REPORT OF THE JOINT PROGRAMME TASK FORCE AT ITS 2ND MEETING

19 MAY 2016

GLAND, SWITZERLAND

CONVENED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE

CONTENTS

ACRONYMS

AUAR	Automated Underwater Acoustic Recorder
Company	Sakhalin Energy Investment Company Ltd.
DMSO	Dimethyl Sulfoxid
DNA	Deoxyribonucleic acid
ENL	Exxon Neftegas Limited
FRC	Fast Rescue Craft (with jet drive)
IFC	International Finance Corporation
IISG	Interim Independent Scientists Group
ISRP	Independent Scientific Review Panel
IUCN	International Union for Conservation of Nature
IWG	Interdepartmental Working Group on the Conservation of the Okhotsk-Korean (Western) Gray Whale Population (IWG) of the Russian Federation
IWC	International Whaling Commission
Joint Programme	Sakhalin Energy/ENL Joint Programme on Gray Whale Monitoring and Research
JPTF	Joint Programme Task Force
MMO	Marine Mammal Observer
MNR	Ministry of Natural Resources and Ecology of Russian Federation
NGO	Non-Governmental Organization
NTF	Noise Task Force
Panel	Western Gray Whale Advisory Panel
POI	Pacific Oceanological Institute
PS6	IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012)
PSA	Production Sharing Agreement
PSTF	IFC Performance Standards Task Force
WGWAP	Western Gray Whale Advisory Panel

1 INTRODUCTION

The 2nd meeting[1] of the Joint Programme Task Force (hereafter JPTF) was held at IUCN Headquarters, Gland, Switzerland, on 19 May 2016 under the co-chairmanship of Greg Donovan and Randall Reeves. The list of participants is given as Annex A.

Stewart Maginnis, Director of Nature-based Solutions Group at IUCN, welcomed participants on behalf of the Secretariat and expressed his commitment to the Western Gray Whale Advisory Panel (WGWAP or Panel) and other IUCN panels. He appreciated the achievements of WGWAP and was impressed by its impact on efforts to conserve western gray whales. He thanked Reeves and Donovan for their leadership of the Panel and Stephanie Lock, the Sakhalin Energy (also referred to as the Company) team and all Panel members for their commitment. A good measure of progress, according to Maginnis, was the recent increase in recognition of WGWAP's and IUCN's work by officials in the Ministry of Natural Resources and Ecology of the Russian Federation (MNR).

The aims of this meeting were 5-fold, to: (1) brief all participants on opportunities, constraints, timeframe and procedures for determining the future Sakhalin Energy/Exxon Neftegas Limited (ENL) Joint Programme on Gray Whale Monitoring and Research; (2) specify how and when the Panel is expected to provide its advice; (3) identify essential (and perhaps also optional) elements of the programme and to list and prioritise questions or hypotheses that the programme should be designed to address; (4) begin the process of determining approaches, methods, logistics, personnel etc. needed to implement such a programme; and (5) agree on a workplan and schedule for delivery of relevant Panel advice through 2016. It was understood that follow-up actions as agreed by the JPTF would be pursued by the relevant parties according to the agreed workplan without the need to await a formal Panel report.

The meeting agenda is given as Annex B. The list of documents and presentations is given as Annex C, along with information on their availability.

2 PRESENTATIONS BY SAKHALIN ENERGY

2.1 Update on Sakhalin Energy/ ENL Joint Programme planning beyond 2016

These presentations were intended to (a) summarise progress made to date by the two companies in planning the programme beyond 2016, including continuations, changes, constraints due to regulatory requirements/challenges, funding limitations, obligations to Lenders etc., and (b) set forth Sakhalin Energy's vision of how and when the Panel's advice is expected.

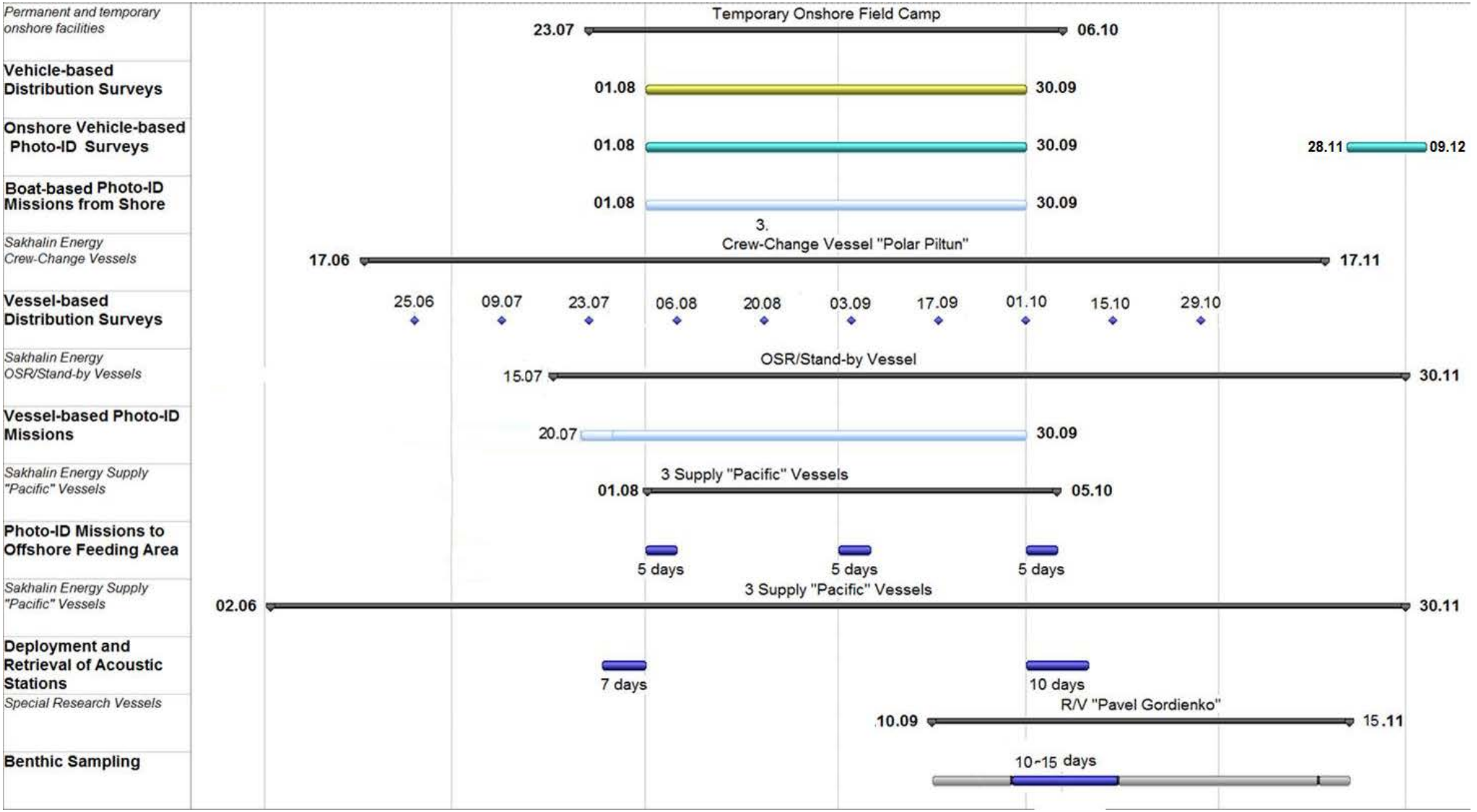
2.1.1 Scope of work for Joint Sakhalin Energy/ENL 2016 Gray Whale Monitoring Programme

Samatov indicated that the Scope of Work for 2016 had already been submitted to Russian authorities and given official confirmation and therefore it would be essentially the same as in 2014 (Figure 1). He summarised the main elements as follows:

- The onshore distribution survey will involve visual observation by two vehicle-equipped teams of three people, visiting the usual stations and operating from 1 August through 30 September;
- Vessel-based distribution surveys will be conducted using Sakhalin Energy crew change vessels with four Marine Mammal Observers (MMOs), running from the end of June to the end of October;
- The benthic component will use a special research vessel and sample the standard grid of stations in late September and early October;
- Vessel-based photo-ID effort will be carried out using small, jet-powered Fast Rescue Craft (FRC) based on the three Sakhalin Energy supply vessels, in good weather, from 20 July to 30 September;

[1] An ad-hoc Joint Programme Task Force with a different remit met in February 2013: http://www.iucn.org/western-gray-whale-advisory-panel/panel/task-forces/joint-programme-task-force

Figure 1. Overview of 2016 Joint Programme operating schedule



- Shore-based photo-ID and biopsy effort from small boats will be carried out from the same two camps as in previous years from 1 August through 30 September;
- Shore-based photo-ID from vehicles will operate throughout August and September, and then again from the end of November until 10 December;[2]
- Acoustic and hydrological monitoring will be carried out using Sakhalin Energy supply vessels to deploy, maintain and recover Automated Underwater Acoustic Recorder (AUARs) at the standard 13 monitoring stations. It will involve five people working from the end of July until early October.

2.1.2 Discussion

It was noted that in the absence of participation by ENL, progress towards developing a new or renewed Sakhalin Energy/ENL Joint Programme, at least within a WGWAP context, will necessarily be limited.

Panel members asked for clarification concerning the locations of the benthic sampling stations, noting that shallow near-shore waters in the Piltun region are important for feeding, especially by mothers with calves. Samatov confirmed that no sampling would be attempted in waters less than 8m deep, which is the shallowest at which the vessel can operate. He considered the existing sampling design and methods to be adequate because the whales' primary benthic prey occur mainly in depths of 5-15m. He further confirmed that it was too late at this point to consider any changes in 2016, and that the use of divers for benthic sampling would not be considered for safety reasons.

Samatov also confirmed that contrary to previous informal reports, the companies plan to continue collecting gray whale biopsies in 2016 to support the genetic studies that are underway under their sponsorship.

2.2 'Refreshing' the Sakhalin Energy/ENL Joint Programme (Document JPTF-2/2)

Lock began by reminding participants that Sakhalin Energy and ENL have been sharing the costs of the programme and noting that the Interdepartmental Working Group (IWG) on the Conservation of the Okhotsk-Korean (Western) Gray Whale Population of the Russian Federation, under the auspices of MNR, has asked the companies to prepare a summary of their future plans at its November 2016 meeting. She also noted that the independent Russia Gray Whale Project (formerly the Russia-US Programme) has also been invited to present a summary of its programme and plans at the November 2016 IWG meeting.

According to Lock, industry-funded gray whale research and monitoring programmes began in 1997, and there have been significant changes within both companies since then. In the first 20 years, many of their activities centred on infrastructure construction whereas by next year (2017) they will both be in long-term operational (production) mode. During the operational phase, it is expected that the companies will come under increasing pressure from the Russian Party[3](and other stakeholders) to demonstrate value from the Sakhalin Energy/ENL Joint Programme.

The Sakhalin-I and Sakhalin-II projects both operate under Production Sharing Agreements (PSAs)[4] with the Russian Federation. As such, these projects are accountable to their respective Authorized State Body of the Russian Federation for budget approval and stewardship of any and all programs. Other companies that operate in the region do not operate under PSAs and are not involved in the Sakhalin Energy/ENL Joint Programme. Their obligations for wildlife and environmental protection fall entirely under relevant Russian Federation legislation.

Importantly, Lock stated that if the IUCN Red List of Threatened Species™ classification of western gray whales were to be changed from Critically Endangered to Endangered, expectations for the companies in terms of monitoring the Sakhalin whale population and making efforts to mitigate any potential impacts of their activities on the whales would remain the same.

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[2] This second stint is planned because of interesting results during that time interval in a previous year

[3] The Russian Federation Government and Sakhalin Oblast Administration represent the Russian Party in the Production Sharing Agreement (PSA) signed between the Russian state and Sakhalin Energy (and similarly also ENL).

[4] A Production Sharing Agreement (PSA) is a commercial contract between an investor and the state. According to a PSA, the state grants an investor an exclusive right to develop a mineral deposit or an oil and gas field and the investor develops the field or deposit using its own resources and at its own risk.

Although the Sakhalin Energy/ENL Joint Programme is subject to state approval and is cost recoverable, the WGWAP process is not recognised as essential by the Russian Federation and therefore its associated costs must be covered by shareholders. The transition to a 'steady-state' operational phase comes with an expectation by Sakhalin Energy to reduce costs.

Lock also acknowledged that low oil prices over the past year have had an effect on the Company's planning and ability to fund activities. Some savings have been achieved since 2015, without cutting back significantly on any of the Sakhalin Energy/ENL Joint Programme components. However, continuing low oil prices would put the 2017 Sakhalin Energy/ENL Joint Programme under further scrutiny and there is a strong need to continue to demonstrate the programme's value.

2.2.1 Discussion

Several participants expressed concern that the brevity of IWG meetings generally makes it impossible to engage in in-depth presentations and discussions of the kind that would be required for serious evaluation of proposed changes to the Sakhalin Energy/ENL Joint Programme. Therefore, it was suggested that providing ample time and opportunity for the Panel to consider and comment on the companies' proposals and plans would be useful. Sakhalin Energy concurred.

It was pointed out that other operators (besides Sakhalin Energy and ENL) would, as usual, be invited to the forthcoming IWG meeting, but it was not known whether or to what degree they would participate. To date, the IWG has not tried to impose any gray whale monitoring or mitigation requirements on those other operators, but MNR can do so if it chooses to.

ENL has not formally subscribed to the International Finance Corporation's (IFC) 2012 Performance Standards on Environmental and Social Sustainability (hereafter IFC Performance Standards). This may or may not have future implications for maintaining the Sakhalin Energy/ENL Joint Programme.

In response to a question, Lock confirmed that the South Piltun (PA-C) development was currently considered uneconomic and it is impossible to say if and when it might again be part of Sakhalin Energy's long-term planning.

Participants agreed that this JPTF meeting would not generate any formal recommendations, but it was generally understood that it would be appropriate for such recommendations to result from the next JPTF meeting such that they would then be considered by the Panel at WGWAP-17. Lock noted that she did not foresee a great deal of intersessional work by the Company concerning changes to the Sakhalin Energy/ENL Joint Programme (e.g. developing proposals for the JPTF and/or the Panel to consider before or during the November 2016 meetings). She acknowledged that the Company currently has less internal capacity for analytical work as well as less flexibility to have such work carried out by contractors than was the case, at least for some periods of time, in the past. Nonetheless, optimization of the Sakhalin Energy/ENL Joint Programme is a priority, so it is important to identify relevant analyses, including analyses of data in-hand.

As a matter of clarification, Lock explained that the Sakhalin Energy/ENL Joint Programme's scope was likely to be the same in 2017 as in 2016 (the companies' budgets for 2017 were already being finalized in May 2016), and therefore major changes should not be expected until 2018. She added that in fact some changes could be made in 2018 with more made in the following years. In other words, there is no fixed, firm deadline by which the programme's renewal must be completed.

2.3 Objectives of the Sakhalin Energy/ENL Joint Programme

Lock summarized the objectives of the current Sakhalin Energy/ENL Joint Programme as to:

(a) monitor the spatial and temporal distribution, abundance and population dynamics of Sakhalin gray whales;
(b) gather information on the whales' demography and ecology;
(c) understand the genetics of the population that uses the Sakhalin feeding areas;
(d) describe the composition of benthos and estimate food availability and the sustainability of feeding habitat;
(e) investigate hydrological parameters that may affect benthos production;
(f) measure ambient noise and the sound exposure of whales in feeding areas that is due to human activities;

(g) develop science-based mitigation and management measures;
(h) monitor and describe whales' behaviour, particularly during human activities such as seismic surveys;
(i) update knowledge and disseminate results and findings from the monitoring and research of the Sakhalin Energy/ENL Joint Programme; and
(j) fulfill requirements of Russian Federation environmental legislation.

Lock provided a preliminary list of the Company's view of the achievements of the Sakhalin Energy/ENL Joint Programme to date, intended to stimulate discussion. This preliminary list was as follows:

(a) capacity building in Russian research institutes, specifically regarding whale research and monitoring;
(b) identification of returning and/or new calves and non-calves through extensive photo-identification;
(c) estimates of Sakhalin gray whale numbers and population dynamics;
(d) determination of timing and duration of the main feeding period of gray whales off Sakhalin;
(e) identification of two distinct feeding areas off Sakhalin: Piltun (near-shore) and Offshore;
(f) identification and documentation of a (possibly 'secondary') feeding area off Kamchatka Peninsula;
(g) assessment of benthic prey fields off Sakhalin (species, locations, abundance etc.);
(h) measurements of anthropogenic noise and progress in the development of acoustic monitoring technology;
(i) recognition that human activity has not deterred gray whales from returning to feed at Sakhalin;
(j) body condition of whales improves during the feeding period and the proportion of the whales regaining condition over the summer is within the presumed range of natural variability;
(k) development and application of satellite-linked tagging and telemetry, yielding significant scientific insights concerning gray whale movements and phenology;
(l) DNA analyses from biopsies providing high-quality information on population genetics;
(m) no evidence has been obtained thus far to indicate that Sakhalin gray whales use a separate breeding area from those used by 'eastern' gray whales;
(n) increasingly, whale experts are referring to Sakhalin gray whales as a 'feeding aggregation';
(o) with assistance of scientific and technical experts, development and implementation of rigorous measures to minimize risks to gray whales from company activities, and making information concerning these measures available to the wider oil and gas industry through report sharing, presentations and publications;
(p) observation and description of unmitigated threats to gray whales at Sakhalin posed by non-industry activities (e.g. entanglement in fishing nets, lines and equipment; close approaches by tourist vessels) and bringing these threats to the attention of authorities.

Participants recognized that this was a preliminary list, and thanked Lock for offering it as a 'strawperson' for discussion. Lock emphasized that the list of Sakhalin Energy/ENL Joint Programme objectives, in particular, reflects the perspectives of both companies and it refers specifically to the Joint Programme only. As such, it should not be interpreted as pertaining to one-off or exceptional activities such as those related to construction (e.g. platforms, pipelines, pilings, piers) or seismic surveys which are undertaken and monitored individually by one company or the other.

2.3.1 Discussion

Lock's presentation stimulated a number of comments from Task Force members, as it was intended to do.

It was noted that aspects of the Sakhalin Energy/ENL Joint Programme have changed over the years since 2006 when WGWAP was established. For example, the shore-based behaviour and aerial survey components were eliminated, genetic sampling was introduced, the photo-ID component was expanded in terms of number of field teams and platforms, the regular field season is now shorter and Sakhalin Energy's own vessels are now used for much of the work (rather than dedicated research vessels as in the past). These changes have been driven at least partly by reduced budgets and shifting priorities within the companies.

Several members stressed the importance of having distribution and behaviour data from early in the season, starting no later than early July. Without such data for years with relatively little noise-producing activity, it will remain difficult to interpret the early-season data collected by the companies in years with seismic surveys or other potentially disturbing activities. Without such data, the idea that the most effective mitigation measure for seismic surveys is to begin and complete them as early in the season as possible will remain untested.

It was noted that few of the items on the list of achievements appear to be based on peer-reviewed publications. Such a list would be accorded greater credibility if the items on it were supported by relevant publications, including, whenever possible, multiple studies that use different approaches to address a given question and studies that are integrative, synthetic or comparative. Lock indicated that Sakhalin Energy would be receptive to suggestions of how to close information gaps over the next year or two, using data that have been collected by the programme to date to build a stronger record of peer-reviewed publication. Such a process could help guide future planning by identifying elements of the programme that should be modified, strengthened or discontinued in view of data needs. The companies may wish to consider suspending fieldwork altogether for a year, or even two, and concentrating resources instead on the completion of scientific manuscripts for publication.

It was also stressed that data collection alone is only a partial achievement. Rigorous analysis of the data is essential before any meaningful achievement of a research or monitoring programme can be claimed. Also, in listing either the objectives or the achievements of a programme, it is important to distinguish between objectives and methods and to avoid confusing the application of methods towards reaching an objective with the actual achievement of that objective. Also, there is always a need to recognize the difficulty of determining and attributing causation. For example, changes in the abundance of gray whales off Sakhalin could be due to a variety of factors and, unless the evidence were strong and pointed directly and unambiguously to a single factor, any claim regarding credit (or blame) would need to couched in uncertain terms.

In a similar vein, some claims concerning credit for scientific findings (e.g. genetic analyses) require acknowledgement of the role(s) played by other groups (e.g. the Russian Gray Whale Project) or individuals, and not only those associated with the Sakhalin Energy/ENL Joint Programme.

Regarding objectives, it was noted that consideration should be given to the distinction between short and long term. In the short term, concern may centre on the acute effects of specific activities, whereas over the longer term what matters most is to prevent the chronic deterioration of habitat quality which would lead to broader and more lasting 'biodiversity' loss. The lack of any reference to cumulative effects (or impacts) in the list of objectives was noted.

Panel members suggested several avenues of research that they believe should be strengthened in the Joint Programme. This included (a) a more focused and analytical investigation of the forces and processes responsible for creating the exceptional benthic productivity in the two identified gray whales feeding areas off Sakhalin, (b) more emphasis on evaluation of the effectiveness of mitigation measures and (c) greater effort to improve understanding of gray whale population structure. Although these themes may be implied in the programme objectives as listed above, it was suggested that more explicit reference to them in the objectives would be appropriate. It was also suggested that consideration be given to framing the objective on measurement of underwater sound in terms of striving 'to minimize the exposure of gray whales to human-caused underwater sound'. In that way, the objective would be made clear, and the work of measuring and assessing exposure would be placed in a purposeful context.

It was stressed that some of the objectives concerning the gray whales themselves could not be met by relying solely on samples and data collected at Sakhalin. Regarding demographic aspects such as genetic distinctiveness, for example, samples from other areas are needed for full and meaningful analyses. Therefore, the concepts of cooperation and coordination (if not also collaboration) with other researchers working in other parts of the species' North Pacific range should be incorporated somehow into the JP's scope and methods.

Finally, Panel members reiterated their often-expressed concerns about information sharing, particularly as the lack of timely and full access to data and information could limit the Panel's ability to contribute to the companies' planning of the Sakhalin Energy/ENL Joint Programme.

2.4 Preliminary programme strategies

Lock continued her presentation of document JPTF-2/2 with a list of preliminary Sakhalin Energy/ENL Joint Programme strategies and associated programme elements (Box 1), which she noted were intended to take a long-term horizon (10 years, or even further considering the 20-30 year operations phase of Sakhalin 2). She again stressed that

this list had been produced jointly by Sakhalin Energy and ENL, and that it reflects initial thoughts and should not be interpreted as 'final' in any sense. The companies intend to consider an array of options – increase, reduction, modification, etc. – for each program strategy and component based on objectives and needs. Lock also once again stressed that discrete activities such as seismic surveys would require separate monitoring and mitigation plans, which would be developed outside the Sakhalin Energy/ENL Joint Programme by the company involved.

Each proposed strategy in the table was briefly considered by Lock, as follows:

(1) The companies consider photo-ID work and distribution surveys to be valuable. The vehicle-based photo-ID programme seems unlikely to be retained, however, as it is not considered cost-effective due to the many hours that need to be spent in the field. Should new technologies be considered?
(2) How much more investment should the companies make in genetic sampling and analysis? Biopsies have now been collected from approximately 80 individual whales (to be confirmed following analysis). Additional sampling in 2016 might increase the fraction of the total Sakhalin population sampled to more than half. Additional satellite-linked tagging should be considered only if it contributes to the Sakhalin Energy/ENL Joint Programme objectives. International, multi-stakeholder funding may be needed (to which Sakhalin Energy would consider contributing);
(3) Such extensive acoustic monitoring may no longer be necessary, and it may prove desirable to continue it only for specific activities, e.g. during seismic surveys;
(4) Sakhalin Energy is willing to consider a range of options for benthic sampling, e.g. could the sampling be carried out every two years? Could it stop entirely? Are the companies' activities likely to be having any negative impact on the benthos?
(5) Under data sharing and publications, the wording 'continue to encourage' could be strengthened.

2.4.1 Initial discussion

Several participants expressed unease with the way the companies had proceeded to develop strategies, albeit it provisional or preliminary ones, on the basis of programme objectives that were themselves described as tentative and subject to modification, presumably at least partly as a result of discussions in the JPTF, which have just begun with this meeting. Under the objectives as currently framed and stated, it may be difficult to agree on issues related to data collection, analytical methods and conclusions drawn. For example, most of the objectives refer to learning about and monitoring the whales and their environment, and several of the suggested achievements and proposed strategies are based on conclusions drawn by the companies from the work of the Sakhalin Energy/ENL Joint Programme. Some Task Force members questioned whether under the circumstances it would be possible to have open, serious discussions about alternative methods, analytical approaches and interpretations of results. All participants agreed, however, that strategies for future activities of the Sakhalin Energy/ENL Joint Programme need to be based on objective evaluation of the strengths and weaknesses of the programme to date, all in the light of objectives set by the companies.

The Task Force agreed that the potential of new technologies (animal instrumentation, remote sensing, unmanned vehicles etc.) to enhance data collection should be carefully evaluated. Also, the companies will need to bear in mind that the removal or scaling back of some aspects of the programme may have unintended and unwelcome consequences. For example, if behaviour is monitored only during periods of potential disturbance, it is impossible to make meaningful comparisons to whale behaviour in the 'natural' state. Also, the removal of certain elements of the programme could limit or even preclude the companies' ability to assess or monitor cumulative effects, assuming that such ability is, or becomes, a priority.

Box 1. Preliminary Sakhalin Energy/ENL Joint Programme strategies for discussion

Programme strategies	Programme elements
1. Monitor and describe the **numbers**, **distribution**, and **condition** of gray whales off Sakhalin	• **Photo-ID & distribution** (a) Annual (b) Shore-based teams using observation towers (c) Shore-based small vessel programme (provides the best-quality data) (d) Vessel-based programme using vessels of opportunity from Sakhalin Energy's or ENL's fleet (provides both photographic and distribution data from the Offshore feeding area) (e) Vehicle-based photo-ID programme unlikely to be retained on cost-benefit basis (f) Use photographs to classify body condition (g) Maintain and regularly update a population model of the gray whale population (numbers, reproduction, trends) (h) Consider possibility of using new technologies (drones, satellite imagery, innovative tags) • **Necropsy and whale health** (a) Although such studies are considered worthwhile, the companies have neither expertise nor authority, hence this is not being considered under the Joint Programme scope
2. Understand the population's **composition** (sex and age structure) and **parent-offspring and other family relationships**, and **affinities** with 'eastern' gray whales	• **Genetic analyses** (a) Companies currently have samples in storage from approximately 80 individual whales (to be confirmed following analysis) (b) The 2016 season presents an opportunity to increase this to more than 50% of Sakhalin population (estimated > 90 samples) (c) Advice from geneticists will inform companies on sample size deemed adequate to achieve objectives • **Geographical life cycle** (a) More satellite-linked tagging should be undertaken by companies only if this contributes to the Sakhalin Energy/ENL Joint Programme objectives (b) This subject requires discussion between companies and Bruce Mate (Oregon State University, Marine Mammal Institute) to understand latest possibilities and determine benefits (c) Broader studies should be part of an internationally funded programme, to which companies may consider contributing
3. Monitor and describe the **behaviour** of gray whales off Sakhalin	• **Acoustics** (a) Significant quantity of data already collected to demonstrate changes in sound levels attributable to routine company operations (b) Consider continuing acoustics program only for specific activities (e.g. seismic surveys, piling and construction projects) and exclude from the annual Joint Programme (c) Companies can consider the Joint Programme as a contribution to knowledge of cumulative effects of seismic surveys • **Behavior observation and analysis** (a) To be conducted only for specific activities (e.g. seismic surveys)
4. Monitor and describe the extent and composition of vital gray whale feeding habitat	• **Benthic sampling** (a) Consider monitoring every other year, or exclude component (benthos not being affected by company activities) and resume only in case of significant change in data obtained from Strategy 1 or by a third party • **Whale foraging and energetics** (a) Although such studies have scientific value, the companies do not believe there is any causal link with their activities or any relevance to the Joint Programme objectives, hence this element is not being considered as part of the 'refreshed' Joint Programme scope (b) This could be incorporated in a broader program with national or international funding
5. Data sharing and publications	• **Publish information** produced by the programme for use by the wider industry and agencies (a) Continue to encourage Joint Programme scientists to present their research at international conferences and in scientific peer-reviewed journals (b) Continue to publish information on monitoring and mitigation programmes for use by broader industry • **Data-sharing and shared decision-making** (a) Photo ID catalogue matching… to be discussed (b) Data sharing… to be discussed

3 RESEARCH COMPONENTS IN THE LIGHT OF OBJECTIVES AND SUB-OBJECTIVES

3.1 Acoustics

3.1.1 Control station(s)

This item had been discussed at length during the preceding Noise Task Force (NTF) meeting (see NTF-10 report) and it was concluded that there is value in maintaining the existing acoustic station while also deploying an additional station in a 'quiet' area to measure 'natural' background acoustic conditions. It was agreed that more work was needed to decide on the exact location of this second control station.

3.1.2 Routine monitoring

Any decision to discontinue the routine acoustic monitoring programme and monitor only during specific noise-generating activities would mean losing the ability to assess cumulative effects. According to Lock, the companies are not convinced that it is their responsibility to monitor cumulative effects, but this matter remains open for discussion. An intermediate step might be to reduce the scale of routine monitoring but then intensify the monitoring effort in years with exceptional activities. The monitoring of cumulative effects may not require a full programme of the scale undertaken in recent years but instead deployment of only a subset of the stations.

3.1.3 Event-specific monitoring

To date, event-specific monitoring has been undertaken by the two companies separately, not as part of the Sakhalin Energy/ENL Joint Programme. It was suggested that there could be some advantages to changing this pattern. For example, by combining forces, the companies would be able to make more efficient use of personnel, share methods and equipment, undertake collaborative analyses and increase the statistical power of those analyses by pooling their data. The Task Force encouraged Sakhalin Energy to discuss this approach with ENL.

As the quality, precision and capabilities of instruments improve and costs go down, many aspects of data management and analysis become within easier reach of companies like Sakhalin Energy and ENL. By looking for and seizing opportunities to incorporate newer and better tools, at least some of the companies' monitoring activities should become more affordable and routine.

3.1.4 Hydrological measurements

Racca drew attention to the often large between-year variability in flow from the Amur River, and the significant resultant variation in salinity along the east coast of Sakhalin Island. The deployment effort to obtain hydrological measurements is a relatively simple operation that involves winching a probe over the side of a vessel and down through the water column. However, acquiring systematic hydrological data from a predetermined transect grid may be more problematic now since the acoustics programme no longer has access to a dedicated vessel.

3.1.5 Long-term acoustic monitoring

As suggested above (Item 3.1.3), decisions on whether to continue, modify or abandon the Joint Programme's acoustics programme should be made bearing in mind that the costs of monitoring are much lower now than they were a few years or a decade ago. Simple bottom-mounted units without surface buoys or transmission capabilities can be used, and they can be deployed easily from inflatables. Battery packs can last the entire season without being replaced. Some programme components, such as transmission loss measurement that requires the use of an active source (which can affect marine animals), are no longer necessary.

It was suggested that the programme focus should be on continuous monitoring over the entire whale season to ensure that noise from company activities is appropriately managed. Also, it was suggested that consideration be given to the desirability and feasibility of monitoring whale sounds in the feeding areas.

3.1.6 Other

There was some discussion of newly available devices ('tags') that are deployed on the whales themselves to measure received sound and acquire other types of data; the value of these has been stressed in previous Panel and NTF reports. It was also noted that for some species (but not gray whales, so far) new approaches are becoming available to estimate calling rates and use such rates to produce density estimates from acoustic monitoring data.

3.2 Whale behaviour

Most of the monitoring of gray whale behaviour at Sakhalin has occurred during periods when noise-generating activities (construction, seismic survey etc.) were underway, and even when effort has been made to collect data on 'undisturbed' behaviour (e.g. immediately before a seismic survey begins), the field teams have often encountered technical and logistical difficulties (e.g. due to ice, adverse weather conditions) that limited the quality and quantity of data obtained. Much of the discussion under this item of the agenda was devoted to considering how newly available technology might enable the companies to acquire and analyse behavioural data more efficiently.

As is true of any research programme, the first step should be to determine the questions to be addressed and the types of data and analyses required to answer them. In other words, in this instance the approaches and methods should be driven by the questions the companies want or need to answer. One simple example would be, "How long do the whales spend in the area?" This means the companies need to know when the whales begin to arrive and when they begin to leave the feeding areas, how their density changes during the time of occupation and, importantly, how these parameters vary from year to year. The whales' 'residence time' could be considered a possible indicator of the impact of disturbance by industrial activity, though other hypotheses would need to be considered as well (e.g. changes in prey densities, disturbance by fishing or tourism).

'Medium-term tags' (which can record data for up to three weeks) are now available that record an animal's position, orientation etc. and allow the possibility of identifying and quantifying feeding events. Such tags offer the possibility of monitoring behaviour on a scale somewhere between very precise (one or a few days) and fairly coarse (months, mainly to track long-distance movements). This could help answer some key questions about gray whale feeding and ecology that have not even been asked thus far (at least within the scope of the Sakhalin Energy/ENL Joint Programme), such as how do gray whales actually use the feeding areas, how do they find and partition resources, how long is a feeding bout, are 'mud plumes' reliable indicators of a 'successful' feeding dive or are some of them exploratory, do gray whales re-visit or avoid feeding pits, and how (if at all) does noise disturbance alter the feeding behaviour of the whales (also see Item 3.4.1)? During the discussion it was pointed out that the recent deployment of newly developed tags on blue whales to acquire fine-scale data on diving and prey increased the power of certain analyses by five-fold.

As discussed in some detail in the report of the Performance Standards Task Force (PSTF-1 report), analyses of the behavioural responses of gray whales to seismic surveys at Sakhalin have had insufficient power to detect small or moderate effects. This signifies a need for the companies to make a rigorous inventory of the kind, quality and quantity of data already available, consider how those data have been analysed to date, and seek ways to use the data to maximum effect. The desirability of pooling data, with due regard for potentially confounding variability caused by differences in personnel, equipment and methods, should be self-evident.

In recent studies, researchers have experienced difficulties keeping tags attached to gray whales in feeding areas. More development and testing are clearly needed, but at the rate of current development in this field, the companies should investigate and keep up-to-date with developments. Lock reported that both companies had seriously considered deploying new tags in 2015 (as part of monitoring related to the seismic surveys), but were discouraged from doing so by the challenges of complex logistics, planning etc.

The use of drones is becoming almost routine for collecting data on behaviour (and body condition, health etc.) of many marine mammals, including gray whales.

In conclusion, there was general agreement by the Task Force that behavioural monitoring is not essential every year and event-specific monitoring should be adequate. Acoustic monitoring of 'baseline' conditions during years with no major noise-generating activity, together with an occasional well-planned effort to collect good data on whale behaviour in undisturbed conditions throughout the ice-free season (using visual observers and/or tagging) should make it possible to assess the impacts of specific events. Years without seismic surveys or other noise-generating activities should be regarded as opportunities not only to obtain needed baseline data, but also to train researchers and technicians and to test novel field methods and equipment. Similarly, years with noise-generating activities should be seen as opportunities for carrying out quasi-controlled experiments to learn more about behavioural responses. For example, if instruments could be deployed, preferably on a number of animals, well before a survey begins, with data continuing to be acquired during and between noisy periods as well as for a time after the survey is completed, this would likely lead to a major advance in understanding.

A central purpose of behaviour analyses in the Sakhalin context is to establish and characterize any causal links between industrial activities and trends in whale occurrence or behaviour. One approach is to determine which causal factors that might underlie an observed trend can be 'ruled out'. However, such a process is necessarily influenced by the slow dynamics of the animals. That is, there can be a considerable time lag between the activity that triggers, or begins a chain of events that eventually triggers, a change in use of the area by whales and the detection of such a change, e.g. by observation of fewer whales coming to Sakhalin or of those that come spending less time there. Both companies recognize this challenge and the mitigation measures they take are proactive or precautionary. To the extent possible, everyone involved wants to avoid waiting until a problem has been detected to initiate diagnosis acting to prevent or mitigate further harm.

3.3 Whale population characterisation and demographic parameters

3.3.1 Population/stock identification

Sakhalin Energy reported that it is planning a workshop with ENL and both companies' contractors in August 2016 to discuss and decide on a Sakhalin Energy/ENL Joint Programme strategy for pursuing genetic studies. The Panel has repeatedly emphasized that it expects the subject of stock identity of North Pacific gray whales to be dealt with primarily by the International Whaling Commission (IWC) Scientific Committee and it therefore has little to offer apart from encouraging the companies and other research groups to participate fully in international collaborations to derive maximum value from samples, data and expertise. Also, it was noted that biopsies taken for genetic studies have other potential uses, as explained under Item 3.4.

Attention was again drawn to the study by Rolland *et al.* (2012) showing a significant decrease in stress hormone levels in right whale faeces during September-October 2001, immediately following the terrorist attack on the World Trade Center in New York – a period when shipping activity declined dramatically and therefore the whales' exposure to anthropogenic noise was much reduced. It was suggested that the companies consider a comparative study of hormone levels in biopsies collected in 'quiet' and 'noisy' years. Apparently, the approach used by Rolland *et al.* (2012) would not be feasible because opportunities to collect faecal material from gray whales at Sakhalin are infrequent. Alternatively, it might be possible to collect small quantities of stress hormones in blow samples using drones. It was notes that a study is currently under way to compare stress hormone levels in faecal, biopsy (blubber) and blow samples in right whales (e.g. see Hunt *et al.*, 2014); depending on the results, this may allow an approach to measure stress that does not require faecal samples.

3.3.2 Population structure and dynamics

Lock noted that the companies have generally accepted that monitoring gray whale numbers off Sakhalin is a core responsibility. However, it was recognised that to date nearly everything currently known about demography (age structure, sex ratio, reproductive parameters, survival rates etc.) of the Sakhalin gray whale population has come from analyses of data from the Russian Gray Whale Project (formerly Russia-US programme). A major challenge which needs to be addressed cooperatively by the companies and the Russian Gray Whale Project team, with support as and when necessary from IWC, IUCN and other parties,

is to ensure that all available data, including data collected as part of industry-sponsored programmes, are used in population assessment.

As mentioned earlier (Item 2.1.7), the companies plan to continue their photo-ID and distribution programmes on an annual basis, although possibly with some modifications. There was agreement on the importance of annually obtaining data on calf production (or at least numbers of calves that reach the Sakhalin feeding area). In other words, if the companies decided to reduce the larger programme from the scale of recent years, it would be preferable to maintain a reduced programme every year that could at least record calf counts while undertaking a large-scale programme every few years.

There is scope for improved efficiency in the photo-ID programme – Task Force members pointed out that acquiring 38,000 images in a season is excessive and that reducing the burden of handling and curation of photos could free up time for analysis and publication of results.

The Task Force recognized that creation of a single unified photo-ID catalogue for Sakhalin (and Kamchatka) whales and full collaboration of all interested parties would be ideal and should be the goal. Sakhalin Energy's preference would be for the Sakhalin Energy/ENL Joint Programme to contribute to a single catalogue hosted by an impartial body such as the IWC or IUCN (though it was recognized by all that IUCN as host would not be acceptable to ENL). Donovan pointed out that the IWC already provides central storage for a unified catalogue of photo-identified blue whales in the Southern Ocean.

It was suggested that drone technology could become a useful method for obtaining data on distribution and possibly on body condition and reproduction. It was noted that the potential for photo-identification using drones off Sakhalin is limited due to the lack of through-water visibility and the fact that gray whale matching from dorsal markings and pigmentation is much more difficult than from side views. Currently available endurance of drones is typically 15-20 minutes and highly trained operators are needed. However, rapid improvements on both counts are to be expected.

Burdin mentioned that kites and balloons are employed, in combination, for studies of belugas in the White Sea. These platforms can be launched from inflatable boats or shore, function for 24 hours a day for 7 days a week, and are less expensive than drones. He added that researchers using this approach would be happy to be invited to Sakhalin to demonstrate their methods.

It was suggested that body condition be considered as a possible index or indicator of population status, as a supplement to trends in abundance. In this regard, Panel members reminded the Company of two papers that would be important to consult (Bradford *et al.,* 2008; 2012).

Advances in analytical methods have made it easier to detect and identify whale calls in acoustic monitoring data. The Task Force was advised that the Pacific Oceanological Institute (POI) has identified several segments of such data containing whale calls and that JASCO intends to run them through an automated detection programme as a pilot effort. Whether this will lead eventually to a more efficient means of determining the presence, and perhaps eventually even the density, of gray whales off Sakhalin remains to be seen but it was agreed that further investigation of the approach would be worthwhile. It was noted, however, that gray whales do not echolocate, nor is it known how often and under what circumstances they produce calls, and therefore it will be difficult to infer distribution and density from call detections alone without significant further study.

3.4 Whale foraging ecology

3.4.1 Benthic monitoring programme

As indicated above, the companies question the need to continue the annual benthic monitoring programme initiated by Dr Valery Fadeev in 2001. In response, some Panel members stated that despite the large amount of data that has been collected over the years, analyses (both laboratory and statistical) have not been sufficient to establish the optimal sampling design and frequency. They also stressed the general value of long time series of data when trying to interpret the cause(s) of any observed change in the distribution, behaviour, ecology or population dynamics of Sakhalin gray whales.

Earlier in 2016, Pomerleau and Lowry prepared a document entitled "The ecology of the gray whale feeding area near the mouth of the Piltun Lagoon" (a revised version is given as Annex D). The aim was to provide background information on the current status of knowledge on the ecological processes responsible for whales aggregating near the mouth of Piltun lagoon as well as some comments and suggestions on the Sakhalin Energy/ENL Joint Programme's benthic monitoring programme. For instance, it was noted that the diet of the whales can't be assessed by relying only on observations of feeding behaviour and prey sampling. Analyses of biochemical tracers in whale skin (biopsies) and in tissue samples from known or likely prey species are necessary to establish which species actually contribute to the diet and in what proportions (e.g. by using a Bayesian stable isotope mixing model). Pomerleau and Lowry also mentioned that the current programme doesn't sample the epifauna community which includes potentially important species such as mysids. Among other problems cited in their document were the absence of control stations and the timing of benthic sampling, which has been mostly limited to October although in some years (e.g. 2007, 2013) there has been sampling in late June or July. Ideally, benthic sampling should take place both before and after the peak season of gray whale feeding in order to assess spatiotemporal change and succession or regeneration of benthic communities. Another issue is the variability induced by the mosaic of feeding pits made by gray whales – not accounted for in the current benthic sampling programme. This is perhaps the most important point that needs to be addressed in the near future to assess ecological disturbance, species recolonization and the capacity of the benthic populations off Sakhalin to sustain a growing gray whale population.

In the view of some Task Force members, continuation of benthic monitoring, even if its intensity were to be scaled back, is in the companies' interests. While normal operations during the production phase of the developments may be seen as posing no threat to the benthos, if a major oil spill were to occur, the availability of a long and continuous time series of data on benthic fauna and a programme in place to continue sampling would be seen in a different light. For Sakhalin Energy, the information on benthic fauna may prove important to the company's ability to demonstrate due diligence with regard to the designation and stewardship of 'critical habitat' under IFC Performance Standard 6 "Biodiversity Conservation and Sustainable Management of Living Natural Resources" (2012, hereafter PS6). Finally, if a change in gray whale numbers or body condition at Sakhalin were to occur, the benthic monitoring programme might help explain the cause – e.g. poor feeding due to exceptionally low prey densities rather than disturbance from a seismic survey.

Although the document from Pomerleau and Lowry was well received and Sakhalin Energy welcomed the comments and suggestions, Company representatives continued to question the need for a full-scale annual benthic monitoring programme and indicated their intention to consider a scaled-back programme, possibly limiting annual monitoring to areas near the platforms. With regard to the ecological studies proposed in the Pomerleau-Lowry document, they suggested that at least partial funding would need to come from sources other than Sakhalin Energy, and it was noted that several NGOs had expressed interest in supporting this kind of work.

3.4.2 Analysis of biochemical tracers in whale tissue (skin biopsies) and prey items (see WGWAP-16 report)

The Task Force revisited the idea of using skin biopsies for stable isotope analyses in addition to genetic studies. Bulk stable isotope analysis of carbon and nitrogen would be a relatively inexpensive way to study the feeding and trophic ecology of gray whales and their prey as well as to elucidate the contribution of Piltun Lagoon effluents to feeding areas via an onshore-offshore carbon gradient. Pomerleau and Lowry stressed the importance of having a detailed overview of the trophic ecology of Piltun Lagoon and adjacent waters. The use of stable isotopes has proven to be a valuable way to study feeding ecology of numerous other whale species. Given that the Sakhalin Energy/ENL Joint Programme was expecting to have obtained skin biopsies from up to a total of around 90 individual Sakhalin gray whales by the end of the 2016 field season, some progress with such studies should soon be feasible. Stable isotope signatures in dimethyl sulfoxide (DMSO)-preserved skin samples from previous years can be restored, but the blubber attached to the skin is not suitable for lipid analysis. Ideally, skin biopsies should be frozen in the field.

3.4.3 Contaminant monitoring in water, sediment, benthic organisms and whale tissue

Sakhalin Energy regularly monitors certain contaminant levels around its offshore structures and has found no evidence to suggest that its activities release any regulated contaminants into the environment. The

Company has repeatedly stated that it feels no responsibility for, and has no interest in, carrying out analyses for contaminants originating outside its own sphere of operations – e.g. in Amur River outflow. Nonetheless, as the Panel has repeatedly stated in response, if there were to be a die-off or deterioration in condition of Sakhalin gray whales, it would be in the interest of Sakhalin Energy (and ENL) to be able to account for the presence, levels and sources of an array of potentially implicated environmental contaminants in and near the feeding areas.

Pesticides and heavy metals were monitored during construction and immediately post-construction but only hydrocarbons are being monitored now. For some contaminants, the companies have justified the cessation of monitoring on the grounds that they know such contaminants aren't present in the region. The Panel, in turn, has expressed its view that such assumptions may not be entirely warranted and that baseline levels (e.g. of organochlorines) should be measured and levels monitored at appropriate intervals thereafter to verify that there has not been significant change (see WGWAP-14 report). Task Force members suggested that a clear summary of what the companies have learned to date about contaminants from their monitoring programmes in and near the Sakhalin feeding areas (presence, levels, sources etc.) would provide a useful benchmark.

3.5 Necropsy and whale health

In the past, the Panel urged Sakhalin Energy to incorporate systematic and regular aerial searches of the Sakhalin coastline for whale carcasses and to develop the capacity for rapid response, necropsy and sample collection when any carcasses were found. For several seasons the Company undertook such surveys and made a reasonable effort to facilitate response and necropsy capabilities as recommended (e.g. see reports of Interim Independent Scientists Group (IISG), WGWAP-1, WGWAP-2 *et seq.*). However, this effort was discontinued several years ago even though the same rationale continues to apply, i.e. besides being an indication of good corporate stewardship practice, such surveys and facilitation would be in the interests of energy companies operating off Sakhalin. When whales are injured or die as a result of human activity it is always important to determine the cause, not only so that appropriate mitigation action can be taken but also so that blame is not assigned to the wrong parties. Moreover, when whales die of causes not related (at least directly) to specific human activities (e.g. from harmful algal blooms or disease outbreaks), it's important to know that also. It was noted that the Panel has occasionally received proposals from Russian scientists for support of studies of health and physiology of the gray whales at Sakhalin (and Kamchatka). However, the Panel has consistently been told that studies of whale health are not considered to be in the companies' interests. At least in the view of some Panel members, the status quo where none of the companies operating off Sakhalin takes any responsibility to search actively for whale carcasses, respond to strandings or investigate whale health (beyond taking note of body condition as inferred from photographs), means that the region will continue to be unprepared for future incidents.

4 CUMULATIVE IMPACTS AND INTEGRATED ANALYSES

Although these issues have been highlighted repeatedly in Panel and NTF meetings, little progress has been made (within the WGWAP context) in terms of developing and applying analytical approaches to cumulative impact assessment. One aspect that has hindered discussion is the apparent lack of a common understanding of what the term 'cumulative impact' means. Interpretations range from (a) considering only the activities of a single company over a specific time period (and often only one stressor – noise) to (b) considering all stressors that affect the population (in this case Sakhalin gray whales) throughout its range over an unspecified but long period of time. Making progress on identifying data needs and calculating impacts is difficult without agreement on definitions, spatial and temporal scope, etc.

Their financial support for the recent work by Villegas-Amtmann *et al.* (2015), who applied a bioenergetics model to gray whales and considered the potential costs of disturbance to individuals of different age, sex and reproductive status (see Item 9.5 in the WGWAP-16 report), shows that both Shell and Exxon have an interest in cumulative impacts. Also, it was noted during the meeting that Sakhalin Energy has a particular interest given the explicit requirement under PS6 for companies to describe and mitigate cumulative impacts (see PSTF-1 report).

It was agreed that more thought and discussion is needed on how the Joint Programme might be modified to address cumulative impacts more directly and rigorously. A first step would be to review existing analyses (e.g. the 'integrated analysis' previously completed as part of the Sakhalin Energy/ENL Joint Programme) and consider how they might be improved. A great deal of potentially relevant data has been amassed by the companies (and other groups) over the past two decades and it was suggested that the concept advocated by the Panel in the past (see WGWAP reports) be revived and revisited. This would involve a workshop (or more likely a series of workshops) organized under the aegis of the IWC Scientific Committee and involving recognized experts who would be given access to the necessary data and asked to apply the best available analytical methods. Sakhalin Energy expressed interest in pursuing this idea.

One of the suggested achievements of the Joint Programme listed under Item 2.1.5 is "Observation and description of unmitigated threats to gray whales at Sakhalin posed by non-industry activities (e.g. entanglement in fishing nets, lines and equipment; close approaches by tourist vessels) and bringing these threats to the attention of authorities." Panel members welcomed the news of the companies' interest in these issues. Donovan pointed out that an IWC disentanglement training event, along with a stranding response component, may take place at Sakhalin in the near future. Attention was drawn to the Panel's discussions of fishery issues over the years, as reflected many times in reports starting with the Independent Scientific Review Panel (ISRP) and continuing through WGWAP-16. The white paper on fisheries and gray whales prepared for WGWAP by Lowry (see PSTF-1 report) is intended to guide engagement by the Panel and IUCN in the near term. Participants in this meeting expressed interest in seeing more regular and open communication among the energy companies, the fishing communities, officials in relevant government agencies, IUCN, IWC, NGOs and Panel members to address fishery-whale conflicts and interactions. It was encouraging to learn that discussions of fishing activities in relation to gray whales took place at the most recent IWG meeting and that some management action may be taken to reduce the risk of whale entanglement during the salmon season.

5 WORKPLAN AND TIMELINE

In conclusion, it was anticipated that further work by this Task Force would be more productive after Sakhalin Energy has had a chance to discuss the results of this meeting with ENL, after which it should come back to the Task Force with a revised set of objectives and sub-objectives, preferably connected to explicit research questions that the companies expect their Joint Programme to address. Such a process needs to be completed in time for the next JPTF meeting in Moscow in November 2016. It was also noted that the next Task Force meeting would benefit from participation by one or more ENL representatives.

6 REFERENCES

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ANNEX A – LIST OF PARTICIPANTS

Alexander Burdin (WGWAP)
Justin Cooke (WGWAP)
Mike Donaghy (MDA/Sakhalin Energy)
Greg Donovan (WGWAP)
Jonathan Hancox (Ramboll Environ)
Olof Linden (WGWAP)
Lloyd Lowry (WGWAP)
Stephanie Lock (Sakhalin Energy)
Douglas Nowacek (WGWAP)
Corinne Pomerleau (WGWAP)
Roberto Racca (JASCO/Sakhalin Energy)
Randall Reeves (WGWAP)
Brandon Southall (WGWAP)
Andrey Samatov (Sakhalin Energy)
Grigory Tsidulko (WGWAP)
Alexander Vedenev (WGWAP)
David Weller (WGWAP)

IUCN

Anete Berzina
Giulia Carbone
Simon Delany (Rapporteur)

Interpreters

Alexander Danilov
Grigory Shkalikov

Apologies: Daniel Egging (ENL), Natalya Tsarenko (Sakhalin Energy)

ANNEX B – AGENDA

1 INTRODUCTORY ITEMS

1.1 Introductions and logistics

1.2 Adoption of agenda

1.3 Available documents/materials

2 PRESENTATIONS BY SAKHALIN ENERGY

2.1 Update on Programme planning beyond 2016

2.2 Discussion of the objectives and sub-objectives of the Programme

3 RESEARCH COMPONENTS IN THE LIGHT OF OBJECTIVES AND SUB-OBJECTIVES

3.1 Acoustics

3.1.1 Link to specific objectives

3.1.2 Control station(s)

3.1.3 Routine monitoring

3.1.4 Event-specific monitoring

3.1.5 Hydroacoustic measurements

3.1.6 Other

3.1.7 Work required to provide advice, based upon objectives and sub-objectives

3.2 Whale behaviour

3.2.1 Link to specific objectives

3.2.2 Undisturbed (shore-based observation, drones, gliders, short-term tags, etc.)

3.2.3 Monitoring movements (shore-based observation, tagging, photo matching)

3.2.4 Controlled exposure experiments

3.2.5 Event-specific observations (shore-based observation, tagging, possibly boat-based observation)

3.2.6 Other

3.2.7 Work required to provide advice, based upon objectives and sub-objectives

3.3 Whale population characterisation and parameters

3.3.1 Link to specific objectives

3.3.2 Population/stock identification (e.g. genetic and photographic analyses, modelling)

3.3.3 Structure (age/stage, sex etc.) and dynamics (reproductive parameters, survival etc.)

3.3.4 Abundance (photo and/or genetic mark-recapture analysis within Cooke's individual-based model)

3.3.5 Trends (annual calf counts, modelling)

3.3.6 Distribution

3.3.7 Work required to provide advice, based upon objectives and sub-objectives

3.4 Whale foraging and energetics

3.4.1 Link to specific objectives

3.4.2 Sampling benthos (e.g. see WGWAP-16 report)

3.4.4 Fatty acid, stable isotope and other biochemical analyses of samples of whale tissue (biopsies) and prey items (e.g. see WGWAP-16 report)

3.4.4 Contaminant monitoring in water, sediment, benthic organisms and whale tissue

3.4.5 Other

3.4.6 Work required to provide advice, based upon objectives and sub-objectives

3.5 Necropsy and whale health (including link to specific objectives)

4 CUMULATIVE IMPACTS AND INTEGRATED ANALYSES

5 GENERAL ISSUES OF, FOR EXAMPLE, POTENTIAL FOR DATA SHARING, COLLABORATIVE ANALYSES WITH OTHER RESEARCHERS/GROUPS, DATA INTEGRATION, SCOPE OF DATA COLLECTION AND ANALYSES (E.G. KAMCHATKA), TRANSPARENCY

6 WORKPLAN AND TIMELINE

7 STRATEGY FOR COMPLETION OF FINAL REPORT

ANNEX C – LIST OF DOCUMENTS

Document #	Title	Language	Status
JPTF-2/1	Presentation on 2016 Scope of Work for the Sakhalin Energy/ENL Joint Programme on Gray Whale Monitoring and Research	English / Russian	Confidential
JPTF-2/2	An update on the proposed objectives, strategies and elements of the refreshed Sakhalin Energy/ENL Joint Programme beyond 2016	English	Confidential

ANNEX D – IUCN BACKGROUND STUDY ON THE ECOLOGY OF THE GRAY WHALE FEEDING AREA NEAR THE MOUTH OF PILTUN LAGOON (SAKHALIN)

By Corinne Pomerleau and Lloyd Lowry
7 July 2016 (updated version)

Background

The ecological processes responsible for gray whales aggregating near the Piltun Lagoon mouth and in the offshore feeding area are not well understood. Among the main topics that need further investigation is the role and ecological significance of Piltun Lagoon in sustaining the productivity of the Piltun and Offshore gray whale feeding areas. Piltun Lagoon is approximately 90 km long and 15 km across at its widest point and it is one of the largest lagoons bordering the Okhotsk Sea (Brovko, 2009). Piltun Lagoon is connected to the Sea of Okhotsk by a single narrow channel. Effluent waters from Piltun Lagoon enter the sea via tidal fluctuation and estuarine circulation processes, near the southern end of the Piltun (nearshore) feeding area. This shallow feeding area (< 20 m deep within 5 km of shore) is used preferentially by adult (lactating) females and calves.

Previous work conducted by Fadeev (2009, 2014) within the nearshore feeding area concluded that the Piltun Lagoon outflow of both organic and inorganic subsidies was not significant to whale feeding areas. However, in a study of the hydrodynamic processes on the Sakhalin Shelf in the coastal Piltun Area, Rutenko and Sosnin (2014) found that the high biological productivity of the feeding area of the grey whale was caused by the inflow of biogenic and organic substances from the Amur River and Piltun Lagoon, and summer upwelling of marine water. Scientific evidence from studies on the ecology of other coastal marine lagoons (e.g. Alaska lagoon systems with fauna and physical characteristics similar to Piltun; Dunton *et al*. 2006, 2012) shows the potential for subsidies to benthic productivity from lagoon outflow and suggests that lagoons play an important role in maintaining or creating productive areas, such as the Piltun gray whale feeding area. Dobrynin *et al.* (2004) (see letter of 4 May 2008 from IUCN Programme Office for Russia to ENL)[5] hypothesized that one of the key factors contributing to the broad zone of fine sand and the high productivity of the Piltun feeding area is the export of terrigenous material from Piltun Lagoon, especially in the spring when the presence of sea ice limits wave activity. Nearshore eddies may capture particles and concentrate, redistribute and deposit them over an area to the east and north of the Piltun Lagoon mouth. The same processes may determine the export and retention of particulate organic matter that settles in this area. Therefore, subsidies to gray whale feeding areas on the Sakhalin Shelf could originate in Piltun Lagoon and take the form of:

- Addition of significant quantities of organic detritus in particulate or dissolved form, originating from aquatic or terrestrial processes in the lagoon's watershed;
- Addition of significant quantities of organic detritus in particulate or dissolved form, resulting from phytoplankton production occurring in the lagoon;
- Addition of significant quantities of living phytoplankton produced in the lagoon;
- Addition of significant quantities of inorganic nutrients such as nitrate or phosphate that are known to stimulate primary productivity in nearshore marine waters, resulting from organic decomposition processes within the lagoon.

The Panel's previous benthic ecology expert, Glenn VanBlaricom, played a lead role in articulating the considerations summarized above. The apparent preference by gray whales for feeding in shallow areas around the lagoon mouth and along the lagoon sand bar suggests that there is some beneficial input ('subsidy') from the lagoon to the Piltun feeding area. Given that the Sakhalin gray whales' feeding areas are under increasing pressure from industrial development, the current state of knowledge concerning the

[5] http://cmsdata.iucn.org/downloads/letter_and_statement_of_concern_to_exxon_rus__eng___for_web.pdf

processes that create and maintain those areas' characteristics and productivity need to be assessed and the remaining knowledge gaps need to be addressed.

Past and ongoing monitoring program by the Sakhalin Energy/ENL Joint Programme

Presented here is a summary of the past and ongoing benthic monitoring program according to the detailed materials and methods sections of the reports by Fadeev (e.g. 2007, 2014) on the benthos field work. Studies of the benthos in the gray whale feeding areas off Sakhalin Island have been carried out annually since 2001. Benthic sampling has been conducted mainly in the nearshore waters seaward of Piltun and Chayvo Lagoons and in the Offshore feeding area. The Piltun feeding area extends from Odoptu Bay in the north to the southern limit of Piltun Lagoon in the south and the Offshore feeding area is located in the deeper waters southeast of Chayvo lagoon (30-45 km from the coast from the middle of Chayvo Bay to southern Niyskiy Bay) (Fadeev *et al*., 2007). The locations of the sampling stations have been determined each year using the same approach in both areas. Briefly, the Piltun area has been divided into 60 sectors of equal area (five blocks) and the Offshore survey area has been divided into 36 sectors (four blocks). Occasionally, the sampling (including sampling of epibenthos and plankton) has occurred in conjunction with observed feeding gray whales (at so-called 'feeding points'). Samples of the benthos have been collected using a Van Veen grab sampler, usually in October of each year. In 2007 and 2013, benthic communities in the Piltun feeding area were sampled twice including June/July and October. The primary objective of the monitoring program has been to quantify the distribution and abundance of benthic species (density and biomass) belonging to certain taxonomic groups, with a special emphasis on what are considered to be the main gray whale prey organisms (Fadeev, 2006; 2007; 2014). The long and unbroken time series of data provided by the program constitutes a valuable asset that is worth maintaining – it could prove essential for interpreting the cause(s) of any observed significant variation in the distribution, behaviour, ecology or population dynamics of the Sakhalin gray whale population. However, even though the benthic communities in the region have been well described and the sampling has been mostly consistent in space and time, the biological and physical processes responsible for creating the rich feeding opportunities that attract the whales to the Piltun area are not yet understood. In order to better characterize the ecological drivers of the gray whale aggregations near the Piltun Lagoon mouth and in the Offshore feeding area, the existing benthic program could benefit from the addition of a few sampling components and further analytical and/or statistical work.

Identified issues related to study design and/or sampling

- Inferring the diet and/or the main prey items of a large free-ranging marine mammal from observed feeding behaviour combined with concurrent or delayed prey sampling at the same geographic position is not an effective method of diet assessment.
- The Van Veen grab sampler does not effectively sample the epifauna community and epibenthic species such as mysids which are known to be important prey of gray whales in some areas.
- Sampling design and methods appear to have varied from year to year (e.g. divers, trawls, cameras, grabs, feeding points etc.). Varying methods make it hard to make between- or across-year comparisons.
- There are no data from control stations located outside of the feeding areas.
- Timing of sampling is usually limited to October although some years included sampling in late June or July (e.g. 2007, 2013). Ideally, benthic sampling should take place before and after the main gray whale feeding season.
- Another issue is the variability induced by the mosaic of feeding pits made by gray whales, something that is not accounted for in the current sampling program. This is perhaps the most important point that needs to be addressed in the near future to assess disturbance and recolonization and determine whether, or for how long, the benthic populations on the Sakhalin shelf can sustain a growing gray whale population.

Other identified issues

- From 2006-2008, particulate organic material (POM) samples from the Piltun and Offshore whale feeding areas were compared to samples from the Piltun Lagoon mouth and from within the Lagoon. In a report published in 2009, Fadeev mentioned that he had conducted stable isotope and fatty acid analyses of these POM samples. His conclusions were that amphipods and isopods in the Piltun and Offshore feeding areas feed mainly on diatom phytoplankton, or on organisms that feed on diatom phytoplankton, and that plankton from Piltun Lagoon is only a minor source in either case. No results were presented in the report to support these conclusions.
- Although suspended POM is one of the food sources for benthic organisms (e.g., Iken *et al*. 2010), stable isotope-based studies have shown that other sources may contribute significantly or even primarily to benthic foodwebs.
- Preliminary stable isotope and fatty acid data on gray whales and their potential prey were presented in one of the annual benthic reports (document WGWAP-14/8; Fadeev, 2013). Only three prey species were analysed (which is not an adequate sample size). The conclusion was that "*further investigations into the isotope composition of biopsy samples in more representative samplings of gray whales and food organisms could provide an opportunity to make a more detailed description of the local whale food composition and compare it with the accessibility of food resources*". No further analyses have been conducted (or at least reported) yet.
- Gray whales are highly disruptive bottom feeders that remove and displace both sediment and prey (Oliver and Slattery, 1985), creating large feeding pits (e.g. 4 m long and 2 m wide) (Figure 1). Also, knowing whether the sampling locations do or do not overlap feeding pits is essential for proper assessments of prey densities.

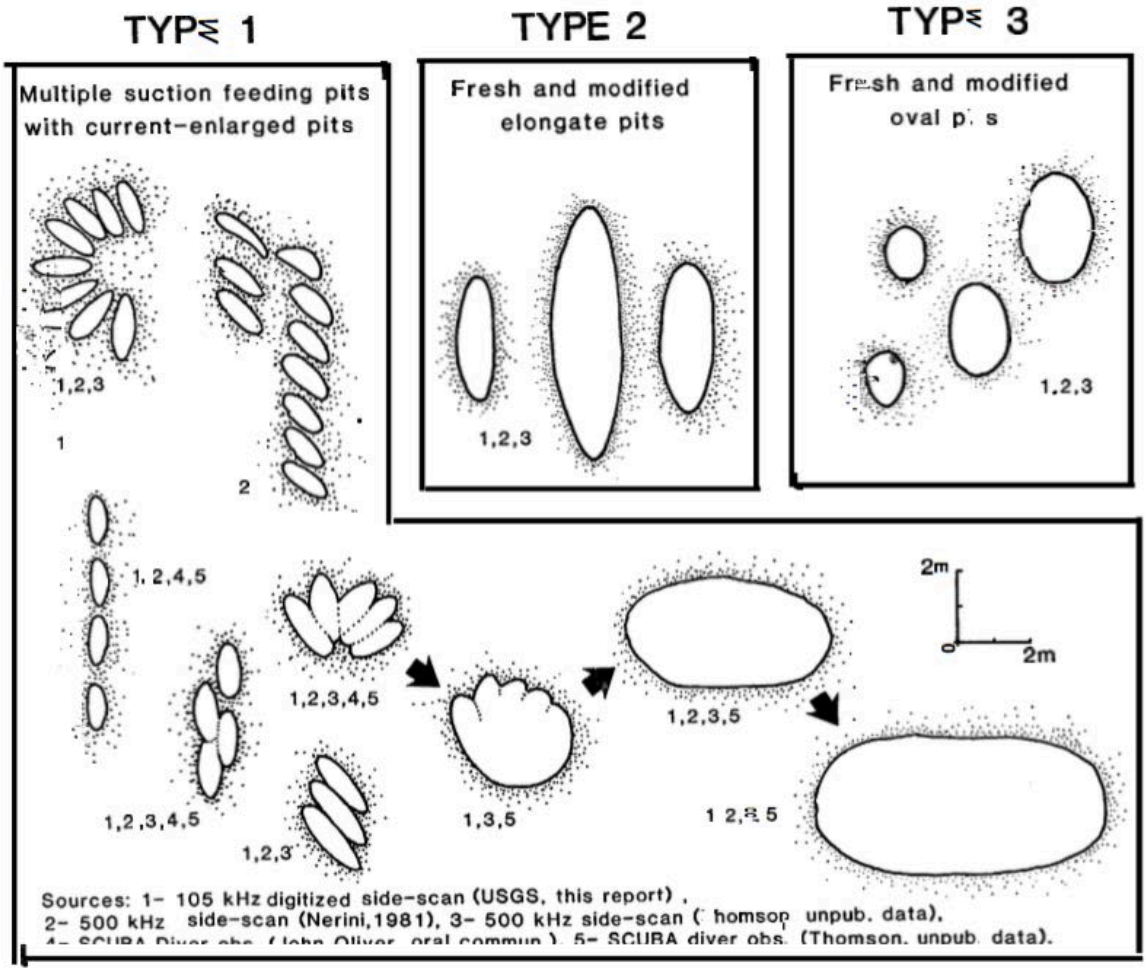

Figure 1. Example of gray whale feeding pits based on observations by side-scan sonor and scuba divers in Chirikov Basin and St-Lawrence Island (Johnson, Nelson and Mitchell, 1983).

Potential actions for ongoing and future ecological monitoring

- An epibenthic sampler should be added to the monitoring program to assess the taxonomic composition and abundance of the epifauna community. An epibenthic sled and/or a bottom trawl are designed to trawl just above the bottom at the sediment/water interface (the epibenthic zone) and collect mobile organisms (e.g., mysids, shrimps and mobile amphipods).
- A side-scan sonar (Johnson *et al.*, 1983; Robert *et al*., 2014) should be added to the program to map and measure pits made by feeding gray whales. This method would assess the intensity of feeding in the two known feeding areas and determine whether and how much gray whales feed in other areas that may be affected by oil and gas activities on the Sakhalin shelf.
- If the benthic monitoring program is to be reduced, benthic sampling should focus on two main things: sampling before and after the main gray whale feeding season in feeding pits and in non-feeding pit areas to assess disturbance and recolonization and to determine whether, or for how long, the benthic populations on the Sakhalin shelf can sustain a growing gray whale population.
- Underwater imagery via a small video camera equipped with a depth sensor attached to epifaunal (trawl or sled) or infaunal (grab) sampling devices would allow estimation of motile prey missed by the grab as well as provide information on the state of the bottom where the sample was taken (i.e., in a recent gray whale feeding spot or not).
- Direct sampling (swimmers or divers) – if water depth, environmental conditions and logistics allow – would permit the collection of specimens in shallow waters. Shallow water sampling (< 5m and 6-10m) was performed by divers in 2001 and 2004-2007.
- If direct sampling is not possible, sampling from a small boat equipped with a smaller Van Veen grab and a winch should be conducted in the shallow water of the Piltun feeding area.
- Benthic sampling should occur prior to and after the main foraging period to determine ecological disturbance and gain greater insights into the benthic communities within the two main gray whale feeding areas, and the impacts of the whale feeding on those communities.
- Additional stations should be sampled outside the two main feeding areas to assess the benthic communities and determine whether there are gray whale prey assemblages.
- Stable isotopes of carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$), and potentially sulphur ($\delta^{34}S$), need to be measured in a larger sample of gray whales and in their known or potential prey. Carbon and nitrogen isotope ratios are commonly used in ecological studies to identify the relative contributions of different carbon sources to a consumer organism and to determine the trophic positions of various organisms (Peterson and Fry, 1987). Previous stomach content studies have shown that gray whales consume more than 19 different prey such as amphipods (e.g., *Anonyx, Atylus, Lembos, Pontoporeia*), decapods (e.g., *Chionoecetes, Nectocrangon, Nephrops*), and other invertebrates such as molluscs and polychaete worms (Nerini, 1984).
- Measurements should be taken of the quality and quantity of detrital transport from Piltun Lagoon to the whale feeding areas. The primary goals for studies of detrital transport should be: identification of source species contributing to detrital mass, stable isotope signatures for detritus transported from the lagoon to the whale feeding areas, and interannual variation in quality and quantity of transported detritus.
- Future work could include a comparison of biogeochemical data with biological community assemblages, to improve understanding of the linkages between terrestrial organic matter and productivity.

Other considerations

- <u>Further review of existing literature on case studies of connectivity between lagoons and nearby marine waters in terms of productivity.</u> There are many published cases of spatial subsidies (in which individuals or resources from one system move or are transferred into a neighboring system; Polis and Hurd, 1996; Polis *et al*., 1997), associated with proximity to lagoon effluents that contribute to coastal marine productivity. This literature indicates the value of at least framing and testing hypotheses concerning the potential role of spatial subsidies from Piltun Lagoon that enhance benthic productivity in the gray whale feeding areas.
- <u>Inventory of existing datasets (biological or physical) relevant to the ecology of the two main feeding areas (Piltun and Offshore) on the northeastern Sakhalin shelf.</u> Data (and/or samples)

relevant to productivity, water mass structure, species assemblages etc. that were collected in previous years may be available. However, these datasets may be difficult to access (e.g., non-sharable data) and would need to be translated from Russian to English.

- A recent zooplankton study in the Sea of Okhotsk (Gorbatenko *et al*., 2014) found large aggregations of the mysid *Neomysis mirabilis*, which inhabits nearshore waters (including near Sakhalin Island). That study found substantial spatial differences in isotope carbon compositions at the base of the food web (POM) in the parts of the Sea of Okhotsk that were sampled, thus confirming that the samples came from different biotopes (coastal waters, shelf zones, and open deep-sea waters).
- One of the main gaps identified so far is the absence of significant literature on the ecological characteristics of Piltun Lagoon.

Preliminary recommendations

- Ecological monitoring of variation in benthic communities over time should be continued in Piltun Lagoon and the nearby marine ecosystems.
- Studies should be initiated to examine the functional ecological linkages among nutrients, sediments, detritus, and planktonic organisms exported via estuarine and tidal flows from Piltun Lagoon to the adjacent gray whale feeding area on the shelf.
- A multivariate spatial model should be used to look at all physical and biological factors (including intensity of whale feeding) in relation to the distribution and abundance (and productivity) of gray whale prey. The feasibility of this kind of analysis depends on the data available and on the spatial coverage of the environmental data (e.g., Víkingsson *et al*., 2015).
- A stable isotope mixing model and perhaps an energetic model to link lagoon and oceanic production to gray whale nutrition should be developed and used to investigate questions such as how much of the whales' annual energy budget comes from the two feeding areas on the north-eastern Sakhalin shelf.
- Ecologically significant anthropogenic disturbances to the Piltun Lagoon ecosystem should be avoided, at least until there is a clear understanding of the potential ecological linkages between natural lagoon effluents and adjacent nearshore benthic communities.

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