WESTERN GRAY WHALE ADVISORY PANEL **WGWAP-17**

17th meeting **11-13 November 2016**

Moscow, Russia

REPORT OF THE WESTERN GRAY WHALE ADVISORY PANEL AT ITS 17TH MEETING

CONVENED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE

CONTENTS

ACRONYMS

AUAR	Automated Underwater Acoustic Recorder
BAP	Biodiversity Action Plan
BPOM	Benthic Particulate Organic Matter
CHA	Critical Habitat Assessment
CMP	Conservation Management Plan
Company	Sakhalin Energy Investment Company
DMU	Discrete Management Unit
ENL	Exxon Neftegas Limited
ENP	Eastern North Pacific
FEB	Far East Branch
FRC	Fast Rescue Cutter
GEF	Global Environment Facility
IBM	A.V. Zhirmunsky Institute of Marine Biology
IFC	International Finance Corporation
ISRP	Independent Scientific Review Panel
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
Joint Programme	Sakhalin Energy/ENL Joint Programme on Gray Whale Monitoring and Research
JPTF	Joint Programme Task Force
MMO	Marine Mammal Observer
MMP	Monitoring and Mitigation Programme
MMPP	Marine Mammal Protection Plan
MNR	Ministry Of Natural Resources and Ecology of the Russian Federation
MVA	Multivariate
NBS/SCH-Northern	Northern Bering Sea/Southern Chukchi-Northern Chukchi-Gulf of Alaska
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration (US)
NSCMB	National Scientific Centre for Marine Biology (formerly IBM) FEB RAS
NTF	Noise Task Force
OBN	Ocean Bottom Node
OSR	Oil Spill Response
OSTF	Oil Spill Task Force
Panel	Western Gray Whale Advisory Panel
PCFG	Pacific Coast Feeding Group
Photo-ID	Photo Identification
POI	V. I. Il'ichev Pacific Oceanological Institute
PSTF	Performance Standards Task Force
PSA	Production Sharing Agreement
PTS	Permanent Threshold Shift
RAS	Russian Academy of Sciences
RGWP	Russian Gray Whale Project
RHIB	Rigid Hull Inflatable Boat
RPN	Russian Federal Service for Supervision of Natural Resource Management (Rosprirodnadzor)
Sakhalin Energy	Sakhalin Energy Investment Company Ltd.
SC	Scientific Committee of the International Whaling Commission
SEL	Sound Exposure Level
SI	Stable Isotopes
SLA	Strike Limit Algorithm
SPL	Sound Pressure Level
SPOM	Suspended Particulate Organic Matter
TTS	Temporary Threshold Shift
UNDP	United Nations Development Programme
WFG	Western Feeding Ground
WNP	Western North Pacific
WGWAP	Western Gray Whale Advisory Panel

EXECUTIVE SUMMARY

The 17th meeting of the Western Gray Whale Advisory Panel (WGWAP-17) was held in Moscow, Russian Federation, from 11-13 November 2016. It was immediately preceded by the 11th meeting of the Noise Task Force (NTF-11) and the third meeting of the Joint Programme Task Force (JPTF-3) at the same venue. Three other inter-sessional WGWAP task force meetings took place in May 2016 in Gland, Switzerland: the tenth meeting of the Noise Task Force (NTF-10), the second meeting of the Joint Programme Task Force (JPTF-2) and the first meeting of the IFC Performance Standards Task Force (PSTF-1).

Upon opening the meeting, Giulia Carbone of IUCN drew attention to two major products related to the Panel's work that were published in 2016, including 'Western Gray Whale Advisory Panel: Stories of Influence'[1] and 'Effective Planning Strategies for Managing Environmental Risk Associated with Geophysical and other Imaging Surveys'[2].

The ongoing collaboration between the International Whaling Commission (IWC) and Panel members in 2016 led to further progress with model testing of gray whale stock identity hypotheses, updating and revision of scientific components of the IUCN/IWC Western Gray Whale Conservation Management Plan, and preparations for a western gray whale stakeholder workshop in early 2018.

Important new information was received on gray whale observations in the western Pacific outside the Sakhalin feeding areas. In particular, acoustic data from the US Navy suggest that at least small groups of probable gray whales are present annually in the East China Sea, moving southwards in the autumn and northwards in the spring. Two dead gray whales were reported in Japan in the spring of 2016. A mother-calf pair of gray whales was photographed in Gizhiginskaya Bay (north-eastern Okhotsk Sea) in late June 2016 in close proximity to two bowhead whales.

Justin Cooke's updated analysis of tagging and photo-identification data produced an estimate of 67% (confidence limits 30% to 100%) for the proportion of Sakhalin gray whales that migrate to the eastern North Pacific). These data alone neither confirm nor exclude the possibility of an additional 'breeding migration' destination in the western North Pacific, but photographic and genetic matches between Sakhalin and the Pacific coast of Japan suggest a western North Pacific migratory route for at least some animals in at least some years.

Cooke's interim update of the population assessment showed that the whales that feed regularly off Sakhalin have continued to increase at about 4% per year. In 2016 the number of animals (excluding calves) was estimated to be 165-200 (using Sakhalin sightings only), 190-220 (using both Sakhalin and Kamchatka sightings) or 300-400 whales (using all Kamchatka and Sakhalin sightings). If the Sakhalin whales contain a subgroup that breeds in the western North Pacific, this part was estimated to have numbered 0-50 whales in 2016. The Panel **emphasized** the importance of regular updates to the population assessment, and **encouraged** documentation of the latest interim population assessment. The Panel again expressed appreciation for the work of the Russian Gray Whale Project (RGWP) which has provided the long time-series of data used in Cooke's assessments. It **strongly recommended** continuation of this program and again emphasized that when presenting results, and especially for between-year comparisons, it is critical to consider annual differences in effort.

Proposals concerning gray whale feeding ecology and the ecological relationship between Piltun Lagoon and nearby gray whale feeding areas were prepared and presented by Corinne Pomerleau on the Panel's behalf, and these were welcomed by Sakhalin Energy., The Panel is **concerned** about an apparent long-term decline in amphipod biomass in the Piltun feeding area because of the implications for gray whale feeding. It is important to consider multiple explanatory hypotheses, some of which may relate to changes in the demography or behaviour of the gray whales and others to biophysical events or processes in the regional marine ecosystem. The Panel therefore **recommended** that the companies explore the nature and causes of this decline in greater detail and provide a report on findings to the next Panel meeting.

A collaboration between IUCN and the Project 'Mainstreaming Biodiversity into Russia's Energy Sector Practice and Policy' of the United Nations Development Programme (UNDP) / Global Environmental Facility (GEF) / Ministry of Natural Resources and Ecology of the Russian Federation (MNR) resulted in a final document 'Principles and Guidelines for the Monitoring and Mitigation of Impacts on Large Whales from Offshore Industrial Activity in Russian Waters' (issued by UNDP; document WGWAP-17/28) for

[1] https://portals.iucn.org/library/node/46182
[2] https://portals.iucn.org/library/node/46291

consideration by Russian authorities. The Panel suggested that the next iteration of this document be accompanied by specific sets of guidelines or regulations applicable to particular areas and species and noted that any new version would benefit from the addition of necessary legal language to ensure early adoption and implementation.

With regard to recent work of the Sakhalin Energy/ENL Joint Programme, the Panel reiterated its concern that the current 'control' site for acoustic monitoring no longer functions as such and again **recommended** that Sakhalin Energy provide a plan for a new control site at a strategically selected location as soon as possible. The Panel also **recommended** that the Company provide a graph of the trend in low-frequency ambient noise levels (sound pressure level - SPL) recorded at the current control site as a basis for determining the extent to which this site is (or is not) functioning as intended.

Work of the NTF in 2016 was dominated by consideration of analyses of results of Sakhalin Energy's seismic survey monitoring and mitigation effort in 2015 and the Company's planning for another, larger-scale seismic survey in 2018. Regarding the latter, Bastian Blonk reported on behalf of Sakhalin Energy that the preferred option was for a 4D streamer survey over the Piltun and Astokh (P-A) fields similar to 2015, extended with ocean bottom node (OBN) sections near the P-A platforms to fill data gaps. In this scenario, the streamer survey would occur first (as soon as the ice retreats) and take an estimated 21 days, followed by the two sections of OBN surveys taking an estimated 8 days for each section.

A major element of the NTF's work has been Cooke's simulation analysis of the implications of Sakhalin Energy's 2015 Monitoring and Mitigation Plan to determine (a) to what extent the mitigation measures contributed to reducing sonic exposure of gray whales and (b) the effects on predicted exposure of the decisions to relax certain measures that were implemented in the 2010 Astokh survey. Following a report by Cooke on progress thus far, the Panel **recommended** that the analysis be completed in time for review at NTF-12 in March-April 2017. Also, the Panel **recommended** that a similar analysis of the planned 2018 seismic survey be conducted once more details become available on timing etc.

In response to Sakhalin Energy's proposal to increase the speed limit for its crew change vessels from 21 to 35 knots, the Panel **advised** that from a gray whale conservation point of view, such an increase would be acceptable for a provisional period of 2 years, pending more refined estimation of the risk. The Panel **recommended** that within the provisional 2-year period, consideration be given to installing dashcams on each vessel that would monitor the sea surface area in front of the bows. Further, it **recommended** that accelerometers be installed with continuous recording, or selective recording of large accelerations.

The issue of gray whale entanglement in fishing gear continued to be a significant concern and an Associate Scientist (Vladimir Burkanov) was enlisted to assist the Panel in preparation of a document for the attention of fishery authorities and for submission to the IWC Scientific Committee at its 2017 annual meeting.

1 INTRODUCTION

The seventeenth meeting of the Western Gray Whale Advisory Panel (WGWAP-17) was held at the World Trade Centre (Congress Centre) in Moscow, Russia, from 11-13 November 2016. The meeting was co-chaired by Randall Reeves and Greg Donovan.

Since the previous Panel meeting in November 2015 (WGWAP-16), the following meetings of WGWAP task forces took place: tenth meeting of the Noise Task Force (NTF-10) Gland, Switzerland, 17-18 May 2016; second meeting of the Joint Programme Task Force (JPTF-2) in Gland, 19 May 2016; first meeting of the IFC Performance Standards Task Force (PSTF-1) in Gland, 20 May 2016; the eleventh meeting of the Noise Task Force (NTF-11) in Moscow, 7-8 November 2016; and the third meeting of the Joint Programme Task Force (JPTF-3) in Moscow, 9 November 2016. The final reports of NTF-10, JPTF-2 and PSTF-1[3] meetings were available online prior to the November 2016 meetings in Moscow. The final reports of NTF-11 and JPTF-3 meetings were being prepared in parallel with the present Panel report and will be available at the WGWAP website[4] as soon as they are completed.

In addition to all Panel members save one (Lloyd Lowry), attendees included representatives of IUCN (Giulia Carbone and Anete Berzina), Sakhalin Energy, Exxon Neftegas Limited (ENL), Shell Russia,

[3] See all at https://www.iucn.org/western-gray-whale-advisory-panel/panel/task-forces/glance-meetings-and-reports
[4] Ibid

agencies of the Russian Federation, Lenders and Lender advisers, the UNDP/GEF/MNR Project 'Mainstreaming Biodiversity into Russia's Energy Sector Practice and Policy' and several non-governmental organizations (NGOs) (for details see Annex 1). The Panel was pleased once again by the large number of Observers who attended the meeting, or at least parts of it. The Panel notes again that it places great importance on this broad participation and engagement, which provides a vital element of transparency to the overall process.

Berzina and Carbone of IUCN facilitated meeting preparations and logistics. Simon Delany served as rapporteur. Interpreters Grigory Shkalikov and Alexander Danilov provided their usual excellent simultaneous Russian-English translation services. The Panel sincerely appreciates the efforts by all of these individuals as they helped make this a successful meeting.

Carbone opened the meeting with a brief message of welcome from IUCN. She noted that several products related to the Panel's work had become available since the last meeting a year ago – 'Western Gray Whale Advisory Panel: Stories of Influence' (Martin-Mehers 2016)[5], 'Effective Planning Strategies for Managing Environmental Risk Associated with Geophysical and other Imaging Surveys' (Nowacek and Southall 2016)[6] and 'Principles and Guidelines for the Monitoring and Mitigation of Impacts on Large Whales from Offshore Industrial Activity in Russian Waters' (issued by UNDP; document WGWAP-17/28[7]).

The meeting agenda is given in Annex 2 and the list of documents in Annex 3. Those documents designated as public are available on the WGWAP website (including a number of items re-classified from confidential or for internal use only to public during or after the meeting).[8] Regarding documents, the Panel expressed its appreciation to Sakhalin Energy and others for their efforts towards ensuring that all documents were available in advance of the meeting, and also to IUCN for endeavouring to provide Panel members with quick and convenient access to the documents. There are, however, some outstanding issues with regards to data and document availability and these are mentioned in the relevant parts of this report.

2 RANGE-LEVEL ISSUES

2.1 Update on IWC Work

2.1.1 Results of IWC Scientific Committee workshops

Donovan reported on the third workshop of the International Whaling Commission (IWC) Scientific Committee (SC) on the Rangewide Review of the Population Structure and Status of North Pacific Gray Whales held in La Jolla, California, from 18-20 April 2016. The objective of this technical workshop was to finalize an initial modelling framework for gray whales throughout the North Pacific (ENP = Eastern North Pacific; WNP = Western North Pacific). Four priority stock structure hypotheses are being assessed, including:

1) Hypothesis 3a. Although two breeding stocks (Western and Eastern) may once have existed, the Western stock is assumed to have been extirpated. Whales show matrilineal fidelity to feeding grounds, and the Eastern stock includes three feeding sub-stocks or feeding aggregations: Pacific Coast Feeding Group (PCFG), Northern Bering Sea (NBS)/Southern Chukchi (SCH)-Northern Chukchi-Gulf of Alaska ('Northern') and Western Feeding Ground (WFG).

2) Hypothesis 3e. Identical to hypothesis 3a except that the Western breeding stock is extant and migrates to and feeds off both coasts of Japan and Korea and returns to feed in the northern Okhotsk Sea. All of the whales feeding off Sakhalin overwinter in the eastern North Pacific.

3) Hypothesis 5a. Identical to hypothesis 3a except that the whales feeding off Sakhalin include both whales that are part of the Western stock and remain in the western North Pacific year-round, and whales that are part of the Eastern stock and migrate to the eastern North Pacific.

5 https://portals.iucn.org/library/node/46182
6 https://portals.iucn.org/library/node/46291
7 https://www.iucn.org/sites/dev/files/wgwap_17-28_final_undp_guidelines_clean_2016_en.pdf
8 https://www.iucn.org/sites/dev/files/wgwap_17_-_3_final_document_list_-_www.pdf

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

The workshop reviewed initial results from the modelling work and details of this effort were reported to the IWC SC in June 2016 (IWC document SC/66b/Rep07 – see WGWAP-17/Inf.4). Amongst other things, the workshop agreed that the projections would assume that future subsistence whaling by the Makah Tribe would occur during the migratory period and would be based on 'the SLA [Strike Limit Algorithm] variant with research'. Other subsistence catches would be based upon the Gray Whale SLA. It was further agreed that due to the complexity of the subject and the limited amount of time available to fully interpret the results developed thus far, a fourth workshop will take place 27-29 April 2017. The primary focus of this fourth workshop will be to interpret model results for each hypothesis and evaluate their implications for conservation and subsistence need satisfaction. It will also review progress on rangewide recommendations.

In closing, Donovan highlighted the importance of cooperation between the IWC Scientific Committee and the Panel to the rangewide assessment and thanked IUCN for their involvement in the process.

2.1.2 Process and timeline to update 2010 IUCN/IWC Conservation Management Plan (CMP), including progress made drafting scientific components

Donovan reported on recent progress on the 'Western Gray Whale Conservation Management Plan' (CMP) and signing of the 'Memorandum of Cooperation Concerning Conservation Measures for the Western Gray Whale Population'. With respect to the latter, in 2014 the memorandum was signed by Japan, Russian Federation and the USA and at the 2016 IWC meeting it was signed by Mexico and the Republic of Korea. It is expected that in time the other remaining range states (Canada and China) will also sign the memorandum. The impetus for creating the memorandum was the development of the draft Conservation Management Plan (CMP) for western gray whales authored by several Panel members and endorsed by IUCN and subsequently the IWC. Both organizations have recognised the need for this CMP and that it will be a living document, in need of updating over time.

2.1.3 Next steps to update the CMP, including a stakeholder workshop planned for early 2018

In an effort to advance completion of the CMP, a small workshop was held in April 2016 to update scientific aspects of the plan and members of the Panel were involved in this process. It is expected that the CMP will continue to be worked on in 2017 and made available prior a stakeholder workshop on implementation of the CMP to be convened in early 2018. IUCN will be involved on the Steering Group for that workshop. It is anticipated that the workshop report will be completed in time for review at the May/June 2018 IWC Scientific Committee meeting.

2.1.4 Fundraising for the Memorandum of Cooperation and overall CMP implementation

The IWC has a small conservation management fund to partially finance the stakeholder workshop. It is expected that after first year of CMP implementation, range states will contribute the necessary funds to advance the conservation actions listed in the plan.

In discussion of the above efforts, the Panel praised the investment of Sakhalin Energy, often through IUCN, in CMP-related processes. That investment has enabled a number of important activities, including a rangewide workshop in Tokyo in 2008 and the satellite-tagging studies that followed. Donovan mentioned the IWC Voluntary Fund for Conservation, to which donations can be specifically directed towards the gray whale CMP and related work. The investment of IUCN and IWC in these processes has been considerable.

The Panel welcomed this information and encouraged IUCN to continue to collaborate with the IWC on these issues.

2.2 Gray Whale Observations outside Sakhalin Feeding Areas

Several recent observations from U.S. Navy passive acoustic monitoring in areas outside the gray whale feeding areas near Sakhalin (Gagnon 2016) were presented and discussed by Brandon Southall (see document WGWAP-17/Inf.6). Acoustic detections of what have been classified as vocalizing gray whales in the East China Sea have been detected on numerous occasions over the last six years (2011–2016) using towed hydrophone arrays in mobile, high-precision acoustic monitoring systems, specifically the Integrated Undersea Surveillance System of the U.S. Navy's marine mammal monitoring programme for the Surveillance Towed Array Sensor System-Low Frequency Active Sonar (SURTASS-LFA). Vocalizations were detected on multiple occasions in multiple years and were consistent in structure across years. Calls include regular 55 Hz frequency sweeps (ca. 1 sec in individual duration), often emitted in pairs or triplets at intervals of 3–4 sec, have been heard in relatively shallow waters of the East China Sea annually since 2011 between September and March.

The short-duration pulses detected exhibit a pattern of multiple harmonics with the first harmonic being very weak, the second and third – usually the strongest. Individual localized calls have been identified as coming from up to 11 different individuals within aggregations, although most of the detections have been of single animals or groups of two or three. Judging by localized positions and longitudinal tracking, the vocalizing animals have typically been either relatively stationary or moving slowly. Animals have been localized to remain in the same general areas for weeks at a time, but have generally been observed to be moving south in the autumn and north in the spring.

These acoustic data have not yet been accompanied by visual observations to confirm species identification, and precise times and locations of detected animals are classified given the nature of the sensor systems. Several cetacean biologists (including Southall and Chris Clark from Cornell University) who are familiar with gray whale sounds recorded in the eastern North Pacific and Arctic consider the patterns recorded in the East China Sea to be generally consistent with gray whale social sounds and inconsistent with those of any other species of baleen whale, giving them a high level of confidence in the species identity. However, it was clearly acknowledged that any additional information, including spectrograms of recorded calls and greater resolution on times and areas of detections, would be useful. Based on the information provided by Chuck Gagnon (2016) and the discussions at this meeting, Southall will continue his communications with Navy scientists who monitor these systems as well as with experts familiar with and studying gray whale acoustics in other areas who may be willing to share voucher samples with Navy scientists for comparison with the calls detected on their systems. He anticipates that efforts will include further analysis of gray whale vocalizations from passive acoustic sensors in the Sakhalin feeding areas, which could contribute to additional analyses of the recorded vocalizations. General locations where the signals have been detected by the Navy sensors could be used to guide targeted deployments of passive acoustic recorders in order to provide a longer-term stationary monitoring capability. Ideally, all of this work will eventually make it possible to design and coordinate field studies to verify species identification, including visual observations, photographs and potentially biopsies.

The Panel expressed its appreciation to Gagnon of the U.S. Navy for his painstaking work in analysing and gaining clearance to share this new information and data, and to Southall and Chris Clark for working long and hard to make it possible.

During the discussion following Southall's presentation of Gagnon (2016), Panel members drew attention to the historical evidence of whaling for gray whales in the South China Sea during the 1800s (Reeves *et al*. 2008) and the occasional records of gray whales in Chinese waters in the late 20th and early 21st centuries (Weller *et al*. 2013; Wang *et al*. 2015).

David Weller also pointed out that a gray whale first recorded as a calf off Sakhalin in 2006 died in a set net in northern Japan in 2007 (Weller *et al*. 2008) and a photo-identified individual moved between Sakhalin Island in summer and Japan in late winter or early spring in both 2014 and 2015 (Weller et al. 2016). These records demonstrate that not all Sakhalin whales migrate to the eastern Pacific as was true of three whales satellite-tracked in 2010/2011 (Mate *et al*. 2015) and others photo-identified both off Sakhalin and in the ENP (Weller *et al*. 2012).

Two dead gray whales were reported from Japan in the spring of 2016, but their individual identity could not be determined from photographs or tissue samples (both carcasses were badly decomposed) when found and reported (Kato *et al.* 2016).

Dmitry Lisitsyn (Sakhalin Environment Watch) provided information and showed photographs of gray whales observed in Vostochny Wildlife Refuge (zakaznik), approximately 220 km south of Piltun. One was seen in 2014, two in November 2015 (see Document WGWAP-17/8 and item 4.1.3 below) and two in 2016. Photographs of the two whales seen in 2016 were compared by Olga Tyurneva to the catalogue of the National Scientific Centre for Marine Biology (NSCMB, formerly called A.V. Zhirmunsky Institute of Marine Biology (IBM)), Far Eastern Branch of the Russian Academy of Sciences (FEB RAS) and determined to be 'new' (i.e. previously unidentified) individuals.

Alexander Burdin reported on a photo-ID survey conducted by the Russian Gray Whale Project (RGWP, formerly called the Russia-US programme) in July 2016 off Kamchatka. In total 23 individual gray whales were encountered, 17 of them in Olga Bay (Kronotsky Gulf, eastern Kamchatka). Fifteen of the whales were photo-identified, of which four of them were already known from Sakhalin studies. One of them was known from the RGWP catalogue to be two years old (born in 2014) and one was an individual previously seen in the Vostochny Refuge in 2015 (photos provided by Lisitsyn, see above). Another of the Olga Bay whales had previously been photographed at Sakhalin in 2015 (Olga Sychenko, pers. comm. to Burdin). Three of the whales photo-identified in 2016 were already in the Kamchatka catalogue of the NSCMB (formerly IBM) FEB RAS. The remaining 11 whales photo-identified at Kamchatka in 2016 were 'new' to the existing catalogues. Burdin also noted that his team surveyed Kamchatka coastal waters south from Petropavlovsk-Kamchatsky in 2016 and no any gray whales were found in Vestnik Bay (south-eastern Kamchatka). Photographs of seven different gray whales in Olga Bay obtained by Vladimir Vertyankin included five not previously identified by the team of the NSCMB, two that had been identified previously off Kamchatka, and one that has been observed regularly at Sakhalin (Document WGWAP-17/8).

Olga Shpak (Institute of Problems of Ecology and Evolution of the RAS) reported on her observations of a mother-calf pair in shallow water at high tide in Gizhiginskaya Bay (north-eastern Okhotsk Sea) in late June 2016. Two bowhead whales (*Balaena mysticetus*) were also in the vicinity. Shpak managed to obtain photographs and a sample of skin from the adult gray whale. Comparison of her photos to the available western gray whale catalogues indicated that this whale had not previously been identified. The area of the sighting was called Northeast Gulf by American whalers who were looking primarily for bowhead whales but also encountered (and hunted) gray whales fairly often in the 1800s, mainly between mid-May and the end of August (Reeves *et al*. 2008). Burdin commented that the northern Sea of Okhotsk has been poorly covered by modern surveys due to its inaccessibility, even though he considers conditions there (e.g. tidal characteristics, abundance of plankton) to be ideal for gray whales.

2.3 Population Modelling and Data Sharing

2.3.1 Population assessment updates

Since the previous Panel meetings there had been two updates relating to the population assessment. An assessment presented to the IWC Scientific Committee meeting in June 2016 (IWC document SC/66b/BRG25) used data from the RGWP through the 2015 season. This work showed that the population had continued to increase but there had been some fluctuation in pregnancy and calf survival rates. These rates were particularly low in 2008 as discussed by the Panel at WGWAP-16.

A revised analysis of the proportion of Sakhalin gray whales that migrate to the ENP was presented to the Rangewide Gray Whale Workshop in April 2016 (IWC document SC/A16/GW2 – WGWAP-17/Inf.4), using the results of tagging off Sakhalin and photo-id data from Sakhalin and Mexico. The analysis showed that the Mexican catalogues, which had been collected mainly in the breeding lagoons, were not representative of the full migratory population, and took this factor into account. The maximum likelihood estimate of the proportion of Sakhalin gray whales that migrate to the ENP was 67%, but the confidence limits ranged from 30% to 100%. Therefore, these data on their own neither confirm nor exclude the possibility of an additional 'breeding migration' destination in the western North Pacific, but the matches between Sakhalin and the Pacific coast of Japan (see item 2.2) are suggestive of a western North Pacific migratory route for at least some animals.

The recent assessments have found that the Sakhalin feeding aggregation appears to be demographically self-contained in the sense that new immigrants born to non-Sakhalin mothers, if there are any, number <1 individual per year. The Sakhalin population is probably not genetically self-contained because the known fathers found in a paternity analysis by Lang (2010) were fewer than the population model would predict to have been found if all paternities had been assigned to individuals within the Sakhalin aggregation.

Comparisons of photo-id data from the Sakhalin and south-eastern Kamchatka feeding areas have shown substantial overlap of individuals between these areas (Yakovlev *et al*. 2013, 2014). The question of whether whales using the Sakhalin and south-eastern Kamchatka feeding areas, taken together, constitute a demographically and/or genetically self-contained population has not yet been investigated.

Cooke presented an interim update of the population assessment based on Sakhalin data collected by the RGWP, supplemented with published data from Kamchatka and the tagging and photo-id data showing migration to the eastern North Pacific. The update shows that the Sakhalin population has continued to increase at about 4% per year. The non-calf population size in 2016 was estimated to be 165-200 whales if only sightings off Sakhalin are included, rising to 190-220 whales if both Sakhalin and Kamchatka sightings of whales known from Sakhalin are included, and to 300-400 whales if all Kamchatka and Sakhalin whales and sightings are included. If the Sakhalin whales contain a subgroup that breeds in the western North Pacific, this part is estimated to have numbered 0-50 whales in 2016.

2.3.2 Action arising

The last joint population assessment, using the NSCMB and Kamchatka data through 2011 and Russian Gray Whale Project data through 2013, was presented in document WGWAP-14/35, with the main results summarized in the WGWAP-14 report. The Panel encouraged an updated population assessment using all available data, subject to availability of a definitive version of the NSCMB dataset as recommended last year (Recommendation WGWAP-16/017).

On behalf of the IWC, Donovan offered to host a central gray whale database at the IWC to which all teams collecting field data would be encouraged to contribute, subject to conditions to be negotiated between the IWC and data holders. The Panel **welcomes** this offer and encourages the IWC to initiate contact with data holders with a view to establishing this database. The Panel stands ready to assist with this project if required.

The Panel **agrees** to defer the issue of an updated joint population assessment, pending progress with the IWC initiative. One of the first tasks of the new IWC project will be to arrange for an update of the cross-catalogue matching. This would preferably include the Sakhalin and Kamchatka catalogues of both the NSCMB and the RGWP as well as photos of individual whales seen in other parts of the Okhotsk Sea and other areas in the western North Pacific. An update of the cross-matching with the Mexican gray whale catalogues is also encouraged.

The Panel will review progress next year. The Panel **emphasizes** the importance of regular updates to the population assessment, and encourages documentation of the latest interim population assessment pending a more comprehensive update to be conducted when the IWC project is up and running.

While the Panel understands that Sakhalin Energy is not in a position to support gray whale research outside Sakhalin, it emphasizes that understanding of the identity and status of the Sakhalin feeding population depends on information from other areas, including Kamchatka, the northern Okhotsk Sea, Japan, the East China Sea and Southeast Asia. Therefore, collaboration and data sharing with gray whale research effort outside of the Sakhalin area, either directly or through the IWC, will be very important.

2.4 Feeding Ecology and Prey-focussed Research

In view of the profound biological significance to western gray whales of the feeding areas off north-eastern Sakhalin, the Panel has repeatedly expressed its support for research focussed on the distribution and density of prey resources and their implications for gray whale feeding ecology. Systematic and robust research is needed to improve understanding of ecological features of the region that attract the whales (e.g. their diet) and the environmental and biological factors responsible for the exceptional productivity of the two known primary feeding areas – the Piltun (near-shore) area and the Offshore area. For example, see in particular the reports of the Independent Scientific Review Panel in 2005 (Chapter IV, item 4), WGWAP-1 in 2006 (item 11), WGWAP-2 in 2007 (item 4), WGWAP-7 in 2009 (item 10), WGWAP-8 in 2010 (item 10), WGWAP-10 in 2011 (item 6), WGWAP-12 in 2012 (item 3.3), WGWAP-14 in 2014 (item 15)[9] and the Environmental Monitoring Task Force in 2011 (items 3 and 4)[10]. Former Panel member Glenn VanBlaricom was responsible for ensuring that this aspect of the panels' work received consistent, expert attention over the period from 2004 through 2014.

In 2015-2016, Panel members Pomerleau and Lowry developed a white paper entitled 'IUCN Background Study on the Ecology of the Gray Whale Feeding Area near the Mouth of Piltun Lagoon (Sakhalin)'. This document, which was appended to the JPTF-2 report (Annex D of that report[11])), outlined a strategy for carrying forward some of VanBlaricom's ideas and concerns and also introduced new suggestions and recommendations for future work of the Sakhalin Energy/ENL Joint Programme.

[9] All available at https://www.iucn.org/western-gray-whale-advisory-panel/panel/meetings/glance-meeting-reports
[10] https://www.iucn.org/sites/dev/files/content/documents/final_emtf_1_report.pdf
[11] https://www.iucn.org/sites/dev/files/content/documents/jptf-2_may_2016_report_final.pdf

As a next step, Pomerleau prepared two proposals for consideration by the IWC Commissioners from countries that have signed the IWC Memorandum of Cooperation (see above). The proposals were shared with several of these Commissioners prior to the IWC biennial meeting in Slovenia in October 2016 and discussed (by Donovan) with them there. At the time of the present meeting it remained uncertain whether any funding would be forthcoming from these sources. The two proposals were presented and discussed briefly at this meeting – see 2.4.1 – 2.4.3 below.

Pomerleau also prepared a detailed proposal specifically for consideration at the Sakhalin Energy/ENL Joint Programme Task Force meeting immediately prior to this Panel meeting (internal working Document JPTF-3/1) – see the JPTF-3 report.

2.4.1 Feeding ecology of gray whales off north-eastern Sakhalin Island (Document WGWAP-17/25)

Pomerleau's presentation of her feeding ecology proposal emphasized the importance of the two north-eastern Sakhalin feeding areas in allowing gray whales to acquire and store energy reserves for the late autumn – winter – early spring fasting season (including long-distance migratory movements). Previous analyses of stomach contents and direct observations of 'eastern' gray whales have shown that they consume a wide array of prey items including amphipods, mysids and small fish, eggs and fry (e.g. Bogoslovskaya *et al.* 1982; Nerini 1984; Darling *et al.* 1998; Dunham and Duffus 2002). Prey species consumed by the gray whales foraging off Sakhalin Island have yet to be identified with certainty. Time-integrated studies of diet are lacking for western gray whales: the only information available is from observed feeding behavior or from inferences based on delayed sampling of presumed prey. The detailed feeding ecology study proposed in Document WGWAP-17/25 would use biochemical tracers (stable isotopes and fatty acids) in samples of gray whale skin and blubber and in the tissues of a wide range of potential prey species. The three main objectives are to: (1) obtain quantitative information on diet composition by using stable isotope mixing models to estimate proportional contribution of each prey source to the whales' diet, (2) examine variability in diet by sex and maturity status and (3) assess inter-annual variability and trends in trophic structure off NE Sakhalin Island over the last 20 years. Although some archived gray whale skin samples may be available to support this work, it will be necessary to evaluate methods of preservation and type of material (e.g. blubber attached or not) as well as conditions for access. Similarly, some prey samples may be available. It is likely that implementation of this research proposal will require not only funding for processing and analysis, but also for additional field sampling to ensure a wide range of potential prey is included (e.g. sandlance, mysids).

2.4.2 Clarification of relationship between Piltun Lagoon and benthic productivity of adjacent waters (Document WGWAP-17/26)

Whether and how the flow of water, nutrients and other material from Piltun Lagoon contributes to the productivity of what has come to be known as the Piltun feeding area is a longstanding interest of the Panel. Pomerleau's proposal on this topic was meant to provide a way forward in seeking to improve understanding of the ecological processes responsible for gray whales foraging near the mouth of Piltun Lagoon and in the Offshore feeding area. Ecological studies of other coastal lagoon systems, including in Alaska and the Gulf of Mexico, have suggested that lagoons play a key role in maintaining or creating productive areas, including the provision of subsidies to benthic productivity. In the case of Piltun Lagoon, a number of knowledge gaps need to be addressed in order to assess its role in the productivity of gray whale feeding habitat.

The proposed studies would examine the influence of Piltun Lagoon outflow on adjacent open-coast benthic communities and its possible role in supporting and maintaining both whale feeding areas, framed within two main working hypotheses. The first is that part of the carbon derived from terrestrial organic matter in Piltun Lagoon is exported and assimilated by pelagic and benthic consumers (e.g. amphipods) in the whale feeding areas and as such represents a significant organic carbon subsidy to the near-shore ecosystem. The second hypothesis is that any subsidies from Piltun Lagoon to the near-shore and offshore feeding areas would decrease with distance from the lagoon mouth.

The main objective of the proposal is to estimate the contribution of lagoon-derived production to invertebrates, including whale prey (e.g., amphipods), in both feeding areas using mass balance isotope mixing models for each sampling site inside the lagoon and along two transects – one near shore (between the Piltun Lagoon mouth and along the coast to a distance of about 20 km, to be confirmed at later date) and the second offshore from the lagoon mouth to the Offshore feeding area. Variance estimates from multiple transects may be preferred over estimates based on a single transect. In terms of sampling outside the lagoon, a gradient sampling design would be used with the distance from Piltun Lagoon mouth serving as a proxy for the degree to which lagoon subsidies influence the feeding habitat (near shore and offshore). The sampling interval would depend on the time and effort that can be allocated to the survey. Inside the lagoon, a transect sampling approach may be used to characterize the isotopic signatures primary of producers. Sampling could include suspended particulate organic matter (SPOM), benthic particulate organic matter (BPOM), marsh plants, seagrass, macroalgae, water samples, temperature, salinity, Chlorophyl-a, nutrients (NH_4^+, PO_4^+, SiO_4, NO_2^-, NO_3^+) and benthic, epibenthic and planktonic organisms. Organic samples would be analysed for stable isotopes (SI) of carbon and nitrogen and used in mass balance mixing models to estimate source proportions at each sampling site. Sampling would need to be repeated over at least two years to gather data on inter-annual variability.

2.4.3 Discussion and conclusions

Although Sakhalin Energy did not make a formal response to the proposals at this meeting, Stephanie Lock indicated a willingness to consult internally and provide such a response in due course. Pomerleau stressed for both proposals that she anticipated producing more detailed versions (e.g. sampling design, sampling frequency, timeline, budget) once it is determined that there is interest on the part of one or more funding sources.

The Panel regards the proposed work as especially timely in the light of the significant recent (and ongoing?) decline in amphipod biomass in the Piltun feeding area as reported by Sakhalin Energy/ENL Joint Programme scientists (see item 4.1.2 below). The working hypothesis of those scientists seems to be that the availability of sand lance has increased and that sand lance is now one of the main components of the Sakhalin gray whales' diet, at least in the shallow near-shore waters. This however must be viewed as only one of several hypotheses that could explain the reported changes, and it is important that alternative hypotheses be articulated and seriously considered, and that any conclusions await the results of rigorous scientific analyses such as those proposed by Pomerleau and her collaborators.

3 MANAGING AND ADDRESSING ISSUES AT THE RUSSIAN FEDERATION LEVEL

3.1 "Principles and Guidelines for the Monitoring and Mitigation of Impacts on Large Whales from Offshore Industrial Activity in Russian Waters" developed within the framework of the UNDP/ /GEF/MRN Project "Mainstreaming biodiversity into Russia's energy sector practice and policy"

Alexey Vladimirov updated the meeting on the development of 'Principles and Guidelines for the Monitoring and Mitigation of Impacts on Large Whales from Offshore Industrial Activity in Russian Waters' (Document WGWAP-17/28; hereafter Principles and Guidelines). Under an agreement between IUCN and the UNDP/ GEF/MNR Project **"**Mainstreaming biodiversity into Russia's energy sector practice and policy", the initial draft prepared in Russia was reviewed and revised by an expert group convened by IUCN as recommended by the Russian authorities. In his presentation Vladimirov highlighted the following:

a) The initial draft of the document was based primarily on experience and findings from the Sakhalin Energy/ENL Joint Programme and the mitigation aspects were developed, in large part, through the WGWAP process;
b) The current revised document from IUCN incorporates consideration of comments and other input from multiple stakeholders in Russia including governmental agencies, oil and gas companies, independent experts and scientific and public organizations;
c) The Principles and Guidelines are aligned with international expertise and 'best practices' – made available, at least in part, through IUCN;
d) After an additional round of public consultations in Russia, the final draft of Principles and Guidelines will be officially submitted to the MNR and it is expected to be endorsed as a Russian legal act in the form of federal recommendations;
e) The overall process is regarded by the UNDP/GEF/MNR Project as an excellent example of effective collaboration among different stakeholders, with the recognized experience from the Sakhalin region used to develop best practices that are applied (or adapted as necessary) in other areas and for other kinds of development. In other words, it establishes a generally 'level-field' national framework consistent with both international standards and Russian legislation.

In discussion following the presentation, two of the Russian scientists who helped draft the initial version of the UNDP/GEF/MNR Project document (Alexander Vedenev and Shpak) pointed out that the earlier version had contained detailed information on monitoring methods and specific criteria for mitigation, which are missing entirely from the current Principles and Guidelines document. In their view, the document should be more prescriptive than it now is.

In response, Vladimirov reiterated that the methods and criteria mentioned were quite specific to the Sakhalin context and that extending them directly to other regions (especially the Arctic) and other species could be problematical. He noted the dearth of studies of large whales elsewhere in Russia over the past 30 years and expressed skepticism that similarly detailed methods and criteria for the other eight species covered by the Principles and Guidelines could be developed in the absence of such studies. In conclusion, he emphasized that MNR had asked the UNDP/GEF/MNR Project to conduct another round of public consultations and therefore all interested parties would have an opportunity to comment officially.

For its part, the Panel thanked the UNDP/GEF/MNR Project and IUCN for their efforts in advancing this initiative and expressed hope that it would lead to stronger protection for the whales throughout Russian waters. The Panel acknowledged that much of the detail provided in the initial version of the document was indeed absent from the current version and suggested that this might be rectified by developing a series of specific sets of guidelines or regulations applicable to particular areas and species in the future. In addition, it was noted that the current version of the Principles and Guidelines would benefit from the addition of any necessary legal language and possibly some reframing by legal experts to ensure the document's early adoption and implementation by Russian authorities.

4 PROGRAMMES ON GRAY WHALE RESEARCH AND MONITORING: REVIEW OF 2015 FIELDWORK RESULTS, PRELIMINARY 2016 RESULTS, AND 2017 PLANS

4.1 Sakhalin Energy/ENL Joint Programme 2015

Final reports of the 2015 Sakhalin Energy/ENL Joint Programme field season were made available to the Panel only weeks before this meeting, unlike in the past when these documents were released soon after being submitted to the Russian permitting authorities. In addition, lead investigators for the various programme elements did not attend this Panel meeting (though several of them had been present at the preceding JPTF meeting). This meant that not only was their work presented by a third party (Andrey Samatov) but also the Panel (and Observers) did not have opportunities to pose questions and exchange information with the individuals who were responsible for the respective analyses of the 2015 fieldwork. The main report (Document WGWAP-17/5) was summarized very briefly in Samatov's presentation as were the individual element reports on benthos and hydrology studies (Document WGWAP-17/6), distribution and abundance (Document WGWAP-17/7), photo-identification (Document WGWAP-17/8) and acoustic hydrophysical survey (Document WGWAP-17/9).

4.1.1 Acoustics

The document describing the companies' acoustic and hydrological monitoring activities for the 2105 season (WGWAP-17/9) provided a broad overview of operations but included only a few summary figures and data reporting the 2015 results. A DVD that contains all of the 2015 acoustic data in the previously agreed formats is mentioned in WGWAP-17/9, but neither this DVD nor the data included in it were submitted for the Panel's consideration before or at the meeting. With respect to the 2016 field results, the Panel was provided with a one-slide summary of the acoustic monitoring efforts. With few details, this summary mentioned that (i) 'new generation' acoustic stations were installed at the standard points, (ii) the average level of anthropogenic noise matched levels of previous years, (iii) the most significant sources of anthropogenic noise were platform supply vessels and (iv) noise from an ENL seismic survey was registered on the southern border of the Piltun area and impulses from pile driving on shore were registered in the northern Odoptu part of the area.

Given the limited summary of the results and without access to the full acoustic data, the Panel can draw no conclusions about the noise levels for either 2015 (other than during the seismic survey period, which was covered in other documents) or 2016. It is unfortunate that neither of these data sets was provided for review by the Noise Task Force (NTF-10 or NTF-11 meetings) ahead of the WGWAP-17 meeting. Consequently, its consideration and discussion of those data must be postponed, with revisions to the Panel's schedule and workplan. The Panel **requests** that these data are provided well ahead of the NTF-12 and WGWAP-18 meetings.

The Panel and the NTF have placed significant emphasis on the need for a strategic modification of the 'noise control' site, the purpose of which is to provide ambient noise data from a location in the region with little or no industrial activity. Unfortunately, however, WGWAP recommendation 16/009B has not yet been acted upon. The urgent need for both a new control site and the deployment of redundant recorders there to account for unit loss or failure (as occurred over the previous two seasons) was again evident from the limited consideration of acoustic data from the 2015 seismic survey (as discussed below under item 6.1 regarding the NTF-10 and NTF-11 meetings) and a cursory review of the portion of the 2015 acoustic data available for time periods before or after the Sakhalin Energy seismic survey. As indicated above and elsewhere (e.g. item 6.1), the Panel's lack of ready access to the 2015 non-seismic acoustic data is limiting and frustrating. However, even if all existing data were available, this would not alter the clear need for an additional acoustic monitoring location to serve as an actual control site, primarily because there is no reason to expect that the traditional control site does or will in the foreseeable future serve in its intended role due to the broad and substantial increase in industrial activity in the area over the last >10 years. Therefore, the Panel **strongly reiterates its previous recommendation** that the Company provide a plan for a new control site at a strategically selected location as soon as possible. Recommendation 16/009B included the stipulation that a new control site would be equipped with an appropriate acoustic recorder for the 2016 season, yet this did not happen; it is imperative to have a new control site established for the 2017 season. The Panel suggests the Vostochny Wildlife Refuge (zakaznik), 200-300 km south of the Piltun feeding area, as an appropriate site for the new control station. The distance is sufficient to provide an adequate buffer such that the recordings made will be representative of the sound field of a non-industrialized control site within the NE Sakhalin region. This location is also relevant given the recent documentation of gray whales in this non-industrialized area (see item 2.2 above).

Together with its recommendation that a new control site be established, the Panel **recommends** that Sakhalin Energy provide a graph of the trend in low-frequency ambient noise levels (sound pressure level - SPL) recorded at the current control site. The data should be averaged on a weekly basis for the full period of deployment for each year from 2003 through 2016. Such a graph will show the extent to which this site is (or is not) functioning as intended.

4.1.2 Benthos and Hydrology

According to Document WGWAP-17/6 and the presentation by Samatov, the most significant finding from the sampling of benthos in the near-shore (Piltun) feeding area was that the decline in total amphipod biomass (47 to 89% of which consisted of *Monoporeia affinis* in 2015) has continued. Maximum values were observed in the years 2002-2004 and minimum values in 2013-2015. A significant increase in sand lance (*Ammodytes hexapterus*) biomass over 2013-2014 values was observed in 2015, with greatest concentrations in the northern part of the study area.

As in previous years, high densities of *Ampelisca* amphipods were recorded in the Offshore feeding area, with a marked gradient at around 50 m of depth – amphipod biomass values $\geq$ 300 g/m^2 are found consistently at depths greater than 50 m (Document WGWAP-17/6). A shift in the peak biomass to greater depths than in previous years was suggested by the 2015 results.

During discussion following Samatov's presentation, Pomerleau pointed out that sandlance prey largely on copepods and therefore the increase in sandlance in the northern part of the Piltun feeding area could be correlated with a shift in zooplankton distribution or an increase in copepod abundance. Pomerleau also pointed out that although the sharp decline of amphipods at Piltun in 2013 had been attributed to lowered salinity linked to an Amur River flood event that year (Document WGWAP-17/6), this would not account for the continued decline in 2014 and 2015. Also during the discussion, Mike Scott informed the Panel that ENL's seismic survey monitoring programme had included substantial benthic sampling in addition to what is reported in Document WGWAP-17/6 and therefore that further insights on dynamics of the benthos in 2015 may become available once the data from that effort are analysed and published.

Because of the potential implications for gray whale feeding energetics, the Panel is concerned about what appears to be a long-term, persistent decline in amphipod biomass in the Piltun feeding area. The Panel therefore **recommends** that the companies explore the nature and causes of this decline in greater detail and provide a report on findings to the next Panel meeting. For such investigations, it is important to consider multiple explanatory hypotheses, some of which may relate to changes in the demography or behaviour of the gray whales and others to biophysical events or processes in the regional marine ecosystem.

4.1.3 Photo-ID

Samatov provided an overview of information collected during the Sakhalin Energy/ENL Joint Programme photo-identification surveys in 2015 (Document WGWAP-17/8). Photo-ID effort was considerably greater than in the past as a result of five teams being dedicated to collecting data in 2015. These teams included one based on the large research ship working mostly in the Offshore feeding area between 26 June and 27 October, one surveying the Near-shore (Piltun) feeding area by operating from a small boat launched from Piltun Lagoon between 1 August and 30 September, and three vehicle-based teams collecting images from shore between 1 June and 31 October as well as between 20 November and 1 December. In combination, these teams collected nearly 77,000 photographs of gray whales and identified 168 individuals. A total of 259 whales were identified by the Sakhalin Energy/ENL Joint Programme scientists from 2002 through 2015.

The ship-based effort resulted in identification of 102 whales in the Offshore area and 31 in the Near-shore area. The small-boat effort resulted in identification of 44 whales in the Near-shore area. The vehicle-based effort resulted in identification of 107 whales in the Near-shore area.

Of the 168 whales identified in 2015, 102 were sighted in the Offshore feeding area and 113 were identified in the Near-shore (Piltun) feeding area. A relatively high degree of mixing between the Offshore and Near-shore areas was recorded: 47 of the 102 whales sighted in the Offshore area were also sighted near shore and 52 of the 113 whales sighted near shore were also sighted in the Offshore area.

The 2015 effort recorded 11 calves and three previously unidentified non-calves. Nine of the calves were still associated with their mothers when first sighted while two apparently had already been weaned and appeared to be independent of their mothers. No mother-calf pairs or independent calves have ever been reported from the Offshore feeding area.

The assessment of body condition continued in 2015 and 29 whales were reported to be in ‘poor’ condition. This is the highest total number of whales considered to be in poor condition since assessment by the Sakhalin Energy/ENL Joint Programme started in 2003. However, the condition of many of these whales reportedly improved over the course of the feeding season.

Besides the 1 June to 31 October vehicle-based photo-identification work, this effort was undertaken between 20 November and 1 December. During that time, 11 days of effort in the Near-shore area (between 52°47'N and 53°50'N) resulted in identification of 19 whales (although the photographs for two of them were reported as being of poor and unusable quality). All of the identified individuals had been sighted earlier in the 2015 field season. With the exception of one whale characterized as an adult based on its sighting history, 12 of these late-season whales were reported to be ≤ 4 years of age and four of them were calves first identified in 2015.

Document WGWAP-17/8 reported on two gray whales photographed on 1 and 2 November 2015 by Lisitsyn in the Vostochny Wildlife Refuge (zakaznik), about 220 km south of Piltun (see item 2.2 above). These whales were not found in the photo-identification catalogue of the Sakhalin Energy/ENL Joint Programme/ NSCMB and therefore were assigned new catalogue subject numbers. Additionally, Vladimir Vertyankin provided photo-identification images of seven gray whales observed on 9 August 2015 in Olga Bay, south-eastern Kamchatka. One of these whales had been sighted off Sakhalin in previous years.

In discussion, the Panel urged the companies to carefully consider the number of photographic images that are being collected on an annual basis – nearly 77,000 photos (of 168 whales) were obtained by the Sakhalin Energy/ENL Joint Programme in 2015. The Panel’s concern about this issue relates to the time and effort required of an analyst (or analysts) to process the data. Understanding the threshold of when data collection becomes excessive is part of ensuring an effective research programme that publishes results on a timely basis. The Panel **reiterates** its point that collection of data is not the end-product of research. Rather, data should be collected in a thoughtful and rigorous manner to feed directly into analyses designed to address specific questions.

Additional discussion centred on evaluating the costs and benefits of deploying five teams dedicated to photo-identification. The Panel encouraged the companies to consider whether combining, downsizing, or even eliminating some of the field efforts would result in increased efficiency without any loss of data quality. It suggested that an evaluation be conducted with the 2015 photo-ID data to assess potential redundancy across the three research platforms (ship, boat, shore).

Finally, the co-chairs of the Panel again expressed their longstanding concern that some conclusions in field reports are not well justified, fail to acknowledge uncertainty, and ignore plausible alternative hypotheses. It is hoped that discussions within the JPTF will begin to address this concern.

4.1.4 Distribution

Samatov summarized Document WGWAP-17/7 describing the distribution of gray whales off northeastern Sakhalin based on observations made in August-September 2015. Distribution surveys were conducted by offshore (vessel-based) and onshore teams following (for the most part) the same transect lines and survey protocols as in 2014. Exceptions to previous protocols included: (1) four low-lying onshore stations (stations 8-10 and 13) in the southern portion of the study area were washed away by winter storms and subsequently moved to the nearest elevated points, and (2) vessel transects in the Offshore feeding area were shifted by one transect south so that lines 2-7 were surveyed instead of lines 1-6. This was done to account for a more southerly distribution of whales in 2015. In 2015, bad weather frequently interfered with both offshore and onshore data collection.

Shore-based observations were made in the Piltun feeding area from 1 August through 30 September. The average number of whales sighted on 13 complete, synchronized surveys was 25.7 and the maximum number was 40, which is the lowest total number recorded since 2004. The majority of whales (73% of sightings) were seen in waters adjacent to the mouth of Piltun Lagoon. Another 13.8% of sightings were made in the northern part of the study area, north of Station 4. Most of the whales (76%) were seen inside the 10 m isobath and 54.8% were inside the 5 m isobath.

While the distribution of whales in 2015 was similar to previous years (2004-2014), Document WGWAP-17/7 mentions several exceptions to this, including: (1) the lowest maximum number (40) of whales counted during synchronous shore surveys since 2004, (2) a decrease to 25.7 (34.6 in 2014) in the average number of whales counted and (3) the presence of a small localized aggregation of whales observed north of survey station 4 and up to 5 km from shore over the entire survey period. The low maximum number of whales counted during 2015 is notable. In 2008 the maximum number of whales counted during synchronous shore-based surveys was 47. In light of the results reported at WGWAP-16 (see WGWAP-16 report, item 8.3.2) which found a correlation between monitoring results in the 2008 feeding season and an apparent time-lagged impact on reproductive success, it is important that the Sakhalin Energy/ENL Joint Programme results and potential sources of anthropogenic disturbance (i.e. seismic surveys) in 2015 be investigated to the greatest extent possible.

In the Offshore feeding area, four complete surveys were conducted in July-August. Sightings were made mostly in the south-eastern portion, similar to what was observed in 2014, in waters 60–65 m deep. Whales were seen feeding, however, throughout the entire Offshore area. Results from synchronized onshore and offshore surveys on 24 August 2015 indicated that the total abundance of gray whales off north-eastern Sakhalin was 107 individuals. On that day, 40 whales were sighted in the Piltun area and 67 in the Offshore area.

Document WGWAP-17/7 notes that until 2006, counts of whales from shore-based distribution surveys were comparable to or higher than the numbers of whales photo-identified, but beginning in 2007, photo-identification methods produced higher total numbers (see Fig. 5-2 in Document WGWAP-17/7). The authors of document WGWAP-17/7 speculated that this change indicates the whales are moving away from the north-eastern Sakhalin feeding areas to other, undetermined feeding locations. This explanation, however, has no empirical basis and in some respects is counter to the intra-season satellite tracks collected in 2010-2011.

The Panel welcomes the information provided by the Company and **reiterates** the importance of this long-term data set and the need for continuing to collect data that are consistent and comparable. In discussion, the Panel noted that some statements made in WGWAP-17/7, especially those relating to cause and effect, seem to be in disagreement with the data presented. Recalling what was stated by the Panel in the report of WGWAP-16 and previously, it would be timely for the companies and their scientists to undertake more extensive analyses of the available multi-year distribution data set. Integration and synthesis of data collected between 2004 and 2016, incorporating benthic data as possible, would allow a number of important questions to be addressed and provide a more detailed understanding of ‘core use’ areas and how these change within and between seasons and years. The Panel **recommends** that the Company initiate this process now, recognizing that it will require considerable time, funding and expertise.

4.2 Russian Gray Whale Project 2015 fieldwork results and preliminary 2016 results

Burdin summarized the final results of fieldwork by the Russian Gray Whale Project (RGWP) in 2015 (Burdin and Sychenko 2016) and 2016.

4.2.1 2015 results

In 2015, 16 photo-ID surveys were conducted between 29 June and 17 August, with a total of 38.8 hours spent observing 114 whale groups. Sixty naturally marked individuals, including eight calves, were identified. Of the 52 non-calves identified, 50 (96.1%) had been photo-documented in the Piltun area from 1994-2014. The first sighting of a mother-calf pair occurred on 2 July. The mothers of all eight calves had been sighted in the study area previously and had had multiple calves prior to 2015. Thus, the total number of known reproductive females documented at Sakhalin by the RGWP since 1995 remained at 33. Two of the 2015 mothers had been first identified as calves themselves in 1998 and 2002, respectively. One of these females has now been documented at Piltun with four calves and the other, three.

4.2.2 2016 results

In 2016, 15 photo-ID surveys were conducted between 6 July and 21 August (7 in July, 8 in August), with a total of 15.2 hours spent observing 135 whale groups. Fifty-six naturally marked individual whales, including six calves, were identified. Of the 50 non-calves identified, 43 (86%) had been photo-documented in the Piltun area from 1994-2015. The mean pod size for all groups encountered in 2016 (n=135) was 1.62 ± 0.752, ranging from 1 (71 groups, or 53%) to 4 (2 groups) individuals per pod. In general, whales observed in 2016 were seen in water depths ranging from 2.6 to 16.5 m (average 8.4 ± 2.51 m).

All six mothers-of-the-year sighted in the study area had had multiple calves prior to 2016. Thus, the total number of known reproductive females 1995 remains at 33. Two of the 2016 mothers had been first identified as calves in 2000 and 2001, respectively. One of them has now been documented at Piltun with two calves and the other, one. The first sighting of a mother-calf pair in 2016 occurred on 7 July. As in previous years, mother-calf pairs were observed in proximity to the lagoon entrance more often than in other parts of the study area compared to other (non-mother-calf) individuals. Four of the mother-calf pairs were first identified in July and two in August. Of the six pairs, three apparently separated sometime in late July or August while in the other three cases, the calves were still with their mothers at the time of the last sighting and therefore nothing about weaning time could be inferred for them.

The number of within-season re-sightings in 2016 ranged from one to nine. Sixteen (29%) individuals were photo-documented only once during the season. Two individuals, a calf of 2015 and a previously known adult, were documented nine and eight times, respectively. Three individuals were photo-identified seven times within the 2016 season and all three of them had been observed in previous years. Out of the eight calves identified in 2015, only four were observed in the near-shore (Piltun) feeding area in 2016. Also, two whales identified as calves in 2014 were encountered in 2016.

No active fishing nets were observed near the mouth of Piltun Lagoon in 2016, but some disused gear was still present in the locations where active fishing took place in 2015. This derelict gear, and not only gear that is being actively fished, represents a continuing entanglement risk to the whales.

4.2.3 Summary

Between 1994 and 2016, the team photo-identified 258 individual gray whales off north-eastern Sakhalin Island during 462 small-boat surveys launched from shore. The possibility of identifying individual calves each year has made it possible to determine the exact ages of many individuals, and this has been valuable for determining age at what is presumed to be first reproduction of several females. Five females first sighted as calves at Sakhalin in early years of this study have been observed there with their own calves, with the age of first year of documented calving (i.e. observed at Sakhalin with a calf) ranging from seven to 11 years.

The Panel expressed appreciation for the RGWP's work and encouraged its continuation. It also noted once again that when presenting results, and especially when making between-year comparisons, it is critical to incorporate consideration of annual differences in effort.

4.3 Preliminary 2016 Sakhalin Energy/ENL Joint Programme field results

It has become standard practice for Sakhalin Energy to provide preliminary information on the previous season's Sakhalin Energy/ENL Joint Programme fieldwork at the late autumn meeting of the Panel, recognizing that it is not feasible for analyses and complete data summaries to be available given that the field season has either just ended or is still winding down.

4.3.1 Presentation

At this meeting, Samatov provided a general overview of effort in 2016 for each element of the programme (document WGWAP-17/10).

Between 1 August and 30 September there were 27 'fully synchronised' distribution surveys and 25 'partial' surveys by the two teams of observers on shore. Three vessel-based distribution surveys were completed in the Offshore feeding area, two of which were coincident with surveys of the near-shore (Piltun) feeding area by the shore-based teams.

The vessel-based photo-ID team logged six days of effort in the near-shore (Piltun) feeding area and seven days in the Offshore feeding area between July and October. Seventy days during the full field season had no vessel-based photo-ID effort; 58 of these days were affected by bad weather. The reported total number of 'sightings (individuals)' was 139 and the total of photographs obtained was 6,308. In addition, the vehicle-based photo-ID team on shore obtained 13,532 photographs and reported 556 'whales' as a result of 93 'missions', and the small-boat photo-ID team launched 19 'missions' from shore, obtaining 8,011 photographs and 19 biopsies and reporting a total of 2011 'sightings (individuals)'. It was noted that some gray whales were still present in the near-shore (Piltun) feeding area in November and that the vehicle-based photo-ID team was planning to spend two weeks in the field in late November and early December attempting to obtain more photographs.

Benthic sampling was conducted only in October. The grid as 'optimized' for the 2016 season consisted of 87 'regular stations' – 45 at Piltun, 8 at Chaivo and 34 Offshore.

The acoustic and hydrological monitoring programme was carried out 'from July to October' although few details were provided. No buoys were lost and all 17 autonomous underwater acoustic recorders that were deployed functioned.

4.3.2 Discussion

Panel members questioned the efficiency of collecting such large numbers of photographs and suggested that the companies carry out a cost-benefit analysis to determine the degree of redundancy that results from having multiple teams in the field. For example, comparing the number of whale identifications obtained from the on-shore (vehicle-based) team with that obtained by the boat-based teams could be informative. Also, it is important to ensure that the photo-ID effort on shore does not in any way compromise the distribution monitoring effort on shore.

Scott (ENL) pointed out that the on-shore photo-ID team (vehicle-based) covers approximately 120 km of coastline while the boat-based team (launching from shore) covers a much smaller area albeit more intensively. Samatov noted that the boat-based teams are more susceptible to bad weather than is the on-shore team.

Is the work of the different photo-ID teams complementary or duplicative? This is the type of question that should be addressed by the JPTF.

The possibility of integrating new technologies (e.g. drones, recently developed tags) into the Joint Programme's methodological repertoire was raised and discussed briefly. The Panel expressed the need for a deliberate, well-reasoned rationale for any application of such technologies and it was agreed that this subject is best addressed by the JPTF.

4.4 Research and monitoring plans for 2017

The Sakhalin Energy/ENL Joint Programme plans for 2017 were still being worked out by the two companies at the time of this meeting. It was expected that the final plans would be developed with due consideration for the results of the two JPTF meetings (JPTF-2 in May and JPTF-3 immediately prior to this Panel meeting) as well taking account of the two companies' meetings with JP scientists in Vladivostok in late January or early February 2017.

The RGWP plans to continue monitoring whales in the Piltun Lagoon area in July and August 2017. Burdin pointed out that normally the timing overlaps only partially with that of the JP and therefore to some degree the two programmes are complementary. The importance of coordinating (and ideally merging) the gray whale photo-identification catalogues, at least for individuals observed in the western Pacific, was noted, as was the willingness of all parties to pursue this, possibly through some kind of collaboration with the IWC.

The Panel emphasized, once again, the great importance of the RGWP which has been the primary source of data for population analyses of various kinds to date. Continuation of this time series is **strongly recommended**.

5 REFRESH' OF SAKHALIN ENERGY/ENL JOINT PROGRAMME ON GRAY WHALE RESEARCH AND MONITORING FROM 2018 AND BEYOND

5.1 Update and Background

Lock provided the following brief summary of Sakhalin Energy/ENL Joint Programme history and plans.

ENL and Sakhalin Energy conduct oil and gas activities off north-eastern Sakhalin as operators of their respective Sakhalin-1 and Sakhalin-2 Production Sharing Agreement (PSA) projects. Both companies attempt to manage and mitigate the risks of their activities to whales. The Sakhalin Energy/ENL Joint Programme, initiated in 1997, has produced a great deal of new data and information on the gray whales off Sakhalin. The information on these animals and their habitat has been used to assess real and perceived risks to the whales, and enabled more effective management through science- and risk-based decisions.

Following completion of construction activities by ENL in 2017, both companies will be in operational phase for offshore assets. During the operational phase, it is expected that the companies will come under increasing pressure to demonstrate value from the Sakhalin Energy/ENL Joint Programme. At the same time, it is likely that the gray whales, currently classified on the IUCN Red List of Threatened Species™ as Critically Endangered, and the companies are assuming that the population will be classified as Endangered over the long term (from the perspective of the two oil and gas projects, meaning several decades into the future), so environmental risk and societal expectations will remain.

The Sakhalin-1 and Sakhalin-2 projects both operate under PSAs with the Russian Federation. As such, these projects are accountable to their respective Authorized State Body of the Russian Federation for budget approval and oversight of any and all programmes conducted by the operators.

Other companies that operate in the region are not part this Joint Programme, nor do they operate under PSAs. Their obligations for wildlife protection fall only under the relevant Russian Federation environmental legislation.

5.2 JPTF-2

After the companies communicated their intentions concerning the opportunity to ‘refresh’ the Joint Programme for the long term, the Panel agreed to reconvene a task force, called the Joint Programme Task Force (JPTF), which met in May 2016 at IUCN’s Headquarters in Gland. The meeting report (JPTF-2) is available on the WGWAP website.[12]

At JPTF-2, the companies presented a briefing document that included a summary of what they considered ‘achievements’ of the programme to date and their initial thoughts on future programme shape and content. Among the findings, comments and advice recorded in the JPTF-2 report were that (1) the ‘achievements’ listed by the companies would have greater credibility if they were supported by relevant publications and (2) they should consider suspending or significantly scaling back fieldwork for a year, or even two, and invest more resources in the completion of scientific manuscripts for publication.

Following the comments and advice received during and after JPTF-2, the companies proposed to MNR a programme that would focus resources in 2017 and 2018 on data analysis. Lock noted that the 2017 field programme had not yet been finalized and that the final 2017 programme would be subject to approvals of the Russian Party and company officials.

[12] https://www.iucn.org/sites/dev/files/content/documents/jptf-2_may_2016_report_final.pdf.

The companies stated that their intentions in 'refreshing' their Joint Programme are to (i) realize the value of the large quantity of data and information already collected, (ii) revise programme objectives and 'sub-objectives' for the medium to long term and (iii) design a monitoring and mitigation programme that will achieve its stated objectives and demonstrate due diligence. According to Lock, the draft long-term, overarching objectives for the programme are to (1) determine any significant impact on gray whales off Sakhalin from company activities, (2) describe (maintain) mitigations to prevent or minimize any such significant impacts and (3) publish information produced by the programme for use by the wider industry and relevant agencies.

5.3 JPTF-3

5.3.1 Summary of Process

The JPTF meeting (JPTF-3) that immediately preceded WGWAP-17 was centered on what Lock referred to as a 'working session' in which breakout groups considered four potential programme components: (i) population structure, (ii) distribution, abundance and health, (iii) benthos and ecology and (iv) behaviour and disturbance. Each of these groups was chaired by a Panel member and each included at least several additional Panel members, a representative of one or both companies and at least one Sakhalin Energy/ENL Joint Programme scientist familiar with the topic. For each component, the relevant group of JPTF members attempted to address a standard template, prepared beforehand by Lock, with the following broad headings:

1) Inputs. What do we already know?
    - Recapitulation of existing data and recognition of 'peer-reviewed' conclusions.
2) Short-term work programme. What needs to be done to realize the results of the programme to date?
    - Drafting of 'sub-objectives' and a ('peer-reviewed') analysis programme.
3) Longer term. What should the 'refreshed' programme consist of for long-term operations?
    - Initiate process of identifying and justifying options to include in the programme over the long term.

A brief summary of the plenary session is included in the JPTF-3 report, and summary worksheets from the four breakout groups, prepared by the respective group chairs, are appended. These summary worksheets were meant to be compilations of comments by participants during what were, in effect, brainstorming sessions. In other words, the worksheets are not to be regarded as conclusive or prescriptive but rather only as informative. Once completed, the final report of JPTF-3 will be posted in the usual manner on the WGWAP website.[13]

5.3.2 General Comments, Conclusions and Next Steps

During the JPTF plenary discussions, participants noted the importance of a framework that ensures all elements of the Sakhalin Energy/ENL Joint Programme are thoughtfully integrated, both in the Joint Programme's design and in the analyses of data that are collected. In this regard, some participants emphasized that the power of most analyses would be considerably enhanced if the data collected by both companies during their 'event-specific' monitoring programmes (i.e. those associated with seismic surveys or construction activities) were included. An integrated and comprehensive relational database, shared by the two companies and to the greatest extent possible also made more widely available, would facilitate timely, credible analyses to guide adaptive management for mitigation and prevention of impacts on whales and other biodiversity.

One benefit of reflecting on what data and information have been obtained thus far and how these have been used is that it can prompt fresh ideas and avenues for investigation. For example, particularly given the interesting new information from the East China Sea (item 2.2, above), it was suggested that the wealth of acoustic data collected by the Sakhalin Energy/ENL Joint Programme over the years may include valuable records of gray whale vocalizations whose scientific value has yet to be explored. In addition to mining existing (archived) gray whale (and killer whale) call data from the Sakhalin Energy/ENL Joint Programme for insights on occurrence, distribution and possibly even relative abundance in the study area, the strategic deployment of acoustic buoys in other regions (e.g. elsewhere in the Okhotsk Sea, East and South China seas) could be an efficient way of learning more about distribution, habitat use, and possibly even relative

[13] https://www.iucn.org/western-gray-whale-advisory-panel/panel/task-forces/joint-programme-task-force

numbers. It was suggested that as a first step, a pilot study might be undertaken that focusses on detecting whale vocalizations in the acoustic records from a specific portion of the Sakhalin study area where gray whales are known to occur often and in relatively high density.

Lock thanked the JPTF participants for their supportive initial input. She stated that the companies intend to jointly review the feedback received from the JPTF-2 and JPTF-3 meetings, meet with Sakhalin Energy/ENL Joint Programme scientists to finalize the 2017 field programme, develop terms of reference for analyses to be undertaken in 2017 and 2018, and develop detailed options for the 'refreshed' Sakhalin Energy/ENL Joint Programme of the future. The companies intend to engage a project manager to lead these efforts. Lock emphasized that the final programme will, as always, be determined with due consideration for regulatory requirements, limitations on the programme's scope under constraints imposed by the PSAs, and the companies' own risk-benefit analyses.

5.4 Infrared Camera System for Counting Gray Whales

During the Panel meeting, Weller gave a short presentation summarizing a shore-based infrared camera system, developed collaboratively by Toyon Research Corporation (Goleta, CA) and the Southwest Fisheries Science Center of the National Oceanic and Atmospheric Administration (NOAA Fisheries, La Jolla, California, USA), that is being used in central California to estimate the number of gray whales during the southbound migration. This system consists of: (i) three infrared cameras that monitor a fixed swath of the migration corridor 24 hours a day, (ii) automated detection software for detecting whale blows, (iii) whale-blow verification software for reviewing and removing false detections and (iv) counting software that estimates the number of whales that have passed the observation station. The automated counting software operates by using the location and timing of whale blows and a dynamics model of whale behaviour. A particle filter is used to operate the dynamics model and estimates the state of a whale or group of whales, including the number of whales that are present.

A side-by-side comparison showed that the results of this infrared camera system compared favourably to results from a team of trained NOAA observers. Benefits of this system include the ability to collect continuous data autonomously over long periods of time, including periods of darkness when human observers are unable to work. The use of this technology has potential application(s) to some of the research and monitoring being conducted off Sakhalin.

6 ADDRESSING NOISE ISSUES INCLUDING REVIEW OF RESULTS FROM 2015 SEISMIC SURVEY AND PLANS FOR FUTURE OBN SURVEY

6.1 Chair's summaries of the NTF-10 (May 2016) & NTF-11 (November 2016) meetings

6.1.1 NTF-10

The tenth meeting of the Noise Task Force (NTF-10) was held at IUCN headquarters in Gland in May 2016, and the following were the topics covered: i) progress with analyses of 2015 seismic survey data, ii) progress with NTF-9 recommendations, iii) plans for a possible future Ocean Bottom Node (OBN) survey including a timeline for decision-making, iv) general issues regarding seismic surveys including 'simultaneous/same season' surveys and safety zones/shutdowns and v) other acoustic issues.

No detailed analyses of the 2015 seismic survey data were available at the NTF-10 meeting. Sakhalin Energy reported only on the quantity and quality of the data collected, e.g. number of survey days, number of sightings. The NTF concluded that with regard to data quantity and quality, (i) the data on whale numbers and distribution were sufficient, (ii) the data on individual whale movements over time during periods of known exposure (or non-exposure) were limited and (iii) the respiration data were inadequate. The NTF agreed on the need for: (a) analyses of whale distribution, abundance and behaviour (movements, respiration etc.); (b) multivariate analyses (using Gailey *et al.* 2016 as a guide and taking into account a full suite of variables such as behavioural state, e.g. feeding, non-feeding, travelling); and (c) if at all possible, analyses that would include individual exposure-response events using the combined data from Sakhalin Energy and ENL.

Sakhalin Energy noted its intention to analyse its own 2015 data first, with comparisons to data from its 2010 and 2012 seismic surveys as possible. It was considered too soon to be able to determine the feasibility of analyses using the combined datasets from Sakhalin Energy and ENL given the uncertainties regarding data availability and compatibility of collection methods. The NTF agreed that the Company should consider pooling its own data across years to increase the power of analyses, regardless of whether ENL eventually agrees to share data and collaborate. A thorough, combined analysis of data collected by the two companies is regarded as ideal from a scientific and conservation perspective. Sakhalin Energy indicated that ENL was open to discussing the possibility of combined analyses but noted that ENL would not consider this seriously until after the results of its own work have been published. Regardless, it was suggested that Sakhalin Energy at least request and integrate into analyses of its own data on animal response, information regarding the timing and location of ENL activities (and those of other companies to the extent possible). This may help account for some of the potentially confounding effects of other disturbances when interpreting whale behavior during periods of activity by Sakhalin Energy. With respect to the ENL 2015 Monitoring and Mitigation Plan (MMP), IUCN reported having approached appropriate officials at the Ministry of Natural Resources and, after delays and complications, also ENL directly (thus implementing Recommendation WGWAP-16/06). ENL's response was that a synopsis of its MMP would be made public after the analyses of the programme's 2015 data have been published. Sakhalin Energy stated that it had provided its own MMP to ENL for purposes of comparison but that ENL was at present unwilling to reciprocate.

Sakhalin Energy reported on progress with implementing Recommendation WGWAP-16/03 (5-minute average sound exposure level (SEL) for a range of frequency bands). Roberto Racca provided highlights of the 2015 seismic survey acoustic monitoring report prepared by the Pacific Oceanological Institute (POI), FEB RAS and presented some data in this recommended format. Racca first presented a sample graphical comparison of overall levels generated using a simple sliding-window algorithm, as was used on-board the telemetric Automated Underwater Acoustic Recorders (AUARs) for Iridium-based transmission, with the corresponding per-pulse levels obtained from post-analysis of the recorded full-waveform data. Results demonstrated that data obtained from these two methods matched well. Racca then reviewed an annotated sample output from the POI report showing both the peak sound pressure level (SPL) and per-pulse SEL metrics produced by the full pulse analysis, which clearly demonstrated that seismic survey pulses from different surveys (those from both the Sakhalin Energy P-A survey and a survey by another operator) could be distinguished. Lastly, he showed a detailed comparison, over several days of data at one station, between the per-pulse SEL from the full waveform analysis and the 5-minute average SEL that had been recommended at NTF-9 as a convenient overall sound level assessment metric for initial analysis. With minor exceptions, the two metrics tracked each other very well over any interval where seismic survey pulses were detected – showing that the 5-minute average SEL indeed provided an easily computed, pulse-agnostic, and yet representative metric of received level for periods both with and without seismic survey activity.

The NTF agreed that, while per-pulse analyses may continue to be relevant for evaluating responses at the individual level relative to detailed behavioral observation, this longer-duration averaging method is a useful way of representing total energy over moderately long to long periods; such a representation of energy is important and useful for assessing cumulative impacts.

The NTF also considered several broader issues that had been the subject of previous NTF and WGWAP deliberations and recommendations. Among these was whether clustering seismic surveys within single seasons or periods versus spacing them out to the greatest extent possible is preferable from the perspective of gray whales. There are clear advantages and challenges to either approach. Concentrating seismic effort would be expected to result in longer intervals of time with reduced disturbance, and these intervals might be scheduled strategically such that biologically more important periods (e.g. initial arrival of whales to the feeding grounds, the period of calf weaning) are relatively 'quiet'. However, this approach would also mean that there are periods of relatively intense noise exposure, potentially resulting in 'intolerable' levels of disturbance. Deliberately spreading out the surveys might minimize intense periods of disturbance but extend the overall duration of exposure to encompass much of the time-window that the whales have for feeding off Sakhalin. The NTF concluded that, unfortunately, there is no clear scientific basis for concluding which of the two approaches is 'better' for whales. However, it was noted that broadly concentrating activity in and near Piltun as early in the season as possible and allowing for quieter, less disturbed periods later in the season when the majority of whales are present is more consistent with the approach long advocated for Sakhalin Energy's seismic surveys by the NTF and WGWAP. The NTF encouraged an ongoing dialogue on this issue, with the goal of ensuring that all operators adhere to common rules and protocols regarding the protection of gray whales and other marine mammals.

The NTF also discussed methods for the automated processing of acoustic data from monitoring buoys to detect anthropogenic noise events. Systematic methods should be tested that allow complete analysis of all acoustic records using automatic detection algorithms based on known noise signatures using previous data that have been audited manually. Racca indicated that efforts were underway to evaluate the potential and accuracy of these methods. The NTF also agreed, again, that anthropogenic noise events should be considered in the context of both local and regional ambient noise. This requires the systematic evaluation of ambient noise in different locations and the identification of natural and anthropogenic contributions to ambient noise. It also requires a true control station with which to evaluate anthropogenic contributions to background noise. The NTF noted the previous WGWAP recommendation (WGWAP-16/009B) on this point and the continuing need for strategic deployment of a new control site recorder. Only with good control data is it possible to compare and interpret trends in ambient noise, assess the industrial contribution over time, and determine the extent to which discrete noise events do or do not exceed typical ambient noise conditions.

Finally, the NTF once again reviewed the issue of comparing radiated noise levels for small boats (Rigid Hull Inflatable Boats, RHIBs and Fast Rescue Cutters, FRCs) used for gray whale observation, photo-ID and biopsy collection. It acknowledged that this issue had been partially resolved in that the recommended field experiment was completed but noted that the recommended review by a small expert group remains open. This latter review must be completed before the Panel can make further recommendations for field operations.

6.1.2 NTF-11

The eleventh meeting of the Noise Task Force (NTF-11) was held in Moscow immediately before WGWAP-17 (8-9 November 2016). The following topics were covered: (i) processing and analysis of 2015 seismic survey data, (ii) plans for a 2018 seismic survey including aspects of the OBN option(s), (iii) general or broader seismic survey issues, and iv) non-seismic-survey-related issues.

Only a very limited amount of new information on the 2015 Sakhalin Energy seismic survey was available at NTF-11 beyond what had been available at NTF-10. The task for received an update on the status of analyses similar to that given at WGWAP-17 (item 6.2 below). It was agreed that the available data on gray whale abundance and distribution was useful and might support a multivariate analysis, but that such an analysis would best be conducted within a larger, integrated collaboration with ENL. The NTF also agreed that, for a variety of reasons including weather and limitations in personnel, the available data on individual whale behavior were very limited and may be insufficient for a discrete analysis without integration with other years and surveys. The NTF-11 synthesis was similar to that reached at NTF-10, namely that no conclusions regarding behavioral disturbance or other consequences resulting from the 2015 survey could be drawn until statistical analyses and inter-annual comparisons have been completed.

The Company gave a detailed update of its plans for a 2018 seismic survey, similar to that presented to WGWAP-17 (described in greater detail under 6.3 below). Blonk described the requirements for and objectives of the survey, including the options for a conventional towed-array survey, an OBN survey, and a combination of the two. Specific needs for resolution and consistency with existing data preclude a full transition to OBN using a smaller sound source in 2018. However, Blonk suggested that a combination of methods would both meet the immediate requirements for the 2018 survey and provide useful information on the efficacy and utility of the OBN approach for future planning. The NTF agreed with this suggestion, noting the value of at once meeting the Company’s need for reliable geophysical data and being able to compare different sound sources in hopes of reducing the overall noise footprint of future surveys.

Blonk stated that details concerning the exact configuration of the conventional and OBN elements of the 2018 survey would be communicated to the NTF and WGWAP as they evolve. He noted that work was needed to optimize the 2018 MMP and that this would require, among other things, additional specification of the survey configuration as this will influence the modelled noise footprint. It was agreed that the general philosophy would be to start the survey as early in the season as possible, focusing on the completion of inshore lines first and, ideally, completing all A-lines by the middle of July. There was also agreement that the existing PML rather than a re-calculation of this was desired, as were maintaining the A-zone, real-time PML monitoring, and minimizing radiated noise from ancillary (i.e. non-seismic) vessels. Finally, the NTF concluded that any new equipment or new equipment configuration from what was used for previous survey or for the associated monitoring work should be fully tested and evaluated well before the survey begins.

Several broader seismic survey issues were discussed, including the implications, in terms of total noise exposure, of establishing A-zone shut-down criteria for all whales rather than only for mother-calf pairs, as was the case in 2015. This was discussed in the context of preliminary analyses presented by Cooke, and the

NTF agreed that the subject should be revisited as a major point of discussion at NTF-12. An additional important point of discussion at NTF-12 will be noise exposure criteria for marine mammals, notably the new NOAA guidelines for auditory weighting functions and Temporary Threshold Shift (TTS)/ Permanent Threshold Shift (PTS) onset.

Release of the IUCN publication on effective planning strategies for seismic surveys was noted (Nowacek and Southall 2016). In many ways, this document grew out of the detailed and systematic processes within WGWAP and the NTF over the years, and some specific examples of this are prominently featured in the resource guide and related online materials.

Finally, the NTF revisited some of the issues highlighted in the NTF-10 report, including the need for automatic noise processing and evaluation as well as the issue of the control station. Though little additional progress was made on either of these issues, they were highlighted as being important and it was noted that some effort is underway on both of them. Regarding a biological basis for strategic timing of major noise events (see item 6.1.1), additional data needs were identified. Specifically, Weller highlighted the fact that pregnant females are the first to arrive on feeding grounds in the eastern Pacific. A hormone analysis of biopsy samples obtained at Sakhalin could reveal whether a similar pattern exists there, which could influence any strategy for the timing of noise events. This may be challenging given the limited number of early-season observations and sampling opportunities. Additional sampling could be required, including identifying females that are present early in one season and return with a calf the following year.

6.2 Review of results from Sakhalin Energy’s 2015 seismic survey

6.2.1 2015 seismic survey monitoring and mitigation programme (MMP) results (including responses to WGWAP recommendations)

Samatov presented an overview and summary of the MMP implemented during Sakhalin Energy’s survey of the P-A license area which took place from 8-28 July 2015, immediately following the completion of ENL’s Odoptu and Sakhalin Energy’s Lunskoye surveys. This included a general summary of the activity and the overall configuration and outcome of the MMP protocols. When asked to comment on coordination of analyses given this sequence of surveys, Samatov stated that timing of the surveys was coordinated by the companies, and there was also coordination between the field visual monitoring teams. The Panel acknowledged these efforts at coordination, but also noted that the 28 July completion date of the P-A survey was two weeks later than the specified goal of mid-July.

The P-A survey consisted of 36 4D lines, each ~ 40 km in length. A source exclusion zone of 2 km was applied and a behavioral safety zone (shut-down) threshold of 156 dB SEL was used to protect mother-calf pairs only. This threshold for effects on behaviour had been carried forward from Sakhalin Energy’s 2010 seismic survey. Panel members noted that this threshold value was used for consistency with the previous MMP, but that unlike 2010 it was not applied to all gray whales but only to mother-calf pairs for 2015. The Panel deemed the continuing use of a 156 dB SEL threshold to be a reasonable approach but also stressed that it is not known with certainty that exposures below that level do not result in behavioural effects. A total of five shut-downs, none due to observations of gray whales, were implemented by the lead MMO and a total of 24.9 hours of standby time was attributed to the presence of marine mammals. A gradual ramp-up in survey noise output was implemented following periods of inactivity as part of the MMP. A total of 23 A-lines were determined (a slight increase over the 19 determined for the 2010 Sakhalin Energy survey).

During the P-A survey, visual monitoring was conducted from four observation points on shore and by MMOs on the seismic source and other survey vessels, coordinated through an onshore command center. Onshore MMOs recorded data from 29 June to 5 August, weather permitting. For the seismic monitoring period (6-29 July), onshore observers reported 14 favourable weather days and 7 days lost due to poor weather conditions. Efforts before and after the survey yielded a combined total of 7 additional days of data collection. Besides the visual observations, data were logged on 9 acoustic stations throughout the pre-, during and post-survey periods. Over a total of 226 scan sessions, the teams recorded 1,707 sightings of gray whales, involving 226 individual animals. Five scans were incomplete due to bad weather. An average of 12 whales was observed per day in July, 23.4 in August.

Data on behaviour were also collected, including 74 theodolite-monitored tracks. However, the sample of useful tracks was very small, with only four of them considered sufficient to monitor respiratory behaviour and to be acceptable for analyses. Several data charts and maps had been presented to the NTF-11 meeting in an effort to describe the distribution of whales before, during and after the survey. The Company interpreted the results as indicating a lack of broad-scale avoidance of the area and suggesting slightly higher speeds and less linear movement patterns than observed during 2010 seismic survey. However, the results presented at both NTF-11 and WGWAP-17 were cursory and preliminary, and the Panel anticipates that a more sophisticated set of analyses will be conducted, e.g. the multivariate analysis (MVA) with acoustic data that was agreed in May 2016 (NTF-10) as well as case studies of the individual tracks obtained during exposures in 2015. The Panel also noted that although within-year comparisons are more robust, there may be some merit in considering broader across-year evaluations. Sakhalin Energy indicated that its target for completion of its analyses was spring 2017 and certainly before the next NTF meeting.

Finally, the Panel noted that in 2015, as in some previous years, multiple seismic surveys took place during the same season and therefore the data need to be interpreted in that context. The Panel has previously discussed the importance of collaborative analyses using the 2015 data from both ENL and Sakhalin Energy (see WGWAP-16 report, item 3).

6.2.2 Panel conclusions concerning 2015 behaviour data

As a general conclusion by the Panel given the information provided, the behaviour data derived only from the Sakhalin Energy survey period appear to be insufficient for analysis following the methods set out in Gailey *et al.* (2015). This is generally because of the absence of certain important data related to exposure and context as well as the limited amount of data acquired during pre-exposure (control) periods. Furthermore, staffing within the monitoring teams during the survey appears to have been insufficient, particularly for the behavioural observations; additional staff likely would have allowed for more data to be collected. However, further consideration of the utility of the data that were collected is desirable. It is possible that a statistical expert (or experts) would be able to extract enough data from the accumulated records to complete a multivariate analysis such as the Panel has suggested. This may require using a more limited subset of exposure and response variables and would likely require external (i.e. non-Sakhalin Energy) expertise as the analytical capacity within the Company's current team appears to be limited. At this juncture, the Panel envisions two potential alternative paths forward. One would be to pool the Sakhalin Energy data with ENL's, the other to either pool Sakhalin Energy's own 2015 data with its 2010 data or carry out some kind of comparison of these two datasets. The former path would be significantly preferable, as the Panel has previously suggested. Furthermore, we believe that for distribution analyses, pooling the two companies' data would be the best way to analyse for potential impacts of the 2015 surveys.

6.2.3 Initial analyses and highlights of 2015 Sakhalin Energy seismic survey acoustic monitoring

Racca had already summarized the results of initial analyses of the acoustic data from the 2015 seismic survey at NTF-10 in May 2016, and so he presented only a short summary of these at WGWAP-17. Data were obtained at 11 recording stations (9 telemetered recorders on the PML and 2 non-telemetric recorders) for the period of 2 July to 1 August. The results included a per-pulse analysis of archival data to obtain SEL and peak/rms SEL, as well as a pulse-agnostic analysis in 5 min average SEL in various frequency bands in order to detect broader temporal noise patterns.

In general, the acoustic data collection went according to plan – with the exceptions that two2 AUARs shifted from their original mooring positions and one had an anomalously high noise floor. There was good agreement between the modelled and recorded levels, and the contractors (POI and JASCO) provided useful metrics to the NTF and the Panel for consideration in analyses, e.g. sound exposure levels (SEL). The number and location of acoustic stations (telemetric and archival) will be revisited for the planned 2018 survey to tailor the acoustic coverage needs to that survey. Finally, Racca noted that the data are ready to be used with analyses of whale distribution and behaviour, as has been done in the past, but that interpolations of sound levels between receivers have not yet been carried out.

6.2.4 Simulation analysis of implications of Sakhalin Energy's 2015 Monitoring and Mitigation Plan (Recommendation WGWAP-16/004)

The purpose of the recommended analysis is to determine to what extent the mitigation measures planned for and implemented in the 2015 seismic survey made a net contribution to reducing sonic exposure of gray whales. It will also determine the effects on predicted exposure of the decisions to relax certain measures that were implemented in the 2010 Astokh survey. The results will be used to guide advice on mitigation measures for the planned 2018 survey and subsequent surveys.

The approach used is to simulate the survey under alternative mitigation scenarios, using information from the survey as actually conducted to guide the simulation and make it as realistic as possible. The simulation model is described in Cooke (2015).

The simulation analysis could not be completed before the NTF-11 meeting, but the NTF agreed on certain details of the analysis to be conducted.

Cooke's preliminary analysis of the results of the 2015 survey revealed:

(i) The effective extra time caused by marine mammal-related shutdowns was more than the downtime nominally recorded as marine mammal-related, because the lengthening of the survey caused by marine mammal interruptions resulted in additional downtime due to weather and other causes. Also, where a line was resumed following an interruption, there was usually considerable overlap between the first and second shootings of the line. The total effective time 'wasted' following a marine mammal-triggered shutdown or postponement was estimated to be 6.8 hr per interruption. The marine mammal-related interruptions extended the 2015 survey by about 24 hours or 5% of the survey duration, but this would have been greater under stricter shutdown criteria.

(ii) The sighting data collected showed a fairly constant abundance of whales for the first three weeks of July, and an increase in the first week of August, following a fog-related data gap in the last week of July. Therefore, mitigation measures that would have resulted in a continuation of the survey beyond the achieved completion date of 29 July could have resulted in sonic exposure of a greater number of whales.

The NTF made a number of **recommendations** for the analysis with which the Panel **concurs**. These are listed in detail in the NTF report and summarized here:

Mitigation options. The net consequences for whale sonic exposure of the following mitigation alternatives should be estimated:

(i) Shutdown for whales in A-zone: (a) cow-calf pairs only, (b) any gray whale, (c) neither

(ii) Time threshold for whales sighted in A zone: (a) previous 6 hr, (b) most recent scan

(iii) A-line acquisition at night or in fog: (a) allowed, (b) not allowed, (c) conditionally allowed (when no whales seen there in previous 6 hr).

Exposure metrics. (a) maximum exposure by whale (dB), (b) cumulative exposure by whale (dB_{SEL}), (c) frequency of exposure above selected thresholds.

Whale distribution assumptions. Whale distribution data from all years for which there are data should be averaged, and the more inshore distribution of mother-calf pairs relative to other gray whales should be taken into account.

Resumption of interrupted lines. The previous assumption that lines can only be acquired in full should be amended in light of experience with the 2015 survey. Rules were agreed for acquiring outstanding segments of lines following interruptions due to marine mammals, standing obstacles, or other causes.

The Panel **recommends** that the analysis be completed in time for review by the NTF-12 meeting scheduled for March or April 2017.

The Panel also **recommends** that a similar analysis of the planned 2018 seismic survey be conducted once more details become available on the proposed extent of the survey. In the first instance, only the proposed streamer survey need be modelled. The part of the survey using OBN's may raise new issues, but the area to be covered (around the platforms) is far enough offshore that it may turn out not to be a major contributor to the cumulative sonic exposure of whales in the feeding ground. The same mitigation alternatives should be modelled for both survey components.

6.3 Update on future Sakhalin Energy's OBN seismic survey plans

6.3.1 Presentation

Blonk summarized the current status of plans for the next Piltun-Astokh (P-A) 4D seismic survey. Internal technical and business discussions combined with initial acquisition design work has reconfirmed the target date of 2018 and led to the following base option for acquisition. A 4D streamer survey over P-A similar to 2015, extended with ocean bottom node (OBN) sections near the P-A platforms to fill data gaps, is now the preferred (base) option. In this scenario, the streamer survey would occur first (as soon as the ice retreats) and take an estimated 21 days, followed by two sections of OBN surveys concentrated around the platforms and taking an estimated 8 days for each section. This option differs from the full-field OBN option (which had been considered the preferred option at the NTF-10 meeting), with the change driven by: (i) concerns about 4D repeatability for full-field OBN and (ii) environmental constraints, predominantly survey duration. A full-field OBN survey could not be completed between ice retreat and arrival of the majority of the whales.

Recent tests in the industry still under evaluation suggest that OBN surveys allow for a seismic source up to 10 times smaller to be used. However, there is a trade-off between a benefit of using a smaller source and the increase in shot density or number needed to obtain technically acceptable seismic images from OBN. Overall, the base option will already require a shot effort about twice what was required in 2015. Blonk raised the possibility of including tests with smaller sources at the back-end of the 2018 programme given potentially substantial benefits for later surveys, but indicated that using smaller sources already for the actual survey in 2018 was not considered feasible.

A backup to the base option would be an OBN-only survey over the smallest technically acceptable Astokh full-field area, combined with a limited OBN survey over part of Piltun such that the total duration would allow shooting to be completed by around 1 August. This backup option could be triggered by: (i) downward cost pressure since the base option is more expensive, (ii) new insights reducing the risk of OBN-streamer 4D incompatibility, and/or (iii) logistical, commercial, or permitting complications for the base option, especially as a result of tendering. The final choice depends on endorsement by company management and shareholders as well as on actual bid returns from potential vendors. The Panel expressed some concern that if this option were pursued, a lack of comparability with the existing seismic data would mean a shorter interval before the next survey following the one in 2018. Blonk maintained that it was unlikely for there to be a less than 3- or 4-year interval after the 2018 survey regardless of the results. The Panel, primarily via interactions within and reports to and from the NTF, will continue to monitor developments on alternative means of acquiring subsea geophysical data, focusing on those that with potential to reduce noise exposure and potential impacts on whales. The Panel also encouraged Sakhalin Energy to consider testing some configurations of airguns within surveys that might result in smaller noise footprints yet still yield useful geophysical data.

The entanglement risk to whales (in node ropes or cables) was discussed briefly, prompted by a documented death of an entangled dolphin in the Gulf of Mexico in January 2014. The apparent cause of this entanglement was identified – the partial use of a less-stiff-than-normal type of cable – and the use of stiffer cable was accepted by US government regulators as an appropriate mitigation measure. Based on this experience together with the lack of identified entanglement cases elsewhere that could be applicable in a Sakhalin setting, Blonk argued that entanglement should be a small and manageable risk. How this risk would be managed was not discussed in detail. Blonk further emphasized that nodes in the base plan would be located only near the platforms and relatively far offshore.

Blonk's presentation continued with a discussion, similar to the one that occurred at NTF-11, regarding mitigation measures for the 2018 survey likely to have the greatest positive impact in terms of whale protection. These measures may include: (i) start and finish operations as early in the season as possible, (ii) training of Marine Mammal Observers (MMOs) including ≥1-week pre- and post-survey data collection periods, and (iii) advanced testing of acoustic stations, real-time as well as archival. The Panel reaffirms its support for using the 2010 MMP as the starting point for future MMPs. The Panel also agrees that it is appropriate to consider updates and revisions of MMPs that continue to maximize protection for whales. Such areas for revision may include: (i) redefinition of the perimeter monitoring line with appropriate reconsideration of distribution data, (ii) modifying the real-time acoustic monitoring programme, given the accumulated experience of past surveys, and (iii) as has been done for previous surveys, establishing (well before the survey start time) a small operational advisory group to ensure timely implementation of the MMP.

Everyone involved recognizes that the timeline for preparation of a 2018 MMP is tight. A complete draft of the logistics plan and a draft MMP are certainly needed by the NTF-12 meeting in April 2017, with a revised, near-final MMP by NTF-13 in early November 2017. This schedule is necessary for at least two reasons: (i) the Company's need to specify the contract for tendering and (ii) the need to allow sufficient lead time for MMP personnel and equipment to be in place for deployment by June 2018.

Finally, Blonk requested specific advice from the Panel on monitoring options in poor visibility conditions and on an approach regarding cumulative energy exposure, especially given the developments exposure criteria.

6.3.2 Panel conclusions and recommendations

Overall, good progress continues to be made in managing industrial noise off Sakhalin (e.g. acoustic processing of seismic survey signals, careful planning to minimize impact of seismic surveys), but the Panel notes several emerging issues as well as some lingering ones that need to be resolved. We **re-emphasize** the critical need to establish a new noise control site immediately. Several analyses that the Panel feels are important to gray whale conservation (e.g. cumulative exposure, amount of time noise levels are elevated) require measurements of background, ambient noise. We **reiterate** the importance of conducting a full analysis of the data (e.g. whale distribution) from the 2015 seismic survey monitoring programme; these data and analyses have two important applications. First is to understand any impacts that the 2015 survey may have had on the whales. Secondly, the Panel, primarily via the NTF, has repeatedly and in multiple forums discussed the need to use data to inform the MMPs for future activities, and the data from past events are critical in this endeavour.

With respect to upcoming activities, preparations for Sakhalin Energy's planned 2018 seismic survey and the accompanying MMP must continue and keep pace with the proposed timeline. Several important issues in this regard are highlighted above. Firstly, results from the simulation analysis (Section 6.2.4) need to be carefully considered and integrated. Secondly, with respect to the different options being considered by the Company, the Panel's emphasis remains on how to minimize the energy being introduced into the water from seismic surveys, and thus minimize the acoustic impacts on the whales, while acknowledging the technical requirements of the survey. Thirdly, there is a critical need to test and train personnel and equipment to be employed as specified in the MMP. Finally, the Panel recognizes the need to apply the most current impact criteria (e.g. noise effects thresholds), and it stands ready to work with IUCN and the Company to integrate these criteria into the overall noise management programme.

7 MANAGING OR ADDRESSING OTHER ISSUES ON THE SAKHALIN SHELF INCLUDING OTHER OIL AND GAS ACTIVITIES AND INTERACTIONS WITH FISHERIES

7.1 Update on oil and gas activities in and near the whale feeding areas in Sakhalin / Sea of Okhotsk in 2016 and beyond

7.1.1 Exxon Neftegas Limited (ENL) 2016-2017 Odoptu sealift operations and ENL's Marine Mammal Protection Plan

The Panel welcomed the participation in the meeting by Exxon Neftegas Limited (ENL) representatives and noted that increased dialogue could only be beneficial for western gray whale conservation. Scott gave a presentation concerning ENL's 'sealift' operation in 2016. He reported that the work occurred over 58 days, from 7 June – 3 August, which included ca. 44 days of downtime. Over this period 11 large modules were delivered via shallow-draft tugs and barges to the temporary offloading facility that had been constructed previously by ENL. Fortunately, the channel at the mouth of Piltun Lagoon proved to be deep enough for the vessels to navigate without the need for 'screeding' (an industry term for 'leveling' shallow sand bars in the channel by dredging), which likely would have been ecologically disruptive.

In his presentation, Scott described several aspects of the Marine Mammal Protection Plan (MMPP) applied by ENL to this operation. A fundamental aspect of the mitigation approach was to complete the work early in the season as possible, theoretically before peak numbers of whales arrived in the Piltun feeding area. The channel was marked with navigational aids, which allowed the tugs to operate without running aground, including operating at night. Night-time operations were considered necessary due to the timing of the tides, i.e. the tug/barge activities had to take place on a flood tide so that if any vessel ran aground, it could be moved off with the rising tide. According to Scott, not operating on flood tides would have necessitated screeding. When it was pointed out that night-time operation represents higher potential for ship strikes on whales, Scott stated that he did not know what proportion of the work had been carried out at night or in other poor visibility conditions, e.g. fog. He pointed out that MMOs were stationed on each vessel, at shore station 9 (the standard observation station at the end of the southern Piltun spit) and at the Piltun lighthouse, but these observers are almost completely ineffective in preventing ship strikes at night or in conditions of poor visibility. The use of night vision and/or infrared technologies was suggested by the Panel (see item 5.4), and Scott indicated that ENL was investigating this option for its operations in 2017. Notably, most of the high tides in 2017 will occur at night.

Vessel speed is a concern that the Panel has raised often, and Scott indicated that the speed limit for vessels in the WGW Safety Area and the Piltun Bay Mouth Area was 10 knots during periods of good visibility and 7 knots at night or in reduced visibility. Scott further stated that the speed of the vessels during the sealift operations was 5 knots. Other mitigation measures applied to the sealift vessels included stopping, slowing and changing course under certain types of circumstance. Scott referred to a detailed table of eight actual mitigation events – 7 related to whales (including gray whales and 2 unidentified species) and one to spotted seals.

Given concerns about noise disturbance caused by numerous vessels running in a small area, many of them being repositioned at any moment in time, ENL deployed 12 acoustic monitoring buoys and the data were analysed by the V. I. Il'ichev Pacific Oceanological Institute (POI) of FEB RAS. According to Scott, no ‘excessive noise’ (i.e. continuous sound > 120 dB) was detected, though no other details (e.g. duration of sound at various levels) were provided as the data were still being analyzed. The Panel has prescribed noise exposure guidelines in the past, and these (and others, e.g. those prescribed by NOAA) include consideration of exposure duration, recognizing that even levels ‘below’ the threshold can become harmful with prolonged exposure. On another noise issue, Scott reported that to ensure navigational safety, bathymetric surveys of the channel at the lagoon mouth (a survey area of approximately 400 x 1200 m) were conducted using a single-beam echo sounder (ODOM MKIII) as the source. The Panel was uncertain which variant of this instrument was used but noted that the ‘low’ frequency model can go as low as 3.5 kHz, which is almost certainly audible to gray whales. The Panel noted that some kinds of high-power, high-resolution acoustic sources have been implicated in behavioural disturbance of cetaceans (Southall et al. 2013), and we encourage all companies to bear this in mind and apply such sources only when needed to ensure navigational safety. If and when echo sounders are deemed necessary, we further encourage users to choose the operational frequency that overlaps the least with whale hearing (to the extent this is known and understood). The Panel is always prepared to assist in such selections.

Scott indicated that 2017 will be the final year of this sealift operation. ENL intends to start the work as soon as possible after the ice clears and again, finish as quickly as possible. The Panel encourages the company to ensure completion by mid-July when whale density typically reaches a maximum. Assuming that ENL will operate with a fully specified MMPP again in 2017, the Panel stands ready to review and advise on the plan in advance if requested. Finally, the Panel encourages timely publication of analyses of the data from this programme as this has the potential to improve future mitigation efforts.

7.1.2 Activities and future plans of other operators in 2016

Berzina expressed her regrets that a representative from Rosneft was unable to participate in this meeting. She then proceeded to summarize publicly available information on a new license area to be operated by Rosneft on the NE Sakhalin shelf at Deryuginskiy, about 60 km north of the mouth of Piltun Lagoon. According to the license terms (issued in late 2014), the operator would need to carry out a 3-D seismic survey within three years of the registration date. In summer 2016, the operator started an environmental background study (said to include monitoring of marine mammals). This study was to be completed within a month but no results were publicly available at the time of this meeting.

7.1.3 Presentation by Russian NGOs on their activities related to monitoring ENL’s sealift operations

A group of NGOs (IFAW-Russia, WWF-Russia, Sakhalin Environment Watch) engaged in an effort to monitor both the human activities associated with ENL’s 2016 sealift operations and the locations and movements of gray whales in the general vicinity of the lagoon mouth when the operations took place. In their report to the Panel, the NGOs pointed out that this was the first occasion since offshore oil and gas development began in the region (ca. 20 years ago) in which significant, prolonged activity by relatively large, loud vessels (tugs and barges) has taken place within the whales’ near-shore feeding area – an area known to be especially important for mother-calf pairs. ENL’s sealift plans were publicly announced and began to undergo Russian environmental impact assessment and permitting processes in 2013. During the intervening years, various groups, including this Panel, have expressed serious concerns about the potential impacts of noise disturbance, oil spills, ecosystem degradation as well as the increased risk of ship strikes from this project (see reports of WGWAP-13, item 3.2; WGWAP-14, item 10; WGWAP-16, item 9.4.2). In fact, the Panel’s most recent Statement of Concern on the ENL project was issued on 26 May 2016, only weeks before the cargo transport operations began.[14]

[14] https://www.iucn.org/sites/dev/files/panel_statement_of_concern_re_enl_pier_construction_project_final_26_may2016-en-ru.pdf

In their presentation, the NGOs offered evidence which they interpreted as demonstrating non-compliance with a number of the rules set out in the State Environmental Expert Review for the project and which the company was obliged to follow in its operations in order to avoid or mitigate impacts on gray whales – for example, limits on vessel traffic levels and speeds, especially at night or in conditions with limited visibility.[15] Although the Panel was not in a position to comment on legal aspects of this issue, it found the data, photographs and other evidence provided by the NGOs troubling. We encourage ENL to give careful consideration to the information obtained by the NGO monitoring programme when planning any further work of this kind. The Panel assumes that ENL, like other operators, expects its employees and contractors to comply with company policies, which in turn conform to permit conditions, and therefore if actions in the field at Piltun in 2016 diverged from the rules established under the Marine Mammal Protection Plan, company officials would wish to know this.

The Panel thanked the NGOs for their presentation and expressed its appreciation to both them and the representatives from ENL and Exxon, who attended the meeting as observers, for a respectful and informative session on this controversial subject.

7.2 Update on interactions between fisheries and whales in Sakhalin

7.2.1 Update on the 2016 entanglement case

Lock reported that on 12 September 2016 the Sakhalin Energy/ENL Joint Programme shore-based photo-identification team sighted and photographed a gray whale approximately 500 m off the southern Piltun spit that was entangled in fishing gear. This whale was steadily moving southward while pulling fishing tackle, possibly net or rope, with 20-30 small floats attached. Observers suggested that the entanglement happened relatively recently because the whale behaved vigorously, seemingly trying to free itself of the entangling gear.

Authorities and stakeholders were informed as follows:

(1) On 13 September 2016 Sakhalin Energy provided information to the Marine Supervision Department of Sakhalin Oblast and provided information to IUCN;

(2) On 16 September 2016 an official notification letter from Sakhalin Energy and ENL was sent to the Pacific Marine Division of the Russian Federal Service for Supervision of Natural Resource Management (Rosprirodnadzor/RPN);

(3) Also on 16 September 2016, Sakhalin Environmental Watch published information received from IUCN on its news website Sakh.com.

Tyurneva of the NSCMB tentatively identified the entangled whale as KOGW137. This whale was not seen and identified again subsequent to the 12 September observation.

The Panel commended the company for providing this information and taking action to notify authorities and stakeholders.

7.2.2 Plans related to disentanglement training

Donovan noted that the IWC's effort to develop a disentanglement training programme under the IWC guidelines for Russian waters is continuing. Funding sources are being investigated and the IWC specialist, David Mattila, is trying to work out practical details, including identifying suitable candidates for training, with Russian authorities.

Grigory Tsidulko described an emerging partnership between the Marine Mammal Council and the outdoor education group Club Boomerang to develop disentanglement expertise on Sakhalin. The two organizations have been discussing the concept of convening a 'marine mammal day', tentatively set for spring 2017. This event is envisioned to include training (potentially by the IWC) on disentanglement and response to live strandings. Discussions with regulators at the federal level regarding necessary documents and permits are ongoing. The recent killer whale ice entrapment on Sakhalin when local people became involved in a 'rescue' operation suggests that a local effort such as that described by Tsidulko may find community support.

[15] http://wwf.ru/resources/news/article/14792

Related to this initiative, the Panel recalled its efforts to help the companies develop necropsy protocols and the caching (by Sakhalin Energy) of three necropsy kits on Sakhalin, two at Yuzhno and one at Nogliki (WGWAP-7 report, item 9.3). Lock confirmed that the kits were indeed purchased but she was uncertain where they are now. The Company does not have the capability to use these kits, but she would ensure that they were located and made available to potential future users. Tsidulko recalled using one of the kits during a visit to Sakhalin by the Environmental Monitoring Task Force. In discussion, it was suggested the kits should include a satellite or radio tag as a way to maintain contact with an entangled whale (whereby a tag could be attached to the gear but not the whale itself) or to a carcass in the case of a stranding. Telemetric tracking is included in the IWC protocol but battery maintenance and long-term storage of such devices in remote locations presents challenges.

7.2.3 Proposed elements of a strategy to address fisheries interactions with whales

The fisheries issue has been a concern of the Panel for several years and this is reflected in its previous reports and statements of concern[16]. At this meeting, Tsidulko summarized recent fisheries interactions with whales off Sakhalin, including an overview of gear types observed and deployment locations near Piltun (see WGWAP-16 report, item 9.6).

In 2016 Panel member Lowry prepared a white paper on the issue for the Panel and stakeholders to use as a basis for deciding how to make progress on documentation and mitigation.[17] A central message of the white paper is that Russian leadership is essential. Within the current Panel membership, there is considerable relevant experience and expertise, especially in the Sakhalin context. However, there was general agreement that specific background in dealing more broadly with Russian fisheries and their associated marine mammal bycatch and entanglement problems would be necessary to achieve real progress. Therefore, Burkanov – a leading expert with specific background on marine mammal bycatch and entanglement in Russian fisheries – was contracted by IUCN as an Associate Scientist to liaise with various Panel members as well as stakeholders (industry, local NGOs etc.) to draft of a working paper on fishery interactions with gray whales, emphasizing the Russian Far East (focusing specifically on Eastern Sakhalin – Southern Kamchatka – Northern Kuril Islands).

In discussion, Donovan commented that related assessments were being undertaken for other portions of the gray whale's range as a part of the IWC rangewide review. Cooke reminded the meeting that between 2005 and 2007, four female western gray whales were accidentally entrapped and died in Japanese set nets while migrating along the Pacific coast of Honshu. His analysis of the population-level consequences of such removals at the time indicated that gray whales would be extirpated from the western North Pacific if deaths in fishing gear off Japan continued at the levels observed in 2005-2007. Since that time, no further entrapments of gray whales in Japan have been reported but there is concern that this may simply mean that gray whales that die in fishing gear are cut loose rather being brought to shore. In 2011 a gray whale off China was fatally entangled in fishing gear.

It was pointed out that gear marking had been an important component in the assessment of fisheries interactions with North Atlantic right whales. Burkanov explained that gear is marked in Russia, on a buoy that is deployed with the gear, but that this 'mark' was rarely recovered from entanglements. Donovan said that gear marking would be included with related issues in a joint IWC, Food and Agriculture Organization of the United Nations (FAO) and NOAA workshop in May 2017.

Burkanov stressed the complexity of getting information about entanglements in Russia. While there is no fishery observer programme, there are requirements for fishing boat captains to log all cases of bycatch. That being said, these logbooks are apparently seldom used and the so-called requirement is not legally binding. Large volumes of fisheries data do exist and archived data have been published. A database has been running since 1996 but these data and information are difficult to obtain. Lisitsyn agreed but thought there were some possibilities to address data gaps. Fisheries operating on Sakhalin require certification, and one of the requirements of certification is to report bycatch. It may be worth asking fisheries authorities to explicitly require that entangled or entrapped marine mammals be reported, and that they share the resulting information. For example, in the Vostochny Refuge, a financial incentive was offered to fishermen to encourage them to report (accompanied by species identification photographs) catches of an endangered salmon species. A similar approach might work for reporting whale entanglements. Samatov commented that

[16] See e.g. https://cmsdata.iucn.org/downloads/wgwap_soc_re_salmon_fishing___letters_to_russian_authorities_07082013.pdf
[17] See Annex D of the IFC Performance Standards Task Force (May 2016): https://www.iucn.org/sites/dev/files/content/documents/jptf-2_may_2016_report_final.pdf

a Pacific Marine Division of RPN had been established in 2015 that was responsible for enforcing protection of Red List species. He has contacted the Sakhalin branch of this inspectorate regarding incidents of entanglements. He considered that such collaboration with a government regulator could be an important part of any such effort.

8 SAKHALIN ENERGY ACTIVITIES NOT RELATED TO THE SAKHALIN ENERGY/ENL JOINT PROGRAMME

8.1 Marine Mammal Protection Plan (MMPP) update

The current version of Sakhalin Energy's MMPP, which is available on the Company's website[18], was finalized in 2009 and has needed updating for a considerable time. A revised draft was sent to IUCN for Panel review on 12 October 2016. However, after a quick check, the Co-chairs determined that further work on the draft by Sakhalin Energy was required before the Panel could be expected to conduct a rigorous and orderly review. Therefore, the Company agreed to make the needed improvements and provide a new version early in 2017, with Panel input expected in time for recommended changes to be incorporated into a final revised MMPP that would be in force for the 2017 field season.

Sakhalin Energy requested that updates to the MMPP be routinely included as an agenda item for Panel meetings.

Jonathan Hancox, speaking on behalf of the Lenders, reminded the meeting that Sakhalin Energy's MMPP is part of the Company's Health, Safety, Environment and Social Action Plan (HSESAP), which is itself an essential part of the loan documentation. Therefore, any change to the MMPP needs formal approval by the Lenders.

8.2 Ship strike avoidance and speed limit proposal for crew change vessels

8.2.1 Introduction

Last year Sakhalin Energy sought the Panel's advice on the effect of allowing the two crew-change vessels, which are high-speed catamarans capable of travelling at 30-35 knots, to operate at full speed (document WGWAP-16/13). Currently, the Company's MMPP allows the vessels to operate at only 21 knots. Apart from the extra transit time, there are apparently disadvantages in terms of passenger comfort, efficiency, and engine cooling problems from running routinely at the slower speed. The origin and rationale for the current 21 kn speed limit is unclear, as it does not appear to be based on a recommendation of the Panel or its predecessors, or on local regulations.

Last year the Panel asked for more details concerning the vessels and the conditions under which they operate (WGWAP-16 report, item 5.1). This year the Company supplied this information in document WGWAP-17/27, which contains some information on the vessels, *Polar Piltun* and *Polar Baikal*. Further information and photos of the vessels can be found at www.marinetraffic.com, which includes a photo of *P. Piltun* with the hull exposed. The masses of the vessels are not given, but based on the information given in WGWAP 17/27 and at www.marinetraffic.com, we suppose the *P. Piltun* weighs about 150t laden, and the *P. Baikal* about 100t.

8.2.2 Provisional risk analysis

The shallow drafts of the vessels (1.5 m and 1.4 m, respectively) imply that some whales on the trackline of a vessel may avoid being struck if they are submerged deeply enough for the vessel to pass over them. Quantifying the ship strike risk is, therefore, a 3-dimensional problem.

The risk to gray whales from strikes by these vessels is the product of a number of factors, as follows:

(i) Average density of whales in the areas traversed by the vessels;
(ii) Proportion of whales on the trackline sighted in time for avoidance action by the vessel;
(iii) Proportion of time whales are submerged below vessel drafts;
(iv) Width of horizontal profile of vessel hull;
(v) Proportion of struck whales that will suffer death or serious injury;

[18] http://www.sakhalinenergy.ru/media/library/eng/Environmental/GrayWhales/2.2Marine_Mammal_Protection_PlanEng.pdf

(vi) Possible evasive action taken by the whales.

For each of these items, the relevant question is how the factor varies with vessel speed. Speed is likely to be important in relation to factors (ii) and (v).

Once the strike risk has been quantified, the next step would be to determine whether the level of risk is acceptable in the context of conservation objectives for Sakhalin gray whales.

The Panel does not at this time have the information required for a proper estimation of the ship strike risk, but Appendix 1 gives a preliminary analysis of this risk using rough calculations and educated guesses for some of the missing parameters.

The preliminary analysis suggests that increasing the speed from 21 knots to 35 knots would increase the expected rate of fatal ship strikes by 50-100%. However, the absolute frequency of fatal strikes is estimated to be well below 0.1 whales/year, even for the higher speed. Although the Panel has not yet advised on an acceptable total level of anthropogenic mortality for the Sakhalin gray whale population, or on how any 'quota' might be shared among the different companies/vessels working in the area, a mortality rate below 0.1 whale/year would probably be considered acceptable for this activity given a Sakhalin gray whale population on the order of 200 whales.

8.2.3 Conclusions

The Panel **advises** that an increase in speed from 21 to 35 knots would be acceptable from a gray whale conservation point of view for a provisional period of 2 years, pending more refined estimation of the risk.

A full-on collision with a whale by either vessel at 35 kn would definitely be noticeable on-board, causing a velocity change of up to 3.6 m/s for the *P. Piltun* or 4.9 m/s for the *P. Baikal*, enough to unseat unbelted passengers. A glancing collision with just enough energy to seriously injure a whale would cause a velocity change (not speed change, because it would not be parallel to the trackline) of about 0.9 m/s or 1.4 m/s for the two vessels. This would also be noticeable, and could cause standing passengers to lose balance. In neither case would belted passengers be at risk. However, even if a collision were noticed, it would not necessarily be clearly attributable to collision with a whale, rather than with some kind of flotsam. The struck whale would not necessarily be visible, even if the vessel was stopped to search for it.

In order to provide data in the event of a ship strike, the Panel **recommend**s that within the provisional 2-year period, consideration be given to installing dashcams on each vessel that would monitor the sea surface area in front of the bows. The Panel also **recommends** that accelerometers be installed with continuous recording, or selective recording of large accelerations. Such equipment is now standard on recent models of road vehicles (although generally only readable with the manufacturer's special software). In any subsequent analysis of the recordings, periods with significant wave action could, if necessary, be excluded from consideration. Collisions with whales or other objects should stand out in the record as isolated acceleration events.

Although ship strikes on whales are expected to be rare off Sakhalin, such equipment should be quite cheap to acquire and install and may bring other benefits, such as evidence in the case of accidents.

Because the largest single uncertain factor involved in estimating collision risk is the proportion of time the whales spend above the draft depth (about 1.5 m), the Panel **suggests** that the parties to the Sakhalin Energy/ENL Joint Programme consider including a project to attach time-depth recorders to one or more gray whales with a view to determining their time-depth profile. The data gathered might also have other uses, such as refining estimates of acoustic exposure, or improving understanding of diving behaviour.

8.3 Oil spill response planning and drills

8.3.1 Company presentation

Lock provided the following summary of Sakhalin Energy's recent activities from the Company's perspective.

Preparedness. The Company's objective is prevention ('Goal Zero – no harm, no leaks') and comprehensive controls are in place for spill prevention and response. Measures have been approved by the Russian authorities and subjected to periodic review (and in-field observation/inspection) by a specialist advisor (PCCI) to the Lenders' consultant (Ramboll Environ) and by specialists from WGWAP.

Oil Spill Response (OSR) Exercises. As part of its annual exercise and drill programme, Sakhalin Energy typically conducts more than 180 OSR exercises and drills across all assets, and the major Tier 3 exercise in 2016 was the latest in a series of major exercises. In recent years this has included: (1) July 2013 major response exercise (Piltun-Astokh) with a focus on dispersants, (2) April 2014 major response practical exercise in ice conditions (Lunskoye), (3) May 2015 major marine response practical deployment exercise (Prigorodnoye Port offshore and Busse Lagoon onshore) including oiled wildlife response and (4) June 2016 major exercise in conjunction with authorities, involving international resources (see below). For 2017 the Company is considering to conduct an integrated well-control exercise.[19]

Major Tier 3 Exercise Piltun 2016. The overarching objective was to execute (and allow evaluation of) the management response by Sakhalin Energy to a major oil release from one of its operating facilities. The more specific objectives included: (1) ability to attract regional and international resources, (2) specific deployment topics and (3) using the 'Unified Command' principle to achieve cooperation among the Company staff, contractors, government agencies and international bodies. Participants included companies, Russian Federation authorities, contractors, international contributors, Lender consultants and shareholders.

Piltun 2016 Exercise Outcomes. All three objectives were achieved and additional opportunities for improvement were identified (see below). Key achievements were: (1) approval for access to Russian Federation aircraft and to OSR resources owned by Oil Spill Response Limited, an international center, (2) deployment objectives were met, e.g. the Waste Management Plan was exercised successfully and (3) unified command was implemented and forward-planning objectives were developed and approved. In the Company's view, completion of this exercise represents a significant milestone in its overall exercise and drill programme.

Piltun 2016 Exercise Findings and Learnings. Participants were commended for their enthusiastic and effective efforts. Findings by PCCI (document WGWAP-17/16) were as follows: (1) exercise well designed and well executed, (2) scenario was realistic and challenging, (3) spill management teams responded well and demonstrated strong communication and cooperation amongst all members, (4) team applied the training concepts and (5) Day 1 training provided a solid basis of knowledge and was an excellent refresher. In addition, PCCI made the following recommendations: (1) restructure future training and distinguish between new and 'refresher' training, (2) design pre-printed status boards, (3) focus training on role definition and information flow, (4) design scenarios and conduct OSR exercises for non-standard events and specific times of year, such as the spring break-up period and (5) improve the Emergency Command Centre room and equipment. Sakhalin Energy has received feedback from several observer reports and identified needed actions in response. The Company will continue to report to WGWAP on exercise outcomes and progress.

8.3.2 Discussion and Panel conclusions

A spill incident occurred in 2015 near Nevelsk port, southern Sakhalin, involving a relatively small amount of oil that nevertheless contaminated a 20 km stretch of coastline. Although Sakhalin Energy was not in any way responsible, the Company mobilized its resources to help with oiled wildlife rescue (primarily seabirds). The Company agreed that the rescue effort was largely unsuccessful (noting that the effort may have been more successful if the response request had been made immediately) and acknowledged that this practical (i.e. non-simulated) test of OSR capabilities provided useful lessons for all parties involved.

The Panel encourages Sakhalin Energy not only to continue its practice of contributing its own resources and personnel to emergency response regionally, but also to follow through on its efforts to learn from such events and adjust its own operations as appropriate.

Sakhalin Energy is planning to conduct an OSR exercise in ice conditions in Spring 2017. Although no details concerning the exact timing and nature of this exercise were made available to the Panel, the Company agreed to keep the Panel informed as planning proceeds.

Alexey Knizhnikov (WWF-Russia) pointed out that 2017 would be the Year of the Environment in Russia and that given the special interest in oil and gas development and other activities in the Arctic, the authorities would be paying close attention to any such exercise focussed on response capabilities in ice.

It was suggested that the Panel revisit the subject of oil spill prevention, which had been considered in depth by the Independent Scientific Review Panel (ISRP report, Chapter IV, item 3) and during the early years of WGWAP (e.g. WGWAP-1 report, item 13; *et seq.*; also see Stevens and Aurand 2008 which however

[19] The 2013 and 2014 exercises are discussed in some detail in the WGWAP-14 report, item 16.

emphasises response rather than prevention). At its third meeting in 2007, the Panel reviewed the report of its Oil Spill Task Force (OSTF) (WGWAP-3 report, item 6) and concluded: "Both the OSTF and the Panel recognised that response preparation levels at or above regulatory standards do not guarantee success in actual responses to oil spills. History has shown that harsh conditions of weather and sea and unanticipated circumstances can compromise response effectiveness despite the most thorough preparation. Effective prevention is the only means of eliminating environmental damage from oil spills."

The Panel therefore welcomes this suggestion and intends to remain attentive to the topic of oil spill prevention in coming years, particularly in relation to measures that can be taken to prevent the contamination of western gray whales and their prey base. In doing so, we recognise that (a) none of us is an industrial safety expert, (b) Sakhalin Energy's performance in terms of oil spill prevention (and response to the small quantities released during its operations over the years) has been excellent so far and (c) the Lenders maintain a strong oversight role with a technical consultant to monitor and report regularly on integrity of Company infrastructure, equipment, response exercises, etc.

8.4 Other activities 2016-2020

Sakhalin Energy provided its annual update on noise-generating activities based on the Company's 5-year projected planning (document WGWAP-17/19). Nothing new or out of the ordinary in terms of activities with high associated noise volumes or other potentially disturbing activities was noted, apart from the seismic survey provisionally planned for 2018 and discussed elsewhere in this report.

9 IMPLEMENTATION OF INTERNATIONAL FINANCE CORPORATION (IFC) PERFORMANCE STANDARDS FOR SOCIAL AND ENVIRONEMTNAL SUSTAINABILITY

9.1 International Finance Corporation (IFC) Performance Standards (PS) Task Force (PSTF) meeting (May 2016)

Reeves gave a brief summary of the results of the May 2016 PSTF workshop (PSTF-1[20]). Among the points emphasized were the following:

- Sakhalin Energy adopted the IFC Performance Standards voluntarily, well after the Sakhalin 2 project was under way. Therefore, the Company regards compliance with the IFC Performance Standards as forward-looking and as not applying to past decisions, activities etc.;
- The Company is solely responsible for assessing impacts and managing its operations so that they are compliant. This includes development of Critical Habitat Assessment, a Biodiversity Action Plan (BAP), and Environmental Impact Assessments for all new activities (e.g. seismic surveys) and project expansions (e.g. South Piltun);
- In relation to habitat defined as 'critical', the Company must (a) demonstrate that all potentially harmful activities have been considered, (b) if not feasible alternative to a harmful action have been identified, show how risks to biodiversity are being mitigated, and (c) describe net gains to biodiversity from Company activities;
- As a separate activity, the Company must describe and mitigate cumulative impacts;
- Lenders are responsible for determining compliance, and their consultants (Ramboll Environ) advise them in this;
- The so-called mitigation hierarchy (avoid, mitigate, restore, compensate) is mentioned extensively in IFC documents;
- Five criteria are used to define habitat as 'critical' and the north-eastern Sakhalin feeding areas of gray whales easily qualify under several of these;
- If the baseline is set as the present (which is the Company's stated intention) and the whales' previous exposure to industrial noise at Sakhalin is ignored in analyses, this could impede a credible assessment of cumulative impacts;

[20] https://www.iucn.org/sites/dev/files/content/documents/pstf-1_may_2016_report_final.pdf

- In developing proposed offsets, the Company may wish to consider a suite of options that could be expected to create 'net gains' for biodiversity – for example, averted loss, spread of good practice, reduction of risk (e.g. from fishing).

9.2 IUCN's Biodiversity Offsets Policy (adopted at the IUCN World Conservation Congress, September 2016)

Carbone described IUCN's recently adopted Biodiversity Offsets policy (document WGWAP-17/INF.3), which stresses that offsets must occur only after all previous steps in the mitigation hierarchy have been considered and no alternatives are available. Biodiversity offsets are meant to address residual impact in order to achieve No Net Loss and preferably a Net Gain at the project level. IUCN proposes certain conditions when offsets must not be used, as follows:

- Where the impacts are likely either (a) to create a high risk of driving one or more previously non-threatened species and/or ecosystems into the IUCN Red List Categories of Vulnerable, Endangered, Critically Endangered, Extinct in the Wild or Extinct, or (b) to drive one or more previously threatened species and/or ecosystems into IUCN Red List Categories of higher threat;
- Where the success of the offset action is highly uncertain due to a lack of knowledge;
- Where there is a substantial risk that investment generated by offsets will substitute for, rather than add to, other investment for conservation (known as 'cost shifting');
- Where the exchanges involved in the project's residual losses and the predicted offset gains are considered socially or culturally unacceptable to relevant stakeholders;
- Where the values that will be lost are specific to a particular place, and therefore cannot be found elsewhere and adequately protected or re-created;
- Where the time lag between the residual loss of biodiversity caused by the project and the gains from the offset causes damage that cannot be remediated and/or puts biodiversity components at unacceptable risk;
- When impacts will occur in internationally and nationally recognized 'no-go' areas such as impacts on natural or mixed World Heritage Sites and protected areas that are recognized as falling within IUCN categories I to VI.

The IUCN policy document merely represents advice to parties that choose to consider it (e.g. governments, companies, financial institutions, NGOs etc.); it is not linked in any formal with to the IFC Performance Standards. In response to a request to clarify the reference to impacts in 'no-go' areas, Carbone stated that interpretation of this matter was under discussion at IUCN. She offered as an example a case where intrinsically damaging industrial processes should not be allowed in Protected Areas that are classified in IUCN Categories I to VI.

9.3 Sakhalin Energy's plans for IFC PS6 implementation and the development of key associated documents

9.3.1 Draft Critical Habitat Assessment (CHA)

Natalia Tsarenko gave an update on Sakhalin Energy's Critical Habitat Assessment (CHA) (document WGWAP-17/22). She emphasized that the Company's policies must be aligned with the requirements of Russian legislation as well as give due consideration to international practices. IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012) requires that the CHA must extend beyond the boundaries of the project's footprint, with the actual scale depending on biodiversity attributes.

Provisionally, the Company has defined two discrete management units (DMUs) off north-eastern Sakhalin for its CHA – one being the coastal zone (< 20 m deep) and the other the so-called shelf zone (between 20 and 200 m deep). The basic determination that gray whales meet multiple criteria for determining that their habitat needs must be fully considered in the CHA was made and agreed last May. At this meeting, Tsarenko summarized initial findings with regard to four other marine mammal species. Provisionally, the Company considers that the bowhead whale may qualify but that the North Pacific right whale, the fin whale and the

Steller sea lion do not. Burdin called attention to the large number (thousands) of northern fur seals (*Callorhinus ursinus*) that congregate on the central east coast of Sakhalin and also pointed out that endangered North Pacific right whales occur at least occasionally and in small numbers off north-eastern Sakhalin, including in the Sakhalin 2 project footprint area (as indeed shown by observations reported in Sakhalin Energy's 2015 MMO Programme close-out report; Document WGWAP-17/14). Tsarenko appreciated this information and promised to consider it in her ongoing CHA work.

After some discussion, it was agreed that the Panel would be provided, inter-sessionally (i.e. between this meeting and WGWAP-18 in November 2017), with a fresh iteration of the Company's proposed CHA with respect to marine mammals, including evaluations of the five above-mentioned species against the critical habitat criteria as well as specific DMUs for each of the species deemed to have met at least one of the criteria. The Panel's role would be essentially a screening one, and should be taken up only after Sakhalin Energy's draft assessment has been checked by the Lenders' consultants. It was anticipated that the CHA would be finalized by the third quarter of 2017.

9.3.2 Outline of Sakhalin Energy's Biodiversity Offsets Strategy in the context of the draft CHA

Offsets were discussed relatively briefly at the May PSTF workshop. There, it was suggested that Sakhalin Energy consider whether there are opportunities to alleviate any of the pressures specified in the existing draft IUCN/IWC CMP for western gray whales and thereby to achieve offsets for the impacts of the Company's offshore activities. It was also noted that the list of existing pressures needed to be reviewed and updated, for example taking account of recent apparent changes in fishing and tourist activity off Sakhalin. As discussed under item 2.1.2 of this report, the IWC and IUCN are planning such a review and update to be completed in 2017.

In a presentation at this meeting, Tsarenko summarized some of the actions taken by Sakhalin Energy in the past to avoid and mitigate impacts on the whales – e.g. rerouting of the pipelines in Phase 2, reinjecting drill cuttings and oil-based mud, establishing vessel corridors and speed limits to reduce risks of ship strikes. The Company's BAP, MMPP and activity-specific MMPs (primarily for seismic surveys in recent years) all reflect an overall commitment to environmental stewardship and good practice. However, when asked for an opinion on whether offsets are required, given the efforts already taken by Sakhalin Energy to protect gray whales and their habitat and the fact that the Sakhalin population has been steadily increasing since the early 2000s, Hancox confirmed that as long as the Company is carrying out activities with potential impacts, offsets are needed to demonstrate net gains for biodiversity. He suggested that the Company consider things like averted loss through reducing the impacts of another operator's activities or reducing the risks from fishing, but he also acknowledged the difficulty of demonstrating conclusively or quantitatively that such actions actually avert loss.

During the ensuing discussion, participants (including Panel members, Company contractors and observers) offered ideas on possible offset options, most of them related to fishing. One of the more practical suggestions was that the Company sponsor and organize a 'clean-up' operation to remove derelict fishing gear (as observed and reported at this meeting by the RGWP team; see item 4.2.2) from the near-shore (Piltun) feeding area. While it may be a challenge to quantify the averted loss from such an effort, proposing that such an operation creates a net gain by demonstrating that a known risk has been removed from the whales' habitat might qualify as an offset. Another approach might be to devise or promote lower-risk fishing gear and fishing techniques for use in areas where the whales are susceptible to entanglement or entrapment.

Several Russian observers noted that salmon distribution along the Sakhalin coast is shifting northward (as it is doing elsewhere) and fixed nets are used increasingly in areas visited by gray whales. Given this, they recommended that the Company (possibly with IUCN and Panel assistance) engage directly with appropriate government management bodies and possibly also indigenous people's groups on Sakhalin to seek changes in fishing regulations and practices. The Panel has sent a 'statement of concern' to MNR in the past (August 2013)[21] outlining the entanglement risks to gray whales, and since then the Panel has further investigated the evidence of gray whale 'interactions' with Sakhalin fisheries (e.g. see reports of WGWAP-14, item 13.1; WGWAP-16, item 9.6). Thorough documentation of the risks to whales, if provided to the appropriate governmental agency (to be determined in consultation with colleagues on the island), could lead to improved management of the entanglement problem.

[21] https://cmsdata.iucn.org/downloads/wgwap_soc_re_salmon_fishing___letters_to_russian_authorities_07082013.pdf

It was agreed that considerable further work on offsets was needed, and all participants were encouraged to share with the Company (via e-mail, copied to IUCN and Hancox) any ideas beyond those mentioned at this meeting. It will be essential for the Company's proposals to be reviewed by the Lenders' consultants before the Panel is asked for its advice. As for the CHA, it was anticipated that a draft offset strategies document would be completed by the third quarter of 2017 and on the agenda for discussion at WGWAP-18.

10 WGWAP PLANS FOR 2017 & BEYOND

10.1 Review of WGWAP recommendations

Berzina provided an update on the searchable public database of recommendations by the IUCN gray whale panels from 2005 to the present (see WGWAP-17/11) [22]. She explained that there is now a functional internal (non-public) tracking tool as well as the public database that is maintained on the WGWAP website, organized by category (e.g. Environmental Monitoring, Noise), Meeting (e.g. ISRP 2005, WGWAP-1 2006), Topic (e.g. Behavior MVA, Photo-ID) and implementation Status (e.g. Closed – implemented/resolved satisfactorily, Open – in progress). She emphasized that IUCN manages the database while the Panel is responsible for assigning status. The database is considered a 'living document' subject to updating at any time and meant to ensure that all panel advice and responses to that advice is documented and made publicly accessible.

It is important to recognize the inherent risk of regarding any statistical sorting of the recommendations database as showing how well or how poorly the process of advice and response to advice is functioning. As pointed out previously by the Panel, the database should not be treated as a precisely kept scorecard of performance but rather as a mechanism to ensure that nothing important 'falls through the cracks' and that progress is always being made towards full compliance with the WGWAP Terms of Reference. Some statistics are nonetheless informative and worth summarizing. The total number of recommendations in the database stood at 562 at the time of this meeting, and Sakhalin Energy was identified as at least one of the 'Responsible Parties' for 425 (76%) of these. Overall, close to 90% of the recommendations were 'closed', 5% were 'open', 4% had been 'rejected' by the Company and 1% had been 'retracted' by the Panel. Of the recommendations directed at Sakhalin Energy that remain 'open', around 60% were classified as 'Open – in progress' and 36% as 'Open – no action taken'. Of the 'closed' recommendations to Sakhalin Energy, somewhat more than half were 'Closed – implemented/resolved satisfactorily' and a quarter 'Closed – superseded by a new recommendation'.

During discussion it was noted that a small number of the closed recommendations are classified as 'Closed – implemented/resolved satisfactorily but needs to be tracked regularly'. This means they are to be tracked by IUCN and checked regularly (at least annually) to make sure the implementation or resolution continues to hold. It was also noted that if at any point the Panel sees the need to reconsider a previously closed recommendation, it can do so by explaining that circumstances have changed or that implementation has been found to be incomplete or impermanent.

10.2 WGWAP Workplan 2017

Donovan summarized elements of the Panel's workplan for 2017 as developed by IUCN and the co-chairs based on what was heard at this meeting.

There will be one full Panel meeting in 2017 (WGWAP-18 in November) and it will be in Moscow. The agenda will be broadly similar to this year's, including consideration of task force reports, outstanding IFC and the Sakhalin Energy/ENL Joint Programme planning issues, and updates on relevant field and analytical work. Duration of the meeting was left undetermined as this may depend on progress made in advance, especially regarding analyses for the Sakhalin Energy/ENL Joint Programme planning and Sakhalin's Energy's preparation of IFC documentation. At least two Noise Task Force meetings are anticipated, one during the first or second quarter and the other immediately prior to WGWAP-18 in November. Additional meetings of subsets of the NTF to address specific technical issues may prove necessary in order to meet Sakhalin Energy's expectation to have a near-final seismic survey MMP ready by late 2017.

[22] The WGWAP Recommendations Database is accessible through the WGWAP website: https://www.iucn.org/western-gray-whale-advisory-panel/recommendations or directly at https://portals.iucn.org/wgwap/.

Among WGWAP tasks initiated but not completed in 2016 are the Panel's critical review of Sakhalin Energy's updated MMPP (item 8.1) and of the Company's CHA and offsets strategy (item 9.3.2) as well as a thorough review and updating of text posted on the WGWAP website (a task for the co-chairs). Also, although important progress was made in 2016 towards updating the IUCN/IWC Conservation Management Plan for Western Gray Whales and integrating it with IWC Memorandum of Cooperation Concerning Conservation Measures for the Western Gray Whale Population (item 2.1), selected Panel members are expected to be engaged in further work on this in 2017.

In terms of additional follow-up to 'special projects' in 2017, there was no assurance of further support for any of the work begun in 2016 on ecological monitoring and gray whale diet (see Pomerleau's proposals under items 2.4 and Document JPTF-3/1) or on the risks of fisheries to gray whales (see item 7.2).

Nor was it likely that the core WGWAP responsibility of population assessment (see item 2.3) could be met in full in 2017 in view of expected programme budget reductions and data availability.

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12 SUMMARY OF RECOMMENDATIONS FROM THE 17TH MEETING OF THE WGWAP

Recommendation Number	Cross-Reference	WGWAP Recommendation	Responsible Party/Parties	Target Completion Date	Sakhalin Energy's Response
4 PROGRAMMES ON GRAY WHALE RESEARCH AND MONITORING: REVIEW OF 2015 FIELDWORK RESULTS, PRELIMINARY 2016 RESULTS, AND 2017 PLANS					
WGWAP-17/01	Item 4.1.1	[..] due to the clear need for an additional acoustic monitoring location to serve as an actual control site, primarily because there is no reason to expect that the traditional control site does or will in the foreseeable future serve in its intended role due to the broad and substantial increase in industrial activity in the area over the last >10 years[..], the Panel **strongly reiterates its previous recommendation (WGWAP-16/009B)** that the Company provide a plan for a new control site at a strategically selected location as soon as possible.	Sakhalin Energy	Plan available for discussion at next NTF meeting (NTF-12), new site functional in 2017 season	
WGWAP-17/02	Item 4.1.1	Together with its recommendation that a new control site be established (WGWAP-17/01), the Panel **recommends** that Sakhalin Energy provide a graph of the trend in low-frequency ambient noise levels (sound pressure level - SPL) recorded at the current control site. The data should be averaged on a weekly basis for the full period of deployment for each year from 2003 through 2016. Such a graph will show the extent to which this site is (or is not) functioning as intended.	Sakhalin Energy	Requested graph available for consideration at next NTF meeting (NTF-12)	
WGWAP-17/03	Item 4.1.2	Because of the potential implications for gray whale feeding energetics, the Panel is concerned about what appears to be a long-term, persistent decline in amphipod biomass in the Piltun feeding area. The Panel therefore **recommends** that the companies explore the nature and causes of this decline in greater detail and provide a report on findings to the next Panel meeting. For such investigations, it is important to consider multiple explanatory hypotheses, some of which may relate to changes in the demography or behaviour of the gray whales and others to biophysical events or processes in the regional marine ecosystem.	Sakhalin Energy	Prior to the next Panel meeting (WGWAP-18)	

Recommendation Number	Cross-Reference	WGWAP Recommendation	Responsible Party/Parties	Target Completion Date	Sakhalin Energy's Response
WGWAP-17/04	Item 4.1.4.	Recalling what was stated by the Panel in the report of WGWAP-16 and previously, it would be timely for the companies and their scientists to undertake more extensive analyses of the available multi-year distribution data set. Integration and synthesis of data collected between 2004 and 2016, incorporating benthic data as possible, would allow a number of important questions to be addressed and provide a more detailed understanding of 'core use' areas and how these change within and between seasons and years. The Panel **recommends** that the Company initiate this process now, recognizing that it will require considerable time, funding and expertise.	Sakhalin Energy	Submission of progress report and workplan prior to next Panel meeting (WGWAP-18)	
WGWAP-17/05	Item 4.4.	The Panel emphasized, once again, the great importance of the RGWP [Russian Gray Whale Project) which has been the primary source of data for population analyses of various kinds to date. Continuation of this time series is **strongly recommended**.	Russian Gray Whale Project and its sponsor(s)	Ongoing	
6 ADDRESSING NOISE ISSUES INCLUDING REVIEW OF RESULTS FROM 2015 SEISMIC SURVEY AND PLANS FOR FUTURE OBN SURVEY					
WGWAP-17/06	Item 6.2.4.	The Panel **recommends** that the analysis [simulation of implications of Sakhalin Energy's 2015 Monitoring and Mitigation Plan to determine to what extent the mitigation measures planned for and implemented in the 2015 seismic survey made a net contribution to reducing sonic exposure of gray whales, as well as determine the effects on predicted exposure of the decisions to relax certain measures that were implemented in the 2010 Astokh survey, the result of which would be used to guide advice on mitigation measures for the planned 2018 survey and subsequent surveys] be completed in time for review by the NTF-12 meeting scheduled for March or April 2017.	Cooke	In time for consideration at next NTF meeting (NTF-12)	
WGWAP-17/07	Item 6.2.4.	The Panel also **recommends** that a similar analysis [similar to that called for in Recommendation WGWAP-17/06] of the planned 2018 seismic survey be conducted once more details become available on the proposed extent of the survey. In the first instance, only the proposed streamer survey need be modelled. The part of the survey using OBN's may raise new issues, but the area to be covered (around the platforms) is far enough offshore that it may turn out not to be a major contributor to the	Sakhalin Energy to ensure resources are available for analyses conduct by a Company contractor independently or	In time for consideration at NTF-13	

Recommendation Number	Cross-Reference	WGWAP Recommendation	Responsible Party/Parties	Target Completion Date	Sakhalin Energy's Response
		cumulative sonic exposure of whales in the feeding ground. The same mitigation alternatives should be modelled for both survey components.	in collaboration with Cooke, or by Cooke independently		
8 SAKHALIN ENERGY ACTIVITIES NOT RELATED TO THE SAKHALIN ENERGY/ENL JOINT PROGRAMME					
WGWAP-17/08	Item 8.2.3.	The Panel **advises** that an increase in speed from 21 to 35 knots [for Sakhalin Energy's two crew-change vessels] would be acceptable from a gray whale conservation point of view for a provisional period of 2 years, pending more refined estimation of the risk. [..] In order to provide data in the event of a ship strike, the Panel **recommend**s that within the provisional 2-year period, consideration be given to installing dashcams on each vessel that would monitor the sea surface area in front of the bows.	Sakhalin Energy	At least a provisional response prior to 2017 season (for inter-sessional consultation by the Panel)	
WGWAP-17/09	Item 8.2.3.	The Panel **advises** that an increase in speed from 21 to 35 knots [for Sakhalin Energy's two crew-change vessels] would be acceptable from a gray whale conservation point of view for a provisional period of 2 years, pending more refined estimation of the risk. [..] The Panel also **recommends** that accelerometers be installed with continuous recording, or selective recording of large accelerations. Such equipment is now standard on recent models of road vehicles (although generally only readable with the manufacturer's special software). In any subsequent analysis of the recordings, periods with significant wave action could, if necessary, be excluded from consideration. Collisions with whales or other objects should stand out in the record as isolated acceleration events.	Sakhalin Energy	At least a provisional response prior to 2017 season (for inter-sessional consultation by the Panel)	

APPENDIX 1. PRELIMINARY ASSESSMENT OF GRAY WHALE SHIP STRIKE RISK FROM CREW CHANGE VESSELS BY JUSTIN COOKE (SEE ITEM 8.2)

By Justin Cooke

At this stage, the Panel can only make a very rough assessment of the expected effect on ship strike risk of a relaxation of the current 21 kn speed limit for crew change vessels stipulated in Sakhalin Energy's Marine Mammal Protection Plan. In this appendix, the factors listed in item 8.2 as contributing to collision risk are examined in slightly more detail.

Frequency of close encounters

Table 4 of document WGWAP-17/27 shows that 32 gray whales were sighted in 248 trips between Kaigan and the PA-A and PA-B platforms, and 6 gray whales in 148 trips between Kaigan and Lunskoye A, or about 10 gray whales per year in total. Only approximate bearings (o'clock) to each whale are recorded (Table 5 of WGWAP-17/27) but based on these approximate bearings, the median perpendicular distance from the trackline was 1 km, such that approximately 50% of the whales sighted would lie within a 2km-wide strip centred on the trackline.

Based on the number seen, there is an average of 5 whales per year within this strip, but not all whales in the strip will have been seen. Not all whales will have surfaced within sightable distance. Furthermore, the rather large radial distances of the sighted whales suggests that binoculars were used to search for whales, which means there can be quite high risk of missing nearby whales. At a speed of 21 kn (11 m/s) approximately 50% of whales would be expected to surface within 1200 m forward of the vessel, thus very roughly we could guess that the true number of whales in the strip is about twice the number seen or about 10 whales per year.

The horizontal cross-section of the *Polar Piltun* is about 8.5 m (2.25 m for each hull and a 4m gap between the hulls). A 12m whale is potentially hittable if its centre of mass lies within the cross-section or within 6 m either side. This yields a 'danger strip' approximately 20 m wide. Not all whales in the strip will be struck, but a whale with its centre of mass inside the 20m strip can be classed as 'close encounter', and the next step would be to estimate the fraction that would actually be hit.

The danger strip is 1% of the width of the median sighting strip, hence the expected number of whales encountered in the danger strip would be about 0.1 whale per year.

Risk of fatal strike for whales at the surface in the danger strip

Assuming that the whale is oriented randomly relative to the trackline, simple trigonometry implies that a whale at the surface whose centre of mass lay within the danger strip would have an approximately 80% chance being hit. Of the whales that are hit, the worst case is where the whale is hit side-on near its centre of mass.

The severity of ship strike required to kill or injure a whale has not been well quantified. On general allometric grounds, the impact energy to cause death or serious injury would scale with $M^{2/3}$ where M is body mass. The best information on survival rates for impacts is from humans, but the published data do not generally correct for body mass, although it has been noted that children survive higher velocity impacts (for example, falls from greater heights) than adults. Extrapolation from humans to whales is problematic, but in very rough terms, if an impact energy of 5-10kJ can kill a 75kg human (roughly a fall from about 10m height) then an impact energy of 0.5 MJ or more would be expected to kill or seriously injure a 25t whale.

When calculating the impact energy of a collision at sea, we need to take account not just of the inertia of the whale, but also the effective additional mass due to the inertia of the water on the other side of the whale. Treating the whale as a cylinder, the additional mass factor for a whale pushed sideways would be 100% (Newman, 1977), while for vessels travelling forward it is usually taken as about 30%. Assuming the initial collision is inelastic, and treating the whale as a rigid body, the impact energy if the whale is hit in the middle side-on would be given by $\frac{1}{2}Mmv^2/(M+m)$ where v is the velocity of the ship, M is the effective mass of the ship, and m is the effective mass of the whale (including additional mass).

At 21 kn, the impact energy of a full-on collision with a rigid whale would be about 2.1-2.3 MJ for the two vessels. Allowing for the flexibility of the whale might reduce the initial impact energy by about half to 2/3, but it would still be enough to kill the animal. This is consistent with the findings of Laist *et al* (2001) that whales can be killed by being struck by vessels travelling at greater than about 14 kn, while noting that their data mainly referred to ships of large mass.

For such full-on collisions the proposed speed change is immaterial, because they would be fatal at either speed. For whales orientated obliquely to the trackline, we need to distinguish between glancing strikes, where the centre of gravity of the whale is behind the point of impact, and snagging strikes, where the centre of gravity is ahead of the point of impact (Fig. 1).

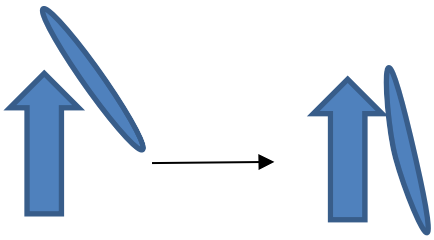

Figure 1a. Glancing strike (whale hit obliquely, whale centre of mass lies behind impact point, whale gets pushed out of vessel path)

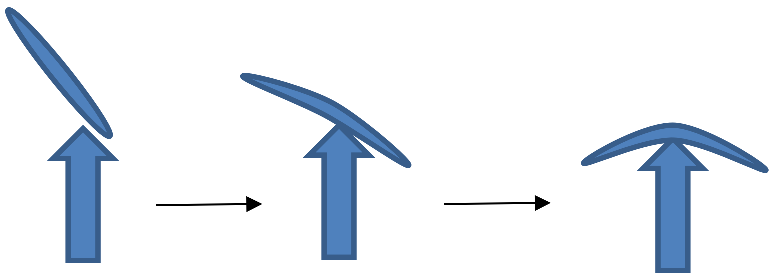

Figure 2b. Snagging strike (whale hit obliquely, whale centre of mass lies ahead of impact point, whale gets pushed into vessel path)

In the case of a glancing strike, the whale will tend to be pushed away from the trackline, hence the initial impact is the only event we need consider. Treating the whale as a rod, we can approximate the impact energy as $E = E_{max}\sin^2\theta/(1+3\alpha^2)$ where E_{max} is the impact energy of a full-on collision, θ is the orientation of the whale relative to the trackline and α is measure of offset of the impact point from the centre of mass of the whale (i.e. α = 0 in the middle of the whale, α = 1 at an end). An increase in vessel speed from 21 kn to 35 kn would increase E_{max} by a factor of 2.8, and hence increase the fraction of hits that exceed a specified lethal energy threshold. Assuming 0.5MJ for the latter, rough calculations suggest the speed increase would increase the proportion of lethal hits from about 25% to about 65%.

With a snagging strike, the whale will be caused to rotate, and tend to slide across the bow, its centre of gravity moving towards the trackline, until it is perpendicular to the trackline. At this point the whale would be subject to a large lateral bending moment. The size of the bending moment depends partly on the elastic properties of the whale, but rough calculations suggest it would exceed 1,000 kNm, even at 21 kn, which would presumably be enough to severely damage the spine. This would compromise the motility of the whale and likely render it incapable of survival. Thus a snagging strike could be lethal even if the blunt trauma of the initial impact is sublethal. The trauma of the initial impact is mainly inflicted within the first 0.1 second from impact, but the peak bending moment can occur up to 1 second after impact.

With a single-hulled vessel, we would expect 50% of ship strikes to be glancing and 50% to be snagging, assuming a randomly orientated whale. With the catamaran, a higher proportion will be snagging, because whales whose centre of mass lies between the two hulls will have a high chance of being snagged by at least one hull. If 60% of strikes are snagging, and snagging strikes are all effectively fatal, then the speed increase from 21 kn to 35 kn would increase the proportion of fatal strikes from 70% to 86%, or by a fraction of only about 20-25%.

Proportion of whales near the surface

The proportion of time that Sakhalin gray whales are close enough to the surface to be hit is not known. Time-depth recorders have been attached to gray whales (Malcolm and Duffus, 2000) but the results to date have not been presented in the form of a profile of fraction of time spent at different depths. The draft of the *Polar Piltun* is given as 1.5 m, but it might be slightly less when operating at high speeds. Ideally, data would be collected on the time-depth profiles of Sakhalin gray whales, but in the absence of more specific information a plausible guess of the fraction of time spent at depths less than 1.5 m, based on the data shown in Malcolm and Duffus (2000), would be around 25%.

Avoidance action by the vessel

The higher the vessel speed, the lower the proportion of whales that will be detected before impact, allowing potential for avoidance action on the part of the vessel crew. The detection probability of a whale on the trackline can be approximated as $1-e^{-a/v}$ where v is the vessel speed and a is a value depending on the diving behaviour of the whale, the efficiency of the observers, and other factors. The value of a is unknown but the absolute difference in detection probability between the two speeds is about 0.17 over a wide range of a values. For example, when the detection probability at 21 kn is 0.5, then at 35 kn it is about 0.33, which would correspond to a 50% increased strike risk due to the higher speed, assuming that all detections result in successful avoidance action.

Evasive action by the whales

There is very little information on this, hence the working assumption has to be that the whales do not take evasive action when approached by fast vessels.

Conclusions

Taken together, the above rough considerations suggest that the expected close encounter rate is about 0.1/yr but that well under half of these encounters would result in a fatal strike. The largest and most uncertain single factor is the proportion of whales that are sufficiently submerged for the vessel to ride above them.

The risk of fatal ship strikes would be increased by 50-100% by an increase in vessel speed from 21 kn to 35 kn, due to a combination of a smaller proportion detected before collision, and a higher proportion of glancing blows that involve fatal energies. However, the low absolute level of strike risk means that the increase in risk associated with a higher vessel speed is probably inconsequential.

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ANNEX 1. LIST OF PARTICIPANTS

Panel Members Present

Alexander BURDIN
Kamchatka Branch of Pacific Geographical Institute
Partizanskaya, 6
Petropavlovsk-Kamchatsky, 683000
Russian Federation

Justin COOKE
Centre for Ecosystem Management Studies
Höllenbergstr. 7
79312 Emmendingen
Germany

Greg DONOVAN (Co-chair)
Head of Science
International Whaling Commission
The Red House, 135 Station Road
Impington, Cambridge CB24 9NP
UK

Olof LINDEN (Day 1)
World Maritime University (WMU)
International Maritime Organization (IMO)
PO Box 500
20124 Malmö
Sweden

Douglas P. NOWACEK
Duke University
Nicholas School of the Environment &
Pratt School of Engineering
135 Duke Marine Lab Rd.
Beaufort, NC 28516
USA

Corinne POMERLEAU
Centre for Earth Observation Science
University of Manitoba
586 Wallace Building
Winnipeg, Manitoba R3T 2N2
Canada

Randall REEVES (Co-chair)
Okapi Wildlife Associates
27 Chandler Lane
Hudson
Québec J0P 1H0
Canada

Brandon SOUTHALL (Day 1 & 2)
Southall Environmental Associates, Inc &
University of California, Santa Cruz
9099 Soquel Drive, Suite 8,
Aptos, CA 95003
USA

Grigory TSIDULKO
Marine Mammal Council
Nakhimovskiy Ave, 36
Moscow 117997
Russian Federation

Alexander I. VEDENEV
Head of Noise in Ocean Laboratory
P.P. Shirshov Institute of Oceanology
Russian Academy of Sciences
Nakhimovskiy Ave, 36
Moscow 117997
Russian Federation

David WELLER
Marine Mammal & Turtle Division
Southwest Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
8901 La Jolla Shores Drive
La Jolla, CA 92037-1022
USA

** Apologies: Lloyd Lowry, Alexey Yablokov (Emeritus)*

Associate Scientists

Vladimir Burkanov (Days 1 & 2)

Sakhalin Energy Investment Company Ltd.

Bastian Blonk (Day 1 & 2)
Mike Donaghy, MDA Ltd
Wouter Drinkwaard, Shell International
Stephanie Lock
Ole Myklestad (Day 1 & 2)
Roberto Racca, JASCO
Andrey Samatov
Natalia Tsarenko

IUCN

Anete Berzina
Giulia Carbone
Simon Delany (Rapporteur)

Observers - Lenders

Jonathan Hancox, Ramboll Environ
Bruce Mate, Ramboll Environ
Moe Suzuki, Mizuho Bank

Observers - NGOs

Alexey Knizhnikov, WWF Russia
Mila Danilova, IFAW Russia
Dmitry Lisitsyn, Sakhalin Environmental Watch

Observers – Russian Authorities

Svetlana Sheynfeld, UNDP Russia/GEF/MNR Project: "Mainstreaming biodiversity conservation into Russia's energy sector policies and operations" (Day 1)

Alexey Vladimirov, UNDP Russia/GEF/MNR Project: "Mainstreaming biodiversity conservation into Russia's energy sector policies and operations" (Days 1 & 3)

Valery Fyodorov, Ministry of Natural Resources and Environment of the Russian Federation (MNR) / Interdepartmental Working Group for the Conservation of the Western Gray Whale Population (IWG) (Day 1)

Other Observers

Olga Kalashnikova, Shell Exploration and Production Services (Russian Federation) (Day 1)

Ekaterina Mikolaevskaya, Exxon Neftegas Limited (ENL) (Day 1 & 2)

Vladimir Nechayuk, ExxonMobil (Day 1 & 2)

Maxim Shoob, Russia/CIS Cluster, Shell (Day 1)

Mike Scott, ENL (Day 1 & 2)

Alexander Somov, Russian Research Institute of Fisheries and Oceanography (VNIRO)

Olga Shpak, Institute of Problems of Ecology and Evolution of the Russian Academy of Sciences (IPEE RAS) (Day 1)

Anzhelika Vasilyeva, Shell Russia (Day 3)

Kirill Zharikov, VNIRO (Days 1 & 2)

Interpreters

Alexander Danilov
Grigory Shkalikov

ANNEX 2. FINAL MEETING AGENDA

WESTERN GRAY WHALE ADVISORY PANEL		**11-13 November 2016**
17th meeting	**World Trade Centre (WTC), Congress Centre, Entrance #7, 2nd floor, Room "Don"** **Moscow, Russian Federation**	
FINAL AGENDA AND TIME SCHEDULE		
Day 1 - Friday, 11 November 2016		**Documents / presentations**
INTRODUCTIONS		
08:45 – 09:00	Welcome coffee	
09:00 – 09:30	**1. Organizational matters** 0:30 [Reeves, Donovan] 1.1 Welcome from IUCN 1.2 Co-chairs welcoming remarks 1.3 Brief introductions of all participants 1.4 Adoption of agenda 1.5 Documents 1.6 Report drafting procedures and timeline 1.7 Logistics	WGWAP-17/1 WGWAP-17/2 WGWAP-17/3 WGWAP-17/4
2. RANGE-LEVEL ISSUES: CONTRIBUTION TOWARDS THE IMPLEMENTATION OF RANGE STATES' MEMORANDUM OF COOPERATION ON GRAY WHALE CONSERVATION AND PROGRESS UPDATING THE IUCN/IWC CONSERVATION MANAGEMENT PLAN (CMP)		
09:30 – 11:30 (with coffee break 10:30 – 10:45)	**2.1 Update on IWC work, the IUCN/CMP and the Memorandum of Cooperation** 2.1.1 Results to date of IWC Scientific Committee Workshops [Donovan] 2.1.2 Process and timeline to update 2010 IUCN/IWC Conservation Management Plan (CMP), including progress made drafting scientific components [Donovan] 2.1.3 Next steps to revise the CMP update, including the stakeholder Workshop planned for late 2017 early 2018 [Donovan] 2.1.4 Fundraising for the Memorandum of Cooperation / CMP overall implementation **2.2 Other rangewide scientific issues** 2.2.1 Gray whale observations outside Sakhalin feeding areas [Southall, Weller, others] 2.2.2 Population modelling and data sharing [Cooke] 2.2.3 Feeding Ecology and Benthos research proposals [Context: Donovan, Presentations: Pomerleau] (a) On the feeding ecology of gray whales off northeast Sakhalin Island, Russia: conservation consideration (b) For the clarification of the relationship between Piltun Lagoon and the benthic productivity of adjacent waters along the northeast coast of Sakhalin Island, Russia; conservation considerations 2.2.4 Fisheries interactions [Reeves] 2.2.5 Other	WGWAP-17/24 WGWAP-17/25 WGWAP-17/26 WGWAP-17/Inf.4 WGWAP-17/Inf.5 WGWAP-17/Inf.5-Annex WGWAP-17/Inf.6 WGWAP-17/Inf.8 WGWAP-17/Inf.9 WGWAP-17/Inf.12

<table>
<tr><td colspan="3">3. MANAGING / ADDRESSING ISSUES AT THE RUSSIAN NATIONAL LEVEL</td></tr>
<tr><td>11:30 – 12:00</td><td>3.1 “Principles and Guidelines for the Monitoring and Mitigation of Impacts on Large Whales from Offshore Industrial Activity in Russian Waters” developed within the framework of the UNDP/MRN/GEF project “Mainstreaming biodiversity into Russia’s energy sector practice and policy” 0:40 [UNDP, IUCN, experts involved]
3.1.1 Progress and cooperation with IUCN
3.1.2 Overview of scientific and technical recommendations and principles
3.1.3 Implementation and next steps
3.1.4 Q&A and discussion</td><td>WGWAP-17/28</td></tr>
<tr><td>12:00 – 13:30</td><td>Lunch</td><td></td></tr>
<tr><td colspan="3">4. PROGRAMMES ON GRAY WHALE RESEARCH AND MONITORING: REVIEW OF 2015 FIELDWORK RESULTS, PRELIMINARY 2016 RESULTS, AND 2017 SCOPE OF WORK</td></tr>
<tr><td>13:30 – 14:30</td><td>4.1 Summary of 2015 fieldwork results, preliminary 2016 field results of the Sakhalin Energy/ENL Joint Programme and plans for 2017 [Sakhalin Energy]
4.1.1 Acoustics
4.1.2 Benthic and hydrology (incl.recs)
4.1.3 Photo-ID and biopsy
4.1.4 Distribution
4.1.5 Q&A and discussion

4.2 Summary of 2015 fieldwork results, preliminary 2016 field results of the Russia Gray Whale Project and plans for 2017
4.2.1 Presentation [Burdin]
4.2.2 Q&A and discussion</td><td>WGWAP-17/5
WGWAP-17/6
WGWAP-17/7
WGWAP-17/8
WGWAP-17/9
WGWAP-17/Inf.7</td></tr>
<tr><td colspan="3">5. REFRESH OF SAKHALIN ENERGY/ENL JOINT PROGRAMME ON GRAY WHALE RESEARCH AND MONITORING BEYOND 2018</td></tr>
<tr><td>14:30 – 16:00</td><td>5.1 Sakhalin Energy/ENL plans for their revised Joint Programme in 2018 and beyond 1:30
5.1.1 Brief update on the status of the Joint Programme refresh [Sakhalin Energy
5.1.2 Co-chairs summary of the Joint Programme Task Force (JPTF-2) (May 2016) & JPTF-3 (November 2016) meetings [Donovan, Reeves]
5.1.3 Next steps to refresh the Joint Programme: summary of strategy, elements and plans [Sakhalin Energy]
5.1.4 Terms of Reference (TOR) for the project manager to focus on publishing the Joint Programme results for the past years and developing the future Joint Programme for the next 10 years
5.1.5 Conclusions and recommendations</td><td>JPTF-2/REPORT
WGWAP-17/10
WGWAP-17/11</td></tr>
<tr><td>16:00</td><td>Adjourn</td><td></td></tr>
<tr><td>18:30</td><td>Light dinner reception at the City Lounge, 20th floor, Crowne Plaza Club hotel/WTC(Entrance #10)</td><td></td></tr>
</table>

Day 2 - Saturday, 12 November 2016		**Documents / presentations**
INTRODUCTIONS		
08:45 – 09:00	Welcome coffee	
09:00 – 09:05	Introductions of new participants in the room (if any)	
6. ADDRESSING NOISE ISSUES INCLUDING REVIEW OF RESULTS FROM 2015 SEISMIC SURVEY AND PLANS FOR FUTURE OBN SURVEY		
09:05 – 09:20	**6.1. Chair's summary of the NTF-10 (May 2016) & NTF-11 (November 2016) meetings** [Donovan, Nowacek] 0:15	NTF-10/REPORT
09:20 – 10:05	**6.2 Review of results from Sakhalin Energy's 2015 seismic survey** 0:45 6.2.1 Presentation on 2015 seismic survey monitoring and mitigation programme results (including responses to WGWAP recommendations) [Sakhalin Energy] 6.2.2 Conclusions from simulation analysis of implications of Sakhalin Energy's 2015 Monitoring and Mitigation Plan (Rec. WGWAP-16/004) [Cooke] 6.2.3 Conclusions and recommendations	WGWAP-17/20 WGWAP-17/21
10:05 – 10:50	**6.3 Update on future Sakhalin Energy's OBN seismic survey plans** 0:45 [Sakhalin Energy] 6.3.1 Presentation on updated plans for an OBN seismic survey between 2018-2020 [Sakhalin Energy] 6.3.2 Conclusions and recommendations	
10:50 – 11:00	Coffee break	
7. MANAGING / ADDRESSING OTHER ISSUES ON THE SAKHALIN SHELF INCLUDING OTHER OIL AND GAS ACTIVITIES AND FISHERIES INTERACTIONS		
11:00 – 12:00	**7.1 Update on oil and gas activities in and near the whale feeding areas in Sakhalin / Sea of Okhotsk in 2016 and beyond** 1:00 7.1.1 Presentation by Exxon Neftegas Limited (ENL) on 2016-2017 Odoptu sealift operations and MMPP (Marine Mammal Protection Plan) implementation [ENL] 7.1.2 Other operators on 2016 activities and future plans (other operators, supplemented as necessary by IUCN overview) 7.1.3 Presentation by Russian NGOs on their activities related to monitoring of the ENL transportation operations [WWF Russia, Sakhalin Environment Watch] and the role of the NGOs and public support in the WGW protection in 2016 [IFAW Russia] 7.1.4 Discussion and conclusions	WGWAP-17/29 WGWAP-17/Inf.10 WGWAP-17/Inf.10-ES
12:00 – 13:00	**7.2 Update on interactions between fisheries and whales in Sakhalin** 1:00 7.2.1 Update on the 2016 entanglement case(-s) in Sakhalin [Sakhalin Energy, others with information] 7.2.2 Plans related to IWC disentanglement training [Donovan] 7.2.3 Proposed elements of a strategy to address fisheries interactions with whales [Burkanov, Tsidulko, Lisitsyn, others] 7.2.4 Conclusions and recommendations	WGWAP-17/23 WGWAP-17/Inf.13
13:00 – 14:30	Lunch	
14:30	Re-convene as necessary / Adjourn	

Day 3 - Sunday, 13 November 2016		**Documents / presentations**
INTRODUCTIONS		
08:45 – 09:00	Welcome coffee	
09:00 – 09:05	Introductions of new participants in the room (if any)	
8. OTHER SAKHALIN ENERGY ACTIVITIES IN 2016, 2017 AND BEYOND		
09:05 – 10:35	**8.1 Sakhalin Energy activities unrelated to the Sakhalin Energy/ENL Joint Programme in 2015, 2016, 2017 and beyond** 1:30 8.1.1 Update of the Marine Mammal Protection Plan (MMPP) [Sakhalin Energy, Co-chairs] 8.1.2 Programme on Marine Mammal Observers (MMOs) and ship strike avoidance, including speed limit proposal (incl. recs) [Sakhalin Energy] 8.1.3 Oil spill response planning and drills (incl. Tier 3 exercise in June 2016 and follow-up action [Ramboll Environ, Sakhalin Energy] 8.1.4 Sakhalin Energy responses/updates on other WGWAP Recommendations [Sakhalin Energy] 8.1.5 Other activities 2016-2020 [Sakhalin Energy] 8.1.6 Conclusions and recommendations	WGWAP-17/13 WGWAP-17/14 WGWAP-17/16 WGWAP-17/17 WGWAP/17/27
10:35 – 10:50	Coffee break	
9. IMPLEMENTATION OF INTERNATIONAL FINANCE CORPORATION (IFC) PERFORMANCE STANDARDS FOR SOCIAL AND ENVIRONEMTNAL SUSTAINABILITY		
10:50 – 11:05	**9.1 Co-chairs summary of the IFC Performance Standards Task Force meeting (May 2016)** 0:15	PSTF-1/REPORT
11:05 – 11:15	**9.2 IUCN's Biodiversity Offsets Policy (adopted at the IUCN World Conservation Congress, September 2016) [IUCN]** 0:10	WGWAP-17/Inf.3
11:15 – 12:45	**9.3 Sakhalin Energy's plans for IFC PS6 implementation and the development of key associated documents** 1:30 9.3.1 Presentation on the draft Critical Habitat Assessment (CHA) [Sakhalin Energy] 9.3.2 Discussion 9.3.3 Discussion on the draft outline for Sakhalin Energy's Biodiversity Offsets Strategy in the context of the draft CHA [Sakhalin Energy] 9.3.4 Discussion 9.3.5 Next steps and elements/expectations for Panel's input	WGWAP-17/22
12:45 – 14:15	Lunch	
10. WGWAP PLANS FOR 2017 & BEYOND		
14:15 – 14:45	**10.1 Review of WGWAP recommendations** [Reeves, Berzina] 0:30	WGWAP-17/11
14:45 – 15:15	**10.2 WGWAP Workplan 2017** [Co-chairs] 0:30 10.2.1 Presentation of workplan 10.2.2 Conclusions and recommendations	
15:15 – 15:30	**11. ANY OTHER BUSINESS** 0:15	
15:30 – 15:45	**12. WGWAP-17 CLOSING REMARKS** 0:15	
15:45	Adjourn	

ANNEX 3. LIST OF DOCUMENTS

List of documents and materials distributed in connection of the 17th meetings of the WGWAP (with links to download those designated as public, including items reclassified from confidential or internal to public during or after the meeting)

DOCUMENT #	TITLE	LANGUAGE	STATUS
	PRIMARY DOCUMENTS		
General			
WGWAP-17/1	Final agenda (including time schedule)	English	Public
WGWAP-17/2	Повестка дня (включая расписание)	Russian	Public
WGWAP-17/3	List of documents distributed in connection with the 17th meeting of the WGWAP	English	Public
WGWAP-17/4	Список документов, распространяемых в соответствии с 17м заседанием КГЗСК	Russian	Public
ENL/Sakhalin Energy Joint Programme			
WGWAP-17/5-Ru (also for JPTF-3)	Отчет по Программе мониторинга серых китов у северо-восточного побережья острова Сахалин в 2015 г. (основной доклад)	Russian	Public
WGWAP-17/5-En (also for JPTF-3)	Report on the Gray Whale Monitoring Program off the Northeast coast of Sakhalin Island, 2015 (main report)	English	Public
WGWAP-17/6-Ru (also for JPTF-3)	СОСТОЯНИЕ БЕНТОСА В РАЙОНАХ НАГУЛА СЕРЫХ КИТОВ (*ESCHRICHTIUS ROBUSTUS*) У ПОБЕРЕЖЬЯ СЕВЕРО-ВОСТОЧНОГО САХАЛИНА В 2015 ГОДУ	Russian	Public
WGWAP-17/6-En (also for JPTF-3)	Benthos studies in the feeding grounds of gray whales (*Eschrichtius robustus*) off the Northeast coast of Sakhalin in 2015	English	Public
WGWAP-17/7-Ru (also for JPTF-3)	РАСПРЕДЕЛЕНИЕ И ЧИСЛЕННОСТЬ СЕРЫХ КИТОВ В ШЕЛЬФОВЫХ ВОДАХ СЕВЕРО-ВОСТОЧНОГО САХАЛИНА В ИЮЛЕ –СЕНТЯБРЕ 2015 г.	Russian	Public
WGWAP-17/7-En (also for JPTF-3)	Distribution and Abundance of Gray Whales in North-East Sakhalin Coastal Waters in July -September of 2015	English	Public
WGWAP-17/8-Ru (also for JPTF-3)	ФОТОИДЕНТИФИКАЦИЯ СЕРЫХ КИТОВ (*ESCHRICHTIUS ROBUSTUS*) У СЕВЕРО-ВОСТОЧНОГО ПОБЕРЕЖЬЯ О. САХАЛИН В 2015 ГОДУ	Russian	Public
WGWAP-17/8-En (also for JPTF-3)	Gray Whale (Eschrichtius robustus) photo-identification off the Northeast Coast of Sakhalin Island in 2015	English	Public
WGWAP-17/9-Ru (also for JPTF-3)	Акустико-гидрофизические исследования на северо-восточном шельфе о. Сахалин в 2015 г.	Russian	Public
WGWAP-17/9-En (also for JPTF-3)	2015 Acoustic Hydrophysical Survey in the Offshore Waters of Northeastern Sakhalin Island	English	Public
JPFT-2/REPORT (also for JPTF-3)	2nd Joint Programme Task Force report (May 2016)	English	Public

DOCUMENT #	TITLE	LANGUAGE	STATUS
WGWAP-17/10-En (also for JPTF-3)	Presentation on the Sakhalin Energy/ENL Joint Gray Whale Monitoring Programme 2016 preliminary results	English	Public
WGWAP-17/10-Ru (also for JPTF-3)	Презентация о предварительных результатах Совместной программы «Сахалин Энерджи»/ЭНЛ по мониторингу серых китов в 2016 г.	Russian	Public
Marine Mammal Protection Plan and Observer Programme			
WGWAP-17/13	Draft updated Sakhalin Energy's Marine Mammal Protection Plan (MMPP)	English	For internal use only at this stage
WGWAP-17/14-Ru	Программа наблюдения за морскими млекопитающими в 2015 г., заключительный отчет	Russian	Public
WGWAP-17/14-En	2015 Marine Mammal Observer Programme, Close-out Report	English	Public
WGWAP-17/27	Gray whales and Sakhalin Energy activities: Crew-change vessel speed proposals	English	For internal use only at this stage
Oil spill preparedness and response (OSRP)			
WGWAP-17/16	PPCI/Lenders site visit report on the Sakhalin Energy's Tier 3 Oil Spill Exercise carried out in June 2016	English	For internal use only at this stage
WGWAP-17/17	Sakhalin Energy's presentation: Continued improvement of Sakhalin Energy's OSR capability in 2016 and 2017, including actions arising from Lenders visit and the ER Oil Spill Tier 3 Exercise conducted in June 2016, as well as indication of plans for 2017	English	For internal use only at this stage
Seismic surveys and other potentially noise-generating offshore activities			
NTF-10/REPORT	10th Noise Task Force report, May 2016	English	Public
WGWAP-17/19	List of Sakhalin Energy's offshore activities potentially generating noise, 2016-2020	English	Public
WGWAP-17/20 (also for NTF-11)	(Draft) Analysis of effects of mitigation strategy changes on the duration of the Piltun-Ashtok seismic survey 2015 and the consequences for sonic exposure of gray whales (by J.Cooke)	English	For internal use only at this stage
WGWAP-17/21 (incl. annexes) (also for NTF-11)	Results of Monitoring of Gray Whales Distribution and Behaviour off North-Eastern Sakhalin During 4D Seismic Survey in the Piltun-Astokhskoye (the Sakhalin-2 Project), July-August 2015 (with five annexes)	English	For internal use only (except PUBLIC Annex 1 – NTF-8 report)
Implementation of the IFC Performance Standards			
PSTF-1/REPORT	1st IFC Performance Standards Task Force report, May 2016	English	Public
WGWAP-17/22	First draft of the Critical Habitat Assessment of Plants, Lichens and Animals of Sakhalin Island provided by Sakhalin Energy: Habitats Offshore North-East Sakhalin and in the Adjacent Coastal Territory	English	Confidential
Population and related matters			
WGWAP-17/24	Interim Population Assessment Update for Sakhalin and Kamchatka Gray Whales, with Reference to Stock Identity (by J.Cooke)	English	For internal use only

DOCUMENT #	TITLE	LANGUAGE	STATUS
WGWAP-17/25	Short CMP funding proposal to be presented to the interested IWC commissioners: The feeding ecology of gray whales (*Eschrichtius robustus*) off northeast Sakhalin Island, Russia: its role in conservation (by C.Pomerleau with collaborators)	English	For internal use only
WGWAP-17/26	Short CMP funding proposal to be presented to the interested IWC commissioners: Clarification of the relationship between Piltun Lagoon and the benthic productivity of adjacent waters along the northeast coast of Sakhalin Island, Russia; key information for conservation of gray whales off Sakhalin Island (by C.Pomerleau with collaborators)	English	For internal use only
Industry guidelines			
WGWAP-17/28-EN	Principles and Guidelines for the Monitoring and Mitigation of Impacts on Large Whales from Offshore Industrial Activity in Russian Waters, developed as regulatory framework, as part of the UNDP/GEF/MNR project "Mainstreaming biodiversity in Russia's energy sector policy and practice"	English	Public
WGWAP-17/28-RU	Принципы и методические рекомендации по мониторингу и снижению негативных воздействий на крупных китообразных при осуществлении хозяйственной Задачи сохранения биоразнообразия в политике и программах развития энергетического сектора России деятельности в морских акваториях Российской Федерации», разработанные в качестве элемента нормативно-правовой базы в рамках проекта ПРООН/МПР/ГЭФ «Задачи сохранения биоразнообразия в политике и программах развития энергетического сектора России» (technical translation - технический перевод)	Russian	Public
Activities of other operators and sectors			
WGWAP-17/29	IUCN compilation of information sheets on other operator activities in the Sea of Okhotsk from the IUCN mapping exercise (including a summary overview), updated v. October 2016	English	For internal use only
WGWAP-17/23-En	Presentation from Sakhalin Energy on sighting of entangled Gray Whale near South Piltun spit in 2016	English	Public
WGWAP-17/23-Ru	Обнаружение запутавшегося в рыболовных снастях серого кита у южной косы залива Пильтун в 2016 году	Russian	Public
WGWAP recommendations			
WGWAP-17/11	IUCN presentation on the WGWAP Recommendations Database and overview 2004-2016 (with the implementation status of the recommendations as of 13 November 2016)[23]	English	Public

[23] For the current and most up to date information on the status of recommendations, please refer to the WGWAP Recommendations Database, accessible through the WGWAP website: https://www.iucn.org/western-gray-whale-advisory-panel/recommendations or directly at https://portals.iucn.org/wgwap/.

FOR INFORMATION DOCUMENTS			
WGWAP-17/Inf.1	IWG-15 meeting protocol, November 2015	Russian / English	Public
WGWAP-17/Inf.2	IWG-16 meeting protocol, April 2016	Russian / English	Public
WGWAP-17/Inf.3	IUCN Motion (now Resolution) on IUCN Policy on Biodiversity Offsets adopted at the IUCN World Conservation Congress, September 2016	English	Public
WGWAP-17/Inf.4	Report from the IWC Modelling workshop on the status of North Pacific gray whales (La Jolla, April 2016)	English	Public
WGWAP-17/Inf.5	Excerpt of the section 10.7 North Pacific gray whales from the Report of the IWC Scientific Committee (SC66, Bled, June 2016), pp.46-48	English	Public
WGWAP-17/Inf.5-Annex	Annex F to the IWC Scientific Committee (Bled, June 2016): Report of the Sub-Committee on Bowhead, Right and Gray Whales	English	Public
WGWAP-17/Inf.6	Gagnon, C. 2016. Western gray whale activity in the East China Sea from acoustic data: Memorandum for Dr. Brandon Southall. Paper IWC/66/CC29 presented to the IWC Conservation Committee, October 2016. 2pp.	English	Public
WGWAP-17/Inf.7	Burdin, S. and Sychenko, O. 2016. Status of western gray whales off north-eastern Sakhalin Island, Russia in 2015. Paper IWC/SC/66b/BRG/12.	English	Public
WGWAP-17/Inf.8	Weller et al. 2016. Gray whale migration in the western North Pacific: further support for a Russia-Japan connection. Paper IWC SC/66b/BRG/16.	English	Public
WGWAP-17/Inf.9 (also for NTF-11)	Report of the IWC Workshop on Acoustic Masking and Whale Population Dynamics (Bled, Slovenia, June 2016)	English	Public
WGWAP-17/Inf.10-RU	ОБЗОР "Общественный мониторинг транспортных операций компании "Эксон Нефтегаз Лимитед" в районе нагульного пастбища серых китов охотско-корейской популяции у залива Пильтун (северо-восточное побережье острова Сахалин)" (Report on NGO Monitoring of the Exxon Neftegas Limited transportation operations in the Okhotsk-Korean gray whale population feeding area near the Piltun Bay mouth (North-East Coast of Sakhalin) (by Regional Public Organization "Sakhalin Environment Watch", IFAW, WWF of Russia, November 2016)	Russian	For internal use at the time of the meeting[24]
WGWAP-17/Inf.10-ES-Ru	Краткое резюме доклада "Общественный мониторинг транспортных операций компании "Эксон Нефтегаз Лимитед" в районе нагульного пастбища серых китов охотско-корейской популяции у залива Пильтун (северо-восточное побережье острова Сахалин)" (РОО "Экологическая вахта Сахалина", IFAW, WWF России, ноябрь 2016 г.)	Russian	For internal use at the time of the meeting [25]

[24] Post-meeting note: NGOs subsequently released an updated final report version dated December 2016 in both Russian and English, which they have now made publicly available online.
[25] Ibid

WGWAP-17/Inf.10-ES-En	Executive Summary of the Report on NGO Monitoring of the Exxon Neftegas Limited transportation operations in the Okhotsk-Korean gray whale population feeding area near the Piltun Bay mouth (North-East Coast of Sakhalin) (by Regional Public Organization "Sakhalin Environment Watch", IFAW, WWF of Russia, November 2016) (unofficial translation from the Russian original)	English	For internal use at the time of the meeting [26]
WGWAP-17/Inf.11 (also for NTF-11)	Racca, R., Ainsworth, L., Gailey, G. and Bröker, K. 2016. Seismic surveys and gray whales near Sakhalin: Multivariate analyses of monitoring data from 2010 Astokh geophysical survey. Proceeding for Meetings on Acoustics, 27, 010020. http://dx.doi.org/10.1121/2.0000275	English	Public
WGWAP-17/Inf.12	Western Gray Whale Memorandum of Co-operation (MoC): Progress and Planning Meeting Report (October 2016)	English	Public
WGWAP-17/Inf.13	Mattila, D. Overview of the work of the technical adviser to the Secretariat to assist with reducing conflicts between cetaceans and marine resource users: October 2014 to October 2016	English	Public

[26] Ibid