

Draft Document List

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SC/67b/

01. IWC Secretariat. Financial position of the Research Fund. 12pp.

SC/67b/ASI

01. Diallo, S.T. and Bamy, I.L. Report of the cetacean sighting survey in the north western Africa coastal waters of COMHAFAT zone (Guinea, Sierra Leone and Liberia). 23pp. The 3rd cetacean sighting survey in the coastal waters of the Guinea, Sierra Leone and Liberia, has been carried out from March 6th to 12th, 2018 with N/O GENERAL LANSANA CONTE. It was carried out by the Centre National des Sciences Halieutiques de Boussoura (CNSHB) under the auspices of COMHAFAT, with the collaboration of some African fishery institutions and fisheries research centers such as the University of Abidjan in Côte d'Ivoire, the IMROP of Nouadhibou in Mauritania. During this survey 558.1 nautical miles (nm) of line transects were covered, 19 schools 8 species for a total of 524 cetacean species were sighted. Precisely in terms of schools and animals sighted, there were: 204 animals of 8 schools of Bottlenose dolphin, 2 schools of 5 animals of Bryde's whale, 2 schools of 85 animals of Short-finned pilot whale, 1 school of 5 animals of Pantropical spotted dolphin, 3 schools of 34 animals of Atlantic spotted dolphin, 1 school of 1 animal of unidentified Baleen, 1 school of 40 animals of unidentified dolphins, 1 school of 150 animals of Spinner dolphin.
02. Cooke, J.G. Abundance estimates for western North Pacific gray whales for use with stock structure hypotheses of the Range-wide Review of the Population Structure and Status of North Pacific gray whales. 15pp. Abundance estimates are derived for western North Pacific gray whales *Eschrichtius robustus* that correspond to the various stock structure hypotheses developed by the IWC Scientific Committee's Range-wide Review of the Population Structure and Status of North Pacific gray whales (IWC 2018a), by fitting an individually-based population model to photo-ID data and other data collected off Sakhalin, Kamchatka and Mexico. Abundance estimates are presented for the putative Western Feeding Group and Western Breeding Stock in 1995 and 2015. Abundance estimates for the Western Feeding Group in 2015 range from about 130 to about 300 whales (aged 1 yr and over) depending on stock structure hypothesis, while abundance estimates for the putative Western Breeding Stock are all less than 100.
03. Palka, D., Cañadas, A., Donovan, G., Freitas, Gunnlaugsson, T., Herr, H., Pike, G., Vikingsson, G., Weinrich, M. and Zerbini, A.N. Report of the intersessional correspondence group that reviewed the Icelandic humpback whale abundance estimates. 5pp. The terms of reference for this intersessional correspondence group (ICG) were to review several papers that estimated abundance of humpback whales from surveys around Iceland (Pike et al. 2002a, 2005, 2009, 2010, 2018, and Paxton et al. 2009). The objectives of these papers were to provide the best abundance estimates for each year the survey was conducted and to investigate trends over the time series. After discussions, the ICG concluded that the 2015 perception bias corrected shipboard abundance estimate of 10,031 (95% CI 4,962 – 20,278) be classified as a Category I for the Icelandic/Faroese study area. After small modifications and conducting another review of the new analysis, the 2007 abundance estimate may be a candidate to be classified as a Category I for the Icelandic/Faroese study area. In addition a few suggestions were made to assist in developing a complete and comparable time series that could be used to investigate trends.
04. Tyurneva, O.Y., Yakovlev, Y.M., Vertyankin, V.V., van der Wolf, P. and Scott, M.J. Long-term photo-identification studies of gray whales (*Eschrichtius robustus*) offshore northeast Sakhalin Island, Russia, 2002-2017. 16pp. Photo-ID studies of the Sakhalin feeding aggregation of North Pacific gray whales (*Eschrichtius robustus*) have been conducted annually since 2002 offshore northeast Sakhalin Island as part of an industry-sponsored monitoring program jointly funded by the Sakhalin-1 (operated by Exxon Neftegas Limited) and Sakhalin II (operated by Sakhalin Energy) oil and gas development projects. With the addition of nine calves in 2017, the Sakhalin gray whale catalog now contains 283 identified individual gray whales. Of the nine new calves, six cow/calf pairs and three calves without mothers were recorded off Sakhalin. One of the identified mothers was sighted for the first time as a nursing cow, bringing the total identified numbers of cows in the database since 2003 to 29. The photo-ID catalog compiled over the last 16 years provides strong evidence of the steady increase in the number of gray whales observed off Sakhalin Island each year. For incorporation into gray whale population modeling, the annual effort and observations of the studies are detailed in the paper and the results are compared with the other long-term gray whale photo-ID studies of the area.
05. Cooke, J.G., Steel, D., Hamner, R.M., Constantine, R. and Baker, C.S. Population estimates and projections of Maui dolphin (*Cephalorhynchus hectori maui*) based on genotype capture-recapture, with implications for management of mortality risk. 16pp. The Maui dolphin (*Cephalorhynchus hectori maui*) is endemic to the west coast of the North Island of New Zealand and has been subject to incidental catches in fishing operations. An individual-based, stage-structured population model was fit to individual genetic identification data collected during 2001-16. A number of variants of the population model were fitted which all yielded essentially the same estimates of recent population size and trend over the period 2001-16, but the variant with sex-specific survival rates and no individual heterogeneity in capture probability provided the best fit. The population is estimated to have declined over this period with approximately 95% probability. The best fitting model showed no evidence of a change in mortality rate over the period 2001-16, but the fit to the data was only slightly poorer ($\Delta AIC \sim +1.5$) when the mortality rate was assumed to have been reduced by 50% after 2008. The population size has become so low (median estimate less than 60 animals aged 1+ in 2016) that the predicted population trajectories are noticeably influenced by random individual birth and death events. This model was projected forward to 2050 for a range of different assumed values for the intrinsic rate of increase (r_0) and the carrying capacity (K). The projections show that in order to place the population on a recovery trajectory with 95% confidence, the anthropogenic mortality hazard (annual risk of a human caused mortality per individual) would need to be reduced to 20% or less of the average 2001-16 level. If the anthropogenic mortality hazard has already been reduced relative to the average 2001-16 level by fishing restrictions, then the further reduction in hazard that is required is proportionally less.
06. Hakamada, T., Matsuoka, K., Miyashita, T. and Pastene, L.A. Revised research plan for a dedicated cetacean sighting survey in 2018 and research plan for 2019 under the NEWREP-NP. 13pp. A plan for a dedicated sighting survey in the North Pacific in 2018 was presented to the 2017 IWC SC meeting. The survey will be conducted as planned using the research vessel Yushin-maru No. 2 (YS2). In addition to this, two additional dedicated sighting surveys are planned for 2018 using the research vessel Kaiyo-maru No. 7 (KY7). The objective of this paper is to outline i) the research plan for the additional dedicated sighting surveys in 2018; and ii) the research plan for a dedicated sighting survey in 2019 under the NEWREP-NP in the western North Pacific. The main objective of the surveys is to examine the distribution and estimate the abundance of common minke whales for management and conservation purposes.
07. Mogoe, T., Yamaguchi, F., Kawabe, S., Katsumata, T., Kasai, H., Sasaki, H., Bando, T. and Matsuoka, K. Results of the NEWREP-A dedicated sighting survey during the 2017/18 austral summer season. 30pp. This paper reports the results of the dedicated whale sighting survey using two vessels (SVs) in the Antarctic Areas V-E (south of 60°S, 165°E–170°W including the Ross Sea) and VI-W (170°W–145°W) under the NEWREP-A in the 2017/18 austral summer season. The SVs conducted the survey under two survey modes (Normal Passing mode: NSP and an Independent Observer mode: IO) based on IWC IDCR/SOWER survey procedures from 10 December 2017 to 20 February 2018. The total searching distance in the research area was 5,196.6 n.miles (9,624.1km), including 2,441.2 n.miles covered in NSP and 2,755.4 n.miles in IO mode. The survey coverage was 61% in the northern stratum and 91% in the southern stratum. A total of five baleen whale species, blue (13 schools/23 individuals), fin (66/106), sei (2/2), Antarctic minke (329/743) and humpback (151/234) whales, and at least three toothed whale species including, sperm (14/14), southern bottlenose (1/2) and killer (42/989) whales were sighted by primary sightings in the research area. Blue whales were found mainly in the western part of the research area. Fin whales were widely distributed in the western sector of Area VI. Antarctic minke whales were the most frequently

- sighted large whale species. They were widely distributed throughout the research area. Humpback whales were mainly encountered in the western sector of Area VI and eastern part of Area V. Estimated Angle and Distance experiments were conducted in the research area. Routine photo-ID and biopsy sampling on large whales were also conducted. A total of 64 photos were obtained from 12 blue, 8 humpback and 44 killer whales. A total of eight biopsy samples (skin and blubber) was also collected from four blue, one fin and three humpback whales using the Larsen biopsy system. A total of seven marine debris was observed. The sighting data were validated and have already been submitted to the IWC Secretariat. During this survey, feasibility studies on telemetry and biopsy sampling of Antarctic minke whales were completed, and the results are presented in this paper. Krill and oceanographic surveys were also conducted along the track lines designed for sighting. The results are reported separately.
08. Øien, N. Report of the Norwegian 2017 survey for minke whales within the Small Management Area EB - the Barents Sea. 10pp. As part of a six-year program over the period 2014-2019 with the aim to get a new estimate of minke whale abundance in the Northeast Atlantic at the end of the period, the Barents Sea east of 28°E, comprising the Small Management Area EB, was surveyed with one vessel during the summer June-August 2017. The intended total survey area was divided into five blocks of which one (EB5) was not covered at all. The others received a reasonable coverage. About 2,944 nautical miles of primary search effort was conducted within the survey blocks. The most common species sighted were minke whale, white-beaked dolphin and harbour porpoise. Apparently minke whale sighting rates have increased about 30 % since the previous survey in 2013 in the area and thus may confirm that major distributional shifts are going on at least with regards to minke whales in the northeastern Atlantic. Fin and humpback whales have remained the same sighting rates and distributional patterns. A group of Greenland right whales was sighted in open waters around 78°55'N, 55°51'E on 18 July 2017.
 09. Pike, D.G., Gunlaugsson, T., Mikkelsen, B. and Víkingsson, G.A. Estimates of the abundance of humpback whales (*Megaptera novaeangliae*) from the NASS Icelandic and Faroese ship surveys conducted in 2015. 21pp.
 10. Matsuoka, K., Hakamada, T., Ueda, Y., Kominami, T., Abe, N., Ohkoshi, C. and Miyashita, T. Result of the Japanese dedicated sighting survey in the western North Pacific in 2017. 11pp. A systematic large-scale and vessel-based sighting survey was conducted in 2017 by Japan to examine the distribution and abundance of large whales in the western North Pacific. The research area was set between 34° N and 45° N and between 140° E and 150° E (sub-areas 7CN and 7CS for common minke whale). The survey was conducted between 28 April and 27 May. The research vessels Yushin-Marū and Yushin-Marū No.3 were engaged. A total of 2,022.6 n.miles was searched by the passing mode in the research area. Coverage of the searching efforts of the planned cruise track line was 82.3% for the 7CN and 92.4% for the 7CS, respectively. In total, five large whale species including fin (3 schools / 3 individuals), Bryde's (7/7), common minke (24/25), humpback (15/16), North Pacific right (1/1) and sperm (19/41) whales were sighted during the cruise. Photo-ID images was collected from humpback (16 individuals) and North Pacific right (1) whales. Biopsy skin samples using a Larsen system were collected from fin (1), humpback (7) and North Pacific right (1) whales, respectively. The sighting data submitted to the IWC secretary based on the SC guideline and will contribute to the work on management and conservation of large whales by the IWC SC.
 11. Hakamada, T., Matsuoka, K. and Pastene, L.A. Research plan for the NEWREP-A dedicated sighting survey in the Antarctic in 2018/19. 10pp. A systematic vessel-based sighting survey is planned in the Antarctic for the 2018/19 austral summer season by Japan as a part of the NEWREP-A. The main objective of this cruise is to examine the distribution and estimate the abundance of large whales for management and conservation purposes. Krill and oceanographic surveys will be also conducted along the track-lines of the sighting survey. The survey will be conducted using two research vessels, Yushin-Marū No. 2 (YS2) and Kaiyo-Marū No.7 (KY7), in Area IV (70°E-130°E). Sighting surveys will be conducted under passing and IO modes. Routine biopsy sampling and photo-id of large whales will be also conducted. The report of the sighting survey will be submitted to the 2019 IWC SC meeting.
 12. Matsuoka, K., Taylor, J., Yoshimura, I., Crance, J. and Kasai, H. Cruise report of the 2017 IWC-Pacific Ocean Whale and Ecosystem Research (IWC-POWER). 47pp. IWC-POWER cruises in the North Pacific follow the series of IWC/IDCR-SOWER (Southern Ocean Whale and Ecosystem Research) cruises that were conducted in the Antarctic since 1978. The 8th annual IWC-POWER cruise was conducted between 03 July and 25 September, 2017 in the eastern part of the Bering Sea. The entire research area was within the US EEZ. The survey was conducted aboard the Japanese R/V Yushin-Marū No.2. The cruise was organized as a joint project between the IWC and Japan. The cruise plan was endorsed at the 67a IWC/Scientific Committee (IWC/SC) meeting (IWC, 2017a). Researchers from Japan, the US and IWC participated in the survey. The cruise had five main objectives: (a) information for the in-depth assessments of North Pacific sei, humpback and gray whales in terms of abundance, distribution and stock structure; (b) information on the critically endangered North Pacific right whale population in the eastern Pacific; (c) completion of coverage of the northern range of fin whales following on from the IWC-POWER cruises in 2010-12; (d) baseline information on distribution, stock structure and abundance for a poorly known area for several large whale species/populations, including those that were known to have been depleted in the past but whose status is unclear; (e) essential information for the development of the medium-long term international programme in the North Pacific in order to meet the Commission's long-term objectives. At the pre-cruise meeting, the Captain and crew of the vessel and international researchers agreed on the procedures and objectives of the survey. The survey was conducted using methods based on the guidelines of the IWC/SC. The acoustic survey was introduced for the first time to acoustically monitor for the presence of marine mammals, with particular importance for detecting and locating North Pacific right whales. Survey trackline coverage was 71.9 % (planned distance of 2,183.7 n.miles) of the original trackline with a total of 1,571.0 n.miles in the Passing with abeam closing mode (NSP) and the Independent Observer passing mode (IO). Additionally, 228.3 n.miles were surveyed during transit between Japan and the research area. Sightings of: fin (145 schools / 198 individuals), humpback (136/165), common minke (17/20), gray (15/22), North Pacific right (9 /18, including 2/3 duplicates), and sperm (25/33) whales were observed during the cruise. Fin and humpback whales were the most frequently sighted large whale species. Gray whales were sighted early in the survey, north of 64°N. There were no sightings of blue or sei whales during the cruise. The Estimated Angle and Distance Training Exercises and Experiments were completed. Photo-identification data were collected for: 15 North Pacific right (12 unique individuals, 3 duplicates), 14 gray (all unique), 55 fin, 34 humpback (32 unique individuals), 1 minke and 56 killer whales. These data are preliminary, pending further processing and photo-identification confirmation. The majority of North Pacific right whales were sighted at the western edge of Bristol Bay and in the middle of the critical habitat. Five of the nine right whale sighting were detected and localised using acoustics. A total of 60 biopsy (skin and blubber) samples was collected from 28 fin, 18 humpback, 9 gray, 3 North Pacific right and 2 killer whales using the Larsen sampling system. A total of 240 sonobuoys were deployed, for a total of 841 monitoring hours. Species detected include fin whales, detected on 46.7% of sonobuoys (112 buoys), killer whales (49 buoys, 20.4%), sperm whales (44 buoys, 18.3%), and right whales (38 buoys 15.8%), followed by humpback whales (23 buoys, 9.6%) and gray whales (4 buoys, 1.7%) and probable Cuvier's beaked whale clicks (1 buoy, 0.4%). A total of 12 objects of marine debris were observed, considerably less than previous cruises. All survey procedures were in accordance with the guidelines set forth and agreed upon by the SC. The 8th annual cruise of this programme was successfully completed and provided important information on cetacean distribution, in particular gray and North Pacific right whales, in an area where limited survey effort had been conducted in recent decades, in a poorly-known and logistically difficult area. These results will contribute to the aforementioned objectives of the IWC/SC.
 13. Matsuoka, K., Miyashita, T., Murase, H., Kitakado, T. and Kato, H. (DRAFT) Proposal for the 2019 and 2020 IWC-Pacific Ocean Whale and Ecosystem Research (POWER). 11pp. This document outlines the line transect sighting survey cruise plans for the 2019 and 2020 IWC Pacific Ocean Whale and Ecosystem Research (POWER) as a short term (up to 2019) and a middle term research programs (after 2020). The research vessel, Yushin-Marū No.2 (YS2) will be available for each cruise. As agreed in the IWC-POWER Technical Advisory Group (TAG) discussion, the 2019 cruise should be a last cruise for the Bering Sea, where the POWER cruise has not been conducted (IWC, 2017). For 2020 cruise, the details of plan will be discussed with some options at the TAG meeting which will be held in this October. Photo-id and biopsy experiments are also planned for both of cruises. Both of cruises would be taken place in mainly July and September. The duration of the survey will be approximately 85 days involving international port refuelling and approximate 60 days of the research area. The outcome of these surveys would also contribute to the inter-essional workshop to plan for a medium-long term POWER international programme in the North Pacific. The data and report of these surveys would be submitted to the IWC/SC meetings after the cruises. Further details of the planning of 2020 will be discussed in the planning meeting.

14. Allison, C., Butterworth, D.S., Canadas, A., Cooke, J.G., Donovan, G., Freitas, L., Herr, H., Kitakado, T., Matsuoka, K., McKinlay, J.P., Palka, D., Punt, A.E., Gunnlaugsson, T. and Zerbini, A.N. Report of the intersessional email group on abundance estimates, status and international cruises (ASI). 6pp.
15. Hakamada, T., Matsuoka, K. and Miyashita, T. Updated $g(0)$ estimate for western North Pacific Bryde's whales and its application to previous abundance estimates. 11pp. An updated $g(0)$ estimate for Bryde's whale is made and applied to previous abundance estimates that considered $g(0)=1$. The $g(0)$ estimates was obtained by applying mark-recapture distance sampling methods (MRDS) to sighting data from Independent Observer (IO) mode conducted during the IWC-POWER surveys in 2015 and 2016. Following suggestions from the Intersessional workshop on North Pacific Bryde's whale Implementation Review, weighted harmonic mean of the $g(0)$ estimates under good and bad Beaufort sea was obtained, by sub-areas.
- 15rev1. Hakamada, T., Matsuoka, K. and Miyashita, T. Updated $g(0)$ estimate for western North Pacific Bryde's whales and its application to previous abundance estimates. 11pp. *REASON FOR REVISION: Editorial changes to Figure 1.* An updated $g(0)$ estimate for Bryde's whale is made and applied to previous abundance estimates that considered $g(0)=1$. The $g(0)$ estimates was obtained by applying mark-recapture distance sampling methods (MRDS) to sighting data from Independent Observer (IO) mode conducted during the IWC-POWER surveys in 2015 and 2016. Following suggestions from the Intersessional workshop on North Pacific Bryde's whale Implementation Review, weighted harmonic mean of the $g(0)$ estimates under good and bad Beaufort sea was obtained, by sub-areas.
- 15rev2. Hakamada, T., Matsuoka, K. and Miyashita, T. Updated $g(0)$ estimate for western North Pacific Bryde's whales and its application to previous abundance estimates. 11pp. *REASON FOR REVISION: Revision to Table 7.* An updated $g(0)$ estimate for Bryde's whale is made and applied to previous abundance estimates that considered $g(0)=1$. The $g(0)$ estimates was obtained by applying mark-recapture distance sampling methods (MRDS) to sighting data from Independent Observer (IO) mode conducted during the IWC-POWER surveys in 2015 and 2016. Following suggestions from the Intersessional workshop on North Pacific Bryde's whale Implementation Review, weighted harmonic mean of the $g(0)$ estimates under good and bad Beaufort sea was obtained, by sub-areas.
16. Gushcherov, P.S., Tiupleev, P.A., Samonov, V.I. and Miyashita, T. Research plan of the cetacean sighting survey in the north western Sea of Okhotsk in 2018. 6pp. Using a Russian research vessel, ВЛАДИМИР САФОНОВ (VLADIMIR SAFONOV), a dedicated systematic cetacean sighting survey will be conducted in the north western part of the Sea of Okhotsk in 2018. The vessel is a stern trawl type research vessel with a barrel for observation. The objective of the survey is to obtain information on distribution and abundance of large whales using the normal closing mode. The period of survey will be from 3 August to 6 September (35 days), and the vessel covers the research area (north of the Sakhalin Island to 57°N, west of 142°E including the Shantar Islands). The research area will consist of four blocks. During the transit to the research area, the vessel will conduct the sighting survey in passing mode to enhance research capability of the crews and researchers. The distance and angle estimation training and experiment will be conducted during the survey. Photo-identification of cetaceans such as northern right whales, gray whales and humpback whales will be also be attempted. When a peeled skin is found after breaching, the vessel will try to collect as DNA sample using a landing net.
17. Gushcherov, P.S., Tiupleev, P.A., Shkarupa, M.A., Makrak, S.V., Samonov, V.I. and Miyashita, T. Cruise report of the cetacean sighting survey in the eastern part of the Sea of Okhotsk in 2017. 26pp. The cetacean survey was conducted in the eastern part of the Sea of Okhotsk in 2017 by R/V Vladimir Safonov since 4 August to 7 September 2017 (35 days), and the vessel covered the research area (51°N-57°N and west of the Kamchatka Peninsula to 152°E). During the research distance of 814,7 n.miles by closing mode for large cetaceans and killer whales in the research area and 557 n.miles by passing mode during transit, the following species were sighted – common minke whale (14 schools – 16 animals), fin whale (31-64), humpback whale (13-32), north Pacific right whale (6-9), killer whale (14-66), Baird's beaked whale (4-30), ziphiidae spp. (2-10), Pacific white-sided dolphin (1-7), dalli type Dall's porpoise (52-213), truei type Dall's porpoise (6-13), unidentified type Dall's porpoise (249-805), unidentified large cetacean (5-7), unidentified small cetacean (2-2), and unidentified cetacean (1-1).

SC/67b/AWMP

01. Givens, G.H., Mocklin, J.A., Brattström, L.V., Tudor, B.J., Koski, W.R., Zeh, J.E., Suydam, R. and George, J.C. Survival rate and 2011 abundance of Bering-Chukchi-Beaufort Seas bowhead whales from photo-identification data over three decades. 24pp. New photo-identification data were collected from a 2011 aerial survey of Bering-Chukchi-Beaufort Seas bowhead whales. We scored and matched these images to existing images from 1985, 1986, 2003, 2004, and 2005. Other interyear comparisons between this set of years were also conducted to generate a complete matching matrix for the 6 years. These data were used to estimate bowhead survival rate and population abundance using Huggins models embedded in a Robust Design capture-recapture analysis. Our estimated survival rate was 0.996 with approximate lower confidence bound 0.976, which is consistent with previous estimates and with research showing that bowhead lifetimes can be very long. Estimated 2011 abundance was 21,391 (CV=0.214, 95% CI 14,119 to 32,407). Although much less precise than the 2011 ice-based abundance estimate (16,820 with CV=0.052, 95% CI 15,176 to 18,643) of Givens et al. (2016), the 2011 photo-id estimate adds to the evidence that the stock is abundant, increasing from previous years, and unlikely to be harmed by limited subsistence hunting.
- 01rev1. Givens, G.H., Mocklin, J.A., Brattström, L.V., Tudor, B.J., Koski, W.R., Zeh, J.E., Suydam, R. and George, J.C. Adult survival rate and 2011 abundance of Bering-Chukchi-Beaufort Seas bowhead whales from photo-identification data over three decades. 25pp. *REASON FOR REVISION: unknown edits.* New photo-identification data were collected from a 2011 aerial survey of Bering-Chukchi-Beaufort Seas bowhead whales. We scored and matched these images to existing images from 1985, 1986, 2003, 2004, and 2005. Other interyear comparisons between this set of years were also conducted to generate a complete matching matrix for the 6 years. These data were used to estimate bowhead adult survival rate and population abundance using Huggins models embedded in a Robust Design capture-recapture analysis. Our estimated survival rate was 0.996 with approximate lower confidence bound 0.976, which is consistent with previous estimates and with research showing that bowhead lifetimes can be very long. Estimated 2011 abundance was 27,133 (CV=0.217, 95% CI 17,809 to 41,337). Although much less precise than the 2011 ice-based abundance estimate (16,820 with CV=0.052, 95% CI 15,176 to 18,643) of Givens et al. (2016), the 2011 photo-id estimate adds to the evidence that the stock is abundant, increasing from previous years, and unlikely to be harmed by limited subsistence hunting.
02. Willoughby, A.L., Clarke, J.T., Ferguson, M.C., Stimmelmayer, R. and Brower, A.B. Bowhead whale carcasses in the Eastern Chukchi and Western Beaufort Seas, 2012-2017. 11pp. Bowhead whale (*Balaena mysticetus*) carcass data and imagery provide insights into the health of the species. The Aerial Surveys of Arctic Marine Mammals (ASAMM) project surveys large areas of otherwise inaccessible offshore bowhead whale habitat in a relatively short period of time. ASAMM offers a long time series of consistent information on floating and beach-cast bowhead whale carcasses detected during standardized line-transect surveys. A total of 27 carcasses identified as bowhead whale were documented from 2009 to 2017. Twenty-one carcasses (78%) were found floating and six were beach-cast (22%). Highest number of carcasses were observed in 2015 (10/27), followed by 2013 (6/27), and 2016 (5/27). Carcasses were distributed across the eastern Chukchi (EC) and western Beaufort (WB) sea study areas from 141.6°W to 168.1°W and 68.9°N to 72.0°N. More bowhead whale carcasses were seen in the EC study area; September had the highest number of bowhead whale carcass sightings in both EC and WB study areas; and September had the most survey effort, but October had the highest bowhead whale carcass sighting rates. Bowhead whale carcasses having injuries consistent with killer whale predation were photo-documented in one carcass in 2017, two carcasses per year in 2012, 2013, and 2015, and three carcasses in 2016. Three of the bowhead whale carcasses documented by ASAMM were likely calves or yearlings: one each in 2013, 2015, and 2017. Each of the calf/yearling carcasses was photographed and showed signs of killer whale interactions. Prior to 2012, evidence of killer whale predation on bowhead whales was not recorded in the ASAMM database or carcass imagery. Two carcasses, one in 2013 and one in 2015, were likely whales struck and lost during aboriginal subsistence hunting activity; this is based on timing, proximity to known

- struck and lost whales, and image review of those carcasses. One carcass in 2015 had gear attached (orange buoy and attached line) that was consistent with commonly used subsistence whaling equipment.
03. Clarke, J.T., Ferguson, M.C., Brower, A.B. and Willoughby, A.L. Bowhead whale calves in the Western Beaufort Sea, 2012-2017. 12pp. Data on Bering-Chukchi-Beaufort Sea bowhead whale (*Balaena mysticetus*) calf distribution, calf ratio, and relative density (sighting rate) were collected via line-transect aerial surveys conducted during July-October 2012-2017 in the western Beaufort Sea, north of Alaska. Calves were seen in all months in all years. A total of 160 calves were seen in summer (July-October) and 245 calves were seen in fall (September-October). Total calves per year ranged from 22 (2012) to 155 (2017). Calf distribution mirrored that of non-calves: in deeper water (>50 m) east of 150°W in July, on the shelf (<50 m) in August and September, and on the shelf and in the deeper waters of Barrow Canyon in October. Bowhead whale calf ratios (total calves relative to total whales) were highest in 2017 and 2013. Seasonal calf ratio was higher in summer than fall in three of the six years. Annual calf sighting rates (# of calves relative to on-effort km) were highest in 2017, 2016, and 2013. More than 75% of calves were detected during circling that was initiated after an initial sighting was obtained, illuminating the importance of investigating sightings. Several calves were observed unaccompanied by an adult, although in most cases other whales were nearby. On five occasions, one adult bowhead whale was observed accompanied by two calves.
 04. Quakenbush, L., Citta, J., George, J.C., Heide-Jørgensen, M.P., Brower, H., Harwood, L., Adams, B., Pokiak, C., Pokiak, J. and Lea, E. Bering-Chukchi-Beaufort stock of bowhead whales: 2006-2017 satellite telemetry results with some observations on stock sub-structure. 26pp. Sixty-four satellite transmitters provided data on bowhead whales from the Bering-Chukchi-Beaufort (BCB) stock between 2006 and 2017 to study their movements and behavior. Sixtyone of which were tagged in the Beaufort Sea and three were tagged in the Bering Sea. In winter, bowhead whales used the western Bering Sea in areas of heavy ice with little use of open water areas. All but one tagged whale migrated past Point Barrow in spring and went to Amundsen Gulf. That whale migrated up the Chukotka coast and summered in the Chukchi Sea. While most whales summered within the Canadian Beaufort Sea, extensive summer movements included travel far to the north and northeast to overlap with bowhead whales from the Baffin Bay-Davis Strait stock. Other summer movements included trips between the Canadian Beaufort and Barrow and back again. One whale, tagged near Point Barrow, traveled to the northern coast of Chukotka, Russia, in the following summer, and did not return to Canada that summer. Fall movements coincided in space and time with oil and gas activities and potentially with shipping activities. Core-use areas that are likely important feeding areas included Amundsen Gulf in spring and summer; Tuktoyaktuk Shelf in summer; Point Barrow in summer and fall; the northern Chukotka coast in fall; and the western Bering Sea in winter. Recent changes in late summer movements (i.e., greater use of mid and western Beaufort Sea) and less use of previous core-use areas in the Bering Sea in winter that were largely ice-free in winter 2016/17 and 2017/18 have occurred and may become more common. None of the movements from tagged whales suggest a multi-stock condition exists within the BCB bowhead whale population.
 05. Suydam, R., George, J.C., Person, B., Stimmelmayer, R., Sformo, T., Pierce, L., Von Duyke, A., de Sousa, L. and Sheffield, G. Subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaska Native during 2017. 9pp. In 2017, 57 bowhead whales (*Balaena mysticetus*) were struck during the Alaskan subsistence hunt resulting in 50 animals landed. The total number of whales landed in 2017 was higher than the average for the previous 10 years (2007-2016: mean of landed =41.7; SD =6.7) while the average number struck was similar (2007-2016: mean struck =55.9; SD =10.1). The efficiency (# landed / # struck) of the hunt (88%) was also higher than the average over the past 10 years (mean of efficiency = 75.2%; SD =6.5%) and was one of the highest ever recorded. Total mortality was estimated at 55 animals after the fate of the struck and lost whales was considered. Spring hunts are logistically more difficult than autumn hunts because of challenging and dynamic environmental conditions, difficulty in accessing open water, and changing sea ice thickness and dynamics. The hunting efficiency during spring is usually lower than autumn, which was the case in 2017. In 2017, the efficiency of the spring hunt was lower (81%) than the autumn hunt (100%). Of the seven whales struck and lost during the spring, three were lost under the sea ice, a fourth whale sank, and harpoons pulled out of two animals. No whales were struck and lost during the autumn hunt. Of the harvested whales, 28 were females and 22 were males. Based on total length (>13.4 m in length), 13 of the females were presumed mature. Six of the mature females were examined. Of those, two were pregnant, one with a mid- and another with a term fetus, and one female was lactating.
 06. Suydam, R. and George, J.C. Subsistence harvest of bowhead whales (*Balaena mysticetus*) taken by Alaskan Natives, 1974 to 2016. 16pp. The harvest of bowhead whales (*Balaena mysticetus*) from the Bering-Chukchi-Beaufort seas stock by Alaskan Natives helps fill important nutritional and cultural needs for communities along the northern and western coasts of Alaska. In 1977, the International Whaling Commission (IWC) banned hunting of bowheads because of the low population estimate of bowheads, increased number of strikes, and the increased number of hunting crews. A quota system was implemented in 1978 by the IWC. The quota is set at a level to allow the bowhead population to increase while still allowing Alaskan Natives to meet subsistence and cultural needs. Data on harvested whales have been collected since the mid-1970s. Between 1974 and 2016, hunters from 12 villages in Alaska, extending from the Bering Sea to the eastern Alaskan Beaufort Sea, harvested 1,373 whales. Hunters at Barrow landed the most whales (n=700) while Shaktolik only landed one and Little Diomedede landed two. The efficiency (# of whales landed/# of whales struck) of the hunt has increased markedly over this period. Currently the efficiency is about 0.80. Some villages hunt only in the spring, some only in the autumn, while Barrow, Wainwright, and the Saint Lawrence Island villages (Gambell and Savoonga) hunt in both the spring and autumn/winter. The average size of whales differs among the villages. Gambell, Savoonga, and Wainwright harvest larger whales than do Point Hope and Barrow. It is not clear whether these differences are due to hunter selectivity, whale availability, or both. The size of landed whales changes during the migration in at least some villages. During the spring, larger whales tend to be taken more frequently near the end of the migration. The opposite is true for the autumn whereby larger whales tend to be taken early while small whales tend to be taken later. Overall, the sex ratio is equal. Generally, males and females do not appear to segregate during the spring or autumn migration. However, large females tend to be more common in late May at Barrow.
 07. George, J.C., Suydam, R., Givens, G., Horstmann, L., Stimmelmayer, R. and Sheffield, G. Length at sexual maturity and pregnancy rates of Bering-Chukchi-Beaufort Seas bowhead whales. 10pp. Pregnancy rates were estimated from examinations of reproductively mature bowhead whales (n=208) landed during the Alaska Native subsistence harvest from 1976-2016. The estimated pregnancy rate was 0.317 (95% CI 0.251 to 0.385). This suggests an inter-birth interval of just over 3 years. Whales harvested in the fall at Utqiagvik and Kaktovik comprise the most reliable pregnancy dataset because pregnancies are easier to detect and whales are more carefully examined. From this restricted dataset (n=33), the pregnancy rate is estimated to be 0.394 (95% CI 0.211 to 0.553). Logistic regression was used to estimate length at maturity from a separate dataset (n=150) that included whale lengths. We defined length at maturity, relative to an equally balanced set of mature and immature whales, as the length at which the estimated probability of maturity equals 0.5. Since the actual dataset is neither balanced nor representative, we introduced a correction calculation. The resulting length at maturity is estimated to be 13.65m (95% CI 13.29 to 13.94). We recognize that our data could be biased by sampling from harvested animals where hunter selectivity occurs and by the approximately 14-month gestation period of bowheads. The estimates reported here are consistent with past investigations and suggest a reproductively robust population. Our finding that pregnancy rates are stable or possibly increasing over the past 40 years is also consistent with the increase population abundance over the same time span. Finally, there is no evidence in the reproductive data of density-regulated reproduction or the population approaching carrying capacity.
 08. Stimmelmayer, R., George, J.C., Willoughby, A.L., Brower, A.B., Clarke, J.T., Ferguson, M.C., Sheffield, G., Stafford, K., Von Duyke, A., Sformo, T., Person, B., Sousa, L. and Suydam, R. 2017 health report for the Bering-Chukchi-Beaufort Seas bowhead whales - preliminary findings. 26pp. At the 2016 IWC Scientific Committee meeting, it was agreed that an annual or bi-annual report on the Bering-Chukchi-Beaufort Seas (BCB) bowhead whale stock would be submitted that summarizes various health-related data (George et al. 2016). This summary is intended to be helpful for providing ancillary but pertinent information for informing management recommendations and tracking the status of the BCB population. This report is the 2nd of the series (George et al. 2017a) and summarizes general information on population indices, whale health and hunter observations of bowhead whales. We provide new information on (1) population size and trends, (2) adult survival rate, (3) acoustic index of relative abundance of migrating whales, (4) calf production (aerial surveys), (5) pregnancy rates of landed adult females, (6) body condition and whale lice burden of landed whales, (7) proportion of landed whales showing evidence of feeding, (8) proportion of landed whales with injuries consistent with line entanglement, killer whale attacks and/or ship strikes, (9) non-harvest related mortality of bowhead whales, (10) pathological findings from postmortem examinations and disease screening surveys of landed whales, and (11) hunter observations. Important population metrics such as population

size and trend, calf production and crude pregnancy rates continue to show positive or stable trends for this stock. While climate warming is a major concern, the various metrics described in this review (in particular population size and trend; calving rate; body condition) suggest that to date, bowheads are not being harmed by sea ice retreat.

09. NO PAPER.
10. Reinhart, S. 2018 update to the International Whaling Commission (IWC): Canadian bowhead harvests since 2015. 2pp.
11. NO PAPER.
12. Suydam, R., George, J.C., Ferguson, M.C. and Givens, G. Update on plans for a population survey in 2019 of Bering-Chukchi-Beaufort bowhead whales. 4pp. Our last successful bowhead survey was in 2011. To have the next estimate available by 2021, we are planning to conduct (1) an ice-based census in spring 2019 (correcting the visual estimate with acoustic data from previous census efforts) and (2) an aerial line transect survey across the US and Canada Beaufort Sea in summer or autumn 2019. The ice-based census efforts are more challenging and less safe than in the past because of expected thinner and less stable ice conditions due to climate change. Therefore, attempting an aerial line-transect survey will increase our chances of having a new estimate by 2021 and initiate a new survey approach that may need to be implemented in the future.
13. Witting, L. A candidate SLA for fin whales in West Greenland. 2pp.
- 13rev1. Witting, L. A candidate SLA for fin whales in West Greenland. 9pp. **REASON FOR REVISION: Paper is now completed.**
14. Witting, L. A candidate SLA for the common minke whale in West Greenland. 2pp.
15. Brandão, A. Potential SLAs for West Greenland fin whales testing against the agreed evaluation trials. 31pp. This paper presents four potential SLAs for West Greenlandic fin whales. The proposed SLAs are based on a weighted-average interim SLA which uses all abundance estimates, but earlier abundance estimates are down-weighted compared to more recent ones. An adjustment to the multiplier of the abundance estimate in the interim SLA is applied which depends on the trend of the abundance indices. Three candidate SLAs are tuned to achieve 1.0, 0.9 and 0.8 for the conservation statistic (D10) at the lower 5 percentile for the Influx hypothesis trial GF34-1B with a MSYR1+ of 1% and the middle need envelope (B). The fourth SLA attempts to provide near complete satisfaction of the conservation performance criterion and meet need satisfaction for all evaluation trials excluding the Influx hypothesis trials. To achieve a lower 5 percentile of the D10 statistic of one for the GF34-1B trial, the lower 5 percentile of need satisfaction (N9 over 20 and 100 years) is never met (SLA1.0). Dropping the D10 statistic to 0.8 for this trial improves need satisfaction by all other trials without sacrificing conservation performance (except for Influx hypothesis trials at MSYR1+= 1%).
16. Ferguson, M.C., Clarke, J.T., Angliss, R., Bengtson, J., Brower, A.B., Citta, J., Clapham, P., Conn, P., Forney, K., George, J.C. and Givens, G. Bering-Chukchi-Beaufort bowhead whale abundance estimation survey workshop report, 4-5 April 2018, Marine Mammal Laboratory, AFSC, NOAA. 24pp.
17. Ilyashenko, V.Y. Needs of Chukotka indigenous people in gray whale harvest products and rationale for updates to the Paragraph 13(b)(2) of the Schedule (the gray whale catch limit). 5pp.
18. Witting, L. On evaluation trials for West Greenland minke whales. 8pp. In this paper, I analyse and discuss a few aspects of the AWMP evaluation trials for common minke whales in the western North Atlantic. This is done to identify potential problems that may need to be solved, or at least discussed, before the trials can be used for an evaluation of candidate SLAs for common minke whales in West Greenland. The paper is based on the control program version that was released on April 17, 2018.
19. Denmark/Greenland. Request for advice on Greenlandic hunts. 2pp.
20. Zagrebelsky, S.V. Whaling in Chukotka from 2013 till 2017. 8pp. During 2013-2017, whaling in Chukotka was conducted by sea-hunters from 9 communities (14 whaling settlements), but whaling only by people from 4 villages (Lorino, Inchoun, Lavrentiya, Uelen), which makes over 70% of the whaling limit. For the last 5 years the average catch per year is 122 gray and 1-2 bowhead whales. The average size of the gray whales from 2013 to 2017 varies from 9.4 up to 10.9 meters for females and from 9.4 up to 10.6 meters for males. Mostly young females are currently whaled – annually females make up 52% to 69% of the slaughtered animals. Whales caught on Chukotka's Arctic coast are statistically larger (by more than 1 meter) and fatter (by 30%) than the whales harvested on the eastern coast. On the reason by the current grey and bowhead whales harvesting in Chukotka region is below a maximum of the sustainable level recommended by the IWC Scientific Committee for both whale species, has been Suggest raising quotas by 10 heads in 2018 and by 10 whales annually (135 animals/per year) for the next 6 years of harvesting (which will increase the amount of the meat produce by 900 tons every year), because the natives population of Chukotka has risen by 11% (in 2010 - 17,900; in 2015 - 19,140 people) since 2010 and also considering the biomass of the harvested whales being currently almost 2 times less than it was in the 1980s-1990s.
- 20rev1. Zagrebelsky, S.V. Whaling in Chukotka from 2013 till 2017. 8pp. **REASON FOR REVISION: none given.**
During 2013-2017, whaling in Chukotka was conducted by sea-hunters from 9 communities (14 whaling settlements), but whaling only by people from 4 villages (Lorino, Inchoun, Lavrentiya, Uelen), which makes over 70% of the whaling limit. For the last 5 years the average catch per year is 122 gray and 1-2 bowhead whales. The average size of the gray whales from 2013 to 2017 varies from 9.4 up to 10.9 meters for females and from 9.4 up to 10.6 meters for males. Mostly young females are currently whaled – annually females make up 52% to 69% of the slaughtered animals. Whales caught on Chukotka's Arctic coast are statistically larger (by more than 1 meter) and fatter (by 30%) than the whales harvested on the eastern coast. On the reason by the current grey and bowhead whales harvesting in Chukotka region is below a maximum of the sustainable level recommended by the IWC Scientific Committee for both whale species, has been Suggest raising quotas by 10 heads in 2018 and by 10 whales annually (135 animals/per year) for the next 6 years of harvesting (which will increase the amount of the meat produce by 900 tons every year), because the natives population of Chukotka has risen by 11% (in 2010 - 17,900; in 2015 - 19,140 people) since 2010 and also considering the biomass of the harvested whales being currently almost 2 times less than it was in the 1980s-1990s.

SC/67b/CMP

01. Arias, M., Coscarella, M.A., Romero, M.A., Sueyro, N., Svendsen, G.M., Crespo, E.A. and Gonzalez, R.A. Southern Right Whale *Eubalaena australis* recolonizes Golfo San Matías (Patagonia, Argentina). 24pp. Historically, the distribution range of the Southern Right Whale in Argentina included winter calving grounds around Peninsula Valdés. After the commercial whaling, Southern Right Whales have shown signs of recovery during the last few decades. They seem to be experiencing a density-dependent process and are expanding their distribution range in Patagonia. We evaluate the presence and distribution of right whales in the Golfo San Matías using coastal aerial surveys between 2007 and 2016, and we studied the effectiveness of this sampling methodology by comparing the sighting per unit of effort outside and inside of the coastal strip. Also we evaluate the trend of relative abundance in the area of greatest concentration between 2014 and 2016 using a GLMM. Whales were observed from August to October, with a peak in late August-early September, and the solitary individuals were the predominant group type along the surveyed area. We present evidence of a geographic distribution change from the west to the northern coast of the Golfo San Matías and a positive trend in the relative abundance was observed in the last years for this area. To make an analysis at a regional scale, we compared the group types and the number of whales/km survey, using a GLM, in the areas of highest concentration in Chubut province with the highest concentration area of Río Negro province. In these areas, it was observed a dominance of mother calf pairs in Chubut and solitary individuals in Río Negro, and the number of whales/km survey was 4 times greater in the Chubut province. Finally we reported evidence of the presence of whales in Golfo San Matías previous to the commercial whaling, highlighting the recolonization process.
02. Sueyro, N., Crespo, E.A., Arias, M. and Coscarella, M.A. Density-dependent changes in the distribution of southern right whales (*Eubalaena australis*) in the breeding ground Peninsula Valdés. 14pp. Southern Right Whales (*Eubalaena australis*) is experiencing a population growth in the South-western Atlantic Ocean. In the breeding ground of Peninsula Valdés, as a consequence of the population increase, expansion to new areas and a change in the habitat use of the coastal area were recorded. Also, as a consequence of population increase changes in distribution and density in the core area are suspected. We analyzed information that was gathered from aerial surveys developed along the coast of

- Península Valdés for 19 years. These surveys were divided into 4 periods. A geographical analysis of 620 km of coast revealed that in 5 km-length segments the density of whales increased to a maximum near to 3 whales per km². This figure is proposed as a threshold that elicits a density dependence response, where the Mother-calf pairs remain in the area, while the other groups decreased their density, forcing them to move to other areas.
03. Marón, C.F., Di Martino, M., Chirife, A., Beltramino, L., Alzugaray, L., Adler, F.R., Seger, J., Sironi, M., Rowntree, V.J., Lábaque, M.C. and Uhart, M. No evidence of malnutrition in dead southern right whale calves off Argentina as inferred from blubber thickness measurements and lipid content analyses. 12pp. Marine mammals rely on their subcutaneous fat layer or blubber to store energy, insulate their bodies and provide buoyancy and streamlining. Right whale calves are born with a thin blubber layer and need maternal milk to increase lipid reserves and grow. From 2003 to 2017, at least 706 southern right whale (*Eubalaena australis*) calves died at Península Valdés (Argentina) calving ground. Malnutrition has been considered as possible contributor to these deaths because it may negatively affect body condition of calves. However, anatomical signs of starvation were not evident during necropsies of calf carcasses. We measured blubber thickness in nine body locations of 345 dead calves to determine whether their blubber was thinner in years with high calf mortality (2003, 2005, 2007-2013) compared to low mortality years (2004, 2006, 2014-2017). Additionally, we asked whether blubber thickness changed with calf length, sex, state of decay and stranding location along the dorsal, lateral and ventral planes of the body. We also analyzed whether the lipid content of the external blubber layer varies among living (n=16) and dead (n=67) calves of similar lengths. Contrary to what we expected, when controlled for calf length and state of decay, our data suggest that blubber was not significantly thinner in high mortality years compared to low mortality years and its lipid content did not vary significantly among living and dead calves. The only variable we found to affect blubber thickness was calf length as it increased as calves grew at all body locations. These findings do not suggest a decline in the blubber condition of calves over the period examined. Moreover, they do not support the hypothesis of reduced transfer of maternal fat reserves to calves in high mortality years. However, this hypothesis should not be discarded, and additional studies should be conducted to further assess the overall health and body condition of right whale calves at Península Valdés.
 04. Fernández Ajó, A.A., Hunt, K.E., Uhart, M., Rowntree, V., Sironi, M., Marón, C.F., Martino, M. and Buck, C.L. Lifetime glucocorticoid profiles in baleen of right whale calves: potential relationships to chronic stress of repeated wounding by Kelp Gulls. 16pp. Baleen tissue accumulates stress hormones (glucocorticoids, GC) as it grows, along with other adrenal, gonadal and thyroid hormones. The hormones are deposited in a linear fashion such that a single plate of baleen allows retrospective assessment and evaluation of long-term trends in the whales' physiological condition. In whale calves, a single piece of baleen contains hormones deposited across the lifespan of the animal, with the tip of the baleen representing prenatally grown baleen. This suggests that baleen recovered from stranded carcasses of whale calves could be used to examine lifetime patterns of stress physiology. Here we report lifetime profiles of cortisol and corticosterone in baleen of a North Atlantic right whale (*Eubalaena glacialis*) calf that died from a vessel strike, as well as four southern right whale (*Eubalaena australis*) calves that were found dead with varying severity of chronic wounding from Kelp Gull (*Larus dominicanus*) attacks. In all five calves, prenatally grown baleen exhibited a distinctive profile of elevated glucocorticoids that declined shortly before birth, similar to GC profiles reported from baleen of pregnant females. After birth, GC profiles in calf baleen corresponded with the degree of wounding. The NARW calf and two SRW calves with no or few gull wounds had relatively low and constant GC content throughout life, while two SRW calves with high numbers of gull wounds had pronounced elevations in baleen GC content in postnatal baleen followed by a precipitous decline shortly before death, a profile suggestive of prolonged chronic stress. Baleen samples may present a promising and valuable tool for defining the baseline physiology of whale calves, and may prove useful for addressing conservation-relevant questions such as distinguishing acute from chronic stress and, potentially, determining cause of death.
 05. Crespo, E.A. and Coscarella, M.A. The Southwestern Atlantic Southern Right Whale, *Eubalaena australis*, population is growing but at a decelerated rate. 18pp. This paper reports on aerial surveys conducted to estimate the relative abundance and trend in growth of the southern right whale (*Eubalaena australis*) population from Península Valdés. The number of whales counted tripled from 1999 to 2016. We modelled number of whales, number of calves, number of Solitary Individuals and number of individuals in Breeding Groups using as predictive variables the Year, the Julian day and Julian day² by means of generalized linear models. The rate of increase decreased from near 7% in 2007 to a 0.5% and 2.40% for total number of whales and number of calves, respectively for 2017. Trends in the rates of increase for total number of whales and number of calves were negative (-0.732% and -0.376%, respectively). We conclude that whales are still increasing their abundance, while the rate of increase is decreasing. Differences in the rates of increase of the group types and changes in habitat use are thought to be consequence of a density dependence process.
 06. Sironi, M., Rowntree, V.J., Di Martino, M., Alzugaray, L., Rago, V., Maron, C.F. and Uhart, M. Southern right whale mortalities at Península Valdés, Argentina: updated information for 2016-2017. 9pp. Southern right whales (*Eubalaena australis*) have experienced high mortality rates at Península Valdés, Argentina in recent years (Rowntree et al., 2013). In 2003, the Southern Right Whale Health Monitoring Program was established by a consortium of NGOs to monitor the health status of this population by post-mortem examinations. Previous reports to the IWC included information on the mortalities through 2015. Here we update information for the 2016-2017 seasons. A total of 774 dead whales were recorded on the Península Valdés calving ground (Chubut Province) since 2003. The number of dead whales was 15 in 2016 and 28 in 2017. As in previous years, most of the dead whales were newborn calves (93% of strandings in 2016 and 96% in 2017; 94.5% for both years combined). More dead whales were recorded in Golfo Nuevo (87% in 2016 and 72% in 2017) than in Golfo San José (13% in 2016 and 28% in 2017). Most whales died in July - August (8 individuals, 56%) in 2016, and in September - October (19 individuals, 68%) in 2017. One juvenile whale stranded alive in Caleta de Los Loros, Río Negro Province on 24 June, 2016 and died seven days later. The remaining whales were dead when reported or found, and post-mortem examinations were performed when and to the extent that carcass condition allowed. Biotoxins, infectious diseases, malnutrition, the physiological and behavioral effects of Kelp Gull (*Larus dominicanus*) attacks on newborn calves and density-dependent processes have been proposed as hypotheses to explain the high calf mortalities in this calving ground (IWC 2011, 2015). Results on biotoxins (Wilson et al., 2015), Kelp Gull lesions (Marón et al., 2015a) and histological findings suggestive of infectious and non-infectious processes (McAloose et al., 2016) were published by Southern Right Whale Health Monitoring Program researchers and collaborators and reported to the IWC Scientific Committee. New lines of research are being developed at present to test the hypothesis that stress from injuries in southern right whales (predominantly due to Kelp Gull attacks) negatively affects their physiological homeostasis and could be a contributing factor to calf deaths in this population.
 07. Burdin, A.M., Sychenko, O. and Mamaev, M. Gray whale research off northeastern Sakhalin Island and Eastern Kamchatka, Russia, in 2017. 11pp. The western gray whale population is presently listed by the IUCN a critically endangered but it's status is presently being reassessed. On the assumption that Sakhalin whales constituted a separate population, Cooke et al. (2016), using photo-id and biopsy data from the Russian Gray Whale Project (Burdin et al. 2015) funded by IFAW, estimated that the feeding aggregation off Sakhalin contained about 175 non-calf individuals by 2016 (although not all of these would be present every year), and had been growing at 2-4% per year. Between 1994 and 2017, 267 western gray whales have been identified during 477 boat-based surveys off northeastern Sakhalin Island. This paper reviews findings from 2017 research activities and combines such with data from previous years, in some cases ranging back to an opportunistic survey in 1994. Photo-identification research conducted off Sakhalin Island in 2017 resulted in the identification of 46 whales, including four calves. Five previously unidentified non-calf were observed. Four mother-calf pairs were observed, all of which had previous sighting histories. Three of these four were observed with calves in previous years while one was observed with its first known calf. In total, a minimum of 34 reproductive females have been observed since 1995. In addition to a number of biological difficulties that western gray whales are facing, the large-scale offshore oil and gas development programs near their summer feeding ground, as well as rope entanglements off Sakhalin during the feeding season and fatal net entrapments off Japan during migration, pose significant threats to the survival of the population.
 08. E., J., Duffy, M., Magolan, J., Galletti Vernazzani, B., Cabrera, E., Landea, R., Buchan, S. and Sayigh, L. First acoustic recordings of critically endangered eastern South Pacific southern right whales (*Eubalaena australis*). 15pp.
 09. Urbán R, J., Swartz, S.L., Martinez, A., Vilorio, G. and Gomez-Gallardo, A. 2018 gray whale abundance in Laguna San Ignacio and Bahía Magdalena, Mexico. 21pp. The 2018 winter gray whale abundance in Laguna San Ignacio (LSI) and Bahía Magdalena lagoon complex (BM) was characterized by numbers of single adult breeding whales similar to that observed in recent years, but numbers of female-calf pairs were lower than expected compared to previous winters, and they departed from the lagoon early. Boat surveys were conducted as previous years.

In LSI 13 surveys began on 18 January and continued until 2 April. The counts of single adult whales (breeding males and females without calves) reached a maximum of 160 whales on 15 February, which was greater and occurred earlier in the season than the 120 single whales seen on 3 March 2017, but less than the 213 single whales observed on 12 February 2016. The number of female-calf pairs seen in 2018 was far less than that observed in 2017 (107 pairs) and in 2016 (124 pairs). In BM the highest numbers of gray whale females with calves were consistently observed in the Canal de Santo Domingo: 3-pairs on 13 January; 9-pairs on 7 February; and 16 pairs on 7 March. Although the number of female-calf pairs in the Canal de Santo Domingo was noticeably less than were observed in this area in 2017 and 2016. The abundance of female-calf was lower than expected, and similar to the abundance observed during the winter breeding seasons from 2007 to 2010 following the rangewide “mortality event” in the late 1990’s. However, the whales appeared to be in good nutritional health, and any indication of nutritional stress or poor condition of the gray whales was not evident.

10. Minton, G. and Antonopoulou, M. The Arabian Sea Whale Network: a brief progress report. 5pp.
- 10rev1. Minton, G. and Antonopoulou, M. The Arabian Sea Whale Network: a brief progress report. 5pp. **REASON FOR REVISION: This revision includes the correct references/document numbers for other papers submitted to this meeting relating to Arabian Sea humpback whales. These document numbers (which were not yet available at the time of the original submission of this document), will make it easier for readers to cross-reference relevant reports.**
11. Kim, H.Y., Sohn, H. and Imai, Y. Possible occurrence of a gray whale off Korea in 2015. 6pp.
- 11rev1. Kim, H.Y., Sohn, H. and Imai, Y. Possible occurrence of a gray whale off Korea in 2015. 6pp. **REASON FOR REVISION: unknown edits.**
12. Nakamura, G., Yoshida, H., Morita, H., Konishi, K., Mogoe, T., Miyashita, T., Kamizawa, Y. and Kato, H. Status report of conservation and researches on the Western North Pacific gray whales in Japan, May 2017-April 2018. 9pp. Following the IWC Resolution 2001-3, 2004-1 and 2005-3, this paper presents most recent status of conservation and research on the western gray whale conducted by Japanese delegation. No anthropogenic mortality due to entanglement has been reported from the adjacent waters off Japan during the period from May 2017 to April 2018, while two opportunistic sightings of gray whale were made in the Aogashima Island (May 2017 and February 2018).
13. Willson, A., Baldwin, R., Cerchio, S., Childerhouse, S., Collins, T., Findlay, K., Genov, T., Godley, B.J., Al-Harthi, S., Leslie, M., MacDonald, D., Minton, G., Zerbini, A.N. and Witt, M.J. Update on satellite telemetry studies and first unmanned aerial vehicle assisted health assessment studies of Arabian Sea humpback whales off the coast of Oman. 11pp. Four previously documented surveys focusing on satellite tagging Arabian Sea humpback whales (ASHW) have taken place off the coast of Oman since 2014. We present information of the most recent multidisciplinary survey from November 2017 including results of telemetry studies to investigate spatial ecology, photo-identification work to support population estimates and the trial of new methods using Unmanned Aerial Vehicles (UAV) in conducting non-invasive health assessments. The findings document the first record of the transoceanic passage of an ASHW within the Arabian Sea and preliminary evidence of regional scale connectivity. Small vessel surveys resulted in 45 hours of effort resulting in a total of 35 sightings and encounters with over 18 identified individual ASHWs. Five tags were successfully deployed, three being attached to whales already identified in the ASHW catalogue (one female and two males) and two whales new to the catalogue (of as yet unknown sex). The recent telemetry work brings the project total to 14 deployed tags. Four whales from the recent tagged group occupied regions previously described as important habitat in the South of Oman including the Gulf of Masirah and Hallaniyats Bay. The tag with the longest tracking duration (n=120 days) documented the passage of an adult female from the Gulf of Masirah across to the west coast of India, south towards to the Gulf of Manar off the southern tip of India and the subsequent return of the whale to the tagging site. Additionally, a hexacopter UAV (drone) was used to acquire digital images of 6 whales to inform investigations into body condition (length-width relationship), tissue scaring and skin disease. UAVs that were flown through respired condensate (blow) resulted in collection of three viable samples collected for micro-biome assessment of the respiratory tract. On a broad geographic scale the tracking data continues to confirm the importance of waters over the continental shelf in southern Oman for ASHW and together with passive acoustic monitoring studies provides new evidence to support previous understanding on the connectivity between humpback whales of the Arabian Sea. The frequency of sightings in the study area, and documented breeding related behaviour during the survey supports existing evidence demonstrating that the Gulf of Masirah is a critical habitat for the ASHW. Effective conservation of this population requires concerted application of threat mitigation, whilst studies continue to support the on-going conservation management requirement to understand the broader spatial ecology of the population.
- 13rev1. Willson, A., Baldwin, R., Cerchio, S., Childerhouse, S., Collins, T., Findlay, K., Genov, T., Godley, B.J., Al-Harthi, S., Leslie, M., MacDonald, D., Minton, G., Zerbini, A.N. and Witt, M.J. Update on satellite telemetry studies and first unmanned aerial vehicle assisted health assessment studies of Arabian Sea humpback whales off the coast of Oman. 15pp. **REASON FOR REVISION: Insertion of missing text on UAV method and results. Insertion of figures including; survey sightings, satellite telemetry tracks, UAV morphology and skin disease assessments.** Four previously documented surveys focusing on satellite tagging Arabian Sea humpback whales (ASHW) have taken place off the coast of Oman since 2014. We present information of the most recent multidisciplinary survey from November 2017 including results of telemetry studies to investigate spatial ecology, photo-identification work to support population estimates and the trial of new methods using Unmanned Aerial Vehicles (UAV) in conducting non-invasive health assessments. The findings document the first record of the transoceanic passage of an ASHW within the Arabian Sea and preliminary evidence of regional scale connectivity. Small vessel surveys resulted in 45 hours of effort resulting in a total of 35 sightings and encounters with over 18 identified individual ASHWs. Five tags were successfully deployed, three being attached to whales already identified in the ASHW catalogue (one female and two males) and two whales new to the catalogue (of as yet unknown sex). The recent telemetry work brings the project total to 14 deployed tags. Four whales from the recent tagged group occupied regions previously described as important habitat in the South of Oman including the Gulf of Masirah and Hallaniyats Bay. The tag with the longest tracking duration (n=120 days) documented the passage of an adult female from the Gulf of Masirah across to the west coast of India, south towards to the Gulf of Manar off the southern tip of India and the subsequent return of the whale to the tagging site. Additionally, a hexacopter UAV (drone) was used to acquire digital images of 6 whales to inform investigations into body condition (length-width relationship), tissue scaring and skin disease. UAVs that were flown through respired condensate (blow) resulted in collection of three viable samples collected for micro-biome assessment of the respiratory tract. On a broad geographic scale the tracking data continues to confirm the importance of waters over the continental shelf in southern Oman for ASHW and together with passive acoustic monitoring studies provides new evidence to support previous understanding on the connectivity between humpback whales of the Arabian Sea. The frequency of sightings in the study area, and documented breeding related behaviour during the survey supports existing evidence demonstrating that the Gulf of Masirah is a critical habitat for the ASHW. Effective conservation of this population requires concerted application of threat mitigation, whilst studies continue to support the on-going conservation management requirement to understand the broader spatial ecology of the population.
14. Iñiguez Bessega, M. Southern right whale of the SW Atlantic: An update on the CMP actions in Argentina (2017-2018). 13pp.
15. Sutaria, D. Baleen whale reports from the eastern Arabian Sea based on interview surveys and stranding reports - update from India. 5pp. In 2017-18, seven unidentified baleen whales, two Bryde’s whales (*Balaenoptera edeni*) and two humpback whales (*Megaptera novaeangliae*) have been reported from the west coast of India (eastern Arabian Sea). The stranding and sighting reports are summarised here. Fishers were interviewed from south Gujarat to west Tamil Nadu, for baleen whale sighting events to identify hotspots, and to collect community perceptions towards baleen whales. Based on these interviews, along with data on strandings, opportunistic song recordings, and the recent presence of a satellite tagged whale from Oman, seven regions have been identified as hotspots and habitats used by humpback whales. Humpback whales in these areas seem to be common during the months of January to March. We continue our work in 2018-20 with systematic vessel based surveys using dipping hydrophones in four of the seven hotspots. We recommend dedicated baleen whale surveys and collaborative efforts with local and international teams, to carry out in-depth analyses of stranding events, and for a larger coverage in visual surveys with the future use of static passive acoustic monitoring systems.

16. Iñiguez Bessega, M. Report of the Conservation Management Plan for franciscana (*Pontoporia blainvillei*). 11pp.
17. Zerbini, A.N., Aro, A.F., Andriolo, A., Clapham, P.J., Crespo, E.A., Gonzalez, R.A., Harris, G., Mendez, M., Rosenbaum, H., Sironi, M., Sucunza, F. and Uhart, M. Satellite tracking of southern right whales (*Eubalaena australis*) from Golfo San Matías, Rio Negro Province, Argentina. 10pp. Satellite transmitters were deployed on nine southern right whales (*Eubalaena australis*) in Golfo San Matías, Province of Rio Negro, Argentina in October 2016 (n=1) and September 2017 (n=8). This region is located nearly 200 km north of Peninsula Valdés (PV), the main breeding and calving ground for this species in the western South Atlantic Ocean. Tag duration varied between 46 and 204 days (average of 117 days). Movement patterns showed marked individual variation. Five individuals moved southwards towards Golfo San José and Golfo Nuevo, in PV shortly after tagging. Four other whales moved north along the coast of the Buenos Aires Province in Argentina and of Uruguay. Movement patterns in coastal areas suggest that whales in the northern Golfo San Matías regularly visit areas further to the south in PV, but interestingly only whales tagged in the former migrated northward along the coast. All whales eventually moved east towards offshore waters of the outer continental shelf and shelf break along the coast of Argentina (from the La Plata River to the Falkland/Malvinas Islands). Most whales tracked until later in the season (after January) migrated east/southeast towards South Georgia/Islands Georgia del Sur and the Scotia Sea/Mar de Escocia, where they remained for the duration of their tags. One individual was migrating east past 22oW of longitude when the tag stopped transmitting. Behavioral states estimated by a hierarchical space-state model indicate areas of potential foraging importance in the outer continental shelf off southern South America, the South Atlantic Basin, the Eastern Scotia Sea/Mar de Escocia and the northern Weddell Sea/Mar de Weddell. These findings complements others from an ongoing long-term study to understand the migratory routes and destinations of southern right whales wintering off the coast of Argentina and, overall, reveals that this species inhabits vast extensions of the South Atlantic Ocean and visits multiple potential feeding areas each season.
18. Vernazzani, B.G., Balcazar-Cabrera, N., Buchan, S., Brownell, J., R.L., Cholewiak, D., Goya, E. and Moore, S. Progress Report on Passive Acoustic Monitoring of the Eastern South Pacific Southern Right Whale, a Key to Improve Conservation Management Plan Outputs: May 2017-April 2018. 7pp. Little is known about the Critically Endangered Eastern South Pacific southern right whale. In 2012, the IWC adopted a Conservation Management Plan for this population and in 2016 the Scientific Committee supported a Passive Acoustic Monitoring (PAM) project to facilitate the identification of potential breeding areas along the coast of Chile and Peru. Advances of the PAM project made from May 2017 to April 2018 include selection of deployment sites; selection and acquisition of acoustic devices; building of mooring and other equipment; logistical planning for first location site; permits requirements; education and capacity building planning.
19. Cerchio, S., Willson, A., Muirhead, C., Al Hathi, S., Baldwin, R., Bonato, M., Collins, T., Di Clemente, J., Dulau, V., Estrade, V., Latha, G., Minton, G. and Willson, M.S. Geographic variation in song indicates both isolation of Arabian Sea humpback whales and presence of Southern Hemisphere whales off Oman. 31pp. Existing genetic, demographic and behavioral evidence indicates that Arabian Sea humpback whales represent an isolated and unique population. The population exhibits a Northern Hemisphere breeding cycle, is believed to feed year-round, and lacks the typical latitudinal migrations and seasonal separation of breeding and feeding ecology exhibited by other populations of humpback whales globally. A key feature of humpback whale breeding behavior is the male acoustic breeding display, song, studied extensively around the world. Key characteristics of humpback whale song include: all males within a population share the same song patterns (phrases); a population's song changes progressively over time; and populations that do not overlap or exchange individuals have distinctly different songs, whereas populations in contact share some or all phrases. Here we use long-term acoustic monitoring off the coast of Oman to further assess the isolation of the Arabian Sea population. A total of 76 samples (amounting to 4,434 minutes of recording) of Arabian Sea song collected between 2011 and 2013 were examined, and phrase content was characterized and compared to 23 samples (totaling 202 min of recording) collected during the same years in the Southwest Indian Ocean from Reunion Island and the Comoros Islands. Song from the Arabian Sea and the Southwest Indian Ocean was distinct across the entire study period, with no evidence for shared phrases in any year. In addition, song fragments recorded off western India in 2011 were composed of two phrases present in the Oman song, suggesting continuity across the Arabian Sea. Moreover, the Arabian Sea song exhibited a markedly atypical low level of temporal variation, with song phrases remaining virtually unchanged during the three examined breeding seasons. Notably, Southwest Indian Ocean song was recorded off the coast of Oman in August 2012 (Boreal summer, Austral winter). This song was recorded on multiple days and included multiple simultaneous singers over a 25 day period indicating the presence of more than a single accidental vagrant Southern Hemisphere animal. We suggest that these Southern songs were produced by Southwest Indian Ocean animals moving into the Arabian Sea, and that this may be more common than is currently thought. The low level of temporal variation shown by the Arabian Sea males along with the lack of adoption of the Southwest Indian Ocean song material, further indicate the uniqueness and distinct nature of this population. It seems possible that isolation mechanisms exist that may inhibit the mixing of the Arabian Sea population with Southern Hemisphere animals, and that this may be reflected in the observed atypical song behavior.
20. Vernazzani, B.G. IWC Eastern South Pacific Right Whale Conservation Management Plan - progress report April 2018. 8pp. Eastern South Pacific southern right whale population found off Chile and Peru is one of the most threatened whale populations worldwide. In 2012, the International Whaling Commission adopted a Conservation Management Plan and in 2016 an implementation strategy. Here we review CMP actions considered under the 2016 implementation strategy and the first bi-national coordination meeting conducted on March 2017. The CMP proves to be a key framework to facilitate the implementation of conservation measures and enhance international collaboration for the long term recovery of the species.
21. Zuazquita, E., Belgrano, J., Sarandon, R. and Zerbini, A.N. Seasonal occurrence of southern right whales (*Eubalaena australis*) in Miramar (Buenos Aires Province, Argentina). 5pp. In the past few years, Southern right whales (SRWs) have been increasingly observed along Argentinian coast, outside their known nursery ground near Peninsula Valdés. In Miramar, on the southwest of the Buenos Aires Province, occurrence of right whales has attracted the attention of the local community as a potential resource for tourism-related activities (e.g. whale watching). Systematic visual surveys have been conducted since April 2016 to assess the seasonal occurrence and relative abundance of SRWs in Miramar and to generate baseline knowledge to contribute to the conservation and assist in developing management actions. Land-based observations were made following a scan method from a high platform on Miramar's waterfront with the aid of 7 x 50 Fujinon reticuled binoculars. A total of 449 Southern right whales was recorded during nearly 484 hours of observation. Despite of the effort throughout the year, the presence of SRWs was only registered during six months of year (May to October), a period that largely coincided in both 2016 and 2017. There was no significant difference between the average sighting rates in 2016 ($\bar{x}=1.22 \pm 1.33$) and 2017 ($\bar{x}=1.70 \pm 2.01$) ($t = -0.37457$, $df = 10$, $p = 0.7158$). Two years of systematic study in Miramar suggests that the seasonal abundance of SRWs peaks in August and September in this area. The continuation of this study will provide a better understanding of the habitat use and the factors that influence seasonal patterns of SRW occurrence off the coast of the Buenos Aires Province.

SC/67b/E

01. Stachowitsch, M., Rose, N.A. and Parsons, E.C.M. State of the Cetacean Environment Report (SOCER) 2018. 19pp.
02. Bukina, L.A., Skurihin, L.E., Lobovikov, S.V. and Litovka, D.I. The occurrence of Trichinellosis in gray whales (*Eschrichtius robustus*) and Pacific walruses (*Odobenus rosmarus divergens*) off Chukotka, Russian Federation. 5pp. The investigation of 299 landed Gray whales and Pacific walruses off Chukotka (Russia) for trichinellosis was conducted in 2006, 2010 and 2017. Trichinella spp. transmission in coastal ecosystems off Chukotka can be carried out due to trophic-ecological factors - necrophagy and predation. The role of mechanical vectors of invasion is performed by numerous invertebrates and some vertebrates. The gray whale samples were negative to trichinellosis, the infestation of walruses was 1.45% in 2006.
03. Litovka, D.I., Simokon, M.V., Kovekovdova, L.T., Blokhin, S.A., Krasnova, V.V., Belikov, R.A., Prasolova, E.A., Ryabov, A.A. and Chikilev, V.G. Overview of monitoring, populational and toxicology researches of gray whales in the Mechigmsky Bay and beluga whales in the Anadyr Liman (western Bering Sea, Russia), 2013-2017. 5pp. An overview of

monitoring, populational and toxicology researches of Gray and Beluga Whales in the western Bering Sea, conducted by Russian scientists in 2013-2017, is given.

03rev1. Litovka, D.I., Simokon, M.V., Kovekovdova, L.T., Blokhin, S.A., Krasnova, V.V., Belikov, R.A., Prasolova, E.A., Ryabov, A.A. and Chikilev, V.G. Overview of monitoring, populational and toxicology researches of gray whales in the Mechigmsky Bay and beluga whales in the Anadyr Liman (western Bering Sea, Russia), 2013-2017. 5pp. *REASON FOR REVISION: uploaded as a new paper in error (it was E12, now withdrawn).*

An overview of monitoring, populational and toxicology researches of Gray and Beluga Whales in the western Bering Sea, conducted by Russian scientists in 2013-2017, is given.

04. Naidenko, S.V., Klyuchnikova, P.S. and Litovka, D.I. Assessment of cortisol concentration in baleens of gray whales harvested in Chukotka, 2003-2017. 6pp. For the first time a sufficiently large sample ($n = 24$) was analyzed for the content of glucocorticoids in baleens of gray whales, harvested for subsistence in Chukotka (Russia). The work was carried out mainly on young animals, the size of their baleens highly positively correlated with the animals' size and age. Reliable sexual differences in the cortisol concentration in different parts of the baleens were not revealed. The trend of increasing of cortisol concentration to the proximal part of the baleen was found. Some revealed correlations suggest that larger whales had a lower cortisol level, which can be an indicator of both lower stress and a lower metabolic rate in larger whales.
05. Hayden, M., Klein, D., Subbiah, S., Wittmaack, C., Lesage, V., Morin, Y., Urbán R, J., Montalvo, C.L., Bickham, J. and Godard-Coding, C. Reproductive and stress steroid hormone analysis in cetacean blubber by liquid chromatography - tandem mass spectrometry. 20pp. The profiling of reproductive and stress steroid hormones in cetaceans provides vital information for both conservation and management decisions. This is especially the case for endangered species, such as the western gray whale (*Eschrichtius robustus*) subpopulation, as stated by the IWC scientific community. We previously validated reproductive hormone profiling in gray whales using ELISA (Gendron et al. 2015) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) (Hayden et al. 2016, Hayden et al. 2017b) and subsequently reported on advancements of the LC-MS/MS methodology (Hayden et al. 2017b). Here we report on (1) further optimization of the LC-MS/MS methodology (both positive and negative ion modes), (2) the quantitation of progesterone, testosterone, cortisol, and estradiol in small (50 mg w/w) samples in both the gray whale and the beluga, and, (3) to our knowledge, the first detection of pregnancy in cetaceans by LC-MS/MS. Steroid hormones were extracted, separated from lipids using gel permeation chromatography, and then quantified using a Thermo Scientific TSQ Quantum Access Max MS mass spectrometry system in heated electrospray positive ionization mode and atmospheric pressure chemical negative ionization mode through selected reaction monitoring. Quantitation of endogenous steroid hormones was performed with the use of isotopically labeled internal standards. Limits of quantitation and detection were compatible with reported levels of steroid hormones in cetacean blubber and extraction efficiencies were comparable to liquid-liquid extraction efficiencies. LC-MS/MS has the capability of quantitating multiple steroid hormones simultaneously, which can be invaluable to assess pregnancy, health and fitness in a single sample. Therefore, this methodology is ideal for species or samples where tissue weight is limited, such as the IUCN-listed critically endangered Western gray whale population. Future directions of this research will involve the inclusion of other biologically relevant steroid hormones in the analysis panel and the establishment of baselines indicative of reproductive maturity using additional samples from animals of known sex and reproductive status.
06. Mosquera-Guerra, F., Trujillo, F., Parks, D., Oliveira-da-Costa, M., Usma, S., Willems, D., Maldonado, R., Amorocho, D., Berg, K., Armenteras-Pascual, D., Van Damme, P.A., Sainz, L., Franco, N., Mantilla-Meluk, H., Carvajal-Castro, J.D., Cambell, E., Cordova, L., Echeverria, A., Caballero, S. and Marmontel, M. Presence of mercury in river dolphins (*Inia* and *Sotalia*) in the Amazon and Orinoco basins: evidence of a growing threat for these species. 30pp. This study reports total mercury concentrations in river dolphins (*Inia* and *Sotalia*) in the Amazon and Orinoco river basins. Mercury was analysed in the tissue of animals found floating dead ($n=19$, 50%), stranded ($n= 4$, 10,5%) and captured for the installation of satellite transmitters ($n= 15$, 39,5%) in the Arauca and Orinoco rivers (Colombia and Venezuela border), Amazonas river (Colombia and Peru border) and Itenez or Guapore river in Bolivia. The mercury concentration ranges recorded were: *I. g. humboldtiana* 0,003 - 3,99 mg/kg-1 ($n=21$, $sd= 1,34$), *I. g. geoffrensis* 0,1 - 0,35 mg/kg-1 ($n=7$, $sd= 0,09$), *I. g. boliviensis* 0,03 - 0,37 mg/kg-1 ($n=8$, $sd= 0,78$), and *Sotalia fluviatilis* 0,1 - 0,87 mg/kg-1 ($n=2$, $sd= 0,55$). As a top predator, it is highly probable that mercury biomagnifies in the dolphins, which might explain the high concentrations found.
07. Frisch-Nwakanma, H. CMS Family guidelines on environmental impact assessments for marine noise-generating activities developed by the Convention on Migratory Species (CMS). 3pp.
- 07rev1. Frisch-Nwakanma, H. and Prideaux, G. CMS Family guidelines on environmental impact assessments for marine noise-generating activities developed by the Convention on Migratory Species (CMS). 3pp.
08. Hall, A.J. Mercury in cetaceans. 16pp. This review highlights the continued global exposure and potential effect of mercury on cetaceans. The fate and transportation of this element in the marine environment is driven by anthropogenic atmospheric and aquatic sources as well as through natural geogenic inputs, with coastal areas and species being more vulnerable to mercury contamination than the open ocean.
09. Angel-Romero, P.A., Barragán-Barrera, D.C., Botero-Acosta, N., Riet-Sapriza, F.G., Caballero, S. and Luna-Acosta, A. Mercury concentrations in wild humpback whales (*Megaptera novaeangliae*) sampled in the Colombian Pacific and the Antarctic Peninsula. 15pp. The G stock of humpback whales (*Megaptera novaeangliae*) undertakes one of the longest cetacean migrations, from the Antarctic Peninsula (feeding area) to the Southeast Pacific, in Ecuador and Colombia, where their breeding and calving areas are located. These whales are being exposed to several pollutants such as mercury, which has been previously reported in the Antarctic Ocean. In order to measure the mercury concentration in G stock humpback whale' skin and blubber, samples were collected in the Antarctic Peninsula (2015, $n=15$) and in the Colombian Pacific (Chocó Province) (2015, $n=14$; 2016, $n=42$). Total mercury concentrations ([THg]) were measured by atomic absorption spectrometry (AMA-454, Altec). Results revealed significant differences between tissue types in the same individual ($n=22$; $p < 0.05$), with higher [THg] found in skin (mean= $26,78 \pm 13,82$ $\mu\text{g/kg dw}$) than in blubber samples (mean= $12,41 \pm 8,10$ $\mu\text{g/kg dw}$). Furthermore, [THg] were significantly different between tissues and between sampling locations, being higher in Antarctic skin and blubber samples ($?=35,07 \pm 13,49$ $\mu\text{g/kg dw}$ and mean= $10,61 \pm 4,11$ $\mu\text{g/kg dw}$, respectively), than in skin and blubber samples from the Colombian Pacific ($?=21,34 \pm 4,79$ $\mu\text{g/kg dw}$ and $?=8,37 \pm 4,53$ $\mu\text{g/kg dw}$, respectively). There were no significant differences between individual females and males. Although humpback whales are not top predators in the Antarctic trophic ecosystem, this study provides new insights of mercury bioaccumulation in Antarctic meso-predators. Our results suggest that whales detoxify THg during migration. In order to further evaluate the impacts mercury exposure in the whales and population, future research should be focused on assessing mercury concentration in internal organs as well as the degree of maternal transfer to the offspring, to evaluate the consequences of mercury exposure at individual and whales and population level.
10. Pierantonio, N., Simmonds, M. and Eisfeld-Pierantonio, S. Relevant debris to be targeted for cetaceans: a review of available information. 50pp. The 2017-2019 Work Programme of The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) requested an assessment of the impact of plastic bags, microplastics and other plastic materials ingested by cetaceans. This review considers the available information, which has increased in recent years, although a clear and quantifiable assessment of effects specifically on cetaceans remains elusive. Here we identify the cetacean species in which impacts of plastic debris and, more generally, marine litter have been documented. The types of debris affecting cetaceans are also presented. We conclude that cetaceans are affected by a wide range of types of debris and that effects range from negligible, through chronic to debris-related mortalities, although clear cases of ingested marine debris causing deaths remain few and scattered. We are unable at this time to point at any specific debris type as presenting a particular threat to cetaceans but we do make a series of recommendations intended to help this situation to be better understood and addressed. These includes development and dissemination of standard post mortem protocols and further research to identify hot-spots.

11. Burkhardt-Holm, P. and N'Guyen, A. Microplastics in the food web of cetaceans - a review. 14pp. Current knowledge on microplastic ingestion by cetacean species is still very limited. So far, only three studies report direct evidence of microplastic ingestion cetaceans. Furthermore, microplastic uptake has been suggested by studies analysing phthalate concentrations in blubber and water samples. In this study, we use the common minke whale *Balaenoptera acutorostrata* to infer the potential for microplastic ingestion by cetaceans via their prey species. In a first step, we review available information about prey species of the common minke whale. In a second step, we review available evidence of microplastic ingestion by these prey species. We include both peer-reviewed papers as well as documents from the IWC scientific meetings (2011-2017). We found that common minke whale is an opportunistic feeder that preys on spatially and temporally available species. This suggests that minke whales feeding in different geographic areas are exposed to different risks of ingesting microplastics. Generally, prey species in coastal areas show higher levels of microplastic contamination than those in offshore areas, putting common minke whale feeding in these areas at higher risk of microplastic ingestion than those feeding in offshore areas. Specifically, we found highest levels of microplastic contamination reported for Scombridae and Gadidae. These species are among the most frequently observed prey species of common minke whale in the Northwest Pacific Ocean, indicating a risk for microplastic ingestion in this area. However, Scombridae as well as Gadidae in these regions have not yet been analysed for microplastic ingestion. Studies investigating microplastic ingestion of cephalopods, Ammodytidae, Engraulidae and Osmeridae are lacking for all areas. We suggest that research on MP ingestion of prey species belonging to these families are urgently needed and we recommend collaborating with scientists having access to fisheries research vessels, especially in the Northern Pacific.
12. **NO PAPER, is on memory stick but please ignore.**
13. Anon. Joint ACCOBAMS/ASCOBANS/SPA-RAC Workshop on Marine Debris and Cetacean Stranding. 15pp.
14. Cunha, H.A., Santos Nero, E.B., Carvalho, R.R., Ikeda, J., Groch, K.R., Diaz-Delgado, J., Flach, L., Bisi, T.L., Catodias, J.L., Azevedo, A.F. and Brito, J.L. First outbreak of cetacean morbillivirus in the South Atlantic: epidemiological context. 14pp.
15. Pierantonio, N. and Simmonds, M.P. Consideration of data collection related to marine debris and cetaceans. 17pp. This paper considers what data might be usefully collected to help better understand the interactions between cetaceans and marine debris and was originally drafted at the request of the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS). Recommendations include that (i) Post-mortem examinations should be conducted using a classical differential diagnostic approach when possible and, when not, efforts to document the presence of marine debris, both ingested and entangled, should still be put into place; and (ii) debris should be characterised by material, size, colour, shape, mass and volume and, where possible, identified to source. A standard list of litter items is provided.

SC/67b/EM

01. McKinlay, J.P., De la Mare, W.K. and Welsh, A.H. Issues Cunen, Walløe and Hjort should consider in relation to their analyses of Antarctic minke whale body condition. 10pp. In recent years, data arising from the J A R PA Special Permit program have been analysed to assess possible changes in minke whale body condition. Most recently, in 2017 at SC67A two separate analysis teams examined the question of declining condition using different methods, with each team reaching appreciably different conclusions. Cunen, Walloe and Hjort (hereafter CWH) developed linear mixed models of blubber thickness, fat weight and half-girth measurements, and found significant declines in these primary measurements over the period of J A R PA. Importantly, CWH asserted that this decline is best modelled as a single, uniform decline applicable to all segments of the minke whale population sampled by J A R PA (i.e. males and females in both the West and East sampling regions). In contrast, McKinlay, de la Mare and Welsh (MDW), fitting additive models to standardised body weight and linear mixed models to fat weight, concluded there was some evidence of a decline in condition for female animals with high diatom loads (17% of the total data), but little evidence to indicate wide-spread declines in minke body condition over the period of J A R PA. Discussions between the analysis teams, and with members of the Working Group for Ecosystem Modelling, identified several issues with both sets of analyses. At this meeting, SC67B, the MDW team present amended results for reassessment by the SC, taking into account the suggestions received during SC67A. MDW again found some evidence for declines in female condition, though confined to animals sampled from the Western region. However, the total decline for this segment of the J A R PA data, over the entire period of the program, was no more than the year-to-year variation in condition evident in other segments of the sampled population. MDW found no evidence for globally declining condition in minke whales. In contrast, CWH have revised their previous work and have submitted it for publication prior to further assessment by the SC, with results again asserting a global decline in condition. Our assessment of the revised work of CWH shows that the authors have not taken into consideration several issues critical for assessing condition using J A R PA data. We therefore take this opportunity to detail our outstanding concerns with the analyses of CWH, some of which, if not adequately addressed in models, may lead to false or amplified signals of declining condition.
- 01rev1. McKinlay, J.P., De la Mare, W.K. and Welsh, A.H. Issues Cunen, Walløe and Hjort should consider in relation to their analyses of Antarctic minke whale body condition. 13pp. *REASON FOR REVISION: This revision provides our review, in an addendum, of EM/02 submitted by Cunen, Walloe, Konishi and Hjort. The revision involves no new analyses of the data.* In recent years, data arising from the J A R PA Special Permit program have been analysed to assess possible changes in minke whale body condition. Most recently, in 2017 at SC67A two separate analysis teams examined the question of declining condition using different methods, with each team reaching appreciably different conclusions. Cunen, Walloe and Hjort (hereafter CWH) developed linear mixed models of blubber thickness, fat weight and half-girth measurements, and found significant declines in these primary measurements over the period of J A R PA. Importantly, CWH asserted that this decline is best modelled as a single, uniform decline applicable to all segments of the minke whale population sampled by J A R PA (i.e. males and females in both the West and East sampling regions). In contrast, McKinlay, de la Mare and Welsh (MDW), fitting additive models to standardised body weight and linear mixed models to fat weight, concluded there was some evidence of a decline in condition for female animals with high diatom loads (17% of the total data), but little evidence to indicate wide-spread declines in minke body condition over the period of J A R PA. Discussions between the analysis teams, and with members of the Working Group for Ecosystem Modelling, identified several issues with both sets of analyses. At this meeting, SC67B, the MDW team present amended results for reassessment by the SC, taking into account the suggestions received during SC67A. MDW again found some evidence for declines in female condition, though confined to animals sampled from the Western region. However, the total decline for this segment of the J A R PA data, over the entire period of the program, was no more than the year-to-year variation in condition evident in other segments of the sampled population. MDW found no evidence for globally declining condition in minke whales. In contrast, CWH have revised their previous work and have submitted it for publication prior to further assessment by the SC, with results again asserting a global decline in condition. Our assessment of the revised work of CWH shows that the authors have not taken into consideration several issues critical for assessing condition using J A R PA data. We therefore take this opportunity to detail our outstanding concerns with the analyses of CWH some of which, if not adequately addressed in models, may lead to false or amplified signals of declining condition. An addendum considers several additional issues in response to a second, more biologically orientated publication in preparation by Cunen, Walloe, Konishi and Hjort (2018).
02. Cunen, C., Walløe, L., Konishi, K. and Hjort, N.L. Supplementary notes and material, with some refined analyses, compared to our IWC/SC/67A/EM04 May 2017 report. 14pp. In this note we present an updated version of the result section in Cunen, Walløe & Hjort (2017). Compared to the report we presented last year, we have made some extensions and refinements of the FIC method, and also certain moderate changes to the wide model for the JARPA data. The updated FIC method is presented in detail in Cunen, Walløe & Hjort (2018). There, we generalise the FIC methodology to cover a wider range of focus parameters and make adjustment to some of the formulae. This FIC version is more precise, but as far as we have seen, the changes to the FIC formulae do not influence the result for the Minke whales analyses to any important extent. We still believe that the FIC framework is perfectly suited for addressing one of the main questions in the JARPA dataset: finding a model that estimates the effect of year with the most precision. The changes one makes to the wide model have a potential for influencing the results. Indeed, as we have explained in Cunen et al. (2017), the choice of the wide model is of prime importance in any FIC analysis. The changes are motivated by the discussions in the Scientific Committee last year and also by comments in de la Mare et al. (2017b) and McKinlay et al. (2018). We will describe the changes briefly in Section 2. Also motivated by comments in last year's Scientific Committee, we have made a small change in the way we compute confidence curves for the focus parameter (i.e. the

effect of year). Last year, the confidence curves were computed with the standard error of the effect of year computed under the winning model, i.e. the model which had the smallest FIC score. In this note, these standard errors are computed with respect to the wide model. This does not influence the results in any significant way, but we regard this choice to be the most consistent with the FIC framework, considering that in the FIC approach we assume that the wide model is the true data-generating mechanism. As in last year's report, the confidence curves are computed assuming that the estimated year effects are normally distributed. Note also that for the results presented in this note we use the full dataset both for the model selection part and for the inference part. In other words, we do not split the data in two, with a selection and inference set, as we did in the 2017 report.

03. McKinlay, J.P., De la Mare, W.K. and Welsh, A.H. No substantial change in Antarctic minke whale condition during the JARPA years. PRINT WARNING 133 PAGES. Minke body condition has been posited as relevant to the development of Antarctic ecosystem models. A number of previous analyses of data collected under the JARPA special permit whaling programme have focussed on whether there is evidence of a statistically significant linear decline in body condition. The focus here is broadened to examine the likely shape and variability in any time trends in body condition without restricting the analyses to linear trends and measures of statistical significance. We analyse trends in Antarctic minke whale body condition using generalised additive models of body weight and blubber thickness (BT 11). We take into account that data arising from each of the West and East sampling regions are confounded in space and time, that females (all pregnant) and males may require appreciably different model structures, and that some ambiguity exists concerning how long animals have spent in Antarctic waters feeding prior to capture. We also focus on the change in body condition that can be attributed to summer feeding in Antarctica. Our results indicate very little trend or variability in the improvement in body condition attributable to the period of summer feeding sampled by JARPA, for males or females from the West or East sampling regions. As the patterns of change we detected are not consistent between regions or sexes, we conclude that past studies estimating a single trend for both sexes over the entire region are implausible. In particular, we show that longer animals have proportionately lower blubber thickness than shorter animals, but that this relationship is only revealed by including body weight as a covariate in models. We additionally identify a time-trend for increasing body lengths in the JARPA catches. Model misspecification by omitted body weight as a covariate in models of blubber thickness is likely to be interacting with increasing lengths in the JARPA catches to induce false signals for changing condition. By inference, this issue would apply equally to analyses of fat weight. While our analyses have improved our understanding of the features of the data relevant to estimating body condition, we remain concerned about the veracity of any results arising from analyses of the JARPA dataset. This is due to the apparent large-scale year-to-year differences in key characteristics of the data, such as the proportion of low and high diatom animals in catches and the increase in average lengths over time. These differences could indicate that the segment of the total population being sampled has changed year-to-year, that subjective data recording protocols have been inconsistent, and that fleet operations have changed over time. We do not believe it is possible to fully resolve the influence of these potential sources of bias using the data available.
04. De la Mare, W.K. The contribution of prey spatial distribution to baleen whale functional responses. 5pp. The functional response of a predator to its prey can be constructed as two processes, the first is the relationship between the local density of prey and the amount ingested by the predator, the second is the relationship between the large-scale prey density to the probability of a predator finding prey at a given local density. Here, local density of prey is that in the immediate vicinity of the predator, which determines how much prey can be ingested by a given feeding behaviour at that location. The large-scale prey density is the average density of prey in an area sufficiently large that locating prey of a suitable density for feeding requires searching by the predator. In the context of whales feeding on patchy prey such as krill, local is on the scale of a prey patch, typically tens to hundreds of metres. Large-scale density is from an area that will contain multiple prey patches, and hence is on the scale of tens to hundreds of kilometres. A method for constructing functional response of lunge-feeding rorquals on a local scales is developed in de la Mare, Friedlaender and Goldbogen (2018) by using an individually based energetics model (IBM) of lunge feeding during dives. The model in this paper develops a method for constructing the part of the functional response due to the probability of encountering a prey patch (hereafter referred to as a swarm; the common terminology for a patch of krill).
05. Wada, A., Mogoe, T., Banjo, S., Kasai, H., Sasaki, H. and Tamura, T. Results of the krill and oceanographic survey under the NEWREP-A in the Antarctic in 2017/18. 13pp. The krill and oceanographic surveys were conducted in the Antarctic area V-E and VI-W during the 2017/18 austral summer season as part of third dedicated sighting survey of the New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A). These surveys, which were conducted by two research vessels Yushin Maru No. 2 (YS2) and Kaiyo Maru No. 7 (KY7), are associated with the main objective II of NEWREP-A. The krill survey was conducted along the zig-zag tracklines designed for the whale sighting survey. Acoustic data using quantitative echosounders EK80 (YS2) and EK60 (KY7) were recorded continuously for total 73 days and 6,608 n.miles. Net sampling using a small ring net (YS2 and KY7) and an Issak-Kid Midwater Trawl (IKMT) (KY7) was carried out to identify species and size composition of plankton echo signs at 47 stations and 11 stations, respectively. Oceanographic observations were also conducted at 112 stations using a Conductivity-Temperature-Depth profiler (CTD) and seawater sampling occurred at 16 stations. Calibration among EK80 and EK60 quantitative echosounders, and simultaneous samplings between small ring net and IKMT were also conducted. Krill and oceanographic data are currently being examined, and results will be reported in related CCAMLR working group and/or the mid-term review of NEWREP-A.
06. Miller, E.J., Potts, J., Cox, M.J., Miller, B.S., O'Driscoll, R., Kelly, N. and Double, M.C. The characteristics of krill swarms in relation to aggregating Antarctic blue whales. 12pp. Foraging grounds of the Antarctic blue whale (*Balaenoptera musculus intermedia*) were surveyed in the austral summer of 2015 during the joint New Zealand-Australia Antarctic Ecosystems Voyage. Using this dataset we describe the distribution of these rare whales in relation to their main prey species, Antarctic krill (*Euphausia superba*). A combination of passive acoustic technology and visual observations were used to locate Antarctic blue whales, whilst simultaneously using active underwater acoustics to characterise the distribution and density of krill swarms. Results suggest that Antarctic blue whales are more likely to be present within the vicinity of krill swarms detected at night, those of higher internal density, greater vertical height, and those found shallower in the water column. This study demonstrates that using complementary, multidisciplinary technologies can provide insights into sub meso-scale (i.e., <100 km) foraging behaviour of rare whales in a challenging environment. The nature of krill aggregations preferred by Antarctic blue whales is an important consideration, not only for the management of this endangered species in a changing environment, but also for the management of Antarctic krill fisheries.
- 06rev1. Miller, E.J., Potts, J., Cox, M.J., Miller, B.S., O'Driscoll, R., Kelly, N. and Double, M.C. The characteristics of krill swarms in relation to aggregating Antarctic blue whales. 12pp. *REASON FOR REVISION: Numerical amendments to Figure 2 and Table 2. Amendment to acknowledgements.* Foraging grounds of the Antarctic blue whale (*Balaenoptera musculus intermedia*) were surveyed in the austral summer of 2015 during the joint New Zealand-Australia Antarctic Ecosystems Voyage. Using this dataset we describe the distribution of these rare whales in relation to their main prey species, Antarctic krill (*Euphausia superba*). A combination of passive acoustic technology and visual observations were used to locate Antarctic blue whales, whilst simultaneously using active underwater acoustics to characterise the distribution and density of krill swarms. Results suggest that Antarctic blue whales are more likely to be present within the vicinity of krill swarms detected at night, those of higher internal density, greater vertical height, and those found shallower in the water column. This study demonstrates that using complementary, multidisciplinary technologies can provide insights into sub meso-scale (i.e., <100 km) foraging behaviour of rare whales in a challenging environment. The nature of krill aggregations preferred by Antarctic blue whales is an important consideration, not only for the management of this endangered species in a changing environment, but also for the management of Antarctic krill fisheries.
07. De la Mare, W. Further development of individual based energetic models including the effects of feeding during migration. 18pp. A number of enhancements have been made to the Individual based energetics models for baleen whales to include options allowing for diving and prey school based foraging behaviour, as well as an improved foraging model that allows for longer term memory of feeding grounds. The model allows for feeding to occur during migration between the feeding and breeding grounds. The spatial characteristics of prey can now be modelled in regions that are recursively defined, that is that any spatial region can contain subregions on a finer scale, and within any region prey can be modelled at the level of schools. Some early results from the enhanced model shows that carrying capacity and the characteristics of yield curves including MSYR and MSYL depend on quantity of food consumed by animals during migration. This has implications for the geographic and temporal scales required in the development of ecosystem models.
08. Cunen, C., Walløe, L. and Hjort, N.L. Reactions and answers to two papers by McKinlay, De La Mare and Welsh. 17pp.

SC/67b/HIM

01. Van Waerebeek, K., Apaza, M., Reyes, J.C., Alfaro-Shigueto, J., L., S., Barreda, E., Altamirano-Sierra, A., Astohuaman-Uribe, J., Ortiz-Alvarez, C. and Mangel, J. Beach-cast small cetaceans bear evidence of continued catches and utilisation in coastal Peru, 2000-2017. 15pp. Considering minimal direct monitoring of cetacean takes in most of South America, strandings data may serve as an useful proxy for removal levels, as the majority of beach-cast small cetaceans near fishing towns are thought to be fisheries related. A total of 942 specimens (873 identified) tallied via mostly opportunistic beachcombing efforts along the Peruvian coast in the period 2000-2017 included 8 species (% of ID-only): *Phocoena spinipinnis* (66.3 %), *Lagenorhynchus obscurus* (14.9 %), 2 *Delphinus* spp. (10.1 %), *Tursiops truncatus* (8.5%), *Grampus griseus* (0.11 %) *Kogia sima* (0.11%), *Mesoplodon peruvianus* (0.11%). Pair-wise comparisons between the northern, central and southern regions revealed significant geographic variation in species prevalences for 10 of 12 sample pairs, but little variation for *T. truncatus*. The overwhelming prevalence of *P. spinipinnis*, especially in southern and south-central Peru, was at odds with pre-2000 data of *L. obscurus* as the predominant species among cetacean takes. On the central coast, *L. obscurus* prevalence declined significantly from 77.5% (1985-1990) to 52.8% (1991-1993) in large samples (thousands) to a present low of 25.4%. Renewed concern is expressed for its conservation status. Uniquely, along the metropolitan Lima coastline, the boat-shy Burmeister's porpoise was rarely found (6.4%), possibly due to high disturbance from intense boat traffic. The Tacna coast, southern Peru, has sparse human population and limited nearshore boat traffic, but extensive gillnets deployed from shore (redes de corriente) extending up to 1-1.5 km. At Ite, Tacna, *P. spinipinnis* represented 76.4% of beach cast small cetaceans. At Wakama (Lima), stranding seasonality of *L. obscurus* (winter highs, summer lows) was consistent with the seasonality from historical catch statistics. A minimum incidence of human interaction (bycatch, intentional take, utilisation) of 58.5 % (n=41) determined at Chilca Playa is an underestimate as decomposition likely erased forensic evidence in a number of specimens. Our results demonstrated the relevance of even small-scale, opportunistic beachcombing efforts, at least until a nationwide strandings network can be established. Enhanced by standardized protocols, continued dedicated surveying along Peru's coastline is recommended, as to provide improved estimates of human interaction and species/age/sex prevalences, compare stranding densities and collect selected data, samples and voucher specimens for natural history studies. Comprehensive records of base-line cetacean mortality levels may help calibrate future unusual (mass) mortality events. Long-term datasets may contribute to the formulation of conservation and management measures.
02. de Jager, M., Hengeveld, G., Mooij, W. and Slooten, E. Modelling the spatial dynamics of Maui dolphins using individual based models. 57pp. The current anthropogenic impacts on nature necessitate more research for nature conservation and restoration purposes. To answer ecological and conservation questions concerning endangered species, individual based modelling is an obvious choice. Individual based models provide reliable results that can be used to predict the effects of different future conservation strategies, once calibrated correctly. However, proper parameterization of these models is challenging and time consuming. Here, we calibrate an individual based model of Maui dolphin movement, which generates Maui dolphin probability distribution maps. We used sighting data for validation of the chosen parameter combinations. For each simulation run, collected simulated data was compared to the empirical survey data, resulting in BoF estimates. First, each of four uncertain parameters was tested in a one-at-a-time sensitivity analysis. Three of the four parameters had a significant effect on the model's BoF. Second, different combinations of these three parameters were simulated. Using BoF on four different aspects of dolphin behaviour, we estimated the most likely parameter combinations. With optimized parameter values, Maui dolphin probability distribution maps were created, which can be used for conservation efforts. Using this approach, one is able to reliably calibrate an individual based model to fit the natural population that it should simulate.
03. Siciliano, S., Cardoso, J. and Francisco, A. Humpback whale (*Megaptera novaeangliae*) feeding behaviour and gillnet entanglements off south-eastern Brazil: 2016-2017. 8pp. Records of live stranded and rescued humpback whales, and entanglements during apparent feeding behaviors in mid-latitude waters off SE Brazil are reported. This is the first documented observation of feeding behavior of humpback whales plunge diving in pursuit of shrimp or squid in Brazilian waters.
04. Jacob, T., Leslie, A. and Ody, D. Protecting large cetaceans from ship strikes in the Pelagos Sanctuary. 14pp.
05. Peltier, H., Czeck, R., Dabin, W., Daniel, P., Deaville, R., Haelters, J., Ijsseldijk, L.L., Jensen, L.F., Jepson, P.D., Keijl, G., Olsen, M.T., Siebert, U., Van Canneyt, O. and Ridoux, V. Small cetacean mortality as derived from stranding schemes: the harbour porpoise case in the northeast Atlantic. 38pp.
06. Anon. Towards understanding the overlap of selected threats and important marine mammal areas (IMMAs) across the Mediterranean Sea. 9pp.
07. Kiszka, J.J., Talwar, B., Minton, G., Collins, T. and Reeves, R.R. Cetacean bycatch in Indian Ocean tuna fisheries: recent updates and perspectives from the 13th Meeting of the Working Party on Ecosystems and Bycatch of the Indian Ocean Tuna Commission. 11pp. Bycatch is the most significant threat to cetaceans around the world. However, the magnitude of bycatch is still poorly known, particularly in certain ocean basins such as the Indian Ocean. Tuna fisheries, both industrial and small-scale, are of major socioeconomic importance throughout the Indian Ocean. Published information suggests that cetacean bycatch rates in this region are relatively low in pelagic longlines and in purse-seines. However, the increasing use of drift gillnets, particularly in the northern Indian Ocean, is of concern. Preliminary estimates have suggested that as many as 60,000 cetaceans are caught annually in gillnets in the Indian Ocean. Further investigations are required to refine these estimates. The Indian Ocean Tuna Commission (IOTC) is responsible for the management of tuna and tuna-like species. The IOTC's Working Party on Ecosystems and Bycatch (WPEB) reviews and analyzes information on non-target species. At its annual meeting in September 2017 the WPEB formally acknowledged the importance of cetacean bycatch and adopted a work plan that included this subject as a research priority. While a severe shortage of data remains, the stage is set for collaboration with the IOTC on data collection and ultimately for mitigating bycatch in the region.
08. Peltier, H., Authier, M., Dabin, W., Dars, C., Demaret, F., Van Canneyt, O., Daniel, P. and Ridoux, V. Can modelling the drift of bycaught dolphin stranded carcasses help estimate total bycatch and identify involved fisheries? A feasibility study. 33pp.
09. Brownell, J., R.L. and Mallette, S.D. Global baleen whale bycatch: the most threatened population. 12pp.
- 09rev1. Brownell, J., R.L. and Mallette, S.D. Global baleen whale bycatch: the most threatened populations. 18pp. *REASON FOR REVISION: none given.*
10. Fruct, P.F., Prado, J.H., Genoves, R.C., Di Tullio, J.C. and Secchi, E.R. Preliminary evidences 1 suggest that the establishment of a bottlenose dolphin protection area in southern Brazil is failing against the reduction of bycatch. 14pp. In response to the increasing rates of entanglement of bottlenose dolphins in gillnets and the large overlap in dolphin distribution and the gillnet fishery around the Patos Lagoon Estuary, the Brazilian Government established in August 2012 a fishing exclusion area aiming at reduce incidental catches of bottlenose dolphins in this area. The aim of this work was to conduct a preliminary evaluation on the effectiveness of the bottlenose dolphin protection area. This preliminary analysis was based on the temporal analysis of the stranding rates along the coastal beaches in areas close to the Patos Lagoon Estuary and the compilation of bycatch records of bottlenose dolphin in other types of legal fisheries operating within or near the boundaries of the protected area. Contrary to expectations we found an overall increasing trend in mortality of bottlenose dolphins after the implementation of the protected area and a similar pattern of life-stage and seasonality in mortality in relation to the period before the establishment of the norm. In addition, we also reported on three additional types of fisheries that are allowed and commonly practiced within the boundaries of the protected area that incidentally captured bottlenose dolphins in southern Brazil. The data presented here strongly suggests that by-catch still affecting bottlenose dolphins in the region.
11. Panigada, S. and Ritter, F. 6th Progress Report on IWC Ship Strike Data Coordination - April 2018. 10pp.
12. Tarzia, M. IWC Bycatch Mitigation Initiative - strategic assessment of potential work on bycatch [draft]. 20pp. Over the past three decades, there has been widespread acknowledgement within the International Whaling Commission of the significant threat to cetacean populations,

and welfare concerns, caused by fisheries bycatch. This led to an agreement at IWC66 from the Commission to establish the Bycatch Mitigation Initiative (BMI). The BMI is made up of three interrelated components; a bycatch coordinator within the IWC Secretariat; a Standing Working Group (SWG) on Bycatch under the Conservation Committee (CC) and an Expert panel to advise the coordinator and the SWG on the development and implementation of a workplan to tackle cetacean bycatch. Given the complexity of tackling bycatch, with a need for research, management and policy work, the BMI will also rely on the involvement of a number of different bodies within the IWC, including the Scientific Committee (SC-where a wealth of existing research exists) and the CC and initiatives such as the Global Entanglement Response Network and Stranding Initiative. Given the urgency for action on this issue and the acknowledgement that other external organisations and bodies are already working on bycatch, there is a need to identify the actions where the IWC can bring about the most added value and influence. This document presents the preliminary findings of a strategic assessment, evaluating a variety of mechanisms for the potential role of the IWC in bringing about change to how cetacean bycatch is tackled at local, national, regional and international scales. Recommendations for both the BMI as a whole, and suggested actions for the SC are outlined for discussion during the SC. This document, once finalised, will then provide the basis for the development of the BMI strategic plan and workplan.

SC/67b/IA

01. Punt, A.E. Updated progress report: A multi-stock model for North Pacific sei whales, with preliminary results. 21pp. The age-, sex-, and season-structured population dynamics model developed to conduct an assessment of North Pacific sei whales is updated to use the available data types (catches, estimates of absolute abundance, estimates of relative abundance, and mark-recapture data). Preliminary applications of the model based on 1-stock and 3-stock hypotheses indicate some conflicts between the catch and abundance data. The data are preliminary and the results should be considered in that context.
02. Mizroch, S.A., Balcomb, K.C. and Rice, D.W. Historical winter and summer distribution of large whales along the eastern North Pacific coast based on data from the US whale marking program, 1962-1969. 29pp. From 1962 through 1969, the US Whale Marking Program conducted 11 dedicated whale sightings and marking cruises along the eastern North Pacific coast from northern California to the southern tip of Baja California and beyond. Most surveys were conducted in winter months and 991 groups of large whales were sighted.
03. Clapham, P.J., Baker, C.S., Calambokidis, J., Donovan, G., Ivashchenko, Y., Kitakado, T., Matsuoka, K., Palka, D., Punt, A.E., Urbán R, J., Wade, P., Yoshida, H. and Zerbini, A.N. Report of the intersessional working group on the Comprehensive Assessment of North Pacific humpback whales. 8pp.

03rev1. Clapham, P.J., Baker, C.S., Calambokidis, J., Donovan, G., Ivashchenko, Y., Kato, H., Kitakado, T., Matsuoka, K., Palka, D., Punt, A.E., Urbán R, J., Wade, P., Yoshida, H. and Zerbini, A.N. Report of the intersessional working group on the Comprehensive Assessment of North Pacific humpback whales. 8pp. *REASON FOR REVISION: name added to participants list.*

SC/67b/NH

01. NO PAPER.
02. Pastene, L.A., Taguchi, M., Lang, A.R., Goto, M. and Matsuoka, K. Population genetic structure and historical demography of North Pacific right whales. 18pp. The number and distribution of North Pacific right whale populations is uncertain. Previous studies based on catch, stranding and sighting records suggested that two populations occur on either side of the North Pacific. In this study this hypothesis was tested by analyzing new and published mitochondrial DNA (mtDNA) control region sequences (399bp) of right whale individuals from the western (n=29) and eastern (n=23) North Pacific. A sub-sample from the western side (n=18) was examined with 13 microsatellite loci to investigate the level of nuclear DNA diversity. Striking mtDNA differences were found between western and eastern North Pacific right whales. The FST between western and eastern North Pacific right whales was high (0.0929) and statistically significant (P=0.0002). This result is consistent with the hypothesis that separate populations inhabit the eastern and western North Pacific. Levels of nucleotide and haplotype diversities were high, 0.0174/0.8916 and 0.0165/0.8538 in the western and eastern populations, respectively. For the microsatellite data, the average expected heterozygosity in the western population was estimated at 0.595. The observed multimodal mtDNA mismatch distribution rejected a model of historical sudden expansion in both populations. Furthermore, Bayesian skyline plots (BSP) generated from the mtDNA data suggested a similar historical trend of female effective population size (N_{ef}) for the two populations, with a stable N_{ef} over time followed by a recent sharp decline. The timing of the decline ranged between 25,000 and 60,000 years ago (considering different populations and two assumptions of mutation rates), which coincide with the last glaciation period in the Pleistocene. Rapid climate changes during this period could have affected the habitat and prey resources of the North Pacific right whales, resulting in the sharp decline in their abundance. No signal of recent recovery was observed in the BSP analysis; however, this could be due to a lack of resolution for contemporary population size as shown in other studies.
03. Branch, T.A., Brownell, J., R.L., Donovan, G., Ivashchenko, Y., Kato, H., Lang, A.R., Matsuoka, K., Mizroch, S., Rosenbaum, H., Širovic, A. and Suydam, R. Data available for an assessment of North Pacific blue whales. 24pp.
04. Inai, K., Matsuoka, K. and Kitakado, T. Preliminary report of abundance estimation for the North Pacific humpback whales using IWC-POWER data. 14pp. The abundance of humpback whales in a summer feeding ground in the North Pacific was estimated using sighting data from 2010-2012 and 2017 surveys of the "International Whaling Commission Pacific Ocean Whale and Ecosystem Research (IWC-POWER)". A design-based line transect method was primarily used for the estimation of density and abundance. In the estimation of detection function, both of half-normal and hazard-rate functions were used with covariates/factors such as "year of survey", "school size", "cue" and "visibility" as well as some likely interaction terms among them. The best model was then selected by an information criterion, AIC. The density and abundance were estimated by Horvitz-Thompson-like estimators to account for possible heterogeneity in detection process within the leg. In addition, a spatial modelling approach was tested as a model-based method using the GAM with potential covariates of longitude, latitude, SST and distance from the land to see any differences in estimates among two estimation methods. As a result, in the design-based model, the abundance of humpback whales migrating to the southern Aleutian archipelago (2010-2012 survey areas; north of 40°N, south of the Alaskan coast including both the US and Canadian EEZs between 170°E-135°W) in summer (July - August) was estimated as 9,868 (CV=0.53) under the hazard-rate model with the survey year, school size and visibility. The northern Aleutian archipelago (2017 survey areas; eastern Bering Sea) in summer (July - August) was estimated as 4,539 (CV=0.64) under the half-normal model with the school size and visibility. In total, 14,407 (CV=0.56). An initial trial for the model-based method provided an estimate in 2010-2012 survey areas as 16,961, which is somewhat larger than the estimate from the design-based estimates, and therefore it warrants further researches to improve the spatial modelling and compare the results. The authors conclude that the model-based estimates in the south area (2010-2012 survey areas) can be used for future in-depth assessment of this species in the North Pacific Ocean.
05. Corkeron, P.J. and Pace, R.M., III. Status of North Atlantic right whales: an update on the events of 2017. 4pp.
06. Tajima, Y., Matsuda, A., Shiozaki, A., Mori, K., Kurihara, N., Nishimaniwa, K. and Yamada, T.K. A yearling right whale calf entangled in a set net off Ito, central Japan. 14pp. A right whale calf was found in a large-scale set net (ogata teichi) in Izu on February 18, 2018. The animal was found dead on the following day. The authors investigate this carcass at the fishery port of Ito, Shizuoka prefecture. Basic biological data and specimens were collected. Preliminary findings are summarized here. In Japan, right whales were captured by the traditional whaling but because the depletion of the species was serious the species was fairly rare and very few specimens are kept in museums.

06rev1. Tajima, Y., Matsuda, A., Shiozaki, A., Mori, K., Kurihara, N., Nishimaniwa, K. and Yamada, T.K. A yearling right whale calf entangled in a set net off Ito, central Japan. 14pp. *REASON FOR REVISION: acknowledgements added.*

A right whale calf was found in a large-scale set net (ogata teichi) in Izu on February 18, 2018. The animal was found dead on the following day. The authors investigate this carcass at the fishery port of Ito, Shizuoka prefecture. Basic biological data and specimens were collected. Preliminary findings are summarized here. In Japan, right whales were captured by the traditional whaling but because the depletion of the species was serious the species was fairly rare and very few specimens are kept in museums.

07. Cholewiak, D., Palka, D., Chavez-Rosales, S., Davis, G., Josephson, E., Van Parijs, S. and Weiss, S. Updates on sei whale (*Balaenoptera borealis*) distribution, abundance estimates, and acoustic occurrence in the western North Atlantic. 16pp.
08. Ivashchenko, Y.V. and Clapham, P.J. Preserving the past: digitization of Soviet whale catches and sightings from the North Pacific. 9pp. In 1948, the USSR began a 30-year campaign of illegal whaling that is estimated to have resulted in almost 180,000 unreported catches worldwide. The true catch totals have now been reconstructed for the North Pacific using Soviet whaling industry reports discovered in Russian archives. However, while the catch revisions have provided a broad overview of Soviet whaling, the reports contain data on the dates, locations and other characteristics of thousands of catches and sightings from across the North Pacific. In addition, there are many records in reports from non-whaling scientific surveys, including some conducted in months rarely covered by whaling data. Together, these data have the potential to prove useful in studies of the distribution, status and population structure of large whales in the North Pacific, and to assist in the planning of future surveys. In a project supported by the North Pacific Research Board (NPRB), we have extracted such data from the hard copy paper reports and entered them into an electronic database. Here, we describe the database, which contains 33,197 records (representing a minimum of 92,871 whales identified to species) digitized from the original hard copy files. The database will shortly be made freely available to NPRB and IWC on an open-access basis.
09. Cerchio, S., Andriantenaina, B., Zerbini, A.N., Pendleton, D., Rasoloarijao, T. and Cholewiak, D. Residency, feeding ecology local movements and potential isolation of the Madagascar Omura's whale (*Balaenoptera omurai*) population. 26pp. In 2015 the first detailed description globally of a population of Omura's whale (*Balaenoptera omurai*) was published, based on two years of focused field work off northwest Madagascar. Since then a focused, multidisciplinary study of the population was conducted in 2015 and 2016, reported here. Field surveys off Nosy Be, Madagascar were conducted for four weeks in 2015 and six weeks in 2016, tallying 202 encounters with Omura's whales, and collecting 55 skin biopsies for DNA and 14 fecal samples. Frequent photographic re-sights of individuals were evident within seasons and several noted across seasons, including at least one reproductive female that was sighted in four of six years from 2012 to 2017, once with a calf, suggesting strong site fidelity. Feeding was observed on a near-daily basis, on dense patches of krill identified morphologically as *Pseudeuphasia latifrons*, which seem to appear in response to dense blooms of a cyanobacteria *Trichodesmium* sp. Passive acoustic monitoring (PAM) was conducted at four sites spread across 80km for one year. Omura's whale song was present year-round indicating residency of the Omura's whale population in this region, with evident spatial and temporal heterogeneity. Four individuals were satellite tagged yielding telemetry tracks ranging from 30 to 58 days. Satellite tagged individuals remained in a restricted range of no more than 405km (mean among individuals of 283km) along the northwest coast of Madagascar, with all individuals moving multiple times throughout their individual ranges. Analysis of movement behavior using behavioral switching state-space model indicated highly localized movement patterns, involving short periods of transiting between specific areas where the whales would then linger for several days displaying primarily localized movements, likely feeding. Habitat suitability modelling indicated favorable conditions for Omura's whale along the west coast of Madagascar, defined primarily by shallow depth and some undefined influence of primary productivity, with little other predicted suitable habitat throughout the Southwest Indian Ocean. Combination of these data sources indicate that this is a resident, non-migratory population whose distribution is likely determined by local shallow water ecological processes and patchy and ephemeral prey resources. Furthermore, this population of Omura's whale may be isolated within a fragmented oceanic/global range for the species. 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. Therefore the development of sustained or long-term funding sources is currently a critical requirement for the continued investigation of this population and success of the project.

SC/67b/PH

01. Olson, P.A. and Jones, C.D. Photo-identification of Antarctic fin whales. 8pp. A photo-identification catalogue of Antarctic fin whales was compiled using photographs from IWC SOWER cruises 2004-2008, and from a CCLR research survey in January 2018 under the auspices of CCAMLR on the South Orkney Islands shelf. Directed fin whale research conducted during two SOWER field seasons yielded the majority of identification photographs. Overall, 30 individual whales were catalogued, represented by 15 left sides and 19 right sides. The suitability of Antarctic fin whale as subjects for photo-ID studies was assessed by scoring photographs of individuals for the prevalence of unique markings such as dorsal fin nicks, scars, and the brightness of chevron and blaze pigmentation. Results confirmed Antarctic whales to be well marked: 97% of identifiable whales exhibited three or more unique markings (match points). 70% had dorsal fin nicks or prominent scars, including 27% with healed killer whale rake marks. 90% carried ovoid scars, most likely from cookie cutter shark bites. Moderately visible or highly visible chevron patterns appeared on 75% of scored whales. The formation of a catalogue serves as a foundation for future studies. Photoidentification data of Antarctic fin whales can be used to determine residency and movement patterns of this poorly understood population of whales.
02. Olson, P.A., de Boer, M., Kennedy, A., Double, M.C., Matsuoka, K., Pastene, L.A. and Findlay, K. Photo-identification of Antarctic blue whales: new data from 1998 and 2015-2018. 6pp. Newly available collections of identification photographs of individual Antarctic blue whales were compared to the images of 441 individuals in the Antarctic Blue Whale Catalogue. The sources of photographs include the IWC IDCR/SOWER cruises in 1989/1990, 1993/1994, and 1997/1998, and opportunistic photographs collected by collegial scientists, naturalists, and tourists 2015-2018. Seventeen new individual blue whales were identified: 4 from the SOWER cruise in 1998 and 14 from the opportunistic photos. There were no matches between any of the newly identified whales or to the Antarctic Catalogue. The 17 new identifications brings the total number of photo-identified Antarctic blue whales up to 458 whales, represented by 342 left sides and 332 right sides. The minimum (332) and maximum (458) number of unique individuals represents 15% and 20%, respectively, of the most recent accepted estimate of abundance of Antarctic blue whales, 2,280 in 1997/1998 (Branch, 2007). All 17 of the new identifications came from IWC Management Areas underrepresented in the catalogue, Areas I and II. The collection of Antarctic blue whale identification photographs provide data for capture-recapture estimates of abundance as well as information on the movement of individual blue whales within the Antarctic region.
03. Blount, D., Holmberg, J. and Minton, G. Flukebook - a tool for cetacean photo identification, data archiving and automated fluke matching. 10pp. Flukebook is a non-profit, open source cetacean data archiving and photo matching tool developed under the Wildbook Platform that uses computer vision and artificial intelligence to facilitate photo-identification of individual animals in the wild. In 2016 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 collaboration has resulted in expanded functionality of the Flukebook platform to allow storage and analysis of survey sightings data that does not include individual encounter or photoidentification data, as well as other functions that will be of use to the global cetacean research community.
04. Vernazzani, B.G., Olson, P.A. and Salgado Kent, C. Progress report on Southern Hemisphere Blue Whale Catalogue: period May 2017-April 2018. 6pp. The Southern Hemisphere Blue Whale Catalogue has a total of 1,519 individual blue whale photoidentifications (photo-IDs) that include areas off Antarctica, Chile, Peru, Ecuador-Galapagos, Eastern Tropical Pacific (E T P), Australia, Timor Leste, New Zealand, southern Africa, Madagascar and Sri Lanka. From May 2017 to April 2018, SHBWC work focused on comparisons of catalogues from Australia, New Zealand and Sri Lanka. Future work will focus on comparisons among South America and E T P to be used for assessment purposes while between region comparisons to check for migration and connectivity will continue to be considered a second priority.

SC/67b/RMP

01. De la Mare, W. Update on incorporating an individual based energetics model into the RMP trials software. 9pp. This note outlines the incorporation of an individual-based energetic model to the RMP testing software. There are no technical difficulties in calling the individual based model software from the existing FORTRAN control program. A set of appropriate functions for incorporating the energetic model into the RMP framework have been written and tested successfully using a mixed language framework provided by the open-source 'GNU compiler collection' (GCC).
02. Kitakado, T. and Goto, M. A plausible range of MSYR(1+) and relative plausibility of stock structure hypotheses for the WNP common minke whales investigated by bycatch data: Updated responses to requests by the Scientific Committee for more detailed explanation for Section 4 of SC/67a/SCSP/13. 9pp. This paper aims at suggesting a plausible range of MSYR(1+) and relative plausibility of stock structure Hypotheses A and C for the western North Pacific common minke whales by responding to comments made in SC67a for more detailed explanation for Section 4 of SC/67a/SCSP/13. First, as supplementary information, the paper begins showing time trajectory of population size for each stock under the two stock structure hypotheses. Then an estimated time trend of bycatch proportion of J animals is given with a set of formulas as requested by the SC, and this is compared to that estimated in RMP/IST trials under different assumptions for stock structure (Hypotheses A and C) and MSYR. The results show that only an MSYR(1+) value of 2% or more under Hypothesis A is consistent with the bycatch data, for which the results discussed above indicate no conservation concern for the J stock under the research catches to be taken by Japan. These conclusions are robust to different specifications of the error structure for the time trend estimate from the bycatch data. Also, the results were not sensitive to handling of unassigned J/O animals. However, there are discrepancies between data and model predictions at a sub-area level, which points to the need to revise the mixing matrices used for the RMP/IST trials.
03. Kitakado, T. Evaluation of management procedures with CLA modified by recruitment information: specifications of trials to evaluate CLA variants for Antarctic minke whales which utilize ageing information. 14pp.

SC/67b/SAN

01. De la Mare, W., Dearie, T., Anderson, H., McKinlay, J.P., Bell, E.M. and Double, M.C. Draft Southern Ocean Sanctuary Management Plan. 14pp. At the decadal reviews of the Southern Ocean Sanctuary (SOS) in 2004 and 2016 the Scientific Committee recommended that the SOS should have a management plan that linked objectives to measurable or identifiable outcomes. This recommendation was endorsed by the Commission. In order to progress this recommendation, the authors have developed a draft management plan for consideration by the Scientific and Conservation Committees. It is the intention of the authors that the Scientific and Conservation Committees will amend and adopt a management plan, at which point the plan will no longer be attributed to the authors.

SC/67b/SCP

01. Convenors' Group. Draft amendments to SC Rules of Procedure - working document for SC/67b. 7pp.
 02. SC Chair, SC Vice-Chair and Head of Science. Scientific Committee Handbook - Working Methods of the IWC's Scientific Committee. 27pp.
- SCP02rev1. SC Chair, SC Vice-Chair and Head of Science. Scientific Committee Handbook - Working Methods of the IWC's Scientific Committee. 26pp. REASON FOR REVISION: updated information.

SC/67b/SCSP

01. De la Mare, W.K. and McKinlay, J.P. NEWREP-A sample size calculations needs to be completed. 4pp. The Scientific Committee, through the Expert Panel review of NEWREP-A and at subsequent Scientific Committee meetings, has recommended to Japan ("the proponents") that they provide more statistically rigorous sample size calculations in support of the current take of animals under the NEWREP-A Special Permit program. during 2015 and 2016, the proponents examined several aspects of Recommendation 26 of the Expert Panel relating to developing realistic models to estimate sample sizes. In reviewing this work, the Scientific Committee has assessed that so far only three of six aspects of the Experts Panel recommendations have been adequately addressed in relation to sample sizes. In 2017, the proponents presented no new work in relation to sample sizes, instead stating that, in their estimation, the original recommendations of the Expert Panel were complete. Australian scientists previously applied to access the requisite data from the proponents in order to undertake the required sample size calculations, but have been refused access to the data for this purpose. Until such time as the proponents fully implement the Expert Panel recommendations for calculating sample sizes it remains that the proponents have not demonstrated that they are able to realise their stated objectives in relation to the NEWREP-A program. The proponent's position is that any further work on sample sizes should be afforded a low priority. However, it is untenable that NEWREP-A continues without appropriate sample size having been correctly calculated, and these calculations should be completed as a matter of urgency.
02. Isoda, T., Yasunaga, G., Yoshida, H., Mogoe, T., Ito, N., Shimatani, K., Nakamura, G., Maeda, H., Inoue, S., Kumagai, S., Goto, M., Nishimura, F., Kim, Y., Asano, Y., Akagi, M., Makajo, K., Yamamoto, R., Watanabe, H., Sonobe, N., Shibata, C., Agari, T., Katsumata, T., Sazawa, R., Hatanaka, T., Takahashi, T., Hatsuse, A., Inoue, T., Kobata, M., Takeuchi, A., Matsumoto, S., Miyoshi, M., Seko, H., Monguchi, Y. and Kato, H. Cruise Report of the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in 2017- Pacific coastal component off Hachinohe and Kushiro. 15pp. The first survey of the NEWREP-NP Pacific coastal component was conducted in sub-areas 7CS off Sanriku (Hachinohe) and 7CN off Kushiro. The survey in Hachinohe was conducted from 18 July to 20 August 2017, using two small-type whaling catcher boats as sighting/sampling vessels and six small fisheries boats supporting the sighting vessels. The survey in Kushiro was conducted from 1 September to 31 October 2017, using four small-type whaling catcher boats as sighting/sampling vessels. Searching for common minke whales and sampling took place in coastal waters about 50 n. miles from Hachinohe and Kushiro Ports. All common minke whales sampled were landed at the NEWREP-NP research stations established in Hachinohe and Kushiro, where biological examination was conducted. During the survey in Hachinohe, a total of eight primary sightings (eight individuals) of common minke whale were made during 4,297.1 n.miles of searching distance (456.2 hours). Three common minke whales (one immature and two mature males) were sampled. The dominant prey species was the Japanese sardine. During the survey in Kushiro, a total of 45 primary sightings (47 individuals) of common minke whale were made during 7,038.5 n.miles of searching distance (724.0 hours). A total of 35 common minke whales (22 males and 13 females) were sampled. The dominant prey species was the Japanese sardine. Biological samples and data required for Primary Objective I and Ancillary Objectives I and II of NEWREP-NP were obtained from all animals sampled. The target sample size of 80 common minke whales however could not be attained, because both surveys were greatly affected by bad weather and sea conditions, for example thick fog and strong cold wind were frequent in Hachinohe and low atmospheric pressure involving typhoons affected the Kushiro area.
03. Konishi, K., Isoda, T., Bando, T., Minamikawa, S. and Kleivane, L. Results of satellite monitored tagging experiments on North Pacific sei whales conducted during the 2017 NEWREP-NP offshore survey 8pp. This document reports the results of the satellite monitored tagging experiments on North Pacific sei whales conducted during the 2017 NEWREP-NP survey. A total of 44 tagging experiments were conducted using SPOT6 type tags with LKArts system for attachments from Yushin-Marui-type sighting/sampling vessels. A total of 15 tags were deployed on sei whales, of these eight tags transmitted the locations and movement of the whales. Two sei whales were tracked for more than 35 days, and these two whales showed a longitudinal movement. In general the tagging experiment of penetrate-type tags from sighting/sampling vessels seems to be practical. However some technical improvements are identified, which could increase the tracking period.

04. Yasunaga, G., Konishi, K., Isoda, T. and Tamura, T. Results of the feasibility study on biopsy sampling and satellite tagging of Antarctic minke whales under NEWREP-A. 9pp. This paper presents the results of the feasibility studies of biopsy sampling and satellite tagging of Antarctic minke whales under the NEWREP-A, which were conducted between the 2015/16-2017/18 austral summer seasons. The feasibility studies were conducted considering the recommendations of the NEWREP-A review workshop. First the Success Proportions of biopsy and whale (lethal) sampling was estimated, then the efficiency between the two approaches were assessed using a Generalized Linear Model (GLM) considering the following response variables: sampling methods (biopsy and whale sampling), Beaufort scale, visibility and sampling area. The explanatory variable in the best fitted model included only 'sampling method', suggesting that environmental variables had not a significant effect. The estimated Success Proportions for biopsy sampling (0.434 ± 0.050) were much lower than that for whale (lethal) sampling (0.967 ± 0.006). Furthermore, the time spent on biopsy sampling was approximately three times longer than that spent on lethal sampling. Therefore the efficiency of biopsy sampling is much lower than that of lethal sampling for Antarctic minke whales in the NEWREP-A. At this stage biopsy sampling of Antarctic minke whales is not a feasible technique that could contribute to the NEWREP-A research objectives. Given these results, no additional experiments on biopsy sampling will be conducted in future NEWREP-A surveys. However additional biopsy samples could be collected opportunistically to increase the sample size and then consider other variables in the statistical analysis in the future. Satellite tagging can respond some specific questions with a moderate number of whales tagged, therefore additional tagging experiments will be conducted in the future focused on responding to such specific research questions.
05. Inoue, S., Yasunaga, G. and Pastene, L.A. Determining sexual maturity in female Antarctic minke whales during the feeding season based on concentrations of progesterone in blubber. 8pp. The relationship between concentration of progesterone in blubber and reproductive status in the Antarctic minke whale was investigated by examining 230 female Antarctic minke whales sampled during the 2015/16 austral summer survey of the New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A). The study was conducted in response to a recommendation from the NEWREP-A review workshop to 'Examine use of hormones in blubber to detect sexual maturity'. Progesterone concentrations in blubber of the sampled whales were related to their reproductive status determined by the traditional method of examining reproductive organs (56 immature, 11 resting, 6 ovulating and 157 pregnant females). Significant differences were found in median progesterone concentration between all reproductive categories except in the case between ovulating and pregnant females. However, the ranges of progesterone concentration overlapped between each reproductive status with the exception of the cases immature/ovulating and immature/pregnant. The results of the present study indicate that the progesterone concentration in blubber samples, which potentially can be obtained by biopsy sampling, cannot be used as a diagnostic index to discriminate between mature and immature female Antarctic minke whales. Discrimination between immature and mature females is fundamental information for population dynamics models such as the catch-at-age analysis (SCAA). Therefore, at this stage, lethal sampling is required to obtain information on sexual maturity of female Antarctic minke whales for use in population dynamic models.
06. Konishi, K., Isoda, T., Nakai, H., Oikawa, H., Kanbayashi, J., Uchida, M., Tsunekawa, M., Ueda, Y., Kominami, T., Kawabe, S., Eguchi, H. and Tamura, T. Results of the first cruise of the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in the 2017 summer season - offshore component. 14pp. This paper reports the results of the first biological survey of sei and common minke whales under the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP)-offshore component. The survey was conducted in part of sub-Areas 7(WR and 7E), 8 and 9 (-170°E), north of 35°N from June to September 2017. Two sighting sampling vessels (SSVs) and one research base vessel were engaged in the survey for 100 days. A total of 56 sightings (involving 61 individuals) of common minke whale and 320 sightings (involving 407 individuals) of sei whales were made during 5,307 n.miles of searching distance. A total of 43 common minke whales and 134 sei whales were sampled as originally planned. Sei whales were all sampled along the predetermined tracklines in the Normal survey which was designed in a systematic way, and common minke whales were sampled along both the Normal survey and the Special survey track lines which were designed for areas where the density of common minke whales was expected to be high. Overall searching effort was optimized and the research area was covered adequately. Biological samples and data required for the two primary objectives of NEWREP-NP were obtained from each whale sampled. In particular earplugs for age determination and reproductive organs for sexual maturity determination were collected for all individuals. Preliminary biological analyses were conducted and results are presented in this paper. Sardine and mackerels were major prey species for both sei and common minke whales. Eight blue and one humpback were photo-identified, and biopsy samples were collected from five blue, 17 sei and one humpback whales. Satellite tags were deployed on 15 sei whales and the locations were obtained from eight individuals. The samples and data collected in this survey will be available for interested national and international scientists under the guidelines for research collaboration in NEWREP-NP.
07. Yoshida, H., Ito, N., Maeda, H., Nakamura, G., Inoue, S., Hirose, A., Nishimura, F., Asano, Y., Yamamoto, R., Watanabe, H., Agari, T., Sonobe, N., Kumagai, S., Sazawa, R., Takahashi, T., Hatsuse, A., Sato, S., Higa, H., Hiruda, H., Miyashita, T., Sasaki, H., Nakajyo, K. and Kato, H. Cruise report of the New Scientific Whale Research Program in the western North Pacific (NEWREP-NP) in 2017 - coastal component off Abashiri in the southern Okhotsk Sea. 21pp. The NEWREP-NP coastal component off Abashiri, northern Japan (southwestern part of the sub-area 11), was conducted in the southern Okhotsk Sea, from 11 June to 6 July 2017. The survey was carried out using five small-type whaling catcher boats as sampling vessels, in coastal waters mainly within about 40 nautical miles from Abashiri port. Common minke whales collected were landed at the NEWREP-NP research station for biological examination. During the survey, a total of 2,449.9 nautical miles (243.4 hours) was searched and the 128 schools (132 individuals) of common minke whales were encountered. Sightings of 39 schools (55 animals) of fin whales, of 4 schools (10 individuals) of humpback whales, of two blue whales, and of a sperm whale were also made. Of 132 common minke whales encountered, 47 animals were collected. Ear plugs and eye lenses for age determination and gonad for reproductive study were collected from all the whales. Sex of animals caught was biased towards the female (9 males and 38 females). Average body length of males was 6.92m (SD=0.55, Range=5.62-7.55m) and 7.35m (SD=0.85, Range=4.96-8.18m) for females. Of 9 males, 8 were sexually mature (88.9%) and 30 of 38 females attained to sexual maturity (78.9%). The 25 mature females were pregnant. Stock assignment was conducted from nuclear microsatellite data. Of 47 animals collected, 28 were assigned to J stock and 17 were identified as O stock. The remaining two animals could not be assigned. Proportion of J stock animals increased from June (53.6%) to July (76.5%). Sex ratio of males was higher in J stock animals (28.6%) than in O stock animals (5.9%). In females, proportion of mature animals was higher in O stock (93.8%) than in J stock (65.0%). From foetus body length, conception date was estimated using the growth formula. Results indicate that animals migrating to the Okhotsk Sea possess separate two breeding seasons, i.e., autumn breeding season and winter breeding season prolonged to spring. Females pregnant with foetus estimated to be conception in autumn were assigned to J stock. All females assigned to O stock conceived in a period from winter to spring. Dominant prey species detected from whale forestomach was Krill (89.4%), followed by Copepoda (4.3%) and only one animal feed on walleye pollock (2.1%). Animals feeding on copepods were assigned to O stock. An individual taking walleye pollock was identified as J stock.
08. Bando, T., Nakai, H., Kanbayashi, J., Umeda, K., Kim, Y., Nishimura, F., Yoshida, H., Tsunekawa, M., Yoshimura, I., Mure, Y., Kominami, T., Eguchi, H., Mogoe, T. and Tamura, T. Results of the third biological field survey of NEWREP-A during the 2017/18 austral summer season. 18pp. This paper reports the results of the biological sampling of Antarctic minke whales during the third New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A) conducted in Area VI (170°W-120°W, south of 60°S) during the 2017/18 austral summer season. The paper also reports the results of the sighting surveys and non-lethal experiments. Two sighting and sampling vessels (SSVs) and one research base vessel engaged in the survey for 83 days. A total of 392 sightings (involving 925 individuals) of Antarctic minke whale were made during 4,164 n.miles of searching distance. A total of 333 Antarctic minke whales (152 males and 181 females) were sampled, and a number of biological samples and data required for the two main objectives of NEWREP-A were obtained from each whale taken. In Area VI-East, the survey was conducted early in the season (December to January) for the first time since the start of JARPA survey in 1987/88. A total of 44 Antarctic minke whale (26 males and 18 females) were sampled in Area VI-East. The obtained samples will contribute to elucidation of the stock structure of Antarctic minke whales, especially to elucidation of the eastern boundary of P-stock. A total of two blue, four humpback and one killer whales were photo-identified and one biopsy sample was collected from a blue whale in the research area. The samples and data collected in this survey are available for interested national and international scientists under the guidelines for research collaboration posted at the home page of the Institute of Cetacean Research (ICR): <http://www.icrwhale.org/NEWREP-AProtocol.html>.

09. Uchida, M., Suzuki, I., Tamura, T., Bando, T., Konishi, K. and Mitani, Y. Preliminary results in stable isotope analysis along edge of baleen plates in the Antarctic minke whales to estimate duration of time on feeding grounds. 11pp. The stable isotope of 16 Antarctic minke whales (*Balaenoptera bonaerensis*) sampled in the New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A) in 2016 and 2017 were examined. The stable carbon ($\delta^{13}\text{C}$) and nitrogen isotope ratios ($\delta^{15}\text{N}$) were determined along the edge of baleen plates of 10 pregnant females in the Ross Sea and 6 immature females of the Antarctic minke whale. Each baleen plate was examined at an interval of 5mm to investigate if there were records of feeding in the $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ derive from the long-term feeding profile. In the pregnant females, about 4 cycles of nitrogen were seen at each baleen plate and the mean length of cycle was $7.7 \pm 2.0\text{cm}$ (mean \pm SD, range: 6.0-10.0cm), while two individuals had nitrogen cycles more than 12cm. No constant cycle was observed in $\delta^{13}\text{C}$. The trophic enrichment factor of the Antarctic minke whale is calculated as 3.48‰, assuming the mean $\delta^{15}\text{N}$ value at base of baleens derived from feeding on the Antarctic krill. From the analyses in immature animals, the $\delta^{15}\text{N}$ kept high value before birth to the end of lactation followed by a rapid down, suggesting feeding on krill causes lower $\delta^{15}\text{N}$. The cycles of stable isotope values in immature animal were longer than those in pregnant females, suggesting the baleen plates in younger animals have higher growth rate. The value of $\delta^{13}\text{C}$ is difficult to interpret its change compare to that of $\delta^{15}\text{N}$ in the Antarctic minke whales. The fluctuation range of $\delta^{15}\text{N}$ in the pregnant females was $0.97 \pm 0.21 \text{‰}$, suggested that they highly depend on only the Antarctic krill. The duration of feeding period of the Antarctic minke whales on feeding grounds remains unknown. However further experiments with the baleen samples obtained at lower latitude during Austral winter possibly show the change of $\delta^{15}\text{N}$ during fasting that can estimate the timing of leaving Antarctic Waters. As an alternative way, if possible to examine, the growing ratio of baleen plates can estimate the seasonal change of $\delta^{15}\text{N}$, and the duration of time on feeding ground could be calculated.

09rev1. Uchida, M., Suzuki, I., Tamura, T., Bando, T., Konishi, K. and Mitani, Y. Preliminary results in stable isotope analysis along edge of baleen plates in the Antarctic minke whales to estimate duration of time on feeding grounds. 11pp. **REASON FOR REVISION: mistake in title.**

The stable isotope of 16 Antarctic minke whales (*Balaenoptera bonaerensis*) sampled in the New Scientific Whale Research Program in the Antarctic Ocean (NEWREP-A) in 2016 and 2017 were examined. The stable carbon ($\delta^{13}\text{C}$) and nitrogen isotope ratios ($\delta^{15}\text{N}$) were determined along the edge of baleen plates of 10 pregnant females in the Ross Sea and 6 immature females of the Antarctic minke whale. Each baleen plate was examined at an interval of 5mm to investigate if there were records of feeding in the $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ derive from the long-term feeding profile. In the pregnant females, about 4 cycles of nitrogen were seen at each baleen plate and the mean length of cycle was $7.7 \pm 2.0\text{cm}$ (mean \pm SD, range: 6.0-10.0cm), while two individuals had nitrogen cycles more than 12cm. No constant cycle was observed in $\delta^{13}\text{C}$. The trophic enrichment factor of the Antarctic minke whale is calculated as 3.48‰, assuming the mean $\delta^{15}\text{N}$ value at base of baleens derived from feeding on the Antarctic krill. From the analyses in immature animals, the $\delta^{15}\text{N}$ kept high value before birth to the end of lactation followed by a rapid down, suggesting feeding on krill causes lower $\delta^{15}\text{N}$. The cycles of stable isotope values in immature animal were longer than those in pregnant females, suggesting the baleen plates in younger animals have higher growth rate. The value of $\delta^{13}\text{C}$ is difficult to interpret its change compare to that of $\delta^{15}\text{N}$ in the Antarctic minke whales. The fluctuation range of $\delta^{15}\text{N}$ in the pregnant females was $0.97 \pm 0.21 \text{‰}$, suggested that they highly depend on only the Antarctic krill. The duration of feeding period of the Antarctic minke whales on feeding grounds remains unknown. However further experiments with the baleen samples obtained at lower latitude during Austral winter possibly show the change of $\delta^{15}\text{N}$ during fasting that can estimate the timing of leaving Antarctic Waters. As an alternative way, if possible to examine, the growing ratio of baleen plates can estimate the seasonal change of $\delta^{15}\text{N}$, and the duration of time on feeding ground could be calculated.

SC/67b/SDDNA

01. Baird, A.B., Givens, G.H., George, J.C., Suydam, R.S. and Bickham, J.W. Stock structure of bowhead whales inferred from mtDNA and SNP DNA. 21pp. This report analyzes mtDNA sequence data and SNP genotypes to examine stock structure in bowhead whales, *Balaena mysticetus*. The focus of the study is the Bering-Chukchi-Beaufort Seas (BCB) stock, with fewer samples from the Eastern Arctic (CAN) and Sea of Okhotsk (OK) used for comparison. mtDNA data includes sequences from the HVR1 portion of the control region, cytochrome-b, and ND1 totaling 2494 bp. The SNP panel, described in Baird et al. (2017), contains 69 autosomal loci (analyzed here) and 7 sex chromosome markers (to be used in future studies). Population genetic analyses indicate that the BCB and CAN populations are not highly differentiated, but that the OK population is easily distinguishable from both BCB and CAN. There is no evidence of significant sub-structuring of the BCB stock when comparisons are made among geographic and seasonal strata. These results are consistent with previous studies of mtDNA control region sequences, focal microsatellites, and a smaller SNP panel, as well as satellite telemetry data.

02. Brüniche-Olsen, A., Westerman, R., Kazmierczyk, Z., Vertyankin, V.V., Godard-Codding, C., Bickham, J.W. and DeWoody, J.A. The inference of gray whale (*Eschrichtius robustus*) historical population attributes from whole-genome sequences. 29pp.

03. Brüniche-Olsen, A., Urbán R, J., Vertyankin, V.V., Godard-Codding, C., Bickham, J.W. and DeWoody, J.A. Genetic data reveal mixed-stock assemblages of gray whales in both Eastern and Western Pacific Ocean. 21pp. Western gray whales (*Eschrichtius robustus*) are critically endangered whereas the Eastern gray whale is relatively common. Both were severely affected by Holocene environmental changes and commercial whaling, but gray whales in the Eastern Pacific now outnumber their Western counterparts by more than 100x. Herein, we investigate the genetic diversity and population structure within the species. Results indicate the gray whale gene pool is differentiated into two lineages, that each lineage contains similar levels of genetic diversity, and that both our Eastern and Western geographic samples were derived from mixed-stock aggregations composed of two distinct lineages. Overall, our data are inconsistent with the idea that the gray whale gene pool consists of a single population at equilibrium.

04. Goto, M., Kitakado, T., Taguchi, M. and Pastene, L.A. Feasibility of the DNA methylation technique for age determination in the Antarctic minke whale. 9pp. In this study, we investigated the feasibility of the DNA-methylation (DNA-M) technique to determine age in the Antarctic minke whale. A total of 100 Antarctic minke whale samples, for which earplug readings were considered excellent or good, were selected for the DNA-M feasibility study. Seven CpG sites in three genes (TET2, CDKN2A and GRIA2) were selected for this study because they showed significant correspondence between CpG methylation levels and age in a previous study on humpback whales. In addition, we investigated changes in the DNA-M rate among different positions of the whale's body, some involving dorsal side (expose to sunlight) and others on the ventral side. DNA-M rate of the seven CpG sites were scored successfully and regressions of each CpG methylation against age determined by earplug were conducted. Coefficient of determination (R^2) of all CpG sites were lower than that of the previous humpback whale study. The assay predicts age from skin samples with a standard deviation of 8.865 years. DNA-M rate fluctuated among 8-10 positions of the whale body. It is concluded that age determination of Antarctic minke whale based on the seven DNA-M sites (from three loci) used in this study is not feasible particularly for use in population dynamics models such as SCAA.

05. José Pérez-Álvarez, M.J., Olavarría, C., Kraft, S., Moraga, R., Sepúlveda, M., M., S.-C., Pavez, G. and Poulin, E. **NOTE: this is the wrong paper.** Genetic diversity of South East Pacific fin whales and lack of genetic differentiation between Southern Hemisphere stocks. 10pp.

05rev1. José Pérez-Álvarez, M.J., Rodriguez, F., Kraft, S., Olavarría, C., Naretto, C. and Poulin, E. Historical and contemporary population structure and the impact of whaling on sei whales. 7pp. **REASON FOR REVISION: Original SC/67b/SDDNA05 was wrong file.**

The largest whale mass mortality event ever recorded took place recently in Southern Chile, where at least 340 dead rorquals were reported (Häussermann et al. 2017). In this event, all the positively identified whales were sei whales, *Balaenoptera borealis*. Population studies of sei whale are very limited in the Southern Hemisphere, even though this species was one of the major targets of commercial whaling worldwide, having an important exploitation history, particularly in Chilean waters. In this context, the whale mortality event has become the largest source of samples for the species in the Southern

Hemisphere and a unique opportunity to address questions regarding genetic diversity and population structure of the species as well as dynamic of population demography considering historical and contemporary temporal frameworks. We are currently undertaken the analyses of skin and bone samples collected in the area ($n = 160$). Preliminary analyses of a set of those samples ($n = 50$) include that (1) the forensic technique we are using has proven successful in amplifying mt and nuDNA (sex), (2) 14 mtDNA control region sequences from skin samples (699 bp) revealed 13 haplotypes ($h = 0.989$, $\pi = 0.94\%$), (3) 36 mtDNA control region sequences from bones (650 bp) revealed 23 haplotypes ($h = 0.971$, $\pi = 0.99\%$), (4) all sequences corresponded to sei whales when compared with BLAST and DNA Surveillance data bases, and (5) sexing bones samples identified 22 males, 6 females and 8 unknown. Future work will include the collection of more samples from the same area, other areas along Chilean coast where sei whales are observed and other geographic regions in the Southern Hemisphere. We expect to include data from other Northern Hemisphere sei whales through collaboration.

06. Taguchi, M. Results of the genetic analyses recommended by the ‘Workshop on Western North Pacific common minke whale stock structure in preparation for the start of the *Implementation Review* in April 2018. 10pp. This document reports the work conducted in response to one of two recommendations on genetic analyses from the ‘Workshop on Western North Pacific common minke whale stock structure in preparation for the start of the *Implementation Review* in April 2018’. The recommendation was labelled as ‘Analysis 1’ in the workshop report. The aim of ‘Analysis 1’ was to review the stock assignment threshold which is currently set at 90% for the STRUCTURE analysis, using two types of datasets with 26 microsatellite loci.

SC/67b/SH

01. Vermeulen, E., Wilkinson, C., Thornton, M., Peters, I.T. and Findlay, K. Report on the Mammal Research Institute Whale Unit southern right whale survey - 2017. 24pp. The South African southern right whale (*Eubalaena australis*) population has been monitored through annual aerial surveys across the southern Cape coast since the early 1970’s. From 1979 onwards these annual surveys have incorporated identification using photography of natural markings, resulting in an uninterrupted 38-year survey series of photo-identification history. In recent years, these surveys showed a marked decline in the presence of southern right whale unaccompanied adults (since 2010) and cow-calf pairs (since 2015) along the South African coast. Reasons for this decline remain speculative. In order to continue monitoring this population and further investigate the observed trend, a series of aerial surveys were conducted in the whale calving and nursing season (June to December) of 2017. The annual photo-identification aerial survey was flown as usual in October with the aim to count all southern right whales and photograph all females with calves and individuals with a brindle or grey blaze colouration between the area of Nature’s Valley and Muizenberg. This year, the survey was flown coastwise over the period 2 to 9 October 2017 and in a general westward direction using an Airbus EC120B helicopter (only the first day was flown in an eastward direction). A total of 29 hours and 30 minutes of flight operations were required to complete the survey, of which 23 hours and 44 minutes was flown as search effort and 5 hours and 46 minutes was flown in transit to and from the survey start and end points. In total, 179 groups comprising 180 cow-calf pairs of southern right whales (360 animals) and 65 groups comprising 135 unaccompanied adults were observed. Considering the decrease in southern right whale sightings in recent years, and the extension of the survey in 2016 survey to Lambert’s Bay on the west coast of South Africa, this year’s survey was also extended between Muizenberg and Lambert’s Bay on 10 October 2017. Within this extended area, 3 groups of 3 cow-calf pairs (6 animals) and 17 groups of 26 unaccompanied adults were encountered, bringing the total to 182 groups comprising 183 cow-calf pairs of southern right whales (366 animals) and 82 groups comprising 161 unaccompanied adults observed during the entire survey. Regarding cow-calf pairs, this reflects an increased presence along the South African coast when compared to the 55 cow-calf pairs encountered in the 2016 aerial survey, yet levels remain the second-to-lowest count in the last 17 years of survey (Findlay et al., 2017). Regarding the unaccompanied adults, this year’s count reflects among the highest presence since 2010, although levels remain significantly lower than those observed pre-2010. In order to investigate the seasonal increase and decrease of cow-calf pairs along the southern Cape coast during whale season, additional aerial surveys were flown in July, September and November between the area of Hermanus New Harbour and Witsand (covering the main calving areas), with the sole purpose to count cow-calf pairs. These surveys were flown along the coast using an autogyro (due to financial limitations) in an eastward direction, and each survey was undertaken in less than 3hs of flight time. Results of these surveys suggest a peak presence of cow-calf pairs along this stretch of coastline in early September, opposed to the previously believed peak in October (when the annual photo-identification survey is conducted). Although numbers may not be fully comparable due to different survey methods, this seasonal abundance warrants further investigation in future years. Additionally to the aerial surveys, all photo-identification data available from the 2014 through to the 2017 annual aerial surveys were processed using the Hiby-Lovell automated computer based image recognition system. Results indicated an increasing occurrence of 4 and 5 year calving intervals post-2014. Sighting histories are being analysed to assess the consequences of these increased calving intervals on the population’s demographic parameters. Although the reason for the continued low presence of southern right whales on the South African breeding ground remains speculative, currently available data point towards two working hypotheses, including a temporal shift in seasonal presence and a decreased calving success (indicated by an increasing calving intervals). However, both hypotheses require further investigation. Therefore, the continuation of the aerial survey series and an in-depth assessment of the resulting demographic parameters is of crucial importance to monitor and investigate the recent changes in coastal presence of southern right whales in their breeding grounds off South Africa, and its effect on the dynamics of the population.
02. Sremba, A.L., Lang, A.R., Saremi, N., Shapiro, B., Pitman, R., Wilson, P., Martin, A.R. and Baker, C.S. Loss of maternal lineages in Antarctic blue whales described from whole mitochondrial genomes of historical and contemporary samples. 7pp. During the 20th century, the Antarctic blue whale was heavily exploited by the commercial whaling industry with over 340,000 whales killed, reducing the population to less than 0.1% of its pre-exploitation abundance. This exploitation began on the South Atlantic island of South Georgia and in various whaling stations around the Antarctic Peninsula. Over one hundred years later, bones of whales killed by the early commercial whaling industry in the Southern Hemisphere lay scattered along the shorelines and abandoned whaling stations. These bones have preserved the genomic diversity of pre-exploitation Antarctic blue whales and offer the opportunity to explore the impact of exploitation on genomic diversity through comparison to contemporary populations. Using next-generation sequencing (Illumina HiSeq), we reconstructed 18 distinct mitochondrial genomes from 20 blue whale bones collected from South Georgia and the Antarctic Peninsula. We compared these to 53 distinct mitogenomes from 73 contemporary samples considered to be Antarctic blue whale. From this comparison, we resolved a total of 69 unique mitogenome haplotypes of which only two were shared between the historical and contemporary samples. The sharing of only two of the mitogenome haplotypes between the historical and contemporary samples suggests a loss of maternal lineages due to 20th century whaling.
03. Pastene, L.A., Acevedo, J. and Branch, T.A. Morphometric analysis of Chilean blue whales and implications for their taxonomy. 17pp. In the Southern Hemisphere, blue whales are currently divided into two subspecies, Antarctic blue whales (*Balaenoptera musculus intermedia*) and pygmy blue whales (*B. m. brevicauda*). Pygmy blue whales occur in the western and northern Indian Ocean, southern and southwestern Australia to Indonesia, New Zealand, and the Eastern Tropical Pacific to Chile. Their taxonomic status is in flux, with debate about whether northern Indian Ocean blue whales (pygmy) and Chilean blue whales each should be listed as separate subspecies. Length frequencies of sexually mature female blue whales from several regions of the Southern Hemisphere, call type, and genetics, have been used to propose that Chilean whales are a separate subspecies from pygmy blue whales throughout the Indian Ocean. This interpretation has been accepted by the Society for Marine Mammalogy’s List of Marine Mammal Species and Subspecies. Here, we provide crucial morphometric data to directly address this taxonomic question that were obtained in a biological survey during the 1965/66 Chilean whaling season by a Japanese whaling company. The data for this season consist of sex, total body length, length from tip of snout to center of eye, and length from notch of flukes to anus for 60 blue whales ranging from 21.2 to 24.9 m in total length. The data provide strong evidence that maximum body length, fluke-anus measurement, as well as the ratio of fluke-anus to total body length, are different among Antarctic, pygmy and Chilean blue whales, with the values of the Chilean blue whales being intermediate between pygmy and Antarctic blue whales. These results are similar to those obtained for the distribution of total body length of sexually mature females, and they are also consistent with the available genetic data and differences in song types among regions, and strongly support the suggestion that Chilean blue whales should be considered a separate subspecies.
04. Torres, L.G., Barlow, D.R. and Klinck, H. New Zealand blue whale distribution and response to disturbance analysis underway to inform management decisions. 4pp.

05. Barlow, D.R., Torres, L.G., Hodge, K.B., Steel, D., Baker, C.S., Chandler, T.E., Bott, N., Constantine, R., Double, M.C., Gill, P., Glasgow, D., Hamner, R.M., Lilley, C., Ogle, M., Olson, P.A., Peters, C., Stockin, K.A., Tessaglia-Hymes, C.T. and Klinck, H. Documentation of a New Zealand blue whale population based on multiple lines of evidence. 32pp. Species conservation depends on robust population assessment. Data on population abundance, distribution, and connectivity are critical for effective management, especially as baseline information for newly documented populations. We describe a pygmy blue whale (*Balaenoptera musculus brevicauda*) population in New Zealand waters with year-round presence that overlaps with industrial activities. This population was investigated through a multidisciplinary approach, including analysis of survey data, sighting records, acoustic data, identification photographs, and genetic samples. Blue whales were reported during every month of the year in the New Zealand Exclusive Economic Zone, with reports concentrated in the South Taranaki Bight (STB) region, where foraging behavior was frequently observed. Five hydrophones in the STB recorded the New Zealand blue whale call type on 99.7% of recording days (January-December 2016). A total of 151 individuals were photo-identified between 2004 and 2017. Nine individuals were resighted across multiple years. No matches were made to individuals identified in Australian or Antarctic waters. Mitochondrial DNA haplotype frequencies differed significantly between New Zealand (n = 53 individuals) and all other Southern Hemisphere blue whale populations, and haplotype diversity was significantly lower than all other populations. These results suggest a high degree of isolation of this New Zealand population. Using a closed capture-recapture population model, our conservative abundance estimate of blue whales in New Zealand is 718 (SD = 433, 95% CI = 279-1926). Our results fill critical knowledge gaps to improve management of blue whale populations in New Zealand and surrounding regions.
06. Pastene, L.A., Hakamada, T., Acuña, P., Taguchi, M., Goto, M., Matsuoka, K. and Nishiwaki, S. Site-fidelity and movement ranges of southern right whales in Antarctic Area IV inferred from genetic tagging. 11pp. Genetic markers ('tags') were employed to identify individual southern right whales in order to assess their site-fidelity and sex-specific ranges in the Antarctic Area IV (i.e., between 80°-135°E and south of 60°S). In total, 157 biopsy samples were collected as skin biopsies from free-ranging whales during fourteen summer surveys. The DNA was extracted from each biopsy sample and genotyped at fourteen microsatellite loci, sequenced for 430 nucleotides of the mtDNA control region, and the sex determined by the presence of a Y-chromosome specific locus. The overall probability of identity (the probability that two unrelated individuals from the same panmictic population have identical multi-locus genotypes) was estimated at 1.95 x10⁻¹⁰. After removal of biopsies with identical multi-locus genotypes sampled during the same sighting, the number of individuals was reduced to a total of 153. Eight 'mark-recapture' incidences were detected (four males and four females). Individual matching by multi-locus genotypes was supported by mtDNA, sex determination, and in two cases where pictures were available, by photo-identification. These eight recaptures suggested that individual whales tended to return to the same location in the Antarctic in subsequent years. The average longitudinal dispersal ranges were 13°06' and 7°15' in males and females, respectively. The time span between the 'mark' and the 'recapture' ranged from 3-13 years with an average at 7.3 years. Preliminary application of a 'mark-recapture' method based on an open population model, resulted in abundance estimates in Area IV similar to those obtained using sighting survey data and the Line Transect Method in the same area and similar period.
07. Double, M.C., Westwood, K., Bell, E.M., Kelly, N., Miller, B.S., de la Mare, W., Andrews-Goff, V.A., Cox, M.J., Kawaguchi, S., King, R., Melbourne-Tomas, J., Davidson, A., Nicol, S., Williams, G., Laverock, B., Ratnarajah, L., Seymour, J., Friedlaender, A., Herr, H., Findlay, K., Iñiguez Bessega, M. and Miller, E.J. Cruise plan for the 2019 IWC-SORP research voyage 'The availability of Antarctic krill to large predators and their role in biogeochemical recycling in the Southern Ocean'. 11pp. In January to March 2019 the Australian Antarctic Division will lead a 49-day Antarctic voyage on the Australia's Marine National Facility vessel the RV Investigator. This voyage will contribute to the IWC-SORP's 'Antarctic Blue Whale Project' and 'Acoustic Trends' themes. The voyage's objective is to determine whether the characteristics of krill swarms can predict the distribution and behaviour of Antarctic predators, particularly Antarctic blue whales. The density, distribution, and fine-scale 3D structure of krill swarms will be described relative to predator density and distribution estimated through visual surveys and passive acoustics. In addition, through measurements of the abundance and speciation of whale faecal iron the voyage will assess the controversial theory of iron-fertilisation by whales and determine whether iron concentrations are higher within aggregations of feeding whales than within krill - only aggregations or than in adjacent areas. The data collected on this voyage will further describe how large Southern Ocean whales interact with krill in time and space which will inform the development of management tools for both whales and krill.
08. Olson, P.A., Kinzey, D., Double, M.C., Matsuoka, K., Pastene, L.A. and Findlay, K. Capture-recapture estimates of abundance of Antarctic blue whales. 11pp. Photo-identification data of Antarctic blue whales from 1990/91 to 2014/15 were used in a capture-recapture analysis to produce estimates of super-population abundance for the circumpolar Antarctic. An estimate for IWC Management Area III 1992/93 to 2013/14 was also produced. Photographs were collected during IWC, IWC-SORP, ICR, and SAABWS cruises and also made available by opportunistic contributors. The circumpolar estimates are 4,629 (95% CI 2,563 to 8,558) Antarctic blue whales (left side photographs) and 4,485 (95% CI 2,514 to 8,192) (right side photographs) for the years 1990/91 to 2014/15. These estimates show improved precision with the addition of 30% more photo-ID data than was available for a previous capture-recapture study based on data from 1992/93 to 2008/09. Estimates of abundance for Area III are 1,944 (95% CI 903 to 4,390) (left side photographs) and 2,575 (95% CI 1,089 to 6,380) (right side photographs). As more data become available in the future, the reliability of capture-recapture estimates should improve.
- 08rev1. Olson, P.A., Kinzey, D., Double, M.C., Matsuoka, K., Pastene, L.A. and Findlay, K. Capture-recapture estimates of abundance of Antarctic blue whales. 11pp. *REASON FOR REVISION: Updated two figures to show a more complete range of confidence intervals.*
Photo-identification data of Antarctic blue whales from 1990/91 to 2014/15 were used in a capture-recapture analysis to produce estimates of super-population abundance for the circumpolar Antarctic. An estimate for IWC Management Area III 1992/93 to 2013/14 was also produced. Photographs were collected during IWC, IWC-SORP, ICR, and SAABWS cruises and also made available by opportunistic contributors. The circumpolar estimates are 4,629 (95% CI 2,563 to 8,558) Antarctic blue whales (left side photographs) and 4,485 (95% CI 2,514 to 8,192) (right side photographs) for the years 1990/91 to 2014/15. These estimates show improved precision with the addition of 30% more photo-ID data than was available for a previous capture-recapture study based on data from 1992/93 to 2008/09. Estimates of abundance for Area III are 1,944 (95% CI 903 to 4,390) (left side photographs) and 2,575 (95% CI 1,089 to 6,380) (right side photographs). As more data become available in the future, the reliability of capture-recapture estimates should improve.
- 08rev2. Olson, P.A., Kinzey, D., Double, M.C., Matsuoka, K., Pastene, L.A. and Findlay, K. Capture-recapture estimates of abundance of Antarctic blue whales. 11pp. *REASON FOR REVISION: Growth rate value needed correction.*
Photo-identification data of Antarctic blue whales from 1990/91 to 2014/15 were used in a capture-recapture analysis to produce estimates of super-population abundance for the circumpolar Antarctic. An estimate for IWC Management Area III 1992/93 to 2013/14 was also produced. Photographs were collected during IWC, IWC-SORP, ICR, and SAABWS cruises and also made available by opportunistic contributors. The circumpolar estimates are 4,629 (95% CI 2,563 to 8,558) Antarctic blue whales (left side photographs) and 4,485 (95% CI 2,514 to 8,192) (right side photographs) for the years 1990/91 to 2014/15. These estimates show improved precision with the addition of 30% more photo-ID data than was available for a previous capture-recapture study based on data from 1992/93 to 2008/09. Estimates of abundance for Area III are 1,944 (95% CI 903 to 4,390) (left side photographs) and 2,575 (95% CI 1,089 to 6,380) (right side photographs). As more data become available in the future, the reliability of capture-recapture estimates should improve.
09. Goetz, K., Childerhouse, S., Paton, D., Ogle, M., Hupman, K., Constantine, R., Double, M.C., Andrews-Goff, V., Zerbini, A.N. and Olson, P.A. Satellite tracking of blue whales in New Zealand waters, 2018 voyage report. 13pp. Between 28 January and 10 February 2018, the National Institute of Water and Atmospheric Research and collaborators conducted a voyage to attach satellite tracking devices to pygmy blue whales in the Taranaki region of New Zealand. The aim of this voyage was to examine the movement of pygmy blue whales in New Zealand waters. This paper provides a summary of preliminary data collected during this research voyage. In total, we spend 72.51 hours (1637.54 km) actively searching for blue whales over 8 survey days. Eleven blue whale sighting events were made (16 total individuals). One sighting was a duplicate from the

previous day, meaning that 14 animals were unique individuals. Other sightings included fin whales, common dolphins, Hector's dolphins, and fur seals. Two satellite tags were successfully deployed and six skin/blubber samples were collected from four blue whales. Photo-identification data were collected for five individual blue whales. Overall, blue whales were found further south and in lower numbers than normally reported and were not seen surface feeding which is likely due to La Niña conditions which resulted in significantly different oceanographic conditions including water temperatures 4-6° warmer than normal, reduced west wind flows and a consequent reduction in productive upwellings in the Taranaki region and a significantly lower level of primary productivity than is normally expected in the region. All photo-identification data will be provided to a collaborative Southern Hemisphere Blue Whale Catalogue, supported by IWC and collaborations have been established with other researchers to share and compare data.

- 09rev1. Goetz, K., Childerhouse, S., Paton, D., Ogle, M., Hupman, K., Constantine, R., Double, M.C., Andrews-Goff, V., Zerbini, A.N. and Olson, P.A. Satellite tracking of blue whales in New Zealand waters, 2018 voyage report. 12pp. *REASON FOR REVISION: Found a couple small errors in the number of photo-identifications and typos.*

Between 28 January and 10 February 2018, the National Institute of Water and Atmospheric Research and collaborators conducted a voyage to attach satellite tracking devices to pygmy blue whales in the Taranaki region of New Zealand. The aim of this voyage was to examine the movement of pygmy blue whales in New Zealand waters. This paper provides a summary of preliminary data collected during this research voyage. In total, we spend 72.51 hours (1637.54 km) actively searching for blue whales over 8 survey days. Eleven blue whale sighting events were made (16 total individuals). One sighting was a duplicate from the previous day, meaning that 14 animals were unique individuals. Other sightings included fin whales, common dolphins, Hector's dolphins, and fur seals. Two satellite tags were successfully deployed and six skin/blubber samples were collected from four blue whales. Photo-identification data were collected for five individual blue whales. Overall, blue whales were found further south and in lower numbers than normally reported and were not seen surface feeding which is likely due to La Niña conditions which resulted in significantly different oceanographic conditions including water temperatures 4-6° warmer than normal, reduced west wind flows and a consequent reduction in productive upwellings in the Taranaki region and a significantly lower level of primary productivity than is normally expected in the region. All photo-identification data will be provided to a collaborative Southern Hemisphere Blue Whale Catalogue, supported by IWC and collaborations have been established with other researchers to share and compare data.

- 09rev2. Goetz, K., Childerhouse, S., Paton, D., Ogle, M., Hupman, K., Constantine, R., Double, M.C., Andrews-Goff, V., Zerbini, A.N. and Olson, P.A. Satellite tracking of blue whales in New Zealand waters, 2018 voyage report. 12pp. *REASON FOR REVISION: Fixed dates and sightings table and error to photo Id data. Also fixed legends on three figures.*

Between 28 January and 10 February 2018, the National Institute of Water and Atmospheric Research and collaborators conducted a voyage to attach satellite tracking devices to pygmy blue whales in the Taranaki region of New Zealand. The aim of this voyage was to examine the movement of pygmy blue whales in New Zealand waters. This paper provides a summary of preliminary data collected during this research voyage. In total, we spend 72.51 hours (1637.54 km) actively searching for blue whales over 8 survey days. Eleven blue whale sighting events were made (16 total individuals). One sighting was a duplicate from the previous day, meaning that 14 animals were unique individuals. Other sightings included fin whales, common dolphins, Hector's dolphins, and fur seals. Two satellite tags were successfully deployed and six skin/blubber samples were collected from four blue whales. Photo-identification data were collected for five individual blue whales. Overall, blue whales were found further south and in lower numbers than normally reported and were not seen surface feeding which is likely due to La Niña conditions which resulted in significantly different oceanographic conditions including water temperatures 4-6° warmer than normal, reduced west wind flows and a consequent reduction in productive upwellings in the Taranaki region and a significantly lower level of primary productivity than is normally expected in the region. All photo-identification data will be provided to a collaborative Southern Hemisphere Blue Whale Catalogue, supported by IWC and collaborations have been established with other researchers to share and compare data.

10. San Martin, A.A., Paso Viola, M.N., Dellabianca, N.A., Riccialdelli, L., Torres, M.A. and Massone, A.R. The first report of a necropsy in fin whale (*Balaenoptera physalus*) stranded in Tierra del Fuego in 2016. 12pp. Fin whales (*Balaenoptera physalus*) occur worldwide and can be found mainly in oceanic waters. Stranding may be caused by disease, starvation, abandonment, or other unknown reasons. This study reports the first confirmed record of *B. physalus* at the coast of Tierra del Fuego, Argentina (53°36'14.59"S/ 67°58'4.03"W) and provides information about the possible cause of death. Any superficial lesions were found and pathological analysis was not able to convincingly explain the stranding of the fin whale. However, histological section of lungs and respiratory tract showed a pneumonia principle that in combination with bad physical condition (e.g. insufficient fat deposits), may have contributed to its stranding and subsequent death.
11. Sirovic, A., Branch, T.A., Brownell, J., R.L., Cerchio, S., Lang, A.R., Buchan, S., Findlay, K., Miller, B.S., Olson, P.A., Rogers, T., Samaran, F. and Suydam, R. Blue whale song occurrence in the Southern Hemisphere. 13pp.

- 11rev1. Sirovic, A., Branch, T.A., Brownell, J., R.L., Cerchio, S., Lang, A.R., Buchan, S., Findlay, K., Miller, B.S., Olson, P.A., Rogers, T., Samaran, F. and Suydam, R. Blue whale song occurrence in the Southern Hemisphere. 13pp. *REASONS FOR REVISION: Added data from paper SC/67b/SH/14/Rev1 (updated Figures 1, 2, Table 1, and references).*

12. Sirovic, A. Progress report on the development of a permanent blue whale song reference library. 5pp.
13. Pérez-Álvarez, M.J., Olavarria, C., Kraft, S., Moraga, R., Sepúlveda, M., Santos-Carvalho, M., Pavez, G. and Poulin, E. Genetic diversity of south east Pacific fin whales and lack of genetic differentiation between Southern Hemisphere stocks. 10pp. The fin whale is distributed from temperate to subpolar waters of both hemispheres. Currently, three sub-species of fin whales are considered valid, *Balaenoptera physalus physalus* in the Northern Hemisphere (NH), *B. physalus quoyi* and *B. physalus patachonica* in the Southern Hemisphere (SH). The latter is described as a pygmy-type subspecies and proposed to be located mainly in low to mid latitudes in SH (Clarke 2004). Recently, Archer et al. (2013) detected a strong genetic differentiation between North Pacific and North Atlantic fin whales, suggesting a taxonomic subdivision at the sub-species level. Little information was available, however, for the South Pacific and South Atlantic oceans, impeding a global taxonomic revision of this taxon. This study aims to contribute to this question with genetic data from the South East Pacific, specifically from a feeding area in the north-central coast of Chile (ca. 29°02'S, 71°36'W). Mitochondrial DNA analysis (Dloop) of 19 biopsy samples recovered 17 different haplotypes, with only two shared between individuals. A haplotype diversity (*h*) of 0.97 and nucleotide diversity (π) of 0.8% were estimated at a local level. At a global scale, phylogeographic analyses, including different ocean populations (sensu Archer et al. 2013), showed a clear genetic differentiation between Southern and Northern Hemispheres as it has been previously reported, as well as between North Pacific and North Atlantic Oceans. However, we detected a low and unidirectional genetic connection from South to North Pacific. In contrast, no significant genetic structure was detected when comparing populations from the Southern Hemisphere (South East Pacific) with that from the Atlantic Southern Ocean; $\Phi_{ST} = 0.01539$, $p = 0.1333$), even considering samples that would represent the putative pygmy fin whale sub-species (*B. physalus patachonica*), suggesting the existence of a single evolutionary unit in this area. Therefore, these results might challenge the validity of the proposed pygmy fin whale sub-species and propose the existence of three taxonomic units (two for the Northern Hemisphere and one for the Southern hemisphere).

14. Cerchio, S., Rasoloarijao, T. and Cholewiak, D. Progress report: acoustic monitoring of blue whales (*Balaenoptera musculus*) and other baleen whales in the Mozambique Channel off the northwest coast of Madagascar. 14pp. Migratory baleen whales of the Southern Ocean, particularly Antarctic blue (*Balaenoptera musculus intermedia*), pygmy blue (*Balaenoptera musculus brevicauda*), fin (*Balaenoptera physalus*) and Antarctic minke (*Balaenoptera bonaerensis*) whales, move each year into subtropical and tropical waters during the Austral winter, presumably for breeding; however, information for each is highly limited regarding migratory timing, population distribution, and potential breeding habitat. Recently, SC/66b/SH33 reported evidence for the presence of blue whales off northwest Madagascar, ca. latitude 13.3°S, including a pair encountered in 1,800m depth water off Nosy Be, and distant recordings of Madagascar song-type from shallow water in December 2014 and 2015. These discoveries prompted an acoustic monitoring project in the deep waters off northwest Madagascar during 2017, in part funded by the IWC SC. Three passive acoustic recorders were deployed during four 4-month deployments starting in December 2016 and ending in April 2018, anchored just off the shelf break at depths ranging from 250-270m. Initial review of data from the first three deployments from December 2016 to November 2017 revealed

extensive documentation of both Antarctic and Madagascar pygmy blue whale song-types, fin whales and Antarctic minke whales. SWIO (Madagascar) pygmy blue whale song was present bi-modally with peaks of singing activity during May-July and October-January. This pattern suggests a previously unrecognized migratory corridor between summer feeding and winter breeding grounds south and north of Madagascar, respectively. Antarctic blue whale song was present throughout the Austral winter from June to September (overlapping with the first peak of SWIO pygmy blues), suggesting a previously unrecognized breeding season aggregation. NIO (Sri Lanka) blue whales song, as well as a potentially new, previously undescribed blue whale song was detected for short periods between January and May. Fin whale song was present during the late Austral winter, from early August to mid-September. At times high SNR series of fin whale 20Hz pulses were recorded, which included a single secondary frequency peak at 94-96Hz; this appears to be distinct from the different types previously reported from the Southern Ocean, however further analysis and direct comparisons are necessary. The timing of fin whale song suggests a later arrival than Antarctic blue whales and a lower rate of occurrence and occupancy, potentially representing the northern extent of breeding habitat. Antarctic minke whale pulse trains representing three distinct song types, were found to be very common in the higher bandwidth. Although a systematic browse above 100Hz has not yet been completed, Antarctic minke whales were present from at least early August to early November, so remaining seasonally later than Antarctic blue or fin whales. In addition, the project has also documented humpback whales (*Megaptera novaeangliae*), Omura's whales (*Balaenoptera omurai*).

14rev1. Cerchio, S., Rasoloarijao, T. and Cholewiak, D. Progress report: acoustic monitoring of blue whales (*Balaenoptera musculus*) and other baleen whales in the Mozambique Channel off the northwest coast of Madagascar. 14pp. *REASON FOR REVISION: Brief additional details added. Corrections to some presented data and general clean up edits.*

Migratory baleen whales of the Southern Ocean, particularly Antarctic blue (*Balaenoptera musculus intermedia*), pygmy blue (*Balaenoptera musculus brevicauda*), fin (*Balaenoptera physalus*) and Antarctic minke (*Balaenoptera bonaerensis*) whales, move each year into subtropical and tropical waters during the Austral winter, presumably for breeding; however, information for each is highly limited regarding migratory timing, population distribution, and potential breeding habitat. Recently, SC/66b/SH33 reported evidence for the presence of blue whales off northwest Madagascar, ca. latitude 13.3°S, including a pair encountered in 1,800m depth water off Nosy Be, and distant recordings of Madagascar song-type from shallow water in December 2014 and 2015. These discoveries prompted an acoustic monitoring project in the deep waters off northwest Madagascar during 2017, in part funded by the IWC SC. Three passive acoustic recorders were deployed during four 4-month deployments starting in December 2016 and ending in April 2018, anchored just off the shelf break at depths ranging from 250-270m. Initial review of data from the first three deployments from December 2016 to November 2017 revealed extensive documentation of both Antarctic and Madagascar pygmy blue whale song-types, fin whales and Antarctic minke whales. SWIO (Madagascar) pygmy blue whale song was present bi-modally with peaks of singing activity during May-July and October-January. This pattern suggests a previously unrecognized migratory corridor between summer feeding and winter breeding grounds south and north of Madagascar, respectively. Antarctic blue whale song was present throughout the Austral winter from June to September (overlapping with the first peak of SWIO pygmy blues), suggesting a previously unrecognized breeding season aggregation. NIO (Sri Lanka) blue whales song, as well as a potentially new, previously undescribed blue whale song was detected for short periods between January and May. Fin whale song was present during the late Austral winter, from early August to mid-September. At times high SNR series of fin whale 20Hz pulses were recorded, which included a single secondary frequency peak at 94-96Hz; this appears to be distinct from the different types previously reported from the Southern Ocean, however further analysis and direct comparisons are necessary. The timing of fin whale song suggests a later arrival than Antarctic blue whales and a lower rate of occurrence and occupancy, potentially representing the northern extent of breeding habitat. Antarctic minke whale pulse trains representing three distinct song types, were found to be very common in the higher bandwidth. Although a systematic browse above 100Hz has not yet been completed, Antarctic minke whales were present from at least early August to early November, so remaining seasonally later than Antarctic blue or fin whales. In addition, the project has also documented humpback whales (*Megaptera novaeangliae*), Omura's whales (*Balaenoptera omurai*).

15. Jackson, J.A., Sremba, A.L., Zerbini, A.N., Reyes Reyes, V., Herr, H., Archer, F.I., Sirovic, A., Baker, C.S., Olson, P.A., Torres-Florez, J.P., Lang, A.R., Rogers, T.L., Samaran, F., Fretwell, P., De la Mare, W., Aguilar, A., Kelly, N., Bell, E.M., Miller, B.S., Cerchio, S. and Leslie, M.S. Southern Hemisphere fin whale stock structure: a summary of published information to date. 10pp. Here we summarize available data pertaining to fin whale stock structuring around the Southern Hemisphere, suggest possible stock structure hypotheses and propose future work to improve understanding of the identity and differentiation of fin whale aggregations around the Southern Hemisphere.
16. Vernazzani, B.G., Attard, C.R.M., Barlow, D.R., Burton, C., de Vos, A., Double, M.C., Gill, P., Jenner, C., Jenner, M.N.M., Moller, N., Olson, P.A., Salgado Kent, C. and Torres, L.G. Preliminary results of 2017 IWC comparisons among Southern Hemisphere blue whale catalogues off Australia, New Zealand and Sri Lanka regions. 8pp. Blue whales are known to occur off Australia, New Zealand and Sri Lanka but little is known about their long-term movements. The Southern Hemisphere Blue Whale Catalogue is a platform to share individual photo-identification catalogues among blue whale researcher groups. Comparisons of 698 photo-identified blue whales from seven different research groups working in the Perth Canyon (west Australia), Geographe Bay (west Australia), Bonney Upwelling (southern Australia), around New Zealand, and Sri Lanka provided sixteen whales resighted between different areas. Matches have been found within Australian catalogues and within New Zealand catalogues but no matches have been found between regions. Blue whales initially sighted in the Perth Canyon, Geographe Bay and the Bonney Upwelling were subsequently resighted in any of these areas, representing a high level of connectivity between these areas and thus, strengthening the hypothesis of one distinct population of Australian whales. These results also support the hypothesis of an isolated New Zealand blue whale population from the Australian population. Further efforts are needed to compare photo-identification catalogues from these areas with other catalogues from the eastern South Pacific and Southern Ocean to better understand population structure.
17. Garrigue, C., Derville, S. and Bonneville, C. Searching for humpback whales two centuries post-whaling: what is left in the Chesterfield-Bellona archipelago? 17pp. Humpback whales were severely depleted by commercial whaling, and understanding key factors of their recovery is a crucial step for their conservation worldwide. In Oceania, the Chesterfield-Bellona archipelago was identified as one of the primary humpback whale whaling sites of the 19th century. However, given its remoteness, it has remained almost unaffected by anthropogenic activities since then. In this study, we report on the first large-scale multidisciplinary dedicated surveys conducted in the Chesterfield-Bellona breeding area to assess the current status of its humpback whale population, two centuries post-whaling. In 2016 and 2017, two surveys were conducted, totaling 24 days of effort and 57 groups encountered, among which 13 whales were identified through photo-id, 16 through genotyping and 22 with both methods. A total of 6 whales were equipped with satellite tracking devices. Though humpback whales still appear to visit the area during austral winter, especially the inner shallow waters of the reef complex and the neighbouring off-shore shallow banks, their density was relatively low (0.041 whales/km surveyed on average). Surprisingly for a breeding area, the sex ratio was very skewed towards females (1:2.8). A large proportion of the groups encountered included a mother and calf (45%), especially in the most sheltered waters south of the Chesterfield plateau. Photo-IDs and genetic comparisons suggest a strong connectivity with the New Caledonian South Lagoon breeding area. Although no match was detected to-date with the Australian Great Barrier Reef, a connectivity with the South East Australian migratory corridor is suggested by the tracking of three females (including one with calf).
18. Bell, E.M. IWC-SORP Research Fund: progress reports (2016-2018). 41pp.
19. Herr, H. Southern Hemisphere fin whales: update on available data sets. 12pp. This paper is an update of the meta-data collection on available Southern Hemisphere fin whale data sets presented in SC/67A/SH09. During the intersessional period 2017/18 the table has been amended by addition of 9 new datasets, updates on 12, correction of 2 and deletion of 1 datasets. The table presented here is the most recent overview of available data sets on Southern Hemisphere fin whales.

19rev1. Herr, H. Southern Hemisphere fin whales: update on available data sets. 14pp. *REASON FOR REVISION: Some new tables added.*

This paper is an update of the meta-data collection on available Southern Hemisphere fin whale data sets presented in SC/67A/SH09. During the intersessional period 2017/18 the table has been amended by addition of 9 new datasets, updates on 12, correction of 2 and deletion of 1 datasets. The table presented here is the most recent overview of available data sets on Southern Hemisphere fin whales.

20. Jackson, J.A., Carroll, E.L., Kennedy, A., Leaper, R., Calderan, S., Leslie, M.S., Andriolo, A., Stepien, E., Zerbini, A.N., Miller, B.S., Kelly, N., Stowasser, G., Cheeseman, T. and Moore, M. Sightings and acoustic records of right whales collected in South Georgia (Islas Georgias del Sur) waters January-February 2018. 13pp.
21. Bell, E.M. Annual Report of the Southern Ocean Research Partnership (IWC-SORP) 2017/18. *PRINT WARNING*: 108pp. The Southern Ocean Research Partnership (IWC-SORP) was established in 2009 with the aim of developing a multi-lateral, non-lethal scientific research programme that would improve the coordinated and cooperative delivery of science to the IWC. There are now 13 member countries in the Partnership: Argentina, Australia, Belgium, Brazil, Chile, France, Germany, Italy, Luxembourg, New Zealand, Norway, South Africa, and the United States. This paper reports on the continued progress of IWCSORP and its five ongoing research themes since the Scientific Committee meeting in 2017. This progress includes the production of at least 33 peer-reviewed scientific papers in 2017/18, bringing the total number of peer-reviewed publications related to IWC-SORP produced since the start of the initiative to ca. 126. Moreover, 124 IWC-SORP related papers have been submitted to the Scientific Committee, 21 of them this year. Fieldtrips to 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 have taken place in the past year. Thousands of images for photo-identification have been collected, satellite tags have been deployed on killer whales, Antarctic minke whales and humpback whales. As well as video suction cup tags on Antarctic minke and humpback whales. Biopsy samples have been collected from killer whales, humpback and Antarctic minke whales; and hundreds of hours of cetacean acoustic recordings have been made and analysed.
22. Brandão, A., Vermeulen, E., Ross-Gillespie, A., Findlay, K. and Butterworth, D.S. Updated application of a photo-identification based assessment model to southern right whales in South African waters, focussing on inferences to be drawn from a series of appreciably lower counts of calving females over 2015 to 2017. 19pp. This paper extends the analyses of Brandão et al. (2013) which applied the three-mature-stages (receptive, calving and resting) model of Cooke et al. (2003) to photo-identification data available from 1979 to 2012 for southern right whales in South African waters, by taking five further years of data into account. The lower counts of calving females over 2015 to 2017 are indicated to be a reflection of time variability in the probability that a resting whale rests another year, rather than of any mass mortality. The 2017 number of parous females is estimated to be 1 765, the total population (including males and calves) 6 116, and the annual population growth rate 6.5%. This reflects a small decrease to the 6.6% increase rate estimated previously; even in the instance of lesser numbers seen in recent years than estimated previously. Information from resightings of grey blazed calves as adults with calves allows estimation of first year survival rate of 0.852, a slight increase from the previous estimate of 0.850, compared to a subsequent annual rate of 0.988.
23. Branch, T.A., Monnahan, C.C. and Sirovic, A. Separating pygmy blue whale catches by population. 24pp. Based largely on song type, there are at least four clearly distinct populations of pygmy blue whales found respectively in the northern Indian Ocean (NIO, Oman to Sri Lanka), south-western Indian Ocean (SWIO, Madagascar), south-eastern Indian Ocean (SEIO, Australia-Indonesia), and southwestern Pacific Ocean (SWPO, New Zealand). For population assessments, catches need to be separated by these populations, but this has not previously been attempted. Scattered pygmy blue whale catches were taken at Durban (n = 4, SWIO); the west coast of Australia (n = 33, SEIO); east coast of Australia (n = 1, 1954, SWPO); in New Zealand and eastern Australia (n = 127, 1912-13, SWPO); and in pelagic expeditions off Kerguelen Island (n = 125, largely 1929/30), and in the southern Indian Ocean in 1934/35 (n = 13), 1935/36 (n = 1), 1937/38 (n = 1) and 1961/62 (n = 2). However, the vast majority of pygmy blue whale catches were caught by Japanese expeditions (2578, nearly all in 1959/60–1963/64) in the southern Indian Ocean; and Soviet expeditions (9299, nearly all in 1962/63–1971/72) that whaled in the northern and southern Indian Oceans and eastward into New Zealand waters. Here, we separate blue whale catches among the four populations using song types, satellite tag data, and fetal lengths. Fetal lengths in Soviet catches demonstrate that blue whales off southern Somalia (south of 2°N) have synchronized conception dates in the austral summer, while those north of 9°N and off India (north of 4°N) have aseasonal reproduction, suggesting SWIO blue whales extend to 2°N, further north than previously assumed. A surface fitted to the locations of different blue whale calls was used to estimate the proportions of each population throughout the range of pygmy blue whales, and to split the pelagic catches by population. Estimated total catches for each of the four pygmy blue whale populations were 1228 (NIO), 6889 (SWIO), 3646 (SEIO), and 421 (SWPO), with 97.6% of the overall total of 12,184 coming during 1959/60 to 1971/72.

SC/67b/SM

01. Anon. Report of the Tenth Meeting of the Comité Internacional para la Recuperación de la Vaquita (CIRVA). 67pp.
- 01rev1. Anon. Report of the Tenth Meeting of the Comité Internacional para la Recuperación de la Vaquita (CIRVA). 67pp. *REASON FOR REVISION: Corrections to a figure.*
02. Cosentino, M. and Souviron-Priego, L. The Aquatic Wild Meat Database: a useful tool for monitoring small cetaceans illegally exploited for food and other purposes. 8pp. Aquatic wild meat is defined as the products derived from aquatic megafauna (e.g., aquatic mammals) that are used for food and other purposes (e.g., bait). It is obtained through illegal or unregulated hunts as well as from stranded (dead or alive) or bycaught animals. This activity constitutes a serious threat to many species of aquatic mammals around the world. Understanding the drivers of the use of aquatic mammals is of paramount importance to implement effective conservation measures and management programmes to monitor these activities. The Aquatic Wild Meat Database aim is to centralise available data on aquatic mammal utilisation at a global scale, making it possible to detect understudied areas and those of greater concern. This open access, online application was created in using the R package shiny. The data is obtained by contacting authors specialised in the field, as well as from scientific articles and grey literature such as reports and newspaper articles. The application can also be used to collect anecdotal records that are rarely published, by allowing users to contribute using a simple form. The data is displayed as a global interactive map and trends graphs per country, which can help identify areas where opportunistic utilisation led to directed catches. There are currently 91 data points from 26 countries. Future work includes continue to populate the database and expanding to other taxa. The Aquatic Wild Meat Database is expected to be a useful tool for the scientific community and the public at large, and help implement conservation measures in the areas of greater risk.
03. Marcondes, M.C.C., Angeli, M., Fontes, F., Palazzo, J.T., Campos, R., Dapper, C. and Cremer, M. Report on franciscana fisheries interaction in FMA 1a, Brazil. 17pp.
04. Alfaro-Shigueto, J., Campbell, E. and Mangel, J.C. Hydrovias: an emerging threat to river dolphins in Peru. 7pp. As a means to promote regional collaboration, an extensive review of threats to river dolphins is being presented during this SC67B meeting. In this paper we describe plans for a Hydrovia Amazonica (waterway), a US\$95 million contract by the Peru government for dredging over 4 main rivers in the Peru Amazon, including the Huallaga, Marañon, Ucayali and the Amazonas. Concerns about the possible effect of this 2700 km via are discussed as well as its effect on Amazonian dolphins in Peru.
05. Siciliano, S., Tavares, D.C., de Moura, J.F. and Di Benedetto, A.P.M. Final Report Project: Assessment of the fisheries characteristics in southeastern Brazil: Moving towards a monitoring program to assess Franciscana bycatch in FMA 1b – northern Rio de Janeiro. 24pp.
06. Castro, C., Cárdenas, D., Kaufman, G. and Van Waerebeek, K. Marine mammals used as bait with improvised Fish Aggregating Devices in Ecuador. 10pp.
07. Mei, Z., Hao, Y., Wang, K., Wang, Z., Zheng, J., Han, Y., Xiong, X., Chen, M. and Wang, D. A range wide survey of the Yangtze finless porpoise (*Neophocaena asiaorientalis*). 4pp.
08. Ministry for Primary Industries, Department of Conservation and New Zealand Government. Māui dolphin: 2018 update on New Zealand's research and management approach. 7pp. Māui dolphins (*Cephalorhynchus hectori maui*), a sub-species of New Zealand's endemic Hector's dolphin (*C. hectori*), are critically endangered. Numbering 63 individuals (95% CI: 57–75) over 1 one year of age, Māui dolphins showed evidence of population decline (1.5-2.0% per year from 2001-16), although there is some evidence of stabilisation more recently (from

- 2010-11 to 2015-16). As part of the review of New Zealand's Hector's and Māui dolphin Threat Management Plan (TMP) in 2018, a program of ongoing data collection and research, including a spatially explicit multi-threat risk assessment, is underway. This paper outlines data collection over the past 12 months and the research being undertaken to inform the review of the TMP. The TMP will be released for public consultation later in 2018.
09. Costa, M.O., Marmontel, M., Xavier da Rosa, D.S., Coelho, A., Wich, S., Mosquera-Guerra, F. and Trujillo, F. Effectiveness of unmanned aerial vehicles for population estimates of Amazon river dolphins. 16pp. Quantifying the distribution and abundance of wildlife is key for developing sound management and conservation plans. Throughout the last decades much effort has been invested into freshwater dolphin surveys in the Amazon and Orinoco basins. However, the large dimensions of the river systems, the complex and expensive logistics required, and the lack of funds limit the replication of such studies across the entire region. As a response, we evaluated the effectiveness of the use of UAVs in the detection of two Amazon dolphin species, *Sotalia fluviatilis* (tucuxi) and *Inia geoffrensis* (pink river dolphin). This study has demonstrated that the use of UAVs can improve population estimates of Amazon river dolphin species that are traditionally carried out through visual surveys. The use of UAVs could provide a less expensive method, be more accurate and record more dolphin groups and individuals than visual surveys.
 10. Frisch-Nwakanma, H. Guidelines on national legislation regarding live capture of cetaceans for commercial purposes developed by the Convention on Migratory Species (CMS). 2pp.
 11. **NO PAPER. It is on the memory stick but please ignore.**
 12. Ingram, D.J. and Avila, I.C. Improving our understanding of aquatic wild meat: database requirements and research agenda. 13pp. Overexploitation by humans is one of the greatest threats to the world's wildlife. For fish, information on catches are now readily available across much of the world, and information on terrestrial wild meat harvests is now being collated in a purpose-built database. There are several records of the direct or opportunistic harvesting of aquatic mammals for use as wild meat worldwide. Currently however, our understanding of the take of aquatic mammals for aquatic wild meat is limited, especially at the regional level. In response to growing concerns about aquatic wild meat, we developed a research agenda to better understand the issues of aquatic wild meat, and describe the pertinent questions that could be answered through the development and analysis of an aquatic wild meat database.
 13. Emin-Lima, R., Siciliano, S., Moreira, R.H.M., Pereira, T.S., Amaral, T.M.M.M. and Silva de Paula, W. Unrecognized and so many threat: case studies in conservation of the Araguaian boto (*Inia araguaiaensis*). 8pp.
 14. Mosquera-Guerra, F., Trujillo, F., Oliveira-da-Costa, M., Marmontel, M., Armenteras-Pascual, D., Usma, S., Willems, D., Carvajal-Castro, J.D., Mantilla-Meluk, H., Franco, N., Amorocho, D., Maldonado, R., Berg, K., Sainz, L. and Van Damme, P.A. Movements and habitat use of river dolphins (Cetartiodactyla: Iniidae) in the Amazon and Orinoco river basins, determined from satellite tagging. 27pp. Satellite telemetry is a valuable method to identify the movement patterns and habitat use of river dolphins in South America. The collection of satellite tracking data is less laborious and more accurate than other types of follow-up studies such as VHF technology. A total of 15 dolphins of the genus *Inia* were tagged in the rivers Tapajós (Brazil), Amazon and Orinoco (Colombia) and San Martín (Bolivia) with transmitters Spot 299A, connected by Argos satellite (Wildlife Computers, Redmond, WA, USA). This study is the first to identify patterns of movement and habitat use of *I.g.geoffrensis*, *I.g. humboldtiana* and *I.g. boliviensis* using this type of technology in the Amazon and Orinoco. The results show that the largest displacements were presented by *I.g. boliviensis*, where a male individual managed to move 333.7 km between the rivers San Martín and Iténez in Bolivia, followed by one male of *I.g.geoffrensis*, marked in the Tapajós river, a female *I.g.geoffrensis* tagged in the Colombian Amazon and finally an *I.g. humboldtiana* with a displacement of 48.8 km. These results show long differential transboundary movements between the subspecies studied as a result of spatial heterogeneity, water types, system productivity, biomass, and a differential use of habitats. Finally, the importance of the confluences, small tributaries and wetland complex within the protected areas such as the national and departmental natural parks Juruena (Brazil), Iténez (Bolivia), Amacayacú and the Tarapoto Ramsar site (Colombia) is highlighted.
 15. Brownell, J., R.L., Mallette, S.D. and Rebolledo, R. Illegal totoaba fishing in San Felipe, Mexico in January 2018. 7pp.
 16. Mosquera-Guerra, F., Trujillo, F., Parks, D., Oliveira-da-Costa, M., Marmontel, M., Armenteras-Pascual, D., Usma, S., Willems, D., Carvajal-Castro, J.D., Mantilla-Meluk, H., Franco, N., Amorocho, D., Maldonado, R., Berg, K., Sainz, L., Van Damme, P.A. and Cambell, E. Analysis of distribution of river dolphins (*Inia* and *Sotalia*) in protected and transformed areas in the Amazon and Orinoco basins. 24pp. The South American river dolphins have evolved in the continental aquatic ecosystems of the Amazon, Grande, Iténez - Mamoré, Araguaia - Tocantis and Orinoco rivers. The spatial and temporal distribution and the habitat use of these cetaceans do in these systems, are determined by distinct environmental characteristics such as precipitation regimes, elevation, productivity and biomass specific to each system. In addition, geomorphological accidents, such as rapids, have emerged as barriers that separate dolphin populations, potentially promoting processes of speciation. To date, there is no comprehensive analysis of river dolphins distribution and representativeness in protected areas or areas transformed by hydroelectric plants. In the present work, through niche and spatial modeling tools, we research the representativeness of both protected areas and areas transformed by hydroelectric plants in the Amazon and Orinoco basins in the distribution of river dolphins (*Inia* and *Sotalia*). The models presented here were constructed using the MaxEnt algorithm through the integration of 35,594 georeferenced records and 19 environmental variables derived from the Bioclim and Hydroshed database, which were parameterised in the R programme. A good representation of the distribution of river dolphins within the protected areas was evidenced, although the limited management of the aquatic ecosystems inside the protected areas does not guarantee the conservation of these species. A major threat identified for river dolphins in South America is the loss of habitat and fragmentation as a result of the construction of hydroelectric dams. We examined the degree of overlap between the distribution of *Inia* and *Sotalia* and hydroelectric projects in construction, operation and planning phases and provided an initial quantification of this tensor. Finally, we consider that the cumulative impacts (fragmentation, regulation of the flood pulse, retention of limiting nutrients and alteration in the levels of productivity) generated by this type of infrastructure at the macrobasin scale will exacerbate the level of the threats to the conservation of river dolphins and their habitats in the Amazon and Orinoco basins.
 17. **NO PAPER. It is on the memory stick but please ignore.**
 18. Natoli, A., Rosel, Archer, F.I., Brownell, J., R.L., Cipriano, F., Hoelzel, R., Krutzen, Lang, A.R. and Perrin, W. Report of the SM/SD joint intersessional workshop: resolving Tursiops taxonomy worldwide. 46pp.
 19. Fruet, P.F., Daura-Jorge, F., Genoves, R.C., Bezamat, C., Di Tullio, J.C., Simoes-Lopes, P.C. and Secchi, E.R. A review on the life history parameters and threats to bottlenose dolphins in two estuaries of southern Brazil. 15pp. In this work we summarized the updated available information on the population ecology and threats faced by two estuarine Management Units (MUs) of bottlenose dolphins in Southern Brazil: Laguna (LGN) and Patos Lagoon Estuary (PLE). Main data presented were extracted from published papers and complemented by some new information provided by personal observations from researchers conducting ongoing long-term monitoring programs. Both MU's share similar unprecedented low levels of genetic variation, life history patterns and low abundance, despite representing the largest population sizes for the species along the coast of southern Brazil and Uruguay. These MUs are experiencing increased rates of human-related mortalities, especially due to bycatch in gillnets and facing considerable coastal habitat degradation. Bottlenose dolphins from Laguna, in particular, have been affected by a chronic dermal infection, with evidence of an increase in the number of affected animals in recent years. We call the attention to the high chances of population decline in the future due their small population sizes and stochastic events, high degree of residency and the increasing incidence of mortality as consequence of unregulated fisheries and other human activities in these areas.

SC/67b/WW

01. Rose, N.A., Frisch-Nwakanma, H., Smith, C., Smith, S. and Ferriss, S. Update on swim-with-whales intersessional group. 2pp.

02. Wulff, R. Whale Watching Strategic Plan (2018-2024) - draft. 6pp.
03. Notarbartolo di Sciara, G. and Frisch-Nwakanma, H. Work on recreational in-water interactions with aquatic mammals under the Convention on Migratory Species. 2pp.
04. Vilches, F.O., Rowntree, V.J., Sironi, M. and Moreda, C.M. Incorporating whale-watch photographs into a 47-year aerial photoidentification catalog for a better assessment of the population dynamics of southern right whales off Argentina. 6pp. A photographic catalog of 3,200 individually identified southern right whales has been built up on their calving ground at Península Valdés, Argentina, through annual aerial surveys since 1971. This long-term database is a unique resource for biological research, conservation and education, which sensitively records the population's dynamics. However, the database still represents a relatively small sample of whale life histories occurring in Valdés. A way to increase this sample size is to incorporate photographs taken during whale-watch tours in Puerto Pirámides, the hub of Argentina's whale-watch industry. Unlike aerial survey photographs, boat-based photographs are taken almost daily during the seven months of the year when the whales are present. Recently, the operators contributed 460,000 photographs of whales taken between 2003 and 2016. Initial findings added 105 new individuals to the catalog (86 adults, 19 calves) and increased the number of sightings of 45 previously known individuals, some of which had not been seen for 16 years. New information about ages and mother-calf relationships was also found, as well as extended data about calving frequencies of known females. Further and continued analysis of the whalewatch photographs will greatly enrich our understanding of the biology, dynamics and ecology of this population. The resulting expanded database will help to improve conservation strategies and boost citizen science and community work in Valdés.
05. Clark, A., Anderson, H. and Heaton, S. Indian Ocean Rim Association (IORA) Sustainable Whale and Dolphin Watching Tourism Network. 10pp. The IORA Sustainable Whale and Dolphin Watching Tourism Network was endorsed by the IORA Committee of Senior Officials in 2016. The Network aims to foster regional cooperation on sustainable whale and dolphin watching tourism, including through sharing information, capacity building, and providing access to expertise. A concept note for the Network was circulated to IORA member states in February 2018 inviting nominations to the Network. Australia will support the Network in its first year of operation by producing a biannual newsletter. This paper invites members of the Scientific Committee to provide content for the newsletter.
06. Nunny, L. and Simmonds, M. Solitary sociable dolphins: a preliminary update. 12pp. Around twenty-eight solitary sociable dolphins have been identified in the years from 2008 to date and are reported from Europe, the US, Australia and elsewhere. Most are bottlenose dolphins, as has been the case previously, but other species are also recorded exhibiting this behaviour.
07. Parsons, E.C.M. and Smith, C.E. Recent advances in whale watching research 2017-2018. 22pp. Whale watching research encompasses a wide variety of disciplines and fields of study, from monitoring the biological impacts of whale watching activities on cetaceans and assessments of the effectiveness of whale watching management and regulations, to the sociological and economic aspects of whale watching. This article is the latest in a series of annual digests, which describes the variety and findings of whale watching studies published over the past year, since June 2017.
08. Minton, G., Ferriss, S. and Wulff, R. Report on the development of the online IWC Whale Watching Handbook. 12pp.
09. New, L. Update on the Modelling and Assessment of Whale Watching Impacts (MAWI) Steering Group. 4pp.

Progress Report summaries

SC/67b/ProgRep

01. Croatia. 4pp.
02. Netherlands. 4pp.
03. New Zealand. 7pp.
04. Japan. 8pp.
05. Argentina. 6pp.
06. Iceland. 3pp.
07. United States of America. 10pp.
08. Spain. 28pp.
09. Mexico. 4pp.
10. Italy. 8pp.
11. Republic of Korea. 4pp.
12. Denmark. 4pp.
13. Norway. 3pp.
14. Brazil. 5pp.
15. France. 7pp.
16. UK. 4pp.
17. Australia. 18pp.
18. Germany. 4pp.

Reports from intersessional meetings

SC/67b/Rep

01. Workshop on the Poorly Documented Takes of Small Cetaceans in South America: including in-depth review of the hunting of the hunting of the Amazon River dolphin (*Inia geoffrensis*) for the piracatinga (*Calophysus macropterus*) fishery, 19th - 21st March 2018, City of Santos, Brazil. 68pp.
02. Report of the Second *Implementation Review* Workshop on Western North Pacific Bryde's Whales, 14-16 February 2018, Tokyo, Japan. 23pp.
03. Report of the Workshop on Identifying Key Research Questions for the Modelling and Assessment of Whale Watching Impacts (MAWI), 5-6 April 2018, La Spezia, Italy. 17pp.
- 03rev1. Report of the Workshop on Identifying Key Research Questions for the Modelling and Assessment of Whale Watching Impacts (MAWI), 5-6 April 2018, La Spezia, Italy. 16pp.
04. Report of the Planning Meeting for the 2018 and 2019 IWC-POWER Cruise in the North Pacific, 15-17 September 2017, Tokyo, Japan. 27pp.
05. Report of the Workshop on Western North Pacific Common Minke Whale Stock Structure in Preparation for the Start of the *Implementation Review* in April 2018, 12-13 February 2018, Tokyo, Japan. 11pp.
06. Report of the 2017 AWMP Workshops on the Development of SLAs for the Greenlandic Hunts, 18-21 October 2017, Copenhagen, Denmark. 25pp.

07. Report of the Fifth Rangewide Workshop on the Status of North Pacific Gray Whales, 28-31 March 2018, Big Sur, California, USA. 21pp.

07rev1. Report of the Fifth Rangewide Workshop on the Status of North Pacific Gray Whales, 28-31 March 2018, Big Sur, California, USA. 43pp. *REASON FOR REVISION: appendices and references added.*

Commission documents

SC/67b/COMM

01. Cooperation with other organisations. 12pp.

For Information documents

01. Riekkola, L., Zerbini, A.N., Andrews, O., Andrews-Goff, V., Baker, C.S., Chandler, D., Childerhouse, S., Clapham, P., Dodémonti, R., Donnelly, D., Friedlaender, A., Gallego, R., Garrigue, C., Ivashchenko, Y., Jarman, S., Lindsay, R., Pallin, L., Robbins, J., Steel, D., Tremletta, J., Vindenes, S. and Constantine, R. 2018. Application of a multi-disciplinary approach to reveal population structure and Southern Ocean feeding grounds of humpback whales. *Ecol. Indicators* 89: 455-465. Obtaining direct measurements to characterise ecosystem function can be hindered by remote or inaccessible regions. Next-generation satellite tags that inform increasingly sophisticated movement models, and the miniaturisation of animal-borne loggers, have enabled the use of animals as tools to collect habitat data in remote environments, such as the Southern Ocean. Research on the distribution, habitat use and recovery of Oceania's humpback whales (*Megaptera novaeangliae*) has been constrained by the inaccessibility to their Antarctic feeding grounds and the limitations of technology. In this multi-disciplinary study, we combine innovative analytical tools to comprehensively assess the distribution and population structure of this marine predator throughout their entire migratory range. We used genotype and photo-identification matches and conducted a genetic mixed-stock analysis to identify the breeding ground origins of humpback whales migrating past the Kermadec Islands, New Zealand. Satellite tracking data and a state-space model were then used to identify the migratory paths and behaviour of 18 whales, and to reveal their Antarctic feeding ground destinations. Additionally, we conducted progesterone assays and epigenetic aging to determine the pregnancy rate and age-profile of the population. Humpback whales passing the Kermadec Islands did not assign to a single breeding ground origin, but instead came from a range of breeding grounds spanning ~3500 km of ocean. Sampled whales ranged from calves to adults of up to 67 years of age, and a pregnancy rate of 57% was estimated from 30 adult females. The whales migrated to the Southern Ocean (straight-line distances of up to 7000 km) and spanned ~4500 km across their Antarctic feeding grounds. All fully tracked females with a dependent calf (n=4) migrated to the Ross Sea region, while 70% of adults without calves (n=7) travelled further east to the Amundsen and Bellingshausen Seas region. By combining multiple research and analytical tools we obtained a comprehensive understanding of this wide-ranging, remote population of whales. Our results indicate a population recovering from exploitation, and their feeding ground distribution serves as an indicator of the resources available in these environments. The unexpected Kermadec Islands migratory bottle-neck of whales from several breeding grounds, variable distribution patterns by life history stage and high pregnancy rates will be important in informing conservation and management planning, and for understanding how this, as well as other whale populations, might respond to emerging threats such as climate change.
02. Cunen, C., Walløe, L. and Hjort, N.L. Submitted. Focused model selection for linear mixed models, with an application to whale ecology. *Annals of Applied Statistics*: 39pp. A central point of disagreement, in certain long-standing discussions about a particular whaling dataset in the Scientific Committee of the International Whaling Commission, has directly involved model selection issues for linear mixed effect models. The biological question under discussion is associated with a clearly defined parameter of primary interest, i.e. a focus parameter, which makes model selection with the Focused Information Criterion (FIC) more appropriate than other selection methods. Since the existing FIC methodology has not covered the case of linear mixed effects models, this article sets up the required framework and develops the necessary formulae for the relevant FIC. Our new criterion requires the asymptotic distribution of estimators derived for a given candidate linear mixed model, but with behaviour examined under a wider linear mixed model. These results, needed here to build our FIC, also have independent interest.
03. Carroll, E.L., Alderman, R., Bannister, J.L., Bérubé, M., Best, P.B., Boren, A.L., Baker, C.S., Constantine, R., Findlay, K., Harcourt, R., Lemaire, L., Palsbøll, P.J., Patenaude, N.J., Rowntree, V.J., Seger, J., Steel, D., Valenzuela, L.O., Watson, M. and Gaggiotti, O.E. In press. Incorporating non-equilibrium dynamics into demographic history inferences of a migratory marine species. *Heredity*: 49pp. Understanding how dispersal and gene flow link geographically separated populations over evolutionary history is challenging, particularly in migratory marine species. In southern right whales (SRWs, *Eubalaena australis*), patterns of genetic diversity are likely influenced by the glacial climate cycle and recent history of whaling. Here we use a dataset of mitochondrial DNA (mtDNA) sequences (n=1,327) and nuclear markers (17 microsatellite loci, n=222) from major wintering grounds to investigate circumpolar population structure, historical demography, and effective population size. Analyses of nuclear genetic variation identify two population clusters that correspond to the South Atlantic and Indo-Pacific ocean basins that have similar effective breeder estimates. In contrast, all wintering grounds show significant differentiation for mtDNA, but no sex-biased dispersal was detected using the microsatellite genotypes. An approximate Bayesian computation (ABC) approach with microsatellite markers compared scenarios with gene flow through time, or isolation and secondary contact between ocean basins, while modeling declines in abundance linked to whaling. Secondary-contact scenarios yield the highest posterior probabilities, implying that populations in different ocean basins were largely isolated and came into secondary contact within the last 25,000 years, but the role of whaling in changes in genetic diversity and gene flow over recent generations could not be resolved. We hypothesise that these findings are driven by factors that promote isolation, such as female philopatry, and factors that could promote dispersal, such as oceanographic changes. These findings highlight the application of ABC approaches to infer connectivity in mobile species with complex population histories and currently low levels of differentiation.
04. Carroll, E.L., Bruford, M.W., DeWoody, J.A., Leroy, G., Strand, A., Waits, L. and Wang, J. 2018. Genetic and genomic monitoring with minimally invasive sampling methods. *Evolutionary Applications* 2018: 1-26. The decreasing cost and increasing scope and power of emerging genomic technologies are reshaping the field of molecular ecology. However, many modern genomic approaches (e.g., RAD-seq) require large amounts of high-quality template DNA. This poses a problem for an active branch of conservation biology: genetic monitoring using minimally invasive sampling (MIS) methods. Without handling or even observing an animal, MIS methods (e.g., collection of hair, skin, faeces) can provide genetic information on individuals or populations. Such samples typically yield low-quality and/or quantities of DNA, restricting the type of molecular methods that can be used. Despite this limitation, genetic monitoring using MIS is an effective tool for estimating population demographic parameters and monitoring genetic diversity in natural populations. Genetic monitoring is likely to become more important in the future as many natural populations are undergoing anthropogenically driven declines, which are unlikely to abate without intensive adaptive management efforts that often include MIS approaches. Here, we profile the expanding suite of genomic methods and platforms compatible with producing genotypes from MIS, considering factors such as development costs and error rates. We evaluate how powerful new approaches will enhance our ability to investigate questions typically answered using genetic monitoring, such as estimating abundance, genetic structure and relatedness. As the field is in a period of unusually rapid transition, we also highlight the importance of legacy data sets and recommend how to address the challenges of moving between traditional and next-generation genetic monitoring platforms. Finally, we consider how genetic monitoring could move beyond genotypes in the future. For example, assessing microbiomes or epigenetic markers could provide a greater understanding of the relationship between individuals and their environment.
05. Aquatic Mammals Working Group of the CMS Scientific Council. 2017. Recreational in-water interaction with aquatic mammals. 12th Meeting of the CMS COP, Manila, Philippines, 23-28 October 2017. 36pp. As requested by the First Meeting of the Sessional Committee of the Scientific Council, the Aquatic Mammals Working Group has developed a briefing document on the impacts of tourist or recreational activities involving in-water human interaction with aquatic mammals.
06. Anon. 2017. Proposal for a CMS Concerted Action for Arabian Sea humpback whales (*Megaptera novaeangliae*) within the existing global concerted action for the species. Document UNEP/CMS/COP12/Doc.26.2.4 presented at the 12th Meeting of the CMS COP, Manila, Philippines, 23-28 October 2017. 25pp. The Appointed Councillor for Aquatic Mammals has submitted the attached proposal* for a Concerted Action for the Arabian Sea Humpback Whale (*Megaptera novaeangliae*) in accordance with the process elaborated in paragraph 4 and Annex 3 of Resolution 11.13.

07. Minton, G. 2018. Workshop report: Managing data for whale conservation in the Arabian Sea: a practical introduction to the ASWN Flukebook online data platform. Muscat, Oman, 21-23 January 2018. 37pp.
08. Leroy, G., Carroll, E.L., Bruford, M.W., DeWoody, J.A., Strand, A., Waits, L. and Wang, J. 2017. Next-generation metrics for monitoring genetic erosion within populations of conservation concern. *Evolutionary Applications* 2017: 1-18. Genetic erosion is a major threat to biodiversity because it can reduce fitness and ultimately contribute to the extinction of populations. Here, we explore the use of quantitative metrics to detect and monitor genetic erosion. Monitoring systems should not only characterize the mechanisms and drivers of genetic erosion (inbreeding, genetic drift, demographic instability, population fragmentation, introgressive hybridization, selection) but also its consequences (inbreeding and outbreeding depression, emergence of large-effect detrimental alleles, maladaptation and loss of adaptability). Technological advances in genomics now allow the production of data that can be measured by new metrics with improved precision, increased efficiency and the potential to discriminate between neutral diversity (shaped mainly by population size and gene flow) and functional/adaptive diversity (shaped mainly by selection), allowing the assessment of management-relevant genetic markers. The requirements of such studies in terms of sample size and marker density largely depend on the kind of population monitored, the questions to be answered and the metrics employed. We discuss prospects for the integration of this new information and metrics into conservation monitoring programmes.
09. Attard, C.R.M., Beheregaray, L.B., Sandoval-Castillo, J., Jenner, K.C.S., Gill, P.C., Jenner, M.N.M., Morrice, M.G. and Möller, L.M. 2018. From conservation genetics to conservation genomics: a genome-wide assessment of blue whales (*Balaenoptera musculus*) in Australian feeding aggregations. *Royal Society Open Science* 5: 170925. Genetic datasets of tens of markers have been superseded through next-generation sequencing technology with genome-wide datasets of thousands of markers. Genomic datasets improve our power to detect low population structure and identify adaptive divergence. The increased population-level knowledge can inform the conservation management of endangered species, such as the blue whale (*Balaenoptera musculus*). In Australia, there are two known feeding aggregations of the pygmy blue whale (*B. m. brevicauda*) which have shown no evidence of genetic structure based on a small dataset of 10 microsatellites and mtDNA. Here, we develop and implement a high-resolution dataset of 8294 genome-wide filtered single nucleotide polymorphisms, the first of its kind for blue whales. We use these data to assess whether the Australian feeding aggregations constitute one population and to test for the first time whether there is adaptive divergence between the feeding aggregations. We found no evidence of neutral population structure and negligible evidence of adaptive divergence. We propose that individuals likely travel widely between feeding areas and to breeding areas, which would require them to be adapted to a wide range of environmental conditions. This has important implications for their conservation as this blue whale population is likely vulnerable to a range of anthropogenic threats both off Australia and elsewhere.
10. Sprogis, K.R., Bejder, L. and Christiansen, F. 2010. Swim-with-whale tourism trial in the Ningaloo Marine Park, Western Australia. Report to the Department of Parks and Wildlife, Western Australia. Murdoch University, Murdoch, WA. 49pp.
11. Miller, B.S. and Miller, E.J. 2018. The seasonal occupancy and diel behaviour of Antarctic sperm whales revealed by acoustic monitoring. *Nature Scientific Reports* 8: 5429. 13pp. The seasonal occupancy and diel behaviour of sperm whales (*Physeter macrocephalus*) was investigated using data from long-term acoustic recorders deployed of east Antarctica. An automated method for investigating acoustic presence of sperm whales was developed, characterised, and applied to multiyear acoustic datasets at three locations. Instead of focusing on the acoustic properties of detected clicks, the method relied solely on the inter-click-interval (ICI) for determining presence within an hourlong recording. Parameters for our classifier were informed by knowledge of typical vocal behaviour of sperm whales. Sperm whales were detected predominantly from Dec-Feb, occasionally in Nov, Mar, Apr, and May, but never in the Austral winter or early spring months. Ice cover was found to have a statistically significant negative effect on sperm whale presence. In ice-free months sperm whales were detected more often during daylight hours and were seldom detected at night, and this effect was also statistically significant. Seasonal presence at the three east Antarctic recording sites were in accord with what has been inferred from 20th century whale catches of western Antarctica and from stomach contents of whales caught of South Africa.
12. Temple, A.J., Kiszka, J.J., Stead, S.M., Wambiji, N., Brito, A., Poonian, C.N.S., Amir, O.A., Jiddawi, N., Fennessy, S.T., Perez-Jorge, S. and Berggren, P. 2017. Marine megafauna interactions with small-scale fisheries in the southwestern Indian Ocean: a review of status and challenges for research and management. *Rev. Fish. Biol. Fisheries* 2017: 28pp.
13. Kiszka, J.J., Berggren, P., Braulik, G., Collins, T., Minton, G. and Reeves, R. 2017. Cetacean bycatch in the western Indian Ocean: a review of available information on coastal gillnet, tuna purse seine and pelagic longline fisheries. Document IOTC-2017-WPEB13-40 Rev_1 intended for IOTC-WPEB 2017 use only. 12pp.
14. Bartholomew, D.C., Mangel, J.C., Alfaro-Shigueto, J., Pingo, S., Jimenez, A. and Godley, B.J. 2018. Remote electronic monitoring as a potential alternative to on-board observers in small-scale fisheries. *Biological Conservation* 2019: 35-45.
15. Murase, H., Palka, D., Punt, A.E., Pastene, L., Kitakado, T., Matsuoka, K., Hakamada, T., Okamura, H., Bando, T., Tamura, T., Konishi, K., Yasunaga, G., Isoda, I. and Kato, H. In press. In-depth assessment of an eastern Indian Ocean stock and a western South Pacific stock of Antarctic minke whale from 2001 to 2014 conducted by the Scientific Committee of the International Whaling Commission: A synthesis and summary. *J. Cetacean Res. Manage.* 63pp. An 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 was carried out from 2001 to 2014 by the Scientific Committee of the International Whaling Commission (IWC/SC). This paper is a synthesis and summary of the outcomes of the assessment, although research on this species is ongoing. The assessment covered a wide range of topics including systematics, commercial and research catches, survey methods, stock structure, abundance estimates, spatial distribution patterns, biological information, population dynamics, species interactions, food habits, energetic requirements, pollutants and marine debris interactions. Stock structure studies revealed that at least two stocks (I-stock and P-stock) are distributed between 35°E–145°W, with a soft boundary between 100°E and 165°E. Two sets of agreed circumpolar abundance were produced by using data obtained by the IWC assessment cruises (namely CPII - 1985/86–1990/91, and CPIII - 1991/92–2003/04) and a null hypothesis of no change in overall abundance between CPII and CPIII would not be rejected because the confidence interval for the ratio of the total abundance between them included 1.0. The results of a Statistical Catch-at-age Analysis (SCAA) applied to the two stocks revealed that (1) abundance increased from 1930 until the mid-1970's, and declined over the period from the mid-1970s until 1988 and (2) trends in abundance over the most recent 20 years were relatively flat. Although the primary focus at the start of this assessment was to try to understand abundance trends during 1984–2004, it expanded to increasing knowledge on the life history of this species. The assessment also advanced many aspects of analytical methods in the course of discussions in the IWC/SC.
16. Irvine, L. and Salgado Kent, C. 2017. The distribution and relative abundance of humpback whale (*Megaptera novaeangliae*) calves within the Ningaloo Marine Park, Western Australia between June and August 2016. A report. 31pp.
17. Van Opzeeland, I. and Boebel, O. 2018. Marine soundscape planning: seeking acoustic niches for anthropogenic sound. *Journal of Ecoacoustics* 2: 23pp. Both marine mammals and hydroacoustic instruments employ underwater sound to communicate, navigate or infer information about the marine environment. Concurrent timing of acoustic activities using similar frequency regimes may result in (potentially mutual) interference of acoustic signals when both sources are within audible range of the recipient. While marine mammal fitness might be negatively impacted upon, both on individual and population level, hydroacoustic studies may generate low quality data or suffer data loss as a result of bioacoustic interference. This article pursues, in analogy to landscape planning, the concept of marine soundscape planning to reconcile potentially competing uses of acoustic space by managing the anthropogenic sound sources. We here present a conceptual framework exploring the potential of soundscape planning in reducing (mutual) acoustic interference between hydroacoustic instrumentation and marine mammals. The basis of this framework is formed by the various mechanisms by which acoustic niche formation (i.e., the partitioning of the acoustic space) occurs in species-rich communities that acoustically coexist while maintaining high idelity (hi-i) soundscapes, i.e., by acoustically partitioning the environment on the basis of time, space, frequency and signal structure. Hydroacoustic measurements often exhibit certain flexibility in their timing, and even instrument positioning, potentially offering the opportunity to minimize the ecological imprint of their operation. This study explores how the principle of acoustic niches could contribute to reduce potential (mutual) acoustic interference based on actual acoustic data from three recording locations in polar oceans. By employing marine soundscape planning strategies, entailing shifting the timing or position of hydroacoustic experiments, or adapting signal structure or frequency, we exemplify the potential efficacy of smart planning for four different hydroacoustic instrumentation types: multibeam echosounders, air guns, RAFOS (Ranging and Fixing of Sound) and tomographic sound sources.
18. NAMMCO. 2018. Report of the Global Review of Monodontids, 13-16 March, Hillerød, Denmark. 83pp.
19. Martin, A.R. and Da Silva, V.M.F. 2018. Reproductive parameters of the Amazon river dolphin or boto, *Inia geoffrensis* (Cetacea: Iniidae); an evolutionary outlier bucks no trends. *Biological Journal of the Linnean Society* 123, 666 to 676. Reproductive parameters of the Amazon river dolphin, or boto *Inia geoffrensis*, were estimated from a population of individually recognizable animals in the Brazilian Amazon throughout 24 years. Gestation lasts 12.3–13

- months, and calves are nursed for 1.5–5.8 years. The mean inter-birth interval is 4.6 years, and there is no evidence of reproductive senescence. Females first give birth at a mean age of 9.7 years and become sexually mature at body lengths of 180–200cm. Body length at birth averages 84cm. The annual pregnancy rate was ~0.4, but the annual birth rate was 0.22; therefore, almost half of pregnancies do not result in a calf seen by our research team. Entanglement of neonates in monofilament gillnets might account, at least in part, for these losses. Births can occur year round, but peak at low water, when botos and their newborn calves are concentrated on river margins. Despite profound physical and behavioural adaptations over millions of years to a life in shallow, fresh waters and complex habitats, the boto has remarkably similar reproductive characteristics to those of its marine counterparts, dolphins of the family Delphinidae. The fundamental reproductive characteristics of small odontocetes have apparently been robust to change over a very considerable evolutionary timespan.
20. Baker, C.S., Steel, D., Nieuirk, S. and Klinck, H. In press. Environmental DNA (eDNA) from the wake of the whales: droplet digital PCR for detection and species identification. 25pp.
 21. Hall, A.J., McConnell, B.J., Schwacke, L.H., Ylitalo, G.M., Williams, R. and Rowles, T.K. 2018. Predicting the effects of polychlorinated biphenyls on cetacean populations through impacts on immunity and calf survival. *Environmental Pollution* 233: 407-418. The potential impact of exposure to polychlorinated biphenyls (PCBs) on the health and survival of cetaceans continues to be an issue for conservation and management, yet few quantitative approaches for estimating population level effects have been developed. An individual based model (IBM) for assessing effects on both calf survival and immunity was developed and tested. Three case study species (bottlenose dolphin, humpback whale and killer whale) in four populations were taken as examples and the impact of varying levels of PCB uptake on achievable population growth was assessed. The unique aspect of the model is its ability to evaluate likely effects of immunosuppression in addition to calf survival, enabling consequences of PCB exposure on immune function on all age-classes to be explored. By incorporating quantitative tissue concentration-response functions from laboratory animal model species into an IBM framework, population trajectories were generated. Model outputs included estimated concentrations of PCBs in the blubber of females by age, which were then compared to published empirical data. Achievable population growth rates were more affected by the inclusion of effects of PCBs on immunity than on calf survival, but the magnitude depended on the virulence of any subsequent encounter with a pathogen and the proportion of the population exposed. Since the starting population parameters were from historic studies, which may already be impacted by PCBs, the results should be interpreted on a relative rather than an absolute basis. The framework will assist in providing quantitative risk assessments for populations of concern.
 22. Charlton, C., Bannister, J., McCauley, R.D., Brownell, J., R.L., Ward, R., Salgado Kent, C. and Burnell, S. Submitted. Demographic parameters of southern right whales (*Eubalaena australis*) off Australia. *Mar. Ecol. Prog. Ser.*: 29pp. Demographic parameters for southern right whales (SRW), *Eubalaena australis* off Australia were estimated using 26 years of photo identification (ID) mark recapture data and 25 years of count data. An annual cliff based SRW photo-ID and count study was completed at the Head of the Great Australian Bight (HoB), South Australia (SA) from 1991-2016. Annual aerial photo-ID and count surveys were completed for the 'western' sub-population of SRW from 1993-2016. At HoB, the estimated mean rate of increase for all SRW was 3.17% per annum ($R^2=0.54$, ± 1.3 , 95% CI), and for females with calves was 4.6% ($R^2=0.57$, ± 1.7 , 95% CI) (1992-2016). Owing to cohort structure and pulses in calf production, the annual maximum count was highly variable among years ($\bar{x}=39$, $SD=17.8$). The HoB photo-ID database includes 1,186 non-calf individuals, of which 459 are reproductive females with 471 inter-annual calving intervals. SRW sighted at HoB represent 21-48% of the 'western' sub-population in Australia where this fraction decreased over the study period. Mean photo-ID success of 92% and mark recapture rate of 70% was recorded for females with a calf. The estimated apparent mean calving interval was 3.3 years ($SD=0.8$, ± 0.3 , 95% CI); and mean age at first parturition 9.3 years ($n=22$, $SD=2.1$, ± 0.9 , 95% CI). The oldest whale was approximately 50 and oldest female with a calf 41. Natal site fidelity was recorded for 33% of known age individuals. These SRW demographics data provide information for monitoring recovery, population status, species conservation management and global comparative studies.
 - 22rev1. Charlton, C., Bannister, J., McCauley, R.D., Brownell, J., R.L., Ward, R., Salgado Kent, C. and Burnell, S. Submitted. Demographic parameters of southern right whales (*Eubalaena australis*) off Australia. *Mar. Ecol. Prog. Ser.*: 29pp. **REASON FOR REVISION: formatting changes, added a line to conclusion.**
Demographic parameters for southern right whales (SRW), *Eubalaena australis* off Australia were estimated using 26 years of photo identification (ID) mark recapture data and 25 years of count data. An annual cliff based SRW photo-ID and count study was completed at the Head of the Great Australian Bight (HoB), South Australia (SA) from 1991-2016. Annual aerial photo-ID and count surveys were completed for the 'western' sub-population of SRW from 1993-2016. At HoB, the estimated mean rate of increase for all SRW was 3.17% per annum ($R^2=0.54$, ± 1.3 , 95% CI), and for females with calves was 4.6% ($R^2=0.57$, ± 1.7 , 95% CI) (1992-2016). Owing to cohort structure and pulses in calf production, the annual maximum count was highly variable among years ($\bar{x}=39$, $SD=17.8$). The HoB photo-ID database includes 1,186 non-calf individuals, of which 459 are reproductive females with 471 inter-annual calving intervals. SRW sighted at HoB represent 21-48% of the 'western' sub-population in Australia where this fraction decreased over the study period. Mean photo-ID success of 92% and mark recapture rate of 70% was recorded for females with a calf. The estimated apparent mean calving interval was 3.3 years ($SD=0.8$, ± 0.3 , 95% CI); and mean age at first parturition 9.3 years ($n=22$, $SD=2.1$, ± 0.9 , 95% CI). The oldest whale was approximately 50 and oldest female with a calf 41. Natal site fidelity was recorded for 33% of known age individuals. These SRW demographics data provide information for monitoring recovery, population status, species conservation management and global comparative studies.
 23. Ritter, F., Steindorff, C., Sommer, C. and Smit, V. 2017. Observing cetaceans from land co-operation as the driving force behind sustainable whale watching tourism. Text version of a poster presented to ECS, Italy. The Canary Islands are known for an extraordinarily high cetacean species diversity and whale watching tourism has developed rapidly since the 1990s. Off La Gomera, where 23 cetacean species have been documented, few operators offer whale watching trips to date. Through a long-term collaboration with one operator, the NGO MEER has been realizing a best practice approach to whale watching, where scientific data collection and public education for locals and tourists are integrated in various ways. In 2017, the first permanent platform for the observation of cetaceans from land was established. It is designed and equipped for scientific research (i.e. documentation of sightings, BDA studies, monitoring of ferry traffic, etc.), but also serves as an aid for whale watching operators when cetacean sightings from land are communicated to the observation vessels. From April through October 2017, on 40 observation days (96 h 45 min of sighting effort), 69 cetacean sightings were documented, comprising six species. Various behavioural states and responses to vessels were observed. Regularly, sightings were conveyed from land to whale watching vessels at sea. As a service to convey sightings made from land brought forward through an NGO, the platform is available for all current operators, and hence fulfils a variety of valuable tasks, apart from research: it a) acts as a mediator between operators competing for the same resource; b) helps increasing the sighting success of vessels; and c) helps creating a sense of community within operators. In the future, the platform also shall help reducing potential disturbances by dispersing boats within the area covered by operators. Thus, the new platform represents an essential part of a long-term conservation strategy to further develop whale watching as a sustainable use of cetaceans off La Gomera. It is hoped that similar platforms will be established on other Canary Islands and elsewhere.
 24. Moore, J.E., Martin, A.R. and Da Silva, V.M.F. 2018. Intrinsic growth (R_{max}) and generation time (T) estimates for *Inia geoffrensis*, in support of an IUCN Red List assessment. *NOAA Tech. Mem.* NOAA-TM-NMFS-SWFSC-596: 13pp.
 25. Avila, I.C., Kaschner, K. and Dormann, C.F. 2018. Current global risk to marine mammals: taking stock of the threats. *Biological Conservation* 221: 44-58. Marine mammals are impacted by many anthropogenic activities and mitigating these impacts requires knowledge about the geographic occurrence of threats. Here, we systematically reviewed, categorized and georeferenced information from >1780 publications about threats affecting 121 marine mammal species worldwide between 1991 and 2016. We created risk maps by assigning threat to countries where they had been reported, further refining spatial allocation to specific ocean basins and Longhurst biogeographical provinces and subsequent intersection with mapped species' distributions. We superimposed risk maps for different taxa and threats to visualize geographic patterns of risks and quantify risk severity with respect to number of species affected. Almost all marine mammal species have been reported to face at least one threat. Incidental catch affected the most species (112 species), followed by pollution (99 species), direct harvesting (89 species) and traffic-related impacts (86 species). Direct human activities, mainly fisheries, urban development, whaling/ hunting and tourism were the major source of threats affecting most species (> 60 species). Risk areas were identified for 51% of marine mammal core habitat. Besides, the majority of local marine mammal communities are at high-risk in 47% of world coastal-waters. Hotspots were located mainly in temperate and polar coastal waters and in enclosed seas such as the Mediterranean or Baltic Sea. However, risk areas differed by threat types and taxa. Our maps show that human activities in coastal waters worldwide impose previously unrecognized levels of cumulative risk for most of marine mammal species, and provide a spatially explicit frame of reference for the assessment of mammals' species conservation status.
 26. Anon. 2017. Technical support information to the CMS family guidelines on environmental assessment for marine noise-generating activities. Document UNEP/CMS/COP12/Inf. 11/Rev1 presented to the 12th Meeting of the COP, Manila, Philippines 23-28 October 2017. 78pp. Guidelines on

- Environmental Impact Assessments for Marine Noise-generating Activities have been developed for the CMS Family, as presented in UNEP/CMS/COP12/Doc.24.2.2. The Technical Support Information presented in this document provides detailed background information to support the Guidelines. Focal Points and members of the advisory bodies and relevant working groups of CMS, ACCOBAMS and ASCOBANS had opportunity between November 2016 and February 2017 to peer review the expert-authored Technical Support Information modules, with changes made at the discretion of each author. The resulting final modules will also be made available separately on the CMS website. Revision 1 contains updates to section F.1.11. European Union Legislation and Implementation, included upon request of the European Commission.
27. Pace, R.M., III., Corkeron, P.J. and Kraus, S.D. 2017. State-space mark-recapture estimates reveal a recent decline in abundance of North Atlantic right whales. *Ecology and Evolution* 7: 8730-8741. North Atlantic right whales (*Eubalaena glacialis* Müller 1776) present an interesting problem for abundance and trend estimation in marine wildlife conservation. They are long lived, individually identifiable, highly mobile, and one of the rarest of cetaceans. Individuals are annually resighted at different rates, primarily due to varying stay durations among several principal habitats within a large geographic range. To date, characterizations of abundance have been produced that use simple accounting procedures with differing assumptions about mortality. To better characterize changing abundance of North Atlantic right whales between 1990 and 2015, we adapted a state-space formulation with Jolly-Seber assumptions about population entry (birth and immigration) to individual resighting histories and fit it using empirical Bayes methodology. This hierarchical model included accommodation for the effect of the substantial individual capture heterogeneity. Estimates from this approach were only slightly higher than published accounting procedures, except for the most recent years (when recapture rates had declined substantially). North Atlantic right whales' abundance increased at about 2.8% per annum from median point estimates of 270 individuals in 1990 to 483 in 2010, and then declined to 2015, when the final estimate was 458 individuals (95% credible intervals 444-471). The probability that the population's trajectory post-2010 was a decline was estimated at 99.99%. Of special concern was the finding that reduced survival rates of adult females relative to adult males have produced diverging abundance trends between sexes. Despite constraints in recent years, both biological (whales' distribution changing) and logistical (fewer resources available to collect individual photo-identifications), it is still possible to detect this relatively recent, small change in the population's trajectory. This is thanks to the massive dataset of individual North Atlantic right whale identifications accrued over the past three decades. Photo-identification data provide biological information that allows more informed inference on the status of this species.
 28. De la Mare, W.K., Friedlaender, A. and Goldbogen, J. Submitted. Developing functional responses using an individual-based energetics model for orca foraging dives. *Functional Ecology*: 24pp. 1. Ecosystem models are used (implicitly and explicitly) to infer the interactions between high trophic level predators such as whales and fisheries on their prey. Formal ecosystem models fundamentally depend on the relationships between the amount of food taken by a predator and the characteristics of their prey field (the functional response). 2. In complex marine ecosystems identifying functional responses is practically impossible by direct methods. Here a method is developed that overcomes this constraint by using an individual based, process driven model based on detailed measurements of lunge feeding whales using high resolution, animal-borne tag data. The functional responses are calculated using the model to bring together behavioural data, energetic demands and observable prey field characteristics, such as internal patch density and vertical distribution. 3. Results from the model based on Antarctic minke whales and blue whales preying on krill show that blue whales are able to feed successfully on less dense prey aggregations than minke whales but at a higher cost in the proportion of energy consumed. Functional responses are sensitive to how prey density is measured, particularly to the effects of prey vertical distribution and its integration over depth. The dependence of the functional response on prey vertical distribution can be reduced by considering the maximum rather than average prey density. 4. The approach could be applied to other high level predators that can be tagged to obtain direct measures of their foraging behaviour. Process based behavioural models coupled with observations of prey can quantify functional responses when direct measurements are impractical. Better information on functional responses are essential to resolve questions relating to the impacts of fisheries on high level predators and vice versa.
 29. International Whaling Commission. 2018. Further information related to impacts of underwater noise on marine life. Document MEPC 72/INF.9 presented to IMO's Marine Environment Protection Committee, 72nd session, agenda item 16.
 30. International Whaling Commission. In press. Song recorded near a super-group of humpback whales on a mid-latitude feeding ground off South Africa. *JASA Express Letters*: 23pp.
 31. Frasier, T.R., Petersen, S.D., Postma, L., Johnson, L., Heide-Jørgensen, M.P. and Ferguson, S.H. 2015. Abundance estimates of the Eastern Canada-West Greenland bowhead whale (*Balaena mysticetus*) population based on genetic capture-mark-recapture analyses. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2015/008. 26pp. We conducted Bayesian analyses of genetic capture-mark-recapture data to estimate abundance of the Eastern Canada-West Greenland (EC-WG) bowhead whale population. We employed two different analytical approaches, one that ignored location data and treated the entire data set as one large capture-mark-recapture data set, and another that used location-specific data to explicitly account for the presence of unsampled areas. For both approaches we conducted analyses based on two different data sets, one containing data from throughout the entire study period (19 years), and the other containing a 5-year subset of the data. The rationale was that the population size may have changed throughout the 19 years of sample collection, which would bias subsequent estimates. A total of 1,177 samples, from 9 locations throughout the distribution, were genotyped at 21 microsatellite loci. Of these, 992 unique genotypes were identified, with 49 recaptures occurring between years and/or locations. Both estimates for the 5-year data set were smaller than for the 19-year data set, which is consistent with a population increase throughout the study period. Although the estimates differ for each approach, our best estimate of total population abundance is 7,660 individuals (95% HDI 4,500- 11,100). We also obtained location-specific estimate for four areas: Greenland (2,854, 95% HDI 1,230-6,460); Igloodik (2,760, 95% HDI 1,980-5,050); Pangnirtung (3,500, 95% HDI 1,700-4,960); and Repulse Bay (38, 95% HDI 20-124).
 32. Doniol-Valcroze, T., Gosselin, J.-F., Pike, D., Lawson, J., Asselin, N., Hedges, K. and Ferguson, S.H. 2015. Abundance estimate of the Eastern Canada – West Greenland bowhead whale population based on the 2013 High Arctic Cetacean Survey. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2015/058. 33pp. Bowhead whale hunting is an integral part of Inuit culture. Up-to-date abundance estimates of the entire Eastern-Canada West-Greenland (EC-WG) bowhead population are necessary to support sustainable management of the harvest. A multi-year survey design was chosen in 2002-2003 because two separate populations of eastern Arctic bowhead whales were still recognized at the time. Since then, eastern Arctic bowheads were re-assessed as a single population. No aerial surveys had attempted to cover the full extent of bowhead whale summer distribution in the Eastern Canadian Arctic in a single year. DFO conducted the High Arctic Cetacean Survey (HACS) in August 2013 to update abundance estimates for known stocks of Baffin Bay narwhal and for the EC-WG bowhead whale population. The survey was designed to cover the largest possible proportion of the summering areas of the EC-WG population while at the same time improving on the precision of past estimates. Three aircraft were used simultaneously to cover the vast survey area within a short time frame. This document presents the results of the survey and new abundance estimates for the EC-WG bowhead population, as well as an updated Potential Biological Removal (PBR) estimate. Distance sampling methods were used to estimate detection probability away from the track line. Mark-recapture methods were used on the sighting data from two platforms on each side of the aircraft to correct for the proportion of whales missed by visual observers. Abundance in Isabella Bay was estimated using density spatial modelling to account for its complex shape and uneven coverage. Estimates were corrected for availability bias (whales that are not available for detection because they are submerged when the plane passes overhead) using a new analysis of satellite-linked time depth recorders transmitting information on the diving behaviour of bowhead whales in the study area in August. The survey achieved complete coverage of important summer aggregation areas like Prince Regent Inlet, Gulf of Boothia, Admiralty Inlet, Eclipse Sound, Isabella Bay and Cumberland Sound. However, Fury and Hecla Strait, Northern Foxe Basin and Roes Welcome Sound could not be covered. The fully corrected abundance estimate for the EC-WG bowhead whale population was 6,446 (Coefficient of Variation [CV] 26%). Sources of uncertainty arise mainly from the high level of clustering observed at several scales, in particular in Isabella Bay and Cumberland Sound. Based on this abundance estimate and a recovery factor of 0.5 in the PBR calculation, the EC-WG bowhead whale population can support a total human-induced mortality of 52 whales annually.
 33. Da Silva, V.M.F., Freitas, C.E.C., Dias, R.L. and Martin, A.R. In press. Both cetaceans in the Brazilian Amazon show sustained, profound population declines over two decades. *PLOS One*: 21pp. Obligate river dolphins occur only in the rivers of Asia and South America, where they are increasingly subject to damaging pressures such as habitat degradation, food competition and entanglement in fishing gear as human populations expand. The Amazon basin hosts two, very different, dolphins - the boto or Amazon river dolphin (*Inia geoffrensis*) and the smaller tucuxi (*Sotalia fluviatilis*). Both species have wide geographical ranges and were once considered to be relatively abundant. Their IUCN Red List conservation status of Data Deficient (DD), due to limited information on threats, ecology, population numbers and trends, did not initially cause alarm. However, the development of dolphin hunting to provide fish bait at around the beginning of this millennium broadly coincided with the onset of a widespread perception that numbers of both species were in decline. Consequently, the need for population trend data to inform conservation advice and measures became urgent. This paper presents a 22-

year time series of standardised surveys for both dolphins within the Mamirauá Reserve, Amazonas State, Brazil. Analysis of these data show that both species are in steep decline, with their populations halving every 10 years (botos) and 9 years (tucuxis) at current rates. These results are consistent with published, independent information on survival rates of botos in this area, which demonstrated a substantial drop in annual survival, commencing at around the year 2000. Mamirauá is a protected area, and is subject to fewer environmental pressures than elsewhere in the region, so there is no reason to suspect that the decline in dolphins within the Reserve is more pronounced than outside it. If South America's freshwater cetaceans are to avoid following their Asian counterparts on the path to a perilous conservation status, effective conservation measures are required immediately. Enforcement of existing fishery laws would greatly assist in achieving this.

34. Cholewiak, D., Clark, C.W., Ponirakis, D., Frankel, A., Hatch, L.T., Risch, D., Stanistreet, J.E., Thompson, M., Vu, E. and Van Parijs, S.M. In press. Communicating amidst the noise: modelling the aggregate influence of ambient and vessel noise on baleen whale communication space in a national marine sanctuary. *Endangered Species Research*: 18pp. Anthropogenic noise negatively impacts many species. One of the more insidious effects of elevated noise levels is the reduction in area over which animals are able to acoustically communicate, often termed communication masking. This study utilizes modeling approaches to evaluate relative levels of masking for 4 baleen whale species from the combination of current ambient noise conditions and noise from discrete vessels operating in the Stellwagen Bank National Marine Sanctuary. Acoustic data were collected using bottom-mounted autonomous recorders. One day was analyzed for each of 5 different species-specific sound types, corresponding to peaks in occurrence of fin and humpback whale songs, humpback whale social sounds, minke whale pulse trains and North Atlantic right whale gunshots. Source levels for animals and 3 categories of vessels were calculated empirically; sound propagation was modeled using Bellhop ray tracing. An agent-based modeling framework was used to calculate changes in communication space (CS) in comparison to reference conditions (10 dB lower than current ambient noise). In these single-day snapshots, current ambient noise and noise from vessels for which automatic identification system (AIS) data were available contribute most heavily to loss of CS, followed by whale-watching and fishing vessels. Right whale gunshots experience the least amount of masking, while fin, humpback and minke whale signals experience masking levels of 80% or more. While these results incorporate several simplifying assumptions, this study further develops the framework by which to comparatively quantify masking, providing information on the relative degree of masking experienced between species and allowing for important insights on the relative contributions of different anthropogenic sound sources.
35. Tiedemann, R., Ernst, A. and Autenreith, M. 2018. Interpreting currently available NA minke whale genotype data in the context of current stock structure hypothesis, with an attempt to estimate mixing proportions among putative stocks. Paper SC/M18/AWMP05 presented to the AWMP Workshop, March 2018, Copenhagen, Denmark.
36. International Whaling Commission. 2018. Report of the Scientific Committee. Annex Q. Report of the Working Group on ASI. Appendix 3. Tables of 'accepted' abundance estimates. *J. Cetacean Res. Manage (Suppl.)* 19: 389-392.
37. Bedriñana-Romano, J., Rodrigo Hucce-Gaete, R., Alejandro Vidri, F.A., Morales, J., Williams, R., Ashe, E., Garcés-Vargas, J., Torres-Florez, J.P. and Ruiz, J. 2018. Integrating multiple data sources for assessing blue whale abundance and distribution in Chilean Northern Patagonia. *Diversity and Distributions* 2018: 1-14. Aim: Species distribution models are useful tools for depicting important habitat, assessing abundance and orienting conservation efforts. For small populations in poorly studied ecosystems, available data are often scarce and patchy. To overcome this limitation, we aim to evaluate the use of different data types within a hierarchical Bayesian framework with the goal of modelling the abundance and distribution of a small and highly migratory population of blue whale (BW, *Balaenoptera musculus*) summering in Chilean Northern Patagonian (CNP). Location: CNP, Eastern South Pacific (ESP). Methods: We constructed a Bayesian hierarchical species distribution Model (HSDM), combining a binomial N- mixture model used to model BW groups counts in line- transect data (2009, 2012 and 2014) with a logistic regression for modelling presence- availability data (2009–2016), allowing both models to share covariate parameters for borrowing strength in estimations. Results: Distance to areas of high chlorophyll- a concentration during spring before summering season (AHCC- s) was the most important and consistent explanatory variable for assessing BW abundance and distribution in CNP. Incorporating accessorial presence- only data reduced uncertainty in parameters estimation when comparing with a model using only line- transect data, although other covariates of secondary importance failed to be retained in this model. Main conclusions: Our results remark the capability of HSDM for integrating different data types providing a potential powerful tool when data are limited and heterogeneous. Results indicate that AHCC- s, and possibly thermal fronts, could modulate BW abundance and distribution patterns in CNP. Preliminary model- based delimitations of possible priority conservation areas for BW in CNP overlap with highly used vessel navigation routes and areas destined to aquaculture.
38. Gleason, C. and Parsons, E.C.M. In press. An initial review of whalewatching guidelines for endangered and critical endangered cetaceans. *JCRM*: 13pp. At the 2012 meeting of the International Whaling Commission Scientific Committee, the Commission's strategic plan on whalewatching was reviewed by the whalewatching sub-committee with a view to provide scientific advice. The sub-committee considered that a priority was to identify threatened populations that were likely subject to whalewatching pressures. The purpose of this study was to provide an initial review of endangered and critically endangered whales, dolphins and porpoises, whether they were subject to whalewatching and whether whalewatching regulations were present. Threatened populations were identified using published literature, internet sources and the IUCN Red List. 34 populations were identified, 18 being critically endangered and 16 endangered. Although this is a positive initial step, continued discussion whalewatching of these species is necessary in order to provide guidance on species or area-specific regulations that may help to prevent further stressors on these populations.
39. Gleason, C. and Parsons, E.C.M. In press. The global impacts of the International Whaling Commission's Whalewatching Sub-Committee. *JCRM*: 14pp. In 1996 the general principles for whalewatching were agreed upon at the IWC Scientific Committee meeting (SC/48). Since then the whalewatching sub-committee (WW) has been invested in reducing the impacts of whalewatching on cetaceans. However, it was unclear if information gathered and utilised by the WW sub-committee was being widely disseminated to the whalewatching community. This study was undertaken to determine the WW sub-committee's effectiveness regarding the dissemination of scientific information, specifically the general principles of whalewatching, and its recommendations within the whalewatching community at large. To reach a broad audience a survey was created using the online application Survey Monkey and disseminated via the listserv MARMAM. Overall, 57 responses were collected over a period of four months from 25 countries, with over one-third noting that the IWC principles for whalewatching were used to inform local whalewatching management. Additionally, useful information regarding future IWC communications and involvement in management regimes was collected.
40. Hansen, R.G., Boye, T.K., Larsen, R.S., Nielsen, N.H., Tervo, O., Nielsen, R.D., Rasmussen, M.H., Sinding, M.H.S. and Heide-Jørgensen, M.P. In press. Updated abundance of whales in west and east Greenland in 2005-15. *NAMMCO Publications*: 47pp. An aerial line transect survey of whales in West and East Greenland was conducted in August-September 2015. The survey covered the area between the coast of West Greenland and offshore (up to 100 km) to the shelf break. In East Greenland, the survey lines covered the area from the coast up to 50 km offshore crossing the shelf break. A total of 423 sightings of 12 cetacean species were obtained and abundance estimates were developed for common minke whale, from now on called minke whale, (*Balaenoptera acutorostrata*) (32 sightings), fin whale (*Balaenoptera physalus*) (129 sightings), humpback whale (*Megaptera novaeangliae*) (84 sightings), harbour porpoise (*Phocoena phocoena*) (55 sightings), longfinned pilot whale, from now on called pilot whale, (*Globicephala melas*) (42 sightings) and white-beaked dolphins (*Lagenorhynchus albirostri*) (50 sightings). The developed at-surface abundance estimates were corrected for both perception bias and availability bias if possible. Data on surface corrections for minke whales and harbour porpoises were collected from whales instrumented with satellite-linked time-depth-recorders. Options for estimation methods are presented and the preferred estimates are: Minke whales: 5,095 (95% CI: 2,171-11,961) in West Greenland and 2,762 (95% CI: 1,160-6,574) in East Greenland, fin whales: 2,215 (95% CI: 1,017-4,823) in West Greenland and 6,440 (95% CI: 3,901-10,632) in East Greenland, humpback whales: 993 (95% CI: 434-2,272) in West Greenland and 4,223 (95% CI: 1,845-9,666) in East Greenland, harbour porpoise: 83,321 (95% CI: 43,377-160,047) in West Greenland and 1,642 (95% CI: 319-8,464) in East Greenland, pilot whales: 9,190 (95% CI: 3,635-23,234) in West Greenland and 258 (95% CI: 50-1,354) in East Greenland, white-beaked dolphins 15,261 (95% CI: 7,048-33,046) in West Greenland and 11,889 (95% CI: 4,710-30,008) in East Greenland. The abundance of cetaceans in coastal areas of East Greenland has not been estimated before, but the limited historical information from the area indicate that the achieved abundance estimates were remarkably high. When comparing the abundance estimates from 2015 in West Greenland with a similar survey conducted in 2007 there is a clear trend towards lower densities in 2015 for the three baleen whale species and white-beaked dolphins. Harbour porpoises and pilot whales however, did not show a similar decline. The decline in baleen whale and white-beaked dolphin abundance is likely due to emigration to the East Greenland shelf areas where recent climate driven changes in pelagic productivity may have accelerated favourable conditions for these species.
41. Jost, L., Archer, F., Flanagan, S., Gaggiotti, O., Hoban, S. and Latch, E. 2018. Differentiation measures for conservation genetics. *Evolutionary Applications*: 1-10. We compare the two main classes of measures of population structure in genetics: (i) fixation measures such as FST, GST, and θ and (ii) allelic differentiation measures such as Jost's D and entropy differentiation. These two groups of measures quantify complementary aspects of

population structure, which have no necessary relationship with each other. We focus especially on empirical aspects of population structure relevant to conservation analyses. At the empirical level, the first set of measures quantify nearness to fixation, while the second set of measures quantify relative degree of allelic differentiation. The two sets of measures do not compete with each other. Fixation measures are often misinterpreted as measures of allelic differentiation in conservation applications; we give examples and theoretical explanations showing why this interpretation can mislead. This misinterpretation has led to the mistaken belief that the absolute number of migrants determines allelic differentiation between demes when mutation rate is low; we show that in the finite island model, the absolute number of migrants determines nearness to fixation, not allelic differentiation. We show that a different quantity, the factor that controls Jost's D , is a good predictor of the evolution of the actual genetic divergence between demes at equilibrium in this model. We also show that when conservation decisions require judgments about differences in genetic composition between demes, allelic differentiation measures should be used instead of fixation measures. Allelic differentiation of fast-mutating markers can be used to rank pairs or sets of demes according to their differentiation, but the allelic differentiation at coding loci of interest should be directly measured in order to judge its actual magnitude at these loci. indicate that the achieved abundance estimates were remarkably high. When comparing the abundance estimates from 2015 in West Greenland with a similar survey conducted in 2007 there is a clear trend towards lower densities in 2015 for the three baleen whale species and white-beaked dolphins. Harbour porpoises and pilot whales however, did not show a similar decline. The decline in baleen whale and white-beaked dolphin abundance is likely due to emigration to the East Greenland shelf areas where recent climate driven changes in pelagic productivity may have accelerated favourable conditions for these species.

42. Watt, C.A., Marcoux, M., Leblanc, B. and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for bowhead whales (*Balaena mysticetus*) in the Canadian High Arctic. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2015/046. 28pp. Twenty-five bowhead whales (*Balaena mysticetus*) were fitted with satellite tags near the communities of Igloodik and Pangmirtung, Nunavut in July-August 2012 and 2013 and twenty-two provided information on the time whales spent at 0-2, 0-3, 0-4, 0-6, 0-8 m depths in August. Bowhead whales diving to depths up to 8 m depths were considered possibly available to be viewed by observers during aerial surveys. To obtain an accurate estimate of bowhead abundance, for calculating total allowable catch and managing stocks, a correction for bowhead whales that are present but not visible to aerial observers is necessary. An instantaneous availability correction factor used to correct aerial surveys can be estimated from the proportion of time diving animals spend near the surface where they can be detected and identified. To provide a bias correction for the 2013 aerial survey, the proportion of time bowhead whales spent at different depths (0-2, 0-3, 0-4, 0-6, 0-8 m) was analyzed in a mixed effect model with individual whale as a random variable and period of August (early (August 1-15), mid (August 16-23), and late (August 24-31)), time of day (day or night), sex, and summering area (Prince Regent Inlet/Gulf of Boothia/Foxe Basin (PRI/GoB/FB), or Cumberland Sound) as fixed factors. To investigate other environmental factors related to bowhead diving behaviour, we also tested models with slope and depth as fixed factors. Models that included time of day and period of August performed the best in the 0-2 m and 0-3 m bins, while models that included time of day, period of August, and area of tagging performed best in the 0-4, 0-6, and 0-8 m bins. Since aerial surveys were primarily conducted in early and mid-August, always during the day, an availability bias which excluded night, and combined both sexes for each area was calculated. Without experimentation, previous studies have relied on a correction for bowhead whales based on the 0-4 m bin. Since we are unsure of the deepest depth to which bowhead whales can be seen, we wanted to increase the variance around our estimate and calculated uncertainty in the availability bias correction based on a combination of the 0-2, 0-4, and 0-6 m depth bins since there is no evidence to suggest which depth is best. In early August, bowhead whales spent 21.6 ± 3.12 % of their time in the 0-2, 0-4, and 0-6 m combined depth bins in Cumberland Sound and 24.7 ± 5.11 % in the PRI/GoB/FB region, and thus we recommended an instantaneous availability bias correction of 4.63 (± 0.669) for Cumberland Sound and 4.05 (± 0.838) for the PRI/GoB/FB region for strata surveyed in early August 2013. In mid-August, bowhead whales spent 17.6 ± 1.65 % of their time in the 0-2, 0-4, and 0-6 m combined depth bins in Cumberland Sound and 29.1 ± 7.09 % in PRI/GoB/FB; thus, we recommend an instantaneous availability bias correction of 5.68 (± 0.533) for Cumberland Sound and 3.44 (± 0.838) for the PRI/GoB/FB region for strata surveyed in mid-August 2013. For areas surveyed outside of Cumberland Sound or the PRI/GoB/FB region in 2013 we recommend using a combined estimate for the areas based on the 0-2, 0-4, and 0-6 m combined depth bins. In early and mid-August, bowhead whales from both areas spent 24.3 ± 4.52 % and 25.1 ± 5.30 % of their time respectively in the 0-2, 0-4, and 0-6 m combined depth bins, resulting in an instantaneous availability bias correction of 4.12 (± 0.766) for early and 3.98 (± 0.840) for mid-August. Future research is necessary to determine the depth at which aerial observers can detect bowhead whales.
43. Pike, D. and Doniol-Valeroze, T. 2015. Identification of duplicate sightings from the 2013 double-platform High Arctic Cetacean Survey. *DFO Can. Sci. Advis. Sec. Res. Doc.* 2015/034. 28pp. One of the key assumptions of distance sampling is that all animals on line are detected by observers. Double-platform methods have been developed to address situations of incomplete detection at the track line, but they require the identification of sightings seen by both observers. However, there is no means to independently and unequivocally determine whether or not a given pair of sightings is in fact a duplicate pair, or to select the most likely duplicate among a set of candidate sightings observed in close proximity. Most previous studies have used ad-hoc methods and arbitrary thresholds. Here, we develop a data-driven approach to identify single and duplicate sightings made during the 2013 High Arctic Cetacean Survey (HACS). We make use of four covariates to compare sightings made by front and rear observers: difference in time of sighting, difference in declination angle, difference in group size and difference in species identity. To estimate the relative weights of these covariates, we compared two datasets in a logistic regression framework: a set of sighting pairs that contain both duplicates and nonduplicates and a similar dataset known to contain no true duplicates (the observations made at the same time but on the other side of the plane). This allowed us to determine which combinations of factors were most successful at discriminating duplicates and to rate each candidate pair within the same-side data with an index of dissimilarity. Candidates with the lowest scores were identified as duplicates using two different methods and a range of threshold values for each covariate. Depending on the procedure used, 19% to 30% of narwhal sightings in the HACS dataset were seen by both observers, whereas 36% to 50% of bowhead whale sightings were seen by both observers. However, the aggregated nature of the sightings and particularly the relatively high proportion of missing primary data such as declination and group size made the identification of duplicates uncertain in many cases.
44. Doniol-Valeroze, T., Gosselin, J.-F., Pike, D. and Lawson, J. 2015. Spatial modelling of narwhal density in fiords during the 2013 High Arctic Cetacean Survey (HACS). *DFO Can. Sci. Advis. Sec. Res. Doc.* 2015/059. 37pp. Narwhal stocks in Baffin Bay, Jones Sound and Smith Sound were surveyed in the 2013 High Arctic Cetacean Survey (HACS). Previous studies have shown that narwhals spend time inside narrow inlets and fiords on their summer distribution range. Thus, any surveying effort must include these areas to provide a credible abundance estimate. Estimating abundance in fiords, however, creates logistical and statistical difficulties because of their narrow complex shapes and high cliffs, preventing the use of conventional distance sampling based on systematic transects. To address these issues, we used a two-stage cluster sampling design in which fiords designated as primary sampling units were selected in a way that maintained equal probability and systematic coverage. Within each fiord, we estimated density and abundance of narwhals using spatial density modeling. Density surface models do not require track lines to be designed according to a formal survey sampling scheme, and accommodates both non-random and unequal coverage. Moreover, the resulting variance of the abundance estimate incorporates both the variance from the detection function and that of the spatial model. Because no observations were made in West Ellesmere fiords, no abundance estimate was produced. Sightings of narwhals in the other fiords during HACS were highly variable. After expanding the abundance estimates to unsurveyed fiords, total (surface) abundance estimates were 45 for Jones Sound fiords (CV 94%), 1,916 (CV 45%) for Smith Sound fiords, 143 (CV 85%) for Admiralty Inlet fiords, 1,135 (CV 19%) for Eclipse Sound fiords, and 3,799 (CV 35%) for east Baffin Island fiords. Abundance estimates for the fiord strata will be added to other strata estimated via conventional distance sampling.
45. Taffi, M., Paoletti, N., Angione, C., Pucciarelli, S., Marini, M. and Lio, P. 2014. Bioremediation in marine ecosystems: a computational study combining ecological modelling and flux balance analysis. *Frontiers in Genetics* 5 (319): 13pp. The pressure to search effective bioremediation methodologies for contaminated ecosystems has led to the large-scale identification of microbial species and metabolic degradation pathways. However, minor attention has been paid to the study of bioremediation in marine food webs and to the definition of integrated strategies for reducing bioaccumulation in species. We propose a novel computational framework for analysing the multiscale effects of bioremediation at the ecosystem level, based on coupling food web bioaccumulation models and metabolic models of degrading bacteria. The combination of techniques from synthetic biology and ecological network analysis allows the specification of arbitrary scenarios of contaminant removal and the evaluation of strategies based on natural or synthetic microbial strains. In this study, we derive a bioaccumulation model of polychlorinated biphenyls (PCBs) in the Adriatic food web, and we extend a metabolic reconstruction of *Pseudomonas putida* KT2440 (iJN746) with the aerobic pathway of PCBs degradation. We assess the effectiveness of different bioremediation scenarios in reducing PCBs concentration in species and we study indices of species centrality to measure their importance in the contaminant diffusion via feeding links. The analysis of the Adriatic sea case study suggests that our framework could represent a practical tool in the design of effective remediation strategies, providing at the same time insights into the ecological role of microbial communities within food webs.

46. Taffi, M., Paoletti, N., Angione, C., Pucciarelli, S., Marini, M. and Lio, P. 2014. Bioremediation in marine ecosystems: a computational study combining ecological modelling and flux balance analysis. *Frontiers in Genetics* 5 (319): 13pp. The pressure to search effective bioremediation methodologies for contaminated ecosystems has led to the large-scale identification of microbial species and metabolic degradation pathways. However, minor attention has been paid to the study of bioremediation in marine food webs and to the definition of integrated strategies for reducing bioaccumulation in species. We propose a novel computational framework for analysing the multiscale effects of bioremediation at the ecosystem level, based on coupling food web bioaccumulation models and metabolic models of degrading bacteria. The combination of techniques from synthetic biology and ecological network analysis allows the specification of arbitrary scenarios of contaminant removal and the evaluation of strategies based on natural or synthetic microbial strains. In this study, we derive a bioaccumulation model of polychlorinated biphenyls (PCBs) in the Adriatic food web, and we extend a metabolic reconstruction of *Pseudomonas putida* KT2440 (iJN746) with the aerobic pathway of PCBs degradation. We assess the effectiveness of different bioremediation scenarios in reducing PCBs concentration in species and we study indices of species centrality to measure their importance in the contaminant diffusion via feeding links. The analysis of the Adriatic sea case study suggests that our framework could represent a practical tool in the design of effective remediation strategies, providing at the same time insights into the ecological role of microbial communities within food webs.
47. Sirovic, A., Oleson, E.M., Buccowich, J., Rice, A. and Bayless, A.R. 2017. Fin whale song variability in southern California and the Gulf of California. *Nature Scientific Reports* 7: 10126. 12pp. Songs are distinct, patterned sounds produced by a variety of animals including baleen whales. Fin whale songs, which consist of short pulses repeated at regular interpulse intervals (IPIs), have been suggested as a tool to distinguish populations. Fin whale songs were analyzed from data collected from 2000–2012 in Southern California and from 2004–2010 in the Gulf of California using autonomous acoustic recorders. IPIs were measured for each identifiable song sequence during two random days of each month with recordings. Four distinct song types were identified: long doublet, short doublet, long triplet, and short triplet. Long and short doublets were the dominant songs in southern California, while long and short triplets were dominant in the Gulf of California. An abrupt change in song type occurred in both areas during the monitoring period. We argue that each song type is unique to a population and these changes represent a shift in the primary population in the monitoring area. Occasional temporal and spatial song overlap indicated some exchange or visitation among populations. Fin whales appear to synchronize and gradually modify song rhythm over long time scales. A better understanding of the evolutionary and ecological importance of songs to in whale populations is needed.
48. de Boer, M.N., Jones, D., Jones, H. and Knee, R. 2018. Spatial and temporal baseline information on marine megafauna-data facilitated by a wildlife tour operator. *Open Journal of Marine Science* 8: 76-113. The protection of marine megafauna within Europe is rather fragmented. Developing conservation measures for highly mobile species presents definite challenges, particularly due to the many knowledge gaps. Recent studies have shown that these gaps can be filled in by Platforms of Opportunity (PO) which create low-cost approaches. However, the number of wildlife tour operators actively collecting PO data related to distribution and relative abundance of marine fauna remains limited. In this study, we investigated whether effort-corrected data on marine megafauna facilitated by a wildlife tour operator afforded robust long temporal data (2011-2015). Sightings data, collected in the wider Mount's Bay area (southwest Cornwall, UK), along with a GPS application, were collected to accurately record survey effort. In addition, radial sighting distances and detection curves were computed to explore the robustness of the data. Density maps of marine megafauna indicated that encounters occurred throughout the area in all three seasons but the temporal distribution was significantly different with numbers peaking in autumn. Odontocetes were mostly recorded during autumn, basking shark (*Cetorhinus maximus*) and ocean sunfish (*Mola mola*) were more abundant during summer and leatherback turtles (*Dermochelys coriacea*) were recorded occasionally. Our data showed that this shallow coastal environment is particularly important as a nursing area for harbour porpoises (*Phocoena phocoena*). Risso's dolphins (*Grampus griseus*) showed a high semi-residency pattern for adults with calves within one core-habitat. As such, the study provides important spatial and temporal baseline data that are essential for the protection of marine megafauna through the development of an ecological network of marine protected areas within UK waters. Although, data facilitated by wildlife operators have certain shortcomings we highlight that the protocols developed here secured efficient and precise data. Such collection protocols can be implemented on a larger scale, ultimately enhancing research monitoring efforts and marine ecosystem management.
49. Anon. 2016. Working Group on Bycatch of Protected Species (WGBYC), 1-5 February 2016, ICES HQ, Copenhagen, Denmark. 83pp.