

Report of the Scientific Committee

Bled, Slovenia, 24 April-6 May 2018

Annex O

Report of the Sub-Committee on Cetacean Stocks that Are or Might be Subject of Conservation Management Plans (CMPs)

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

International Whaling Commission
Bled, Slovenia, 2018

Annex O

Report of the Sub-Committee on Cetacean Stocks that Are or Might Be Subject of Conservation Management Plans

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1. INTRODUCTORY ITEMS

1.1 Convenor's opening remarks

Walløe welcomed the participants.

1.2 Election of the Chair and co-Chair

Walløe was elected Chair and Urbán was elected co-Chair.

1.3 Appointment of rapporteurs

Johnson was appointed to act as rapporteur.

1.4 Adoption of Agenda

The adopted Agenda is shown in Appendix 1.

1.5 Review of available documents

The documents available for discussion by the sub-committee included SC/67b/CMP01-21, SC/67b/SM03, SC/67b/SM05, Anon. (2017) [SC/67b/ForInfo06], SC/67b/SDDNA02, SC/67b/SDDNA03, Minton (2018) [SC/67b/ForInfo07] and Madhusudhana *et al.* (2018).

2. STOCKS THAT ARE OR MIGHT BE THE SUBJECT OF A CONSERVATION MANAGEMENT PLAN (CMP)

2.1 Stocks with existing CMPs

2.1.1 SE Pacific southern right whales

2.1.1.1 NEW INFORMATION

SC/67b/CMP08 reported on the first acoustic data for southern right whales in the Eastern South Pacific. Data were recorded on a Marine Acoustic Recording Unit (Cornell University) off the southwestern tip of Isla de Chiloe from 29 January to 17 June 2012. Spectrograms were visually audited for upsweep calls. Preliminary analysis of 46 of the 139 days yielded more than 4,000 right whale upsweep calls throughout 27 of the 46 days. Attribution of upsweep calls to eastern South Pacific southern right whales was supported by the simultaneous occurrence of upsweep calls and a visual sighting 28 km north from the recording device on 21 April 2012. Acoustic recording provided valuable information about call parameters and patterns as well documented the presence of this critically endangered subpopulation.

2.1.1.2 PROGRESS WITH THE CMP

SC/67b/CMP18 reported on advances made with respect to 'Passive Acoustic Monitoring of the Eastern South Pacific Southern Right Whale, a Key to Improve Conservation Management Plan Outputs' (PAM project) that is supported by the Scientific Committee. The PAM project was initiated to facilitate the identification of potential breeding areas along the coast of Chile and Peru by obtaining acoustic recordings from a complete annual cycle. Only two locations per year (northwestern Isla de Chiloe in southern Chile and Valparaiso-San Antonio in central Chile) will be monitored because of the limited budget. Acoustic devices have been acquired and will be programmed to record continuously from 20Hz to 24KHz, allowing for a maximum of 76 days of continuous recording, and thus, maintenance of the equipment will need to be schedule every 2-3 months. Permits have been obtained and the first deployment, which will occur using small boats, is schedule for May 2018, weather permitting. An educational and capacity building program will be implemented at the selected sites to support other priorities actions under the CMP. To date, the PAM project has received wide support. However, additional funding is needed for 2019-20 to cover field costs at future locations and partially support data analysis.

In response to questions regarding southern right whale reproductive call behaviours it was noted that they produce enough vocalisations to allow for their detection, but it remains unknown if they engage in vocalisations specific to reproduction. The sub-committee agreed that acoustics are an efficient way to research species that lack data on basic

life-history characteristics such as distribution. The sub-committee highlighted the importance of this effort to collect basic data on the critically endangered population and **advised** that the work continue such that the design of future sighting surveys will be more informed.

SC/67b/CMP20 reported on advances made towards implementing priority actions of the CMP for this population. Four confirmed sightings were made in 2017, three of which were opportunistic and did not include photographs or genetic samples. The fourth corresponds to the entangled and dead whale reported last year (Galletti Vernazzani *et al.* 2017). Advances with respect to increasing sightings in reproductive areas were made through the PAM project (SC/67b/CMP18). Advances will be made with respect to increasing capacity to respond to entangled whales in 2018 under the 'First Bi-National Combined Capacity Building on Cetacean Stranding and Entanglement Response Training under the IWC Conservation Management Plan for Eastern South Pacific Southern Right Whale' that will be held in Lima, Peru. The training will have 31 trainees from Chile and Peru plus invited trainees from Ecuador, Colombia and Panama. Press releases and mainstream articles were released in the Chilean press and a logo was developed to raise citizen awareness. In the future, posters will be developed and distributed in 2018 along the coast of Chile and Peru to increase identification capacities of cetacean species, a community manager of social networks will be appointed for a period of six months and information sessions will be conducted in locations where the PAM project is implemented. Finally, the second coordination meeting of the CMP steering committee will be conducted between 22 and 23 August in Lima, Peru.

In response to a question of whether people were involved, the sub-committee was informed that in Chile citizens, including fishers, are encouraged to report sightings to a national sighting network and that posters will be distributed to increase their awareness of how they can help collect base-line information along the coast of Chile and Peru. The network is helpful in mapping the distribution of southern right whales. However, real-time sighting information is needed to collect photographic identifications and biopsies from sighted whales because deploying effort takes time and currently sighting information can be delayed by a few days. The sub-committee discussed additional avenues to increase sightings without requiring field work and **advised** that satellite imagery be explored for sighting whales in remote areas and to locate stranded whales. The sub-committee **commended** the efforts made to implement the CMP in Chile and Peru and **encouraged** their continued coordination.

In August of 2017 a local citizen sighted and documented southern right whales and calves in the Gulf of Penas, a remote area with limited access and the location of the largest mass stranding of baleen whales ever recorded (Häussermann *et al.*, 2017). Following previous recommendations by the sub-committee to collect baseline data on this stock, a funding proposal was put forward to deploy efforts in this remote area in 2018 to collect photographic identifications and biopsies of whales.

The sub-committee noted that a line-transect survey would not likely successfully detect whales in this area even if they were present. The sub-committee **advised** the use of satellite imagery or passive acoustic monitoring devices to find the presence of whales in the area. The use of satellite imagery was also suggested for finding suitable land-based vantage points as the terrain can be treacherous.

Attention: SC, CC

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

- (1) commends the scientific work and international co-operation being undertaken for the PAM project and looks forward to receiving the results of the acoustic studies such that future sighting surveys will be more informed and baseline information on the location of breeding grounds will be available; and*
- (2) advises that satellite imagery be explored as an additional means, beyond acoustic data, to inform the design of sighting surveys because it is likely that line-transect surveys would not successfully identify whales in some areas even if they were present.*

2.1.2 SW Atlantic southern right whales

2.1.2.1 NEW INFORMATION

SC/67b/CMP05 reported on the abundance and continued increase of southern right whales around Península Valdés, Argentina, the main breeding and calving ground for this species in the western South Atlantic Ocean. The rate of increase decreased from nearly 7% in 2007 to 0.5% for total number of whales and 2.40% for number of calves in 2017. The decreasing trends in the rates of increases of total whales and calves (-0.732% and -0.376%, respectively) is thought to be the consequence of changes in distribution due to density-dependence processes, described in SC/67b/CMP02. Cow-calf pairs remained in high-density areas, while other groups (i.e., solitary individuals and breeding groups) moved to adjacent areas when the average density (whales per 5 km segment) reached a proposed threshold of 3 whales per km². Higher densities were recorded given a specific location and time period (e.g., 15.87 whales per km² in the El Doradillo area during August-September), but the overall process was best described using an average density. SC/67b/CMP/01 reported on the increasing presence of whales in Golfo San Matías (north of the Península Valdés nursing area) between 2007 and 2017. Golfo San Matías is not a core area but it was area inhabited by southern right whales prior to commercial

whaling. Solitary individuals were the most abundant type of whales observed in this recolonised area, and peak densities were observed from late August to early September.

SC/67b/CMP06 summarised strandings of southern right whales near Península Valdés. Seven hundred and seventy-four strandings, informed by land and aerial surveys and opportunistic sightings, have been studied by the Southern Right Whale Health Monitoring Program since 2003. As in previous years, most of the animals stranded in 2016 and 2017 were newborn calves (14 of 15 and 27 of 28, respectively). The majority of the 2016 and 2017 strandings were recorded in Golfo Nuevo (87% in 2016 and 72% in 2017), and the remaining strandings were recorded in Golfo San José. More than half of the 2016 strandings occurred during the months of July and August (56%), whereas the majority (68%) of 2017 strandings occurred later in the year (September-October). A stranding of a live juvenile was reported on 24 June, 2016 in Caleta de Los Loros, Río Negro Province, and the animal died seven days later. Following recommendations and research priorities of the Scientific Committee, the data collected from post-mortem examinations are currently being used to inform two lines of research, nutritional condition (SC/67b/CMP03) and levels of stress hormones (SC/67b/CMP04).

SC/67b/CMP03 reported on the nutritional condition of southern right whale calves from 2003 to 2017 in the Península Valdés nursing area. Blubber thickness was measured at nine body locations from 345 dead calves. Additionally, lipid content of the external blubber layer was measured in 16 living and 67 dead calves of similar length. Blubber was not thinner in high mortality years compared to low mortality years, after controlling for calf length and state of decay, and lipid content did not vary among living and dead calves. Results do not support the hypothesis that the reduced transfer of maternal fat reserves to calves led to high calf mortality in 2003, 2005 and 2007-13 and are congruent with visual assessments made during necropsies that the majority of stranded calves do not appear to be emaciated, regardless of calf mortality levels. Blubber thickness was affected by calf length, increasing at all measured body locations as calves grew, but not by sex or stranding location.

The sub-committee discussed the distribution of mortalities in the Península Valdés nursing area, highlighting how more whales die in the south (Golfo Nuevo) compared to the north (Golfo San José) even though calves found stranded in Golfo Nuevo had thicker blubber than those found stranded in Golfo San José. It was hypothesised that calf mortality, which displays strong interannual variation (e.g., 113 deaths in 2012 and 14 in 2016) and is currently decreasing, could be related to what adults are experiencing in their feeding areas (Leaper *et al.*, 2006; Seyboth *et al.*, 2016).

SC/67b/CMP04 presented preliminary results regarding the levels of stress hormones (glucocorticoids, GCs) in baleen tissue, testing the hypothesis that stress from injuries due to kelp gull (*Larus dominicanus*) attacks negatively affects the physiological homeostasis of southern right whale calves in the Península Valdés nursing ground. Baleen tissue accumulates GC as it grows, and the tip of the baleen represents that which was grown prenatally. Profiles of cortisol and corticosterone were measured using baleen from a North Atlantic right whale calf that died from a vessel strike and four southern right whale calves that were found dead with varying severity of wounds associated with attacks by kelp gulls. Prenatally grown baleen from all five calves exhibited a distinctive profile of elevated GCs that declined shortly before birth, similar to GC profiles of pregnant females. Profiles from the North Atlantic calf and the southern right whales calves with no or few gull wounds ($n=2$) indicate that calves have relatively low and constant GC levels throughout their life, while calves with high numbers of gull wounds ($n=2$) had pronounced elevations of GC levels in postnatal baleen followed by a precipitous decline shortly before death, a profile suggestive of prolonged chronic stress. The presence of GC in baleen may present a promising and valuable tool for defining the baseline physiology of calves and may prove useful for addressing conservation-relevant questions such as distinguishing acute from chronic stress and, potentially, determining cause of death.

The sub-committee highlighted the importance of this work, **commended** the research being done and **recommended** that more samples be analysed such that a full report can be presented in two years time. Currently, research grants and an adopt-a-whale program act as the main funding sources for the collection and analysis of the baleen samples. The sub-committee **recommended** that a funding proposal be submitted to the committee to assist in the funding of future work. Beyond analysing additional baleen samples, future work could investigate: (1) food stress within the pre-birth range by comparing the body condition of cows to the presence of stress hormone levels in the baleen of their offspring; (2) differences in stress signals in areas with and without whale watching; (3) relationships between stress signals and stable isotopes; and (4) the time scale of stressful events by experimenting with where GCs are extracted from on the baleen samples. Additionally, members of the sub-committee highlighted how research in waters surrounding Península Valdés will be informative for other areas where whales experience unusual events that lead to increased stress.

The presence, or lack thereof, of kelp gulls and the frequency of gull attacks in the areas utilised by southern right whales was discussed by the sub-committee. Gull attacks are most frequent in the Península Valdés nursing grounds, however, current abundances of the surrounding kelp gull populations remain unknown. Future studies on the abundance of kelp gulls are planned but are dependent on funding. It was noted that kelp gulls that use human refuse as a food source have the potential to bring non-native pathogens to the whale populations and their own colonies and these pathogens could be an additional source of stress. However, previous research did not find that pathogens contributed to changes in calf-mortality rates (Marón *et al.*, 2015; McAloose *et al.*, 2016).

SC/67b/CMP17 presented results of a satellite-tracking study in Argentina on southern right whales that was initiated following the Committee's recommendation (Annex F of IWC, 2017). Nine individuals were instrumented with location-only satellite tags in Golfo San Matías, Province of Rio Negro, which is located nearly 200km north of Peninsula Valdés, in October 2016 ($n=1$) and September 2017 ($n=8$). Tag duration varied between 46 and 204 days (average of 117 days). Movement patterns showed marked individual variation. Five whales moved southwards towards Golfo San José and Golfo Nuevo shortly after tagging, and four whales moved north along the coast of the Buenos Aires Province and Uruguay. Movement patterns in coastal areas suggest that whales in the northern Golfo San Matías visit areas further to the south in Peninsula Valdés, but interestingly only whales tagged in the former migrated northward along the coast. All whales eventually moved towards offshore waters of the outer continental shelf and shelf break along the coast of Argentina (from the La Plata River to the islands at 51°45'S/59°00'W). Most whales tracked until later in the season (after January) migrated southeast towards the islands at 54°26'00"S/36°33'00"W and the Scotia Sea, where they remained for the duration of their tags. Behavioural 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 and the northern Weddell Sea. These findings are complementary to an ongoing long-term study to understand the migratory routes and destinations of southern right whales wintering off the coast of Argentina and, overall, reveal that this species inhabits vast extensions of the South Atlantic Ocean and visits multiple potential feeding areas each season.

The sub-committee **commended** the those involved in the tagging study and the efforts put forth to provide valuable life-history information regarding southern right whales, which is imperative for their conservation. The sub-committee **recommended** that more results be presented in the future and that efforts be put forth to deploy more tags to increase the robustness of the study. Future results should include the amount of variability that can be attributed to annual variability or individual variability and differences in movements between cow-calf pairs and individual animals, where the latter is known to be true for humpback whales. Researchers noted that although whales were tagged across multiple years all tags were placed during September and October, and thus, the effect of season is not hypothesised to be a factor in movement difference. Five additional lines of research were **encouraged** by the sub-committee: (1) use re-sightings across years to investigate the long-term effects of tagging; (2) ecological niche analyses to provide inference on why whales use certain areas; (3) investigate the co-occurrence of tagged whales and krill fishers because visually they appear to be utilising the same habitat; (4) compare reproductive success, nutritional condition and mortality with that of other krill predators in Antarctica; and (5) compare high-resolution tagging data with information on ocean use to inform future ocean-use protocols.

SC/67b/CMP21 presented results of a land-based survey to assess seasonal distribution and relative abundance of southern right whales near Miramar, on the southwest coast of the Buenos Aires Province, Argentina. The recent expansion of right whales into this region has attracted the attention of the local community as a potential resource for tourism-related activities (e.g., whale watching). Systematic visual surveys conducted between April 2016 and March 2018 detected southern right whales from May to October with peaks in August and September. There was no significant difference ($t=-0.37$, $df=10$, $p=0.72$) between the average sighting rate in 2016 ($\bar{x}=1.22\pm 1.33$) and 2017 ($\bar{x}=1.70\pm 2.01$). The continuation of this study will provide a better understanding of the habitat use and the factors that influence seasonal patterns of southern right whale occurrence off the coast of the Buenos Aires Province.

In discussion it was noted that the municipality decided to limit whale watching to land-based activities because of the seasonality of the sightings.

Attention: SC, G

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

- (1) **commends** the work being undertaken on understanding the mortality events and **encourages** its continuation;
 - (2) **encourages** the researchers working on stress hormones in baleen to increase their sample size, consider suggestions for additional studies provided in Annex O (item 2.1.2.1) and present a full report to the Committee when it becomes available; and
 - (3) **commends** the telemetry work, encourages its expansion and draws attention to additional analyses that could be addressed using the telemetry data suggested in Annex O (item 2.1.2.1).
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2.1.2.2 PROGRESS WITH THE CMP

The overall objective of the southern right whale CMP is to protect their habitat and minimise anthropogenic threats to maximise the likelihood that the population will recover to healthy levels and recolonise their historical range. The CMP was adopted in 2012 per recommendations by the Scientific Committee following a mortality event in the Peninsula Valdés area and was implemented in 2013 in Buenos Aires. Actions related to the CMP were summarised in two parts, actions developed in Argentina (SC/67b/CMP14) and actions developed in Brazil.

SC/67b/CMP14 summarised actions related to the CMP for the period June 2017-April 2018 in Argentina. Long-term monitoring continued, and efforts were made to share data across catalogues that provide complementary information. Stranding programs were also continued, as well as 16 hours of aerial surveys that detected 12 carcasses of right whales

in inaccessible areas. Surveys, telemetry research and acoustic monitoring were used to inform movements, migration routes and the location of feeding grounds. Research on the nutritional condition, presence of stress hormones and presence of pathogens was conducted in relation to attacks by kelp gulls.

Progress was also made towards the implementation of the CMP by institutions of Brazil (Appendix 2). Long-term monitoring has been conducted through two sightings networks and a stranding network. Aerial surveys of the second largest breeding ground for this species have been conducted by the Project Baleia Franca/Instituto Australis since 1987. Two surveys were conducted in 2017 sighting 29 individuals in July and 49 individuals in September. The aerial sightings are being used to estimate abundance and population viability. Additional opportunistic sightings that sometimes include photos and biopsies have been recorded by the Humpback Whale Institute (Caravelas, Brazil) between 12°S to 20°S since 1993. Seventeen institutions monitor the range of the distribution for strandings and reported nine strandings along the south and southeast coast of Brazil over the last three years (available from Aquatic Mammal Monitoring System). Whale entanglement is mitigated through a protocol developed in 2006 by the Southern Right Whale Protected Area Management Council that provides assistance and guidelines to coordinate actions and a contingency plan involving institutions of the Santa Catarina State. In 2016, the Council organised a theoretical and practical training course that was part of the disentanglement program conducted by the 'Global Whale Entanglement Response Network'. Boat-based whale watching has been prohibited since 2015 and a government management plan for whale watching is being finalised. Lastly, the Project Baleia Franca/Instituto Australis and the R3 Animal are conducting environmental education activities to tourists and local communities focused on informing individuals about southern right whales.

SC/67b/CMP20 reported a stranding of a ship-struck SW Atlantic southern right whale in Punta Dungenes (52.3°S, 68.4°W), which is the second reported case of a collision between a ship and right whale in Estrecho de Magallanes. These events raise concern of anthropogenic threats to the SW Atlantic population. The stranding highlighted the migratory nature of large baleen whales and emphasised the need for researchers working on southern right whales throughout their distribution to be informed about studies being conducted in all regions. The sub-committee **recommended** collaborative efforts should be initiated to facilitate a regional population assessment of this species in the future.

The sub-committee **commended** the efforts made by institutions in Argentina and Brazil towards implementing the CMP and **encouraged** their continued coordination. The sub-committee advised that future research investigate migratory destinations of the whales that winter off Uruguay and Brazil, which remain unknown.

Attention: SC, CC

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

- (1) welcomes the progress being made in the implementation of the CMP reported by Argentina and Brazil and supports its continuation;*
- (2) encourages the continued co-operation and collaboration amongst range states towards implementing the CMP and addressing mortality events in this population; and*
- (3) recognising the report of a ship-struck southwestern Atlantic southern right whale in the range of the southeastern Pacific (Estrecho de Magallanes), encourages co-operation with those involved in the southeastern Pacific CMP to facilitate a regional assessment; and*
- (4) encourages the research work identified under Item 2.1.2.1.*

2.1.3 North Pacific gray whales

2.1.3.1 REPORT OF THE INTERSESSIONAL WORKSHOP (SC/67B/REP07)

Donovan summarised the report of the Fifth Rangewide Workshop on the Status of North Pacific Gray Whales (SC/67b/Rep07).

The Workshop was held at the Granite Canyon Laboratory, California of the Southwest Fisheries Science Center from 28-31 March 2018. The primary tasks of the workshop were to: (a) review the results of the modelling work identified at the Fourth Workshop (IWC, 2018a) and SC/67a (IWC, 2018b); (b) examine the new proposed Makah Management Plan (submitted by the USA – given as Annex E, Appendix 1) for gray whaling off Washington state; and (c) to update as possible (and develop a workplan for) updating the scientific components of the Conservation Management Plan (CMP) for western gray whales (WGW).

The Workshop received new information on genetic studies using SNPs that it noted would be presented at the SD sub-committee at SC/67b for a full discussion but that also contributed to discussions of priority hypotheses for the Workshop. In its discussions, the Workshop had agreed that incorporating photo-identification data into genetic results will greatly improve interpretation of stock structure and movements and recommended that the genetic dataset should be examined comparing whales seen only once off Sakhalin with those whales seen in multiple years.

The Workshop considered updated information from photo-identification studies including consolidation of WGW catalogues. It was pleased to hear that agreement had been reached for the two catalogues to be consolidated into one catalogue under the auspices of the IWC. The Workshop reiterated the importance of the ongoing long-term research and

monitoring programmes being conducted off Sakhalin Island. It also received information on a possible sighting of a gray whale off Korea – the first since 1977. It was noted that an updated paper would be presented to SC/67b (SC/67b/CMP11).

The major focus of the Workshop related to finalising the specifications for modelling to enable results to be available for SC/67b. A new component included the need to incorporate the recently developed Makah Management Plan (SC/67b/Rep07, Annex E, Appendix 1) into the modelling framework; the Plan is somewhat complex and the Workshop focus was on understanding the intended process and ensuring that it was parameterised in an appropriate way. A further key area was finalising the stock structure hypotheses to be given priority. After a review, the Workshop concluded that Hypotheses 3a and 5a would form the reference cases but that sensitivity trials would be conducted for Hypotheses 3b, 3c, 3e and 6b. The full specifications for these hypotheses are provided in SC/67b/Rep07 (Annex E, Appendix 1 and Annex F).

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

Another important component of the trials relates to bycatches and considerable effort was put into capturing the uncertainty in past and future estimates of fishing mortality based upon the available data. Abundance estimates for the eastern North Pacific and the PCFG had been approved by the Committee last year (IWC, 2017) but new estimates for the western feeding group were presented by Cooke and these were used to develop estimates required by hypotheses. It was agreed that these would need to be confirmed at SC/67a by the Committee. Modifications were also made to the mixing proportions.

The sub-committee **thanked** the members involved in the Workshop for the breadth of work that was produced and welcomes future work that is planned. The factors considered in the trials are provided in

Table 1 whilst the final list of trials can be found in SC/67b/Rep07, Annex E.

The Workshop developed a workplan to enable results to be presented at SC/67b.

With respect to the Conservation Management Plan updates, the Workshop noted that the work to complete the computing specifications, especially taking into account the new Makah Management Plan, meant that there was insufficient time to update the CMP sections, also recognising that this could best be completed after the modelling results became available, ideally at SC67b. Attention was drawn to the updated seasonal maps that had been developed and participants were asked to send any comments or suggestion for modification to Donovan and Reeves.

The Workshop had recommended that the Scientific Committee considers establishing a small drafting group comprised of at least the national co-ordinators of the Memorandum of Co-operation, Reeves (IUCN) and Donovan be convened to meet intersessionally (e.g. at IUCN headquarters) to provide an updated version of the plan after SC/67b.

An important component of the CMP effort is the need for a stakeholder workshop (tentatively forecast to occur in 2019) that helps to finalise the CMP and develops a strategy for its implementation (IWC, 2017b). The workshop, which would be co-sponsored by IWC, IUCN and the signatories to the Memorandum of Cooperation, will be broad-based and include representatives of national and local governments, industry (e.g., oil and gas, fishing, shipping and tourism), IGOs and NGOs. Objectives include: (1) review and updating of the CMP; (2) establishing a stakeholder Steering Group to monitor CMP implementation; (3) arrange for a coordinator of the CMP; and (4) establish a work plan and consider funding mechanisms to implement the actions of the plan. The IWC has a Voluntary Fund for Conservation, to which donations can be specifically directed towards the gray whale CMP and related work. It is expected, however, that after the first year of CMP implementation, range states will contribute the necessary funds to advance the conservation actions listed in the plan. The Workshop welcomed the support offered by IUCN with respect to organising the stakeholder workshop.

In conclusion, Donovan thanked the participants for their excellent co-operation and constructive discussions, and in particular highlighted the extensive work of Punt and Brandon. to occur as a direct result of this workshop. A workshop is planned to complete the updating of the IUCN/IWN CMP and to develop conservation-related questions to be addressed within the rangewide population modelling framework, which is summarised above. The sub-committee also stressed the importance of range states to the Memorandum of Co-operation having national co-ordinators and encouraged those who have not (e.g., the Russian Federation and Mexico) to do so result of the Committee's work. The sub-committee **endorsed** rangewide population modelling framework and looks forward to seeing results of research that uses it to address conservation related questions. ahead of the proposed meeting to update the CMP.

Table 1

Factors considered in the model scenarios. The bold values are the base-levels and the values in standard font form the basis for sensitivity analyses.

Factor	Levels
Model fitting related	
Stock hypothesis	3a, 3b, 3c, 3e, 5a, 6b
MSYR ₁₊ (western)	As for WFG
MSYR ₁₊ (north)	4.5% , 5.5%, Estimated (common); estimate (separately)
MSYR ₁₊ (WFG)	4.5% Estimated (common); estimate (separately)
MSYR ₁₊ (PCFG)	2%, 4.5% , 5.5%, Estimated (common); estimate (separately)
Mixing rate (migration season in BCBC)	0.28 , 0.17, 1.00
Immigration into the PCFG	0, 1, 2, 4
Bycatches and ship strikes	Numbers dead + M/SI, dead x 4 ; dead x 10; dead x 20
Pulse migrations into the PCFG	10, 20, 30
Projection-related	
Additional catch off Sakhalin (mature female)	0, 1
Catastrophic events	None , once in years 0-49, and once in years 50-99
Northern need in final year (from 150 in 2014)	340
Struck and lost rate	(0.1; odd-years; 0.5 even years) , 0.5 all years
Future effort	Constant , Increase by 100% over 100 years
Probability of a photo (struck and lost whales)	0.8; odd-years; 0.6 even years
Probability of a photo (landed whales)	0.9
Probability of false positive rate PCFG	0.05 , 0.1
Probability of false negative rate PCFG	0.25
Probability of false positive rate WFG	0.01
Probability of false negative rate WFG	0.041 (stock hypotheses 3a, 3c, 3e, 6b); 0.040 (stock hypothesis 3b); 0.049 (stock hypothesis 5a)
Probability of a sex assignment given a PCFG match	0.81

2.1.3.1 REGIONAL STUDIES

2.1.3.1.1 MEXICO

SC/67b/CMP09 summarised 2018 winter gray whale abundance in Laguna San Ignacio and the Bahía Magdalena Complex. Counts of single adult whales (breeding males and females without calves) were similar to that observed in recent years, but counts of cow-calf pairs were lower than expected compared to previous winters. In Laguna San Ignacio counts of single adult whales reached a maximum of 160 on 15 February which was greater and earlier than the 120 single whales seen on 3 March 2017, but less than the 213 single whales observed on 12 February 2016. The highest count of cow-calf pairs (49) occurred late in the season on 23 March. Fewer cow-calf pairs were seen in 2018 than 2017 (107 pairs) and 2016 (124 pairs). Within the Bahía Magdalena Complex, counts were performed in three areas where gray whales aggregate, Canal de Santo Domingo in the north, Bahía Magdalena and Bahía Almejas in the south. Counts were overall lower than those observed in 2017 but similar to the low counts observed in 2016. Several factors may have contributed to the low counts of cow-calf pairs but they do not necessarily equate to a population decline and could be the result of a temporary shift in habitat use.

The sub-committee **commended** the effort needed maintain this long time series of data and welcomed the discussions it generated regarding the comparison of counts across regions through time. Some cow-calf pairs used both areas in Mexico. Approximately 10-12 cow-calf pairs were still inhabiting Laguna San Ignacio at the end of the field season and were whales that were previously seen south in the Bahía Magdalena Complex. All of the whales that were in Laguna San Ignacio in February had left the area completely before the whales seen in Bahía Magdalena Complex were seen there. NOAA gray whale calf production surveys (late-March to May) off central California have reported normal counts at the mid-point of their 2018 survey but an additional 4 weeks of survey effort remain. Therefore, the level of calf production in 2018 as estimated by this survey has yet to be determined. An additional calf-count survey was **encouraged** for Punta Banda, Mexico, a high vantage point that extends well beyond the rest of coastline south of Ensenada, to address apparent differences in numbers of calves observed in the lagoons with counts from California.

2.1.3.2 RUSSIA

The sub-committee has had long-standing co-operation with the IUCN Western Gray Whale Advisory Panel (WGWAP) and there is a joint IUCN/IWC CMP for western gray whales. Reeves again summarised activities and findings of WGWAP since SC/67a (see Appendix 3). The two meetings of the Noise Task Force and one of the full Panel of scientists continued to focus primarily on developing a robust monitoring and mitigation plan for Sakhalin Energy's Piltun-Astokh 2018 seismic survey that will take place in June and July as ice conditions allow. The Sakhalin Energy survey is the only major noise-generating activity known to be planned for 2018, unlike 2015 when both Sakhalin Energy and Exxon Neftegas Limited conducted large-scale seismic surveys near the gray whales' Piltun feeding area. The following issues,

among others, were addressed by the panel over the past year: (1) the continuing (at least through 2016) decline of amphipod biomass in the Piltun feeding area; (b) the decision of the two oil companies to eliminate both benthic sampling and acoustic monitoring from their joint programme on gray whales; (c) the potential disturbance to whales caused by Exxon Neftegas Limited's 'sealift' operation involving transits by shallow-draft tugs and barges of the area near the mouth of the lagoon where gray whales concentrate (especially cows and calves) – an operation that began in 2016 and was completed in early July 2017; and (d) the ongoing threat of entanglement in salmon fishing gear along the Sakhalin coast (although no new entanglements of gray whales were observed or reported there in 2017).

The sub-committee again thanked Reeves and the other WGWAP members for this update and **recommended** further work be conducted to update the IUCN/IWC CMP, which is documented in the work plan (see Item 3.1).

SC/67b/CMP07 reviewed findings from 2017 field studies conducted by the Russian Gray Whale Project (formerly the Russia-U.S. Program) on gray whales feeding near Piltun Lagoon in the western North Pacific off Sakhalin Island, Russia. This research program provides a 20+ year time series (since 1997) that has served as the foundation for the assessments of the population (see SC/67b/ASI02). Photo-identification research in 2017 resulted in the identification of 46 individuals, including four calves and five previously unidentified non-calves. All cow-calf pairs observed in 2017 had previous sighting histories off Sakhalin. One of these females, first identified as calf in 2005, had never been previously observed with a calf. This new mother contributes to a total of 34 reproductive females that have been documented since 1995. The general distribution of gray whales in 2017 was similar to 2016 but notably different to that in 2015, with most of the whales encountered south of the mouth of Piltun lagoon. The authors noted that potential impacts from nearby offshore oil and gas developments, including nearly annual seismic surveying and recent barge and tug traffic in and out of Piltun Lagoon, remain a concern for the well-being of the population. Additionally, the coastal salmon trap-net fishery, which overlaps spatially and temporally with feeding gray whales during the summer and fall, continues to present considerable risk as is apparent by the recent entanglements of two whales, one in 2013 and one in 2016 (Weller *et al.*, 2011). This fisheries-related risk is of particular concern because adult females and their calves show strong fidelity to this feeding area at a critical time when the females are recovering from pregnancy and lactation and the calves are being weaned.

The sub-committee noted the continued risk of whales becoming entangled in gear placed by the salmon trap-net fishery and **encouraged** efforts be put forth to decrease this risk. Previously, an entanglement workshop was conducted and accounts of fishers' ability and willingness to disentangle whales from nets have been documented on social media (e.g., the successful disentanglement of a whale from a net on the east coast of Kamchatka in 2017), and thus, future efforts might include decreasing the likelihood of whales encountering nets.

Two papers (SC/67b/SDDNA02 and SC/67b/SDDNA03) relevant to the stock structure of North Pacific gray whales were discussed by the SD&DNA Working Group this year (Annex I under agenda item 4.2) and summaries of the discussions were presented to the CMP sub-committee. SC/67b/SDDNA02 used whole genome sequences generated from samples collected from gray whales off Sakhalin Island, Russia ($n=2$) and near Barrow, Alaska ($n=1$) to evaluate the demographic history of gray whales in the North Pacific. SC/67b/SDDNA03 utilised a panel of SNPs that were designed from these genome sequences to investigate the genetic diversity and population structure of the species. While the results of both studies are consistent with the presence of two stocks of gray whales in the North Pacific, they also provide additional information relevant to evaluating the potential for admixture between these two stocks. The sub-committee welcomed the work and **advised** that it continue such that further understanding of the stock structure hypotheses can be made.

2.1.3.1.3 JAPAN

SC/67b/CMP12 reported on the recent status of conservation and research on gray whales in Japan. During the period May 2017-April 2018, no anthropogenic mortalities were reported. Two opportunistic sightings of gray whales were made near Aogashima Island (approximately 360km south of Tokyo Bay) in May 2017 and February 2018. Photographs were taken of the sightings, which were sufficient for species identification but not for photo-identification.

The source of mortality cited for the 1996 occurrence was discussed. Some members noted that the whale bore multiple harpoons and lines (Brownell and Kasuya, 1999). The authors of SC/67b/CMP12 stated that the official records of the mortality are correct (i.e. entanglement).

2.1.3.1.4 KOREA

SC/67b/CMP11 reported on the possible occurrence of a gray whale off Korea. A video clip taken of what appears to be a gray whale was uploaded to YouTube in 2015. The whale in the video was swimming near a port in Samcheok located on the east coast of Korea. Work will continue to confirm the species identification

The stock to which the sighting potentially belongs to was discussed given that the Korean stock has a small probability of existence. The sub-committee **encouraged** the collection of genetic samples should subsequent sightings be made. Additionally, the sub-committee thanked the authors for their presentation and their willingness to investigate sightings from social media as a form of citizen science, particularly in areas with little to no information on critically endangered species.

Attention: CG-R, SC, G

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

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

2.1.3.3 CMP

The short-term objectives for the gray whale CMP include: (1) update of the CMP in light of new information; and (2) develop conservation questions that can be assessed using the new modelling framework for gray whales rangewide.

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

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

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

2.1.4.1 NEW INFORMATION

SC/67b/SM03 reported on franciscana (*Pontoporia blainvillei*) bycatch in FMA Ia. Artisanal fishers from five locals (n=240 small boats) operating in North Espírito Santo State, Brazil were interviewed and provided information on their gear, socioeconomic status and knowledge of cetaceans. Landings information was collected from July to December in Espírito Santo (n=1,206 landings) revealing that trawling and gillnets were responsible for 83.9% of the targeted catch, which was largely comprised of shrimp and dolphinfish (*Coryphaena hippurus*). Bycatch of nine Guiana dolphins (*Sotalia guianensis*) and one unknown species were reported, two of which were captured in trawl nets and eight in gillnets. Bycatch was most likely underreported because fishers often omit information fearing penalties if they report bycatch. Future work will include a mark-recapture experiment using objects made of bamboo and other materials to simulate carcasses to evaluate the proportion of carcasses that reach beaches and are observed. This research was supported by the Italian government through the Small Cetaceans Research and Conservation Fund and by the Brazilian Fund for Biodiversity through a request for franciscana research within FMA I to reduce bycatch in surveyed and non-surveyed areas. The request for proposals was initiated in part by the Brazilian government so as to verify the effectiveness of the Brazilian ordinance (IN) 12 (e.g., gill-net regulations and no-take zones), which was put in place to reduce the impact of fishing on protected species.

The sub-committee discussed the overlap of Guiana dolphins with franciscanas and it was noted that they inhabit the same areas and prey on similar food items, however, the diet of Guiana dolphins is more diverse than that of franciscana (Cremer *et al.*, 2012). Fishers have some difficulty distinguishing between the species. Neither species is brought back to shore by fishers because of the fear of penalties, and instead, bycatch is sometimes used as shark bait. Some bycatch is reported to the strandings network which report to the SIMMAM database, which has almost 3,000 records of stranded franciscana, spanning more than 35 years (Barreto *et al.*, 2004). Actions have been taken to promote collaboration with fishers regarding the use of bycatch-related carcasses for research purposes.

The sub-committee requested additional details regarding the methods of the mark-recapture experiment and **encouraged** efforts towards an observer program rather than the proposed experiment. If the experiment does take place, the use of

actual carcasses were **encouraged** to increase the robustness of the results. At present, experiments are being carried out using bamboo models of carcasses to simulate franciscana drift rates. It was suggested that the use of actual carcasses would be more informative. The use of alternative floating material is being used because of the lack of available franciscana carcasses in adequate numbers for statistical robustness. It is believed that drift rates from alternative floating materials will be more informative than drift rates inferred from other areas or other species because the continental shelf is very wide in this area, which leads to differences in currents and other factors that make extrapolating drift rates difficult.

SC/67b/SM05 reported results of a project funded by the IWC Small Cetacean Fund and the Government of Italy to assess the characteristics of the fisheries that operate within franciscana management area (FMA) Ib, assess the compliance of fishers with IN12 and evaluate areas that a high risk of franciscana bycatch. FMA I corresponds to the northern portion of the franciscana distribution, including the coasts of Rio de Janeiro and Espírito Santo, and is geographically isolated from FMA 2-4. The FMA includes two populations, FMA Ia and Ib, with bycatch being a threat to both populations. Quantitative estimates of fishery-associated mortality were not available for FMA Ia and are greater than 10 years old for FMA Ib. The area from Atafona (São João da Barra) to Macaé, off Cabo de São Tomé, should be considered the main area of incidental captures of franciscanas within FMA Ib. The ports of Macaé, Tamoios (Cabo Frio) and Armação dos Búzios remain unsurveyed and it is recommended that they be surveyed in the future, particularly Tamoios because the fishery in this area coincides with a high diversity of marine megafauna. Aerial surveys highlighted the use of a narrow stretch of coast, from Barra do Furado (Quissamã) to Farol de São Thomé (Campos dos Goytacazes), by franciscana and Guiana dolphins. The area is also used by many gill-net boats. The compliance of fisheries with IN12 was found to be limited and it was poorly enforced in all visited locations. Conservation of the species could improve with the potential establishment of the Mosaic Jurubatiba Whale Heritage Site, for which franciscana is the flagship species.

The sub-committee emphasised the importance of research to determine the effectiveness of management procedures, such as was done in this study.

2.1.4.2 PROGRESS WITH THE CMP

SC/67b/CMP16 summarised activities developed under the CMP for franciscana and progress made during the period May 2017-April 2018 in Argentina and Brazil. The overall objective of the CMP, which was submitted by Argentina, Brazil and Uruguay (IWC/66/CC11) and adopted in 2016, is to protect franciscana habitat and minimise anthropogenic threats, in particular bycatch. The CMP includes seven high priority actions, ranging from public awareness and capacity building through research to mitigation. Coordination with Uruguay to implement the CMP in this area will be initiated during a workshop that will take place in May 2018 with the main stakeholders. The CMP is funded by the IWC CMP Voluntary Funds and the World Wildlife Fund.

The sub-committee highlighted the usefulness of the actions included in the CMP towards future assessments of the status of franciscana, which is imperative for determining the fruitfulness of conservation efforts. Previously, it was difficult to gather information from the Buenos Aires fisheries because of the lack of unionisation and the difficulty in placing observers on unregulated vessels. An ‘informal’ observer program was established in 2004 and observers currently cover 30% of the fleet. Additionally, remote electronic monitoring, which has been considered a financially viable alternative in other areas, was noted as a potentially viable option for monitoring bycatch in industrial fisheries in the area.

Attention: CG-R

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

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

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

SC/67b/CMP10 summarised the progress of the Arabian Sea Whale Network (ASWN), an informal collaboration among researchers, consultants and conservation and governmental organisations interested in the conservation of whale populations throughout the Northern Indian Ocean. Since the formation of the network in 2015, ASWN partners have expanded their efforts to collect data on whale distribution and conservation status. Research coming from Oman, Pakistan, India and Sri Lanka was presented to several sub-committees at this meeting.

The ASWN provides a mechanism with which to disseminate and advocate for research. A membership database is regularly updated to facilitate the exchange of information. A website (arabianseawhalenetwork.org), which is receiving increasing levels of visitor traffic from around the world, is also regularly updated. Increased awareness has led to

improved reporting of incidental sightings of humpback whales throughout the Arabian Sea through social media and other means. Additionally, awareness efforts led by WWF Pakistan and other conservation bodies led to the declaration of two marine protected areas in Pakistan, Astola Island and Indus Canyon.

The Arabian Sea humpback whale is considered the network's flagship species and many activities and communications are focused on this endangered, isolated and non-migratory population of whales. For example, the regional online data platform, created in collaboration with Wild Me (*wildme.org/*) and Flukebook (*Flukebook.org*), uses artificial intelligence to match photographic identifications of humpbacks but also acts as a sightings database for all species (SC/67b/PH03). A four-day workshop was held to introduce members to and evaluate the data platform as well as update members on research activities in Oman, India, Pakistan and Sri Lanka (SC/67b/ForInfo07). One of the ASWN's primary goals is to promote and foster research and collaboration in previously unsurveyed parts of the Arabian Sea humpback whales' suspected range. Ensuring the continuation of research efforts in Oman, where surveys have been conducted since 2000, is another primary goal. A whale tagged during one of these surveys increased media attention for Arabian Sea humpback whales after it crossed from the Sultanate of Oman to the southern tip of India and back again. Information regarding the whereabouts of the whale were shared across the network and led to the mobilisation of a research team in India to search for the whale.

A Concerted Action for Arabian Sea humpback whales under the Convention on Migratory Species (CMS; SC/67b/ForInfo06) was drafted and passed with wide support from Arabian Sea range states at the CMS COP in October 2017. It is hoped that this Concerted Action can be implemented in conjunction with a CMP as a means to translate current research and conservation efforts and plans into concrete, government-supported conservation measures in Arabian Sea humpback whale range states.

The sub-committee **commended** efforts to develop the Concerted Action and was impressed by the level of detail it includes, already covering many of the elements required for a CMP. The sub-committee **advised** that efforts are continued to work toward a joint CMS-IWC CMP.

The sub-committee supported the collaborative efforts of members of the ASWN and **encouraged** that they continue. Specifically, it was **advised** that capacity building for local scientists be continued such that surveys can be deployed in suspected areas of humpback whale distribution and data can be gathered for future assessments. A future funding source will be needed to support coordination of the network and regional-level conservation efforts. The funding provided by Emirates Wildlife Society-WWF and WWF Pakistan for the first two years of ASWN coordination has run out.

The observer programme initiated by WWF-Pakistan (SC/67b/CMP05) that utilises crew members of tuna gill-net vessels operating along Pakistan's coast as observers now includes 85 vessels and reported 95 whale sightings in 2017. Sightings included 42 sightings of Arabian Sea humpback whales, 13 sightings of blue whales, 5 sightings of Bryde's whales, 4 sightings of sperm whales, 1 sighting of killer whales and 30 sightings of baleen whales that could not be identified to species level due to lack of adequate photographic or video documentation. The data revealed three main areas of concentration, between Ormara and Phor, southwest of Karachi and the Indus Canyon area. Sightings were concentrated during the months of November and December, but it is not clear if the timing of the sightings reflects the seasonal distribution of whales or the seasonal nature of fishing effort. Targeted surveys across seasons were **encouraged** to tease apart questions related to the timing of whale distributions. These sightings represent the first wide-ranging effort to collect sightings since whaling in this area and can be used to inform further studies including where to perform dedicated whale surveys. Placing university educated observers on fishing boats in this area is limited because of the basic conditions and, instead, efforts have been placed towards educating the crew on being observers even though sighting whales will always remain a task secondary to fishing. The sub-committee **advised** that the crew-based observer programme, for which funding expires in December 2018, be continued.

SC/67b/CMP13 reported on the research of Arabian Sea humpback whales in Oman. Small-vessel surveys were conducted over two weeks in November 2017 with the primary objective of instrumenting humpbacks with satellite tags and the secondary objective of assessing whale health using unoccupied aerial systems (drones). Five satellite tags were deployed, transmitting for 18 to 120 days. Four of the tagged whales remained over the continental shelf of central and southern Oman. The fifth was tracked for four months from the Gulf of Masirah (site of tagging), across the Arabian Sea to Vasco de Gama, down to the Gulf of Manar off the southern tip of India and back to the site of tagging. This satellite track represents the first record of the movement of a whale across the Arabian Sea and helped to fill gaps in knowledge about their spatial ecology and could inform locations for future research in unsurveyed areas. Analysis of high resolution images from the unoccupied aerial systems provided length-width relationships of seven whales, blow samples from three whales and coverage of tattoo-like skin disease measured on the dorsal surface (0.5-75.0%) from seven whales. The unoccupied aerial systems appeared to be successful in measuring whale health and the authors advised that it be integrated as a standard feature of future research to develop long-term metrics for tracking whale health. The authors recommend continuing the investigation of broader spatial ecology of whales across the region whilst mitigation efforts in areas of known critical habitat are expedited.

The sub-committee **commended** the efforts put forth to collect information on the movement of humpback whales in the Arabian Sea. The outcome of this work has important implications for future assessments of stock definitions and status. The sub-committee **advised** that the tagging efforts continue and that body condition results be compared to images from

unoccupied aerial systems used in other study areas (e.g., North Atlantic) and that body condition be compared to stock C in the southern hemisphere, which is the presumed source population for whales in the Arabian Sea. It also **advised** that photographs be assessed for evidence of anthropogenic threats.

The sub-committee received information on preliminary estimates of survival and current abundance of Arabian Sea humpback whales. Estimates were based on capture histories of 85 whales photo-identified between 2000 and 2016 off the coast of Oman. The analyses demonstrated that sightings of whales in each field season are generally few and that sample sizes varied widely within each season. Sampling coverage in recent years has been geographically restricted to two known ‘hotspots’ and was focused on finding whales to deploy satellite tags. This non-random approach violates some key assumptions of mark-recapture models and analyses need to account for sources of heterogeneity (Hammond, 1986; Hammond *et al.*, 1990; Barlow *et al.* 2011). The estimates of abundance, which were not submitted to the ASI subcommittee, were believed to be negatively biased. Future research will apply spatially-explicit mark-recapture and survival models to this dataset. The subcommittee **advised** that an intersessional working group (email correspondence) be formed to review the methods thereby increasing the robustness of the estimates that will be provided to the ASI subcommittee in SC/68a.

SC/67b/CMP15 provided an update on recent sightings ($n=2$) and strandings ($n=8$) of baleen whales (humpback whales, Bryde’s whales and blue whales) from the west coast of India (including the states of Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu). An 8m humpback whale was reported on 21 September, 2017 as a live stranding and was refloated by fishermen only to strand dead 2 days later. There are some suspicions that this whale was not an Arabian Sea animal based on external appearance. An offshore survey was conducted as part of a marine mammal research methods workshop carried out by NOAA (lead), the University of Washington and the Government of India in December 2017. Additionally, the report summarised the presence of whales and fishers’ perception about baleen whales elicited during an extensive campaign to conduct interviews among fishing communities in south Gujarat, Goa, Kerala and Tamil Nadu. Seven humpback whale hot-spots were identified, which appear to be most commonly used during the months of January to March, though sightings were reported from September onwards. In particular fishermen in Kanyakumari (west Tamil Nadu) reported seeing and hearing humpback whales, usually in the months of January to March. Three fishermen described freeing whales from gill nets. Future work will include systematic small-boat surveys that will include hydrophones as well as more intensive interview surveys in southern states.

In discussion it was noted that there were many more strandings than sightings, which likely the result of increased effort. The sub-committee concurred with the SH sub-committee that the collection of genetic information would be helpful for identifying stock structures within the area.

SC/67b/CMP19 reported on geographic and temporal (2011-13) variation in songs of humpback whales in the Arabian Sea collected from long-term acoustic monitoring off the coast of Oman. Samples were compared with samples collected from Reunion Island and Comoros Islands in the southwest Indian Ocean during the same period, as well as song fragments collected off the west coast of India in 2011. Songs from the Arabian Sea and the southwest Indian Ocean were distinct, with no evidence of shared phrases, suggesting isolation given our current understanding of humpback song dynamics. Song fragments recorded off western India were composed of two phrases present in the Oman song, suggesting continuity across the Arabian Sea. Songs of southwest Indian Ocean animals from multiple simultaneous singers were recorded off the coast of Oman over a 25-day period in August 2012 (Boreal summer, Austral winter); it was concluded that SW Indian Ocean whales moved into the Arabian Sea and this may be more common than currently thought. There was no indication of the adoption of song material and no cultural diffusion of songs into the songs of the Arabian Sea. The low level of temporal variation (i.e., no change over the three years) shown by the Arabian Sea males along with the lack of adoption of the Southwest Indian Ocean song material confirms the uniqueness and distinct nature of the Arabian Sea population. Behavioural isolation mechanisms were hypothesised to inhibit its mixing with other populations, thereby exacerbating its vulnerability to conservation threats. Continued monitoring is **advised** to: (1) detect the movement of southwestern Indian Ocean animals in Boreal winter; (2) document potential diffusion of southwestern Indian Ocean song; (3) provide a long-term data set for the comparison of songs across Oman, Pakistan and India to assess continuity of whales in the Arabian Sea; and (4) evaluate the unprecedented temporal stasis of song in the Arabian Sea.

Madhusudhana *et al.* (2018) reported on humpback whale songs recorded off Grande Island, Goa, India (central west coast of India in the eastern Arabian Sea) during March 2017. Six of the nine days had fragments of humpback songs and were used to conduct a unit-based analysis to describe the acoustic characteristics of the units (notes) and make inferences regarding phrases. However, no phrase, theme or song-level analysis was presented due to the limitations of this sample scheme (1 min every 15 min).

These recordings are informative for the designation of population boundaries, particularly given the knowledge that humpback whale songs tend to be more mutable than other baleen songs. For example, songs of whales in the southern Pacific Ocean almost always originate in Australia in the west and move to Polynesia in the east. The acoustic recordings of humpback whale presence off the west coast of India and the recorded movement of a satellite tag from Oman to the west and south coasts of India highlight the apparent importance of habitat off the coasts of India. The sub-committee **advised** that the research program continue to monitor songs of Arabian Sea humpback whales and that additional data

sets be acquired (e.g., Mahanty *et al.*, 2015; Madhusudhana *et al.*, 2018) for comparison purposes, particularly from the southwest Indian Ocean, if they exist, to further evaluate the continuity in song and population connectivity.

Attention: G, SG-A, SG-A

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

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

Attention: C-A, S

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

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

2.2.2 Other species/populations

2.2.2.1 MEDITERRANEAN FIN WHALE CMP

Donovan reported on the endorsement of the concept of a CMP by ACCOBAMS for fin whales in the Mediterranean Sea. A small group will meet in the summer of 2018 to draft an outline of the CMP that will be presented at SC/68a. Additionally, ACCOBAMS is seeking information regarding the conservation status of additional species to determine if they too should have CMPs.

2.2.2.1 SOUTH AMERICAN RIVER DOLPHIN

Advice was sought regarding the development of a CMP for South American River Dolphins, which currently have several actions plans endorsed by various range states. A draft CMP will be discussed at SC/68a.

Attention: CG-A

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

3. WORKPLAN AND BUDGET REQUESTS FOR 2019-20

3.1 Work plan and intersessional groups

The sub-committee's work plan and intersessional groups are found in Table 2 and Table 3.

Table 2

Summary of the work plan for the sub-committee on conservation management plans (CMP).

Item	Intersessional 2018/19	2019 Annual Meeting (SC/68a)	2020 Annual Meeting (SC/68b)
Southeast Pacific right whales		Review progress on scientific aspects of CMP	Review progress on scientific aspects of CMP
South Atlantic right whales		Review progress on scientific aspects of CMP	Review progress on scientific aspects of CMP
Gray whales Franciscana	Workshop	Prepare for in-depth review	
Humpback whales in the northern Indian Ocean	Abundance estimates (email)	Review progress on the development of a CMP	Review progress on scientific aspects of CMP
Mediterranean fin whales		Review progress on the development of a CMP	
South American river dolphin		Review progress on the development of a CMP	

Table 3

Summary of intersessional group for the 2018-19 time period that will report back to the conservation management plan (CMP) sub-committee.

Type	Group	Terms of Reference	Members
	Workshop	Continue to guide the rangewide assessment	Donovan (Convenor), Punt, R. Reeves
	Abundance estimates	Guide the methods of the abundance estimates for Arabian Sea humpback whales	Collins

3.2 Budget requests

The sub-committee **thanked** the members of the small working group for prioritising the submitted budget requests. Five requests for funding (Table 4) were prioritised. The small working group agreed that a better process for evaluating the funding proposals is needed in the future. Perhaps most importantly, adequate time is needed for their review which would be facilitated by their early submittal.

Table 4

Summary of budget requests for the 2018-2020 period from the sub-committee on conservation management plans (CMP). For an explanation of each project see main text.

Title	2019	2020 (£)
Abundance estimates of the franciscana dolphin off Buenos Aires province, Argentina	7,140	
Workshop to complete the updating of the IUCN/IWC CMP on western gray whales and to develop conservation-related questions to be addressed within the rangewide population modelling framework	10,500	
Passive acoustic monitoring of the Eastern South Pacific southern right whale, a key to improve conservation management plan outputs	13,700	16,800
A quantitative assessment of threats to Arabian Sea humpback whales using existing photographic and UAV data	9,500	
Population dynamics of southern right whales at Peninsula Valdés, Argentina: the influence of kelp gull lesions on the health, changes in increase and mortality rates in the context of a density-dependent process	19,130	

4. ADOPTION OF REPORT

The Report was adopted at 10:03 on 03 May 2018. The sub-committee **thanked** Walløe and Urbán for their excellent Chairmanship and Johnson for excellent rapporteuring.

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Appendix 1

AGENDA

1. Convenor's opening remarks (Convenors: Walløe, Urbán Ramírez)
2. Election of Chair
3. Appointment of rapporteur(s) (Kelli Johnson suggested)
4. Adoption of agenda
5. Review of available documents
6. Stocks that are or might be the subject of Conservation Management Plans (CMP)
 - 6.1 Stocks with existing CMPs
 - 6.1.1 SE Pacific southern right whales
 - 6.1.2 SW Atlantic southern right whales
 - 6.1.3 North Pacific gray whales
 - 6.1.4 Franciscana
 - 6.2 Progress with identified priorities
 - 6.2.1 Humpback whales in the northern Indian Ocean including the Arabian Sea
 - 6.2.2 Other species/populations
8. Workplan and budgets requests for 2019-20
9. Adoption of Report

Appendix 2

ACTIONS RELATED TO THE SOUTHWEST ATLANTIC SOUTHERN RIGHT WHALE CMP IN BRAZIL (2016-18)

Juliana Di Tullio, Fábila Luna – SWA-SRW-CMP co-ordinators

Collaborators: Karina Groch, Luciano Dalla Rosa, Eduardo Renault-Braga, André Barreto, Elisa Seyboth, Camila Domit, Eduardo Secchi, Miguel Iñiguez Bessega, Alexandre Zerbini, Milton Marcondes, Salvatore Siciliano, Pedro F. Fruct.

Monitoring Actions

MON-01: Ensure long-term monitoring of abundance, trends and biological parameters.

- (1) The Project Baleia Franca/Instituto Australis, located in the State of Santa Catarina, southern Brazil, has been monitoring southern right whales with aerial surveys since 1987. This area holds the largest breeding ground of this species in Brazil and the second largest in the western South Atlantic. This area includes an Environmental Protection Area (EPA; Brazilian Government Federal Decree of 14 September 2000) created to manage human activities in a region that is key to the life cycle of southern right whales in Brazil. Results of the aerial surveys conducted in 2016 and 2017 are presented as follows.
 - The total area monitored varies between years, but the area between Cabo de Santa Marta (28°36'35"S) and Pântano do Sul beach (27°53'00"S) is regularly monitored since 1997. Surveys followed a parallel trajectory at a distance of approximately 500m from shore and at a tentative altitude of 300m. The search for individuals was restricted to a stripe of up to 1500m from shore, where mother-calf pairs concentrate. The number of whales varied over time, particularly after 2002. In 2006 the maximum number of whales (194). However, in the last three years this number has dropped. In 2017, two aerial surveys were conducted and accounted for 29 individuals in the end of July and 49 in September. The number of individuals for the 2017 season was the lowest ever since 2002. In Rio de Janeiro there were no sightings of right whales during the last two years. And in Sao Paulo state only one sighting was recorded in 2017.
 - Ongoing studies include estimation of abundance and other population parameters using Pollock's robust design applied to photo-identification data collected between 2004 and 2017, and a population viability analysis as part of a PhD by Renault-Braga.
- (2) The Humpback Whale Institute, located in Caravelas, southern Bahia State, has been gathering data on southern right whales in the northern limit of the species distribution (between 12°S to 20°S) in the Southwest Atlantic. These data are being collected opportunistically during dedicated humpback whale surveys since 1993 and will continue in the next years. Photo identification data and biopsies samples are also collected. Calves are frequently observed and one female has shown some site fidelity to Abrolhos Bank, being resighted in two different years in a period of five years.

MON-02: enhance existing strandings networks including the capacity for undertaking post-mortems.

The distribution range of the species has been monitored for strandings by 17 institutions. For example, Universidade Federal do Rio Grande-FURG has systematically surveyed the Rio Grande do Sul State coast since 1969 (Prado et al. 2016). In 2011 the Brazilian Government established a National Stranding Network, which gathers stranding data for the SIMMAM web database (www.simmam.acad.univali.br/site/). In this database for the last 3 years, there were only 09 strandings of right whales reported in south and southeast coast of Brazil.

MIT-01: Development of a regional entanglement response strategy.

In 2006, the Southern Right Whale Protected Area Management council developed a 'Stranding and Disentanglement of Marine Mammals Protocol' providing assistance and guidelines to coordinate actions and a contingency plan involving different institutions of Santa Catarina State. In 2016 and 2017, the council organised a theoretical and practical training course for 81 participants from 25 institutions. The 2016 training was part of the disentanglement program conducted by the 'Global Whale Entanglement Response Network' (IWC).

MIT-04: Develop mitigation actions to address major threats identified through the Sensitivity Atlas.

Boat-based whale watching tourism in the Southern Right Whale Protected Area has been prohibited since 2015. The protocol to evaluate whale watching activities effects in whales behaviour is being developed by researchers of the protected area management council, Instituto Australis and Universidade Estadual de Santa Catarina. The necessary government management plan for whale watching is also being finalised.

PACB-01: Develop a strategy to increase public awareness.

The Project Baleia Franca/Instituto Australis based in Itapirubá Norte (Santa Catarina) and the R3 Animal (NGO), in Florianópolis, are engaged in environment education activities to tourists and local communities focusing on southern right whale.

References published during this period

Seyboth, Elisa; Groch, Karina R.; Dalla Rosa, Luciano; Reid, Keith ; Flores, Paulo A. C.; Secchi, Eduardo R. 2016. Southern Right Whale (*Eubalaena australis*) Reproductive Success is Influenced by Krill (*Euphausia superba*) Density and Climate. *Scientific Reports*, v. 6, p. 28205.

Abstract: Seyboth et al. (2016) analysed annual data on southern right whale number of calves obtained from aerial surveys carried out between 1997 and 2013 in southern Brazil, where the species concentrate during their breeding season. The number of calves recorded each year varied from 7 to 43 ($x = 21.11, \pm 11.88$). Using cross-correlation analysis Seyboth et al. (2016) examined the response of the species to climate anomalies and krill densities. Significant correlations were found with krill densities ($r = 0.69, p = 0.002, \text{lag } 0 \text{ years}$), Oceanic Niño Index ($r = -0.65, p = 0.03, \text{lag } 6 \text{ years}$), Antarctic Oscillation ($r = 0.76, p = 0.01, \text{lag } 7 \text{ years}$) and Antarctic sea ice area ($r = -0.68, p = 0.002, \text{lag } 0 \text{ years}$). Results suggest that global climate indices influence southern right whale breeding success in southern Brazil by determining variation in food (krill) availability for the species. Therefore, increased frequency of years with reduced krill abundance, due to global warming, is likely to reduce the current rate of recovery of southern right whales from historical overexploitation.

Renault-Braga, Eduardo P.; Groch, Karina R.; Flores, Paulo A.C.; Secchi, Eduardo R.; Dalla Rosa, Luciano. In review. Area usage estimation and spatio-temporal variability in distribution patterns of southern right whales, *Eubalaena australis*, of southern Brazil. *Marine Ecology*.

Abstract: Renault-Braga et al. (in review) estimated area usage and investigated spatio-temporal variability in distribution patterns of southern right whales, *Eubalaena australis*, in southern Brazil, from aerial surveys conducted between 2003 and 2012. Results showed considerable variation in area usage within and among years, and recent changes in the general distribution pattern of right whales in this calving ground. The number of right whales sighted in these aerial surveys was also modeled as a function of environmental, physiographic and temporal variables using generalised additive models, including a hurdle model (Renault-Braga, in prep). The models confirm September as the month of peak abundance in the region, and suggest, for example, that southern right whales prefer areas with low declivity and depths shallower than 10m. In addition, the Ribanceira/Ibiraquera region stood out as the area with higher numbers of whales in the region.

Appendix 3

PROGRESS REPORT ON IUCN WESTERN GRAY WHALE ADVISORY PANEL (WGWAP) WORK FROM JUNE 2017 TO MAY 2018

Reeves, R., Weller, D., Cooke, J., Donovan, G.

The Western Gray Whale Advisory Panel (WGWAP)¹, which is convened by the International Union for Conservation of Nature (IUCN), continued to provide advice to various parties, but particularly to Sakhalin Energy Investment Company (SEIC), concerning the gray whales that feed each summer off Sakhalin Island, Russia. Since SC/67a, there has been no major change in the Panel's composition and remit although a continued reduction in budget has required further scaling back the Panel's range of activities. Reeves and Donovan continue as Co-chairs and Cooke and Weller as members. As indicated last year (Reeves *et al.*, 2018), IUCN and Sakhalin Energy agreed to extend the WGWAP project for a third five-year term from 1 January 2017.

As last year, three formal meetings took place between June 2017 and May 2018:

- (1) 13th meeting of the Noise Task Force (NTF-13), November 2017 in Amsterdam, Netherlands;
- (2) 18th meeting of the Panel (WGWAP-18), November 2017 in Moscow, Russia; and
- (3) 14th meeting of the Noise Task Force (NTF-14), March 2018 in Gland, Switzerland.

Final reports of Panel and Noise Task Force (NTF) meetings are available on the WGWAP website. In addition, all recommendations made by the WGWAP and its predecessor IUCN western gray whale panels can be viewed on a searchable database².

The objectives of the 2017 and 2018 NTF meetings were: (1) evaluate updates on Sakhalin Energy's proposed 2018 Piltun-Astokh seismic survey; (2) agree and finalise a Monitoring and Mitigation Plan (MMP), a preparatory work plan and field protocols for that survey, including consideration of data collection and aspects of future analyses; and (3) review and reconsider previous non-seismic acoustic Panel recommendations. For its 2018 survey, Sakhalin Energy plans to have a standard streamer-type component covering a part of the Piltun and Astokh fields (area 350km²), expected to last 3-4 weeks). In addition, an ocean bottom node (OBN) survey of 1.5-2 weeks duration is planned, covering an area of about 50km² immediately surrounding the Company's two platforms (Piltun-A and Piltun-B). The OBN survey uses receivers deployed on the ocean floor rather than towed behind the seismic vessel. Unlike the situation in 2015 when both Sakhalin Energy and Exxon Neftegas Limited (ENL) conducted large-scale surveys near the whale feeding area, back to back, the Sakhalin Energy survey is the only major noise-generating activity known to be planned for 2018. It is expected to begin as early in June as ice conditions allow and to be completed no later than the end of July.

¹<http://www.iucn.org/western-gray-whale-advisory-panel>.

²<http://www.iucn.org/western-gray-whale-advisorypanel/recommendations>.

In its WGWAP-18 report, the Panel again emphasised the importance of regular updates to the population assessment and expressed appreciation for the work of the Russian Gray Whale Project (formerly the Russia-US Program), and of the Joint Programme, which have been collecting photo-identification data since 1995 and 2002 respectively. These data have been used as input into regular population assessments submitted to WGWAP and to the IWC Scientific Committee. Abundance and trend estimates have been generated that correspond to the various stock structure hypotheses developed for the Scientific Committee's range-wide assessment. These are presented to this meeting in document SC/67b/ASI02.

Related to these assessments and following a long-standing recommendation of the Panel endorsed by this Committee, agreement in principle has been reached to the concept of developing a combined photo-identification catalogue and related database, inclusive of information from Sakhalin and Kamchatka. This combined catalogue and database would be held under the auspices of the IWC and follow the guidelines specified in its time-tested data sharing agreement and the new guidelines for databases and catalogues.

The Panel reiterated its concern about an apparent long-term decline in amphipod biomass in the Piltun feeding area because of the implications for gray whale feeding. This decline appeared to be continuing at least through 2016. The Panel's recommendation that the joint research programme of the two oil and gas companies (Sakhalin Energy and Exxon Neftegas Limited [ENL]) explore the nature and causes of this apparent decline in greater detail and report on findings has yet to be implemented although ENL representatives have reported that a major study is nearing completion and will be submitted for publication shortly. No benthic sampling was conducted during the 2017 open-water season and none is planned for the 2018 season. The two companies have substantially scaled back their gray whale field efforts since 2016, eliminating both the benthic sampling and acoustic monitoring components and the future of the entire program is uncertain.

At the last two WGWAP meetings, representatives of ENL provided summaries of the monitoring and mitigation work conducted in association with a major 'sealift' operation to support construction of a temporary offloading facility within Piltun Lagoon. The operation, which involved numerous transits by shallow-draft tugs and barges of the area near the mouth of the lagoon where gray whales concentrate (especially mothers and calves), was completed in early July 2017. The Panel concluded in the report of its November 2017 meeting that this had been 'a well-planned and well-executed operation'.

The issue of gray whale entanglement in fishing gear continued to be a significant concern and the document prepared for WGWAP and submitted last year (SC/67a/HIM17) has been revised and submitted for journal publication. No new entanglements were observed and reported at Sakhalin in 2017.

The ongoing collaboration between IWC and WGWAP in 2017-18 led to further progress with model testing of gray whale stock identity hypotheses, updating and revision of scientific components of the IUCN/IWC Western Gray Whale Conservation Management Plan to be implemented under the IWC Memorandum of Cooperation among the participating range states. Preparations for a western gray whale stakeholder workshop co-sponsored by IWC and IUCN are underway – it is anticipated to be held in early 2019.

REFERENCE

Reeves, R., Weller, D., Cooke, J. and Donovan, G. 2018. Progress report on IUCN Western Gray Whale Advisory Panel work from June 2016 to May 2017. *J. Cetacean Res. Manage.* 19 (Suppl.):361.