Annex F

Report of the Sub-Committee on Bowhead, Right and Gray Whales

Members: Alps, Baird, Bando, Bickham, Bjørge, Brandão, Brownell, Cooke, Crespo, Donovan, Findlay, George, Givens, Goodman, Haug, Ivashchenko, Kato, Kim, Lang, Leslie, Litovka, Maeda, Manley, Mate, Matsuoka, Mikhno, Moore, Moronuki, Nakamura, Okazoe, Perryman, Prewitt, Reeves, Rojas-Bracho, Rosenbaum, Scordino, Sironi, Stimmelmayr, Suydam, Thomas, Tiedemann, Walløe, Weller, Witting, Zeh, Zerbini.

1. INTRODUCTORY ITEMS

1.1 Opening remarks, election of Chair and appointment of rapporteurs

Walløe welcomed the participants and was elected Chair. Double, Scordino and Suydam were appointed to act as rapporteurs.

1.2 Adoption of Agenda

The adopted agenda is given as Appendix 1.

1.3 Review of available documents

The documents available for discussion by the sub-committee included SC/66a/BRG01-11, SC/66a/BRG13-23, SC/66a/Rep08-09, SC/66a/IA07, SC/66a/HIM15, George *et al.* (In press), Boertmann *et al.* (2015) and Mate *et al.* (2015).

2. BOWHEAD WHALES

2.1 Bering-Chukchi-Beaufort (B-C-B) Seas stock of bowhead whales

2.1.1 New biological information

SC/66a/BRG03 presented an update on the 2011 Bowhead Whale Aerial Abundance Spring Survey photo analysis. Aerial photographic surveys for bowhead whales were conducted near Point Barrow, Alaska, from 19 April to 6 June in 2011. A total 6,801 bowhead whale images were obtained (not accounting for resightings). After within-season matching, the sample size was reduced to 2,123 uniquely identified bowhead whales. There were 32 between-day recaptures (1.5% of the unique whale sightings) and 72 calves (3.4%) were photographed. After scoring, there were 478 marked whales (22.5%) in the photographically captured population; the proportion of marked whales is similar to past surveys. The within-season matching effort and scoring of the 2011 photographs is completed. Effort is currently focused on comparing 2011 against photos taken in the 2003, 2004, 2005 aerial abundance surveys and is nearly completed, and work continues for surveys of the 1980s for estimating survival rates.

The authors expressed their gratitude to the aerial survey crew for a job well done and reported that they expect to have a new population abundance estimate at the 2016 meeting.

The sub-committee noted that the comparison of photographs taken in 2011 to photographs taken during surveys in 1985 and 1986 will provide very important estimates of survival and growth rates. The authors hope to complete the comparison to 1985 and 1986 this year.

George *et al.* (In press) examined correlations between the body condition of B-C-B bowhead whales and summer sea ice conditions and upwelling-favourable wind in the Beaufort Sea. A long term dataset collected from whales harvested by Alaskan Eskimos was used to estimate various body condition indices (BCI's) for individual whales but relied mainly on a bowhead girth/length metric to compute BCI. A series of offshore regions frequented by bowhead whales in summer were delineated and used to quantify inter-annual summertime environmental conditions including: (a) average percent open water; (b) duration of the ice-melt season; (c) date of freeze-up; and (d) mean upwelling-favourable winds (in the study area). Body condition was analysed relative to these metrics for both the preceding summer feeding season and the previous three seasons combined. The authors' analysis indicates a significant increase in the long term trend in an axillary girth-based body condition index (BCI_{girth}) over the study period (1989-2011). The authors suggest that the increase in BCI_{girth} is likely associated with the trend in overall reduction of sea ice, including increased duration of open water, changes in upwelling potential (wind stress), and possibly higher primary production in the Pacific Arctic marine ecosystem favouring water-column invertebrates. A strong seasonal difference in BCI's was noted for sub-adult bowheads, presumably associated with summer feeding; however, yearlings were found to drop in BCI over at least the first summer after weaning. The results indicate an overall increase in bowhead whale body condition and a positive correlation with summer sea ice loss over the last 2.5 decades in the Pacific Arctic. The authors speculate that sea ice loss has positive effects on secondary trophic production within the B-C-B bowhead's summer feeding region. While not part of this study, the abundance of B-C-B bowheads increased markedly over the same period (e.g. SC/66a/BRG09).

The sub-committee thanked the authors for presenting this paper because there is increasing concern regarding the impacts of climate change and the loss of sea ice on bowhead whales and other arctic species. The sub-committee believed that caution was warranted when interpreting the authors' data because it is very difficult to project how bowheads will fare with projected future loss of sea ice. For example, it is possible that in the future the range of other baleen whale species will expand into the present day range of bowhead whales which would cause increased competition for prey. However, it was also noted that Yankee whalers hunted bowhead whales in the Bering Sea suggesting that bowhead whales can feed successfully in open-water habitats where competition with other baleen whales occurs.

SC/66a/BRG09 presented a density dependent population dynamics model with parameterisation based on fecundity variables that can be independently, empirically estimated. Using a baseline version of this model, the authors fit a population growth trajectory for B-C-B bowhead whales using a time series of abundance estimates from the 2004 photo-id survey and ice-based surveys including the most recent in 2011 which provided a precise estimate of high abundance. Model projections begin in 1914, believed to correspond approximately to the lowest historical abundance of this stock. Unlike most past assessments, the model fitting approach employs maximum likelihood techniques. The results indicate that there is little evidence for recent density

regulation, with no deceleration of population increase in the most recent 30 years; Givens *et al.* (2013) estimated a 3.7% (95% CI 2.8-4.7%) annual increase rate from survey data. SC/66a/BRG09 estimated 1914 abundance to be about 1,100 whales and the model fit the 2011 survey estimate of 16,892 whales (95% CI 15,704-18,928 whales) very well. Estimates of survival rates imply realistic age expectancies, with 11% of calves expected to survive to age 100. Estimates of fecundity parameters imply strong reproduction and a possible calving interval as short as two years. One implication of these findings is that B-C-B bowhead status has changed substantially since the *Bowhead SLA* was developed and tested, with new evidence of a large, steadily increasing stock. The *Bowhead SLA Evaluation Trials* may have insufficiently explored scenarios where continuing need satisfaction would be the primary concern in the face of negligible conservation risk.

The sub-committee thanked the authors for this new analysis on the population dynamics of B-C-B bowhead whales. In discussion, sub-committee members offered ideas that might enable better estimation of carrying capacity and/or some demographic parameters. Environmental variability can reduce the ability of a deterministic model to detect density regulation so it could be helpful to include environmental variability in the model if possible. It was also suggested that including length data may help with estimation of demographic parameters in the model.

Witting suggested that using alternative population dynamics models could produce population trajectory estimates that were consistent with both the historical catch record and the current abundance estimates. This would eliminate the need to discard any early catch data. He presented results from a selection-delayed population dynamics model (Witting, 2013) which fit the data well. Specifically, the selection-delayed population dynamics model resulted in prediction of carrying capacity that is broadly similar to past estimates of carrying capacity of B-C-B bowhead whales.

The sub-committee **encouraged** ongoing work on the population dynamics of B-C-B bowhead whales and the continuation of body condition and ecosystem relevant studies, as reported in George *et al.* (In press).

2.1.2 New catch information

Harvest data from the aboriginal hunt for bowhead whales in Alaska were presented in SC/66a/BRG06. In 2014, 53 bowhead whales were struck resulting in 38 animals landed. Total landed for the hunt in 2014 was similar to the average over the past 10 years (2004-13: mean of landed=41.6; SD=8.6). Efficiency (no. landed/no. struck) in 2014 was 72% which was similar to the average for the past 10 years (mean of efficiency=76.5%; SD=7%). Of the landed whales, 18 were females, 19 were males, and sex was not determined for one animal. Based on total length, four of the 18 females were presumed mature (>13.4m in length) and at least one was pregnant.

In discussion the authors noted that although small whales (<7.5m) were harvested in Alaska, none appeared to be calves based on hunter observations and baleen length of small whales. George noted that bowhead whales have a unique biology among baleen whales in that juveniles exhibit little growth from one to four years of age resulting in suckling calves having lengths that can overlap with yearlings. This lack of growth is likely caused by the slow development of baleen plates in juveniles preventing effective feeding. Thus, baleen length is considered to be a better indicator of calf status than is whale length.

It was also noted that one whale was struck in the village of Wainright and recovered in Barrow. This whale was not reported as struck and lost because it was recovered and butchered.

SC/66a/BRG07 reported that the Russian Federation had no bowhead whale landings or struck and lost in 2014.

2.1.3 Management advice

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

2.2 Other bowhead stocks

2.2.1 New biological information

Boertmann *et al.* (2015) reported on a systematic aerial survey for walrus (*Odobaenus rosmarus*) in the Northeast Water Polynya off northeast Greenland that revealed several observations of bowhead whales. Applying distance sampling methodology in part of the polynya, the study provided an uncorrected at-surface strip census estimate of 20 bowhead whales (CV:0.58), and correcting for animals that were submerged during the passage of the plane increased the abundance to 102 whales (95% CI 32-329). This is the largest abundance of bowhead whales reported from the Greenland Sea since the days of whaling in the sixteenth to seventeenth centuries. The Northeast Water Polynya was inaccessible to vessels during the whaling period because of heavy pack ice, and it is only recently that researchers have visited this area; thus only a few sightings of bowhead whales within the area exist prior to the survey in 2009. The polynya may nevertheless be one of the most important summering grounds for the Spitsbergen stock, and the whales may benefit from advection of calanoid copepods from the productive deep basins along the coast of Svalbard east of the polynya. This discovery provides renewed hope for the Spitsbergen stock of bowhead whales that until now has shown only inconclusive signs of recovery despite more than 100 years of protection from whaling.

Brownell presented SC/66a/BRG20 for Gavrilo, about the status and distribution of the Spitsbergen population of bowhead whales in the waters around Franz-Josef Land Archipelago (FJLA), Russia. The Russian Arctic National Park (RANP) includes the northern tip of Novaya Zemlya Archipelago and FJLA. RANP also manages the refuge and is responsible for wildlife monitoring in the area, including the bowhead whale. Moore and Reeves (1993) reported 37 sightings between 1940 and 1990, and most of these were in the waters near Svalbard and Franz Josef Land. New observations were presented for the period 2010 to 2014. These observations were collected from summer surveys, opportunistic helicopter flights, and opportunistically from tourist cruise vessels and occasionally from land. Most of the records are original data collected during 2010-14. During this period, there were 109 groups which included 217 individuals. Most of the whales were encountered within the archipelago; during ice-free seasons they tended to concentrate south of the central part of Franz-Josef Land (FJL) and in the western part of the archipelago. These new data show that bowhead whales occur regularly in the area,

at least in spring and summer from April to September. Total numbers in the area might exceed 100 animals, but no small individuals or calves were observed. These new data, together with a recent report from northeast Greenland (Boertmann *et al.*, 2015), suggest that existing overall Spitsbergen bowhead population estimates (Christensen *et al.*, 1992; Kovacs *et al.*, 2009; Zeh *et al.*, 1993) may be an underestimate and should be re-evaluated.

All commercial activity is prohibited within the protected area of FJL, including commercial fishing, shipping, prospecting for mineral resources, and mining. Nevertheless, there are a number of hazards from outside the refuge. Major risks are from oil and gas development and associated seismic surveys in the surrounding shelf areas. Recent development licences include areas directly bordering the southern boundaries of the protected area, which is an important summer feeding ground for the bowhead whales. In addition, there are plans to transport petroleum products from West Siberia to the east, which will increase ship traffic in the vicinity of FJL. The military is also increasing their activities, including large-scale vessel operations and increased ship traffic in the newly designated anchorage site in the Cambridge Strait, in western FJL where bowhead whales are known to regularly occur and feed. All these human activities, especially the seismic surveys that will be conducted in the northern Russian part of the Barents Sea near FJL, require urgent measures for monitoring and research on this endangered bowhead whale population as well as protection of its important summer feeding grounds. The critical elements of a mitigation and monitoring plan, which must be developed before the start of any seismic surveys, include: collection of baseline ecological data; substantial advance planning, communication, and critical review; integrated acoustic and visual monitoring of sounds and whales during seismic operations; and systematic analysis of results to inform future planning and mitigation (Nowacek *et al.*, 2013).

The sub-committee thanked the authors for these papers on the poorly studied Spitsbergen bowhead whale stock. In discussion it was pointed out that the historic central portion of the Spitsbergen range was much further east than where the two reported studies occurred. Whales were observed south of the surveyed area while off effort suggesting that the survey may be an underestimate of the bowhead whales in the region. However, it is also possible that the extrapolation of the observed count of bowhead whales to an abundance estimate could result in an overestimate if the whales in the survey area spent more time at the surface than was expected based on findings of Hansen *et al.* (2012).

The sub-committee noted that there are recent reports of bowhead whales throughout the historic range of the Spitsbergen bowhead stock such as in the Greenland Sea (Boertmann *et al.*, 2015), in Franz Joseph Land Archipelago (SC/66a/BRG20), and acoustic and visual detections in Fram Strait (Stafford *et al.*, 2012). Recognising the small size of the Spitzbergen bowhead whale population, the sub-committee expressed concern at the news of increased industrial, military, and shipping activities occurring in the historic range of the Spitsbergen bowhead whale stock. The sub-committee requests that the Commission draws the attention of the range states to these potential threats to this small population. In particular, it draws attention to:

(1) the need to continue and intensify monitoring of the population throughout its range, ideally in a co-ordinated manner by all range states; and
(2) the guidelines for responsible practices for seismic surveys (Nowacek *et al.*, 2013) that were endorsed by the Committee and the Commission in 2014.

2.2.2 New catch information

SC/66a/BRG08 reported that two bowhead whales were landed in the eastern Arctic region of Canada out of a quota of five whales in 2014. Genetic samples were collected from one of the landed whales. In 2015, the quota will increase to seven bowhead whales.

The sub-committee thanked the Canadian government for providing catch data and quota data for future hunts. The sub-committee also expressed appreciation for the collection of genetic samples and **encouraged** future collection of genetic samples from landed whales.

Witting reported that no bowhead whales were landed or struck and lost in Greenland during 2014.

3. GRAY WHALES

3.1 Stock structure and movements

3.1.1 Report from intersessional Workshop

Donovan reported on the 2nd Workshop on the rangewide review of the population structure and status of North Pacific gray whales, La Jolla, California, 1-3 April 2015 (see SC/66a/Rep08). This Workshop was a technical follow-up to the 2014 Workshop (IWC, 2015d) that had thoroughly reviewed the available information on *inter alia* stock structure, abundance and biology with a view to developing an initial modelling framework for gray whales throughout the North Pacific. The 2015 Workshop reviewed the progress made intersessionally on recommendations made at the 2014 Workshop and the 2014 Annual Meeting of the Scientific Committee (IWC, 2015a). These included additional work on the comparison of photographic and genetic catalogues, development of Single Nucleotide Polymorphisms (SNP) assays for use with gray whales to improve genetic analyses, additional work including a new research cruise to improve sample sizes (genetic and photo-identification) for the feeding areas between northern California and Kodiak Island, with emphasis on the waters north of Washington, additional telemetry work, improved abundance estimates for PCFG (Pacific Coast Feeding Group) whales, improved early catch history data for the western North Pacific and better estimates of ship strikes and bycatches throughout the North Pacific. Focus within the Workshop was on how the additional information could feed into the modelling framework, now and in the future.

A key analysis identified at the 2014 Workshop was to examine the existing data to see what bounds could be put on the proportion of whales that feed off Sakhalin and migrate to the eastern North Pacific. Following an analysis by Cooke (2015), the Workshop concluded that if such a breeding ground exists, then the proportion of the Sakhalin animals that use it is probably lower, and possible considerably lower than 63%. The Workshop made a number of recommendations for work to be undertaken that would narrow the confidence range for this. The Workshop's primary focus was to review the excellent intersessional work undertaken by Punt (2015) to produce initial specifications and runs for an age- and sex- structured population dynamics model. The Workshop reviewed progress and in particular examined the parameterisation of the hypotheses allocated as priorities for examination at the 2014 Scientific Committee meeting and the updating of the modelling framework. This involved further schematic visualisation and clarification of the hypotheses and work to develop the catch mixing matrices and finalisation of the datasets by hypotheses. The Workshop also refined the manner in which uncertainty will be reflected in the trial structure and developed a work plan

to allow initial results to be considered at the 2015 Scientific Committee meeting. The importance of developing a plan to update the IUCN/IWC Conservation Management Plan at the 2015 Scientific Committee meeting was also noted.

The sub-committee **welcomed** the continued progress to assess the population structure and status of North Pacific gray whales, thanked Donovan and the participants and **endorsed** the recommendations. It was also noted that substantial work had been completed in the short time between the Workshop and SC/66a, although additional data and analyses are still needed, including work to further quantify the bounds on the proportion of animals that feed off Sakhalin and breed in the western North Pacific. In addition to the recommended work in SC/66a/Rep08 with respect to *inter alia* matching, it was suggested that there may also be some information from the commercial whaling period and from age structure data that could provide some insights. Cooke emphasised that if the matching is not complete, the bounds will not be valid. Weller noted that matching was in progress.

3.1.2 Population modelling

SC/66a/BRG02 outlined a sex- and age-structured population dynamics model that can represent the stock hypotheses developed during the April 2014 and 2015 rangewide reviews of population structure and status of North Pacific gray whales. The model allows for multiple breeding stocks, each of which may consist of several feeding aggregations, multiple feeding and wintering grounds, as well as migratory corridors. Animals can move permanently between feeding aggregations in a pulse or diffusively. The values for the parameters of the model can be estimated by fitting it to data on trends in relative and absolute abundance, in addition to mixing proportions based on mark-resight data, bycatch rates, and estimates of numbers immigrating into the PCFG. Example applications of the model are provided based on the recommendations during the April 2015 rangewide review of population structure and status of North Pacific gray whales.

The sub-committee thanked Punt for his efficiency and the speed at which he provided results. His initial efforts show that the model framework is working. Before drawing conclusions from the model, additional data are still needed. The additional data include: (1) abundance estimates for gray whales in feeding areas; (2) completed matching of whales seen in multiple locations; (3) data on the amount of effort related to potential bycatch from gillnets, pots, etc. (data may be available for California, USA, but perhaps not for other areas); (4) narrowing the bounds on stock composition near Sakhalin; and (5) a reality check of the assumptions about parameters including quantifying uncertainty.

Weller reported progress on photographic and genetic matching and obtaining a full list of historical and recent records of gray whales off Japan. Work with respect to updated abundance estimates should be completed next year in the case of PCFG whales. The Southwest Fisheries Science Center has completed the field work for the 2015 abundance survey of gray whales migrating south along the California coast and another is planned for 2016.

Weller also reported on progress with respect to the planned NOAA ship survey in the North Pacific for gray whales from late July to early December, referred to and welcomed in SC/66a/Rep08 as a contribution to obtaining more information on gray whales from northern waters. The specifics for that cruise, including survey design, are being developed and it is hoped that there may be one leg of the survey in early August that will focus on right whales in an area to the southeast of Kodiak Island, Alaska. The sub-committee **welcomed** the news of this cruise and **encouraged** NOAA to cover both North Pacific right whales and gray whales if possible.

3.2 Western North Pacific gray whales

3.2.1 New biological information

SC/66a/BRG10 presents the results of hormone (progesterone) and stable isotope ($\delta^{13}C$ and $\delta^{15}N$) analyses using biopsies taken near Sakhalin Island in 2011, 2012 and 2013. Tissue samples from stranded eastern gray whales were used to optimise progesterone assays for determining reproductive fitness and pregnancy and the analysis of C and N stable isotopes to assess chemical feeding ecology. Extraction of steroid hormones and analysis of progesterone was validated. The amount of blubber for progesterone extraction and pregnancy determination was optimised from 150mg to 50mg (wet weight). Female progesterone levels (n=5) ranged from levels below the detection limit (0.01ng/g) to 3.02ng/g, and male progesterone levels (n=3) ranged from 0.02-0.39ng/g. Progesterone levels have not been measured for gray whales of known reproductive status but the values reported here are consistent with those reported of non-pregnant female odontocetes and minke whales, and with males of those species (Kellar *et al.*, 2006; 2009; Mansour *et al.*, 2002; Perez *et al.*, 2011). The females were probably not pregnant. Further work planned includes measuring progesterone levels in adult females of known reproductive status further reducing minimum tissue required for assay from 50mg to 30mg.

SC/66a/BRG10 also reported on isotopic ratios of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) from 10 Sakhalin biopsy samples (epidermis): $\delta^{13}C$ ranged from -17.66 to -14.97, while $\delta^{15}N$ ranged from 11.21 to 14.26. The relatively broad range may reflect variation in feeding ecology (e.g. feeding areas, trophic levels). Validation studies on the eastern animals suggested that stable isotope ratios in the epidermis are independent of epidermal layer. The patterns of $\delta^{13}C$ and $\delta^{15}N$ (higher $\delta^{13}C$ with moderate to low $\delta^{15}N$) for the Sakhalin whales was substantially different from those from the east (higher $\delta^{15}N$ with moderate to low $\delta^{13}C$). The results suggested lower trophic level feeding for the Sakhalin animals. However caution is needed in interpreting the results given that the Sakhalin samples were from free ranging animals, while those from the east came from carcasses of stranded animals.

In discussion, the uncertainty in the comparison between the stable isotope values noted by the authors was noted and in addition, it was recognised that while the Sakhalin animals were all in the feeding areas at the time of biopsying, the eastern samples were from dead stranded whales along the migration route. It was also suggested that further comparison with addition baleen whale species was required. Results from other studies have suggested the need for additional improvement of assay performance and QA/QC work. Proposed future use of mass spectrometry for blubber hormone analysis will be helpful to move this important gray whale work forward.

The sub-committee welcomed this study and **encouraged** that where quantity of sample allowed, the biopsy samples also be used for other analyses (e.g. contaminants, stress hormones, etc.).

The current migratory routes and wintering areas of gray whales in the western North Pacific are enigmatic. Historical evidence indicates that the coastal waters off Japan were an important part of the migratory route but modern day observations of gray whales off Japan are uncommon. Fewer

than 20 sightings or strandings of gray whales in Japanese waters have been documented between 1990 and 2015 (Kato *et al.*, 2014; Nambu *et al.*, 2010). SC/66a/BRG17 reported on two gray whale sightings in 2015 off the Pacific coast of Japan. These observations include: (1) a gray whale sighted and photographed between 17 and 21 March 2015 in coastal waters off Kozu Shima Island, Japan (this same whale was also seen and photographed at Niijima Island on 22 and 24 March 2015), lateral flank and dorsal fluke images were obtained; and (2) a gray whale sighted and photographed between 19 April and 9 May 2015 in the Pacific coast waters of Suruga Bay off Shimizu, Japan, dorsal and ventral fluke images were obtained.

Photographs and videos collected during these sightings were compared to the 1994-2014 Russia-US photo-identification catalogue from Sakhalin Island, Russia (Weller and Burdin, 2015) and a confirmed match was made between Kozu Shima and Niijima (March 2015), Suruga Bay (April-May 2015) and Sakhalin Island (August 2014). This individual, first identified as a calf off Sakhalin in 2014, was observed there on three occasions together with its mother and one time alone during August 2014. The mother of this calf is a known 12 year old female. She was first sighted off Sakhalin as a calf in 2004, and 2014 was her first known calving event.

The occurrence of gray whales off the Izu Islands has been previously reported (Darling, 1994). Similarly, there are a number of relatively recent records of gray whales from the Pacific coast of Honshu (Kato *et al.*, 2014). This includes a female yearling entrapped in a set net in January 2007 that was matched to earlier photographs of it as a calf (with its mother) while on the Sakhalin feeding ground in July and August 2006 (Weller *et al.*, 2008). This match from 2006 (Sakhalin) and 2007 (Japan) along with the new matches from 2015 provide verification of a migratory link between the summer feeding ground off Sakhalin Island and waters around Japan, suggesting an unknown wintering location somewhere along the coast of Asia.

The sub-committee thanked Weller for providing information about the sightings. In discussion, Weller commented that the animal was likely 16 or 17 months old based on the barnacle ageing technique (Bradford *et al.*, 2011) that confirmed it was a calf in the previous year. The animal sighted off Kozu Shima and Niijima had not been biopsied when off Sakhalin but its mother had been. Whilst the animals seen off Sakhalin in 2006 and 2014 were both young, adult whales have also been seen off Japan. The water near where the whales were seen was clear and the bottom sandy, suggesting that the area does not support large amounts of gray whale prey and was probably a migratory route. However, some whales seen off Japan have remained there for several weeks which might suggest occasional local feeding opportunities.

SC/66a/BRG18 reported that no gray whales were seen during several cetacean sighting surveys, including JARPNII and surveys conducted by National Research Institute of Far Seas Fisheries, from spring to autumn 2014. There were three reports of opportunistic sightings of a western gray whale off Kozushima Island, located in the south of Tokyo Bay, off Miho beach in Shimuzu, Shizuoka prefecture, and off Teradomari town in Niigata prefecture in the Sea of Japan. The whale off Kozushima Island was confirmed to be the same animal sighted off Miho beach; it has also been seen off Sakhalin.

In response to the report of the sightings, the Fisheries Agency of Japan (FAJ) communicated with the Tokyo Metropolitan Government Office and prefectural governments of Shizuoka and Niigata to request these local governments to take necessary action. Upon request from the FAJ, the local governments asked their coastal communities of fishermen to be aware of these facts and reminded them of the regulation related to the conservation of gray whales in Japan in order to avoid entanglement and ship strikes. Additionally, Japan had received no reports of strandings or entanglements from other locations in the past year.

A morphological comparison among five specimens from the Pacific coast of Japan, one from Ulsan, Korea and one from California, USA was published in 2014 (Nakamura and Kato, 2014). This paper was discussed at the recent rangewide Workshop (SC/66a/Rep08). It was reported that a further study based on the cranial morphology combined with genetics is progressing to clarify whether diagnostic morphological differences between eastern and western stocks exist, with an increased number of specimens from California. It was suggested that a recent paper examining the cranial morphology of a fossil gray whale from northern California (Tsai and Boessenecker, 2015) would be helpful. That paper had suggested that gray whales had originated in the western Pacific.

Kato commented that local press had claimed that a third animal sighted off Teradomari, Japan was the same as one seen the previous year in the same place. The sub-committee **recommended** that an effort be made to obtain the photos to confirm whether this was the same animal or not.

Mate *et al.* (2015) used Argos satellite-monitored radio tags to track three gray whales from the animals that regularly feed off Sakhalin. They moved from Sakhalin across the Bering Sea and Gulf of Alaska at high speeds (~6.5km/h) into the traditional south-bound winter migration path of the gray whales that migrate along the west coast of the USA and Canada. One of the tagged whales was a 10-year old female that travelled down the West Coast of the United States to nearly the southern tip of Baja, Mexico, passing by all three major Baja breeding areas while off Baja for 42 days. She returned to Russia after 5.5 months, taking a different return route and traveling 22,500km in the round-trip. The ability of these animals to navigate across open water over long distances is novel and impressive.

The Committee welcomed publication of this information and noted that this tagging programme was carried out under the auspices of the IWC and had been a key factor in the decision to begin the rangewide review and to undertake the major comparison of photographic and genetic data from both sides of the Pacific (IWC, 2015b).

In discussion it was noted that the tagged animals went north through Unimak Pass, in the eastern Aleutian Islands, at about the same time as the eastern animals. There was about a 4-5 week separation from the timing of movements among the tagged whales that moved quickly with very few pauses, although one lingered off of British Columbia, Canada, in an area with known mysid abundance.

The sub-committee noted the value of these tagging studies and **reiterated** the value of additional telemetry effort off Sakhalin and Kamchatka (IWC, 2014) noting the discussion of this in SC/66a/Rep08.

3.2.2 Conservation status

A collaborative Russia-US research program on critically endangered western gray whales summering off northeastern Sakhalin Island, Russia, has been ongoing since 1995. SC/66a/BRG16 reviewed findings from 2014 research activities and combined these with data from previous years, in some cases ranging back to an opportunistic survey in

1994. Photo-identification research conducted off Sakhalin Island in 2014 resulted in the identification of 79 whales, including nine calves. Three previously unidentified non-calves were observed. When combined with data from 1994-2012, a catalogue of 235 photo-identified individuals has been compiled. Not all of these 235 whales can be assumed to be alive, however. Of the nine mother-calf pairs identified in 2014: (a) all nine mothers had been sighted in the study area prior to 2014; (b) seven of them have been recorded to have had multiple calves during the 1994-2014 study period; and (c) two of them were observed with a calf for the first time in 2014. A 2015 field program will begin in early July and this effort will represent the 20th year of research by the Russia-US team on western gray whales off Sakhalin Island.

The most recent population assessment by Cooke (SC/66a/BRG23) indicated that there is no immigration, and thus it is likely the new non-calves seen had been missed in previous photographic surveys.

The sub-committee **welcomed** the information from the Russia-US collaborative research program. The sub-committee also commented that it had appreciated receiving annual information in the past about the other western gray whale study near Sakhalin conducted jointly by Exxon and Sakhalin Energy. The sub-committee **encouraged** the Exxon and Sakhalin Energy programme to provide an update on the work to the 2016 Annual Meeting.

As indicated last year (IWC, 2015b), oil and gas activities continue to increase near Sakhalin. The annual progress report from the Western Gray Whale Advisory Panel (WGWAP), which is convened by the International Union for Conservation of Nature (IUCN), summarised efforts made over the past year to develop plans to mitigate a large-scale seismic survey by Sakhalin Energy scheduled to begin in early July 2015 (see Appendix 2). In addition to that survey, a much larger survey by Exxon Neftegas Ltd (ENL) is planned to begin in early June and other seismic work is expected continue off NE Sakhalin throughout the summer and until well into September 2015, with few (if any) periods when there is no seismic ensonification of some areas on or near the gray whale feeding areas. This situation is unprecedented in this area and gives cause for considerable concern.

In light of these developments, the sub-committee **stressed** the importance of agreeing a co-operative approach amongst companies, regulators and other stakeholders to consider cumulative and synergistic effects of activities on Sakhalin gray whales and the development of joint and consistent mitigation measures. It noted the guidelines for responsible seismic surveys (Nowacek *et al.*, 2013) endorsed by the Committee and Commission last year in this regard. It **recommends** that all operators become involved in studies and monitoring of Sakhalin gray whales and follow best mitigation practices to ensure protection of these whales and their habitats off Sakhalin Island. In this regard, the sub-committee noted that it has previously had reports on the scientific work of the Joint Program of Sakhalin Energy and Exxon Neftegas. This work is important and the sub-committee **encourages** the submission of papers addressing this work in the future.

The sub-committee noted that new public information provided by the company has shown that ENL's pier and causeway construction project in Piltun Lagoon, described in some detail in last year's report (IWC, 2015b), will become particularly intensive in the open-water seasons of 2016 and 2017. As indicated in a recent report by Sakhalin Energy (see Appendix 3), 'ENL's activities for 2016-17 (including construction activities, presence of vessels, materials reloading, and movement of modules through the mouth of Piltun lagoon), will make it either technically infeasible or impractical for the Company to record a seismic survey at that time due to an unknown degree of data quality degradation and unknown operational delays (longer survey period, re-recording of lines), with no practical reduction in potential exposure for marine mammals.'

The sub-committee therefore **reiterated** its concern of last year about this project (IWC, 2015a, p.32) and its possible impacts, including cumulative ones, on Sakhalin gray whales and their prey. It again **urges** the authorities to take steps to protect the Piltun lagoon area.

3.2.3 Conservation advice

The sub-committee again **acknowledged** and **welcomed** the important work of the IUCN WGWAP as reflected in the updated report provided to this meeting (see Appendix 2) and **encouraged** its continuation. It noted that the work of the WGWAP and the IWC Scientific Committee are important components of the Memorandum of Co-operation (*http://iwc.int/document-3540*) signed by three gray whale range states last year (Japan, Russian Federation, USA). It welcomes this memorandum and **encourages** other range states to sign. The sub-committee also recognised the importance of updating the IUCN/IWC Conservation Management Plan for western gray whales in light of the new information discussed *inter alia* at the two rangewide Workshops (IWC, 2015d; SC/66a/Rep08). This is discussed further under the work plan (see Item 6).

With respect to activities on the Sakhalin shelf, it is clear that that the companies have decided to proceed with major seismic surveys, on an unprecedented aggregate scale, in the vicinity of the Sakhalin gray whale feeding grounds in 2015. It appears likely that this will be followed by two successive seasons of major disturbance in and near Piltun Lagoon in connection with the ENL construction project.

The sub-committee **appreciated** the efforts made by Sakhalin Energy to respond to most of the WGWAP recommendations concerning mitigation of the potential impacts of its seismic survey on the whales and to ensure a credible monitoring and mitigation programme (MMP) is in place (Appendix 3). It also **welcomed** Sakhalin Energy's decision to include accommodation of an independent observer. It also notes that ENL have stated that they will follow the 'IUCN guidelines'. However, the details of its MMP have not been made available or reviewed.

The sub-committee **welcomed** the adoption of these guidelines (i.e the guidelines for responsible seismic practices included in Nowacek *et al.* (2013) that have also been endorsed by the IWC), **urged** their adoption by all companies and **recommended** that they have their MMPs reviewed by outside experts (e.g. the WGWAP or IWC Scientific Committee). However, the sub-committee retained **strong concerns** over the aggregate scale of disturbance this year (mainly by seismic surveys but this is also expected to be a relatively strong year for salmon runs, bringing potential associated risk of entanglement) and over the next two years (mainly by the ENL project). Therefore, the sub-committee **recommended** that greater effort be made by all concerned – companies and authorities – to ensure that industrial (and other) activities are coordinated, cumulative disturbance is minimised and credible mitigation and monitoring programmes are in place. The sub-committee also **urged** a collaborative analysis of the scientific results of the monitoring programmes of the two companies being undertaken in 2015, including input from the WGWAP and other experts outside the companies themselves.

3.3 Eastern North Pacific gray whales

3.3.1 New biological information

SC/66a/BRG19 provided information about gray whales that washed ashore dead along the coast of Chukotka, Russia. In 2013, 16 dead stranded gray whales were reported on the Arctic coast of Chukotka. In August 2014, at the Gulf of Crest (the northwestern Bering Sea), two dead gray whales were found and examined near to the village of Uelkal. Presumably they had died in 2013 and were washed ashore by a storm. A general examination of all 18 gray whale carcasses showed no killer whale bites/scars, gunshot or harpoon wounds, or traces of fishing gear. The authors concluded that they were not 'struck and lost whales', but had likely died of natural causes. The Chukotka Natives have been asked to report every finding of dead whales so they could be examined.

The sub-committee thanked the authors for the report and was pleased to hear that beached animals would be examined. The sub-committee also **encouraged** collection of genetic samples from stranded animals and comparisons between animals examined in Alaska and Chukotka.

Monitoring of gray whales in San Ignacio Lagoon and Magdalena Bay in Baja California Sur, Mexico has been occurring for many years. Results from surveys in winter 2015 are provided in SC/66a/BRG21. In San Ignacio Lagoon, surveys were conducted from 19 January to 9 April. Numbers were similar to recent past observations. The peak total count of whales in the lagoon occurred on 13 February when 79 single whales and 134 cow-calf pairs were seen. High counts of cow-calf pairs extended from 29 January to 19 February 2015, which exceeded the previous nine years. A high count of 116 single whales occurred on 8 February, which is higher than previous seasons. In Magdalena Bay, low numbers of gray whales were seen. A high count of 15 whales occurred on 27 January. Because of the low number of whales in Magdalena Bay in January and February, no surveys were conducted in March. The low counts indicate that the bay was not used extensively in 2015. High water temperature likely influenced the numbers of gray whales in Magdalena Bay. Surprisingly, humpbacks and Bryde's whales were seen near the mouth of Magdelana Bay for the first time. Residence time of gray whales in San Ignacio Lagoon ranged from one to 82 days. Photos from 2006 to 2013 provided information about calving interval, which was 2.44 years (n=75 whales). This compares to a previous estimate of 2.25 years (n=60 whales) for 1977 to 1982.

In discussion, the high counts of mothers and calves in San Ignacio Lagoon were noted. Moore commented that there have been high recent counts of calves in the northeastern Chukchi Sea, especially in 2012 and 2013 (Brower *et al.*, 2014) and suggested comparison of the numbers of calves between the two areas.

With respect to entanglement, Urbán noted that three calves were entangled inside the lagoon in 2015. The gear was likely from lobster traps because they are the only fishing gear permitted in the lagoons. Calves are typically entangled in the mouth or around fins/tails. All the entangled calves were disentangled by trained teams. There are two teams prepared and on standby to disentangle whales. It is typical that two or three calves are entangled each year. There is some information about mortalities within lagoons but few documented cases of entangled whales washing up dead along the coast of Baja California.

In response to a comment about the long duration of some of the animals in the lagoons, Urbán speculated that females that lose their calves may remain in the lagoon for longer than other whales. It is possible that females that lose a calf may stay to try to get pregnant. Males may stay in lagoons for long periods for breeding opportunities. Mate mentioned that he tagged a female gray whale in 2005 that remained in the lagoon for a long period of time. The animal later died from a complication (i.e. prolapsed uterus) related to having lost a calf earlier in the season.

With respect to the small number of whales in Magdalena Bay and the supposition that water temperature was driving the abundance of gray whales there, Urbán responded that in 1998 there were El Niño conditions and the same thing happened; there were few whales in Magdalena Bay. When water temperatures are warmer, the gray whales move north. During La Niña events, when there is colder water in Baja California, there are more gray whales farther south.

The sub-committee **thanked** Urbán and his collaborators and **recommended** the continuation of this important long-term study of gray whales in the breeding lagoons of Baja California Sur, Mexico.

3.3.2 Catch information

SC/66a/BRG07 reported that 124 gray whales were struck in Chukotka, Russian Federation, in 2014 resulting in 122 gray whales (42 males and 80 females) landed. Two whales were struck and lost and none of the landed whales was 'stinky' (inedible). The weapons used in the hunt included harpoons, darting guns, and rifles. About 44% of whales demonstrated aggressive behaviour. The mean amount of ammunition used on each whale was approximately the same as in 2013 season while mean time to death was slightly shorter. In most cases (except May and early June) ice was absent during the 2014 hunting season. Body length of gray whales taken in 2014 ranged from 8 to 14.5m, with an average of 10.1m (which is the same as in the 2013 season). Body weights of those whales ranged from 6 to 32.4 tons with a mean weight of 11.8 tons. The largest whale, a male, was taken in Neshkan of the Chukotsky region. It was 14.5m long and weighed 32.4 tons. Among the whales taken, there were two females with foetuses and no females were lactating. Samples were collected from a total of 49 whales. Observations and sample collection from subsistence harvested gray whales were conducted by scientists from the TINRO-Center (Vladivostok) and ChukotTINRO (Anadyr).

SC/66a/BRG14 summarised catch data for the Chukotkan hunt from 2012 to 2014. From May to December during those years, about 400 gray whales were landed. Traditionally the largest number of gray whales (i.e. 179 whales or 47%) was landed in the village of Lorino in Mechigmensky Zaliv. In four seasons, scientists examined 95 gray whales caught in that bay. Of those 95 whales, 66% were females that averaged 10.2m in length. The average length of males was 10m. Most whales (70%) landed by Lorino were sub-adults. The largest harvested gray whale was 14.3m and the smallest was 7.7m. About 90% of the landed whales had complete or half-full stomachs and all whales were in good body condition. In 2012-13 eight 'stinky' whales were landed in Chukotka. It appears that the number of such gray whales landed in the hunt is decreasing and hunters have stated that the number of 'stinky' whales, seals, seabirds and fishes is at least stable. Hunters have learned to identify stinky whales from a distance and avoid hunting them.

In 2013-14, 43 gray whales were photo-identified and a preliminary comparison of gray whales catalogued from Kamchatka and Sakhalin waters show no matches. Photos were collected of harvested gray whales with the objective of comparison with the Sakhalin and Kamchatka catalogues. It was not possible to compare photos because of technical

reasons. More than one hundred genetic samples were collected from harvested gray whales. Efforts will be made to continue collecting genetic and other biological samples, particularly from stinky whales.

The sub-committee thanked the authors for providing information about the harvested gray whales. The sub-committee **encouraged** the additional collection of suitable photographs of living and dead whales and **recommended** comparison with the available catalogues from both the western and eastern sides of the Pacific, in accordance with the recommendations from the two rangewide Workshops (IWC, 2015d; SC/66a/Rep08). Similarly, as recommended at the Workshops, it **encouraged** prompt analysis of the genetic data from the harvest for comparison with other areas of the North Pacific. It also **stressed** the importance of archiving samples in a recognised facility.

In discussion of body condition, Litovka stated that this is estimated based on blubber thickness and body length. This allows for comparisons across ages and between sexes. It was noted that the index is measured differently for subsistence harvested bowhead whales where it is based upon girth and length measurements. With respect to age categories, Litovka clarified that the 1+ age category is for whales that are one to two years in age. Yearlings were defined as animals that were less than one year old but had already separated from their mothers.

3.3.3 Management advice

The sub-committee **agreed** that the *Gray Whale SLA* remains the appropriate tool to provide management advice for eastern North Pacific gray whales. It was also **agreed** the proposed Makah whaling management plan remains the appropriate tool to provide management advice for hunts in Washington State, USA provided that a research program monitors the relative probability of harvesting a PCFG whale in the Makah Usual and Accustomed Fishing Grounds (IWC, 2014). The sub-committee **agreed** that the present block quota was in agreement with the *SLA* and would not harm the stock.

4. RIGHT WHALES

4.1 New information on southern right whales

SC/66a/Rep09 reported on a Workshop (convened by Iñíguez, CMP coordinator) held at the Centro Nacional Patagónico (CENPAT) in Puerto Madryn, 5-6 August 2014. The goal of the Workshop was to update on the information available on the mortality of southern right whales around Península Valdés, Argentina. Participants included experts on the ecology and marine environment of the Península Valdés region, scientists studying right whales and kelp gulls in the South Atlantic and two international experts on gull control and stress response in cetacean. During discussions the five main hypotheses for the high calf mortality identified by the first IWC Workshop (IWC, 2011) were reviewed in the light of any new information: (1) decreased availability of food; (2) exposure to biotoxins; (3) infectious disease; (4) kelp gull attacks; and (5) a combination of all factors. The Workshop concluded that good progress has been made since the 2010 IWC Workshop (IWC, 2011) in a number of areas. The Workshop also supported the strong recommendations made by the IWC Scientific Committee that research and long-term monitoring of this stock should continue without interruption.

Based on previous information (IWC, 2011; 2013; Thomas *et al.*, 2013), the Workshop agreed on three main hypotheses:

(1) kelp gull and southern right whale interaction and its effects on whale behaviour and health;
(2) density-dependent processes and their effects on right whale population dynamics; and
(3) a decline in food availability and its effects on right whale body condition and health.

Several recommendations were made to assist in investigating these three hypotheses (see item 11, SC/66a/Rep09):

(1) the Workshop strongly supports studies to detect and investigate strandings and the corresponding analysis of samples collected to evaluate body condition and presence or absence of any causes of mortality;
(2) recommends the development of a regional entanglement response strategy in conjunction with the IWC;
(3) recommends a further training Workshop be held in Argentina to continue working on mitigation measures;
(4) work on whale-gull interaction should continue as a top priority and several recommendations were given to accomplish this action;
(5) provision of logistical and financial support for those studies to further examine possible mechanism linking gull attacks to high mortality;
(6) continue and further develop studies on demography and population dynamics;
(7) increase telemetry work to identify feeding areas; and
(8) continue studies on genetic and isotopes of southern right whales to obtain information on diet.

The Workshop acknowledged the importance of the IWC Conservation Management Plan for the Southern Right Whale Southwest Atlantic population. Whilst recognising the progress made, it stresses that further commitment is required to develop long-term actions to ensure the effective conservation of southern right whales and their habitat, in accordance with the objectives of the IWC's Conservation Management Plan.

SC/66a/BRG05 describes aerial surveys for southern right whales carried out from 1999 to 2014 in Península Valdés (PV). Information was as follows: (a) the rate of increase was estimated using GLM procedures. A set of models included as predictor variables the Year and the Julian Day, using also Julian Day^2. Four response variables were modelled: (a) the total number of whales; (b) the number of calves; (c) the number of solitary individuals; and (d) the number of mating groups. The population increased 3.23% annually and the number of calves increased by 5.54%. The rate of increase declined from 6.22% (1999-2007) to 3.23 (1999-2014). Solitary Individual and Mating Groups are no longer growing. A nautical survey for counting whales in deeper waters was carried out in September 2014 in an area of 112.55km^2 close to Puerto Madryn. Transects were carried out with a zig-zag pattern. Sixty whale groups of size one or two were recorded. Detection probability, encounter rate and group size contributed to the variance with 81%, 17% and 2% respectively. Density (D) was estimated as 4.1 whales/km^2. The number of whales estimated by GLM for the coastal zone is an instantaneous count of whales encountered at any given Julian day. A cumulative function was developed to estimate the total number of whales moving around PV every year considering the residence times estimated for females with calves. The estimated number of whales in the coastal area in 2014 was 1,556 and the number of calves born in 2014 was 466. This model should be further examined to deal with variability. The trend of mortality rates was analysed through time. Data of

live and dead calves was obtained for the period 1971-73, 1981-82 and 2003-14. The number of estimated calves born each year was obtained by means of the cumulative function developed in section (b). It is clear that mortality rates are variable between years. Maximum rates were observed in 2007, 2008 and 2009, the highest rate being in 2008 reaching almost 30% while minimum rates were observed in 2004 and 2014. The rates observed in the former years show the same pattern of variability ranging from 2-10%. Finally, the analysis of the information presented in this paper supports that the southern right whale population is increasing in the nursing area around PV. In spite of the fact that the number of whales in the surveyed area is increasing, the rate of increase is steadily decreasing. Density has been also increasing and whales have been expanding their distribution to deeper waters during the last decade. The analysis of mortality rates since the early 70s show an increase. All these facts together are coherent with a density-dependence response.

SC/66a/BRG23 presented photo-id data collected during 1970-2012 on southern right whales in their winter calving grounds at Península Valdés, Argentina. These data were analysed using an updated version of the stage structured model that allows for birth intervals to depend on survival or mortality of the previous calf. The best-fitting model using the AIC criterion contained heterogeneity in capture probabilities between years, life stages and individuals, in addition to annual variability in the calf mortality rate and in the proportion of mothers recorded in association with their calves. The results show that almost all mothers of surviving calves take a resting year before getting pregnant again, whereas only about 40% of mothers who lose their calf take a resting year before getting pregnant again. Following a resting year, the pregnancy rate is over 90%. The calf mortality rate shows substantial variation over time around a median level of ~18%, with no overall upward or downward trend. The proportion of non-surviving calves that are still with the mother when she is sampled also varies over time, with an upward trend. Consequently, the model predicts a steep increase in observable calf mortality since 2000, despite the fact that the population calf mortality rate is not estimated to be higher than in previous decades. The steep rise in observable calf mortality since 2000 is consistent with the trend in recorded strandings in the gulfs of Nuevo and San José during this period. No change in the population growth rate of 6.5±0.2% per annum is detected yet, but it is important that recent data be processed and that the population continue to be monitored in the coming years.

The sub-committee endorsed the scientific and management recommendations in the Workshop report (SC/66a/Rep09), and concluded that while some priority actions have been taken, significant progress remains to be made on a number of key recommendations (see item 11, SC/66a/Rep09). The sub-committee encourages that the priority actions be implemented as soon as possible, and that progress be reported in SC/66b.

SC/66a/BRG01 reported that during the last decade, southern right whale (*Eubalaena australis*) calves died in large numbers on their calving ground at Península Valdés, Argentina (606 calf deaths recorded since 2003). The proportion of two-year calving intervals (which result from calving failures) increased during this period. Normally, females give birth once every three years, spending one year pregnant, one year nursing, and one year recovering to support the next pregnancy. However, females that lose a calf early in lactation may recover quickly and conceive a second calf in one year rather than two; thus the frequencies of two-year intervals are expected to increase when perinatal (late-term foetus and neonatal calf) mortality increases. Four- and five-year calving intervals also occur occasionally and are thought to result from calving failures. Using data from annual aerial photographic surveys of the Península Valdés population, we determined the frequencies of directly observed 2-, 3-, 4- and 5-year intervals that began with a calving in 1971-2009. Two-year intervals constituted 3% of the total in years of relatively low calf mortality (1971-2002, 2004 and 2006), but 22% in years of high calf mortality (2003, 2005 and 2007-09). A mathematical model of right-whale population dynamics was used to assess potential short- and longer-term effects of a sustained increase in calf deaths. In this model, the birth rate increases during the first eight years of increased perinatal mortality (roughly equivalent to 2005-13), because a female that loses a calf returns sooner than one that successfully weans a calf. The birth rate begins to decline later, when the female calves that died in high-mortality years fail to enter the adult population. If elevated rates of calf mortality continue for another decade or two, the population's growth is expected to slow substantially.

The sub-committee thanked the authors for the presentation and acknowledged that food limitation may explain the apparently high stranding rates observed in this population. Nutritional data were presented in SC/66a/Rep09 that will be supplemented by ongoing analyses of blubber thickness of stranded calves which may show differences in the nutritional status of these whales.

SC/66a/BRG22 reports on the first attempt to deploy satellite tags on Southern right whales (SRWs) in the west South Atlantic. This study was motivated by recommendations of the Scientific Committee in regards to the need to assess migratory movements and feeding destinations in light of the hypotheses put forward to explain the high mortality observed for this species in Península Valdés (PV), Argentina. Satellite transmitters were attached to seven individuals in their breeding grounds in Golfo Nuevo, PV in October 2014. Five fully implanted tags, deployed in two mothers and three juveniles, transmitted for a to-date average of 93 days (range: 23-212 days), with one tag still transmitting by the time this paper was completed. The migratory movements of four whales were documented and showed substantial individual variation. These individuals visited the outer Patagonian shelf east of Península Valdés and north of the Falkland/Malvinas Islands, the Scotia Sea near South Georgia/Islas Georgias del Sur and the South Sandwich Islands/Islas Sandwich del Sur, and western South Atlantic basin between 39 and 58°S. State-space models were used to estimate behavioural states and suggested areas of potential foraging importance in the Patagonian shelf, the subtropical convergence and the continental shelf break east of South Georgia/Islas Georgias del Sur. The present study described unprecedented information on the spring migration of southern right whales from PV. The latitudinal range and variability shown in the migratory movements of whales tagged near PV are consistent with those of SRWs from South Africa (Mate *et al.*, 2011) and from the Auckland Islands (Childerhouse *et al.*, 2010). These results are considered preliminary because of the relatively small number of whales tagged. Additional tag deployments are needed to better understand seasonal movements of whales wintering in PV and the space-use patterns in their foraging grounds. Ultimately, integrating movement and genetic data should allow the potential relationships between genetic, behavioural, and environmental factors to the unusual mortality events of SRWs of PV to be explored.

In summary the sub-committee welcomed the analyses provided in SC/66a/BRG01, SC/66a/BRG05, and SC/66a/BRG23 which elucidated demographic issues associated with recent observations of calf mortality and SC/66a/BRG22 which demonstrated movements of animals to putative feeding grounds, with a longer-term goal to evaluating associations with the food availability hypothesis. The sub-committee **recommended** this work continues with the aim of better understanding both the causes and consequences of the temporal variations in observed mortality. The sub-committee recommends work continue on understanding habitat-use for particular feeding grounds (including methods involving satellite tracking, stable isotopes, genetics and oceanography) by right whales from Península Valdés and on overall population demography. The sub-committee welcomes the progress toward the relevant associated recommendations in IWC (2011).

While it is not yet clear whether gull attacks play a significant role in the observed mortalities, the sub-committee reiterated its concern over the extent of the gull attacks, which is clearly changing the behaviour of right whales in the area with likely energetic consequences (Thomas *et al.*, 2013). The sub-committee **recommended** that the priority actions outlined SC/66a/Rep09 be undertaken to the address the gull harassment problem.

The sub-committee noted that in 1961/62 Soviet whaling ships caught 1,335 right whales to the east of Argentina (Tormosov *et al.*, 1998) including the shelf region off Península Valdés where some tracked whales apparently spent time foraging. These tracking data and stable isotope data from biopsied whales are likely to be valuable in the further investigations of the productivity of the well separated feeding areas of this population. It has been suggested this variability may be linked to rates of calf mortality in the breeding area. This study showed that some whales feed off both the Patagonian shelf and further south in the same feeding season.

SC/66a/BRG04 reported on the 2014 annual southern right whale survey flown coastwise by helicopter in early October between Nature's Valley and Muizenberg, South Africa following the same survey design as previous years. Almost 48 hours of flight operations were required to complete the survey, with some 38 hours search effort flown and almost 10 hours flown in transit to and from the survey start and end points. Totals of 461 cow and calf pairs of southern right whales (922 animals), 87 unaccompanied adult southern right whales, 18 humpback whales (four cow and calf pairs and 10 adult animals), one Bryde's whale and six groups of bottlenose dolphins and five groups of humpback dolphins were sighted during the survey. The relatively high down time due to bad weather means that the field counts of cow-calf pairs may include duplicate sightings of individuals. A general westwards movement of whales along the coast during the two week survey period means that individuals have some probability of being encountered more than once on a survey. Such duplicate whales will be accounted for once photographic matching of these individuals has been carried out. Cow and calf pair sightings appeared generally clumped in San Sebastian Bay, along the de Hoop coastline, in Brandfontein Bay, between Die Dam and Pearly Beach and in Walker Bay. Lesser concentrations were found between Skipskop (the western portion of the de Hoop coastline) and Cape Agulhas (Struisbaai). The low numbers of unaccompanied adult whales (87 individuals) on this survey were concentrated in Walker Bay and San Sebastian Bay. The low numbers of unaccompanied adult animals relative to cow-calf pairs remain of concern and incidental sightings point to a westward shift in the distribution of unaccompanied adults over the last five years. An investigation of a possible shift in the distribution of these unaccompanied adult animals to the west of the survey area is becoming increasingly important and a fixed wing aerial survey component covering the region between Muizenberg and the Namibian border at the Orange River Mouth needs to be carried out.

Findlay further explained that drones will be employed to survey this region but only to expand the temporal rather than the spatial coverage of the survey. The methods of the long-term aerial survey will remain constant to ensure all years remain comparable.

Bannister outlined the results of the 22nd annual survey for right whales flown off coastal southern Australia in late August 2014. Funded by the Australian Government through the Australian Marine Mammal Centre, Hobart, the survey, as since 1993, covered some 900 n.miles (*ca*. 1,700km) close to the coast between Cape Leeuwin, Western Australia and Ceduna, South Australia, to which the majority of the Australian right whale population (the 'western' subpopulation) resorts in winter/spring. The 2014 cow/calf count (232) was not as high as the record 2013 count of 246, or as those for 2011 (236) and 2009 (244, the highest count prior to 2013). The exponential 'cow/calf pair' rate of increase for 1993-2014 was 0.0704 (95% CI 0.0462-0.0945) equivalent to an annual rate of 7.29% (4.73-9.91). The results to 2014 are the current 'best estimates' of increase rate for this sub-population. So far some 2,020 animals have been individually identified, mostly to 2011, and the sightings database contains 3,582 records up to and including 2014. The estimated size of that part of the population found in the survey area is 2,750. Given the very much smaller number in the 'eastern' Australian subpopulation, the 'Australian' right whale population probably numbers around 3,000. Population size is estimated using a multiplication factor of 3.94, as agreed following the 2011 Buenos Aires Workshop (IWC, 2013), applied to the observed three-year total of adult females.

The question of current abundance relative to initial stock size was raised. For the Australian population, currently estimated at around 3,000 (see above), Bannister reported the view that it might well have numbered 10,000 originally. For the Southern Hemisphere as a whole, the Buenos Aires Workshop (IWC, 2013) concluded that initial population size would have been 'about 70,000' and that at some 13,600 in 2010 it would now be approaching about 20% of its pre-exploitation abundance.

The sub-committee recognises the value of long-term datasets so welcomed the reports of aerial surveys off South Africa and Australia and **recommended** they continue.

SC/66a/IA07 reported the sighting records of southern right whales collected during the 2014/15 Japanese dedicated whale sighting survey in Antarctic Area IV (south of 60°S). Two dedicated sighting vessels were engaged and successfully conducted the research for 32 days, from 1 February to 4 March 2015 in Areas IV (south of 60°S, 70°E-115°E, 75% of the Area IV), based on IWC/IDCR-SOWER survey procedures. The total searching distance in the research area was 3,869.9 n.miles (7,167km). Southern right (27 schools/43 individuals) were sighted only between 90°E-115°E in the research area. A total of five mother and calf pairs were observed. A total of 39 individuals were successfully photographed and biopsy sampled using the Larsen-gun system, including four mother and calf pairs. The

sighting data have been submitted to the IWC Secretariat. Photo-ID data will be catalogued and submitted to relevant international catalogues. Biopsy samples will be registered in the ICR database and analysed for genetic research.

The sub-committee thanked the authors and welcomed this report.

4.2 New information on North Pacific right whales

SC/66a/HIM15 reported an immature North Pacific right whale entangled in the mussel aquaculture farm off Namhae County, Republic of Korea, on 11 February 2015. Immediate disentanglement effort was attempted until evening when efforts ceased for safety reasons. The following day underwater and aerial surveys attempted to relocate the whale but were unsuccessful. This was the first sighting of a right whale in Korean waters since the last right whale was landed in 1974.

The entanglement event was discussed in detail at the third Workshop on large whale entanglement issues (IWC, 2015c). The sub-committee commended the Republic of Korea for their attempts to disentangle this whale.

Clapham summarised the US National Marine Mammal Laboratory's (NMML) studies of North Pacific right whales using existing acoustic data. Because of the loss of sea ice and the likelihood of greatly increased trans-polar ship traffic through the Bering Sea, there is an urgent need to better understand the existing range and habitat use of right whales in this region. Acoustic monitoring has suggested that right whales occur in the Bering Sea in most months of the year, and historical records indicate they were found throughout this area as well as in the Aleutian Islands. Passive acoustic data have been collected in the Bering Sea by the NMML since 2007. A total of 57 moorings have been deployed at 15 sites in the Bering Sea and at two sites north of the Bering Strait. NMML is currently focusing on two core subsets of these data: the Aleutian Passes and the northern Bering Sea/Southern Chukchi region. Unimak Pass is known to be frequently used by trans-Pacific shipping, and thus (like the Bering Strait) represents a dangerous choke point where ships and whales might co-occur. The next phase of the currently funded analysis will focus on the northern Bering Sea area. Funding for a second year of work to clear the backlog of acoustic recordings is currently being sought. The results of this analysis will inform management by providing a better understanding of the temporal occurrence of right whales in this area, and the potential overlap between this population and anthropogenic activities such as shipping and fishing gear. NMML is also considering an additional study to examine 19th Century whaling logbooks and journals to assess whether the historical distribution of right whales extended into the northern Bering Sea close to the Bering Strait. Townsend (1935) included some plots of right whale catches by Yankee whalers in this area, but it is not clear if these were actually bowhead whales. Clarification is important, because if the range of right whales extends into the Bering Strait that would place them at increased risk of ship strike in this major shipping choke point.

Clapham also noted that the US has recently proposed shipping lanes through the Bering Sea and Bering Strait, and these lanes pass through the western margin of the federally designated Critical Habitat area for right whales. There is an ongoing effort to implement mitigation measures relative to the proposed route, which include moving the route to the west or introducing speed restrictions through the Critical Habitat.

In discussion, the sub-committee recalled the valuable acoustic data on right whales collected in the south-eastern Bering Sea from 2000-06 (Munger *et al.*, 2008). Acoustic data can also be used to link whale presence to local oceanographic conditions (Stafford *et al.*, 2010) and thereby better describe whale habitats. Satellite tracking data would also be very valuable but logistical and financial considerations may preclude tagging efforts. Possible short or long term impacts of tagging on individual whales should be considered although previous expert Workshops on this matter have concluded that the risks are minimal (Baker *et al.*, 2012; Weller, 2008). Ship traffic is expected to increase rapidly in this region so the sub-committee recognised the importance of describing the season distribution of this endangered population of right whales.

4.3 New information on North Atlantic right whales

SC/66a/BRG11 reports updates on the status of the North Atlantic right whale population which has been categorised as critically endangered or on the brink of extinction. Recent analyses and reports have demonstrated that, although the western North Atlantic stock has far from fully recovered from a precipitous population decline likely caused by early commercial whaling, the small population that was extant in the 1960s has undergone a slow relatively constant increase in abundance. Based on the records of photographically recaptured individually identifiable whales recorded in the North Atlantic Right whale catalogue, there has been a 2.8% per annum increase in the minimum number alive during the period 1990-2012. During the last three years there have been substantially differing patterns of habitat usage observed as compared to the several decades before. Statistical estimators of abundance, growth and entanglement-related mortality rate are currently in development. In US waters, additional management actions have been put into effect to reduce the numbers of vertical lines in the water with the aim of reducing entanglements of right and humpback whales.

The report of a continued increase in the size of this critically endangered population was welcomed by the sub-committee although the rate of increase is low compared to other right whale populations. Currently the data are not sufficient to assess whether entanglement mitigation measures reduce mortality in this population. The information presented in SC/66a/BRG11 will inform future assessments of this population. A proposal for an assessment of North Atlantic right whales will be developed for consideration at SC/66b.

4.4 Conservation issues

SC/66a/BRG13 describes the Australasian Right Whale Photo-Identification Catalogue (ARWPIC), an online portal for the integration of previously disparate offline photo-identification datasets and provides researchers with the means to contribute, process, manage and share data, and match individual whales within a centralised catalogue. ARWPIC was developed cooperatively with the right whale research and management community and scoping documents were developed through wide consultation, targeted Workshops and investigation of other online photo-identification catalogues. ARWPIC data contribution and the terms and conditions of data use are designed to support and encourage open access to data under a Creative Commons licence. At the time of launch in April 2015, ARWPIC contained profiles of some 2,000 individual whales, 4,000 sightings and 10,000 supporting images. Bannister noted that these data were collected during the long-term aerial surveys off western and southern Australia (see for example Bannister, 2011) and by the Tasmanian Department of Primary Industries, Parks, Water and Environment.

Importantly the ARWPIC system can be readily adapted for application to other species, is not geographically restricted, and could be used to support a photo-identification catalogue covering the full range of southern right whales. Collectively the photo-identification data can contribute to management and conservation of this endangered species by enabling analyses of habitat use, movement and migration patterns, population parameters, threat exposure risk, health indices and population estimates[1].

The sub-committee thanked the authors for the explanation of the ARWPIC system and thought it could represent the model for the management and curation of all photo-identification datasets. The sub-committee recognised that ARWPIC is an important development that could be adopted for other species where photo-identification studies are applicable.

SC/66a/BRG15 summarises the progress on the IWC Conservation Management Plan for the Critically Endangered Eastern South Pacific Southern Right Whale Population during the period June 2014 to April 2015. In the short term, the plan is focused to: (1) obtain baseline data, particularly referring to population size, areas of concentration of the species (breeding or feeding areas) and stock structure; (2) conduct a detailed assessment of potential impacts in identified areas of concentration and; (3) develop specific mitigation strategies. Three sightings were reported along the Chilean coast totaling three adults and one calf. Unfortunately pictures for photo-identification could not be taken. A mother-calf pair was reported off Isla de Chiloe, southern Chile, representing the southernmost cow-calf pair recorded which suggests Chiloe could be part of a breeding area (Galletti Vernazzani *et al.*, 2014). Based on this information it is highlighted that more research efforts are needed to further monitor the presence of southern right whales in this area during austral winter/spring. It was recorded that an adult southern right male was entangled off Pichilemu, central Chile, on 17 October 2014 but efforts to relocate the animal were unsuccessful. In order to build capacity to respond to entanglements, the government of Chile is collaborating with Dr. David Mattila (Technical Advisor for Entanglement Response and Ship Strike Reduction of the IWC Secretariat) in a disentanglement Workshop in November 2015.

Since 2011, the IWC SC has made strong recommendations in relation to the large-scale wind farm project in Chiloe. The project was revoked in 2012 by the Chilean Supreme Court, but a new Environmental Impact Assessment was initiated. In 2014, the Chilean Navy requested the company developer provide information on the possible impacts on cetaceans, particularly for blue whales and southern right whales.

A joint public awareness campaign by the National Fisheries Service, the Chilean Navy and Centro de Conservacion Cetacea has been released to improve public awareness on this critically endangered southern right whale population.

Iñiguez summarised the progress made by the Conservation Management Plan (CMP) of the SW Atlantic population of the southern right whale from June 2014-April 2015. The kelp gull-southern right whale interaction is a top priority of this CMP. A Workshop on mortality of southern right whale off Península Valdés was held in Puerto Madryn, Argentina and its report submitted to the Scientific Committee (IWC, 2011). A proposal to continue satellite telemetry was presented at this Workshop, and the study began in October 2014 (SC/66a/BRG22). Iñiguez (Coordinator of this CMP) thanked the IWC for funding three projects on southern right whales off Península Valdés and confirmed that the results will be submitted to SC/66b. A follow-up IWC disentanglement Workshop is being considered. This would continue the development of the regional capacity initiated by a similar Workshop in 2012 (IWC, 2013).

The sub-committee welcomes these reports on the CMPs for southwest Atlantic and eastern South Pacific southern right whale populations. Activities under these CMPs are critical to the conservation management of these populations and the sub-committee recommends continuation of this work.

5. ABUNDANCE ESTIMATES

There are no updated abundance estimates for bowhead, gray or right whales. The sub-committee requested that Cooke provide a primary paper on the abundance of the Sakhalin feeding aggregation for the 2016 Annual Meeting, incorporating any changes to the model structure and all the available Sakhalin and Kamchatka data.

6. WORK PLAN AND BUDGET REQUESTS

In the coming year the work planned for bowhead whales includes reviewing: (1) a new abundance estimate of B-C-B bowhead whales informed from an aerial photo-id survey in 2011; (2) further studies on B-C-B bowhead whale body condition and ecosystem relevant studies; and (3) catch data for B-C-B and West Greenland bowhead whales.

The primary activity planned for gray whales is continuation of the range-wide review of population structure and status. In order to successfully complete modelling efforts required for the Workshop data need to be compiled on: (1) updated abundance estimates and variance and covariance matrices for feeding grounds; (2) complete matching of gray whales photographed south of Sakhalin Island along the coast of Asia; (3) fishing effort along the US and Canadian west coast to determine trends by fishery type (e.g. pots, gillnets, set nets, etc.); and (4) further analyses to narrow the bounds on the stock composition of whales observed at Sakhalin Island. Modelling efforts will include: (1) update modelling framework with revised abundance estimates and mixing matrices; (2) conduct further sensitivity examination to pre-specified parameter values; (3) incorporate available data on fishing effort for the west coast of the US; (4) evaluate parameter uncertainty using bootstrapping; and (5) integrate the gray whale and PCFG *SLA*s into the modelling framework. The steering group for modelling will be Donovan, Punt, Weller, Scordino, Reeves, and Bickham. In April a small technical Workshop will be held in La Jolla, California to: (1) conduct review of updated modelling; and (2) review projections and identify updated framework and trial runs to be submitted to SC/66b. The steering group for the technical Workshop will be Donovan and Punt co-Convenors, Weller, Scordino, Bickham, Reeves, Lang, and Cooke. Following the technical Workshop a Technical Drafting Group meeting will be held to provide new draft text to update the scientific components of the IUCN/IWC Conservation Management Plan, with an emphasis on new information on stock structure, movements and modelling to be submitted to SC/66b. The steering group for the Technical Drafting Group will be Donovan, Reeves, Weller, Brownell, Kato, An, Lang, Cooke, and Bickham.

During this next year it is also proposed that a Steering Group be established comprising members of the Scientific

[1]See *https://data. marinemammals.gov.au/arwpic/* for the portal, help files and explanatory videos.

Committee, Conservation Committee, IUCN, MoC co-ordinator and representatives of the range states to develop formal terms of reference, participants, timing and venue for a stakeholder Workshop to update the IWC/IUCN CMP in light *inter alia* of the Memorandum of Cooperation.

Other work planned for gray whales includes review of ongoing studies of gray whales at Baja lagoons and review of catch data.

A proposal for assessment of North Atlantic right whales will be presented for consideration. The sub-committee will also review new research on biology of right whales.

This year we have received two funding proposals. The first is to hold the small technical Workshop and is expected to cost £8,000. The second is to hold the technical drafting meeting and is expected to cost £2,000.

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Appendix 1

AGENDA

1. Introductory items
   - 1.1 Convenor's opening remarks
   - 1.2 Election of Chair
   - 1.3 Appointment of rapporteurs
   - 1.4 Adoption of Agenda
   - 1.5 Review of available documents
2. Bowhead whales
   - 2.1 Bering-Chukchi-Beaufort (B-C-B) Seas stock of bowhead whales
     - 2.1.1 New biological information
     - 2.1.2 New catch information
     - 2.1.3 Population modelling
     - 2.1.4 Management advice
   - 2.2 Other bowhead stocks
     - 2.2.1 New information
     - 2.2.2 New catch information
3. Gray whales
   - 3.1 Stock structure and movements
     - 3.1.1 Report from intersessional Workshop
     - 3.1.2 Population modelling
   - 3.2 Western North Pacific gray whales
     - 3.2.1 New biological information
     - 3.2.2 Conservation status
     - 3.2.3 Conservation advice
   - 3.3 Eastern North Pacific gray whales
     - 3.3.1 New biological information
     - 3.3.2 Catch information
     - 3.3.3 Management advice
4. Right whales
   - 4.1 New information on southern right whales
   - 4.2 New information on North Pacific right whales
   - 4.3 New information on North Atlantic right whales
   - 4.4 Conservation issues
5. Updated list of accepted abundance estimates
6. Work plan and budget requests
7. Adoption of report

Appendix 2

PROGRESS REPORT ON IUCN WESTERN GRAY WHALE ADVISORY PANEL (WGWAP) WORK FROM JUNE 2014 TO MAY 2015

R. Reeves, D. Weller, J. Cooke, G. Donovan and R.L. Brownell, Jr.

The Western Gray Whale Advisory Panel (WGWAP), which is convened by the International Union for Conservation of Nature (IUCN), has continued to provide advice, particularly to Sakhalin Energy Investment Company (SEIC), concerning the gray whales that feed in summer off Sakhalin Island, Russia – see Reeves *et al.* (2015). The northeastern Sakhalin Shelf is under extreme development pressure from the oil and gas industry, and this gives cause for great concern about the potential impacts on this small population of 'western' gray whales.

The following formal meetings have been held under the aegis of WGWAP since SC/65b; for reports on all of these meetings see the WGWWAP website (*http://www.iucn.org/wgwap/*):

(1) 14th meeting of the Panel (WGWAP-14), 29 September to 1 October 2014 in Yuzhno-Sakhalinsk, Russia;
(2) 7th meeting of the Noise Task Force (NTF-7), 3-5 October 2014 in Yuzhno-Sakhalinsk, Russia;
(3) 8th meeting of the Noise Task Force (NTF-8), 17-18 November 2014 in Washington, DC; and
(4) 15th meeting of the Panel (WGWAP-15), 8-9 December 2014 by teleconference.

The Panel has invested a great deal of time and effort in assisting SEIC to evaluate the risks to gray whales from planned seismic surveys at Sakhalin and to develop appropriate monitoring and mitigation measures. Details of this work are presented in the NTF and WGWAP reports cited above (also see Adjunct 1).

Another issue of great concern to the Panel is the construction by Exxon Neftegas Ltd (ENL) of a pier inside Piltun Lagoon which will require at least one and possibly two or more seasons of noisy activity (channel dredging, barge/tug traffic etc.) at and near the lagoon mouth where gray whales, and especially mothers and their calves, congregate to feed. The Panel was advised just before SC/66a that this ENL work is expected to be so intensive in the open-water seasons of 2016 and 2017 that it will preclude seismic survey work in the region in those seasons. As noted by SEIC in its response statement[2] '… [ENL] activities for 2016-17 (including construction activities, presence of vessels, materials reloading, and movement of modules through the mouth of Piltun lagoon), will make it either technically infeasible or impractical for the Company to record a seismic survey at that time due to an unknown degree of data quality degradation and unknown operational delays (longer survey period, re-recording of lines), with no practical reduction in potential exposure for marine mammals.'

Updated population assessments were presented to the 14th WGWAP meeting using data from the Russia-US and IBM photo-identification and biopsy programmes in NE Sakhalin, and the photo-identification conducted off eastern Kamchatka. Earlier problems with reconciling the three data sets were resolved by recognising different stage-specific sampling intensities for the three programmes: e.g. the Russia-US programme focusses on mothers and calves while off Kamchatka mainly subadults are seen. The results show that by 2013 there were about 40 breeding females increasing at an average annual rate of about 4% over the previous 10 years, regardless of the choice of data set. Estimates of aged 1+ population size were more dependent on assumptions but mainly in the range 160-180. There is significant annual variation in calf production but the factors associated with this have not yet been identified. The assessment using Russia-US data is available online[3], but the assessment using industry-funded data appears still to be subject to confidentiality restrictions. The Panel had recommended that all three monitoring programmes continue but the Kamchatka programme has been discontinued due to lack of funding.

In addition to those meetings, there was an 'informal' working meeting of Panel members, IUCN, SEIC and various stakeholders on 27-29 April at IUCN Headquarters in Gland, Switzerland. Although the Panel did not produce its own report of this meeting, it did issue a public statement of concern regarding seismic surveys on and near the Sakhalin gray whale feeding grounds planned for the summer of 2015 (dated 8 May 2015; see Adjunct 1). That statement was supplemented by an analysis by Cooke (dated 16 May 2015) called 'Updated predictions of cumulative sound exposure for Sakhalin gray whales from the proposed 4D seismic survey in 2015, with comparative predictions for other surveys'[4].

A separate report clarifying aspects of the Panel's scope, mandate, composition, etc. was in preparation at the time of SC/65b and expected to be posted on the WGWAP website by sometime in June 2015[5]. Also, SEIC released its own public response to the Panel's statement of concern[6].

Reports from IWC Workshops on the Rangewide Review of the Population Structure and Status of North Pacific Gray Whales (IWC, 2015; SC/66a/Rep08) have been presented and considered at WGWAP meetings. Also, the Panel has followed with interest the continuing, but infrequent, observations of gray whales in East Asia outside the Sakhalin and Kamchatka regions (e.g. SC/66a/BRG18) including a new photographic match between Japan and Sakhalin (SC/66a/BRG17).

In addition to the five authors of this document, the current WGWAP membership includes Brian Dicks, Doug Nowacek, Grisha Tsidulko, Glenn VanBlaricom, Alexander Vedenev and Alexey Yablokov. Brandon Southall is a longstanding Associate Scientist who helps specifically with noise-related issues. The Panel is co-chaired by Reeves and Donovan.

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[4] *http://cmsdata.iucn.org/downloads/cooke_final_16_may_2015_1.pdf.*

[5] *http://www.iucn.org/wgwap/wgwap/meetings/wgwap_wm.*

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Adjunct 1

WGWAP statement of concern with respect to proposed seismic activity on the Sakhalin shelf in 2015 (8 May 2015)

IUCN postponed WGWAP-16 because Sakhalin Energy had not delivered expected information and documents in a timely fashion or in some cases, at all. Instead, IUCN hosted an informal working meeting at its headquarters in Gland from 27-29 April 2015 (comprising the Panel, IUCN, Sakhalin Energy staff, Lender representatives, and NGOs).

The Panel is very disappointed at this breakdown of communication since early 2015 and the absence of some essential information. This was particularly problematic with respect to the Panel's ability to provide final advice for monitoring and mitigation of Sakhalin Energy's planned 2015 seismic survey.

In the absence of complete information, a formal WGWAP-16 Panel meeting and hence a formal Panel report with recommendations, the Panel makes the following statement based on information that was available to it on 8 May 2015. As noted below, the basis for this includes some information provided by Sakhalin Energy during and shortly following the informal meeting. The Panel is also hoping to complete some additional modelling work that takes into account the new information but this is complex; if and when those results become available, it may necessitate an additional statement from the Panel[7].

Whilst the statement focusses on the 2015 seismic programme, the Panel notes that there are other activities that may disturb gray whales in the Sakhalin area, including possible entanglement in fishing gear and other non-seismic activities of the oil and gas companies. These should be included in any full assessment of cumulative impact but at present there is insufficient information to support such an assessment.

Background to the proposed 2015 seismic surveys

The Panel began working with Sakhalin Energy to develop a monitoring and mitigation plan (MMP) for the Company's proposed 2015 seismic survey in October 2013 based on the MMP that had been developed for a 2010 seismic survey and subsequently used as a case study to inform guidelines for responsible practices to minimise impacts of seismic surveys on marine mammals (Nowacek *et al.*, 2013). The total area of Sakhalin Energy's proposed 2015 survey is twice that of the Company's 2010 survey.

The primary mitigation measure advised by the Panel for seismic surveys at Sakhalin is to ensure they are completed as early in the season as ice conditions allow and before peak numbers of whales have reached the Piltun feeding area. This was again the principal measure around which the MMP was developed for the 2015 survey, expected to begin around 10 June[8] and last for about 30 days. Some relaxation of provisions in the 2010 MMP was justified given this mitigation objective to complete the survey before most of the whales had arrived.

In October 2014, when development of the MMP for the planned 2015 Sakhalin Energy survey was approaching completion, the Panel learned that Exxon Neftegas Ltd (ENL) was also planning a major seismic programme (including some work on behalf of Rosneft), part of which is near the 2015 Sakhalin Energy survey off Sakhalin. However, as ENL does not seek the Panel's advice, detailed information on that company's plans was not available. It was nonetheless clear that the combined level of planned seismic activity adjacent to and inside the primary gray whale feeding area off Sakhalin was greater than had ever before occurred and therefore that the Panel needed to take the ENL surveys into account when providing advice regarding the 2015 season.

The Panel has long been aware of the problem that only one operator among several participates in the WGWAP process, and of the difficulties this brings for Sakhalin Energy. The Company's continuing engagement in the WGWAP process, especially given these circumstances, is appreciated by the Panel as well as IUCN and other groups that are active participants and contributors (e.g. some Russian authorities, lenders and NGOs).

Advice provided at the end of 2014

After a final NTF meeting (NTF-8) in November 2014, the Panel provided its advice in the WGWAP-15 report issued in December 2014. In summary, the Panel concluded that from a precautionary perspective, it would not be appropriate for both companies' full proposed seismic programmes to take place in a single season given the predicted and prolonged ensonification beyond the threshold that has been shown to result in behavioural disturbance of almost the entire gray whale coastal feeding and especially nursery area. With the available information on the ENL surveys at that time, the Panel estimated that: (1) the cumulative sound exposure of gray whales during the 2015 Sakhalin Energy survey would be greater than that during the 2010 survey (which could result in the whales moving away from their preferred feeding area); and (2) the cumulative exposure resulting from the 2015 ENL surveys would be considerably greater than that from the Sakhalin Energy survey. The Panel recommended that serious consideration be given to postponing either the Sakhalin Energy survey or the ENL surveys to 2016 (recommendations WGWAP-15/007 and 008). The Panel urged the companies to work together to develop a solution. The Panel also agreed on an MMP for the Sakhalin Energy survey subject to the provision of important information to show that the Company was prepared to implement the MMP successfully, and assuming that the seismic survey would start as soon as ice conditions permitted. It also recommended that other companies follow the same approach with appropriate modifications taking into account the details of their surveys.

The Panel's position on 7 May 2015

Through a meeting of the Biodiversity Group (BG) of the Environmental Council under Supervision of the Governor of Sakhalin Oblast on 4 March 2015, the Panel was first informed, in broad terms, of the arrangement that had been agreed by the two companies. To avoid simultaneous seismic shooting (which could: (a) make results uninterpretable from the business perspective; (b) ensonify the whole gray whale feeding area; and (c) create a more complex sound exposure context that could complicate and exacerbate behavioural reactions of whales), they had agreed to stagger the Odoptu ENL survey and the Sakhalin Energy Piltun-Astokh survey, such that the Sakhalin Energy survey would begin only once that portion of the ENL survey closest to the feeding area

[7]See *http://cmsdata.iucn.org/downloads/cooke_final_16_may_2015_1.pdf* for the technical supplement by Cooke.
[8]*http://www.iucn.org/wgwap/wgwap/meetings/wgwap_wm/.* Report available at: *https://www.iucn.org/ wgwap/wgwap/task_forces/noise_task_force/.*

(known as 'A' lines) has been completed. This means that the Sakhalin Energy survey would begin about one month later than had been anticipated when the 2010 MMP was modified in collaboration with the Panel at the end of 2014. Part of the companies' rationale for this approach was that it would avoid ensonification of the entire feeding area at a given time, and thereby allow the whales 'quiet' areas as potential refuge from high disturbance areas. To the Panel's knowledge, no exposure modelling has been conducted by either company or both to examine the implications of the new joint agreement with regard to the timing and nature of cumulative acoustic exposure of gray whales. This is in spite of the Panel's explicit reference in its WGWAP-15 report to the need for such modelling and its expressed willingness to assist in such modelling noted by IUCN/the panel at the BG meeting in early March.

Sakhalin Energy 2015 survey

The Panel expected to receive detailed new information on Sakhalin Energy's plans for the 2015 survey well in advance of the planned WGWAP-16 meeting in late April 2015; as noted above, the information did not arrive and IUCN postponed the formal meeting. At the working meeting, Sakhalin Energy provided additional information on some aspects of the survey, as follows.

(1) The sound source and particularly the configuration of the airgun array have been modified since the Panel's meeting at the end of 2014 (WGWAP-15) with the aim of reducing the acoustic energy expected to enter the feeding area and the modelled estimates will be verified in the field. No information was available during the meeting on the effect this change would have on the cumulative modelling as performed by the Panel in 2014. The Panel nevertheless welcomed this new information and will attempt to complete some additional cumulative modelling based on the new sound source as soon as possible.
(2) The Company may shoot some 'A' lines at night for operational reasons due to tides (this possible need arises out of the changed start date). This would not be consistent with the agreed December 2014 approaches to the 2015 MMP and no modelling results to investigate the implications for gray whaleswere presented to the Panel at this meeting.
(3) Some information was provided informally on preparations for practical implementation of the MMP at the meeting. These have also been included in Sakhalin Energy's recently updated response to the WGWAP-15 recommendations.

As noted above, the Panel had noted that its support for the 2015 MMP as of December 2014 was conditional upon timely receipt of certain information from the Company concerning implementation that satisfied its concerns (see NTF-8 and WGWAP-15 reports). This was stressed as being especially important given the much greater scale of the 2015 survey than the 2010 survey.

Given that the start of the Sakhalin Energy survey is only two months away, the Panel is extremely concerned by the limited information it has received thus far and also by the nature of some of that information. The company's proposed MMP was not received by the Panel until 5 May. While pleased finally to receive this document it is unclear why it was not completed and provided prior to the working meeting so that the Panel could have discussed it together. As it is, an initial review shows that it is not in complete accord with the WGWAP-15 recommendations, for example with respect to: (a) now allowing for shooting of some A-lines at night; and (b) the lack of application of restrictions to all animals, not just mother-calf pairs, after 15 July – although not yet in the revised Sakhalin Energy MMP seen by the Panel, the Company has recently confirmed that it will apply mitigation to all gray whales after 1 August in accord with its response to the WGWAP-15 recommendations, not just mother-calf pairs. In terms of the practical implementation of the MMP in 2015, the Panel has a number of important difficulties in assessing the readiness of the company. The implementation of the MMP is complex as witnessed during the 2010 survey. Major challenges face the newly appointed leader of the survey command centre, who did not participate in implementation of the 2010 MMP or in development of the 2015 MMP. The Panel remains concerned about:

(a) the experience and capabilities of the leaders of the four behaviour observation teams (who are still unknown to the Panel);
(b) the lack of advanced field testing of the new technology (e.g. night vision) and a protocol for such testing (this is not anticipated to occur until the Lunskoye survey early in the season);
(c) lack of information in the revised MMP on the role of the chase vessel in the proposed pre-dusk scans and whether MMOs will be on board and when;
(d) installation of the 'Big-Eyes' binoculars and training of the operators;
(e) the ability of the MMOs on-board the vessel (s) to carry out their many duties and have adequate rest periods (while expected, the daily schedule for MMOs has not yet been received); and
(f) the communication protocols – hardware and software to be used to integrate, visualise and archive data in the field and how a smooth communication process will be achieved among the various monitoring teams and platforms.

The Panel recognises that operational matters are the responsibility of the Company. However, the Panel can only conclude at this time that it is not confident the outstanding logistical and practical issues can be resolved in the limited time available before the survey begins.

A positive point with respect to the proposed 2015 survey is that Sakhalin Energy has agreed to allow an Independent Observer (appointed by and reporting to IUCN, acting in cooperation and under advice from the Panel) to monitor all aspects of MMP implementation during the survey and indeed the Company will provide all necessary support to allow this individual to carry out his responsibilities. The Independent Observer's report will be reviewed by the Panel and made publicly available on the WGWAP web site.

ENL 2015 surveys

ENL has stated in a number of forums that its seismic survey MMP meets 'IUCN guidelines' (presumably meaning Nowacek *et al.* (2013) and an associated brochure produced by IUCN in collaboration with the Panel). Whilst we welcome ENL's acknowledgement of the value of the approach that has been developed collaboratively by the Panel, Sakhalin Energy and IUCN, we stress that ENL has not provided the Panel with any detailed information on its MMP or on how it was developed (in spite of repeated requests that it do so). Therefore the Panel cannot verify whether ENL's MMP does or does not conform to the 'IUCN guidelines'. To the Panel's knowledge, there is also no plan for an Independent Observer to be present.

Conclusions

The Panel is not in a position to evaluate the feasibility of either Sakhalin Energy or ENL modifying its MMP at this late stage. Nor can the Panel assess the consequences of any such modifications on gray whales off Sakhalin without the necessary information. However, the Sakhalin Energy survey alone will result in considerably greater cumulative sound exposure of whales on the Piltun feeding/nursery area than previously estimated for this survey alone[9], given the later start time for the survey. This also calls into question the decision to allow relaxation of some of the provisions in the 2010 MMP that was made when the Panel believed that the survey would take place one month earlier. We recognise there are major business and financial implications for the Company in delaying the survey until 2016 and we acknowledge and appreciate the fact that Sakhalin Energy has demonstrated a great deal of co-operation and openness compared to other operators. Nonetheless, given the circumstances described above and from a precautionary scientific perspective, further to its recommendation WGWAP-15/008 that Sakhalin Energy 'reconsider' its plan to conduct the seismic survey in 2015, the Panel now concludes that from a precautionary perspective, Sakhalin Energy should not conduct the survey in 2015 but should postpone it to 2016. This would allow: (1) the survey to begin as early in the season as ice conditions allow; (2) more time to prepare fully for effective implementation of the MMP; and (3) less overall sound exposure of gray whales during the 2015 season (i.e. only the ENL surveys would occur). The Panel stresses that this unfortunate state of affairs in which major seismic activities by or for several companies can take place without an integrated environmental impact assessment should not occur again. The Panel strongly believes that the importance of more dialogue among the operators, the authorities, other stakeholders and the Panel on how to address the issue of cumulative acoustic impacts on gray whales off Sakhalin in a multi-operator context is greater than ever before.

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Appendix 3

COMPANY RESPONSE IN RELATION TO WGWAP STATEMENT OF 8 MAY 2015

SAKHALIN ENERGY 2015 PILTUN-ASTOKHSKOYE 4D SEISMIC SURVEY

Sakhalin Energy plans to conduct a 4D Seismic Survey in July 2015 with objectives to undertake seismic monitoring of hydrocarbon production and water injection at the Piltun-Astokhskoye field, and to provide a 3D image for planning of future production wells from the existing facilities. Reservoir monitoring seismic surveys are required to contribute to efficient and effective production of hydrocarbons from the fields that the Company operates.

On 8 May 2015, the Western Gray Whale Advisory Panel (WGWAP) issued a public Statement relating to the planned 4D Seismic Survey of Piltun-Astokh.

Sakhalin Energy has extensively and openly engaged with external stakeholders, and continues to engage actively with the WGWAP. The Company welcomes the comment of the Panel that they '*acknowledge and appreciate the fact that **Sakhalin Energy has demonstrated a great deal of co-operation and openness** compared to other operators*.'

- A large quantity of information has been shared and openly discussed at meetings of the Noise Task Force and WGWAP since 2013, and on other meetings where representatives of the Panel were present, as shown in Adjunct 1.
- In particular, the draft Monitoring and Mitigation Plan for the survey was provided to the NTF-7 in October 2014 (NTF-7/4), has been further discussed in detail on subsequent meetings, and the latest version of the document (with a limited number of changes) was provided following discussions at the April Working Meeting.
- It was regrettable that some key reports and information was not provided by the Company prior to the April Working Meeting, to allow for review by the Panel. Ways to prevent this occurring in the future have been discussed and agreed amongst IUCN, the Panel and the Company.

Sakhalin Energy's **Monitoring and Mitigation Plan** (MMP) adopts best practices and adequately mitigates risks. State Environmental Expert Review has issued a positive decision supporting the environmental impact assessment for 2015 seismic survey including proposed monitoring and mitigation measures.

- *Start date and survey timing*. Initially the Company planned to commence the 2015 4D Seismic Survey as early as practicable following ice free conditions (that is, an expected start date of 10 June 2015).

  As recommended by the Panel, and in consultation with Exxon Neftegas Limited (ENL), the Company gave serious consideration to postponement of survey activities into 2016. However, particularly in the light of details of future ENL/other company activities that became available after the Panel's statement, it was determined that postponement was not feasible because those activities for 2016-17 (including construction activities, presence of vessels, materials reloading, and movement of modules through the mouth of Piltun lagoon), will make it either technically infeasible or impractical for the Company to record a seismic survey at that time due to an unknown degree of data quality degradation and unknown operational delays (longer survey period, re-recording of lines), with no practical reduction in potential exposure for marine mammals. The Company stresses that many development activities

[9]See *http://cmsdata.iucn.org/downloads/cooke_final_16_may_2015_1.pdf* for the technical supplement by Cooke.

are critically dependent on 4D seismic information and not having this information will lead to potentially sub-optimal development decisions by the Company.

A key recommendation of WGWAP-14 and WGWAP-15 was that the companies work together to develop a suitable practical arrangement that will result in reduced acoustic disturbance on the feeding/nursery grounds and thus would represent an environmentally responsible way forward. The Companies decided not to pursue 24 hour time sharing across both survey areas, rather to record one survey and then the other, which leaves some relatively less-ensonified areas within the feeding ground at all times.

The environmentally most sensitive areas (A lines) for both surveys must be recorded first. It became apparent that the majority of sensitive areas are within the ENL Odoptu survey area, hence Sakhalin Energy agreed for ENL to record the Odoptu survey A lines first, and to delay the Piltun-Astokh survey to July. Currently the Company is planning for earliest start date 1 July (based on the currently observed relatively fast melt rate of ice, and based on efficient completion of the ENL Odoptu survey A lines) and a latest start date 12 July (in case of late ENL Odoptu survey A lines completion).

- *Positive development – Reduced number of A lines.* A significant improvement was achieved through optimisation of the Seismic Airgun Array, reducing the size of the source from 3,250 cu-in to 2,888 cu-in. This results in a reduction in the shoreward reach of the sound exposure level contours, meaning that sound exposure levels for whales in the feeding area are reduced, and the number of high priority A lines is reduced from 24 to 19 (out of total 36 seismic acquisition lines). Furthermore, although modelling indicated a safety distance of 1,600m, the Company will adopt a safety distance of 2,000m in accordance with the SEER conclusion.
- *Behavioural shutdown rule.* The Panel agreed that the behavioural shutdown rule (i.e. shutdown of survey operations based on specific whale location/behavioural criteria) be applied for only mother-calf animals (not to all whales) up to 15 July (by which time whale abundance is expected to have reached at least 75% of its maximum level). The Company welcomed this modification of the shutdown rule, although the date of 15 July was not discussed with Company. The Company anticipates that it will not be practicable to record the A lines if the rule is applied for all whales on this date, because of the high number of shutdowns which would greatly delay the acquisition completion (this is in fact confirmed by Panel member Cooke's modelling).

  After 1 August the mitigations discussed in the MMP would apply to all whales not just mother-calf pairs. The Company will adhere to the date of 1 August which was agreed as the time at which whale abundance probably reaches it maximum level. Prior to this date, a trade-off can be made between protection of individual whales 'now' and protection of a larger group 'later'. Note that this issue may possibly be avoided or minimised if early start date (1 July) can be achieved.
- *Potential for night time recording.* Unfortunately, the changed start date potentially impacts the daily recording timing of the survey, as follows: (a) to avoid poor data quality due to 'feathering' of the streamers, meaning that streamers are dragged off alignment by the movement of the tide, it is important to record the line during a period of minimal tidal movement (e.g. low tide); and (b) to achieve technical data quality and comparability requirements, it is important to record each of the lines at the same time in the tidal cycle as was done for the 1997 baseline survey.

  In this case, due to tidal conditions in mid-July, there may be times when the required west feathers (i.e. low tide) occur during the night (or partially during the night).

  If the Piltun-Astokh survey would start late (12 July), the commitment to acquire during daylight can clash with requirement to align with tidal cycle, possibly forcing acquisition of those lines into periods of night time. Ignoring the tidal cycle would lead to feather mismatch, requiring infill lines (repeated recording) thus extending the total survey duration. Alternatively, postponing the start date until favourable tidal conditions may move the survey into peak whale numbers (August). Note that this issue would be avoided if an early start date (1 July) can be achieved. However, planning considers the range of possibilities.
- *Cumulative model*. The Company welcomes the results of the updated cumulative model (published by Panel member Cooke[10]).

  The modelling results show that **night time acquisition is beneficial to cumulative distribution of maximum exposure and cumulative exposure**; this is due to the reduced overall survey duration when relaxing night time recording. The results also show that the **behaviour shutdown rule has little effect on both maximum and cumulative exposure**. This conclusion is in accord with the spreadsheet modelling developed by the Company and the Task Force. The Panel's statement was released before the results of the modelling by Cooke became available.

Operational preparations involve are currently being implemented by the Company in order to achieve the requirements of the MMP.

- Information is continuing to be shared by the Company to WGWAP, such as Marine Mammal Observer (MMO) schedule, and the WGWAP Statement of 8 May included additional new requests for information from the Company. The Company continues to be open to share such information. However, the Company notes that the WGWAP engagement process (formalised Task Forces and Panel meetings) is not formally designed, to enable frequent discussion of operational details leading up to a survey or to allow the Panel to make conclusions about logistical and practical preparedness.
- Operational preparedness is firmly the responsibility of the Company. An Independent Observer is in place to verify implementation.
- As stated earlier, for future surveys and similar activities, the Company is discussing with IUCN the necessity to agree in detail what information is expected to be provided by the Company for review of the Panel and by what time. This will be discussed and agreed at the conclusion of the survey considering feedback from all parties.

In conclusion, the Company will take all necessary and reasonable measures to implement the MMP during the 2015 4D Seismic Survey, and in particular to record high priority (A) lines as soon as possible and prior to 1 August. Revised modelling supports this approach and reveals the plans to be safer than the Panel's Statement assumed. An Independent Observer will be present in the field to report to the WGWAP on implementation of the MMP.

[10]See: *http://www.iucn.org/wgwap/wgwap/meetings/wgwap_wm/ technical supplement.*

Adjunct 1

Engagement event	Topics relevant to 2015 4D seismic survey	Information shared
WGWAP-13 Meeting, May 2013, Tokyo	Company reported planning for 4D seismic survey of Piltun Astokh in 2015 as part of ongoing reservoir monitoring, and that repeat surveys may be foreseen approximately every three years thereafter (WGWAP-13 report).	• Multiple reports relating to mitigation and monitoring applied during the 2012 seismic survey.
Noise Task Force Meeting 4 (NTF-4), May 2013, Tokyo	At the initiative of Sakhalin Energy, NTF meeting was held to discuss, among other topics, the details of 2015 4D seismic survey.	• Summary and discussion of 2015 survey (NTF-4 report section 6.2) including survey area, planned mitigation measures, and planned survey design information.
NTF-5 Meeting, Oct 2013, Amsterdam	Discussion of 2015 4D survey status of preparation, scheme of work, design and technical parameters, EIA, and details of the MMP.	• Presentations on status, work scheme, design and technical parameters, EIA and MMP are summarised in the publically available NTF-5 report.
NTF-6 Meeting, April 2014, Amsterdam	Discussion of 2015 4D survey including update on progress, work/analyses including presentation on initial acoustic modelling, progress on consideration of appropriate sound levels with regard to mitigation in light of analyses since 2010 and case studies, MMP, and other known activities on the Sakhalin shelf.	• NTF-6/5 presentation on 3D/4D Seismic Plans, Piltun-Astokh, Sakhalin Energy 2014-16. • NTF-6/6 presentation: summary of mitigation measures for past surveys. • NTF-6/7 presentation: analysis of pulse levels at tracked whales in 2012 South Piltun HR2D seismic survey. • NTF-6/8 presentation: initial acoustic modelling of planned 2015 Piltun-Astokh 4D seismic survey.
WGWAP-14 Meeting, September 2014, Sakhalin	Company described plans for the 350km² streamer seismic survey across Piltun-Astokh, to be a repeat of 1997 3D baseline surveys. Confirmed intention to begin the survey as early in the season as ice conditions allow, i.e. by around 10 June. ENL presented information on planned 1,600km² survey of Odoptu, Chayvo and Arkutun-Dagi licenses, as well as Rosneft's North-Chayvo license area. Recommendation from Panel for companies to work together to synchronise surveys.	• Presentation summary of 2015 survey plan. • Written summary from ENL on planned 1,600km^2 survey of Odoptu, Chayvo and Arkutun-Dagi licenses, as well as Rosneft's North-Chayvo license area.
NTF-7 Meeting, October 2014, Sakhalin	Discussion of updates of other activities on the Sakhalin shelf in 2015, update on progress for the 2015 seismic survey by the Company including Status of tender including technical parameters (vessel size, arrays, streamers, etc.) and Project plan, update on work/analyses for the 2015 survey including progress on acoustic modelling work completed for Piltun-Astokh survey, update on appropriate sound levels with regard to mitigation, Delineated Feeding Boundary (DFB) and Perimeter Monitoring Line (PML), review of behaviour and distribution monitoring, and review of the proposed revised MMP.	• NTF-7/3 2015 4D survey technical note by Sakhalin Energy. • NTF-7/4 2015 monitoring and mitigation plan for the 2015 Piltun-Astokh 4D seismic survey. • NTF-7/6 -1,2,3 presentation: 2015 survey simulations, including two detailed spreadsheets (with update and 2010 line register shared after NTF-7). • NTF-7/7 presentation: discussion proposal for a revised behavioural protection approach for Piltun-Astokh 2015 4D survey.