No further dedicated time for biopsy experiments was planned at this stage, but this could be reconsidered at the mid-term review. Meanwhile, NEWREP-A will only collect additional biopsy samples opportunistically.

With respect to the best approach to assess the efficiency of biopsy versus lethal sampling, a standard approach for measuring the efficiency of biopsy sampling and to compare this to the process of lethal sampling was proposed (Clapham *et al.* II, in Annex U2).

Attention: S

*The Committee had last year agreed on establishing an intersessional Advisory group tasked ‘to provide advice on developing an experimental protocol for ascertain whether it is possible to reliably biopsy minke whales and, if so, under what circumstances (experience, vessel type, equipment, environmental conditions, etc.). This group could use as starting point the advice provided by the Expert Panel’ (JCRM 19 suppl:431-490). Due to a clerical error the group did not convene. Attention was drawn to a protocol to evaluate non-lethal techniques presented to SC66b (Mogoe *et al.*, 2016). This protocol included four questions to help identify the feasibility and practicability of non-lethal methods.*

*The Committee **agrees** to re-establish the Advisory group (Annex Y), under Palka for consideration at SC68a. It also **agrees** that suggestions for refining questions in the method used by Mogoe and colleagues (2016) should be added to the tasks of this group.*

19.1.2.3 EPIGENETIC AGEING (RECOMMENDATION 8)

Recently, epigenetic (DNA-methylation) ageing has been successfully used to estimate age in humpback whales (Polanowski *et al.* 2014). As noted under Item 11.4.4, this year, the Committee invited Jarman, the leading specialist in this technique to give an overview presentation to the Committee as a special night session. This covered topics such as current and future prospects for this class of methods (see Annex I, item 5.5).

SC/67b/SDDNA04 presented a feasibility study on epigenetic ageing in Antarctic minke whales in response to Recommendation 8 from the Expert Panel (for details see Annex I, item 5.5).

Some suggestions were made on how to improve resolution (in particular, evaluate more loci and then restrict to those loci highly correlated with age); the current set of loci do not provide sufficient precision for use in the population dynamics modelling exercise recommended for NEWREP-A. Given that there is an upper limit to the degree of precision that can be achieved using this technique, the Committee noted that the utility of epigenetic age estimation (and other methods of age determination) will depend on the degree of precision needed for the specific application of interest (see recommendation under Item 11.4.1).

19.1.2.4 DETERMINING SEXUAL MATURITY IN BLUBBER (RECOMMENDATION 9)

SC/67b/SCSP05 presented results from the NEWREP-A research component focused on determining sexual maturity in female Antarctic minke whales, during the feeding season based, on concentrations of progesterone in blubber. The authors concluded that the progesterone concentration in blubber samples cannot be used as a diagnostic index to discriminate between mature and immature female Antarctic minke whales and that lethal sampling is required to obtain information on sexual maturity for use in population dynamic models.

Some members of the Committee disagreed with that conclusion, as they demonstrated that the amount of misclassification in immature versus mature females would be small (~1%, see Wade *et al.* in Annex U2) and thus that progesterone levels in biopsy samples would allow discrimination between mature and immature animals.

They noted that the stated purpose of the study was to discriminate between immature and mature females for fitting population dynamics models such as the catch-at-age analysis; the only misclassification that occurred was a total of 3 (out of 230) whales between the resting and the immature classes, and therefore the only misclassification rate that is important remains ~1% of the total sample.

Some other members noted, also in relation to recommendation 10, that misclassification for discriminating between resting and immature animals was higher and thus the method less reliable for that task.

In response to a request, the authors provided a histogram showing the numbers of immature, resting, ovulating and pregnant animals (Figure 1 of Yasunaga *et al.* in Annex U2). Based on the assumption of cut off values (1.0 ng/g) of progesterone set in Wade *et al.* (see in Annex U2), six of 56 immature whales and three of 11 resting whales were misclassified. Misclassification ratios were thus 10.7% and 27.2%, respectively, and these were not considered negligible by the authors (see details in Yasunaga *et al.* in Annex U2).

19.1.2.5 SAMPLE SIZES REQUIRED TO DETECT CHANGE IN ASM (RECOMMENDATION 26)

SC/67b/SCSP01 focused on the need to complete NEWREP-A recommendation 26 on the calculation of sample size. The Committee discussed its previous conclusions in this regard. In 2016, the Committee assessed that three of six aspects of the Expert Panel's recommendations had been adequately addressed in relation to sample sizes. Some members of the Committee consider that until the proponents fully implement the Expert Panel recommendations for calculating sample sizes, the proponents have not demonstrated that they are able to meet their stated objectives in relation to the NEWREP-A programme. The proponents' position and that of some Committee members is that the work has been completed to a reasonable level and that any further work on sample sizes will be afforded a low priority.

The Proponents reiterated their position regarding the work on and status of recommendation 26 ('Provide a thorough power analysis of sample sizes required to detect change in ASM and follow the other recommendations in this item') from the NEWREP-A Review Workshop (IWC, 2016). In view of the proponents, the work on recommendation 26 has been completed to a reasonable level. Details can be found in GOJ (2015; 2016a) and GOJ (2016b). The IWC SC has already concluded that the approach being taken to address the recommendation is appropriate (IWC 2018). Consequently, the proponents have concluded that the reasonableness of the proposed sample size (333) has been adequately demonstrated. The proponents recognize that in 2016 the Scientific Committee suggested some further refinement work; however, they consider that such refinement work goes beyond the original scope of recommendation 26 from the NEWREP-A review workshop. Nevertheless, in deference to the Committee, it was the proponent's intention to address the refinement work for this year's Scientific Committee. However, because of unanticipated specialist personnel unavailability, this has had to be postponed. The proponent's intention is to continue contributing to this work subject to logistical constraints and the availability of specialist analysts.

19.1.2.6 COMMITTEE'S ADVICE

The table in Annex U4, provides a detailed update of the Committee's view of progress on previous recommendations. An overview is given in Table 25.

Table 25

NEWREP-A – Overview on progress with recommendations.

Recommendations in are not in priority order. Recommendations that relate to purposes A, B, C and D are higher priority for completion. Recommendations coded uniquely as “E: Relevant to improve existing components of the proposed programme” are excluded from this table as they were optional. Key for ‘Purpose’: A: To evaluate the contribution of a particular objective or sub-objective of the programme to meet conservation and management needs; B: To evaluate the 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).

Recommendation	Purpose	Deadline	Proponents self-evaluation on progress as of SC67b	Committee’s comments
(1) Age data and RMP/IST	A, C, D	August 2016	Completed to a reasonable level	SC66b: A range of opinions as to the extent to which this recommendation has been addressed. SC67a: No new information. SC67b: Some information presented (See section 19.1.2.1).
(2) Stock definition	A, D	May 2016	In progress.	SC66b: No progress. SC67a: As in SC66b. SC67b: As in SC66b.
(3) Mixing rates (simulations on precision and bias)	A, D	May 2016	To be completed by the mid-term review.	SC66b: No progress. SC67a: As in SC66b. SC67b: As in SC66b.
(4) Biopsy feasibility study	B, C, D, E	Field season 2017-2018	Completed.	SC66b: Some progress (SC/66b/IA05). SC67a: Some progress (SC/67a/ASI07). SC67b: Partially completed, further refined analysis is needed (see 19.1.2.2). A WG was formed to review and improve methods.
(5) Telemetry feasibility study	B, E	Field season 2018-2019	Completed.	SC66b: Some progress (SC/66b/IA05). SC67a: Some progress (SC/67a/ASI07). SC67b: Completed.
(8) DNA methylation ageing technique	B, C, D	March 2017	Completed.	SC66b: No progress. SC67a: As in SC66b. SC67b: Partially completed, further refined analysis is encouraged. See section 19.1.2.3.
(9) Hormones in blubber and sexual maturity	B, C, D	March 2018	Completed.	SC66b: No progress. SC67a: As in SC66b. SC67b: Blubber hormones analysis completed. On accuracy see section 19.1.2.4.
(10) SCAA and misassignment ‘resting’ females/immature females.	A, C, D	August 2016	To be completed by the mid-term review*.	SC66b: No progress. SC67a: As in SC66b. SC67b: New information presented (SC/67b/SCSP05).
(11) SCAA, density- dependence, and stock mixing	A, C, D	May 2016	Completed*.	SC66b: Partially completed: updates on stock mixing and mixing rates still necessary. SC67a: As in SC66b. SC67b: As in SC66b.
(12) Time-varying natural mortality and SCAA	A, C, D	August 2016	To be completed by the mid-term review*.	SC66b: No progress. SC67a: As in SC66b. SC67b: As in SC66b.
(13) Time varying ASM data and SCAA	A, C, D	May 2016	To be completed by the mid-term review*.	SC66b: No progress. SC67a: As in SC66b. SC67b: As in SC66b.
(15) Krill acoustic sampling	B, E	March 2017	Completed.	SC66b: Completed.
(17) Power analysis for krill abundance	A, E	August 2016	To be addressed.	SC66b: Will be addressed in consultation with CCAMLR specialists SC67a: No progress. SC67b: As in SC66b.
(18) Stomach contents vs krill survey	A, B, C	May 2016	To be addressed.	SC66b: Will be addressed in consultation with CCAMLR specialists SC67a: No progress. SC67b: As in SC66b.
(22) Energy intake (requirements)	A, B, D	August 2016	To be addressed. Need clarification from the IWC SC	SC66b: No Progress. SC67a: As in SC66b. SC67b: As in SC66b.
(23) Stable isotopes in baleen plates	B	August 2016	Completed.	SC66b: Will be addressed in consultation with other research institutions. SC67a: Some progress presented. SC67b: Completed.
(26) Sample sizes required to detect change in ASM	D	May 2016	Completed to a reasonable level	SC66b: Overall, the approach being taken to address the recommendation is appropriate, but some further refinements are required. SC67a: No Progress. SC67b: As in SC67a.

*See note in Table #, Annex U4.

19.3 JARPN II

The new information provided on JARPN II is relevant only to the discussion of the NEWREP-NP ‘non-lethal vs lethal’ feasibility study (see Item 19.3).

19.4 NEWREP-NP

19.4.1 Report on ongoing research

Three papers were presented on progress made during the 2017 surveys of different aspects of the NEWREP-NP programme (SP03, 06, 07, see Annex U3 for summaries).

In particular, SC/67b/SP03 reported the results of the satellite tagging of North Pacific sei whales. A total of 44 tagging attempts were made using SPOT6 tags with the LKArts attachments system. A total of 15 tags were deployed on sei whales, and eight whales were tracked. Two sei whales were tracked for more than 35 days, and both showed longitudinal movement. The authors concluded that the tagging experiment showed that deploying such tags from sighting/sampling vessels was practical, but identified technical improvements to try to increase the tracking period.

In discussion, it was noted that the proportion of successful deployments was low (7 failures in 15 attempts); and suggestions on how to improve this included: (a) strategic placement of tags on the upper body of whales to ensure tag longevity and reduce potential physical impacts (e.g. lesions) and (b) replacement of the current screw-on anchor system with an integrated tag design to decrease the possibility of tag breakage. It was noted that guidelines for cetacean tagging should become available within the next year and published in the IWC Journal. It was noted by the authors that the cause of the failures in SP03 were difficult to evaluate since a tag in an optimal position on the whale had also failed. New tags with a modified anchor system and stopper will be used during the next season.

The Committee welcomes new information on the feasibility of satellite tagging sei whales and notes the valuable movement data collected from two of the longer-term (>35 days) deployments. The Committee **encourages** the collection of more telemetry data and notes that this may help improve abundance estimation (by providing information on correction factors) and provide inferences on stock structure.

SC/67b/ASI10 presented a summary of results of the NEWREP-NP dedicated sighting survey in the western North Pacific in 2017 whilst SC/67b/ASI06 presented the research plan for the next systematic vessel-based sighting survey in the western North Pacific under NEWREP-NP in 2018 and 2019. As indicated under Item 24.3, the new NEWREP-NP sighting cruise plan has been endorsed by the Committee; Annex Q (item 4.2) provides more details on both these papers.

19.4.2 Update on previous recommendations

The table in Annex U4, provides a detailed update of the Committee's view of progress on previous recommendations. An overview is provided in Table 26 (see next page).

Table 26

Summary of status of recommendations relevant to NEWREP-NP

No. of recommendation	Priority by the Committee	Timeline	Proponents self-evaluation on progress as of SC67b	Scientific Committee Evaluation
(1) Lethal vs non-lethal quantitative review of data	Very high	Before start	SC67a: Completed.	SC67a: Different opinions as to whether the recommendation has been met. SC67b: No progress.
(3) Sexual maturity (blubber and serum)	High	Before start	SC67a: Completed.	SC67a: The Proponents demonstrated intention to include analysis of blubber for progesterone, but there are few details of how. SC67b: Partially addressed.
(4) Sightings surveys	High	Before start and annually	Addressed and ongoing.	SC67a: Completed: survey plan was presented. SC67b: Completed: survey plan was presented.
(5) Stomach contents	High	Before start	SC67a: Completed.	SC67a: Completed.
(7) Immune function assays	High	Before start	SC67a: Completed.	SC67a: Completed.
(8) Lipophilic compounds	High	Before start	SC67a: Completed.	SC67a: Completed.
(10) Coordination with IWC-POWER	High	Before start and annually	Addressed and ongoing	SC67a: Completed annually.
(11) Coastal component: sampling strategy	High	Before start	Disagree with Panel	SC67a: No progress as proponents disagree with Panel. SC67b: No progress.
(12) Offshore components: sampling strategy	Very high	Before start	SC67a: Completed.	SC67a: Completed.
(13) downweight historical age-composition data	Very high	Before start	Disagree with Panel.	No progress.
(15) efficiency of biopsy sampling (additional captures unnecessary)	Very high	High priority ASAP in 2017	Disagree with Panel.	No progress.
(17) Telemetry	High	Before start	Ongoing	SC67a: Partially addressed. SC67b: New information (SC/67b/SCSP03).
(21) Sample size (potential reduction of lethal sample size)	Very high	Before start	To be considered by the mid-term review.	SC67a: The possibility for further work has been considered. SC67b: No progress.
(22) Sample size (in general)	Very high	Before start	Not relevant.	SC67a: Small progress. SC67b: No progress.
(23) Impact of catches on common minke whales (subset of 2013 <i>Implementation</i>)	Very high	Before start	Disagree with Panel.	SC67a: Major concerns addressed. SC67b: Completed. Refined analyses were presented. It could be reconsidered in the next <i>Implementation Review</i> .
(24) Impact of catches on common minke whales (new abundance)	Very high	Before start	Disagree with Panel.	SC67a: Major concerns addressed. SC67b: Completed. Refined analyses were presented. It could be reconsidered in the next <i>Implementation Review</i> .
(25) Sei whale (abundance, $MSYR_{1+}=1\%$, $MSYR_{mat}=4\%$)	Very high	Before start	SC67a: Completed.	SC67a: Completed.
(27) Higher priority to analyses and modelling	High	Before start	Ongoing	SC67a: It is not clear that additional qualified personnel have been hired. SC67b: No progress.
(28) Sample and data archiving, relational database(s)	High	Before start	Ongoing	SC67a: Partially addressed for DNA data and associated biological information.
(29) Contingency plan	High	Before start	Ongoing	SC67a: Partially addressed.

20. WHALE SANCTUARIES

20.1 Review of the Southern Ocean Sanctuary Management Plan

The Schedule amendment establishing the Southern Ocean Sanctuary (SOS) requires the Sanctuary to be reviewed at succeeding ten-year intervals, unless otherwise revised by the Commission. The first review of the SOS took place in 2004 (IWC, 2005) and the second review was completed in 2016 (IWC, 2017). In 2014 (IWC, 2015c), the Commission adopted eight objectives for the SOS (summarised in Annex R, item 3). The Commission also provided terms of reference for the review to be undertaken by the Scientific and Conservation Committees. The Scientific Committee review made several recommendations (IWC, 2017c). These recommendations were taken into account in a draft Southern Ocean Sanctuary Management Plan (SC/67b/SAN01) developed by Australian scientists and discussed in Annex R (item 3). It was noted that, while the draft Plan does contain performance measures, it does not contain criteria for its own review.

The purpose of the draft Management Plan is twofold: (1) to inform the Commission and public about the sanctuary objectives and actions planned for the next ten years; and (2) to propose strategies toward the achievement of the SOS's goals using the best means available and provide clear performance measures for each proposed action.

The operative part of the Plan is a Research and Action Plan that involves assessing and addressing threats and research on the recovery of whale populations and their habitats. The Research and Action Plan is structured based on the Commission's agreed objectives for the SOS. Each objective is linked directly to a measurable objective, action or approach and performance measure.

The Committee also discussed the potential contributions that data and results from the Japanese whale research programme in the Southern Ocean (NEWREP-A) could make to the objectives and goals of the Plan and the Committee agrees to incorporate reference to NEWREP-A under Objectives 4-6.

The amended Plan, with Objectives 1 and 8 (relating to policy) and the chapeau of Objective 5 redacted to clarify that the Committee did not address these elements of the Plan, is given as Annex R (Appendix 2).

A statement from the Government of Japan regarding its position on the SOS and this draft Management Plan is attached as Annex R, Appendix 3.

Attention: C-A, CC, SC,

The Committee reviewed the components of a draft Management Plan for the Southern Ocean Sanctuary (SOS) that are related to science and therefore within its remit and:

- (a) **endorses** the measurable objectives, approach/actions and performance measures of Objectives 2 -7 of the amended draft Southern Ocean Sanctuary (SOS) Management Plan (Annex R, appendix 2); and*
- (b) **agrees** to include a new standing item on the agendas of all relevant sub-committees and working groups: 'new information relevant to the SOS Management Plan' in order to assist the Commission in monitoring and measuring progress on the scientific objectives of the Plan.*

21. SATELLITE TAGGING DEVELOPMENT AND BEST PRACTICES

21.1 Tag Workshop Meeting, Silver Spring, MD, USA 6-8 September 2017

A workshop on cetacean tag development, tag follow-up and tagging best practices was held at the National Marine Fisheries Service in Silver Spring, Maryland, USA from 6-8 September 2017. The workshop was co-sponsored by the Office of Naval Research (ONR), the International Whaling Commission (IWC), and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA/NMFS). The purpose of the workshop was to review and evaluate progress in tag design and attachment since the 2009 ONR Cetacean Tag workshop (ref - attached), with an emphasis on (a) recent tag attachment improvements, (b) follow-up studies that examined the effects of tagging, and (c) reviewing and providing input on draft cetacean tagging best practices guidelines.

Several presentations were made, with a focus on sharing information and discussion of the best available science of design and effects of tagging to facilitate future advancements in tag design and application, maximising attachment durations to the extent required to answer the questions being posed, whilst minimising potential impacts to the animals.

Discussion on the status of tag attachment development and follow-up studies occurred, along with extensive discussion regarding the cetacean tagging best practices guidelines. While much was accomplished towards the collective goals of the workshop, one item not covered in sufficient detail was discussion on the future directions in tag attachment technology. Therefore, a second smaller workshop will be convened in June of 2018 with a subset of the original attendees that focus specifically on tag attachments. The final report will merge the results of the September 2017 workshop and the June 2018 workshop.

22. IWC LIST OF RECOGNISED SPECIES

The Committee has agreed to follow the guidance of the Society for Marine Mammalogy's Committee on Taxonomy. This year (see Item 17.5), in completing its review of the taxonomy of *Tursiops*, the Committee noted that the current taxonomy provided by the SMM Committee for *Tursiops* was well supported by morphological and molecular genetic data, as well as ecological and distributional data.

23. IWC DATABASES & CATALOGUES

23.1 Guidelines for IWC catalogues and photo-ID databases

At last year's meeting, the Committee agreed IWC Guidelines for Photo-identification Catalogues (IWC, 2018f), noting that adding technical Appendices would be valuable in the future. Draft items for inclusion as Appendices were discussed by the *Ad hoc* Working Group on Photo-identification (Annex S, item 5.1) covering five issues: (1) cataloguing software; (2) image matching software; (3) seminal papers defining individual identification, by species; (4) photo quality guides; and (5) photo/data collection apps. Work will continue on developing these appendices intersessionally (Annex Y).

23.2 Progress with existing or proposed new catalogues

23.2.1 Integration of eastern South and Central Pacific blue, humpback, and fin whale photo-catalogues

There was no new information specific to this item this year.

23.2.2 Southern Hemisphere and Indian Ocean humpback whale catalogues

23.2.2.1 ANTARCTIC HUMPBACK WHALE CATALOGUE

The Antarctic Humpback Whale Catalogue (AHWC), maintained at College of the Atlantic, USA, was established in 1987 and during the past 30 years its data have been used in dozens of studies and publications (Stevick *et al.*, 2017). With a recent loss in funding, the catalogue database is now 'frozen' and is not being actively updated. The Working Group expressed strong disappointment at this news as well as the hope that the AHWC's funding situation will change and enable the catalogue to continue.

Attention: SC, G

The Scientific Committee has been informed that due to a loss of funding, the Antarctic Humpback Whale Catalogue curated by the College of the Atlantic, USA will no longer be updated. The Committee:

- (1) **draws attention** to the great value this catalogue (established in 1987) has provided to the Committee, including receiving photographs from the IWC IDCR and SOWER cruises and providing information for the Committee's Comprehensive Assessment of Southern Hemisphere humpback whales;*
- (2) **welcomes** news that the existing catalogue will remain a resource for scientists; and*
- (3) **encourages** potential funders to support future continuation of the catalogue.*

The Committee also received an update on the development and status of 'Happywhale', a web-based marine mammal photo-ID crowd-sourcing platform (SC/67b/PH05)¹². This is discussed in Annex S (item 2.2). In recent months Happywhale provided images to catalogues relevant to the IWC and IWC-SORP of Southern right whales, Antarctic blue whales, and Antarctic killer whales. It will also contribute to the ongoing in-depth assessment of North Pacific humpback whales (see Annex F item 4.2.1).

23.2.2.2 ARABIAN SEA WHALE NETWORK'S FLUKEBOOK

In 2016 (IWC, 2017), the IWC approved funding for the development of a regional data platform for the Arabian Sea Whale Network (ASWN), to be implemented in collaboration with Wild Me, the developers of Flukebook. This year the Committee received information SC/67B/PH/03 that described Flukebook, a non-profit, open source cetacean data archiving and photo matching tool as discussed in Annex S (item 2.1; SC/67B/PH/03). The ASWN is joining Flukebook with two primary objectives: (1) to consolidate and more effectively manage humpback whale and other cetacean data collected in Oman over the past 20 years; and (2) to provide an online platform that will allow comparison and regional-level analysis of cetacean data collected by different research groups throughout the Arabian Sea (so far photographs are mainly from Oman, with a few from Pakistan and India). The Committee **looks forward** to updates on this work.

23.2.3 Southern Hemisphere Antarctic and pygmy blue whales: Catalogues and databases

23.2.3.1 SOUTHERN HEMISPHERE BLUE WHALE CATALOGUE (SHBWC)

The SHBWC has become the largest repository of Southern Hemisphere blue whale photo-identifications. It now includes a total of 1,519 individual blue whale photo-identifications from areas off Antarctica, Chile, Peru, Ecuador-Galapagos, Eastern Tropical Pacific (ETP), Australia, Timor Leste, New Zealand, southern Africa, Madagascar and Sri Lanka. The Committee received information on the progress made with the catalogue (SC/67B/PH/04), especially in light of the recommendations made last year to conduct catalogue comparisons in the Indo-Australian region (IWC, 2018b). This is discussed in more detail in Annex S (item 3.2). Comparison work (SC/67B/SH16) found (a) no matches between Australia, New Zealand and Sri Lanka, reinforcing the hypothesis of separate populations; and (b) exchange within Australia, suggested a single population; and (c) re-sights found in New Zealand suggest some site fidelity. Additional work is underway. The relevance of the catalogue to population assessments is discussed in Annex H Item 7.1.1.2.

23.2.3.2 ANTARCTIC BLUE WHALE CATALOGUE (ABWC)

In 2017, the Antarctic Blue Whale Catalogue compared photographs from the IWC IDCR/SOWER cruises in 1989/1990, 1993/1994, and 1997/1998 as well as opportunistic photographs collected by collegial scientists, naturalists, and tourists 2015-2018. The catalogue now contains almost 460 individuals. The results of the comparison of new Antarctic blue whale identification photographs to the ABWC is summarised in SC/67B/PH02 and discussed in Annex S (item 3.1); 17 new individual blue whales were identified. The collection of Antarctic blue whale identification photographs provide data for capture-recapture estimates of abundance (SC/67B/SH08) as well as information on the movement of individual blue whales within the Antarctic region. The relevance of the catalogue to population assessments is discussed Annex H, Item 7.1.1.1.

Attention: SC

- (1) The Southern Hemisphere Blue Whale Catalogue provides data useful for estimating abundances and examining connectivity between feeding and breeding grounds. The Committee **agrees** that the catalogue continue.*
- (2) The Committee **agrees** that the Antarctic Blue Whale Catalogue continue its work collecting adding photo-identification data to the catalogue in order to assist with developing estimates of population abundance for Antarctic blue whales.*
- (3) The Committee **agrees** that the development of a simple guide (physical and electronic versions) to help tourists and naturalists take photos that are suitable for photo-identification should be undertaken. This will support the photo-ID*

¹² <https://happywhale.com>

catalogues from the Antarctic region for use in population assessments by the IWC, particularly for blue whales, right whales, fin whales, and humpback whales.

23.2.4 Southern Hemisphere fin whale photo catalogues

The Committee received information on a new photo-identification catalogue of Antarctic fin whales. Photographs from SOWER cruises 2004-2008 are included as well as those collected opportunistically near the South Orkney Islands during a Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) fisheries research voyage (SC/67B/PH01). This is discussed in Annex S (item 4.1). The catalogue serves as a foundation for future photo-ID studies, especially those proposed for the western Antarctic Peninsula. The relevance of the photo-identification of fin whales to population assessments is discussed Annex H, Item 7.1.2.

Attention: S, SC

1) The Committee **encourages** continuation of the Antarctic Fin Whale Catalogue which can potentially provide data toward estimating abundance or identifying movement patterns.

2) The Committee **agrees** that an exhaustive search be conducted to locate SOWER photos that are missing from the IWC archives, including those of fin whales.

23.2.5 Western Pacific gray whale photo catalogues

The Committee received information on two photo-identification catalogues relating to the Sakhalin Island feeding aggregation: one (SC/67B/ASI04), based on work undertaken as part of an industry-sponsored Exxon Neftegas Limited-Sakhalin Energy Investment Company joint monitoring program discussed in Annex S, item 4.2); and the other conducted by the Russia gray whale project (SC/76b/CMP/7) discussed in Annex O (item 2.1.3). The Committee welcomed news that the two catalogues would be unified under the auspices of the IWC.

23.3 Work plan

The work plan on work related to catalogues is provided in Table 27.

Table 27

Work plan on issues related to catalogues.

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Appendices for IWC Guidelines for Photo-identification	Continue compilation	Appendices ready for review	Continue compilation	Appendices ready for review
Upload all available New Zealand blue whale identification photographs to SHBWC (also pertains to Annex H item 7.1.1)	Cross-reference between separate area catalogue holdings before uploading to SHBWC avoid duplication; intersessional correspondence group (Annex Y)	Included in SHBWC report	-	-
Development of how-to photo-ID materials for naturalists and citizen scientists (also pertains to Annex H item 7.1.1.2)	Prepare hard copy and PPT photo-ID guides	Guide completed and available (pending funding)		
4) Search for missing SOWER photographs, especially fin whale photos from 2006/2007	Search Secretariat archives and contact SOWER researchers for personal copies of photos	Report		

23.4 Potential future IWC databases

23.4.1 Global database for disentanglement activities

As discussed under Item 13.2, development of a dedicated entanglement database will be considered further at the June 2018 meeting of the Global Whale Entanglement Response Network (see Annex J, item 2.3).

23.4.2 Global bycatch database

No new information was presented on the development of a global bycatch database was presented this year. Consideration of such a database could take place as part of the Bycatch Mitigation Initiative and should it be taken further, follow the guidelines for the proposal of new databases developed last year (IWC, 2018, pp. 403-404).

23.4.3 Development of simple technical guidelines for new proposals

No changes were suggested to the guidelines developed at last year's meeting (IWC, 2018, pp. 403-404).

24. IWC MULTINATIONAL RESEARCH PROGRAMMES AND NATIONAL RESEARCH CRUISES THAT REQUIRE IWC ENDORSEMENT

24.1 IWC-POWER

The Committee received the results of the 8th annual IWC-POWER cruise conducted between 3 July and 25 September 2017 in the eastern Bering Sea. Researchers from Japan, USA and IWC participated on the surveys (SC/67b/ASI12). The Committee also received the report of the planning meeting for the 2018 IWC-POWER cruise, which will be conducted in the central Bering Sea, and cruise plans for the 2019 and 2020 cruises (SC/67b/Rep02). Details and preliminary results of the 2017 IWC-POWER survey and future plans for 2018, 2019 and 2020 are provided in Annex Q, item 4.1.

Attention: SC, C-A, CG-R

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

- (1) **thanks** Japan who generously supplies the vessel and crew, for their continued support of this IWC programme;*
- (2) **thanks** the USA who provided an acoustician and acoustic equipment for the 2017 cruise and will do so for the 2018 cruise;*
- (2) **agrees** that the 2017 cruise was duly conducted following the requirements and guideline of the Committee (IWC, 2012) and looks forward to receiving abundance estimates based on these data;*
- (3) **endorses** the plans for the 2018, 2019 and 2020 POWER cruise and **recommends** a meeting of the Technical Advisory Group along with the planning meetings for 2019 and 2020 cruises;*
- (4) **strongly recommends** that Russia facilitates the proposed research by providing permits for the IWC-POWER cruise to survey the Russian Exclusive Economic Zone in 2019;*
- (5) **looks forward** to receiving a report from the 2018 survey at the next SC meeting.*

24.2 Southern Ocean Research Partnership (IWC-SORP)

The Southern Ocean Research Partnership (IWC-SORP) was established in March 2009 as a multi-lateral, non-lethal scientific research programme with the aim of improving the coordinated and cooperative delivery of science to the IWC. The Partnership currently has 13 member countries: Argentina, Australia, Belgium, Brazil, Chile, France, Germany, Italy, New Zealand, Norway, South Africa, the United States of America, and Luxembourg was welcomed at this meeting. New members are warmly welcomed.

There are five ongoing IWC-SORP themes:

- (1) 'The Antarctic Blue Whale Project';
- (2) 'Distribution, relative abundance, migration patterns and foraging ecology of three ecotypes of killer whales in the Southern Ocean';
- (3) 'Foraging ecology and predator-prey interactions between baleen whales and krill';
- (4) 'Distribution and extent of mixing of Southern Hemisphere humpback whale populations around Antarctica?' focused initially on east Australia and Oceania; and
- (5) 'Acoustic trends in abundance, distribution, and seasonal presence of Antarctic blue whales and fin whales in the Southern Ocean'.

Bell presented the IWC-SORP Annual Report 2017/18 on the continued progress of research undertaken researchers involved in the five themes since last year (SC/67b/SH21). This progress includes the production of 33 peer-reviewed publications during 2017/18, bringing the total number of peer-reviewed publications related to IWC-SORP since the start of the initiative to 126. In addition, 125 IWC-SORP related papers have been submitted to the Scientific Committee, 22 of them this year.

Fieldtrips were undertaken to a variety of places during the past year, including the western Antarctic Peninsula, Marion Island, the Ross Sea, the Chesterfield-Bellona Reef complex west of mainland New Caledonia, and the Great Barrier Reef, Australia. Thousands of images for photo-identification have been collected; a variety of satellite tag-types deployed on Antarctic minke whales, humpback whales and killer whales as well as biopsy samples collected from these same species; video suction cup tags have been deployed on Antarctic minke whales and humpback whales; and hundreds of hours of acoustic recordings have been made and analysed. The support of tour companies in providing opportunistic research platforms to facilitate these activities and external data contributors were acknowledged by the Committee.

Attention: SC, G

The Committee reiterates the great value of the IWC-SORP (Southern Ocean Research Partnership) programme to its work. The Committee:

- (1) **encourages** the continuation of the Southern Ocean Research Partnership programme;
- (2) **commends** the researchers involved who are key to the overall success of the Partnership in IWC-SORP for:
 - (a) the impressive quantity of work carried out across diverse member nations;
 - (b) their contributions to the work of the Committee; and
- (3) **encourages**:
 - (a) the continued development, testing and implementation of leading edge technology; and
 - (b) the continued development of collaborations between ships of opportunity and external bodies that can provide platforms for research and/or contribute data, inter alia, photo-identification data, to IWC-SORP and the wider Committee

24.2.1 Workplan

The work plan for issues related to IWC-SORP is given in Table 28.

Table 28
Workplan for the Southern Ocean Research Partnership.

Topic	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	Intersessional 2019/20	2020 Annual meeting
Analyses	Continued analysis of data/samples from previous IWC-SORP voyages/fieldwork	Report	Continued analysis of data/samples from previous IWC-SORP voyages/fieldwork	Report
Voyages	Argentine coastguard 'Tango' voyage along Western Antarctic Peninsula (early 2019)	Cruise report		
	Almirante Maximiano voyage along Western Antarctic Peninsula (early 2019)	Cruise report		
	Australian-led RV Investigator voyage to Ross Sea (early 2019)	Cruise report		
	New Zealand-led RV Tangaroa voyage to Ross Sea (early 2019)	Cruise report		
	German-led RV Polarstern voyage to Scotia Sea (early 2019)	Cruise report		
	Baleen whale and krill research voyages along Western Antarctic Peninsula	Reports	Baleen whale and krill research voyages along Western Antarctic Peninsula	Reports
Ships of opportunity	Continued use of ships of opportunity to conduct cetacean research	Reports	Continued use of ships of opportunity to conduct cetacean research	Reports
Acoustics	Retrieval and redeployment of passive acoustic recorders	Report	Retrieval and redeployment of passive acoustic recorders	Report
	Completion of annotated library of acoustic detections	Report		

24.3 National cruises that require IWC oversight

The Committee welcomed plans for national research cruises to be conducted in the intersessional period of 2018-2019. Details on the cruise plans and cruise reports are presented in Annex Q, item 4.2.

Attention: SC, C-A

The Committee **recognises** the great value to its work provided by data from national cruises. The Committee:

- (1) **endorses** the proposed sighting survey plans for cruises to be conducted with IWC oversight in the southwestern Okhotsk Sea by Russia, and in the North Pacific and the Antarctic by Japan; and
- (2) **encourages** submission of abundance estimates from these studies the future.

24.4 Review of cruise reports from national programs with IWC oversight

The Committee considered a process to optimise the review of cruise reports from national research programs with IWC oversight. Details are given in Annex Q, item 2.7

Attention: SC, CG-R

The Committee **recognises** the value of information provided by national cruises with IWC oversight. The Committee noted that a process to optimise the review of national cruise reports is needed and

- (1) **recommends** contracting governments to submit reports of multi-year cruises with IWC oversight biennially, in years between Commission meetings (e.g., SC “A” years);
- (2) **agrees** that cruise reports will be summarised in a table;
- (3) **notes** that that in certain circumstances, cruise reports may require additional evaluation; and
- (4) **agrees** that the ‘Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme’ should be modified at next year’s meeting to accommodate procedural changes with respect to the submission and review of national cruise reports.

24.5 Work Plan

The Committee’s work plan for continuing the IWC-POWER programme in 2019 and 2020 is provided below in Table 29.

Table 29

Workplan for issues related to IWC-POWER.

Item	Intersessional 2018-19	SC68a	Intersessional 2019-20	SC68b
IWC-POWER Cruise	Conduct 2018 survey and planning meeting for the 2019 Cruise (Bering Sea)	Review cruise report, report from the planning meeting and new abundance estimates from IWC-POWER cruises.	Conduct 2019 survey and planning meeting for the 2020 Cruise	Review cruise report, report from the planning meeting and new abundance estimates from IWC-POWER cruises.

25. SCIENTIFIC COMMITTEE BUDGET FOR THE CURRENT BIENNUM

25.1 Status of previously funded research, workshop proposals, data processing and computing needs

25.1.1 Funded proposals for the current biennium 2017-2018

Table 30 summarises the status of the work funded by the Committee last year. The 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 30). These are all still of great value to the Committee and should be completed before the next meeting. Details of all ongoing projects can be found in SC/67B/01 Rev1.

25.1.3 Report on funds reallocations and contingencies for the Research Fund, Voluntary Fund for Small Cetaceans and SORP Voluntary Fund

SC/67b/01Rev1 provides information on the actual position against budget for the Research fund for 2017 as well as the position to 31st March for the 2018 financial year. The paper gives summary level and detailed information for the Research fund as well as the expected level of contingency available, which remains static at around 10% of the Research budget, or £32k. The document also provides details of the reallocations of budget amongst budget headings for 2017 and the 2018 year-to-date. Annex 1 gives a detailed position along with a status report for each budget line. Section 3 also provides details of voluntary funds which relate to Scientific Committee business – the Gray Whale Tagging Fund, the Small Cetaceans Fund and the SORP fund. For each there is an update of 2017 expenditure and 2018 to-date information along with details of commitments to future work in these funds.

Table 30

Summary of progress on proposals funded at SC67a

SC/67a no.	RP Title	Status
SC01	Invited Participants - SC/67b	Completed
IA01(67a)	Workshop for an in-depth assessment of North Pacific humpback whales	Ongoing (Annex F)
EM01	Two joint SC-CAMLR and IWC-SC Workshops	Ongoing (Annex L)
AWMP01	AWMP first intersessional Workshop and genetic work	Completed (SC/67b/Rep06)
AWMP02	AWMP second intersessional Workshop	Completed (SC/67b/Rep06)
CMP01(67a)	5 th Workshop on the rangewide review of population structure and status of North Pacific gray whales	Completed (SC/67b/Rep07rev1)
BRG04	Satellite tagging best practices Workshop	Ongoing, Item 21
WW01	Intersessional Workshop: data gaps and modelling requirements for assessing the impacts of whale watching	Completed (SC/67b/Rep03rev1)
RMP01	Intersessional Workshop: <i>Implementation Review</i> of North Pacific Bryde's whales	Completed (SC/67b/Rep02)
RMP01(67a)	Intersessional Workshop: <i>Implementation Review</i> for Western North Pacific minke whales	Completed (SC/67b/Rep05)
WW01(67a)	Review CC Strategic plan on whalewatching pre-meeting on intersessional workshop	Completed (Annex N)
E05/E01(67a)	Cumulative impacts - pre-meeting or intersessional meeting	Completed (Annex K)
SM01	Intersessional Workshop: resolving <i>Tursiops</i> taxonomy	Completed (SC/67b/SM18rev1)
SM01(67a)	Intersessional Workshop: boto mortality	Completed (SC/67b/Rep01)
SH07	Defining blue whale population boundaries and estimating associated historical catches, using catch data in the Southern Hemisphere and northern Indian Ocean	Completed (SC/67b/SH23)
AWMP02	AWMP developers fund	Completed (Annex D)
IA02	Assessment modelling for an in-depth assessment of North Pacific sei whales	Ongoing (SC/67b/IA01)
RMP02	Essential computing support to the Secretariat for RMP	Completed (Annex D)
Research		
BRG01	Aerial photographic survey of southern right whales on the South Africa Cape nursery ground	Completed (SC/67b/SH01)
BRG03	Passive acoustic monitoring of the eastern South Pacific southern right whales, improving CMP outputs	Completed (SC/67b/CMP18)
SH03a	Northern Indian Ocean humpback subspecies determination-genetics	Ongoing (Annex H)
IA03	IWC-POWER cruise	Completed (SC/67b/Rep04)
SH01(67a)	Coding for Australian blue whale photo catalogue	Ongoing (Annex PH)
E02(67a)	Mercury in cetaceans (requested by the Commission)	Ongoing (SC/67a/E08)
SH02	Southern Hemisphere Blue Whale Catalogue	Completed (SC/67a/PH04)
SH08	Development of a permanent blue whale song reference library	Completed (SC/67a/SH11Rev1)
HIM01	Ship Strike Database Coordinator	Completed (SC/67a/HIM11)
E01	Cetacean Diseases of Concern	Ongoing (Annex K)
E03(67a)	IWC strandings initiative	Ongoing (Annex K)
E04	SOCER (State of the Cetacean Environment Report)	Completed (SC/67a/E01)

The Committee received a brief report on the IWC-SORP Research Fund. Following an open, competitive Call for Proposals (26 July to 17 August 2016) a total of £144,058 GBP was allocated from the IWC-SORP Research Fund to 10 research projects, ahead of the 2016-2017 austral summer survey season. Progress on these projects is detailed in SC/67b/SH18.

The Committee also noted that since SC67a, substantial vessel time has also been secured by IWC-SORP researchers for the 2019 and 2020 austral field seasons.

Attention: C, F&A, S

A full report on the new Call for Proposals, opened in September 2017 and closed in January 2018, was also received. A total of 19 proposals were received and evaluated by the Assessment Panel under the coordination of the Chair of the Scientific Committee. The Committee thanks Fortuna for convening the Assessment Panel and expressed its gratitude to the Panel members who all provided valuable and thoughtful input into the assessment process. The Committee welcomes the outcome of the Assessment Group and agrees with the allocation of a total of £493,544 GBP from the IWC-SORP Fund to 15 projects (Table 31).

The Committee agrees on these recommended allocations and requests the Secretariat to submit them to the Finance and Administration Committee, as soon as feasible, for its consideration. Should the Commission endorse these financial recommendations, the Committee requests the Secretariat to inform successful and unsuccessful proponent immediately after the next Commission's meeting.

Table 31
List of the funding allocations by project recommended by the IWC-SORP Assessment Panel

ID	Chief Investigator	Title	Requested amount (£)	Recommended amount (£)	Level of funding (Partial/Full)
1	Baker & Steel	Is migratory connectivity of humpback whales in the Central and Eastern South Pacific changing? A decadal comparison by DNA profiling	27,598	26,375 (deducted in house instrument expenses)	P
2	Charrassin	Application of satellite telemetry data to better understand the breeding strategies of humpback whales in the Southern Hemisphere	21,200	21,200	F
3	Branch	Modelling somatic growth and sex ratios to predict population-level impacts of whaling on Antarctic blue whales	32,594	32,594	F
4	Friedlaender & Constantine	Pregnancy rates in Southern Ocean humpback whales: implications for population recovery and health across multiple populations	29,334	19,984 (equipment deducted and some analytical costs)	P
5	Herr	Recovery status and ecology of Southern Hemisphere fin whales (<i>Balaenoptera physalus</i>)	82,300	81,900 (equipment deducted)	P
6	Friedlaender & Constantine	A circumpolar analysis of foraging behaviour of baleen whales in Antarctica: Using state-space models to quantify the influence of oceanographic regimes on behaviour and movement patterns	34,711	34,711	F
7	Buchan & Miller	A standardized analytical framework for robustly detecting trends in passive acoustic data: A long-term, circumpolar comparison of call-densities of Antarctic blue and fin whales	43,369	41,369 (publication costs)	P
8	Lang & Archer	Inferring the demographic history of blue and fin whales in the Antarctic using mitogenomic sequences generated from historical baleen	22,710	22,710	F
9	Zerbini & Clapham	Assessing blubber thickness to inform satellite tag development and deployment on Southern Ocean whales	22,646	22,426 (supply costs deducted)	P
10	Širović & Stafford	Acoustic ecology of foraging Antarctic blue whales in the vicinity of Antarctic krill studied during AAD interdisciplinary voyage aboard the <i>RV Investigator</i>	34,183	30,107 (airfares deducted)	P
12	Kelly & Maire	Development of statistical and technical methods to support the use of long-range UAVs to assess and monitor cetacean populations in the Southern Ocean	30,576	30,576	F
13	Reisinger & de Bruyn	An integrative assessment of the ecology and connectivity of killer whale populations in the southern Atlantic and Indian Oceans	33,650	33,650	F
14	Bengston Nash	Implementation of humpback whales for Antarctic sea-ice ecosystem monitoring; Inter-program methodology transfer for effective circumpolar surveillance	91,202	51,555 (equipment costs deducted)	P
17	Carroll, Torres, Graham	Circumpolar foraging ecology of southern right whales: past and present	21,290	21,290	F
18	Infúñez Bessega	Habitat use, seasonality and population structure of baleen and toothed whales in the Scotia sea and the western Antarctic Peninsula using visual and passive acoustic methods and genetics	26,579	23,097 (equipment costs reduced, communication & network costs deducted)	P
TOTAL			693,195	493,544	

Finally, the Committee was informed that the next Call should open prior to SC/68b (i.e. late 2019/early 2020) in readiness for IWC68 (2020). This timing would allow strategic prioritisation of the research toward which the Call is directed in order to meet IWC-SORP and IWC/SC priorities; allow knowledge gaps to be identified; and allow the IWC-SORP SSC to seek additional funding to augment the funds available in the IWC-SORP Research Fund.

26. COMMITTEE PRIORITIES AND INITIAL AGENDA FOR THE BIENNium 2019-2020

The Committee's priorities and work plan by broad subject matter are provided in Tables under the relevant agenda items.

The Committee agrees that the Chair, Vice-Chair and Head of Science, in co-operation with the Convenors, should examine the individual work plans by topic and develop an overall Committee biennial workplan and priorities taking into account the overall work load, meeting venues and efficiency. This should be submitted to the Commission meeting as an Annex to their two-year overview.

27. SCIENTIFIC COMMITTEE BUDGET FOR THE BIENNium 2019-2020

27.2 Budget for the next biennium

As in 2016, 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. Funding was not approved for one project (*Gulf of Penas, Southern right whales*) as further information is needed before funding can be agreed. The savings from 2018, some self-reductions and adjustments between years allowed inclusion of all funding proposals for 2019 and 2020 in the new budget of £315,800 per year.

Table 32
Workshop proposals agreed during this meeting (TBD: to be decided).

Title	Relevance	Date	Venue
Western gray whale update of CMP and conservation issues within modelling framework	CMP		
Marine debris	E	December 2019	Barcelona, Spain
Noise pre-meeting	E	Pre-meeting 2020	TBD
Cetaceans & ecosystem functioning: a gap analysis*	EM	TBD	TBD
Joint IWC-IUCN workshop to evaluate how the data and process used to identify Important Marine Mammal Areas (IMMAs) can assist the IWC to identify areas of high risk for ship strike	HIM	April 2019	Greece
Comprehensive Assessment of North Pacific humpback whales	NH		
Comparative biology, health, status & future of NA right whales	NH	Late 2019	Boston, USA
<i>Implementation Review</i> : North Pacific minke whales	RMP		
Catch series: Southern right whales	SH	Pre-meeting 2020	TBD
Intersessional workshop of the task team on South Asian River dolphins	SM	Feb 2019	TBD
Guiana dolphin pre-assessment	SM	October 2019	Curitiba, Brazil
Modelling whale watching impacts (MAWI)	WW	December 2019	
POWER planning meeting	ASI	Oct 2018	Tokyo, Japan
Wildmeat workshop	SM	Late 2019/early 2020	Africa
Tagging best practices	ASI	Jun 2018	Seattle, USA

* Japan referred to its statement on the adoption of the Agenda (Annex Z) and considered that several of the items for the proposed workshop (Item 16.4.4) are outside the competence of IWC. Therefore, it cannot support the proposed workshop or associated funding from the Committee's budget.

Table 33 shows the Committee budget requests for the biennium for each of the proposed priority activities.

27.2.1 Invited Participants

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-Convenors and rapporteurs, subject area experts and Convenors of intersessional groups. All sub-committees and Working Groups benefit from this budget item. This year under this budget item, 62 scientists from Australia, Argentina, Belgium, Brazil, Canada, Chile, China, Colombia, France, Germany, Italy, Japan, Mexico, Netherlands, Norway, Oman, Peru, Slovenia, South Africa, Spain, UK, USA were supported.

27.2.2 Workshops

RP16 WESTERN GRAY WHALE UPDATE OF CMP AND CONSERVATION ISSUES WITHIN MODELLING FRAMEWORK

The CMP is over 10 years old and requires updating. Initial work has been undertaken but the results of the rangewide workshop need to be incorporated and conservation-related questions need to be developed that can be addressed within the new population modelling framework developed as a result of the Committee's work. This is primarily related to the CMP and AWP groups, however, it is also of importance to the work of IA and ASI in terms of precedents for future assessments and the work of HIM in terms of examining scenarios that take into account bycatch and the uncertainty associated with estimating it.

RP06 MARINE DEBRIS WORKSHOP

There remains an urgent need to better understand and address the threats posed by marine debris to cetaceans. The most effective way to do this, building on earlier work by the IWC and taking into account the greatly expanded interest in this topic by many other international bodies, is to hold a workshop. It is proposed that the workshop is held in Barcelona in December 2019 just before the World Conference on Marine Mammalogy (the joint meeting of the SMM and ECS).

RP05 NOISE PRE-MEETING

The sub-committee on Environmental Concerns will address Anthropogenic Noise as a focus topic during the Scientific Committee meeting in 2020. A pre-meeting workshop is proposed for SC68b, to address emerging issues related to the management of underwater noise and its impacts on marine species.

RP08 CETACEANS & ECOSYSTEM FUNCTIONING: A GAP ANALYSIS

Experts on the role and impact of cetaceans on ecosystem functioning will participate in a workshop/pre-meeting to discuss the current state of knowledge on the ecosystem functioning provided by cetaceans as requested by the Commission in Resolution 2016-3. This Resolution directed 'the Scientific Committee to further incorporate the contribution made by live cetaceans to ecosystem functioning into [its] work' and asked 'the Scientific Committee to screen the existing research studies on the contribution of cetaceans to ecosystem functioning, to develop a gap analysis regarding research and to develop a plan for remaining research needs'.

RP17 JOINT IWC-IUCN WORKSHOP TO EVALUATE HOW THE DATA AND PROCESS USED TO IDENTIFY IMPORTANT MARINE MAMMAL AREAS (IMMAs) CAN ASSIST THE IWC TO IDENTIFY AREAS OF HIGH RISK FOR SHIP STRIKE

The identification of 'high risk areas' for ship strikes of cetaceans is a key step toward establishing mitigation actions, through scheduling, re-routing or speed reduction. IUCN's proposed initiative to identify Important Marine Mammal Areas (IMMAs), would likely assist this effort. The SC has encouraged cooperation with the IUCN Task Force on this. The IUCN TF has completed three regional IMMA workshops, including the Mediterranean Sea. This proposed joint workshop will focus on identifying overlap between shipping and the IMMAs identified in the Mediterranean Sea.

Table 33
Summary of budget requests for the 2019-20 period. For explanation and details of each project see text.

RP no.	Title	Sub-committee/ working group	2019 (£)	2020 (£)
Invited Participants				
	Invited Participants - SC/68a and SC/68b	SC	85,000	65,000
Meeting/Workshop				
RP16	Western gray whale update of CMP and conservation issues within modelling framework	CMP	10,500	0
RP06	Marine debris	E	0	20,000 ¹
RP05	Noise pre-meeting	E	0	12,000
RP08	Cetaceans & ecosystem functioning: a gap analysis	EM	0 ²	0
RP17	Joint IWC-IUCN workshop to evaluate how the data and process used to identify Important Marine Mammal Areas (IMMAs) can assist the IWC to identify areas of high risk for ship strike	HIM	10,000	0
RP19	Comprehensive Assessment of North Pacific humpback whales	NH	1000 ³	0
RP37	Comparative biology, health, status & future of NA right whales	NH		20,000
RP21	<i>Implementation Review</i> : North Pacific minke whales	RMP	13,000 ⁴	15,000
RP29	Catch series: Southern right whales	SH	0	15,800
RP25	Intersessional workshop of the task team on South Asian River dolphins	SM	7,000 ⁵	0
RP26	Guiana dolphin pre-assessment	SM	0	9,990
RP27	Modelling whale watching impacts (MAWI)	WW	0	17,000 ⁶
Modelling/computing				
RP20	In Depth Assessment of North Pacific sei whales	ASI	5,000	0
RP22	Develop an age-structured emulator for the individual-based energetics model (IBEM)	RMP	7,000	0
RP23	Essential computing support	RMP	11,500	11,500
RP36	Simulating line transect data to investigate robustness of novel analysis methods	ASI	6,000	0
Research				
RP01	IWC-POWER cruise	ASI	22,500 ⁷	22,500 ⁸
RP11	Abundance estimates of the franciscana dolphin in Buenos Aires province, Argentina	CMP	7,100	0
RP09	Gulf of Penas, Southern right whales	CMP	0	0 ⁹
RP10	Population dynamics of southern right whales at Península Valdés, Argentina	CMP	19,130	0
RP12	ES Pacific Southern right whales acoustic monitoring	CMP	13,700	16,800
RP13	Sample holotype specimen of <i>Megaptera indica</i> at the Muséum National d'Histoire Naturelle (Paris)	CMP	0	1,975
RP14	Assessing isolation of Arabian Sea humpback whales and continuity across the Arabian Sea through geographic variation in song	CMP	16,400	0
RP15	Quantitative assessment of threats to Arabian Sea humpback whales using existing photographic and UAV data	CMP	9,500	0
RP24	Collaborative analysis of WNP minke whale stock structure	SD-DNA	6,247	0
RP28	Updated catch series and assessments of four pygmy blue whale populations	SH	0 ¹⁰	12,865
RP30	Multi-ocean analysis of southern right whale demographic parameters and environmental correlates	SH	13,600	13,600
RP31	Southern Hemisphere fin whale song	SH	0	12,000
RP34	Photo-Identification information placards for naturalists and citizen scientists	SH	1000	0
RP07	IWC strandings initiative – emergency response and investigations	E	4,500	4,500
Databases				
RP18	Ship strikes database coordinator	HIM	7,000 ¹¹	7,000 ¹²
RP33	Antarctic Blue Whale Catalogue: comparison of new photographs from 2014-20	SH	3,000	800
RP32	Southern Hemisphere blue whale photo catalogue	SH	16,810	3,000 ¹³
RP38	Secretariat database management	SC	3,000	3,000
Reports				
RP03	Mercury in cetaceans	E	0 ¹⁴	0
RP04	State of the Cetacean Environment Report	E	3,000 ¹⁵	3,000 ¹⁶
RP02	Amendment of RMP Guidelines to incorporate spatial modelling approaches to estimate abundance	RMP	3,000	0
General items				
	<i>Implementation</i> : resolutions and instructions from Commission & follow up from previous years' recommendations	SC	10,313	28,470
Total request			£315,800	£315,800

Notes: ¹Budget was reduced from £22,200, ²£20,300 was the expected financial need for 2019 but savings from 2018 allowed for the reduced budget of £0; ³£11,400 was the expected financial need for 2019 but savings from 2018 allowed for the reduced budget of £1,000; ⁴£15,000 was the expected financial need for 2019 but savings from 2018 allowed for the reduced budget of £13,000. ⁵Budget was reduced from £8,958, ⁶£20,000 was the expected financial need for 2020 but financial savings for 2018 allowed for the reduced budget of £17,000, ⁷£32,500 was the expected need for 2019 but financial savings from 2017 allowed for the reduced budget of £22,500, ⁸£32,500 was the expected need for 2020 but financial savings from 2018 allowed for the reduced budget of £22,500, ⁹The requested budget was £15,000 but further information is required before funding can be considered. The project will be re-evaluated at the 2019 SC meeting, ¹⁰£6,185 was the expected financial need for 2019 but financial savings from 2018 allowed for the reduced budget of £0, ¹¹budget was reduced from £10,000, ¹²budget was reduced from £10,000, ¹³funding of approximately £7,280 may be requested for 2020 next year depending on progress, ¹⁴£4,000 was the expected financial need for 2019 but savings from 2018 allowed for the reduced budget of £0, ¹⁵budget was reduced from £4,000, ¹⁶budget was reduced from £4,000.

27.2.1 Invited Participants

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-Convenors and rapporteurs, subject area experts and Convenors of intersessional groups. All sub-committees and Working Groups benefit from this budget item. This year under this budget item, 62 scientists from Australia, Argentina, Belgium, Brazil, Canada, Chile, China, Colombia, France, Germany, Italy, Japan, Mexico, Netherlands, Norway, Oman, Peru, Slovenia, South Africa, Spain, UK, USA were supported.

RP19 COMPREHENSIVE ASSESSMENT OF NORTH PACIFIC HUMPBACK WHALES

At SC67a, following discussion of the results of an assessment workshop held in April 2017, a Steering Group was established to facilitate a second North Pacific humpback whale assessment workshop, and to coordinate work required for this meeting. This meeting was not held prior to SC67b and the workshop is now planned for prior to the 2019 meeting of the Scientific Committee, with a view to completing or significantly advancing the assessment.

RP37 BALAENID WORKSHOP: BIOLOGY, HEALTH, STATUS

The North Atlantic right whale's population rate of increase is much lower than that of all other well-studied balaenid populations. This workshop will compare reproductive biology, health and status of North Atlantic right whales with those of other balaenid populations with the goal of determining their potential for growth and assessing the role of anthropogenic mortality as a driver of current population decline. Possible causes of the NARW's lower reproductive rate need reassessment include: sub-lethal effects of entanglements; environmental contaminants or marine biotoxins; inadequate prey base; stress from noise; genetic factors; and infectious diseases. This review will also help understanding of population changes for other balaenid populations.

RP21 IMPLEMENTATION REVIEW: NORTH PACIFIC MINKE WHALES

These workshops are essential in order for the Committee to conduct a full *Implementation Review* for Western North Pacific common minke whales following the Committee's Requirements and Guidelines. Conducting *Implementation Reviews* are a required activity under the RMP.

RP29 CATCH SERIES: SOUTHERN RIGHT WHALES

A new review of available catch data for measuring regional takes of southern right whales is overdue and the availability of new sources suggests that it is timely to do this. The expected outcome of this workshop is updated regional estimates of southern right whale catches, which can be used to conduct regional assessments of southern right whale past exploitation and develop population trajectories to measure past abundance and current recovery levels.

RP25 INTERSESSIONAL MEETING OF THE TASK TEAM ON SOUTH ASIAN RIVER DOLPHINS

The South Asian river dolphin, *Platanista gangetica*, is listed as an endangered cetacean species by the IUCN Red List assessment. Across its range, in the countries of India, Pakistan, Nepal, and Bangladesh, the species remains highly threatened by a range of anthropogenic activities at multiple scales. These range from localised threats caused by hunting, fisheries bycatch, or local disturbances as well as from large-scale alterations of the rivers by dams, barrages, waterways and river-linking schemes. In particular, large-scale and rapidly accelerating water development in the Indo-Ganges-Brahmaputra floodplains make the outlook for the South Asian river dolphin conservation grim. In recognition of this situation, the Scientific Committee has established a Task Team for the species and the team of experts will meet in person and discuss how to go forward.

RP26 GUIANA DOLPHIN PRE-ASSESSMENT (*SOTALIA GUIANENSIS*)

An intersessional workshop will assess the geographic extent of Guiana dolphin threats and conservation measures needed in both national and international contexts. The outcomes of the workshop shall include: (1) a Comprehensive Assessment of the status of Guiana dolphins; (2) recommendations to potentially improve management actions and the monitoring efforts associated with the current conservation plans of actions; and (3) a consolidated report to be presented to the SC at next year's meeting for review.

RP27 MODELLING WHALE WATCHING IMPACTS (MAWI)

There is little research on the potential mid- and long-term impacts of whale watching on cetacean populations. This is due to the complexity of the required modelling approaches, lack of clarity regarding the data needed to inform them, and the need to identify locations suitable for data collection. Without addressing these issues understanding the potential mid- and long-term impacts of whale watching is not possible. The workshop will bring together modellers and field researchers to achieve the following outcomes: (1) identify existing modelling approaches that could be used to understand the potential mid- and long-term impacts of whale watching, and determine whether new approaches are required; (2) determine which data currently being collected are suitable for answering questions regarding the mid- and long-term impacts of whale watching, and what new data are required; and (3) determine the feasibility of data collection, and identify locations where this has already been done or could be achieved.

27.2.3 Modelling/computing

RP20 ASSESSMENT MODELING FOR AN IN-DEPTH ASSESSMENT-NORTH PACIFIC SEI WHALES

The IA sub-committee is currently conducting a Comprehensive Assessment for North Pacific sei whales. This involves evaluating the status of a population using a population dynamics model that is specific to the biological parameters and movement behaviour of that particular population and is fitted to monitoring data. During the intersessional periods after

the 2018 SC meeting and possibly also after 2019 SC meeting, it is expected that population dynamics models will be finalised and run using the existing data. This will result in an assessment of the status of the population.

RP22 DEVELOP AN AGE-STRUCTURED EMULATOR FOR THE INDIVIDUAL-BASED ENERGETICS MODEL (IBEM)

An IBEM provides an alternative population dynamics model to the usual cohort models, particularly because density dependence in births, growth and age-specific mortality are emergent properties of a species in a given environment (which can be stochastic). The IBEM is computationally infeasible for conducting *ISTs*; the proposal is to develop a computationally efficient cohort model (emulator) which uses demographic parameters and their covariances generated using the IBEM.

RP23 ESSENTIAL COMPUTING SUPPORT TO THE SECRETARIAT

Regular *Implementation Reviews* are required under the RMP and AWMP. Computing support is also required for Comprehensive and in-depth assessments. The Committee is currently about to undertake an *Implementation Review* for the North Pacific common minke whales, and more will follow. The Committee has developed a complex trials structure for *Implementation Reviews*. A key task in this process is to develop and validate the code for the simulation trials that are the core component of this process. Experience has shown that the Secretariat staff alone cannot handle this complete process themselves, so computing support is needed.

RP36 SIMULATING LINE TRANSECT DATA TO INVESTIGATE ROBUSTNESS OF NOVEL ANALYSIS METHODS

The IWC SC has already invested time and money in developing simulated line transect data to evaluate the robustness of the Norwegian minke whale and Antarctic minke whale survey data. This project will update the old code for the simulator to make it more user-friendly so that it can be made available to all SC members and to produce some standard data sets in accordance to the specifications of the ASI sub-committee.

27.2.4 Databases/catalogues

RP01 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. This is one of the most important international collaborations undertaken by the IWC and the cost to the IWC is minimal given the generous contribution of a vessel by Japan and acoustic equipment by the USA. Committee 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 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 2020 Annual Meeting.

RP11 ABUNDANCE ESTIMATES OF THE FRANCISCANA DOLPHIN IN BUENOS AIRES PROVINCE, ARGENTINA

Abundance estimates of franciscanas will be based on a series of aerial surveys along the coast of Buenos Aires Province, with the same survey design of surveys carried out in 2003 and 2004 (Crespo *et al.*, 2010). The new estimate will allow comparing density values with those obtained in the previous surveys. This item represents only one third of the funds required for the project, with the remainder being provided by the Government of Argentina.

RP09 GULF OF PENAS, SOUTHERN RIGHT WHALES

Eastern South Pacific (ESP) Southern right whales (SRW) are classified as critically endangered as there are no more than 50 SRW in this population and there is no information on the ESP SRW breeding and feeding grounds. Gulf of Penas is one of the most remote and exposed areas in Chile, with limited access and wild weather that have prevented its exploration. The largest baleen whale mass mortality of almost 400 sei whales occurred in this area and almost remained unnoticed. Recently, a local living nearby the Gulf of Penas recorded the presence of SRWs, including several calves. The Gulf might be the unknown breeding ground of the ESP SRW. This area will be explored during the austral winter breeding season with a group of researchers and government officers to confirm this finding and if so, start immediately working towards the protection and management of the species and the area.

RP10 POPULATION DYNAMICS OF SOUTHERN RIGHT WHALES AT PENÍNSULA VALDÉS, ARGENTINA: THE INFLUENCE OF KELP GULL LESIONS ON THE HEALTH, CHANGES IN INCREASE AND MORTALITY RATES IN THE CONTEXT OF A DENSITY-DEPENDENT PROCESS

The recent mortality of southern right whales at Península Valdés, Argentina is the highest ever recorded for the species. Understanding the causes is critical to propose management and mitigation actions. Preliminary results from glucocorticoids in baleen from stranded calves show that stress from injuries due to Kelp Gull attacks negatively affects their physiological homeostasis, potentially leading to death. Also, aerial counts show an important reduction in population rate of increase as a whole (from 7% in the past to 0.5% at present), and changes in distribution (mainly of adults) and density along the Argentinian coast.

RP12 PASSIVE ACOUSTIC MONITORING OF THE EASTERN SOUTH PACIFIC SOUTHERN RIGHT WHALE

The Eastern South Pacific southern right whale population is Critically Endangered and in 2012 the IWC adopted a Conservation Management Plan (CMP). Over the years, few opportunistic sightings have been recorded and no breeding area has yet been identified. Until a breeding ground is found many CMP priority actions cannot be implemented. Thus, in 2016 the IWC Scientific Committee decided to support this passive acoustic monitoring (PAM) project to facilitate the identification of potential breeding areas along the coast of Chile and Peru. This project seeks to obtain temporal coverage over a complete annual cycle and spatial coverage depending on the number of sites. The PAM project is likely the most

cost-effective way to investigate the seasonal and temporal distribution of southern right whales along the coast of Chile and Peru. The information will be crucial to identify aggregation areas and facilitate the implementation of CMP for this population.

RP13 SAMPLE THE HOLOTYPE SPECIMEN OF *MEGAPTERA INDICA* (GERVAIS, 1883) AT THE MUSÉUM NATIONAL D'HISTOIRE NATURELLE (PARIS)

Several lines of evidence suggest that humpback whales in the Arabian Sea/Northern Indian Ocean comprise a discrete, isolated and non-migratory population that merits a taxonomic revision. Genetic analyses of available samples are now underway in order to determine whether sub-species/species designation is merited. The resultant nomenclature will necessarily draw on a description of the type specimen of *Megaptera indica*, which is held at the Muséum National d'Histoire Naturelle in Paris. This work will develop an approach for examining and sampling this specimen so that the taxonomy of Arabian Sea humpback whales can be accurately defined, better informing regional conservation efforts, highly relevant to the IWC's stated interest in the establishment of a Conservation Management Plan for Arabian Sea humpback whales.

RP14 ASSESSING ISOLATION OF THE ARABIAN SEA HUMPBACK WHALE POPULATION AND CONTINUITY ACROSS THE ARABIAN SEA THROUGH GEOGRAPHIC VARIATION IN SONG

A study of geographic variation in humpback whale song indicates that the Arabian Sea song from Oman is distinct from the Southwest Indian Ocean (SWIO) song, and evidence from a small Indian sample suggesting continuity in song between the western and eastern Arabian Sea. This work will be followed up on with a detailed comparison of song across the Arabian Sea and continued assessment of song differences with the SWIO: The project will (1) assess the connectivity of Arabian Sea humpback whales from Oman to India by comparing existing samples of song between the two regions from several different years; and (2) assess and re-examine the differences in song exhibited between Oman and the SWIO with more recent data, particularly in light of evidence that SWIO singers were found off Oman during the Boreal summer of 2012.

RP15 A QUANTITATIVE ASSESSMENT OF THREATS TO ARABIAN SEA HUMPBACK WHALES USING EXISTING PHOTOGRAPHIC AND UAV DATA

The research will assess the prevalence of anthropogenic and natural threats to Arabian Sea humpback whales through a robust and quantitative assessment of available photographic data. These data include the entire Oman photo-ID catalogue, imagery recently acquired using UAVs (drones) and images provided by third parties. The latter include several images from elsewhere in the populations range. The project will provide an assessment of the relative prevalence of a suite of indices typically associated with major threats (fisheries entanglements, ship-strikes, other scars) as well as scars associated with natural sources (barnacles, cyamids, *Penella* sp., killer whales). Project outcomes will include assessment of the risks posed by each threat, as well as the development of a set of metrics with which further changes can be monitored. Project results will be reported to the IWC SC in 2019 and will contribute to the development of a draft Conservation Management Plan for this population.

RP24 COLLABORATIVE ANALYSIS OF WNP MINKE WHALE STOCK STRUCTURE USING JAPANESE MICROSATELLITE DNA DATABASE AND SPATIALLY EXPLICIT POPULATION STRUCTURE ANALYSES.

This item will help address the recommended 'analysis 2' from the report of the workshop on Western North Pacific common minke whale stock structure (SC/67b/Rep05) in support of the next intersessional meeting on WNP common minke whale stock structure. This specific aspect of the work will apply spatially explicit population structure analyses that provide greater power than the program STRUCTURE together with geographic context. The data will be analysed as a total dataset (not based on any assignment in STRUCTURE), but also include temporal subdivision to assess possible seasonal changes in patterns of connectivity. The latter aspect may be critical to understanding the true pattern of structure, but it will also be the most time-consuming, requiring extensive replication of the analyses. The results of these analyses will provide an assessment of structure in the context of biogeography using methods that have considerably more power than the program STRUCTURE and using an approach that will consider temporal patterns of movement.

RP28 UPDATED CATCH SERIES AND ASSESSMENTS OF FOUR PYGMY BLUE WHALE POPULATIONS

The SH sub-committee is conducting in-depth assessments of populations of Southern Hemisphere blue whales. Assessments have previously been conducted for two of the six populations (Antarctic blue whales, and Chilean blue whales), but not for the four pygmy blue whale populations addressed by this research. This project will provide crucial catch separation data and associated uncertainty needed to conduct stock assessments and provide the first stock assessments for each of the four populations. Such data are critical inputs for the assessments planned by the SC.

RP30 MULTI-OCEAN ANALYSIS OF SOUTHERN RIGHT WHALE DEMOGRAPHIC PARAMETERS AND ENVIRONMENTAL CORRELATES

This study aims to compare population demographics of southern right whales in Southern Hemisphere wintering grounds and investigate correlations between reproductive success and abundance trends, and environmental variables. This study is a component of the proposed SORP project - The right sentinel for climate change: linking foraging ground variability to population recovery in the southern right whale.

RP 31 ANALYSIS OF FIN WHALE SONG VARIABILITY ACROSS SOUTHERN HEMISPHERE

Fin whale songs consist of short pulses repeated at regular interpulse intervals (IPIs). These songs have been suggested as a tool to distinguish populations. Features that have been used for fin whale song separation include: spectral structure of individual pulses; their patterning; the IPIs; and presence of a higher frequency component of the pulses. Based on this higher frequency component, there appear to be two fin whale song types in the Southern Ocean. We propose to use a

combination of song feature measurements to identify whether fin whale songs in the Southern Hemisphere could be indicative of population structure. Data to be used include recorders deployed in the Western Antarctic Peninsula, Weddell Sea, and Eastern Antarctica (Kerguelen and Casey) from 2014-16. Additional SH lower-latitude recordings are available in southeastern Pacific and South Indian Ocean. Overall, the analysis will enable a comprehensive review of fin whale song variability across the SH.

RP34 PHOTO-IDENTIFICATION INFORMATION PLACARDS FOR NATURALISTS AND CITIZEN SCIENTISTS

Pre-cruise training and reference placards describing examples of photo-identification subjects (large whales) will be developed for distribution to the tourist vessel industry in the South Georgia and Antarctic Peninsula region. Information will include primary ID features used for seven species likely to be encountered; right, blue, sei, fin, humpback, sperm and killer whales (key species). A Powerpoint presentation will be developed for distribution to naturalists working on tourist vessels, to orient them and their clients to the basics of whale identification photography. Minimal training is required for a considerable improvement to the quality of identification photographs that are collected by naturalists and citizen scientists and ultimately provided to the established photo-ID catalogues from the region. A formal collaboration with the global photo-ID platform, HappyWhale will be established.

RP07 IWC STRANDINGS INITIATIVE – EMERGENCY RESPONSE AND INVESTIGATIONS

Over the next two years, the Emergency Response and Investigations fund will support response, collection of data to determine the cause(s) or contributing factors for the event and/or to fill critical data gaps identified by the SC or Commission. The Initiative will be evaluated annually and policies and procedures adapted according to feedback from responses and through Steering Group/Expert Panel advice.

27.2.5 Databases and catalogues

RP18 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.

RP33 ANTARCTIC BLUE WHALE CATALOGUE: COMPARISON OF NEW PHOTOGRAPHS FROM 2014-2020

In year one (2019) this project will compare the identification photographs of an estimated 45 individual Antarctic blue whales collected during ICR cruises 2014-17, to the Antarctic Blue Whale Catalogue. These identifications would increase the size of the catalogue (458 individuals) by almost 10%. In year two (2020) additional photos representing approximately 12 IDs are expected from collaborating scientists and citizen scientists that will be compared to the catalogue. The expected outcome is an expanded dataset that may improve estimates of population abundance and reveal new information on movement patterns.

RP32 SOUTHERN HEMISPHERE BLUE WHALE PHOTO CATALOGUE

The Southern Hemisphere Blue Whale Catalogue (SHBWC) is an international collaborative effort to facilitate cross-regional comparison of blue whale photo-identifications catalogues. To date more than 1,500 individual blue whales have been contributed to the SHBWC from researchers groups working on areas off Antarctica, Chile, Peru, Ecuador-Galapagos, Eastern Tropical Pacific, Australia, Timor Leste, New Zealand, Madagascar and Sri Lanka. Therefore, the SHBWC has become the largest repository of Southern Hemisphere blue whale photo-identifications. Results of comparisons among different regions will improve the understanding of basic questions relating to blue whale populations in the Southern Hemisphere such as defining population boundaries, migratory routes, visual health assessments, and to model abundance estimates. The results will contribute primarily to the IWC Southern Hemisphere blue whale assessments.

RP38 DATABASE MANAGEMENT

The IWC Secretariat hosts several databases for the SC. These have annual service costs associated with them including, web/database servers, storage, backups, software licences and other associated infrastructure or costs.

27.5.6 Reports

RP03 MERCURY IN CETACEANS: BIOGEOCHEMICAL CYCLING, TOXICOLOGICAL IMPACTS

In response to the Commission resolution on mercury, the objective of the work is to complete the global review of mercury in cetaceans, resulting in the documentation and mapping of decadal trends. The Scientific Committee will also invite experts in mercury in the environment and its cycling and in mercury and selenium cetacean toxicology to participate to provide further detail and interpretation of the current status and potential impact of mercury on cetacean populations at an ocean basin scale.

RP04 PRODUCTION OF ANNUAL STATE OF THE CETACEAN ENVIRONMENT REPORT (SOCER) FOR THE SCIENTIFIC COMMITTEE AND COMMISSION (2019 AND 2020)

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 the Atlantic Ocean (2019) and the Pacific Ocean (2020). It will, in both years, also present key current global developments that are affecting the cetacean environment. It will also contain a glossary of technical terms used and species names. A 5-year compendium spanning all regions is also being produced.

RP02 AMENDMENT OF THE RMP GUIDELINES TO INCORPORATE SPATIAL MODELLING APPROACHES TO ESTIMATE ABUNDANCE

The 'Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme', referred to as the 'RMP Guidelines' (IWC, 2012) constitutes a document prepared by the Scientific Committee to state the requirements and to guide the collection and analysis of survey data to compute abundance estimates for use in the Revised Management Procedure (RMP). Currently this document provides detailed guidance for developing estimates using design-based line transect shipboard and aerial surveys. Amendments are required to consider other methods, for example, model-based analysis of survey data and mark-recapture models. This project will update the RMP Guidelines as required by the Scientific Committee. This update will be completed in consultation with the project's steering committee and presented for consideration of the SC by SC68b. The expected outcome is a new, revised document of with the 'RMP Guidelines'.

27.5.7 General items

IMPLEMENTATION: RESOLUTIONS AND INSTRUCTIONS FROM COMMISSION & FOLLOW UP FROM PREVIOUS YEARS' RECOMMENDATIONS

This line is required to accommodate additional work requested by the Commission at IWC67 and work generated by meetings, workshops and projects funded and concluded in the first year (2019). This line can also accommodate new project proposals generated during the 2019 Scientific Committee meeting.

28. WORKING METHODS OF THE COMMITTEE

28.1 Rules of Procedure of the Scientific Committee

Attention: C, S

*As per usual practice in the last biennium the Committee has been reviewing its working methods to improve transparency and align its processes with the biennial pace of the Commission. These changes and a number of changes that were made in previous years and approved by the Commission (i.e. SORP Voluntary Fund, new process to allocate and manage the Research Fund and the Small Cetacean Voluntary Fund Rules of Procedure) require a number of adjustments and additions to the Commission Rules of Procedure, Financial Regulations and Scientific Committee Rules of Procedure. The Committee **agrees** to submit all proposed amendments to the Commission for its consideration (Annex W).*

*The updated Rules also refer to the online 'Scientific Committee Handbook' that has been updated at this meeting. The Committee **requests** the Secretariat to post the updated version online as soon as feasible. The Committee also **agrees** to that a pdf version of the Handbook be made available as a document for the Commission meeting.*

28.2 Biennial reporting and related matters

At its 2015 meeting, the Joint Conservation Committee and Scientific Committee Working Group (Joint CC/SC WG) agreed to undertake a collation and analysis of conservation-relevant recommendations from the Scientific Committee and organise these recommendations into key issues/areas highlighting those that feature regularly, including the creation of a pilot database. Double, Convenor of the Global Databases and Repositories Steering Group (GDR), presented an update on the development of this database. The Scientific Committee is fully engaged in this process and, this year, a standing agenda item was added to all sub-committee agendas to ensure a regular, more formal review of progress in delivering recommendations than was the case in the past.

Attention: SC, CC

*The Committee **welcomes** the development of the IWC Database of Recommendations, noting that this tool will give recommendations more prominence and improve the ability to measure progress. The Committee **agrees** to:*

- (1) continue to improve its standardised way to present recommendations to include core information¹³ to facilitate input into the database; and*
- (2) to work closely with the Secretariat to assist with the overall process of data entry.*

28.3 Additional proposals for revisions to 'Annex P'

The Committee continued this year the work begun last year to update Annex P in response to Commission Resolution 2016-2 and recommendations by previous Expert Panels.

Attention: C-R, SC,

*The Committee **recommends** the revisions to the previous Annex P reported in Annex P in response to Resolution 2016-2 and recommendations made by Expert.*

¹³ IWC/MAY18/CCSC/01

28.4 Succession plan for key Scientific Committee experts

Last year, the Committee had identified the need to consider ‘succession planning’ for key participants, particularly in relation to the *Implementation Reviews* and assessment processes. Informal discussions continued informally during the intersessional period and invitations were issued to three modellers to evaluate their interest in becoming active members of the IWC Scientific Committee, but only one could attend. Concern regarding succession planning of these other key positions on the Committee still remains and an intersessional group has been re-established to look at this and report back to the Committee next year (Annex Y).

The Committee also refers to its discussion related to a Deputy Head of Science in its review of the governance report (see Item 28.6.2).

28.5 Update on Data Availability requests

Suydam provided a summary of requests received under the Data Availability Agreement shown in Table 34.

Table 34

Summary of requests under the Data Availability Agreement.

Date	Requested by	Objective/Subject	Outcome
June 2015	de la Mare (Australia) – Procedure B	(a) Consistent with recent advice of the Scientific Committee with particular respect to minke whale nutritive condition analyses, to develop a set of models that best capture the Committee’s previous recommendations, taking into account the structure of the underlying processes giving rise to the data; and (b) To provide analyses relevant to the determination of sample sizes for detecting specified trends in the age at sexual maturity (ASM).	SC/66B/EM/02, SC/67A/EM/01, SC/67A/EM/02, SC/67A/EM/03, SC/67A/EM/04, SC/67A/EM/07, SC/67A/EM/08, SC/67B/EM/01 Rev1, SC/67B/EM/02, SC/67B/EM/03, SC/67B/EM/08, See EM Annexes, 2016 to 2018. Differing results between research groups about changes in body condition of Antarctic minke whales
January 2018	Baker (USA)	The intent of the request is to examine plausible stock hypotheses. Analyses will rely primarily on tests of Hardy-Weinberg expectations, exact tests of differentiation, randomized Chi-squared tests (contingency tables), Analyses of Molecular Variance (AMOVA), as well as mixed-stock analyses, clustering methods and kinship (parent offspring pairs), to investigate dispersal and differences in haplotype frequencies, genotypes and sex for various geographic and temporal strata.	On-going

28.6 Any other matters

28.6.1 Welfare Assessment Tool

Since our last discussion in 2015 on animal welfare related matters relevant to the Committee (IWC, 2016, p.86), Dr. Nicol (Professor of the Royal Veterinary College, London) developed a ‘Welfare Assessment Tool’ following the recommendations of the Workshop to ‘Develop Practical Guidance for the Handling of Cetacean Stranding Events’ (South Africa, 2016) on this matter. This year, the Committee received a report from Nicol on the latest phase of the development of such a tool, that is being developed to help assess non-hunting related threats in the context of the IWC’s Welfare Action Plan and in a joint project between the RVC and Humane Society International, supported by the UK Department for Environment, Food and Rural Affairs (Defra). The approach is based on application of the ‘five domains model’ (Beausoleil and Mellor, 2015; Mellor *et al.*, 2015) and two hypothetical case studies have been explored, one related to marine debris and the other to whale-watching.

Trial assessments were presented and the Scientific Committee was asked for assistance and advice in the development of real examples for consideration. The Committee welcomed the information provided and further discussions were held informally. The Tool was also considered by the Whale Watching Subcommittee (see Annex N) and will be presented for consideration by the Commission at the next meeting of the Working Group on Whale Killing Methods and Associated Welfare Issues.

28.6.2 Review of the IWC review report

The final report from the Governance Review was released on the 16th April 2018 (downloadable here: <https://archive.iwc.int/?r=6890>). The Independent Review Panel report represents the view of the three panellists, based on a survey, in-person interviews and analysis of documents. It represents only the first step of the Governance Review process. The Chair of the Operational Effectiveness Working Group of the Finance and Administration Committee asked the Scientific Committee to provide a voluntary feedback to the Commission on recommendations related to the Committee.

The Scientific Committee formed an *ad hoc* Working Group to develop an initial response, which was then discussed in Plenary. The initial WG membership was restricted to the Scientific Committee Chair and Vice Chair, all Heads of Delegations present at the meeting, sub-groups Convenors that are also delegates, and former Scientific Committee Chair present at the meeting. This subset represented the view of Committee members that, given their roles, had a strong knowledge on the current and past structure and procedures of the Committee. More delegates and invited participants joined the discussion in Plenary. The final version of this preliminary feedback, which has the support of all 32 delegations attending the meeting and additional members of the Scientific Committee is provided in Annex X.

The Scientific Committee organised its discussion and feedback on Review Panel's recommendations and comments around five mutually exclusive subject areas (pre-eminence of the Scientific Committee, IWC strategic planning, communication, Scientific Committee function in relation to Commission and other subsidiary bodies, Secretariat function in relation to the Scientific Committee). Within each subject area, those recommendations of perceived importance to the WG were identified. Where feasible, a timeline for developing a response was proposed.

Attention: C, SC

*Given the fact that both the Chair of the Commission (Morishita) and the Chair of the F&A Working Group on Operational Effectiveness (Phelps) reminded the Committee that the Commission has not yet decided the fate of the 'IWC review report', nor has yet requested a full engagement by the Committee, the Committee **agrees** to submit the preliminary feedback on the report (Annex X) for the Commission's consideration.*

*In addition, given the productive exchange of opinions and ideas on several aspects of the Committee working methods that occurred in during its discussions, the Committee **agrees** to establish an Intersessional Correspondence Group on 'Improving on-going working practices of the IWC Scientific Committee' under DeMaster (see Annex Y). The ICG will provide a written summary of its proposals to the Scientific Committee 60 days prior to the start of the annual meeting of the Scientific Committee in 2019. This ICG will also be in charge dealing with the preparation of a draft document for the follow-up on Governance Review, should the Commission instruct the Committee to do so at its next biennial meeting.*

28.6.3 Additional discussion on other issue related to the Committee working procedures

A number of suggestion for improving the ability to follow a topic during the Scientific Committee meeting were discussed by the Committee and the Convenors group. In order to facilitate the full participation of members of the Committee to various sub-groups and, especially, to the discussion of cross-cutting issues relevant to different groups, the Committee **agrees** that next years the Convenors should: (a) organise joint-sessions early in the meeting and release draft reports of those discussion, as soon as feasible; (b) adopt a simple coding system for 'hot topics' (e.g. North Pacific common minke whales: NPMW, Antarctic minke whales: AMW; biopsy sampling; etc.), which will be included in the daily timetable together or instead of the Agenda item. The Convenors group will carefully consider these issues intersessionally.

29. PUBLICATIONS

The Secretariat reported on the excellent progress made with the *Journal* this year, and in particular that the previously noted backlog has now been dealt with. This has been particularly assisted by the excellent work of the new Associate Editors including Fortuna, Leaper, New, Jackson, Punt, Tiedemann, Zerbini. The Committee **thanked** the Publications Team for its dedication and hard work and **reiterated** the importance of the *Journal* and *Supplements* to its work.

30. ELECTION OF OFFICERS

This was the final year of office for the Chair (Fortuna) and the Vice-Chair (Suydam). In accordance with its Rules of Procedure, the Vice-Chair becomes the new Chair for the next three years. The Committee elects Zerbini (Brazil) to be the new Vice-Chair by consensus. The outgoing Chair will provide the formal report to IWC67 in Florianopolis, Brazil of the SC Reports from the 67a and 67b SC meetings.

The Committee rose in appreciation to thank the outgoing Chair. It wished to formally record its immense gratitude for her excellent leadership over the past three years. Dr. Fortuna's scientific and organizational skills provided a lasting legacy to the Committee. She adeptly faced the many complex and challenging issues during her term and tremendous progress has been made for the benefit of the entire Commission in meeting its science and stewardship objectives. The Chair, Head of Science, and Executive Secretary of the Commission added their thanks and congratulations to the many participants expressing their appreciation to Dr. Fortuna.

The Committee also welcomed with enthusiasm the new team of Suydam and Zerbini and looked forward to working with them over the next three years.

31. ADOPTION OF REPORT

The Committee adopted the report at 17:45 hrs on 6 May 2018, apart from the final items discussed during the last session. As is customary, these items were agreed by the Chair, rapporteurs and convenors. The Chair thanked the participants for

their scientific contributions as well as their constructive dialogue. Given the sensitivity of several agenda items, this positive approach helped ensure that all views could be presented and rigorously discussed for a productive outcome. The Chair especially thanked the convenors, rapporteurs, Head of Science, and Vice-Chair for their excellent assistance. Finally, she reiterated her thanks to the government of Slovenia and the hotel staff for the facilities and great service, which contributed greatly to the success of the meeting.

Fortuna concluded that it had been an honour to serve as the IWC Scientific Committee Chair over the past three years. She expressed her gratitude for all the support provided by so many as she led this effort. She voiced her thanks for the Secretariat, and in particular her deep appreciation for the guidance provided by the Head of Science (Donovan) without whom she could not have accomplished her work.

Suydam congratulated Fortuna for having expertly led the Scientific Committee as their Chair over the past three years. He noted that the praise and applause from the participants in the room were well very much deserved given her outstanding leadership. Suydam noted that it will be a particular challenge to follow the incredible example set by Fortuna and thanked her for her mentorship. The Executive Secretary (Lent) added to these words of gratitude and commendation on behalf of the Secretariat and wished her all the best. She also offered the full support of the Secretariat to the incoming SC Chair Suydam.

Echoing the sentiments raised under Item 30, participants thanked the Chair for her adept, fair and efficient handling of the meeting, her unflagging dedication and her great contribution to the effective working of the Committee.

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