

**WESTERN GRAY WHALE ADVISORY PANEL**  
**9<sup>th</sup> Meeting**

**WGWAP-9**  
**3-6 December 2010**  
**Geneva, Switzerland**

**REPORT OF THE WESTERN GRAY WHALE ADVISORY PANEL**  
**AT ITS NINTH MEETING**

**CONVENED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE**

**CONTENTS**

<b>1</b>	<b>OPENING.....</b>	<b>5</b>
1.1	INTRODUCTION AND LOGISTICS .....	5
1.2	ADOPTION OF AGENDA.....	5
1.3	DOCUMENTS .....	5
1.4	REPORTING PROCEDURES AND TIMELINES .....	5
1.5	STATUS OF RECOMMENDATIONS FROM PREVIOUS MEETINGS .....	5
	1.5.1 <i>Analyses of absence of whale observations at stations 10 and 11 in September 2009 (WGWAP-8 report, p. 5).....</i>	6
	1.5.2 <i>ENL analysis of the effect of pile driving.....</i>	7
<b>2</b>	<b>REPORTS ON FIELD ACTIVITIES IN 2010 (OTHER THAN THOSE ASSOCIATED WITH THE ASTOKH 4-D SEISMIC SURVEY).....</b>	<b>7</b>
2.1	PRELIMINARY SUMMARY OF EFFORT AND/OR RESULTS OF SAKHALIN ENERGY/ENL 2010 FIELD PROGRAMME (DISTRIBUTION, BEHAVIOUR, ACOUSTICS, PHOTO-ID AND BENTHIC MONITORING).....	7
	2.1.1 <i>Distribution and benthic monitoring.....</i>	7
	2.1.2 <i>Behaviour.....</i>	8
	2.1.3 <i>Photo-identification .....</i>	9
	2.1.4 <i>Acoustics.....</i>	9
	2.1.5 <i>MMO programme in 2010.....</i>	9
	2.1.6 <i>Carcass survey programme in 2010.....</i>	9
	2.1.7 <i>Future of the joint Sakhalin Energy-ENL gray whale monitoring programme.....</i>	10
2.2	PRELIMINARY SUMMARY OF EFFORT AND RESULTS OF WORK BY NON-INDUSTRY GROUPS (INCLUDING WHALE OBSERVATIONS AND PHOTO-ID/BIOPSY).....	12
<b>3</b>	<b>REVIEW OF INFORMATION ON RELEVANT ACTIVITIES BY OTHER COMPANIES IN 2010.....</b>	<b>12</b>
3.1	LEBEDENSKOYE SEISMIC SURVEY .....	12
3.2	OFFSHORE SEISMIC SURVEY.....	14
3.3	GENERAL.....	14
<b>4</b>	<b>BRIEFING BY SAKHALIN ENERGY ON WORK IN 2011 AND BEYOND.....</b>	<b>14</b>
4.1	BACKGROUND .....	14
4.2	DISCUSSION .....	15
4.3	PANEL ADVICE .....	15
	4.3.1 <i>General advice.....</i>	15
4.4	CONCLUDING REMARKS .....	17
<b>5</b>	<b>4-D SEISMIC SURVEY.....</b>	<b>17</b>
5.1	REPORT OF THE 6 <sup>TH</sup> MEETING OF THE SEISMIC SURVEY TASK FORCE.....	17
	5.1.1 <i>Objectives.....</i>	18
	5.1.2 <i>Review of the 4D survey.....</i>	18
	5.1.3 <i>Future analyses.....</i>	19
	5.1.4 <i>Amendments to future mitigation and monitoring plans.....</i>	21
	5.1.5 <i>Conclusion .....</i>	23
5.2	PANEL DISCUSSIONS .....	23
5.3	2011 SOUTH PILTUN 2D SURVEY .....	24
	5.3.1 <i>Report of the 6th meeting of the seismic survey task force.....</i>	24
	5.3.2 <i>Nature of the survey.....</i>	24
	5.3.3 <i>Discussion within the SSTF.....</i>	24
5.4	DISCUSSION AT WGWAP-9.....	26
	5.4.1 <i>Exclusion zone .....</i>	27
	5.4.2 <i>Monitoring .....</i>	27
	5.4.3 <i>The use of a single airgun or an array.....</i>	28
	5.4.4 <i>Side-scan sonar.....</i>	28
<b>6</b>	<b>PHOTO-ID.....</b>	<b>29</b>
6.1	RESULTS OF THE COMPARISON OF THE 2009 CATALOGUES .....	29
6.2	RESULTS OF PHOTO-ID WORK DURING SATELLITE TAGGING .....	30

6.3	FUTURE OF PHOTO-ID WORK .....	30
<b>7</b>	<b>POPULATION ASSESSMENT .....</b>	<b>31</b>
<b>8</b>	<b>OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE.....</b>	<b>32</b>
<b>9</b>	<b>REPORT FROM ENVIRONMENTAL MONITORING TASK FORCE AND FUTURE WORK PLAN .....</b>	<b>33</b>
<b>10</b>	<b>SATELLITE TAGGING .....</b>	<b>33</b>
10.1	UPDATE ON RESULTS OF EASTERN GRAY WHALE TAGGING IN 2009 .....	33
10.2	PRELIMINARY REPORT ON RESULTS OF WESTERN GRAY WHALE TAGGING IN 2010.....	33
10.2.1	<i>Fieldwork</i> .....	34
10.2.2	<i>Assessment of technical problems in relation to field protocols</i> .....	34
10.2.3	<i>Summary of effort and results</i> .....	35
10.2.4	<i>Recommendations by the tagging team</i> .....	35
10.2.5	<i>Discussion and next steps</i> .....	36
<b>11</b>	<b>SAKHALIN ENERGY PROPOSAL ON NECROPSY TRAINING (RECOMMENDATION WGWAP-7/016).....</b>	<b>37</b>
<b>12</b>	<b>MULTIVARIATE ANALYSIS (MVA) .....</b>	<b>38</b>
12.1	RESULTS .....	38
12.2	PROGRESS ON WORKSHOP.....	39
<b>13</b>	<b>PROGRESS ON RANGEWIDE INITIATIVE AND WGW CONSERVATION PLAN.....</b>	<b>40</b>
<b>14</b>	<b>INFORMATION FROM MEETINGS OF RUSSIAN INTERDEPARTMENTAL WORKING GROUP ON WGW CONSERVATION .....</b>	<b>40</b>
<b>15</b>	<b>WGWAP SELF-EVALUATION.....</b>	<b>41</b>
15.1	REPORT ON MEETING WITH PANEL AND NGOS .....	41
15.2	PANEL TERMS OF REFERENCE.....	41
15.3	COMMUNICATIONS STRATEGY.....	42
15.4	WGWAP EVALUATION.....	42
<b>16</b>	<b>OTHER BUSINESS .....</b>	<b>42</b>
16.1	D-TAGS .....	42
16.2	CLOSE.....	42
	<b>REFERENCES.....</b>	<b>42</b>
	<b>SUMMARY OF RECOMMENDATIONS FROM THE 9<sup>TH</sup> MEETING OF WGWAP.....</b>	<b>45</b>

**ACRONYMS**

ADMB	Automatic Differentiation Model Builder
AIS	Automated Information System
ARTS	Air Rocket Transmitting System
AUAR	Automated Underwater Acoustic Recorder
DMNG	DalMorNefteGeophizika
EIA	Environmental Impact Assessment
EMTF	Environmental Monitoring Task Force
ENL	Exxon Neftegas Limited
FEB RAS	Far East Branch, Russian Academy of Sciences
IBM	Institute of Marine Biology
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
IWG	Interdepartmental Working Group on Western Gray Whale Conservation of Russian Federation
MMO	Marine Mammal Observer
MMPP	Marine Mammal Protection Plan
MNR	Ministry of Natural Resources of Russian Federation
NGO	Non-Governmental Organization
POI	Pacific Oceanological Institute
RHIB	Rigid Hull Inflatable Boat
RMS	Root-Mean-Square
SEL	Sound Energy Level
SPL	Sound Pressure Level
SSG	IWC-WGWAP Scientific Steering Group (Satellite Tagging)
SSTF	Seismic Survey Task Force
WGWAP	Western Gray Whale Advisory Panel

**1 OPENING**

The ninth meeting of the Western Gray Whale Advisory Panel (WGWAP-9) was held at Hotel Epsom, Geneva, Switzerland, from 3-6 December 2010 under the chairmanship of R.R. Reeves.

Panel members present are listed in Annex 1. Dicks and VanBlaricom were unable to attend.

Alexander Burdin attended the meeting at the request of the Panel in order to provide first-hand information on work of the Russia-US research team in Sakhalin and Kamchatka during the 2010 season.

Representatives of the following organisations also attended the meeting (see Annex 1):

AEA Group	Mizuho Corporate Bank, Ltd
Credit Suisse	Pacific Environment
International Union for Conservation of Nature	Sakhalin Energy Investment Company Ltd
	WWF International

Finn Larsen and Béatrice Riché of IUCN facilitated meeting preparations and logistics. Sarah Humphrey served as meeting rapporteur. The efforts of Larsen, Riché and Humphrey in support of the Panel’s work are greatly appreciated.

**1.1 Introduction and logistics**

The plenary meeting of the Panel followed a meeting of the Seismic Survey Task Force held at the same venue on 29 November – 1 December 2010. On 3 December Panel members participated in a brief informal session with NGO and lender representatives to discuss communications issues and the future of the WGWAP process.

**1.2 Adoption of agenda**

The agenda was adopted with only minor changes (Annex 2).

**1.3 Documents**

The list of documents is given in Annex 3. Those designated as public are available at [www.iucn.org/wgap](http://www.iucn.org/wgap).

**1.4 Reporting procedures and timelines**

Reeves indicated that he expected the draft Panel report to be ready for Sakhalin Energy fact-checking review by early January 2011. Given the inevitable delays related to the holiday season, however, it was agreed that the draft would be delivered to IUCN (for transmittal to Sakhalin Energy) no later than mid-January and that the final report would be posted on the IUCN website by the end of January.

**1.5 Status of recommendations from previous meetings**

IUCN, the Panel and Sakhalin Energy have continued to make progress on the task of resolving disagreements and misunderstandings concerning previous recommendations of this panel and other western gray whale panels (ISRP, Lenders Workshop, IISG). The cumulative list, including updated status for some recommendations, is publicly available (<http://www.iucn.org/wgap/wgap/recommendations/>).

Reeves emphasised the importance of continuing to monitor this aspect of the Panel’s work and noted it was the responsibility of all parties involved to contribute to the process of ensuring that the Panel’s advice and recommendations are understood and implemented in a timely and transparent manner. The WGWAP terms of reference make clear that Sakhalin Energy is expected to follow the

Panel's advice and recommendations, and "to clearly identify and document specific areas and points where (i) they were/will be accepted and/or implemented or (ii) they were not/will not be accepted and/or implemented (including a clear explanation therefore)".

**1.5.1 Analyses of absence of whale observations at stations 10 and 11 in September 2009 (WGWAP-8 report, p. 5)**

Although not the subject of a formal Panel recommendation, the seemingly anomalous pattern of gray whale occurrence near two of the Sakhalin Energy/ENL joint programme observation stations (stations 10 and 11) in September 2009 was noted in the report of WGWAP-8. In advance of WGWAP-9, the Panel asked Sakhalin Energy to prepare an exploratory analysis incorporating relevant distribution, acoustic and benthic data from this time and area. This request was addressed only partially, with a short presentation of the distribution and acoustic data followed by discussion. Muir reported that there had been no benthic sampling in this area during September and that nothing unusual had been observed in the samples taken there in August.

There are some gaps in the distribution data due to poor weather conditions, but it is clear that the number of whales in the vicinity of stations 10 and 11 dropped to near zero after 1 September. Close inspection of the available acoustic data for the periods 11 August to 3 September and 11-25 September revealed a non-moving source of low-frequency continuous noise lasting about an hour followed by gaps of approximately two hours occurring over the 3-4 day period from 20-24 August. Whale numbers near the two stations dropped to near zero within a few days after the onset of this noise, which appears to have been associated in some way with the PA-A (Molikpaq) platform. During the WGWAP meeting, Sakhalin Energy made direct inquiries to platform personnel in an attempt to identify activities during this period that could have been responsible for the noise. The 'engineering' group reported that it had not been undertaking any 'noisy' activities. The engineers reportedly were cutting penetrations for power but such work is not considered to be noisy. Also, work on the process module was suspended around the period in question. By the end of this meeting, no further information was available concerning potentially noisy 'regular operations' on the platform or on potential noise from a standby vessel that was operating in the area.

The Panel is well aware that a correlation alone does not prove that there is a causal relationship and therefore in a case such as this one, the search for a noise source that is temporally and spatially correlated with the anomalous whale distribution is simply an initial step in the process of investigation. However, two data-related issues hamper this effort. Firstly, buoys X, Y and Z were all inactive and in need of servicing at the same time (between 4-10 September), resulting in a regrettable gap in the acoustic record. Whilst recognising that these units require servicing, the Panel **recommends** that servicing be scheduled such that no two adjacent buoys are out of commission at the same time.

Secondly, the ongoing lack of statistical analysis of distribution data continues to restrict our ability to interpret whether apparent changes represent significant deviations from normal distribution patterns. Although we appreciate that the presented data have been appropriately corrected for effort and, as such, represent actual whale densities, no statistical analyses of distribution patterns and the significance (or non-significance) of changes in distribution are ever presented. The Panel **requests** that for WGWAP-10 an analysis of whale density for the period 15 August–15 October 2009 be calculated and presented (*e.g.* as a 1- or 2-week moving average) specifically to determine whether the observed change in distribution was statistically significant.

The Panel also **requests** that Sakhalin Energy provides for WGWAP-10 a final report on activities on or near the PA-A platform that could have caused the recorded noise. Finally, the Panel **requests** that a presentation be made at WGWAP-10 of the acoustic data for the period 15 August–15 September 2009 for buoys X-Z, in the format specified in recommendation WGWAP-7/002 for continuous noise.

The above recommendations and requests are made in the hope of being able to identify the noise source and thus ensure that in the future, such noise can be monitored and managed appropriately to mitigate disturbance to the whales.

Vedenev drew attention to the fact that platform upgrades occur from time to time and it is important that sound profiles of the platforms following such upgrades are obtained and analysed. Reeves emphasised that there is an implicit assumption that Sakhalin Energy will keep the Panel advised on any aspects of the company's operations that could significantly change the acoustic environment or otherwise affect western gray whales. Therefore, the Panel **requests** that Sakhalin Energy report on this issue at WGWAP-10 by updating and clarifying information on recent changes with acoustic implications at either platform.

### ***1.5.2 ENL analysis of the effect of pile driving***

As summarised in the report of WGWAP-8 (pp. 6-7), a special effort was made in 2009 under the joint Sakhalin Energy-ENL monitoring programme to collect data for analysing the potential effects on gray whales of onshore pile driving. The Panel was advised at WGWAP-8 that ENL was preparing a detailed analysis of the potential effects of that company's 2008 and 2009 pile-driving activities, including incorporation of acoustic measurements with distribution and behaviour data. No new information was available at this meeting but the Panel was again assured that analyses were ongoing and it was noted that a report on acoustics might be presented at the next annual meeting of the IWC Scientific Committee in June 2011. As previously (WGWAP-8 report, pp. 6-7), the Panel expressed interest in seeing the acoustic data collected during pile driving analysed in relation to gray whale distribution and behaviour, but it was not clear if or when such work might be conducted.

At WGWAP-8, the Panel had formally recommended (Recommendation WGWAP-8/001) that Sakhalin Energy provide for consideration at WGWAP-9 a relatively simple analysis of the presence/absence of mother-calf pairs off Station 07, a site near ENL's 2009 pile-driving activities, in comparison to other sampling stations. Sakhalin Energy has formally rejected this recommendation, noting that the action is 'not for Sakhalin Energy' as it does not have the relevant data. This issue was not discussed further at WGWAP-9.

## **2 REPORTS ON FIELD ACTIVITIES IN 2010 (OTHER THAN THOSE ASSOCIATED WITH THE ASTOKH 4-D SEISMIC SURVEY)**

### **2.1 Preliminary summary of effort and/or results of Sakhalin Energy/ENL 2010 field programme (distribution, behaviour, acoustics, photo-ID and benthic monitoring)**

Muir, Gailey, Tyurneva and Rutenko presented summaries of effort (and some preliminary results) associated with distribution and benthic monitoring, behaviour monitoring, photo-ID work and acoustic monitoring, respectively, under the joint Sakhalin Energy/ENL programme in August-September 2010. This included slide presentations on: 1) shore-based distribution, 2) vessel-based distribution, 3) benthic, 4) shore-based behaviour, 5) Sakhalin photo-ID, 6) Kamchatka photo-ID in Olga Bay and 7) acoustic/hydrologic studies. The 2010 data are still being analysed and therefore no final results or conclusions were included in the presentations. The final reports on this work are expected to be available for review at WGWAP-10.

The close-out report of the carcass survey programme (WGWAP-9/11) and the preliminary report of the MMO programme (WGWAP-9/15) were also considered under this agenda item.

#### ***2.1.1 Distribution and benthic monitoring***

##### ***2.1.1.1 Benthic***

On behalf of Fadeev, who did not attend the meeting, Muir gave a presentation on the research effort and sampling locations of the benthic research programme conducted 1 August to 1 October 2010 from the R/V *Akademik Oparin*. Areas sampled included the Piltun, intermediate, Chaivo and offshore areas. As in previous years, epibenthic and plankton net sampling was used at sites where whales were observed feeding. Data from the 2010 benthic and net sampling efforts are presently being analysed and the results are expected to be available for discussion at WGWAP-10.

### 2.1.1.2 Vessel-Based Distribution

Muir provided an overview of data collected during the joint Sakhalin Energy/ENL 2010 vessel-based distribution surveys. Overall, the 2010 effort generally mirrored that of previous years in both scope and timing. The surveys were conducted from the R/V *Akademik Oparin* and followed the transect lines employed in 2009. In general, visibility and sea state conditions were very good during the study period, allowing complete surveys of the offshore (n = 4), Arkutun-Dagi (n = 2), Piltun (n = 2) and Piltun-Astokh (n = 2) areas. Surveys of the Piltun-Astokh region represent a relatively new effort (initiated in 2009) to better document the distribution of whales in proximity to the PA-A and PA-B platforms (as well as the planned PA-C platform; see Item 4, below).

Preliminary results from the 2010 surveys indicated that whales were found farther from shore, seaward of the 20 m isobath, especially in the northern portion of the near-shore Piltun feeding area. In addition, sightings of whales were made farther east in the offshore area as had also been noted in 2009. Finally, additional sightings between the offshore and Piltun feeding areas were made as a result of the addition of the Piltun-Astokh surveys.

In discussion of these preliminary findings, the Panel asked about benthic sampling coverage in the locations farther from shore where whales were observed (in both the near-shore and offshore areas). Whilst more detail regarding this topic will be provided when the analyses of 2010 data are finalised, Muir was unable to provide any additional information at this meeting. Regarding the sightings of whales beyond the eastern end of the 2009 and 2010 offshore survey transects, the Panel **recommends** that future transect lines be extended east to provide adequate coverage of that region.

### 2.1.1.3 Shore-Based Distribution

Muir gave an overview of information collected during the joint Sakhalin Energy/ENL 2010 shore-based distribution surveys. Overall, the 2010 effort mirrored that of previous years in both scope and timing. Surveys were conducted between 5 August and 28 September 2010. Although poor weather conditions prevailed during some parts of the study period, there were a total of 19 complete surveys (*i.e.* all 13 shore stations were covered in a single day). Similar to the preliminary results from the vessel-based surveys, the 2010 shore-based surveys indicate that some whales in the near-shore feeding area tended to be farther from shore than in most previous years (*i.e.* seaward of the 20 m isobath).

In discussion of the distribution data the Panel asked if the more offshore distribution could be related to a change in methodology (*e.g.* a change in the height, or calculation thereof, of the shore stations). Muir responded that the shore station heights are unchanging and therefore confirmed that the offshore shift represented a real but yet to be explained change in distribution.

### 2.1.2 Behaviour

Gailey presented an overview of the joint Sakhalin Energy/ENL shore-based behaviour research in 2010, which was generally similar to that of previous years except that only one team (as opposed to the standard of two) collected data in 2010. In total, 36 days and about 280 hours were dedicated to collection of distribution and behaviour data. In addition, the shore-based team continued efforts to obtain photo-ID data.

Similar to the vessel- and shore-based distribution teams, the behaviour team noted that a significant number of whales were distributed farther from shore than in most previous years (east of the 20 m isobath). This pattern was apparent at six of the seven shore stations (the exception being the most southern station near the mouth of Piltun Lagoon).

In discussion, the Panel asked what factors, either anthropogenic or natural, might be contributing to the observed shift of whales to deeper waters farther offshore. Gailey replied that whilst they have precise theodolite-derived positional data on these whales, it is difficult to relate the shift to disturbance or prey availability without equally precise information pertaining to those factors.



Sakhalin Energy explained that the reduction in effort from two behaviour teams to one in 2010 was a cost-saving measure for the joint Sakhalin Energy/ENL programme and that the intention is to eliminate the behaviour programme in 2011 to achieve further cost savings.

### **2.1.3 Photo-identification**

Tyurneva summarised effort and preliminary results of the joint Sakhalin Energy/ENL photo-ID programme in 2010. Overall, the effort generally was similar to previous years in both scope and timing. Small-boat surveys, based on the R/V *Akademik Oparin*, were conducted on 17 days between 27 July and 5 October, with 36 hours dedicated to photographing whales in the Piltun, offshore and Chaivo areas. Nearly 13,500 photographs were obtained and are presently being processed. Although preliminary, Tyurneva reported that four mother-calf pairs and two already independent calves were identified. Final results of the 2010 photo-ID effort are expected to be available for discussion at the next meeting of the Panel.

In addition to the photo-ID effort off northeastern Sakhalin in 2010, small-boat surveys were conducted in Olga Bay on the southeastern coast of Kamchatka. These surveys took place between 22 June and 10 August, with four days of effort in June, seven in July and two in August. There was no effort in Vestnik Bay in 2010 because the number of whales seen there in previous years was relatively low.

### **2.1.4 Acoustics**

Rutenko provided a preliminary summary of the 2010 acoustics data, some of which is discussed elsewhere in this report, *e.g.* noise from seismic surveys conducted by or for other companies (Item 3) and noise from the tagging boats (Item 10). He also showed some of the environmental data being used to inform the acoustics work, *inter alia* water temperatures and salinities. The Panel recognises the value of considering these data and appreciates their incorporation into the acoustics programme.

The Panel **requests** that its members responsible for reviewing the acoustics data (Vedenev and Nowacek) be provided with the full 2010 acoustics data set (in the form of a CD) no later than two weeks before the start of WGWAP-10.

### **2.1.5 MMO programme in 2010**

Nothing exceptional arose during the 2010 season with regard to the MMO programme (WGWAP-9/15). Vessel traffic management measures (corridors, speed limits) were unchanged from previous years. The few reports of vessels deviating from prescribed navigation corridors were related to the Astokh 4D seismic survey or to environmental sampling along the offshore pipeline. At least through mid-October, no 'near misses' of gray whales (or other marine mammals) were reported. Four instances were reported in which a vessel was required to either change course or slow down to reduce the risk of striking a gray whale. In addition, mitigation measures were taken to avoid collisions with minke whales (*Balaenoptera acutorostrata*) on four occasions and with killer whales (*Orcinus orca*) on two occasions.

### **2.1.6 Carcass survey programme in 2010**

In 2007, in response to a recommendation by the Panel, Sakhalin Energy established a specific programme to survey the Sakhalin coastline for cetacean carcasses. This programme has two elements: one involves opportunistic observation during crew change flights (June-October), the other dedicated monthly helicopter flights (July-October) directly along the shoreline to search for carcasses. In 2010 the dedicated effort was limited to one flight in August and two in October (WGWAP-9/11). According to the company, 'the number of surveys was reduced in line with the company's policy on use of non-winged aircraft' (WGWAP-9/11, p. 7). The only carcass detected in the 2010 field season was that of a bearded seal (*Erignathus barbatus*).

During discussion, Sakhalin Energy expressed its view that the dedicated helicopter surveys for carcasses represent an unacceptable safety risk and therefore should be discontinued. The company

suggested that, instead, dedicated observers could be placed aboard crew change flights to search for carcasses. This, however, would mean a complete lack of carcass survey coverage along the coast to the north of the PA-B platform (compare Figures 1 and 2 in WGWAP-9/11) (notwithstanding the limited opportunistic efforts by shore-based distribution teams [as indicated elsewhere in this report, Sakhalin Energy intends to discontinue the shore-based behaviour monitoring effort] and by MMOs on vessels; p. 10 in WGWAP-9/11). Moreover, the Panel noted that crew change flights occur only when conditions for vessel passage are unacceptable (*e.g.* high sea states or coastal fog), and such conditions could compromise the effectiveness of effort to detect carcasses along shore. Bell pointed out that the helicopters fly only when there is at least 2 km of visibility and that this should allay the Panel's concern about effectiveness to some extent.

The Panel noted that, given the company's safety concerns and the fact that these are in part due to the type and age of helicopters in use, one option would be to upgrade these. However, Sakhalin Energy pointed out that it does not own the helicopters but rather depends on a contractor who owns and operates them. Another option would be to employ a fixed wing aircraft for the beach surveys. Such aircraft generally tend to cause less noise disturbance than helicopters, and this would be an advantage. However, Sakhalin Energy commented that it is often necessary for the dedicated aircraft to fly lower than specified in the Panel's recommendation and this could preclude the use of an airplane. Finally, Vedenev suggested that an unmanned aircraft (drone) could be used for this type of reconnaissance, which would reduce both cost and the safety risk. The company indicated that the use of a drone for pipeline monitoring had been considered and that it might be worth considering as a future (but not immediate) possibility for carcass surveys, bearing in mind the potential military or security concerns.

The current status of the relevant recommendation (WGWAP-2/004) is 'Closed – implemented/resolved satisfactorily'. This status was assigned on the understanding that the company's commitment to the dedicated survey programme would continue. In fact, in November 2007 when this commitment was made, the company had indicated not only that it would undertake dedicated surveys covering the coast from Nogliki to Okha, but also that it would 'investigate the possibility of carrying out the Island length surveys...'. The Panel **requests** that Sakhalin Energy provide a clear, updated statement of its plans so that the matter can be resolved at WGWAP-10. Based on what it was told at WGWAP-9, the Panel needs either to reiterate or to modify its previous recommendation concerning dedicated carcass surveys so that Sakhalin Energy can either implement the recommendation or reject it, with an explanation.

### ***2.1.7 Future of the joint Sakhalin Energy-ENL gray whale monitoring programme***

Although not on the agenda and therefore not discussed in detail at this meeting, the future of the Sakhalin Energy-ENL joint programme has been discussed often in the past. Issues surrounding this programme's future were addressed explicitly at WGWAP-5. The Panel's report of that meeting (agenda Item 14.1) states that the monitoring effort 'must be adequate to detect changes in whale abundance and distribution over time, should they occur, and, where possible, to link such changes to environmental and anthropogenic factors'. Importantly, it further notes that although the companies indicated their intention to develop and implement additional programme components for specific circumstances (*e.g.* in relation to seismic surveys), 'the short-term expansion of monitoring during a particular activity may not be sufficient to allow adequate evaluation of effects or ensure the success of mitigation measures'. Already by 2008 the field season for the various programme elements had been reduced from 90 to 75 days.

At the present meeting, Sakhalin Energy announced that the behaviour component of the joint programme was to be discontinued in 2011, for the following reasons: (a) neither company considered that it was getting what it had hoped to from the behaviour data; (b) there have been contractual difficulties between the companies and the contractors; (c) data collected from year to year were similar and no significant changes in whale behaviour have been detected; (d) the necessary expertise to continue the work is not available in Russia; and (e) the two principal researchers who have been leading the behaviour work (G. Gailey and O. Sychenko) need a break from fieldwork to complete their academic degree programmes. In response, the Panel stressed the

following: (a) observations of behaviour are a necessary element in any analysis of the effects of a particular industrial activity (*e.g.* a seismic survey); (b) such analyses depend on having a reliable ‘pre-disturbance’ (control) dataset against which to compare the data collected during (and preferably also after) the activity (treatment and post-treatment data); (c) it is not realistic to think that the specialised expertise necessary for effective behaviour monitoring can be developed or sustained without programme continuity; (d) the utility and value of data from other programme elements, perhaps most notably acoustics data, is unavoidably tied to having corresponding data on whale behaviour; (e) it is only within the behaviour component of the overall programme that any serious effort has been made to date to implement the Panel’s repeated recommendations for integrated analyses (*e.g.* see recommendation WGWAP-8/002), *e.g.* by incorporating acoustic information and data (*e.g.* see WGWAP-2 report section 8; Gailey *et al.* 2007a, 2007b, 2007c); (f) increasingly, the behaviour work has contributed to other programme components, *e.g.* by collecting data on abundance and distribution and by augmenting the IBM team’s photo-ID data, especially in regard to identification of mother-calf pairs; and (g) Sychenko is Russian, has completed her graduate degree and is presumably available to lead this research.

Behaviour monitoring of gray whales off Sakhalin was initiated in 2001 when ENL conducted a seismic survey near the Piltun feeding area. Results from that work indicated that the sounds generated by the seismic survey significantly affected 5 of the 11 behaviour variables monitored (Gailey *et al.* 2007a). From 2002-2004, ‘baseline’ data were collected on the presumably natural behaviour of the whales (*i.e.* in the absence of major industrial activities) and this provided some insight on the range of natural variability. Analyses of data from those seasons also revealed evidence of gray whale responses to disturbance from vessel approaches (*e.g.* for photo-ID) and from seismic surveys that occurred in 2004 (by companies other than Sakhalin Energy or ENL). The results of behaviour monitoring in 2005 and 2006 during the installation of Sakhalin Energy’s concrete gravity-based structure and top-sides as well as pipeline construction suggested that the sounds from such activity affected the whales’ distance from shore and elicited subtle but significant physiological responses (possibly signifying stress) (Gailey *et al.* 2007b, 2007c, 2010). The central importance of behaviour monitoring to the recent Astokh 4-D seismic survey monitoring and mitigation programme is plainly evident (see agenda Item 5, below).

In view of the fact that analyses of behaviour in relation to acoustic conditions have been the primary avenue for assessing the effects of industrial activities on western gray whales thus far, the Panel finds the companies’ decision to discontinue the behaviour monitoring component puzzling. There is a risk that this will render it virtually impossible to investigate the effects of future and ongoing industrial operations in a meaningful way. Moreover, it seems particularly ill-advised for Sakhalin Energy to be scaling down its overall monitoring effort at the same time that it has announced plans to scale up its industrial footprint via the South Piltun development (see agenda Item 4, below). Therefore, the Panel **recommends** that Sakhalin Energy reconsider its decision to terminate the collection and analysis of data on gray whale behaviour at Sakhalin (also see WGWAP-2 report, section 8, including recommendation WGWAP 2/011) and that it provide a clear scientific rationale for any further reduction (*i.e.* to a level below the minimal effort in 2010) in this component of the joint programme.

One other matter of continuing concern to the Panel is obtaining access to data, especially acoustic data, collected as part of the joint programme. It was agreed that improved access was desirable whilst recognising the rights of data collectors/owners. Donovan drew attention to the data sharing protocol established by the Panel in collaboration with Sakhalin Energy and IUCN (see [http://www.iucn.org/wgwap/wgwap/data\\_sharing\\_protocol/](http://www.iucn.org/wgwap/wgwap/data_sharing_protocol/)). That protocol was developed and approved with the expectation that it would obviate problems concerning timely access to data needed for the Panel to carry out its mandate. The cooperative effort by various parties (including Sakhalin Energy, ENL, IUCN, IWC and the WGWAP) to plan, carry out and share data from the recent satellite tracking programme (see agenda Item 10, below) is an encouraging example of what can be accomplished through such an agreed protocol. Use of the protocol as the basis for obtaining access to data from the joint programme warrants further investigation by the Panel and Sakhalin Energy.

## **2.2 Preliminary summary of effort and results of work by non-industry groups (including whale observations and photo-ID/biopsy)**

In 2010 research on gray whales by the Russia-US team continued off northeastern Sakhalin Island; also in 2010 the team's studies expanded to include waters along the east coast of Kamchatka. The Russia-US programme has been ongoing since 1995 and it has provided much of what is known about the critically endangered western gray whale population. Burdin, who participated in the WGWAP-9 meeting as an Associate Scientist, presented the Russia-US team's report on its findings in 2010 (Burdin *et al.* 2010). In addition to recent results, the report summarised data from previous years, in some cases all the way back to 1994.

The Sakhalin effort in 2010 consisted of (1) four boat-based photo-ID surveys in August (11.5 hours) resulting in the identification of 44 individuals including four first-year calves and one previously unidentified non-calf, and (2) shore-based observations from the Piltun lighthouse (viewing area of ca. 80 km<sup>2</sup>) in July and August. Burdin *et al.* (2010) includes only results of the photo-ID work. However, in his verbal presentation Burdin indicated that whale distribution, as observed from the lighthouse in the periods 10-31 July and 15-30 August, was similar to previous years, with the animals tending to move north in late July and then south in August. He reported the average estimated distance of whales from shore to be almost 5 km, which is greater than in previous years. No biopsies were obtained at Sakhalin in 2010 by the Russia-US team.

Most of the data in Burdin *et al.* (2010) and in Burdin's verbal presentation concerned observations in Olga Bay (Kamchatka, Kronotsky Gulf), where 19 whales were photo-identified in 2010. Of these, six were already included in the Russia-US team's Sakhalin catalogue. Many of the whales seen in Olga Bay were young animals. Eight biopsies were obtained.

When the results from 2010 are combined with data from 1994-2009, the Russia-US catalogue now contains 185 photo-identified individuals, not all of which are still alive. Since 1995 a total of 26 reproductive females have been photo-identified and 85 first-year calves have been documented.

Based on the available data on benthic communities, the near-shore and coastal morphology of the area and the highly concentrated distribution of gray whales, Burdin considers the potential extent of gray whale feeding habitat in Kronotsky Gulf to be quite limited, spanning only about 20 km of coastline and extending from shore to a few meters or perhaps as much as a kilometre offshore. He noted that volcanic activity episodically causes die-offs of the benthos and that the sea urchin-dominated benthic communities in Olga Bay are not very productive. Therefore, in Burdin's view, there is no reason to consider the importance or value of this area as a reliable feeding site for gray whales to be on a scale comparable to that of the Piltun feeding area at Sakhalin. Tyurneva added that a benthic study in Olga Bay in 2009 found conditions there to be similar to those off Chaivo Lagoon (Sakhalin) where small numbers of gray whales feed intermittently.

In his presentation, Burdin also summarised recent fieldwork along the north-western coast of Kamchatka, much of which has features broadly similar to those of north-eastern Sakhalin. Mainly minke whales and belugas (*Delphinapterus leucas*) were observed during a 820 km small-boat survey in August 2009. Local people told the researchers that whales fitting the description of gray whales were common off north-western Kamchatka in May (Burdin 2010). According to Burdin, the west coast of Kamchatka is generally clear of ice by late April or early May due to regional wind patterns.

## **3 REVIEW OF INFORMATION ON RELEVANT ACTIVITIES BY OTHER COMPANIES IN 2010**

### **3.1 Lebedenskoye seismic survey**

In April 2007 the Panel learned of plans by Rosneft to conduct a seismic survey in the Lebedenskoye licence area, which lies along the coast of Sakhalin Island to north of the mouth of the Piltun Lagoon (see WGWAP-2 report). At the time, this survey was expected to take place in the summer of 2008, but it was delayed until 2010. In its reports since 2007, the Panel has repeatedly

expressed concern that this near-shore survey could cause significant disturbance, if not outright direct harm, to the gray whales in the Piltun feeding area, and especially to the mother-calf component of the population. Several attempts were made to obtain specific information about the survey and to warn the Russian government of the significant potential impacts on the whales (see [http://www.iucn.org/wgwap/wgwap/public\\_statements/](http://www.iucn.org/wgwap/wgwap/public_statements/)). The issue was also discussed at IWC meetings and this resulted in a letter from IWC Commissioners from several countries to Rinat R. Gizatulin, Director of the Department for environment ecological safety State Policy, Russian Ministry of Natural Resources (WGWAP-9/Inf.3). The response from the Ministry indicated that after reviewing the monitoring and mitigation plan submitted by Rosneft, it had concluded that no further measures were needed to protect the whales (WGWAP-9/Inf.5).

Information presented at this meeting and at the immediately preceding Seismic Survey Task Force meeting confirmed that a Lebedenskoye seismic survey indeed was carried out in the summer and autumn of 2010 (*e.g.* see WGWAP-9/19). Rutenko presented data from Sakhalin Energy-ENL joint programme buoys 'A-10', 'Odoptu-N-20', 'Odoptu-N-10' and 'Odoptu-S-20' and these acoustic data indicated that levels of noise received even in areas outside the Lebedenskoye licence area were above those known to cause behavioural disturbance to feeding gray whales (Malme *et al.* 1986). Given the inferred location of the seismic survey vessel, received levels within the feeding area certainly would have been, at times, well above the disturbance thresholds. Furthermore, given the distance between the seismic survey vessel (assuming only that it was somewhere within the licence area) and the buoys, it is likely that portions of the feeding area (*i.e.* inshore of the 20 m isobath within the license area) were exposed to levels that would be expected to cause hearing damage in gray whales (Southall *et al.* 2007).

From the buoy data presented by Rutenko, it can be inferred that the first seismic survey activity occurred on or about 18 August, continuing intermittently until 25 August and then regularly through 27 September (*i.e.* last day for which data were presented to the Panel), though the survey reportedly continued into November. A preliminary report from NGOs (WGWAP-9/19) summarised observations of whales in the Lebedenskoye survey area, and whilst the sample size was small, the report authors concluded that whales had been displaced by the activity. The report also states that Rosneft, the operating company, violated its own monitoring and mitigation plan by acquiring seismic data at night, and this is corroborated by acoustic data presented at the WGWAP meeting showing that seismic pulses occurred at night.

The high levels of noise that clearly occurred in and near the feeding area, together with the preliminary anecdotal reports of possible displacement of whales, justify further investigation of the evidence surrounding the Lebedenskoye seismic survey and its potential effects. Specifically, the Panel **requests** that Sakhalin Energy make acoustic data from recording buoys 'A-10', 'Odoptu-N-20' and 'Odoptu-N-10' available for WGWAP-10 for the following time periods: 21h 30m on 20 August to 01h 20m on 21 August, 25-31 August, 1-4 September and 11-21 September. These data should be in the format specified in recommendation WGWAP-7/002 for pulsed noise. Also, the Panel **requests** that data from distribution stations 1-8 be included for the same periods, and that these data are analysed statistically to determine whether there were significant changes in whale distribution. Finally, the Panel **encourages** the group of NGOs (*i.e.* the authors of WGWAP-9/19) to submit a final report that includes the complete data set.

Finally, during the meeting the Panel was advised that three acoustic sensors had been deployed in the Lebedenskoye area on Rosneft's behalf and that the data from them would be analysed and published. These data are directly relevant to any interpretation of whale distribution and behaviour data collected by the Sakhalin Energy-ENL joint programme from mid-August through September 2010 as well as any observational data collected by NGOs and the Russia-US research team during this same period. Therefore, the Panel **recommends** that IUCN make every effort to obtain the report or reports on these acoustic data as they become available either via Rosneft directly or via the Interdepartmental Working Group (MNR).

### 3.2 Offshore seismic survey

Rutenko presented data from the 'Orlan' acoustic sensor indicating that another seismic survey (apparently conducted on behalf of Gazprom although this could not be confirmed at the meeting) occurred in or near the offshore feeding area from 15 August to 9 September 2010. Sakhalin Energy notified the Panel chair of these activities immediately when it learned of them during joint programme offshore sampling activities in August. According to Rutenko, his institute (POI) was not notified of this survey but does have the acoustic records. The survey was reportedly quite intense and lasted for somewhat more than 21 days. The data presented by Rutenko showed sound levels at the 'Orlan' receiver well above those known to disturb feeding gray whales (Malme *et al.* 1986).

The Panel expressed concern about this additional seismic survey that took place in 2010. To support efforts to interpret information on whale distribution and density throughout the 2010 season, the Panel **requests** that Sakhalin Energy provide in advance of WGWAP-10 data from all acoustic sensors in the area for the period 15 August–10 September, in the format described in recommendation WGWAP-7/002 for pulsed noise.

### 3.3 General

The Panel **reiterates** its longstanding concern about the cumulative impacts of multiple seismic surveys on the feeding of western gray whales. It is particularly worrisome that the three surveys in 2010 occurred in or near three different parts of the population's feeding range near Sakhalin Island, including in the case of the Lebedenskoye survey an area used regularly by mother-calf pairs. Judging by the materials reviewed to date, it appears that only the Sakhalin Energy Astokh 4D survey was conducted with a robust monitoring and mitigation programme in place to minimise the whales' exposure to long periods of intense noise exposure.

The work of the Panel continues to suffer from not knowing in advance, or even after the fact, basic information concerning the nature and timing of activities by other companies on the Sakhalin Shelf. At WGWAP-9 Sakhalin Energy mentioned that Rosneft had formally stated at the last meeting of the Interdepartmental Working Group that no further seismic work in Lebedenskoye was planned. Knowing with certainty, in advance, when and where other noise-generating activities are planned is vital for the Panel to provide reliable advice concerning the adequacy of Sakhalin Energy's mitigation efforts.

## 4 BRIEFING BY SAKHALIN ENERGY ON WORK IN 2011 AND BEYOND

### 4.1 Background

Sakhalin Energy provided some preliminary information on its plans for a major new development project in the Piltun-Astokh field, called South Piltun. This is likely to include construction and installation of a new platform, called PA-C, approximately halfway between the existing PA-A (Molikpaq) and PA-B platforms. It was explained that PA-A and PA-B are about 25 km apart, and the maximum drilling reach from each of them is 7-8 km, which leaves a 'gap' in hydrocarbon recovery potential of some 10 km to be filled by the new platform. An overview of the South Piltun development project, supplied by the company, is given in Annex 4.

Sakhalin Energy plans to conduct a site survey in the summer of 2011, the purpose of which is to minimise the potential drilling hazard to the proposed installation caused by gas in shallow geological formations (depth less than 500 m), to identify obstructions on the seabed, to assess the condition of the seabed and shallow subsurface and to assess the soil strength for the placement of a new platform. Additional specifications for this work and associated monitoring and mitigation are discussed in the report of the 6<sup>th</sup> meeting of the Seismic Survey Task Force (SSTF-6) as well as in this report under agenda Item 5, below.

## 4.2 Discussion

The Panel raised questions concerning (a) the extent to which alternative technologies (*e.g.* ‘jack-up’ rigs, underwater ‘plates’) had been considered before making the decision in favour of another platform, (b) how, if at all, basic construction and installation of the PA-C platform would differ from that of the PA-B platform and (c) whether additional pipeline infrastructure would be required, either offshore or onshore. According to Terwogt, consideration of alternative technologies had been exhaustive, including other options such as floating production, storage and offloading (FPSO), but all were rejected for technical, cost or environmental reasons. She added that there was no reason to think that the basic construction and installation process for a PA-C platform would differ significantly from that experienced with the PA-B platform. A final investment decision has not been taken and offshore construction/installation activities are not likely to begin before 2014. The current pipeline has sufficient surplus capacity to accommodate the expected PA-C oil production but this is not true for the gas phase. A short ‘tie-in’ segment of offshore pipeline would be needed for the oil phase, whereas infrastructural requirements for the gas phase have yet to be investigated.

The current Production Sharing Agreement runs to 2041 and the two existing platforms are expected to remain in production until at least that time.

## 4.3 Panel Advice

### 4.3.1 General advice

As acknowledged in the report of the Independent Scientific Review Panel (ISRP; Reeves *et al.* 2005), the Phase 2 element of Sakhalin II may have substantially reduced certain risks to the western gray whale population by eliminating the transfer of oil from the PA-A platform into tankers for transport to distant markets. However, the report also concluded that construction of the PA-B platform and associated pipeline infrastructure was likely to increase other risks, including some that could be expected to remain throughout the lifetime of the project. With the completion of PA-B construction and the recent Astokh 4D seismic survey in 2010, the present panel had anticipated a period of reduced industrial activity and thus diminished disturbance and risk to the whales. Now, however, plans are underway to develop a third platform and thus add to the cumulative risks faced by western gray whales. This is before definitive conclusions have been drawn on the possible population-level effects of the PA-B construction work in 2005 and 2006 (see agenda Item 12, below). More seismic survey work, of significantly smaller scale and thus likely to be of less impact than the 2010 Astokh 4D survey, is being planned for next season, even though data from the 2010 survey have not yet been analysed (see agenda Item 5, below). The Panel recalls its previous recommendation (WGWAP-5/011) that there be no further industrial activities that might be expected, in the absence of independently verified mitigation measures (such as those developed for the Astokh 4D survey), to disturb gray whales in and near their main feeding areas off Sakhalin.

Despite the considerable progress made over the last five or six years through IUCN engagement with Sakhalin Energy (ISRP, IISG, WGWAP), the western gray whale population remains critically endangered, the scale of industrialisation and urbanisation of the Sakhalin shelf continues to expand, and it is still uncertain whether the whales will be able to adapt and recover under these circumstances of cumulatively increasing risks. In its terms of reference, the Panel is obliged to “proactively provide scientific, technical and operational recommendations it believes are necessary or useful for conserving the WGW population.” Moreover, the Panel is expected to determine whether Sakhalin Energy’s studies, assessments and proposed mitigation plans “(i) take account of the best available scientific knowledge, (ii) identify information gaps, and (iii) interpret both existing knowledge and information gaps in a manner that reflects precaution.” In other words, the Panel must take a precautionary approach in developing its advice.

In 2005 the ISRP concluded that “given the identified risks, as well as the uncertainty surrounding them and the questionable efficacy of proposed mitigation measures, the most precautionary approach would be to suspend present operations and delay further development of the oil and gas

reserves in the vicinity of the gray whale feeding grounds off Sakhalin, and especially the critical nearshore feeding ground that is used preferentially by mothers and calves. This would allow much-needed refinement of risk assessment and further development of appropriate, independent mechanisms for monitoring and verification of mitigation practices.” The WGWAP takes a similar view of the proposed South Piltun development and believes that a precautionary approach should be taken in planning and decision-making.

Therefore, whilst recognising that Sakhalin Energy may view the construction of a third platform as necessary at some point during the lifetime of the project in order to meet its petroleum recovery targets, the Panel **recommends** that construction not begin until there is better understanding of the effects of noise disturbance on the whales (*e.g.* a more thorough analysis of the potential effects of PA-B construction) and appropriate mitigation measures are in place. In this regard, consideration must be given not only to the platform-related construction activities themselves, but also to the cumulative risks to the western gray whale population from other associated activities, including seismic surveys, and any general increase in temporary or permanent human presence in the area that may result directly or indirectly from further construction projects.

#### **4.3.2 Advice on work needed**

This section contains the Panel’s advice on work that needs to be done before it would be in a position to assess the likely impacts from construction of a new platform.

At WGWAP-9 Sakhalin Energy presented the Panel with a general outline of planned activities in relation to the proposed South Piltun development. It is important to emphasise, however, that the Panel’s evaluation of the potential impacts of such a development, and of the adequacy of the company’s proposed monitoring and mitigation efforts, did not begin at this meeting. A thorough evaluation can only be carried out once the required information has been provided, and the following recommendations are intended to provide clarity regarding the types of information needed.

The Panel **recommends** that before making any decision on whether and how to proceed with this proposed new construction (PA-C), Sakhalin Energy should provide for the Panel’s consideration:

- A document describing the feasible options considered in reaching the current tentative decision to proceed with a new platform. This document should include, in particular, an indication of how the risks to western gray whales and their habitat posed by the various options have been accounted for and compared.
- A document describing and comparing options under consideration for transporting oil and gas from the new platform, again specifying how the risks to western gray whales and their habitat posed by the various options have been assessed and compared.
- A general operations plan which includes all of the company’s foreseeable and foreseen activities for 2011-2015 with the potential to disturb or otherwise harm western gray whales and their habitat (*e.g.* seismic surveys).

The first two of those documents can be considered roughly equivalent to the Comparative Environmental Assessment provided to the ISRP in 2004-2005 in relation to the three alternative pipeline configurations for Sakhalin II Phase 2. At the time, the ISRP was expected to provide its own assessment and thus advise the company on which option posed the least risk to the whales.

The third item has been requested repeatedly in the past. For example, in the report of its first meeting in 2006 (WGWAP-1 report, pp. 22-23), the Panel requested that Sakhalin Energy, ‘voluntarily and in a timely fashion’, provide information about planned and potential activities so that comments and recommendations on monitoring and mitigation could be provided ‘well ahead of time’ (other statements on this same topic are in the reports of WGWAP-2, pp. 9-10; WGWAP-3, pp. 33-34). The issue of advance notice is a longstanding source of tension between the Panel and the company and it is closely linked to the issue of scope and amount of monitoring effort. As one example, the Panel stated in December 2008 (WGWAP-5 report, p. 29) that ‘the short-term expansion of monitoring during a particular activity may not be sufficient to allow adequate



evaluation of effects or ensure the success of mitigation measures', citing the reduction of the field season from 90 to 75 days as a case in point (also see concerns regarding complete elimination of the behaviour monitoring effort under Item 2.1.7, above).

It further noted that "the lack of specificity with respect to anthropogenic activities expected even within the [next] three-year period is particularly disappointing as this information is essential to help determine effectiveness or otherwise of the programme; this is not the first time the Panel has requested such information". Whilst recognising that considerable uncertainty always exists within the company itself about the exact nature and timing of future activities, we hope that a more constructive effort can be made in this instance (*i.e.* planning for a South Piltun development) to provide the Panel with notice well in advance and that "last-minute" requests for advice can be avoided.

At WGWAP-9 and in relation to South Piltun, Sakhalin Energy expressed an interest in revisiting with the Panel some of the analyses and recommendations applied to Phase 2 in the light of new data collected and analysed over the last few years. The Panel **agrees** on the value of such an exercise and **recommends** that Sakhalin Energy prepare for consideration at WGWAP-10 a document that summarises progress made since 2004 towards resolving uncertainties and filling data gaps highlighted in past western gray whale panel reports.

In addition, Sakhalin Energy has already **agreed**, and the Panel **recommends**, that the company provide a comprehensive overview of the issues and risks that need to be addressed for a new development such as South Piltun, including *inter alia* oil spills, continuous noise, vessel collisions, disturbance of benthos and cumulative impacts. This overview should include a risk matrix that makes clear how Sakhalin Energy would prioritise the various elements, as well as how the company assesses each issue in terms of potential short-, medium- and long-term effects on the western gray whale population.

#### 4.4 Concluding Remarks

The Panel's decision to proceed as it has at SSTF-6 and WGWAP-9 in providing advice and working with Sakhalin Energy to minimise risks to western gray whales from the company's planned 2D high-resolution seismic survey in 2011 should not be interpreted as an implicit endorsement of the South Piltun development (*i.e.* eventual construction of a new offshore platform and associated infrastructure). Moreover, the Panel again emphasises that a piecemeal approach to assessment of the impacts of oil and gas development on the Sakhalin shelf, in which each new activity or item of infrastructure is considered in isolation, does not constitute 'good practice' from an ecological point of view as it ignores and dismisses cumulative or synergistic effects. In this regard, we draw attention to a concept introduced by Kraus and Rolland (2007) and applied to the endangered North Atlantic right whale (*Eubalaena glacialis*): 'urban whale syndrome'. As described by those authors (p. 504): "It is an open question whether reduced habitat availability, historic or newly introduced chemical pollutants, acoustic disturbance from vessel traffic, and other forms of habitat degradation are slowing the right whale population's recovery. There is no point in saving right whales from the direct kills of shipping and fishing if their habitats have been lost to the increasing urbanization of the ocean. Whales can tolerate a certain amount of habitat degradation, just as humans can. However, scientists don't know if these indirect factors are currently affecting reproduction, feeding, and survival of right whales."

## 5 4-D SEISMIC SURVEY

### 5.1 Report of the 6<sup>th</sup> meeting of the Seismic Survey Task Force

Donovan presented a summary of the work of the 6<sup>th</sup> meeting of the Seismic Survey Task Force (SSTF-6) that occurred immediately prior to WGWAP-9. He stressed that whilst the workshop report was almost complete, it had not yet been agreed by the participants and his summary was

therefore his personal summary as chairman of the SSTF – details can be found in the full report<sup>1</sup>. Donovan prefaced his summary by thanking all of the members of the SSTF who had worked over the years to develop the mitigation and monitoring programme (MMP) and all of those who had participated in the 2010 field effort.

### 5.1.1 Objectives

SSTF-6 had four primary tasks:

- (1) review the initial results of the 4D survey in 2010;
- (2) make suggestions for future analyses of the data collected during that survey;
- (3) consider amendments to the MMP developed for that survey; and
- (4) consider a response to plans for the proposed 2011 2D survey.

### 5.1.2 Review of the 4D survey

The planning for the 2010 4D survey represented a major investment of time by the WGWAP, Sakhalin Energy and SSTF. The development of the final MMP was a result of five SSTF meetings and reviews at five WGWAP meetings. This was one of the most complete whale-focussed MMPs developed for a seismic survey anywhere in the world.

The fundamental rationale behind the mitigation component was:

- (1) Design ahead of the survey
  - (a) Minimise the area surveyed.
  - (b) Minimise the sound levels reaching the expected areas of highest density of whales.
- (2) Measures during the survey
  - (a) Carry out the survey as early as possible in the season, *i.e.* when fewest whales are present.
  - (b) Incorporate measures to stop the survey when needed to protect whales present.

During the early stages of development of the MMP it became apparent that there were very few data available on the effects of noise on gray whales, especially when feeding. It also became apparent that much of what is considered as ‘best practice’ mitigation has rarely, if ever, been properly evaluated. Monitoring was quickly recognised to be an essential component of the planning for the 2010 survey, both to evaluate the effectiveness of the mitigation component of the plan to see if practical changes were required and to ensure that future MMPs could be based on stronger scientific information than was available to the SSTF in drawing up the 2010 MMP.

Details of the practical challenges and accomplishments of the implementation of the MMP can be found in the SSTF-6 report and these are summarised briefly below.

#### 5.1.2.1 Starting the survey as soon as possible

Despite difficult conditions and a number of practical challenges, the shore teams (distribution and behaviour) were mobilised on 30 May. The research vessel (*Pavel Gordienko*) arrived in the area on 5 June and by 8 June had undertaken early distribution surveys and deployed acoustic buoys. Although the area was declared ice-free on 9 June, for a number of reasons, some of which should have been avoidable (such as the initial deployment of streamers not suitable for the cold conditions encountered), the survey did not start until 18 June. It was completed on 2 July.

---

<sup>1</sup> Final report available at [http://www.iucn.org/wgwap/wgwap/task\\_forces/4\\_d\\_seismic\\_task\\_force/](http://www.iucn.org/wgwap/wgwap/task_forces/4_d_seismic_task_force/)

### 5.1.2.2 *Distribution and behaviour teams*

In general, this work went well. The main practical problems related to (a) weather conditions, especially during the post-seismic period which resulted in little effort at that time and (b) inadequate human resources to cover the long hours that had to be worked in good weather and to compensate for downtime due to illness, especially in the first two or three days when many A-lines were shot.

### 5.1.2.3 *Acoustic studies*

In general, this component of the programme also worked well. The source verification exercise was completed successfully and confirmed the 1.5 km exclusion radius as conservative. The real-time monitoring work, whilst intensive, worked well in terms of determining the appropriate 'noise case' (see SSTF-6 for details) and ensuring that sound levels within the feeding grounds (delimited by the perimeter monitoring line, or PML) were within an acceptable range. The importance of the hydrological changes for modelling was highlighted.

### 5.1.2.4 *Environmental data*

Environmental variables can be important to consider in many analyses and data for a number of these were collected from the vessels and by onshore teams as well as from a drilling platform.

## 5.1.3 *Future analyses*

SSTF-6 concluded that given the enormous amount of time and money invested in the development of such a comprehensive MMP, it was important to ensure that thorough analyses of the data collected were undertaken as expeditiously as possible. It agreed that its task should be to suggest such analyses without reference at this stage to the economic constraints that may face Sakhalin Energy or the Panel. However, in doing so it agreed on a number of priority objectives for analyses.

- (1) Evaluation of the MMP's effectiveness at minimising effects of the survey on gray whales:
  - (a) examining the ability to determine when mitigation measures were needed and to implement them successfully; and
  - (b) finding an appropriate balance between completing the survey as early in the season as possible and implementing the measures needed to minimise effects on individual animals, whilst recognising that such implementation may delay completion of the survey.
- (2) Improved future MMPs for seismic surveys:
  - (a) aspects of the above; and
  - (b) increasing the information available on the effects of noise on feeding gray whales such that 'safe' levels can be determined in a more robust manner.
- (3) Improved information for other marine mammals:
  - (a) SSTF-6 agreed that the information collected on species other than gray whales was insufficient for it to recommend analyses on this topic.
- (4) General contribution to scientific knowledge:
  - (a) whilst this may be considered a lower priority from the perspective of western gray whales, it was agreed that there is value in making maximum use of the data collected, *e.g.* in improving acoustic modelling beyond the stage considered 'adequate' in the context of practical development of MMPs.

Within these priorities, SSTF-6 made a number of recommendations and suggestions for future analyses that are summarised below.

5.1.3.1 *Distance estimation*

During SSTF-6, as had been suggested in some previous analyses, it was shown that there are problems in estimating distances to whales accurately. The ability to estimate distance accurately is a key component of both mitigation and monitoring. It is thus of highest priority to understand the limitations of the present approach and then investigate the implications for future MMPs, *i.e.* it is fundamental to a thorough examination of both priority topics (1) and (2) above. Details are under Item 2.6.1 of the SSTF-6 report and in Annex 5A. The Panel **recommends** that analyses of the uncertainties in determining geographic positions when using reticle binocular methods are conducted and the results presented at WGWAP-10.

5.1.3.2 *Trade-off between completing early and implementing mitigation measures*

In order to investigate this, an initial study of the time-budget data for the seismic survey vessel (*Pacific Explorer*) was undertaken during the workshop and the details of the study can be found under Item 2.6.2 of the SSTF-6 report.

In summary, the analysis indicated (see Table 5.1) that MMP-related ‘delays’ amounted to some four days in terms of the total length of the survey. In practice, shutdown had occurred on only four occasions. Whilst it could be argued that the increased survey duration led to a net increase in exposure of whales to noise (as more whales were present in the feeding area as the season progressed), the measures implemented would also have directly reduced the exposure risks to individual whales.

Date	MMP, MI	MI, no MMP	MMP, no MI	MMP corrected <sup>2</sup> no MI	No MI and MMP
Start	18 June	18 June	12 June	12 June	12 June
End	2 July	28 June	27 June	25 June	24 June

<sup>1</sup> Assuming similar current and weather conditions.

<sup>2</sup> Correction for fewer whales and fog days in the period 13-17 June.

**Table 5.1. Influence of MMP and mobilisation issues (MI) on duration of survey<sup>1</sup>.**

The results of the analysis confirmed the view that the most effective mitigation measure is to start the survey as early as possible (without mobilisation issues this would have been even more successful in 2010 than it was). In practical terms, the shutdown measures only prolonged the survey for a short period whilst still offering protection to those whales closest to the seismic vessel.

5.1.3.3 *Improved information on the effects of noise on gray whales*

Obtaining a strengthened scientific basis for mitigation measures was a key objective of the MMP (and the SSTF and WGWAP). SSTF-6 examined the data (acoustic and theodolite tracks) available from the monitoring work and considered the need for integrated analyses to maximise what could be learned from the 2010 effort. It was agreed that the detailed, calibrated sound-level data from real operations, along with the systematic observations of whale behavioural responses, are extremely valuable and warrant thorough analysis. Such analyses will greatly assist in improving future mitigation measures.

Details of the discussion can be found under Item 2.6.3 of the SSTF-6 report. The details of the proposed analyses are given in Annex 5B. The Panel **recommends** that these analyses are initiated and that a progress report is presented at WGWAP-10.

In addition to an improved targeted MVA (multivariate analysis) approach, new tools to analyse the movements of animals have been developed (*e.g.* Schick *et al.* 2008) and it was agreed that recent efforts to integrate and synthesise methods to create new frameworks should be explored with respect to gray whale movement and gray whale responses or the lack thereof in the context of the 2010 Astokh seismic survey.

5.1.3.4 *Exposure of animals to sound east of the PML*

SSTF-6 concluded that it would be useful to examine the data from east of the PML to see if any information could be derived on exposure of animals to sound in that area. An initial analysis was

undertaken of data from all vessels involved in the survey and from the *Pavel Gordienko*. Details can be found under Item 2.6.4 of the SSTF-6 report. This preliminary investigation indicated a number of problems and complexities with the available datasets (including problems of distance estimation identified above). Given this, it was agreed that further investigation of these data at this time was of low priority.

#### 5.1.3.5 *Other issues*

It was suggested at SSTF-6 that multi-sensor acoustic recording tags (*e.g.* suction cup D-TAGS, Johnson and Tyack 2003) could provide valuable data, including received sound levels and information on aspects of whale behaviour. This was acknowledged but it was also noted that such data were of broader relevance than simply the SSTF and the issue was thus referred to the WGWAP.

#### 5.1.4 *Amendments to future mitigation and monitoring plans*

SSTF-6 concluded that although this may have been the most comprehensive seismic survey MMP for cetaceans to date, there is still a need to improve understanding of the potential effects of seismic surveys on whales and hence improve mitigation measures. In this regard, it identified (a) issues upon which it was able to make recommendations at this stage and (b) issues for which further analyses are required before recommendations can be considered.

The recommendations for improvements summarised below thus primarily build upon the practical implementation experience gained. Consideration of potentially more fundamental changes (*e.g.* in terms of definition of A-lines) may become necessary, depending on the results of the analyses recommended under Item 5.1.3.

##### 5.1.4.1 *Report of the independent observer*

A key component of the overall MMP was the incorporation of an independent observer (IO). The IO's report (WGWAP-9/20, summarised as Annex D to the SSTF-6 report) formed an important part of the SSTF-6 overview of the 2010 survey. For logistical reasons, the IO was based on shore and, due to the seismic survey vessel's mobilisation issues mentioned earlier, was present for only five survey days. Nonetheless, his report was valuable to the SSTF and his suggestions for improvements were carefully considered in the SSTF-6 discussions. His overall view was that he

‘recognised the complexity and thoroughness of the MMP and concluded that the people responsible for implementing it carried out their work in a serious, professional manner. He noted that it should provide a benchmark for marine seismic surveys that occur in the vicinity of environmentally sensitive areas for threatened cetaceans.’

This general conclusion was shared by SSTF-6.

##### 5.1.4.2 *Distribution and behaviour*

The primary logistical difficulties identified concerned: (a) mobilisation of teams early in the season when conditions on land made travel difficult; (b) the workload for the teams when the weather was good; (c) the amount of time the research vessel (*Pavel Gordienko*) had to devote to replacing the shore-based teams because of poor visibility from shore; and (d) the use of ‘Big-Eye’ binoculars on the research vessel.

Given this, SSTF-6 made the following suggestions and recommendations.

- (1) Great effort and ingenuity were needed to mobilise the teams successfully and construct observation platforms in 2010; similar effort and ingenuity will almost certainly be required in the future and therefore adequate resources will be needed to support this.
- (2) Consideration should be given to incorporating more observers in the future, recognising that this has logistical and cost implications but substantial benefits in terms of data collection.
- (3) The importance of using well-trained and experienced observers cannot be over-emphasised and training is of even greater importance given the inevitably complex and integrative

nature of the MMP compared to the standard monitoring programme jointly undertaken by Sakhalin Energy and ENL – it is important to provide all teams with an awareness of the overall MMP and the roles of the different teams.

- (4) The unfortunate circumstances preventing the availability of reticle-equipped Big Eye binoculars are unlikely to occur again. The value of this equipment to future MMPs should be re-evaluated in the light of the consideration of the distance estimation issue (see Item 5.1.3.1). The importance of training and experience in their use is stressed.
- (5) The most important issue is the ability of observers (both shore-based and vessel-based) to estimate distances and positions of whales. This is fundamental to successful implementation of mitigation measures as well as investigating effects of noise on whales. The issue of distance/position estimation and its relationship to effective implementation of mitigation measures, as well as the ability to examine potential effects of sound, must be revisited after the results of the study detailed under Item 5.1.3.3 are available. Consideration of technical improvements to distance/position estimation, as well as training and the conduct of experiments to assess bias, should also form part of this re-evaluation.

#### 5.1.4.3 Acoustics

From a logistical point of view, the acoustic equipment worked well and no serious problems were encountered. The acoustics team noted the great value of having real-time AIS information. SSTF-6 concluded that, given recent advances in GIS software, effort should be made in the future to provide all teams with near real-time plots showing AIS data and whale sighting data in addition to PML lines and the A-zone.

It was also suggested that further consideration be given to whether it would be feasible to incorporate bathymetric and real-time hydrological data into modelling for mitigation purposes.

#### 5.1.4.4 Mitigation measures

Any recommendations on mitigation measures that relate to acoustic, distributional or behavioural data/criteria (*e.g.* determination of A-lines, consideration of a ‘moving A zone’, issues related to poor onshore visibility and A-lines when shooting is far from the area of limited visibility) will need to be reviewed after the analyses recommended under Item 5.1.3 have been completed.

As part of a general discussion of potential future revisions to mitigation measures, a number of points were raised that need to be taken into account in future discussions, including:

- (1) the importance of maintaining an appropriate balance between completing seismic surveys as soon as possible in the season (*i.e.* when few whales are present) and having suitably stringent mitigation measures for when whales are in the area;
- (2) in the light of (1), ensuring that contractors are properly prepared to start as soon as possible and have the correct equipment for working in the expected cold conditions – the delay in starting the survey due to the wrong equipment was extremely unfortunate and every effort must be made to prevent reoccurrence in any future surveys;
- (3) the need to maintain simplicity whilst ensuring adequate mitigation measures, taking into account *inter alia* the need for communications amongst teams and the need to integrate various data sources and make decisions in real time;
- (4) the need to incorporate uncertainty associated with determining whale positions; and
- (5) the need for full documentation of any suggested revisions, including both the operational implications and the potential implications, if any, for whale exposure and/or data interpretation.

With respect to (3), it was suggested that the concept of simplicity is also important if other companies are to consider following the SSTF guidelines.

The Panel specifically **recommends** that in future, survey contractors be required to demonstrate in advance their preparedness for Sakhalin conditions, including low water temperatures, so that acquisition can begin without delay once the ice clears.

#### 5.1.4.5 *Role of Independent Observers*

The SSTF agreed that the role of an IO was valuable in principle but that further consideration needed to be given to how to optimise such a person's role, including the timeframe of observation and the platform(s) used.

#### 5.1.4.6 *Consideration of new technologies*

Earlier SSTF meetings had stressed the need to consider technological advances to reduce acoustic and other disturbance to gray whales. Given the acknowledged need for future geophysical profiling, SSTF-6 reiterated the importance of continuing to review developing technologies (and their potential impacts), including electromagnetic profiling. In the light of this, the Panel **recommends** that IUCN should commission a formal review for the Panel's consideration within the next two years.

#### 5.1.5 *Conclusion*

In conclusion, Donovan stated his personal view that the results from the 2010 survey vindicated the task force approach, despite the inevitable difficulties that arise when trying to implement a complex programme in an adverse environment. He congratulated all involved in the successful implementation of the MMP.

### 5.2 **Panel discussions**

The Panel welcomed the SSTF-6 report and acknowledged the vast amount of work that task force members and associate scientists had undertaken before and during the 2010 survey. It thanked all those who had put in such a tremendous effort – scientists, observers, company personnel and contractors. Reeves particularly thanked Donovan for his presentation and efforts chairing the task force over several years.

The Panel noted the task force recommendations in terms of future analyses and improvements to similar future surveys. It also noted the need for a further review of the MMP in the light of analyses to be undertaken. The Panel **endorses** the SSTF-6 report and its recommendations. In particular, it **confirms** the view that given the huge investment by the company and the Panel in designing the MMP and in collecting data during the Astokh 4D survey, it would be false economy if a shortage of resources were to preclude efforts to maximise the information obtained. The Panel therefore **strongly urges** Sakhalin Energy to find the necessary funding to complete the recommended analyses (described in Annex 5) as quickly as possible. The most appropriate way to review the results of those analyses will be to hold a further meeting or meetings of the SSTF – the timing will need to be evaluated at future WGWAP meetings in the light of progress reported by Sakhalin Energy. The Panel **recommends** that Sakhalin Energy present a progress report and an expected timeline for completion of the analyses at WGWAP-10.

The Panel also **agreed** that the present MMP provides a baseline for similar seismic surveys off Sakhalin and elsewhere, whilst recognising that different circumstances (*e.g.* seismic surveys farther offshore) may render parts of the programme inoperable or in need of modification. It **recommends** that the MMP be given prominence and made easily available on the IUCN website.

In this regard, it also welcomes the news that the approach and the results obtained will be highlighted in the scientific literature, often in collaborative publications by combinations of Panel members and company staff and contractors. It was pleased to hear that whilst permissions are required, Sakhalin Energy is in favour of this approach and believes that such permissions to use data and publish results will be granted expeditiously. It looks forward to receiving further details of proposed papers and a publishing timetable at the next WGWAP meeting. In particular, it welcomes news of a major review paper being developed by several members of the SSTF (both Panel and Sakhalin Energy).

Finally, the Panel **agreed** that in principle, data from instruments such as D-TAGS could be valuable for assessing received sound levels and behavioural responses. However, consideration also would need to be given to concerns about disturbance to the whales during tagging, as is true for photo-identification, biopsy and telemetry work. The Panel **agreed** that Vedenev and Nowacek should provide for consideration at WGWAP-10 a detailed outline of potential objectives, survey area and timing, data that would become available, numbers of tags, etc.

### **5.3 2011 South Piltun 2D survey**

#### **5.3.1 Report of the 6th meeting of the seismic survey task force**

As before, Donovan presented a summary of the work at SSTF-6, noting that the report of that workshop had not yet been finalised and so his presentation was merely a personal chairman's summary.

The general subject of the work proposed by Sakhalin Energy for 2011 and beyond is considered under Item 4 (above). Here the focus is on the proposed 2D seismic survey and the use of side-scan sonar.

#### **5.3.2 Nature of the survey**

The rationale behind the survey from the Sakhalin Energy perspective is given in the report of the SSTF-6 under Item 3 and above under Item 4.

Sakhalin Energy stated that the planned high-resolution seismic survey would be of a much smaller scale and involve a much smaller sound source than the 2010 survey. The survey area is a rectangle of 10 km by 6 km of which the nominal location of the PA-C platform is at its centre. The survey is to consist of 61 seismic lines, each 10 km long. Spacing between sail lines is 100 m, complemented by a series of 10 orthogonal lines (1 km apart) to tie the 61 main seismic lines. The seismic receivers are to be encapsulated in a conventional streamer, with a length of 600 m. This short streamer length enables short line turns and hence a reduction in total duration of the acquisition. A single seismic air gun or sleeve gun is to be used as the seismic source. The volume of this source would most likely be 150 in<sup>3</sup>, with an air pressure of 2000 psi. The source and the streamer would both be towed at a depth of approximately 2.5 m. Experiments carried out during the 2010 seismic survey allowed acoustic modelling work to be undertaken for the planned 2011 survey.

#### **5.3.3 Discussion within the SSTF**

SSTF-6 used the 2010 MMP as the basis for its discussions. The default position was that the 2010 MMP would be used unless there was agreement that the information for the 2D survey allowed aspects of the MMP to be modified.

##### **5.3.3.1 General design**

Sakhalin Energy stated that the principles of minimising the seismic survey area to that strictly necessary and basing the PML on the distribution data of the period of the survey as had been the case for 2010 had been met for the 2D survey.

The SSTF reiterated the need for the survey to be undertaken as early in the season and for as short a duration as possible, noting that to avoid the problems of the 2010 survey, the vessel should be adequately prepared to operate under cold conditions. In principle, the more northerly location of the planned survey should make deployment of shore-based observation teams logistically easier.

The SSTF agreed that given the sound level criteria adopted for the 2010 survey, there would be no A-lines, and that therefore for the 2D survey, the guidance that A-lines be acquired preferentially early in the survey is not relevant.



### 5.3.3.2 *Mitigation and monitoring*

#### 5.3.3.2.1 ACOUSTICS

The SSTF agreed that given the projected sound levels at the PML, real-time acoustic monitoring as specified for the 2010 survey (related to the determination of A-lines) would be unnecessary for the 2D survey from a mitigation perspective.

However, there was considerable discussion of a proposal from Sakhalin Energy that no archival acoustic monitoring would be required given the projected sound levels and the mitigation levels considered appropriate for the Astokh 4D survey. The task force was unable to resolve this issue during its meeting and referred the matter to the Panel, in the meantime suggesting that some further analyses be undertaken that might inform the discussions. Key features of the discussion were repeated during the Panel meeting and are included in that part of this report (Item 5.4.2, below).

#### 5.3.3.2.2 VISUAL MONITORING FROM ALL VESSELS

The SSTF agreed that most of the MMO provisions remained valid, as follows:

- (1) experienced, well-trained MMOs must be either on the seismic or the scout vessel for the survey duration;
- (2) a minimum of two active MMOs must be on duty at any given time during shooting, and for the 20 minutes before the start of shooting; and
- (3) MMO observation platforms must be located at the highest elevation available on the vessel and allow for the maximum viewable range from the bow to 90 degrees port/starboard of the vessel.

The only aspects that are not relevant relate to authority for shutdown and communications with real-time acousticians.

#### 5.3.3.2.3 SHORE- AND VESSEL-BASED MONITORING OF THE FEEDING AREA

Given the expected sound levels within the feeding area, Sakhalin Energy proposed that no monitoring was necessary from a mitigation perspective. Again, there was considerable discussion over this proposal and the task force was unable to resolve the matter during its meeting. It referred the matter to the Panel.

#### 5.3.3.2.4 SURVEY CONDUCT

The SSTF agreed that provisions relevant to the A-line selection and update were irrelevant for the 2D survey.

#### 5.3.3.2.5 SAFETY RADIUS/EXCLUSION ZONE

Determination of the safety radius for the Astokh 4D survey was an extensive exercise and carefully specified in terms of modelling the range at which sound from the full airgun array drops below 180 dB<sub>RMS</sub> at the broadside maximum, plus a precautionary margin of 20% and verification and update if needed in the field. Based on modelling results, Sakhalin Energy had calculated a safety radius/exclusion zone of less than 110 m but had extended this to a proposed 500 m safety zone for the 2D survey.

Whilst the SSTF agreed with the general calculations, there was considerable discussion over whether the safety radius should be reduced to 500 m. Therefore, again the SSTF referred the matter to the Panel.

#### 5.3.3.2.6 SHUTDOWN

The SSTF agreed that the existing provisions for shutdown should remain, *i.e.*

- (1) shutdown to be initiated if a whale is observed in the defined exclusion zone;
- (2) shutdown to be initiated if an endangered pinniped is observed in the defined exclusion zone;
- (3) a precautionary shutdown to be initiated if a specified marine mammal is observed on a course likely to result in its entering the exclusion zone.

## 5.3.3.2.7 PRE-SHOOT OBSERVATIONS

SSTF-6 agreed that the existing provision for pre-shoot observations should remain, *i.e.* that before the airgun starts shooting, MMOs must conduct a 20-minute pre-shoot observation of the full exclusion zone.

## 5.3.3.2.8 RAMP-UP AND LINE CHANGES

If only a single gun is used, then ramp-up provisions are clearly irrelevant. If, however, as a result of discussions, a small array is chosen (see Item 5.3.3.3.1, below), then these provisions should be revisited. With respect to line changes, it was agreed that the single gun should remain operative provided this is feasible.

## 5.3.3.2.9 POOR VISIBILITY

SSTF-6 agreed that the existing provisions should remain, *i.e.*

- (1) seismic operations can continue in periods of poor visibility (night, fog etc.) under certain defined circumstances;
- (2) to acquire a line in poor visibility, it must have been surveyed in good visibility conditions (either by the scout vessel or while sailing an adjacent line) during the preceding six hours without any gray whale sightings;
- (3) if poor visibility hinders the scan of the entire line, then the line will not be acquired;
- (4) operations will be shut down for the low visibility/night period if whales are sighted during the pre-dusk scan;
- (5) in poor visibility, operations will not recommence after more than 20 minutes of source inactivity due to the inability to conduct a visual scan.

## 5.3.3.2.10 SPECIAL REQUIREMENTS FOR A-LINES

The SSTF agreed that these provisions were irrelevant given the absence of A-lines.

5.3.3.3 *Other issues*

## 5.3.3.3.1 SOUND SOURCE

There was some discussion about the respective merits of a single airgun source or an array of smaller guns. Recognising that the footprint from the proposed single gun is considerably less than has been a concern in the past, but also recognising the need to minimise anthropogenic sound both within and outside the PML, SSTF-6 suggested that the option of a small array be evaluated against that of a single gun.

The specifications of the side-scan sonar and other high-frequency sonars were not available to the SSTF-6 meeting. However, it was reported that standard equipment already permitted for use in many countries would be used. In discussion, it was noted that:

- (a) high-frequency sounds are of more concern for species other than the gray whale; and
- (b) consideration should be given to temporary shutdown of the equipment during turns since otherwise this might result in ensonification of the horizontal layer.

The issue was referred to the Panel meeting, at which time it was expected that Sakhalin Energy would be able to provide specifications for the equipment to be used.

## 5.3.3.3.2 CONSIDERATION OF IMPLICATIONS OF OVERLAP IN TIMING WITH OTHER SEISMIC SURVEYS

The SSTF was informed that Rosneft had stated it has no plans to resume seismic surveys at Lebedenskoye in 2011. There was some discussion as to whether other companies might decide to 'piggyback' onto the vessel that Sakhalin Energy plans to use. Whilst this could occur, Evans stated that he believed it unlikely.

## 5.4 Discussion at WGWAP-9

Four main issues were referred by the SSTF to the Panel, as follows:

- (1) the size of the exclusion zone;
- (2) the level of monitoring required;
- (3) the use of a single gun or an array; and
- (4) side-scan sonar and the need for shutdown during turns.

Aside from the four issues raised above and an overall conclusion about the survey, the Panel **concurs** with the modifications to the 2010 MMP as recommended by SSTF-6 and detailed above. The Panel **reiterates** the extreme importance of starting (and completing) any 2D survey as early in the season as possible and ensuring that the appropriate equipment is available and ready for deployment in the expected environmental conditions. Further, it **recommends** that an explicit requirement in this regard be included in any contract for the 2D survey and **requests** that Sakhalin Energy provide the Panel with an update on this as soon as possible.

Sakhalin Energy clarified that a number of contracts related to the vessel would need to be finalised between the end of December 2010 and the end of January 2011 if the 2D survey is to be conducted in 2011. This would likely mean making commitments prior to the public release of the final report of WGWAP-9. However, Evans noted that even without the agreed report, Sakhalin Energy was aware of the major issues outlined at SSTF-6 and WGWAP-9 and he gave assurance that the company would take those into account during contract negotiations.

#### **5.4.1 Exclusion zone**

There was considerable discussion of this issue. The main points raised can be summarised as follows.

- (1) Given the sound criterion for the 2010 survey, the exclusion zone could be reduced significantly if acoustic damage was the sole concern.
- (2) However, other factors must also be taken into account when determining the exclusion zone including:
  - (a) MMOs can miss whales;
  - (b) estimating distance at sea is difficult;
  - (c) there is always some risk of collision (an increasing problem at short distances);
  - (d) applicable regulations or guidelines and any conditions attached to the permit need to be followed; and
  - (e) it would be difficult to explain to the public why the exclusion zone for whales from an endangered population in a sensitive area should be smaller than that for animals from other populations in other areas.
- (3) The analysis of information from the 2010 survey showed that even with a larger exclusion zone, the mitigation measures did not significantly delay completion of the survey – the main issue might relate to operating in fog when visibility is between 500 m and 1000 m.

In conclusion, the Panel **recommends** that for the 2D survey, the exclusion zone for western gray whales be 1000 m (provided that this does not conflict with relevant regulations, guidelines or precedents). If Sakhalin Energy provides a rationale and a practical approach for cases of fog that preclude the risk of acoustic injury but would allow for more rapid completion of the survey, then the Panel will consider this at a later date.

#### **5.4.2 Monitoring**

The Panel recognised that the sound levels within the PML for the 2D survey would be significantly below those for the Astokh 4D survey and below the 156 dB<sub>SEL</sub>. This is reflected in its agreement not to require real-time acoustic monitoring. The Panel also recognised the position adopted by Sakhalin Energy with respect to logistics and costs, and noted its view that if the same acoustic criteria were applied for the proposed 2D survey as for the Astokh 4D survey, there would be no

need for an extensive monitoring programme. However, the Panel did not agree with the position of Sakhalin Energy that no monitoring would be needed, for the reasons outlined below.

- (1) An important component of the philosophy behind the MMP for the Astokh 4D survey was that the available information on disturbance to feeding gray whales by seismic surveys was extremely limited (the criteria adopted by the SSTF were clearly identified as being based on very limited, albeit the best, evidence available). It was in view of this limitation that the MMP placed a strong emphasis on collecting data that would improve the situation and thus lead to better-informed criteria and mitigation measures for future seismic surveys.
- (2) Despite the excellent work undertaken in 2010, it is clear that even after the collected data have been analysed there will still be a need to obtain further data, particularly with respect to the possible effects on whale behaviour at a wide range of received sound levels.
- (3) The proposed 2D survey represents an important further opportunity to collect data for use in refining future mitigation measures, especially given that observations likely would be made on animals exposed to a wide range of sound levels including animals beyond the PML.

Given the above, the Panel **agreed** that it was essential that archival acoustic monitoring take place along with shore-based behavioural monitoring. Based on the results of discussions in a subgroup chaired by Donovan and including Panel members and Sakhalin Energy, the Panel **recommends** that the monitoring programme outlined in Annex 6 be implemented during the 2D seismic survey if and when it occurs. In summary, this would involve two buoys at the 10 m and 20 m isobaths and an experienced behavioural team at Blueberry Hill or South Station (Gailey and Broker have been asked to finalise this depending on logistics), with monitoring during the survey and for one week after its completion.

#### **5.4.3 The use of a single airgun or an array**

For a number of reasons, SSTF-6 had asked Sakhalin Energy to re-examine the question as to whether a single airgun (as proposed) or an airgun array should be used for the 2D survey. In making this request, and during further discussion within the WGWAP meeting, the following points were raised:

- (1) the acoustic footprint of the 2D survey would be considerably less than that of the 2010 Astokh 4D survey and much lower sound levels are predicted to reach the PML;
- (2) nonetheless, use of an array of smaller guns could minimise the footprint and provide a more directional downward projection;
- (3) the contractor has already been presented with specifications based on a single airgun.

After due consideration, the Panel **recommends** that Sakhalin Energy conduct a thorough evaluation of the options of a single airgun versus an array, from the perspective of sound footprints, practicality of operation (including technical factors) and contractual issues. It **requests** that the company present the results of that review to the Panel for its consideration. It was pleased to hear from Broker that he had already begun to examine technical factors.

#### **5.4.4 Side-scan sonar**

Sakhalin Energy agreed to examine the logistics of shutting down the side-scan sonar when turning and this was welcomed by the Panel even though it recognised that the frequencies involved are probably beyond the hearing range of gray whales. They are probably within the hearing ranges of some odontocetes and pinnipeds.

## 6 PHOTO-ID

### 6.1 Results of the comparison of the 2009 catalogues

As previously agreed, the two photo-ID teams (Russia-US and IBM) exchanged (via IUCN) their updated catalogues including whales identified through the 2009 season. Each team cross-matched the two catalogues independently and sent results to Larsen at IUCN.

The results of cross-matching the additions to the 2009 catalogues are summarised in Table 6.1. There were no disagreements between the two teams' cross-matching of the additions, nor were there any revisions to previous years' cross-matchings.

The IBM catalogue contained 12 additions in 2009, the Russia-US catalogue nine. All nine additions to the Russia-US catalogue matched additions to the IBM catalogue. Of the common additions, seven were identified by both teams as calves, and two as new non-calves. For the seven calves, the Russia-US team identified the mother in every case, while the IBM team identified the same mother for six. In the seventh case the IBM team did not determine the mother. Of the remaining three additions to the IBM catalogue, one matched a whale that was already in the Russia-US catalogue, while the other two were whales not found in the Russia-US catalogue. Of the latter two whales, one was recorded by the IBM team as a 'possible calf'. This whale was first seen off Kamchatka in 2009 with a possible mother, and seen later in the season off Sakhalin alone. The possible mother was a whale already known to both teams. It had been observed by the Russia-US team with a calf in 2007. It was, therefore, a breeding female that would have been 'eligible' (*i.e.* assuming a 2-year interbirth interval) to have a calf in 2009.

		Russia-US team					
IBM team		Acc. calves	Unacc. calves	Other new	Old	Unknown	Total
Calves (accompanied)		6					6
Calves (unaccomp.)		1				1 *	2
Other new whales				2	1	1	4
Old whales							
Unknown							
Total		7		2	1	2	12

**Table 6.1. Summary of cross-matching of 2009 catalogue additions. The asterix denotes that the calf was seen with 'mother' off Kamchatka prior to being seen alone off Sakhalin; treated as a 'possible calf'. 'New whales' are those seen by the given team for the first time in 2009. 'Old' whales are those known to that team from previous years.**

Table 6.2 summarises the current state of the catalogues. It should be noted that most of the 17 whales unique to the Russia-US catalogue have not been seen since the IBM programme started and are probably dead.

Data up to	Russia-US team	IBM team	Both teams	Russia-US team only	IBM team only	TOTAL
2008	172	165	154	18	11	183
2009	181	177	164	17	13	194

**Table 6.2. Summary of catalogue comparison.**

In addition to the fully catalogued whales, the IBM and Russia-US teams currently have on file eight and five temporary whales, respectively. ‘Temporary whales’ are potentially new individuals for which a right-side photograph of suitable quality is lacking and which, therefore, might conceivably match an already-catalogued whale. Two of the Russia-US temporary whales match whales in the IBM catalogue. The two lists of temporary whales were unchanged in 2009 relative to the 2008 situation, *i.e.* no new temporaries were logged in 2009, and no existing temporaries were resolved.

The Panel thanked the two teams, in particular Bradford and Tyurneva, for the updated matching work. The Panel **recommends** that the annual cross-matching exercise be continued as long as both teams are operating. Further recommendations relating to continuation of the photo-ID programmes are given under Item 6.3.

## 6.2 Results of photo-ID work during satellite tagging

Tsidulko presented a summary of the parts of document WGWAP-9/12 (‘2010 Western Gray Whale Pre-Tagging and Tagging Studies’ submitted by Amanda Bradford as her contract report to IUCN) concerning photo-ID work conducted during the effort to tag gray whales off Sakhalin from early September to early October 2010 (see Item 10, below).

The ship supporting the tagging effort sailed for 34 days, with 29 of those days spent in or near the nearshore (Piltun) feeding area. There were 12 small-boat tagging surveys in the area between the Piltun lighthouse in the south and the Northern Rosneft Facility in the north. Due to the whales’ distribution, most of the effort was concentrated within the northern third of the nearshore feeding area. This effort totalled 58 hours on the water, 2993 photos were taken and 62 individual whales were photo-identified.

Of those 62 whales, 25 were known adult males that had been determined to be candidates for tag deployment according to the agreed criteria (Weller *et al.* 2010; IWC 2010). The remaining 37 whales included ten known reproductive females, ten calves and yearlings and 17 other non-candidate whales. Six of the seven calves identified by the Russia-US team in 2009 (see Item 6.1, above) were resighted during the tagging effort.

Because the main research objective was to deploy satellite tags on adult males, several groups of ‘small whales’ were passed by with no attempt to photo-ID in order to make optimal use of the limited time available for tagging. Thus, it should be borne in mind that the 62 identified whales do not necessarily represent all of the whales sighted during the tagging effort.

During the tagging effort, three non-calf whales were identified that were not previously known to the Russia-US team, although they might be known to the IBM team. The Panel notes the value of matching the identified whales during the tagging work with both catalogues. According to the terms of the agreement for the tagging work, the IWC is the data holder. On behalf of the IWC, Donovan granted permission for the two photo-ID teams to match the whales identified during the tagging effort with their catalogues, although publication priority will be given to those who collected the data. The Panel **recommends** that the two teams include matches with the tagging photo-ID results in their reports of data collected in 2010.

Eight whales were biopsied (by Tsidulko acting as a representative of IPEE) during the pre-tagging surveys, three of which (two calves and one yearling) had not been biopsied previously.

## 6.3 Future of photo-ID work

The Panel was informed that the future of the Russia-US photo-ID work was in doubt given various financial and staffing issues. Bradford is completing her dissertation and will shortly be taking up fulltime employment in Hawaii. The point of contact is now Burdin, but Weller and Bradford remain willing to provide advice. The work of updating the catalogue with the 2010 data and cross-matching with the IBM catalogue will depend on finding support for Burdin’s group.

The Panel emphasises the crucial role played by the Russia-US team's data in estimating trends in the population, as discussed under Item 7 (below). The Panel **strongly urges** that a means be found to continue the Russia-US photo-ID programme, which has been running for 15 years. If this programme were to end now, it would be a great loss because in the field of cetacean research, long time series of data are crucial for estimating and understanding the population dynamics.

The Panel also notes the great value of biopsy samples, which have been used to sex the animals and to determine their genetic relationships. The Panel was informed that, for the last three seasons, it had not been possible for Burdin to obtain permits for biopsy sampling in conjunction with regular photo-ID work off Sakhalin. This is despite the fact that permits were issued to collect biopsies during the pre-tagging study off Sakhalin, and also to collect biopsies off Kamchatka where Prime Minister Vladimir Putin participated in biopsy work in late August 2010.

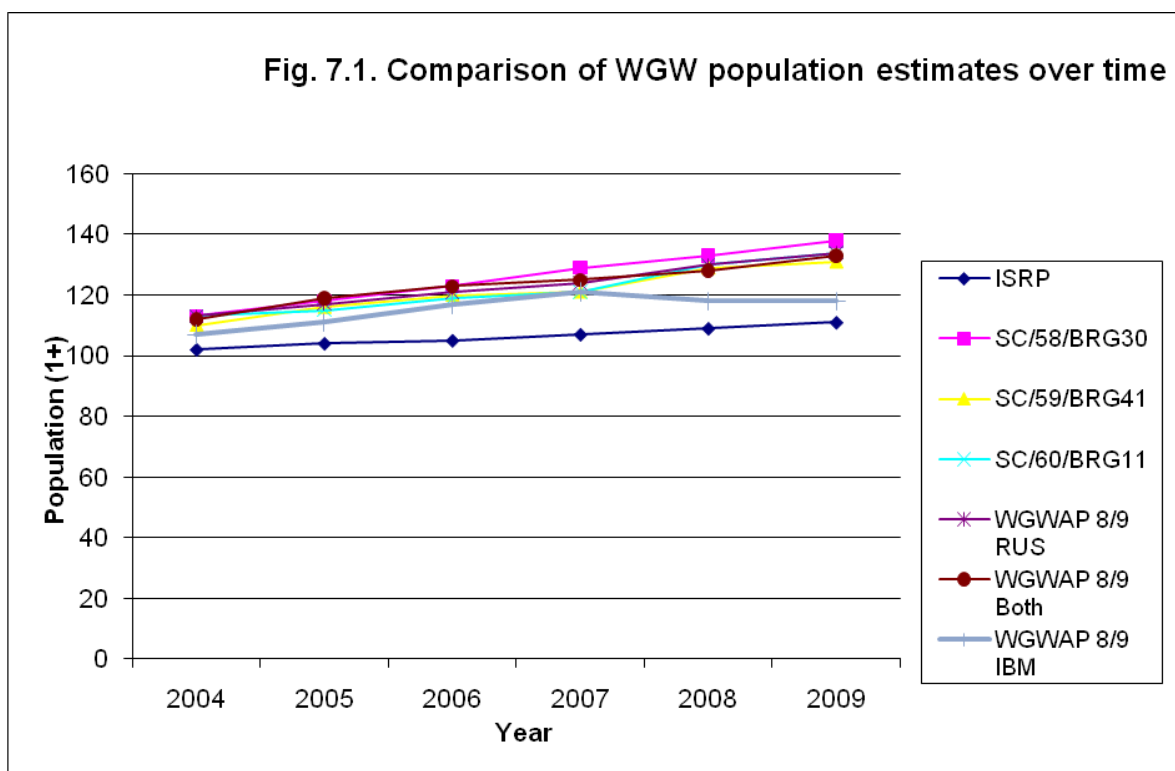
The Panel considers that the collection of biopsies from gray whales is not much more invasive than photo-ID work. In past years, the involvement of Bradford, given her knowledge of the whales and exceptional ability to recognise individuals in the field, had to a large extent enabled the Russia-US team to avoid sampling the same whales multiple times. If other teams start biopsy work, this will probably be more random, such that individuals will tend to be sampled multiple times. The priority should be to obtain biopsies from the calves of the year, since most of the rest of the population has already been sampled. In view of the great importance of having the kind of information that only biopsies can provide, the Panel **recommends** that every effort be made to ensure that biopsies are obtained each year from the calves of the year. To facilitate this, the Panel **requests** that the relevant Federal and Oblast authorities view permit applications to collect biopsies from calves of the year favourably.

## 7 POPULATION ASSESSMENT

A population model using the Russia-US photo-ID team's data from 1995 through 2003 was originally presented in the ISRP report (Reeves *et al.* 2005). This model has been updated annually with new data and minor amendments, and the results presented to WGWAP and the IWC Scientific Committee. A version including data from both teams through 2008 was first presented at WGWAP-8 (document WGWAP-8/9). This version had been adapted to take account of the lower degree of certainty in calf identification in the IBM data set, with the inclusion of the category 'possible calves'. The version of the document now on the WGWAP website contains some slight revisions to the version presented at WGWAP-8. Document WGWAP-8/9 also contains the results of assessments using the Russia-US and IBM data sets individually.

Using both data sets, the estimated population size in 2009 (excluding calves) was 134 animals (90% Bayesian confidence interval 120-142), of which 33 (CI 29-38) were estimated to be reproductive females. The population has been increasing, but population estimates for any given year have tended to remain consistent with each update of the assessment, except for the first ISRP assessment, which was more conservative than later assessments (Fig. 7.1). The population is projected to continue to increase assuming there is no increase in mortality. When citing population estimates from this and other models, it is important not to confuse the year to which the estimate refers with the year of the citation.

The assessment using both data sets was virtually identical to that using the Russia-US data set alone, but the assessment using only the IBM data set showed a much greater degree of uncertainty. This was likely due to a combination of the shorter time series of the latter, the lack of sex information and the uncertainty in unaccompanied calf identification. Regarding the identification of calves, Sakhalin Energy noted that a scoring system had been developed in 2009 that considers a number of different parameters to classify degrees of confidence as to whether a given animal is or is not a calf. The Panel drew attention to a recent paper (Bradford *et al.* 2011) that explains how calves can be distinguished visually from older animals with high confidence, based on examination of barnacle and pigmentation characteristics in the head region. The Panel **recommends** that this approach be used by the IBM team.



It was agreed at WGWAP-8 that the population model would be independently reviewed, and reviewers have been identified. Cooke explained that currently the model depends to a considerable extent on his own computer code, most of which is not specifically related to the western gray whale model. To verify this code would be very time-consuming. He is in the process of exporting the code to the publicly available ADMB platform, which provides a general-purpose model-fitting environment such that only code specific to the model needs to be implemented separately. The reviewers were contacted during this meeting and indicated that they would prefer to wait for the model to be running on ADMB before starting their review. Every effort will be made to ensure that the review is completed by WGWAP-10. If the outcome of the review is favourable, a version of the analysis can be submitted for publication in a peer-reviewed journal. The Panel **recommends** that it also be submitted to the May-June 2011 IWC Scientific Committee meeting.

The Panel and Sakhalin Energy agreed that the joint analysis for publication should include 2009 data, subject to the consent of the data providers. However, the existing assessment using data through 2008 is sufficient for the independent review.

## 8 OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE

In Dicks’s absence it had been agreed in advance that detailed discussions of this topic would be postponed until WGWAP-10. Nonetheless, Reeves presented a brief summary of Dicks’s report (document WGWAP-9/10) on two documents concerning oil in ice, MMS (2009) and WWF (2009), the latter essentially a critique of the former. Whilst Dicks agreed with WWF that the improvements in response capability in Arctic conditions have been only incremental and that the ‘achievement’ has not been as great as claimed, or at least as implied, in the MMS document, he found nothing in either document that would lead him to change his views concerning Sakhalin Energy’s preparedness as expressed in previous WGWAP reports.

At its last meeting, the Panel had recommended that Sakhalin Energy provide an update at this meeting on progress with two documents, one a manual on spill response in ice and the other a handbook for monitoring and assessment of oil spill response operations (recommendation WGWAP-8/011). Evans reported that both are being finalised and that feedback from the lenders has yet to be incorporated into the manual. He pointed out that the company’s connections to both Shell and Gazprom ensure immediate awareness of any new developments in the field of oil spill



response in ice. He also acknowledged that the recent massive spill in the Gulf of Mexico has had the effect of reminding the entire industry of the need for greater precaution and preparedness.

## **9 REPORT FROM ENVIRONMENTAL MONITORING TASK FORCE AND FUTURE WORK PLAN**

Reeves expressed disappointment at the lack of progress on this important aspect of the Panel's work and acknowledged that the responsibility for this lack rests primarily with the Panel. The proposed work plan and timeline outlined in the report of WGWAP-8 have proven unrealistic and therefore the workshop of the task force proposed to take place during winter 2010-2011 must be postponed indefinitely. Also, little or no progress has been made since WGWAP-8 on the proposed literature review.

The Panel reiterated its view that the work of the Environmental Monitoring Task Force (EMTF) is relevant and should be pursued as envisioned in the report of WGWAP-4 (see Annex 6 of that report for the EMTF terms of reference) and as elaborated in the reports of other previous WGWAP meetings. The importance of having a robust, credible environmental monitoring program in place was graphically illustrated during the recent Deepwater Horizon oil spill catastrophe in the Gulf of Mexico.

It was agreed that the Panel would work with IUCN in the coming months to develop a stronger capacity to move ahead with implementation of the EMTF work plan.

## **10 SATELLITE TAGGING**

### **10.1 Update on results of eastern gray whale tagging in 2009**

At WGWAP-8, Mate presented initial results of his group's efforts to tag eastern gray whales off Oregon and northern California in September-December 2009 (see WGWAP-8 report, section 8.1). At that time (early April 2010) four of the 18 successfully deployed tags were still transmitting. At this meeting he reported that the last of those tags had only stopped transmitting in late September and analyses of the overall project were still underway.

Among the early findings are that whales migrated south to Mexico in three 'waves' at similar speeds and staying close to shore. It took them an average of about 17 days to span 15 degrees of latitude during the southward migration, with a net speed of 4.7 km/hr. After spending about three weeks in the Mexican lagoons, they began a somewhat slower northward migration, marked by brief stops possibly to forage opportunistically. In general, migrating gray whales travel at speeds of 4-5 km/hr. Mate noted that segment speeds greater than 5 km/hr are rarely seen and he uses 6 km/hr as a filter speed for processing the satellite data. He considers 125 km/day to be a reasonable rule-of-thumb value for characterising the travel speeds of migrating gray whales.

Tags attached to females transmitted for an average of 125 days, slightly longer than tags on males. Tags deployed opportunistically performed less well than those deployed after a deliberate, systematic approach to the animal. The Wildlife Computers 3-cell tags had significantly better retention and performed better in all categories of retention than the 2-cell tag.

The Panel again congratulated Mate and his colleagues for their excellent work, which is bound to lead to publications of broad scientific interest. In that regard, Mate indicated his intention to present a detailed account to the IWC Scientific Committee at its next meeting in June 2011.

### **10.2 Preliminary report on results of western gray whale tagging in 2010**

Mate reported on the September-October 2010 field effort to tag gray whales off Sakhalin Island. He provided the following summary for this report.

### ***10.2.1 Fieldwork***

The total field effort spanned the period from 1 September–7 October, not including the pre-tagging study at Sakhalin conducted by the Kamchatka Branch of the Pacific Institute of Geography from 5–28 August (see Amanda Bradford's report, document WGWAP-9/12). After accounting for round-trip travel, the period of actual tagging effort spanned 6 September–4 October. The fieldwork proved more difficult than anticipated due to weather (two typhoons and two gales), whale behaviour and logistics. Weather was especially bad after mid-September. The whales were very sensitive to close approaches and changes in engine RPM. An acoustic test on 12 September of the first tagging boat (a diesel jet-drive 7 m fibreglass boat) determined that it was quite noisy underwater while being handled at low speeds as during tagging operations. The team shifted on 18 September to a quieter 5.5 m inflatable Zodiac with a 40 hp 4-stroke outboard motor. After a custom wooden pulpit had been constructed on the bow, this vessel proved workable for a 4-person team and was much more manoeuvrable and less disturbing to the whales. Regrettably, most of the remaining time available brought severe weather challenges. Moreover, on the few good-weather days it appeared that a greater proportion of candidate whales (known adult males) were travelling at higher speeds and often farther offshore than earlier in the month when feeding behaviour was more common.

Whales were acoustically sensitive and in several cases they responded to the presence of the diesel-jet-driven boat at distances of greater than 40 m. The whales frequently changed their behaviour from relaxed surfacings with multiple breaths to directional travel with only one or two breaths after an increase in engine RPM as the tagging boat moved closer to them. This behaviour was particularly noticeable in the fibreglass boat, which required a greater increase in engine speed to manoeuvre using the jet pump.

One tag was deployed on an adult male during repeated close approaches as it surfaced between bottom-feeding activities over a 42-minute approach period. During the entire field season, seven other close (4–6 m) approaches were made to other candidate whales (2 in the fibreglass boat, 5 in the Zodiac) but none developed into a tagging opportunity; this was usually because the whale did not surface close enough. On one occasion another whale's fluke blocked the opportunity to tag the candidate whale. The team was able to approach the same candidate whales repeatedly, even after close approaches, with the Zodiac but not with the fibreglass boat.

### ***10.2.2 Assessment of technical problems in relation to field protocols***

Poor weather was one of the primary problems encountered during this expedition. Weather conditions were outside the limits established in the safety management plan on over half of the days spent at sea. Operating during marginal conditions was difficult as the weight of the platform and people at the bow of the tagging boat caused the boat to 'dig in' to waves spraying water into the boat, covering equipment, making it difficult to see and filling the boat with water. On days with moderate wind chop, approaches to candidate whales could not be maintained if they were swimming into the waves. A tagging boat with a more prominent bow and/or a lighter platform would have reduced the amount of water coming into the boat, allowing for a more comfortable ride. However, little could have been done to reduce the noise created by the boat slapping through wind chop as it approached a whale into the waves. From the preliminary data it appears that at every speed interval the fibreglass boat was 2–4 times louder than the Zodiac at frequencies above 1 kHz.

Using the Zodiac did not solve the boat avoidance problem entirely, but the whales appeared less responsive to it and the added manoeuvrability of the outboard was essential during a number of close approaches. The manoeuvring required during the one successful tag deployment would not have been possible using the jet pump of the fibreglass boat. That said, there were some drawbacks to using the Zodiac. The lack of any rigid surface on which to attach the tagging platform made the tagger's job more difficult. Also, the Zodiac could not operate in as heavy weather conditions as the fibreglass boat. Still, on balance, the team concluded that the increased manoeuvrability and decreased noise made the Zodiac preferable as a tagging vessel.

The procedure of identifying candidate whales prior to a tagging approach worked well. The most effective method was for the photographer to take pictures of the whale during an initial approach. The whale could then be identified by zooming in on key features using the camera's viewscreen. This procedure allowed the candidates to be identified at a greater distance and with fewer identification approaches, thereby reducing the possibility of causing an avoidance response before a tagging approach was initiated.

### ***10.2.3 Summary of effort and results***

The tagging boat was launched on 12 of the 32 days at sea (28 not counting transit days) and a total of 58 hours was spent on the water. Of those 12 days, only two were full days in which the boat was launched immediately after breakfast and the team returned to the ship near sunset. On six of the days, time on the water was limited to 4.5 hours or less because of wind or rain as safety issues. Tagging operations covered a total of 472 km, with an average distance of 39.4 km/trip.

The area of operation ranged from near Piltun lighthouse (latitude 52°52'N) to north of the northern Rosneft facility (latitude 53°22'N). During days of tagging effort, the team surveyed north or south (depending on wind direction and location relative to areas of previous whale concentration and shore-based observations) keeping approximately 1 km from shore, identifying any whales observed and attempting to tag any candidate males. Sixty-two different whales were observed and photographed during the course of the project. Of that, 25 (40%) were candidate males. An average of 14 whales were observed per trip in the tagging boat, an average of six being candidate males. No biopsies were collected during this fieldwork.

The whale tagged ('Flex') is number 032 in the Russia-US catalogue and number 068 ('Belochvost' – White Tail) in the IBM catalogue. He has been observed regularly off Sakhalin since first seen as a calf in 1997 and is now estimated to be 11-12 m in length. The tag was applied on the whale's left side, ~20 cm down from the midline and 20-25 cm forward of the anterior-most dorsal knuckle. The whale was deemed to be in good condition with no signs of emaciation and no unusual concentrations of external parasites. The tag was applied at a distance of about 3.5 m from the boat using 90 psi (~6 bars) of pressure in the ARTS device. The tag appeared to be exposed about 2 cm at the time of tagging, after the immediate release of the pushrod. Analysis of photos taken during a subsequent sighting 1.5 hours after tagging revealed the tag had backed out to approximately 4 cm exposed.

Prior to tagging the whale was consistently surfacing in a very small (~150 m diameter) area. Repeated close approaches were made over a 42-minute period prior to tagging while the whale continued surfacing in the same area, though the last two surfacings prior to tagging appeared to be slightly outside of the typical area. The whale made a mild fluke kick while diving as the tag was deployed but remained in the immediate area (but outside of its pre-tagging site). After approximately 30 minutes, during which photos of the tag on the whale were taken, the whale began travelling north and was not pursued. He later joined another candidate whale that was unsuccessfully approached for tagging.

The deployed tag transmits for four 1-hr periods each day at 0300, 0600, 2100, and 2300 GMT. These time periods were chosen to allow tracking in all of the expected possible future migration routes and areas and to assure at least one of these time periods would occur during daylight hours locally to facilitate relocation efforts. Good location data from Service Argos had been received on a regular basis since the tagging. As of 30 November 2010, the tag had been transmitting for 57 days and a total of 136 locations had been received which met the filtering criteria (average 2.5/day). Based on those locations, the whale had travelled 828 km since tagging but had remained in the northern half of the work area near where it was tagged; it had not yet begun to migrate. With the duty cycle chosen, this tag could provide data for one year if the attachments hold.

### ***10.2.4 Recommendations by the tagging team***

Mate offered the following recommendations on behalf of the tagging team.

- Poor weather dominates the area by mid-September. Future expeditions should plan for many unworkable days and should start earlier in the season, *i.e.* by mid-August.
- The whales are very sensitive to boat approaches and noise. They must be approached very slowly and it is important to be close by when they surface in order to tag them successfully. Thus, a 4-stroke outboard engine will be preferred over the jet-drive for a tagging boat due to its reduced noise output and greater manoeuvrability at low speeds.
- Whale behaviour is key to success or failure of a tagging attempt. It is important to approach as many whales as possible to find individuals behaving in a ‘cooperative’ manner. The behaviour of a given whale can change from one day to the next or even during the course of the same day, so multiple approaches should be allowed by the field protocol.
- Due to the variability of whale distribution from year to year and the safety issues associated with beach launches, there is value in operating from a ship that can move to areas where whales are relatively abundant and to which the tagging team can return quickly when the weather improves.
- Despite the difficulties encountered during this expedition, gray whales can be tagged at Sakhalin given the proper equipment and sufficient time to take advantage of workable weather conditions. The merits of satellite tagging as described in previous WGWAP (and other) reports are undiminished and therefore another field season of tagging effort should be undertaken at Sakhalin.

#### ***10.2.5 Discussion and next steps***

The Panel welcomed Mate’s report and congratulated him and his associates for their accomplishments under very difficult circumstances, including not only the harsh field conditions and technical problems encountered in the field but also the challenges of arranging funding, contracts, permits and logistics, which were just short of insurmountable. The very fact that the expedition proceeded as safely and expeditiously as it did is owing to the hard work and persistence of a wide network of people. It will be extremely unfortunate if the progress made and lessons learned from this first effort cannot be translated into a more successful attempt to complete the job of tagging whales at Sakhalin in 2011. Yablokov drew the meeting’s attention to the fact that the Russian Interdepartmental Working Group had identified the need to proceed with implementation of the 2-year tagging programme as an action item at its most recent meeting (see Item 14, below).

The 12 unused tags remain inside Russia and this eliminates one of the potential obstacles to programme continuation, *i.e.* the need to obtain permits to import tags.

Although Amanda Bradford is unlikely to be available to participate in future tagging efforts, there was general agreement that given the quality of catalogue images and the familiarity of other researchers with the animals, it should still be possible to apply the proven field protocol for individual whale identification (as described under Item 10.2.2, above) and achieve good results without the benefit of Bradford’s special expertise. Nonetheless, the issue of how to replace Bradford or otherwise compensate for her absence in the field is something that will need to be addressed explicitly in plans for further tagging.

Regarding another aspect of the 2010 protocol – limiting tagging attempts to identified adult males only – the Panel concluded that this limitation should remain in place as part of the 2011 protocol. The premise has been and remains that it should be possible to identify the movement routes and winter locations of reproductive females in the population by using adult males as proxies.

Tsidulko stated that the Severtsov Institute of Problems of Ecology and Evolution (IPEE) had already initiated the permitting process for 2011 and that a final decision on a 2011 expedition would be required by approximately mid February to allow sufficient time to obtain annual permits.

Funding appears to be the main impediment to continuation and completion of the tagging effort in 2011. Sakhalin Energy reported that although it remains supportive of further satellite tagging in

principle, no funds are currently available to contribute to a follow-up effort in 2011. Other potential funding sources (besides oil companies) are the lending institutions and the NGOs that have been actively engaged as 'stakeholders' in the WGWAP process from its inception. Elliott pointed to the success WWF has had in fundraising for satellite tagging of species such as polar bears and leatherback turtles, especially working through foundations and wealthy individual donors. She offered to advise IUCN and IWC on a fundraising strategy.

The option of a shore-based tagging effort was discussed as a way of avoiding the high costs associated with a ship-based operation. Ship-based work is clearly more efficient and convenient in a context of limited time. However, Tsidulko, based on his experience working at Sakhalin and on his experience as part of the tagging team in 2010, pointed out that a tagging effort based on shore would be able to operate over a longer time window and thus be poised to take advantage of breaks in the weather, without the high standby costs involved in a ship-based expedition. He suggested that shore-based work over an extended timeframe would be preferable to the alternative of not being able to proceed at all with further tagging effort.

Another possibility would be to integrate tagging into other ship-based work off Sakhalin under the joint Sakhalin Energy-ENL programme (*e.g.* benthic sampling, photo-identification based on the *Oparin*). Such integration was considered worth investigating further although it was recognised that permitting and personnel issues would need to be addressed, as would the problem of renegotiating a field protocol acceptable to both the WGWAP and the IWC Scientific Committee. The latter problem would have to be dealt with for a shore-based initiative as well since the protocol approved for 2010 was tailored to a dedicated, ship-based approach.

## **11 SAKHALIN ENERGY PROPOSAL ON NECROPSY TRAINING (RECOMMENDATION WGWAP-7/016)**

The Panel's recommendation from a previous meeting (WGWAP-7/016) that Sakhalin Energy prepare and present a proposed way forward for identifying and training regional necropsy experts capable of responding to the next gray whale stranding on Sakhalin remains open. Although Sakhalin Energy gave assurance at the last meeting that it would consider this recommendation in the course of ongoing internal planning of the western gray whale research and monitoring programme, nothing new was reported at this meeting. The company considers the Russian government to be responsible for responding to and investigating strandings and that if there is a role for offshore oil and gas companies to play (*e.g.* in contributing to the cost of training specialists, providing logistics support for salvaging and securing carcasses), it should be shared among the companies operating in the region rather than fall onto the back of a single company like Sakhalin Energy. Further, it is only fair to point out that at least until now, Sakhalin Energy has invested significant resources in the carcass survey programme as recommended by the Panel (but see Item 2.1.6, above).

The Panel agrees that stranding response (for gray whales as well as other marine mammals) is technically a responsibility of the Russian government. However, we point out, once again, that it is in the interests of Sakhalin Energy and other companies operating on the Sakhalin Shelf to determine the cause of death of any dead gray whale found in the region. In the absence of evidence to the contrary, the public and NGOs are likely to assume the cause of any such death is in some way related to industrial activities. Moreover, in practical terms, the companies are the only agencies capable of mounting timely responses to gray whale strandings in their respective areas of operation, and it is therefore appropriate for them to do so.

A suggestion made during the meeting that a new wildlife disease institute is being established in Russia needs to be investigated to (a) confirm that such an initiative is underway and if so (b) ascertain what its objectives, scope, capacity etc. are. The Panel re-emphasises that although some veterinarians and pathologists in Russia have experience working with small odontocetes, none has adequate experience and expertise to carry out rigorous necropsies on large whale carcasses. Until such capacity exists, the Panel continues to believe that arrangements should be made along the lines described in the report of WGWAP-7 (Item 9.6), specifically in the context of the inadequate

response to the gray whale stranding at Chaivo in September 2009. It was also noted during the meeting that a whale carcass (likely a gray whale judging by the available photographs) was found in Kronotsk State Reserve (eastern Kamchatka) in the spring of 2010 but it was unclear whether a tissue sample had been collected and made available for genetic analysis.

Reeves reported that he had received a message and proposal during this meeting from Olga Sokolova, National Hematology Research Centre, Russian Academy of Medical Sciences, and Tatyana Denisenko, Department of Microbiology, Academy of Veterinary Medicine and Biotechnology, both based in Moscow. The proposal is entitled 'Western Grey Whale (*Eschrichtius robustus*) Population Health Status Assessment Program'. Although the cover message from the proponents makes clear that their intent is to organise a Russian response team able to travel on short notice to the Far East and conduct necropsies on stranded western gray whales, the scope of the proposal is much broader and includes a comprehensive health assessment of the whale population, involving biopsy sampling of live animals and detailed necropsies. There is no training component and it is implicitly assumed that the personnel proposed to comprise the stranding response team (pathologist, microbiologist, parasitologist, veterinarian, marine biologist and 2-5 assistants) would have the necessary skills. No budget is included in the proposal.

The Panel is encouraged by the evident interest of Sokolova and Denisenko. However, the current proposal is much broader in scope, and in that sense more ambitious, than what the Panel had seen as being required. Much of the sampling and many of the tissue analyses proposed are unrealistic given the logistics involved. Also, the proposal appears to miss the primary concern of the Panel (and presumably the oil companies), which is to ensure that the 'usual suspects' when large whales are found dead in coastal waters or on beaches – vessel strikes, entanglement in fishing gear, illegal harpooning/shooting, predation by killer whales, acute toxicity from harmful algal blooms or exposure to oil or manmade chemical agents – can be assessed conclusively.

As a next step, the Panel concluded that Reeves should send a reply to Sokolova and Denisenko thanking them for their interest and advising them on ways to shape their proposal so that it addresses the Panel's concerns more directly and explicitly. This will include a suggestion that they communicate and explore the potential for collaboration with experts outside Russia (*e.g.* Frances Gulland in California, Michael Moore in Massachusetts, Stephen Raverty in British Columbia). The Panel also expressed a desire to have this matter taken up by Yablokov's Russian strategic planning group on western gray whales.

## 12 MULTIVARIATE ANALYSIS (MVA)

### 12.1 Results

Gailey presented document WGWAP-9/17 on the multivariate analysis of gray whale movement, respiration and abundance during pipeline construction off Piltun in summer 2006. The data were obtained from shore-based observations as documented previously. The aim of this analysis was to determine whether these data suggest any detectable effects of the industrial activity on whale abundance or behaviour.

A total of 18 response variables were defined, relating to aspects of movement, respiration and abundance. These were regressed against a variety of natural and impact variables. The main findings were:

- There was no detectable effect of increased anthropogenic underwater sound on any of the individual movement response variables.
- There was a detectable effect on respiration pattern, as the whales breathed at a faster rate with higher sound level exposure. This could indicate a stress response or at least a higher energetic state.

- None of the combined or individual response variables related to movement and respiration was found to be associated with near-shore sound levels or vessel activity (*e.g.* number of vessels, closest distance, type of vessel).
- As the number of vessels within 5 km increased, the number of whales was observed to decrease.

The Panel expressed its appreciation to Gailey and his colleagues for this comprehensive analysis. As noted in previous Panel discussions, while MVA helps to find evidence of possible effects, the results do not in themselves permit inference on population-level impacts. For this purpose, it would be necessary to formulate a number of hypotheses about the nature of potential impacts, and then to ascertain for each hypothesis what range of impacts is consistent with the data.

For example, if the apparent increase in respiration rate in response to industrial noise is taken at face value, then one could in principle estimate the energetic cost of the disturbance to the animals, assuming constant O<sub>2</sub> consumption per respiration event. For this purpose it might be preferable to take as the baseline an average of respiration rates observed in years without construction activity, because the whales in 2006 may have remained stressed even between bouts of industrial noise, such that periods with low noise do not necessarily represent a true baseline. However, the factor of greatest potential concern may not be the extra energy expended as a result of disturbance, but the potential for energy intake to be reduced by disturbance to feeding, especially for mothers and calves. It does not appear that the data collected would allow food intake to be estimated, although time spent feeding could be used as a proxy.

The meeting agreed that further work would be needed in order to draw inferences on the magnitude of population effects. Options for making progress on this are discussed in the next section.

## 12.2 Progress on workshop

Previous Panel reports (*e.g.* WGWAP-2, WGWAP-5) have discussed the value of a workshop (or series of workshops) to investigate the problem of how to draw inferences on population-level effects from the kind of data used in the MVA. The aim would be to bring outside expertise to bear on this problem. Such a workshop would not be a WGWAP exercise because it would be important to ensure that other companies active in the area, including ENL, contribute data and support. As noted at WGWAP-8, there has been no progress towards organising such a workshop. Sakhalin Energy remains potentially interested in a workshop provided that it is held in Russia and organised by Russian scientists, although foreign experts could be invited.

It was noted that for outside experts to make a meaningful contribution, it would be necessary to have some kind of data sharing agreement, such as along the lines of the WGWAP data sharing protocol ([http://www.iucn.org/wgwap/wgwap/data\\_sharing\\_protocol/](http://www.iucn.org/wgwap/wgwap/data_sharing_protocol/)), so that different analytical approaches could be tried on the data.

There was a general discussion between the company and the Panel as to how work that would improve our ability to make relevant inferences from such data should be encouraged. The company noted its commitment to supporting research in Russia and suggested that the kind of analysis required could be a suitable PhD research topic, which would enable research to be carried out at low cost and with the benefit of training scientists in the process.

Hancox emphasised that from the lenders' perspective, it is important that such analyses yield results within a few months of the industrial activity, so that decisions on whether to proceed with specific projects can be made on the basis of the previous year's experience.

No conclusion was reached on a way forward for the workshop, which is not an item on the WGWAP work plan. It was agreed that the immediate priority is to complete analyses of the data collected during the 2010 Astokh 4D seismic survey. It is expected that these analyses will benefit from the experience gained in the previous years' analyses.

The Panel emphasised that it is important to derive conclusions from the 2006 data before there is further construction work in or near the gray whale feeding areas off Sakhalin.

### **13 PROGRESS ON RANGEWIDE INITIATIVE AND WGW CONSERVATION PLAN**

Larsen reported that a draft of the conservation plan had been presented to the meetings of the IWC Scientific and Conservation committees in June 2010 and it was endorsed strongly by both (see [http://cmsdata.iucn.org/downloads/wgwap\\_9\\_inf\\_7\\_wgw\\_conservation\\_plan\\_2\\_june\\_2010.pdf](http://cmsdata.iucn.org/downloads/wgwap_9_inf_7_wgw_conservation_plan_2_june_2010.pdf) for the full plan). The interim steering committee, which was responsible for completing the draft plan, has had initial discussions concerning implementation, with a focus on preparing a job description for the plan coordinator, identifying a host institution and raising funds. In addition to those tasks, there is a need to establish a stakeholder steering committee (to replace the current interim steering committee), to include range state governments, regional groups (governmental and non-governmental), IUCN and IWC. IUCN's next World Conservation Congress, scheduled to take place in South Korea in September 2012, may provide an opportunity to showcase progress on the plan's implementation.

In discussion it was emphasised that although the initial draft of the plan represented the work of a small group of scientists, the intent is for further refinement and implementation of the plan to be an inclusive process involving government agencies and NGOs as major participants. Aspects of the current draft (*e.g.* continuation of the Russia-US collaborative research programme, public awareness efforts, satellite tagging) perforce depend on a broad range of stakeholders to both participate actively and contribute funding.

WWF expressed disappointment that the draft plan did not explicitly include an endorsement of the proposed marine protected area off Sakhalin Island despite the fact that this proposal has been brought to the attention of the WGWAP in the past. In response, Donovan pointed out that the concept of protected areas is mentioned in the plan but that establishment of one or more of them is not identified as an immediate high priority. Elliott indicated that WWF intends to provide an English translation of the full proposal for further consideration by the coordinator and steering committee.

Several suggestions were made concerning other avenues for the coordinator and steering committee to consider. One is to investigate the possibility of developing a regional agreement within the structure of the Convention on Migratory Species (Bonn Convention). The other is the possibility of using the centenary of Roy Chapman Andrews's 'rediscovery' of western gray whales at the whaling station in Ulsan, Korea in 1912 (Andrews 1916) as an opportunity to bring more public attention to the population and its critically endangered status in the range states, especially South Korea and Japan. As a matter of interest, Brownell pointed out that the catch of gray whales at Ulsan in 1912 (Kato and Kasuya 2002) was well above even the most optimistic estimates of current total population size.

More information on the rangewide initiative is available at <http://iucn.org/wgwap>

### **14 INFORMATION FROM MEETINGS OF RUSSIAN INTERDEPARTMENTAL WORKING GROUP ON WGW CONSERVATION**

No representative of the Russian government attended this meeting and there was no formal presentation or other documentation available to consider. However, several participants (Yablokov, Tsidulko, Broker, Bell) had attended the most recent (4<sup>th</sup>) meeting of the Interdepartmental Working Group (IWG) in Moscow on 9 November 2010 and briefly summarised its proceedings. The main topics covered were the monitoring and mitigation programme associated with Sakhalin Energy's Astokh 4D seismic survey in June-July 2010 (see Item 5, above), the monitoring and mitigation efforts associated with Rosneft's Lebedenskoye seismic survey in August-November 2010 (see Item 3.1, above), preliminary results of the Sakhalin Energy-ENL joint programme in the 2010 season (see Item 2.1, above), satellite tagging (see Item 10, above) and development of a national framework (based on the Sakhalin experience) for marine mammal monitoring during any industrial activity on the shelf or shoreline. Among other action items arising from the meeting were the following: (1) a request that Gazprom provide information on its 2010 seismic survey near the offshore feeding area (see Item 3.2, above), (2) establish a 'biopsy' working group, (3) request that



Rosprirodnadzor present at the next IWG meeting a report on findings concerning cause of death for the gray whale stranded at Chaivo in September 2009 and another whale (probably a gray whale) found off eastern Kamchatka in the spring of 2010, (4) analyse the results of monitoring and mitigation efforts applied during the Astokh 4D and Lebedenskoye seismic surveys in 2010 (to be carried out by the Gray Whale Study Strategic Planning Group headed by Yablokov, in cooperation with Sakhalin Energy, Rosneft and ENL), and (5) prepare and transmit a formal response to the letter from the IUCN Director-General to Prime Minister Putin in June 2010 concerning the Lebedenskoye seismic survey (see [http://cmsdata.iucn.org/downloads/letter\\_from\\_iucn\\_to\\_putin\\_may\\_2010.pdf](http://cmsdata.iucn.org/downloads/letter_from_iucn_to_putin_may_2010.pdf)).

The meeting was advised that the IWG would meet again in late January or early February 2011.

## 15 WGWAP SELF-EVALUATION

Reeves was pleased to note that the Panel's recommendation to IUCN at the last meeting (recommendation WGWAP-8/014), that a mechanism be set up for posting open letters and public statements on the WGWAP website and tracking responses to them, had been implemented fully (see [http://www.iucn.org/wgwap/wgwap/public\\_statements/](http://www.iucn.org/wgwap/wgwap/public_statements/)). He thanked Larsen and Riché for their efficient work in this regard.

### 15.1 Report on meeting with Panel and NGOs

The Panel held an informal 2-hour meeting with NGO representatives and other observers (*e.g.* lender representatives) in the morning of 3 December at the Hotel Epsom. The purpose was to get input on how to improve communications between the Panel and Russian authorities and to solicit thoughts on the future of the WGWAP process, including suggestions about how the Panel's terms of reference should be revised. Among the many constructive outcomes of the session were the following points made by participants:

- Regardless of whether they elicit substantive responses from those to whom they are addressed, open letters and public statements by the Panel are useful to other audiences.
- Consideration should be given to organising a conference on western gray whales in Russia and any such conference should not be purely scientific and technical but include an outreach component involving a broad range of stakeholders. To date, only two international workshops focussing on western gray whales have occurred, the first in Ulsan, South Korea in 2002 (IWC 2004) and the second in Tokyo, Japan in 2008 (report available at [http://cmsdata.iucn.org/downloads/tokyo\\_workshop\\_report.pdf](http://cmsdata.iucn.org/downloads/tokyo_workshop_report.pdf)).
- There is a need not only for technical or semi-technical synthesis documents on subjects such as the effects of seismic survey noise on whales, but also for non-technical 'popular' articles that make knowledge about western gray whales accessible to non-specialists, and particularly in the Russian language.
- Greater emphasis should be given to transmitting WGWAP reports (in Russian) to government officials in Yuzhno, Sakhalin, and such documents should be sent with a cover letter requesting a response. Simply referring people to the WGWAP website is completely ineffective.

### 15.2 Panel Terms of Reference

There were no specific suggestions on how the WGWAP terms of reference should be changed. It was agreed that Reeves would begin discussions and revisit the terms of reference with IUCN and Sakhalin Energy in the first few months of 2011. Hancox reiterated his observations from the previous meeting (see WGWAP-8 report, Item 14) that any changes would need to be agreed by Sakhalin Energy, the convening body (IUCN) and the Panel.

### 15.3 Communications Strategy

Riché made a brief slide presentation on the draft communications strategy that she has been developing over the last several months. Some comments from the NGO/observer meeting on 3 December (Item 15.1, above) were relevant and these will be incorporated into the next draft. In particular, closer attention needs to be paid to ensuring that documents and other forms of communication are in the appropriate language. In late November 2010, a question-and-answer session was set up on the WGWAP website as an outreach tool ([http://www.iucn.org/wgap/news\\_archive/?6522/Saving-western-gray-whales-Ask-your-questions](http://www.iucn.org/wgap/news_archive/?6522/Saving-western-gray-whales-Ask-your-questions)) intended to replace the public meetings as originally envisioned in the terms of reference. The effectiveness of this new approach will need to be evaluated.

Riché indicated that she intended to distribute the draft strategy for comment to the Panel and Sakhalin Energy in the next few weeks.

### 15.4 WGWAP evaluation

As stated at the last meeting, the next independent performance evaluation of the WGWAP is expected to begin in early 2011. Larsen reported that the terms of reference for the evaluation were being developed, the evaluator would likely attend WGWAP-10 in May 2011 and the evaluator's final report should be available before WGWAP-11 in late 2011. He also drew attention to the fact that the full report of the previous WGWAP evaluation together with the IUCN 'management response' is available at <http://www.iucn.org/wgap/wgap/evaluations/>

## 16 OTHER BUSINESS

### 16.1 D-tags

Nowacek briefly described the archival suction-cup tag developed at the Woods Hole Oceanographic Institution, which has been applied successfully on some 20 cetacean species (including gray whales in the eastern North Pacific). The D-tag provides a high-resolution record of animal movements and sound fields for periods up to about 24 hours. It is deployed in much the same way as satellite tags but with essentially no concern about injury to the animal. Nowacek and Weller have engaged in discussions with the International Fund for Animal Welfare concerning the possibility of using D-tags on western gray whales to obtain data on received sound levels and animal responses during a seismic survey. Although it is unlikely that the necessary permits could be obtained and the logistical arrangements made for a study with D-tags as early as 2011, the Panel considers this to be a promising concept that should be investigated seriously for the future.

### 16.2 Close

It was agreed that the next WGWAP meeting would be in Geneva in early May 2011 and that one or more intersessional meetings likely would also be needed to deal with retrospective analyses of data from the Astokh 4D seismic survey monitoring and mitigation program and with aspects of the proposed South Piltun development.

The Panel expressed its appreciation and respect for the efforts of Doug Bell of Sakhalin Energy over the last several years and wished him well as he leaves the company and returns to his home in South Africa. As a parting gift, he was presented with a signed photograph of a western gray whale

## REFERENCES

Andrews, R.C. 1916. Whale hunting with gun and camera: a naturalist's account of the modern shore-whaling industry, of whales and their habits, and of hunting experiences in various parts of the world. D. Appleton & Co., New York. 333 pp..

Bradford, A.L., Weller, D.W., Burdin, A.M. and Brownell, R. L. Jr. 2011. Using barnacle and pigmentation characteristics to identify gray whale calves on their feeding grounds. *Marine Mammal Science*.

- Burdin, A.M. 2010. Results of a 2009 pilot project to survey cetaceans off Northwestern Kamchatka, Eastern Okhotsk Sea. Final report for MMC contract EE0009726. Available from the Marine Mammal Commission, Bethesda, Maryland.
- Burdin, A.M., Tsidulko, G.A., Sidorenko, M.M., Bradford, A. and Weller, D.W. 2010. Western gray whales off Sakhalin Island and eastern Kamchatka, Russia: June-August 2010. Final report to International Fund for Animal Welfare. Kamchatka Branch of Pacific Institute of Geography, Russian Academy of Sciences - Far East Division, Petropavlovsk-Kamchatsky.
- Gailey, G., Würsig, B. and McDonald, T.L. 2007a. Abundance, behavior, and movement patterns of western gray whales in relation to a 3-D seismic survey, northeast Sakhalin Island, Russia. *Environmental Monitoring and Assessment* 134:75-91.
- Gailey, G., McDonald, T., Racca, R., Sychenko, O., Rutenko, A. and Würsig, B. 2007b. Influences of Underwater Sound and Nearshore Vessel Activity on Western Gray Whale Behavior during the Installation of a Concrete Gravity Based Structure off Sakhalin Island, Summer 2005. Prepared for LGL Ecological Research Associates Ltd, for Exxon-Neftegas Ltd and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russian Federation. 150 pp.
- Gailey, G., Sychenko, O. and Würsig, B. 2007c. Western gray whale behavior, movement, and occurrence patterns off Sakhalin Island, 2006, Prepared for LGL Ecological Research Associates Ltd, for Exxon-Neftegas Ltd and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russian Federation.
- Gailey, G., McDonald, T., Racca, R., Sychenko, O., Hornsby, F., Rutenko, A., Vladimorov, V. and Würsig, B. 2010. Western gray whale movement, respiration, and abundance during pipeline construction off Sakhalin Island, 2006. Prepared for LGL Ecological Research Associates Ltd, for Exxon-Neftegas Ltd and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russian Federation.
- IWC. 2004. Report of the workshop on the western gray whale: research and monitoring needs. *Journal of Cetacean Research and Management* 6 (Supplement):487-500.
- IWC. 2010. Appendix 2. Summary report of the co-ordination group on a western gray whale telemetry programme. *Journal of Cetacean Research and Management* 11 (Suppl. 2):174-175.
- Kato, H. and Kasuya, T. 2002. Some analyses on the modern whaling catch history of the western North Pacific stock of gray whales (*Eschrichtius robustus*), with special reference to the Ulsan whaling ground. *Journal of Cetacean Research and Management* 4:277-282.
- Kraus, S.D. and Rolland, R.M. 2007. The urban whale syndrome. Pp. 488-513 in S.D. Kraus and R.R. Rolland, eds, *The urban whale*. Harvard Univ. Press, Cambridge, Massachusetts.
- Malme, C.I., Würsig, B., Bird, J.E. and Tyack, P. 1986. Behavioral responses of gray whales to industrial noise: feeding observations and predictive modeling. Outer Continental Shelf Environmental Assessment Program, Final report of Principal Investigators, NOAA.
- MMS. 2009. Arctic oil spill response research and development program: A decade of achievement. US Minerals Management Service (MMS), Department of the Interior (MMS is now called Bureau of Ocean Energy Management, Regulation, and Enforcement, BOEMRE). Available at: <http://www.mms.gov/tarprojectcategories/arcticoilspillresponseresearch.htm>
- Reeves, R.R., Brownell, R.L., Jr., Burdin, A., Cooke, J.G., Darling, J.D., Donovan, G.P., Gulland, F., Moore, S.E., Nowacek, D.P., Ragen, T.J., Steiner, R., VanBlaricom, G., Vedenev, A. and Yablokov, A.V. 2005. Report of the Independent Scientific Review Panel on the impacts of Sakhalin II Phase 2 on western North Pacific gray whales and related biodiversity. IUCN-The World Conservation Union, Gland, Switzerland. 123 pp.
- Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene, C.R., Jr., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A. and Tyack, P.L. 2007. Marine mammal noise exposure criteria: initial scientific recommendations. *Aquatic Mammals* 33:411-521.
- Weller, D., Brownell, R.L. Jr., Burdin, A., Donovan, G., Gales, N., Larsen, F., Reeves, R. and Tsidulko, G. 2010. A proposed research programme for satellite tagging western gray whales in 2010. Unpubl. doc. SC/61/BRG 31. Available from: IWC Secretariat, Cambridge, UK.
- WWF. 2009. Not so fast: Some progress in spill response, but US still ill-prepared for Arctic offshore development. A review of US Department of the Interior, Minerals Management Service's (MMS) 'Arctic Oil

Spill Response Research and Development Program – A Decade of Achievement’. Report published by WWF, available at: [http://www.iucn.org/wgwap/wgwap/meetings/wgwap\\_9/](http://www.iucn.org/wgwap/wgwap/meetings/wgwap_9/)

**SUMMARY OF RECOMMENDATIONS FROM THE 9<sup>TH</sup> MEETING OF GWAP**

<b>Recommendation Number</b>	<b>Cross-Reference</b>	<b>GWAP Recommendations &amp; Requests</b>	<b>Responsible Party/ Parties</b>	<b>Target Completion Date</b>	<b>Sakhalin Energy Response</b>
<b>Item 1.5: Status of recommendations from previous meetings</b>					
GWAP-9/001	Item 1.5.1	Whilst recognising that these units [autonomous acoustic recorders] require servicing, the Panel <b>recommends</b> that servicing be scheduled such that no two adjacent buoys are out of commission at the same time.	Sakhalin Energy	GWAP-10	
GWAP-9/002	Item 1.5.1	The Panel <b>requests</b> that for GWAP-10 an analysis of whale density for the period 15 August–15 October 2009 be calculated and presented ( <i>e.g.</i> as a 1- or 2-week moving average) specifically to determine whether the observed change in distribution was statistically significant.	Sakhalin Energy	GWAP-10	
GWAP-9/003	Item 1.5.1	The Panel also <b>requests</b> that Sakhalin Energy provides for GWAP-10 a final report on activities on or near the PA-A platform that could have caused the recorded noise.	Sakhalin Energy	GWAP-10	
GWAP-9/004	Item 1.5.1	Finally, the Panel <b>requests</b> that a presentation be made at GWAP-10 of the acoustic data for the period 15 August–15 September 2009 for buoys X-Z, in the format specified in recommendation GWAP-7/002 for continuous noise.	Sakhalin Energy	GWAP-10	
GWAP-9/005	Item 1.5.1	Reeves emphasized that there is an implicit assumption that Sakhalin Energy will keep the Panel advised on any aspects of the company's operations that could significantly change the acoustic environment or otherwise affect western gray whales. Therefore, the	Sakhalin Energy	GWAP-10	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		Panel <b>requests</b> that Sakhalin Energy report on this issue at WGWAP-10 by updating and clarifying information on recent changes with acoustic implications at either platform.			
<b>Item 2: Reports on field activities in 2010</b>					
WGWAP-9/006	Item 2.1.1.2	Regarding the sightings of whales beyond the eastern end of the 2009 and 2010 offshore survey transects, the Panel <b>recommends</b> that future transect lines be extended east to provide adequate coverage of that region.	Sakhalin Energy	WGWAP-10	
WGWAP-9/007	Item 2.1.4	The Panel <b>requests</b> that its members responsible for reviewing the acoustics data (Vedenev and Nowacek) be provided with the full 2010 acoustics data set (in the form of a CD) no later than two weeks before the start of WGWAP-10.	Sakhalin Energy	2 weeks before WGWAP-10	
WGWAP-9/008	Item 2.1.6	... in November 2007 ..., the company had indicated not only that it would undertake dedicated surveys covering the coast from Nogliki to Okha, but also that it would 'investigate the possibility of carrying out the Island length surveys...'. The Panel <b>requests</b> that Sakhalin Energy provide a clear, updated statement of its plans so that the matter can be resolved at WGWAP-10.	Sakhalin Energy	WGWAP-10	
WGWAP-9/009	Item 2.1.7	Therefore, the Panel <b>recommends</b> that Sakhalin Energy reconsider its decision to terminate the collection and analysis of data on gray whale behaviour at Sakhalin (also see WGWAP-2 report, section 8, including recommendation WGWAP 2/011) and that it provide a clear scientific rationale for any further reduction ( <i>i.e.</i> to a level below the minimal effort in 2010) in this component of the joint programme.	Sakhalin Energy	WGWAP-10	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
<b>Item 3: Review of information on relevant activities by other companies in 2010</b>					
WGWAP-9/010	Item 3.1	Specifically, the Panel <b>requests</b> that Sakhalin Energy makes acoustic data from recording buoys 'A-10', 'Odoptu-N-20' and 'Odoptu-N-10' available for WGWAP-10 for the following time periods: 21h 30m on 20 August to 01h 20m on 21 August, 25-31 August, 1-4 September and 11-21 September. These data should be in the format specified in recommendation WGWAP-7/002 for pulsed noise.	Sakhalin Energy	WGWAP-10	
WGWAP-9/011	Item 3.1	Also, the Panel <b>requests</b> that data from distribution stations 1-8 be included for the same periods, and that these data are analysed statistically to determine whether there were significant changes in whale distribution.	Sakhalin Energy	WGWAP-10	
WGWAP-9/012	Item 3.1	Finally, the Panel <b>encourages</b> the group of NGOs ( <i>i.e.</i> the authors of WGWAP-9/19) to submit a final report that includes the complete data set.	NGOs	WGWAP-10	
WGWAP-9/013	Item 3.1	Therefore, the Panel <b>recommends</b> that IUCN make every effort to obtain the report or reports on these acoustic data as they become available either via Rosneft directly or via the Interdepartmental Working Group (MNR).	IUCN	WGWAP-10	
WGWAP-9/014	Item 3.2	To support efforts to interpret information on whale distribution and density throughout the 2010 season, the Panel <b>requests</b> that Sakhalin Energy provide in advance of WGWAP-10 data from all acoustic sensors in the area for the period 15 August–10 September, in the format described in recommendation WGWAP-7/002 for pulsed noise.	Sakhalin Energy	WGWAP-10	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
<b>Item 4: Briefing by Sakhalin Energy on work in 2011 and beyond</b>					
WGWAP-9/015	Item 4.3.1	Therefore, while recognising that Sakhalin Energy may view the construction of a third platform as necessary at some point during the lifetime of the project in order to meet its petroleum recovery targets, the Panel <b>recommends</b> that construction not begin until there is better understanding of the effects of noise disturbance on the whales ( <i>e.g.</i> a more thorough analysis of the potential effects of PA-B construction) and appropriate mitigation measures are in place.	Sakhalin Energy	Progress report at WGWAP-10	
WGWAP-9/016	Item 4.3.2	The Panel <b>recommends</b> that before making any decision on whether and how to proceed with this proposed new construction (PA-C), Sakhalin Energy should provide for the Panel’s consideration at WGWAP-10: A document describing the feasible options considered in reaching the current tentative decision to proceed with a new platform. This document should include, in particular, an indication of how the risks to western gray whales and their habitat posed by the various options have been accounted for and compared.	Sakhalin Energy	WGWAP-10	
WGWAP-9/017	Item 4.3.2	The Panel <b>recommends</b> that before making any decision on whether and how to proceed with this proposed new construction (PA-C), Sakhalin Energy should provide for the Panel’s consideration at WGWAP-10: A document describing and comparing options under consideration for transporting oil and gas from the new platform, again specifying how the risks to western gray whales and their habitat posed by the various options have been assessed and compared.	Sakhalin Energy	WGWAP-10	



Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
WGWAP-9/018	Item 4.3.2	The Panel <b>recommends</b> that before making any decision on whether and how to proceed with this proposed new construction (PA-C), Sakhalin Energy should provide for the Panel’s consideration at WGWAP-10: A general operations plan which includes all of the company’s foreseeable and foreseen activities for 2011-2015 with the potential to disturb or otherwise harm western gray whales and their habitat (e.g. seismic surveys).	Sakhalin Energy	WGWAP-10	
WGWAP-9/019	Item 4.3.2	The Panel <b>agrees</b> on the value of such an exercise and <b>recommends</b> that Sakhalin Energy prepare for consideration at WGWAP-10 a document that summarises progress made since 2004 towards resolving uncertainties and filling data gaps highlighted in past western gray whale panel reports.	Sakhalin Energy	WGWAP-10	
WGWAP-9/020	Item 4.3.2	In addition, Sakhalin Energy has already <b>agreed</b> , and the Panel <b>recommends</b> , that the company provide a comprehensive overview of the issues and risks that need to be addressed for a new development such as South Piltun, including <i>inter alia</i> oil spills, continuous noise, vessel collisions, disturbance of benthos and cumulative impacts. This overview should include a risk matrix that makes clear how Sakhalin Energy would prioritise the various elements, as well as how the company assesses each issue in terms of potential short-, medium- and long-term effects on the western gray whale population.	Sakhalin Energy	WGWAP-10	
<b>Item 5: 4-D seismic survey</b>					
WGWAP-9/21	Item 5.1.3.1	The Panel <b>recommends</b> that analyses of the uncertainties in determining geographic positions when using reticle binocular methods are conducted and the results presented at WGWAP-10.	Sakhalin Energy	WGWAP-10	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
WGWAP-9/22	Item 5.1.3.3	The Panel <b>recommends</b> that these analyses [of the effects of noise on gray whales, see Annex 5B] are initiated and that a progress report is presented at WGWAP-10.	Sakhalin Energy	WGWAP-10	
WGWAP-9/23	Item 5.1.4.4	The Panel specifically <b>recommends</b> that in future, survey contractors be required to demonstrate in advance their preparedness for Sakhalin conditions, including low water temperatures, so that acquisition can begin without delay once the ice clears.	Sakhalin Energy	Before future surveys [statement of intent at WGWAP-10]	
WGWAP-9/24	Item 5.1.4.6	Given the acknowledged need for future geophysical profiling, the Panel reiterated the importance of continuing to review developing technologies (and their potential impacts), including electromagnetic profiling. In the light of this, the Panel <b>recommends</b> that IUCN should commission a formal review for the Panel’s consideration within the next two years.	IUCN	December 2012	
WGWAP-9/25	Item 5.2	The Panel <b>endorses</b> the SSTF-6 report and its recommendations. In particular, it <b>confirms</b> the view that given the huge investment by the company and the Panel in designing the MMP and in collecting data during the Astokh 4D survey, it would be false economy if a shortage of resources were to preclude efforts to maximise the information obtained. The Panel therefore <b>strongly urges</b> Sakhalin Energy to find the necessary funding to complete the recommended analyses (described in Annex 5 [of the WGWAP-9 report]) as quickly as possible.	Sakhalin Energy	Progress report and statement of intent at WGWAP-10	
WGWAP-9/26	Item 5.2	The most appropriate way to review the results of those analyses will be to hold a further meeting or meetings of the SSTF – the timing will need to be evaluated at	Sakhalin Energy	WGWAP-10	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		future WGWAP meetings in the light of progress reported by Sakhalin Energy. The Panel <b>recommends</b> that Sakhalin Energy present a progress report and an expected timeline for completion of the analyses at WGWAP-10.			
WGWAP-9/27	Item 5.2	The Panel ... <b>agreed</b> that the present MMP [monitoring and mitigation programme] provides a baseline for similar surveys off Sakhalin and elsewhere, whilst recognising that different circumstances ( <i>e.g.</i> seismic surveys farther offshore) may render parts of the programme inoperable or in need of modification. It <b>recommends</b> that the MMP be given prominence and made easily available on the IUCN website.	IUCN	February 2011	
WGWAP-9/28	Item 5.2	[Regarding D-tags] the Panel <b>agreed</b> that Vedenev and Nowacek should provide for consideration at WGWAP-10 a detailed outline of potential objectives, survey area and timing, data that would become available, numbers of tags, etc.	WGWAP	WGWAP-10	
WGWAP-9/29	Item 5.4	The Panel <b>reiterates</b> the extreme importance of starting (and completing) any 2D survey as early in the season as possible and ensuring that the appropriate equipment is available and ready for deployment in the expected environmental conditions. Further, it <b>recommends</b> that an explicit requirement in this regard be included in any contract for the 2D survey and <b>requests</b> that Sakhalin Energy provide the Panel with an update on this as soon as possible.	Sakhalin Energy	2D seismic survey	
WGWAP-9/30	Item 5.4.1	The Panel <b>recommends</b> that for the 2D survey, the exclusion zone for western gray whales be 1000 m (provided that this does not conflict with relevant regulations, guidelines or precedents).	Sakhalin Energy	2D seismic survey	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
WGWAP-9/31	Item 5.4.2	The Panel <b>agreed</b> it was essential that archival acoustic monitoring take place along with shore-based behavioural monitoring. Based on the results of discussions in a subgroup chaired by Donovan and including Panel members and Sakhalin Energy, the Panel <b>recommends</b> that the monitoring programme outlined in Annex 6 [of the WGWAP-9 report] be implemented during the 2D seismic survey if and when it occurs.	Sakhalin Energy	2D seismic survey	
WGWAP-9/32	Item 5.4.3	The Panel <b>recommends</b> that Sakhalin Energy conduct a thorough evaluation of the options of a single airgun versus an array, from the perspective of sound footprints, practicality of operation (including technical factors) and contractual issues. It <b>requests</b> that the company present the results of that review to the Panel for its consideration.	Sakhalin Energy	WGWAP-10	
<b>Item 6: Photo-ID</b>					
WGWAP-9/33	Item 6.1	The Panel <b>recommends</b> that the annual cross-matching exercise be continued as long as both teams are operating.	Sakhalin Energy, Russia-US team	Statements of intent and schedule to be agreed at WGWAP-10	
WGWAP-9/34	Item 6.2	On behalf of the IWC, Donovan granted permission for the two photo-ID teams to match the whales identified during the tagging effort with their catalogues, although publication priority will be given to those who collected the data. The Panel <b>recommends</b> that the two teams include matches with the tagging photo-ID results in their reports of data collected in 2010.	Sakhalin Energy, Russia-US team	WGWAP-10	
WGWAP-9/35	Item 6.3	The Panel emphasises the crucial role played by the Russia-US team's data in estimating trends in the	NGOs and others	Before June 2011	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		population.... The Panel <b>strongly urges</b> that a means be found to continue the Russia-US photo-ID programme, which has been running for 15 years.			
WGWAP-9/36	Item 6.3	The Panel <b>recommends</b> that every effort be made to ensure that biopsies are obtained each year from the calves of the year.	Sakhalin Energy, Russia-US team	Statements of intent/ feasibility at WGWAP-10	
WGWAP-9/37	Item 6.3	To facilitate this [biopsy sampling of calves of the year], the Panel <b>requests</b> that the relevant Federal and Oblast authorities view permit applications to collect biopsies from the calves of the year favourably.	Russian Federal and Oblast authorities	Not relevant	
<b>Item 7: Population assessment</b>					
WGWAP-9/38	Item 7	The Panel drew attention to a recent paper (Bradford <i>et al.</i> 2011) that explains how calves can be distinguished visually from older animals with high confidence, based on examination of barnacle and pigmentation characteristics in the head region. The Panel <b>recommends</b> that this approach be used by the IBM team.	Sakhalin Energy, Russia-US team	Statement of intent at WGWAP-10	
WGWAP-9/39	Item 7	Every effort will be made to ensure that the review [of the Cooke model] is completed by WGWAP-10. If the outcome of the review is favourable, a version of the analysis can be submitted for publication in a peer-reviewed journal. The Panel <b>recommends</b> that it also be submitted to the May-June 2011 IWC Scientific Committee meeting.	IUCN and Panel (Cooke)	May 2011	

## **Annex 1. List of participants**

### **PANEL MEMBERS PRESENT**

Robert L. BROWNELL Jr.  
Senior Scientist  
Southwest Fisheries Science Center  
National Marine Fisheries Service  
1352 Lighthouse Ave.  
Pacific Grove, CA 93950  
USA

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

Randall R. REEVES (Chairman)  
Okapi Wildlife Associates  
27 Chandler Lane  
Hudson  
Québec J0P 1H0  
Canada

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

Alexey V. YABLOKOV  
Councillor  
Russian Academy of Sciences,  
Leninsky prospect, 33, office 319  
Moscow 119071  
Russia

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

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

Grigory TSIDULKO  
Sherbakova str. 7 A-42, Mitishi  
Moscow 114008  
Russia

David WELLER  
Southwest Fisheries Science Center  
National Marine Fisheries Service  
8604 La Jolla Shores Drive  
La Jolla, CA 92037  
USA

**Sakhalin Energy Investment Company Ltd.**

Doug BELL

Koen BROKER

Richard EVANS

Glenn GAILEY

Saskia de KONING

Judy MUIR

Roberto RACCA

Alexander RUTENKO

Dorine TERWOGT de Jonge

Olga TYURNEVA

**Associate Scientists**

Alexander BURDIN

**IUCN**

Sarah HUMPHREY

Finn LARSEN

Béatrice RICÉ

**Observer NGOs**

Wendy ELLIOTT, WWF International

Doug NORLEN, Pacific Environment

Audrey WOOD, Pacific Environment

**Observer Lenders**

Bruno BISCHOFF, Credit Suisse (Day 2 &3)

Jon HANCOX, AEA Group

Bruce MATE, AEA Group

Michael POSADSKI, Mizuho Corporate Bank, Ltd  
(Day 3)

## **Annex 2. Final meeting agenda**

### **1. Opening of 9<sup>th</sup> WGWAP meeting**

- 1.1 Introduction and logistics
- 1.2 Adoption of agenda
- 1.3 Documents
- 1.4 Reporting procedures and timelines
- 1.5 Status of recommendations from previous meetings
  - 1.5.1 *Analyses of absence of whale observations at stations 10 and 11 in September 2009*
  - 1.5.2 *ENL analysis of the effect of pile driving*

### **2. Reports on field activities in 2010 (other than those associated with the Astokh 4-D seismic survey)**

- 2.1 Preliminary summary of effort and/or results of SEIC/ENL 2010 field programme (distribution, behaviour, acoustics, photo-ID and benthic monitoring)
  - 2.1.1 *Distribution and benthic monitoring*
  - 2.1.2 *Behaviour*
  - 2.1.3 *Photo-identification*
  - 2.1.4 *Acoustics*
  - 2.1.5 *MMO programme in 2010*
  - 2.1.6 *Carcass survey programme in 2010*
  - 2.1.7 *Future of the joint Sakhalin Energy-ENL gray whale monitoring programme*
- 2.2 Preliminary summary of effort and results of work by non-industry groups (including whale observations and photo-ID/biopsy)

### **3. Review of information on relevant activities by other companies in 2010**

- 3.1 Lebedenskoye seismic survey
- 3.2 Offshore seismic survey
- 3.3 General

### **4. Briefing by Sakhalin Energy on work in 2011 and beyond**

- 4.1 Background
- 4.2 Discussion
- 4.3 Panel advice

### **5. 4-D seismic survey**

- 5.1 Report of the 6th meeting of the Seismic Survey Task Force
  - 5.1.1 *Objectives*
  - 5.1.2 *Review of the 4D survey*
    - 5.1.2.1 *Starting the survey as soon as possible*
    - 5.1.2.2 *Distribution and behaviour teams*
    - 5.1.2.3 *Acoustics studies*
    - 5.1.2.4 *Environmental data*
  - 5.1.3 *Future analyses*
    - 5.1.3.1 *Distance estimation*
    - 5.1.3.2 *Trade-off between completing early and implementing mitigation measures*
    - 5.1.3.3 *Improved information on the effects of noise on gray whales*
    - 5.1.3.4 *Exposure of animals to sound east of the PML*
    - 5.1.3.5 *Other issues*
  - 5.1.4 *Amendments to future mitigation and monitoring plans*
    - 5.1.4.1 *Report of the independent observer*
    - 5.1.4.2 *Distribution and behaviour*
    - 5.1.4.3 *Acoustics*



- 5.1.4.4 *Mitigation measures*
- 5.1.4.5 *Role of Independent Observers*
- 5.1.4.6 *Consideration of new technologies*
- 5.1.5 *Conclusion*
- 5.2 **Panel discussions**
- 5.3 **2011 South Piltun 2D survey**
  - 5.3.1 *Report of the 6th meeting of the seismic survey task force*
  - 5.3.2 *Nature of the survey*
  - 5.3.3 *Discussion within the SSTF*
    - 5.3.3.1 *General design*
    - 5.3.3.2 *Mitigation and monitoring*
      - 5.3.3.2.1 *Acoustics*
      - 5.3.3.2.2 *Visual monitoring from all vessels*
      - 5.3.3.2.3 *Shore- and vessel-based monitoring of the feeding area*
      - 5.3.3.2.4 *Survey conduct*
      - 5.3.3.2.5 *Safety radius/exclusion zone*
      - 5.3.3.2.6 *Shutdown*
      - 5.3.3.2.7 *Pre-shoot observations*
      - 5.3.3.2.8 *Ramp-up and line changes*
      - 5.3.3.2.9 *Poor visibility*
      - 5.3.3.2.10 *Special requirements for A-lines*
    - 5.3.3.3 *Other issues*
      - 5.3.3.3.1 *Sound source*
      - 5.3.3.3.2 *Consideration of implications of overlap in timing with other seismic surveys*
- 5.4. **Discussion at WGWAP-9**
  - 5.4.1 *Exclusion zone*
  - 5.4.2 *Monitoring*
  - 5.4.3 *The use of a single airgun or an array*
  - 5.4.4 *Side-scan sonar*
- 6 Photo-ID**
  - 6.1 Results of the comparison of the 2009 catalogues
  - 6.2 Results of photo-ID work during satellite tagging
  - 6.3 Future of photo-ID work
- 7 Population assessment**
- 8 Oil spill prevention, preparedness and response**
- 9 Report from Environmental Monitoring Task Force and future work plan**
- 10 Satellite tagging**
  - 10.1 Update on results of eastern gray whale tagging in 2009
  - 10.2 Preliminary report on results of western gray whale tagging in 2010
    - 10.2.1 *Fieldwork*
    - 10.2.2 *Assessment of technical problems in relation to field protocols*
    - 10.2.3 *Summary of effort and results*
    - 10.2.4 *Recommendations by the tagging team*
    - 10.2.5 *Discussion and next steps*
- 11 Sakhalin Energy proposal on necropsy training (Recommendation WGWAP-7/16)**
- 12 Multivariate analysis (MVA)**
  - 12.1 Results
  - 12.2 Progress on workshop

- 13 **Progress on rangewide initiative and WGW conservation plan**
- 14 **Information from meetings of Russian Interdepartmental Working Group on WGW conservation**
- 15 **WGWAP self-evaluation**
  - 15.1 Report on meeting with Panel and NGOs
  - 15.2 Panel terms of reference
  - 15.3 Communications strategy
  - 15.4 WGWAP evaluation
- 16 **Any other business**
  - 16.1 D-tags
  - 16.2 Close

**Annex 3. List of documents**

<b>DOCUMENT NUMBER</b>	<b>SUBMITTED BY</b>	<b>TITLE</b>	<b>STATUS</b>
<b>PRIMARY DOCUMENTS</b>			
WGWAP-9/1	IUCN	Provisional agenda (including time schedule) <b>ENGLISH</b>	Public
WGWAP-9/2	IUCN	Provisional agenda (including time schedule) <b>RUSSIAN</b>	Public
WGWAP-9/3	IUCN	List of documents distributed in connection with the 9 <sup>th</sup> meeting of the WGWAP	Public
WGWAP-9/4	Donovan	Preliminary report on Seismic Survey Task Force Meeting, 29 November-1 December 2010, Geneva	Public
WGWAP-9/5	IUCN	Status of Rangewide Conservation Plan (PP presentation)	Public
WGWAP-9/6		No document	
WGWAP-9/7	Mate	Preliminary report on eastern gray whale tracking in 2009-10 (PP presentation)	
WGWAP-9/8	Mate	Preliminary report on western gray whale tagging in 2010 (PP presentation)	
WGWAP-9/9	SEIC	Double Observer Experiment: Preliminary Report	Confidential
WGWAP-9/10	Dicks	Oil spills in ice – Review of MMS report	Public
WGWAP-9/11	SEIC	Marine Mammal Carcass Survey 2010 Close-Out Report	Confidential
WGWAP-9/12	Bradford	2010 Western Gray Whale Pre-Tagging and Tagging Studies	Public
WGWAP-9/13	Burdin	Preliminary results on distribution in 2009 from Russia-US team field work	
WGWAP-9/14	SEIC	SEIC 2010 Astokh 4D Seismic Survey - SSV report v2	Confidential
WGWAP-9/15	SEIC	Marine Mammal Observer Programme 2010 Preliminary Report	Confidential
WGWAP-9/16	SEIC	Marine Mammal Observations during the Piltun Astokh Seismic Survey, 2010 Close-out report	Confidential
WGWAP-9/17	SEIC	Western Gray Whale Movement, Respiration, and Abundance during Pipeline Construction off Sakhalin Island, Summer 2006	Confidential
WGWAP-9/18	SEIC	2010 Astokh 4D Seismic Survey, Comparison of modelling and monitoring results	Confidential
WGWAP-9/19	NGOs	Preliminary results of the NGO monitoring of seismic geophysical explorations at the Lebedenskoye field, July-September 2010	Public

DOCUMENT NUMBER	PREPARED BY	TITLE	STATUS
<i>FOR INFORMATION DOCUMENTS</i>			
WGWAP-9/Inf.1	US-MMS	Arctic Oil Spill Response Research and Development Program	Public
WGWAP-9/Inf.2	WWF-US	Not So Fast: Some Progress in Spill Response, but US Still Ill-Prepared for Arctic Offshore Development	Public
WGWAP-9/Inf.3	IWC Commissioners	IWC Commissioners' letter to Russian MNR regarding Lebedenskoye seismic survey 2010	Public
WGWAP-9/Inf.4	Russian MNR	Reply from Russian MNR to IWC Commissioners' letter regarding Lebedenskoye seismic survey 2010 <b>RUSSIAN</b>	Public
WGWAP-9/Inf.5	Russian MNR	Reply from Russian MNR to IWC Commissioners' letter regarding Lebedenskoye seismic survey 2010 <b>ENGLISH</b>	Public

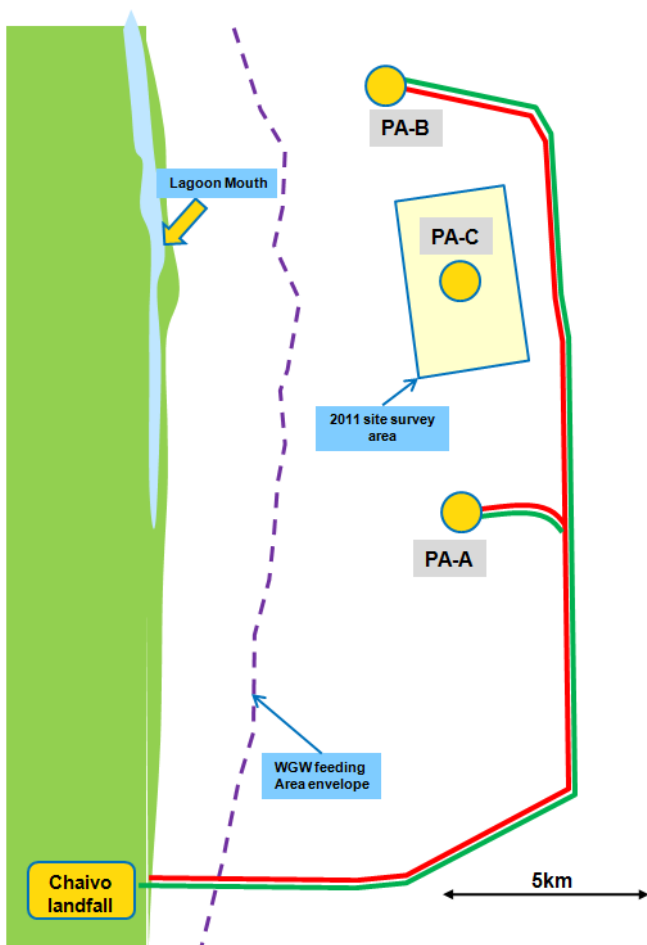
**Annex 4. Briefing by Sakhalin Energy on South Piltun Development Project (as provided by the company; unedited)**

Sakhalin Energy gave a briefing at WGWAP-9 on the South Piltun development project and its timeline, the details of the planned 2011 offshore activities, and the key issues that will need the proven WGWAP collaborative approach to maintain best practice going forward.

The purpose of this briefing was to place the panel in a position by early 2011 to assist with planning for Sakhalin Energy’s next year’s activities and thereafter to advise Sakhalin Energy on the project as a whole. Sakhalin Energy is expecting South Piltun efforts to begin making significant demands on panel time in 2011.

As part of the commitment under the Sakhalin-2 Production Sharing Agreement, Sakhalin Energy has been exploring opportunities on how to recover the undeveloped hydrocarbons in the Piltun-Astokhskoye area. Various development concepts have been considered to date, of which now only the installation of an additional offshore production platform in the area remains. This notional future development is referred to as ‘South Piltun’. It is a phased development, with a first phase of oil development, followed by a later expansion phase for gas. Sakhalin Energy decided to share the option of the platform installation with the WGWAP at a very early stage to ensure timely scientific involvement.

It is however too early to be specific about the option to be chosen or the timeline for the development. At present, Sakhalin Energy has only obtained support from the shareholders and the Russian Party to continue to study the development opportunities, aiming to select the optimal platform development concept for the oil phase in 2012 and initiate the detailed design.



Sakhalin Energy explained to the panel the key stages of any development project:

- Identify and Assess: Various options are considered with basic economics to see whether there is any justification for taking the idea further. At the end of this phase a decision is taken on whether to progress to the Select phase or to abandon the studies.
- Select: All Concept options are carefully considered and a single concept is chosen for development.
- Define: The selected option is developed to provide detailed engineering and economics. It is only at the end of this phase that a decision will be made as to whether to make the investment or not.
- Execute: Commence construction, installation, drilling and then operations.

Currently Sakhalin Energy has just completed the Identify and Assess stage for oil, and will commence Select studies in 2011.

As with all large projects they take time to develop and evaluate, and only once they are found to be sufficiently economically attractive are they presented to the Company Shareholders and the Russian Party, who review the project and take a final decision to commence construction. Other necessary approvals and consents under the Russian legislation will also be obtained prior to any surveys or installation of any facilities. Lenders' requirements on expansion will also be complied with as stated in the HSE and Social Action Plan (HSESAP)

Sakhalin Energy has briefed a sub-group of the WGWAP on these potential future development activities in Q4 2010. This was done to get early input from the panel on key issues that will need the proven WGWAP collaborative approach to maintain best practice going forward. It will hopefully also place the panel in a position by early 2011 to assist with planning for next year's offshore activities and further engagements required.

Sakhalin Energy has taken on this early steer and is currently developing a comprehensive overview of the issues and risks that will need to be addressed for the new development, making use of several previously compiled documents for offshore construction activities. This will be the basis for next year's engagements with the panel, which will focus on Short, Medium and Long Term effects on the WGW population for each of the key development concepts, including both the oil and the gas phase. Sakhalin Energy is taking into account all advice received in the past from the WGWAP on design, construction and installation of its offshore facilities. Some of the analyses and recommendations applied previously will be reviewed together with the WGWAP, in the light of new data collected over the last few years.

With regard to protecting the Western Gray Whales, Sakhalin Energy is confident that the Company is capable of operating in this area with no negative impact on the known population. We have now had a number of years' experience of successful coexistence with this Red-Book species. The results of the WGW studies and monitoring show that the WGW population is growing slowly.

**Annex 5. More detailed specifications of priority analyses to be undertaken of data collected during the 2010 4D seismic survey**

**Annex 5A. Distance estimation**

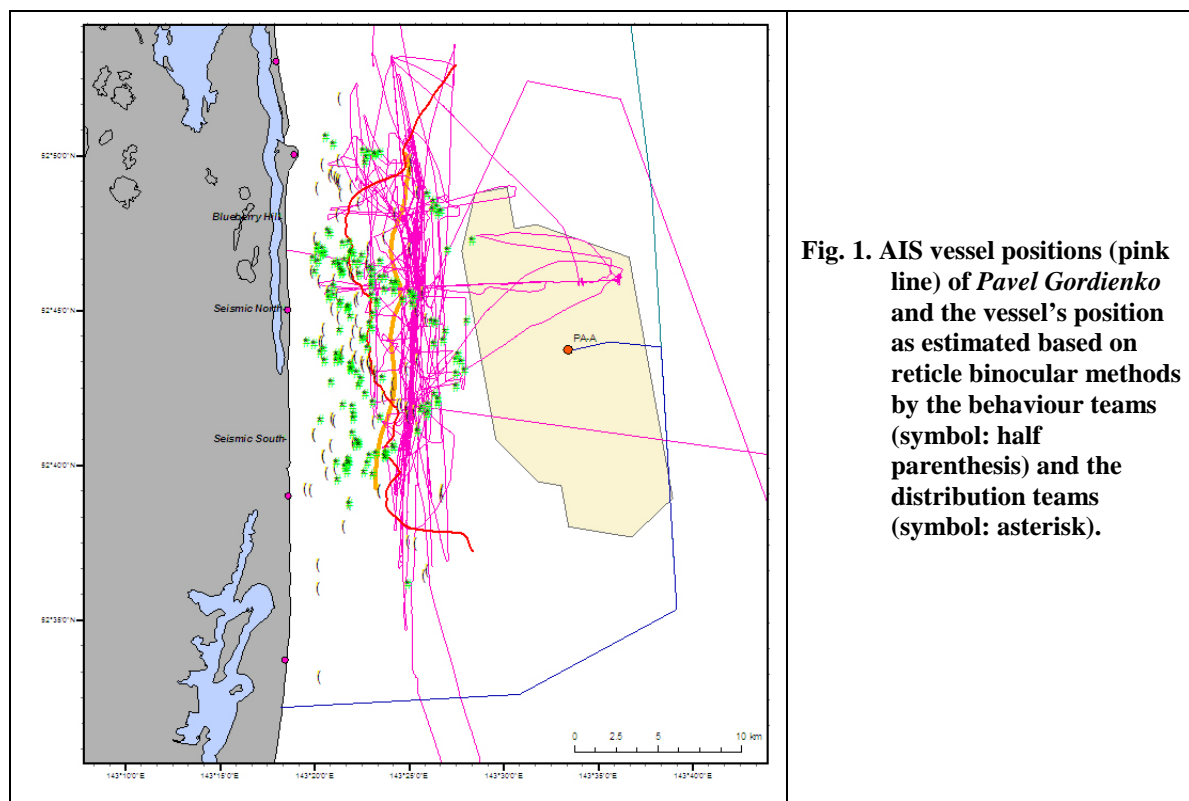
**Objective**

The objective of this study is to examine the uncertainty associated with estimates of geographic positions when using reticle binocular methods from shore and vessel platforms, and, to determine appropriate correction methods.

Fig. 1 illustrates the inaccuracy in estimating the geographic position of a vessel by reticle binocular methods from shore. Further work is required to estimate the magnitude of the inaccuracy when the vessel’s position is within range of the distance-to-horizon from the observation platform.

**Data sets and sample sizes**

The relevant data are from: (1) behavioural scans and theodolite recordings; (2) distribution scans; (3) sightings from *Pavel Gordienko*; (4) positional movements of *Pavel Gordienko* (and all AIS data). Tables 1 and 2 address questions of sample size.



**Fig. 1. AIS vessel positions (pink line) of *Pavel Gordienko* and the vessel’s position as estimated based on reticle binocular methods by the behaviour teams (symbol: half parenthesis) and the distribution teams (symbol: asterisk).**

**Table 1**

**Sample sizes of sightings of *Pavel Gordienko* from behavioural and distribution scans and whales sighted at behavioural stations while conducting theodolite recordings.**

Dataset	<i>PG (scans)</i>	Whales (theodolite)
Behaviour	158	15
Distribution	103	0
Total	261	15

**Methods**

To examine the uncertainty associated with reticle binocular methods, true positions need to be established. The positional information of the *Pavel Gordienko* and theodolite recordings of whales will be used as true positions to compare to those positions estimated by reticle binocular methods.

(1) *Vessel position comparison* - The *Pavel Gordienko* was relatively close to shore (3-7 km) throughout the seismic survey. Scan surveys recorded the position of the vessel on numerous occasions. However, it is possible that the vessel’s position was beyond the horizon, which could be recorded as a zero reticle and may not represent the true position of the vessel. Therefore, the analysis will only use data when the vessel was actually within range of the distance-to-horizon from the observation station. If the vessel was within that range, then the difference between the vessel position and that of the estimated position from binocular methods will be calculated. Plots will be generated per reticle to compare accuracies in geographic locations.

**Table 2**  
**Sightings of *Pavel Gordienko* (PG) for various reticles recorded by the behaviour and distribution teams.**

Reticle	Distribution	Behaviour
0	58	75
0.1	19	44
0.2	14	29
0.3	10	6
0.4	1	3
0.5	1	1
Total	103	158

(2) *Whale position* - Identifying a vessel, which is a constant ‘cue’, is different from a marine mammal, which is briefly seen at the surface. The observer may need to remember where he saw the animal to determine the reticle reading. On occasion, behavioural scans observed whales that were also being tracked by theodolite. Theodolite readings provide a substantially more accurate position compared to binocular estimates. The difference in location estimation of a single whale obtained both by binoculars and theodolite will be examined to determine the accuracy of binocular estimation.

(3) *Pavel Gordienko* sightings vs theodolite observations - On multiple occasions, sightings recorded from the *Pavel Gordienko* were matched by theodolite observations of what were judged to be the same animals at the same time. The sightings from *Pavel Gordienko* suffered *inter alia* from the limitation of not having a reference line (horizon) on which to base a true declination angle to the animal. Observations from the vessel and from shore will be compared to evaluate accuracy of the positional information, with the assumption that theodolite recordings provide the true positions.



## **Annex 5B. Improved information on the effect of sounds on western gray whales.**

### **Available acoustic data**

The available data (noting the number of sensors, deployment depth and operational bandwidth *i.e.* Nyquist frequency), include<sup>2</sup>:

- (1) archival data from sensors at R2-R9 locations (n=8 at ~20 m depth) providing data from 2-15,000 Hz;
- (2) archival data from sensors at P1-P3 locations (n=3 on 10 m isobath) (Fig. 1) from 2-15,000 Hz;
- (3) archival data from 2-15,000 Hz from the SSV experiment (Item 2.4.2) from sensors M1-M3, which were at distances of 0.75, 1.5 and 3.0 km, respectively, from the CPA of the easternmost (B) line of the survey area.

Data from all three sets of recorders provide over 90 dB of dynamic range. The SSTF was pleased to note that the available data are considerably better than for previous seismic surveys.

### **Available distribution and behavioural data**

The behavioural team recorded theodolite tracks for 79 whales and focal behavioural follows were conducted for 36 of those whales. Of the 36 focal follows, 3 occurred before any seismic pulses were produced, 12 during the acquisition of 'A' lines, 12 during 'B' lines, 6 during the survey period but while the seismic source was inactive, and 3 after the survey period. To minimise confounding these data with responses to the presence of nearby ships, any whale positions that were <1 km from a vessel should be excluded from analyses.

### **Available hydrological data**

To conduct the acoustic propagation modelling necessary to generate accurate RL (received level) information at the location of a given whale, it is necessary to include physical information about the water column. One of the tasks given to the *Pavel Gordienko* was to measure the conductivity (*i.e.* salinity) and temperature of the water by depth (CTD). As these CTD measurements are vital for generating accurate acoustic propagation models, they need to be made available to whoever is responsible for generating RL values. Geological information about the seabed should also be included if at all possible, as such information will further improve the model.

### **Objectives**

The objective here is to specify analyses that will be valuable for the overall assessment of potential impacts of the seismic survey on individual whales and on whale distribution within the monitored area – and hence to improve future MMPs.

The SSTF has repeatedly emphasised the need for improved understanding of the effects of sound on whales, noting the paucity of the available data. It **agrees** that these detailed, calibrated sound level data from real operations, along with the systematic observations of whale behavioural responses, are extremely valuable and warrant thorough analysis. Such analyses will greatly assist in improving mitigation measures.

### **Acoustic analyses**

For comparison with distribution data, the SSTF **agreed** that the cumulative SEL for ANSI standard 1/3 octave bands as well as cumulative broadband SEL should be calculated for each available receiver station and be presented in both tabular and graphical formats showing the day-by-day accumulation of acoustic energy received at each location.

The SSTF considered the need for additional analyses and reporting of the acoustic data for use in examining potential responses of individual whales, specifically those for which theodolite data and

---

<sup>2</sup> Notes: (a) the R1 sensor malfunctioned; (b) while not necessarily adding value to the archival data in terms of analysis it is also noted that radio-transmitted acoustic data were available in real time from sensors at the R1-R9 locations (n=9 at ~20 m depth) along the PML within the 2-2000 Hz frequency band.

focal follow tracks are available. For each reported whale location along these tracks, it was **agreed** that it would be beneficial to assess acoustic exposure in terms of several different metrics. These might include:

- Cumulative SEL (1/3-octave and broadband);
- SEL for the seismic pulse nearest in time;
- Peak SPL;
- Kurtosis of the nearest pulse;
- Signal-to-noise ratio (RMS) (1/3-octave and broadband) for the seismic pulse nearest in time.

This ‘whale-track’ level of acoustic analysis requires the use of propagation models to produce the interpolated pulses/levels at a given whale location. There is therefore a need to compare and/or integrate results from different acoustic propagation models, specifically those from POI, JASCO and Avilov. These models use different methods to calculate the propagation of acoustic energy through the water column and the substrate. A comparison of the approaches may reveal different strengths and weaknesses in methodology and subsequent refinement of future models that will be of value in the planning of future seismic surveys.

### **Integrated behavioural and acoustic analyses**

As noted during the development of the 2010 MMP, the results from Malme *et al.* (1986) are the only data available for assessing the effects of repeated acoustic pulses on individual feeding gray whales, and represent some of the only such data on mysticete whales. The data collected during the 2010 Astokh seismic survey provide a valuable addition to that dataset for western gray whales. Although some information was collected for other marine mammals (locations and estimated numbers), the data are insufficient to improve understanding of the effects of sound on those species.

Malme *et al.* (1986) measured four basic characteristics to describe the surfacing-dive behaviour of gray whales:

- (1) respiration or blow interval;
- (2) length of surfacing;
- (3) length of dive; and
- (4) number of blows per surfacing

From these, blow rates could be calculated.

For air gun sounds they recorded increased blow intervals, but the duration of surfacing, duration of dive, and number of blows per surfacing all decreased. They reported that blow rate did not change significantly except at high exposure levels, when it increased and was usually accompanied by cessation of feeding and movement away from the air gun vessel. Recovery to ‘normal’ surfacing-dive parameter values after exposure was less rapid than that for continuous noise, requiring approximately one hour (Malme *et al.*, 1986). Malme *et al.* (1986) reported a probability of 0.1 that a feeding gray whale would demonstrate such reactions at received levels of 163 dB<sub>RMS</sub>, but the first overt responses documented were at ~150 dB<sub>RMS</sub>. Other baleen whales, specifically bowhead whales (*Balaena mysticetus*), show responses to seismic pulses at substantially lower levels, beginning at ~140 dB<sub>RMS</sub> (Richardson *et al.*, 1986).

The data collected from the 2010 seismic survey are more extensive than those of Malme. In addition to data related to blow rates, the behavioural teams have precise positional information, heading (as calculated from successive surfacings and interpolated according to the methods of Gailey *et al.*, 2007), and velocity for a subset of the whales (the 36 focal follows). In addition, ‘aberrant behaviour’ (*e.g.*, breaching), if present, was recorded for all 79 individual whales.

The SSTF **recommends** that, for the 79 whale data sets described, the following analyses be conducted:

- (1) the agreed acoustic quantities be generated for each location and time logged for the whales tracked;
- (2) a 'targeted MVA' be performed that considers only the whale movement and acoustic data, testing for responses or the lack thereof to
  - (a) absolute acoustic levels
  - (b) relative changes in acoustic levels
  - (c) spectral content of received signals
  - (d) absolute position of the seismic vessel (from AIS data)
  - (e) relative changes in the position of the acoustic vessel (from AIS).

As the average duration of the whale tracks is ca. 1 hour, it is assumed that environmental variables can be ignored as they can be considered to be constant over the temporal and spatial scales being considered.

Tests should be carried out (as they relate to the received acoustic energy) for changes in:

- (1) heading (including rate of change);
- (2) respiration rate (FF);
- (3) velocity (FF);
- (4) position relative to the seismic source (as in Malme *et al.*, 1986); and
- (5) occurrences of aberrant behaviour at the location of the observed behaviour.

Subsequent to the completion of the above analyses, the SSTF also noted that new tools to analyse the movements of animals have been developed. It **agreed** that recent efforts to integrate and synthesise methods to create new frameworks should be explored in the context of gray whale movement. For example, Schick *et al.* (2009) present a new hierarchical model for animal movement. Such approaches should be explored in the process of assessing gray whale responses or the lack thereof in the context of understanding the results from the 2010 Astokh seismic survey and in the refinement of MMPs for future surveys.

### References

Gailey, G., Sychenko, O. and Würsig, B. 2007. Western gray whale behavior, movement, and occurrence patterns off Sakhalin Island, 2006, Prepared for LGL Ecological Research Associates Ltd, for Exxon-Neftegaz Ltd and Sakhalin Energy Investment Company, Yuzhno-Sakhalinsk, Russian Federation.

Malme, C.I., Würsig, B., Bird, J.E. and Tyack, P. 1986. Behavioral responses of gray whales to industrial noise: feeding observations and predictive modeling. Outer Continental Shelf Environmental Assessment Program, Final report of Principal Investigators, NOAA.

Richardson, W.J., Würsig, B. and Greene, C.R. Jr. 1986. Reactions of bowhead whales, *Balaena mysticetus*, to seismic exploration in the Canadian Beaufort Sea. *J. Acoust. Soc. Am.* 79(4):1117-1128.

Schick, R.S. 2009. Animal Movement in Pelagic Ecosystems: From Communities to Individuals. Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Ecology, Duke University.

## **Annex 6. Acoustic and behaviour monitoring for the 2D survey.**

Subgroup members: Donovan (chair), Broker, Evans, Gailey, Nowacek, Tsidulko, Racca.

### **Objective**

To increase the sample size of observations (*i.e.* 'augment Malme') by examining behaviour of gray whales during the 2D seismic survey in association with different known sound levels, recognising these will be primarily below 156 dB<sub>SEL</sub>.

This will require synchronised archival acoustic monitoring and visual behaviour monitoring.

Taking logistical information from the 2010 experience (Astokh 4D), the aim was to develop a practical approach to achieve adequate coverage. Further work is needed on some aspects.

### **Resources**

(1) 2 acoustic monitoring buoys at the 10 m and 20 m depth contours;

(2) whilst acknowledging the value of two behaviour sites and teams, the group recognised that logistically the most feasible option was to have 1 behaviour site manned by two behaviour observation teams with experienced leaders.

### **Timing**

The equipment and teams, as for the seismic vessel, need to be in place as early in the season as possible but certainly by the start of the seismic survey. The aim will be to have at least one week of coverage after the seismic survey is completed, weather permitting.

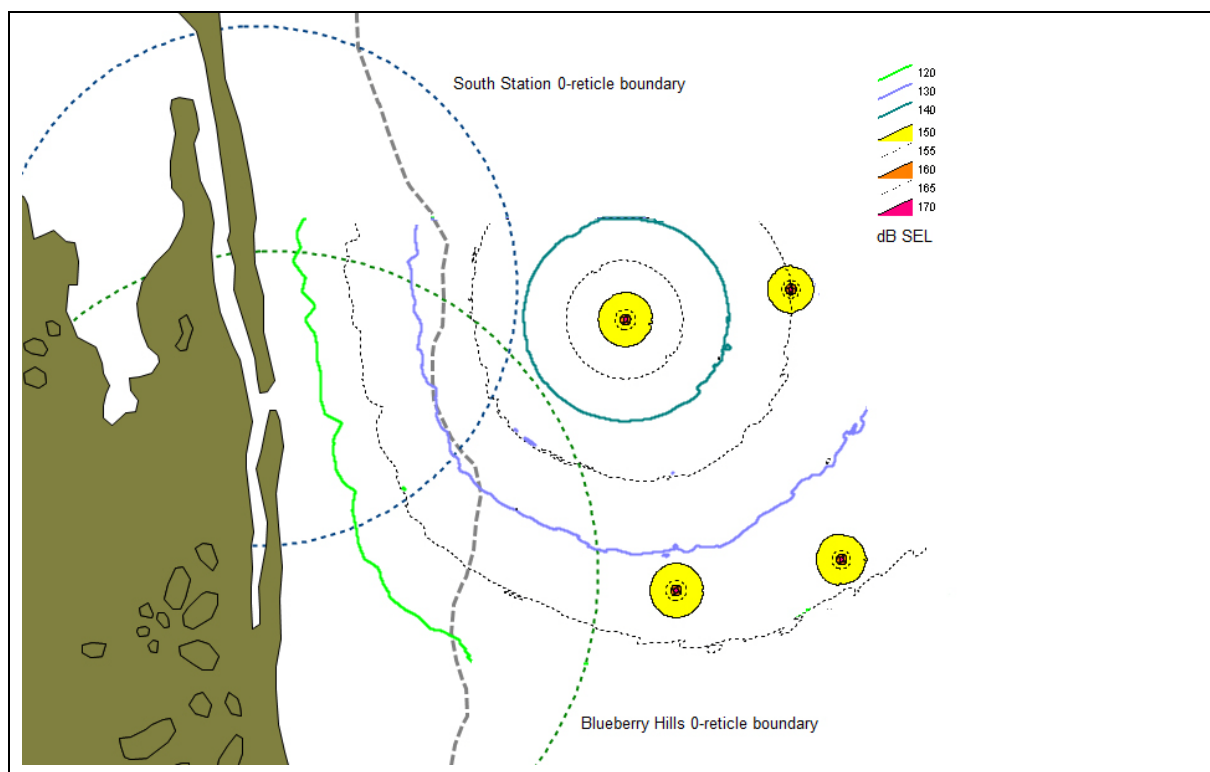
### **Positioning**

The ideal location for the behaviour observation site would be Blueberry Hill (good elevation) with an alternative site to the north of that (South Station), which has been used by Gailey's team before (would require tower). Further work looking at the relevant logistics for the options is required and will be undertaken. Broker and Gailey will arrange for this to occur.

The locations of the acoustic buoys will be decided based upon the location of the behaviour observation teams and their visual range, with the objective of being able to model the best received sound levels for sightings made by the behaviour teams. Racca and Nowacek will investigate this.

### **Further work/decisions/recommendations**

This should be possible to achieve by email.



**Fig. 1. Projected sound levels and projected (maximum) visual range for the two behaviour site options**