WESTERN GRAY WHALE ADVISORY PANEL **WGWAP 4/INF.19**

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Agenda Item: 12 **ENGLISH**

FUTURE SEIC PLANS FOR WGW MONITORING AND RESEARCH
SEIC's 2008-2010 plans for WGW research and monitoring

Submitted by SEIC

WESTERN GRAY WHALE ADVISORY PANEL
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PROGRAM FOR MONITORING OF THE KOREAN- OKHOTSK GRAY WHALE POPULATION OFF THE NORTHEAST COAST OF SAKHALIN ISLAND IN 2008-2010

Submitted by SEIC

2008

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INTRODUCTION

Exxon Neftegas Limited (ENL), operator of the Sakhalin-1 consortium, and Sakhalin Energy Investment Company (SEIC), operator of the Sakhalin II consortium, are developing oil and gas reserves on the continental shelf off northeast Sakhalin Island, Okhotsk Sea, Russia. In order to document regulatory compliance, both the Sakhalin-1 and Sakhalin II projects conduct annual monitoring and assessment studies of the critically endangered and Russian Red book listed western Korean-Okhotsk population of Gray whales (Eschrichtius robustus), hereafter referred to as the western Gray whale (WGW). Due to the protected status of the WGW, this population was identified in Environmental Impact Assessments (EIAs) for the Sakhalin-1 and Sakhalin II projects and during State Ecological Expert Reviews (SEER) as being a species of primary concern on the northeast Sakhalin shelf. The SEERs for each project recommended further studies to understand and monitor the individual and cumulative impact of oil and gas developments on the WGW population. According to the latest data, the total population is approximately 130 animals (Yakovlev and Tyurneva, 2005, 2006; Yakovlev et al. 2007; Vladimirov et al., 2005, 2006, 2007; Cooke et al. 2007; Weller et al. 2007) and it is listed as Critically Endangered in the Red List of endangered species of the International Union for Conservation of Nature and Natural Resources (IUCN) and Endangered in the Russian Red Book. The main feeding areas of this whale population are in direct proximity to the Piltun-Astokh, Odoptu and Chayvo oil and gas fields currently developed by the Sakhalin-1 and Sakhalin II projects; this proximity necessitates annual monitoring of the population ecology and dynamics, especially during periods of project infrastructure construction on the northeast Sakhalin shelf.

The scope of 2008-2010 program continues and extends the studies conducted from 2002 to 2007 by the research institutes of the Goskomrybolovstvo (State Fishery Committee) system and the Russian Federation Academy of Sciences (RAS). The program Scope of Work is annually modified and updated based on the results of the preceding years of study. The program studies conducted since 2002 helped to:

- delineate the Gray whale feeding areas in northeast Sakhalin waters for the first time,
- Refine an estimate of the population size and seasonal dynamics,
- prepare a Russian photo-catalogue of Gray whales,
- identify the main feeding season start and end dates,
- identify key sites with increased whale aggregations and understand seasonal and spatial distribution trends,
- understand characteristics of whale behavior and examine potential disturbance to whales,
- assess prey abundance and identify relationships between large-scale variations in whale distribution and changes in prey distribution and biomass,
- detect whale movements between feeding areas (including Sakhalin and eastern Kamchatka waters),

- conduct acoustic measurements in the vicinity of whale habitat and to measure level of anthropogenic noise penetration into such areas as a result of oil and gas developments,
- plan construction and installation of works in such a way that they have the lowest impact on the whales, etc.

Future studies will certainly help to further understand Gray whale biology and subsequently improve efficiency of efforts to save the population.

This program for monitoring of western Gray whales offshore northeast Sakhalin Island is funded by the Sakhalin-1 (operator Exxon Neftegas Limited (ENL)) and Sakhalin II (operated by Sakhalin Energy Investment Company Ltd. (SEIC) projects. The proposed 2008-2010 program for monitoring of Gray whales will be conducted in accordance with the recommendations of the State Environmental Expert Review on the Sakhalin-1 (2002 and 2003) and Sakhalin-2 (1998 and 2003) projects, providing it is in line with the approved ENL and SEIC Annual Budgets

1 BACKGROUND INFORMATION

The western Gray whale population is one of the smallest of all the world's populations of large whales. Currently the total population is estimated at about 130 animals (Vladimirov et al., 2005, 2006, 2007; Yakovlev and Tyurneva, 2005, 2006; Yakovlev et al., 2007, Cooke et al., 2007).

The coastal area of northeastern Sakhalin near Piltun, Chayvo and Niyskiy bays is currently believed to be the primary feeding area of the Korean-Okhotsk Gray whale population. Gray whales are typical benthic feeders and, in contrast to all other cetaceans, feed primarily on benthic (bottom) and epibenthic (near-bottom) invertebrates. The high biomass of preferred prey in the area (Fadeev, 2003, 2004, 2005, 2006, 2007) is probably the main reason for the formation of feeding groupings of Gray whales in the specific area in nearshore waters of northeastern Sakhalin. Gray whales have been observed to feed in two areas of the coastal shelf waters of the Sea of Okhotsk located not far apart. The first of these – the traditional feeding ground (normally referred to as the "near-shore" or "Piltun" area), is located just offshore from Piltun Bay, with most whales typically staying in shallow water (depths of up to 20-25 m) within 4-5 km from shore (Figure 1). The second feeding area, which was only discovered in 2001 and is called the "Offshore" area, is located 40-50 km south-southeast of the first area opposite Chayvo and Niyskiy bays, 25-40 km from shore in waters 35-60 m deep (Figure 1). In addition, groups of western Gray whales have been recorded feeding off the Eastern coast of Kamchatka (Vertyankin et al. 2004, Tyurneva et al, 2007).

Gray whales arrive off the northeast coast of Sakhalin in late May – early June, when the feeding area clears of ice. In late June - early July their presence in the area increases and by August most of the Gray whales aggregate in the feeding areas where they remain until October. The whales then begin their migration to the wintering grounds, with all whales leaving the northeastern coast of Sakhalin Island by late November – early December, when the sea begins to freeze again.

Gray whales actively feed only during the summer-fall season when they come to the shores of Sakhalin, while the rest of the year, including the breeding season, they survive almost exclusively on accumulated energy reserves stored mainly in a layer of subcutaneous blubber. It is therefore important to ensure normal feeding conditions for the overall health of the Gray whales. Data collected during recent years in the course of research programs on the Korean-Okhotsk Gray whale population (Yakovlev and Tyurneva, 2003, 2004, 2005, 2006; Yakovlev et al. 2007; Weller et al., 1999, 2000, 2001, 2002, 2003; Cooke et al., 2007) attests to the fact that the reproductive potential of the population is currently at an extremely low level, and the reproduction rate in the population is very low - 2.9% on average from 1994 to 2006 (Weller et al., 2007). Only 23 productive breeding females have been identified in the Piltun area (but up to 30 may exist) (Weller et al., 2007), and an average of 6.1 calves per year have been observed by the Russia-USA research team since 1998 (Weller et al., 2007).

The population status of this species, coupled with ongoing exploration and construction activities associated with the development of oil and gas projects off the northeastern coast of Sakhalin provides the basis for continued regular monitoring of important aspects of WGW ecology, including distribution and abundance, a better understanding of the most critical issues of their biology and to ensure minimal impact by anthropogenic activity.

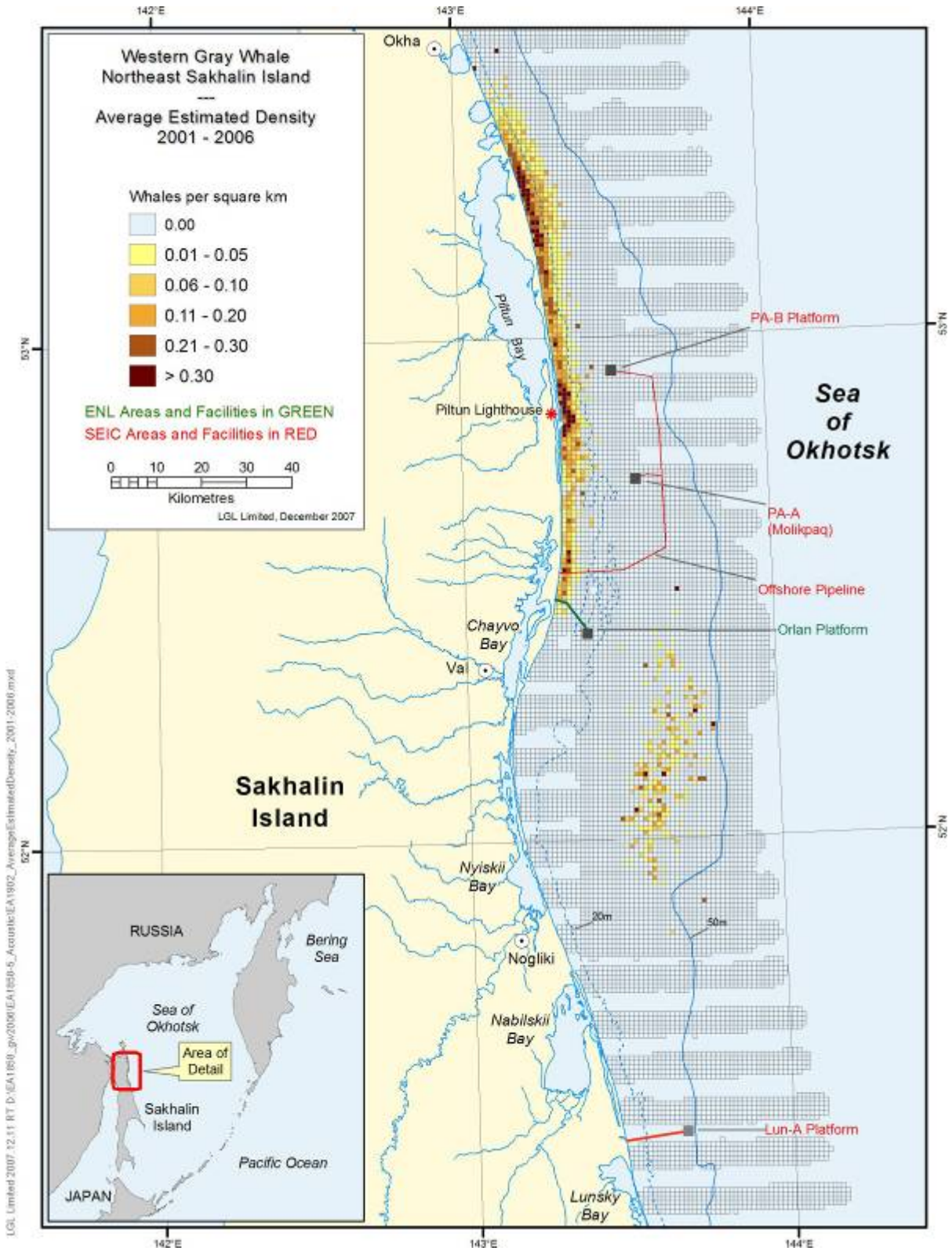


Figure 1 Average density of western Gray whales in the "Piltun" and Offshore" feeding areas in 2001 – 2006, northeastern Sakhalin Island

2 KEY PROGRAM GOALS AND OBJECTIVES

The main goals of this program are to monitor the ecology of the Korean-Okhotsk Gray whale population and its feeding habitat off northeast Sakhalin. The studies assess the distribution and abundance of the population, the seasonal features of the distribution of the animals, their behavior, diet, the status of food resources, and the acoustic and hydrology conditions in whale habitats in the coastal waters of northeastern Sakhalin. The studies also provide data that, in combination with other monitoring, (not covered in this SOW) can be used to assess effects resulting from anthropogenic activity (including industrial noise) associated with offshore field development operations. All studies under the program are coordinated and integrated to obtain the most comprehensive possible picture of the status and activity of the population, as well as the condition of their habitat. The practical result of the studies will continue to be the implementation of the strategic plan to protect the Korean-Okhotsk Gray whale population with increasing commercial activity in the region and the continued use of measures to manage the risks of impact on the population from anthropogenic factors associated with oil and gas field development on the northeastern Sakhalin shelf.

The study area covered by this scope of work is the coastal area of the northeast shelf of the island, including the waters of licensed production areas for the Sakhalin-1 (Odoptu, Chayvo and Arkutun-Dagi fields) and Sakhalin-2 projects (Piltun-Astokh and Lunskoye fields).

The scope of work presented here includes accepted scientific methodologies that are consistent with the stated objectives, ensure representative results and cause minimum disturbance of the whales. The individual components of the 2008-2010 western Gray whale joint monitoring program are described in greater detail in Section 3.

2.1 Safety

Safety of the research crews in the field is the highest priority of the project sponsors. Detailed safety plans will be written for each component of the monitoring program. Before the field season all field personnel will attend safety training. While in the field, a designated safety lead will provide daily safety/summary report to the project sponsors (or designees).

3 VESSEL-BASED SURVEYS

3.1 Goals and Objectives

Vessel-based surveys are an important component of the program for monitoring of the Korean-Okhotsk (western) population of Gray whales and other marine mammals. The goal of the surveys is monitoring and quantitative assessment of spatial and temporal variations in the distribution and numbers of Gray whales along the northeast coast of Sakhalin Island. Although the main study object within the scope of this program is the endangered population of western Gray whales, observations of other cetaceans and pinnipeds will be performed at the same time. Specific objectives of the vessel-based observations are the collection of:

- Systematic data on the distribution of Gray whales off northeastern Sakhalin throughout the feeding season.
- Observations of activity (e.g. feeding, breaching, social behavior) of Gray whales.
- Systematic data on the distribution of other encountered marine mammals.
- Data on the presence of all marine mammals in the Sea of Japan and the Sea of Okhotsk during the period of transiting to and from the study area from Vladivostok.
- Opportunistic data while other vessel-based operations are underway.

3.2 Contractor

The vessel-based survey program will be conducted by the Institute of Marine Biology of the Far Eastern Branch of the Russian Academy of Sciences (IMB FEB RAS), Vladivostok.

3.3 Methods

3.3.1 Survey Area

The area to be studied in 2008-2010 during the systematic vessel-based surveys includes: the two main Gray whale feeding areas (the Piltun and the Offshore areas) and the Arkutun-Dagi license block area of the Sakhalin-1 project. With the vessel moving at the recommended speed of 10-11 knots, a survey of the each of the three areas will take about 9-10 hours and will be completed in one day.

In addition, occasional surveys in the possible feeding areas of Gray whales will be conducted in other areas in the sea of Okhotsk (such as the area of Shantarsky islands, Magadan area, Penzhinskaya Bay) and along the eastern coast of Kamchatka.

The survey in the Piltun area will be conducted on a single transect about 180 km long (from 52° 01’ to 53° 36’ N) running parallel to and 4 km from shore so that the disturbance of whales is minimized (Figure 2). In good weather, the strip surveyed will be ~4 km wide on

each side. This will allow the observers to cover most of the feeding area off Piltun Bay, including areas that are not visible from shore, such as the area beyond the feeding area and a stretch of the coast south to Nyiskii Bay. The coverage will extend about 8 km offshore and will cover approximately 1440 km^2.

Surveys in the Offshore Area will cover an area of about 1040 km^2 southeast of Chayvo Bay (from 51°50' to 52°14 N and from 143°30' to 143°50' E) with depths of 35-60 m. The surveys will require 8 latitudinal transects 6.5 km apart (Figure 2).

Surveys of the Arkutun-Dagi license block area will cover an area of approximately 1000 km^2 covering the majority of the area of the Arkutun-Dagi license block (Figure 2.) The surveys will consist of 7 latitudinal transects 6.5 km apart (from 143°30' to 143°55'E). The transects will be bounded by 52°40' N in the north and 52°18' N in the south (Figure 2).

3.3.2 Survey Schedule

Systematic (in 2007 the surveys were conducted in the Piltun area monthly, and twice a month in the AD and Offshore areas) vessel-based surveys will be conducted during the summer-fall season when Gray whales are present in the Piltun and Offshore areas.

In addition, observations of marine mammals will be conducted during all other activities aboard the vessel (including transiting, taking benthic/prey samples, acoustic and hydrology monitoring and photo-identification studies of Gray whales).

3.3.3 Equipment Used and Data Logging

Survey personnel will have available two pairs of wide-angle range finder reticule binoculars (7x50) with built-in compasses. In addition, the observers will receive one portable computer to load GPS data and enter the results of daily observations, a printer, a satellite telephone for communication, two portable voice recorders and a handheld radio for communication with the captain's bridge. The voice recorders will be used to record data of visual observations of marine mammals, as well as information collected in the course of the survey. Each observer will have a digital watch with a stopwatch; all the watches will be synchronized daily with the GPS satellite time. Data on marine mammal sightings and weather conditions during the survey will be recorded in a special form (see Table 1).

Table 1. Information to be recorded by vessel-based Marine Mammal Observers

Data of visual observations of marine mammals	Survey data
• time of visual observation • GPS way point of all sightings or every 30 min if there are no sightings • marine mammal species • azimuth and distance to visually observed animal • vessel course/azimuth • in the case of Gray whales – nature of observation: whale(s) and mud plumes, whales only, mud plumes only • number of individuals sighted • if plumes are present – number of plumes • orientation or direction of movement of whale(s) • type of group: lone individuals or adult whales with calf (or calves) • type of behavior of animals: feeding, traveling (no feeding), or resting • other pertinent comments	• survey start and end times • start and end times for movement on transect • vessel course/azimuth • hydro-meteorological conditions on each coordinate line or at intersections of lines of two coordinate grids, including: 1. wind direction and speed 2. Beaufort sea state 3. visibility range: 5 – unlimited; 4 – 1000 m; 3 – 600 m; 2 – 300 m; 1 – 50-300 m; 0 – <50 m 4. presence of fog: 0 – no fog; 1 – light fog; 2 – fog 5. visibility/whitecaps: 0 – none; 1 – individual whitecaps; 2 – significant whitecaps rendering observation difficult 6. glare (intensity and azimuth) 7. cloud cover in percent, classes of clouds 8. other comments

In addition, data on the positions/time observed/distance/azimuth of all vessels seen within the visibility range will be recorded according to the procedure as used for recording sightings of the Gray whales.

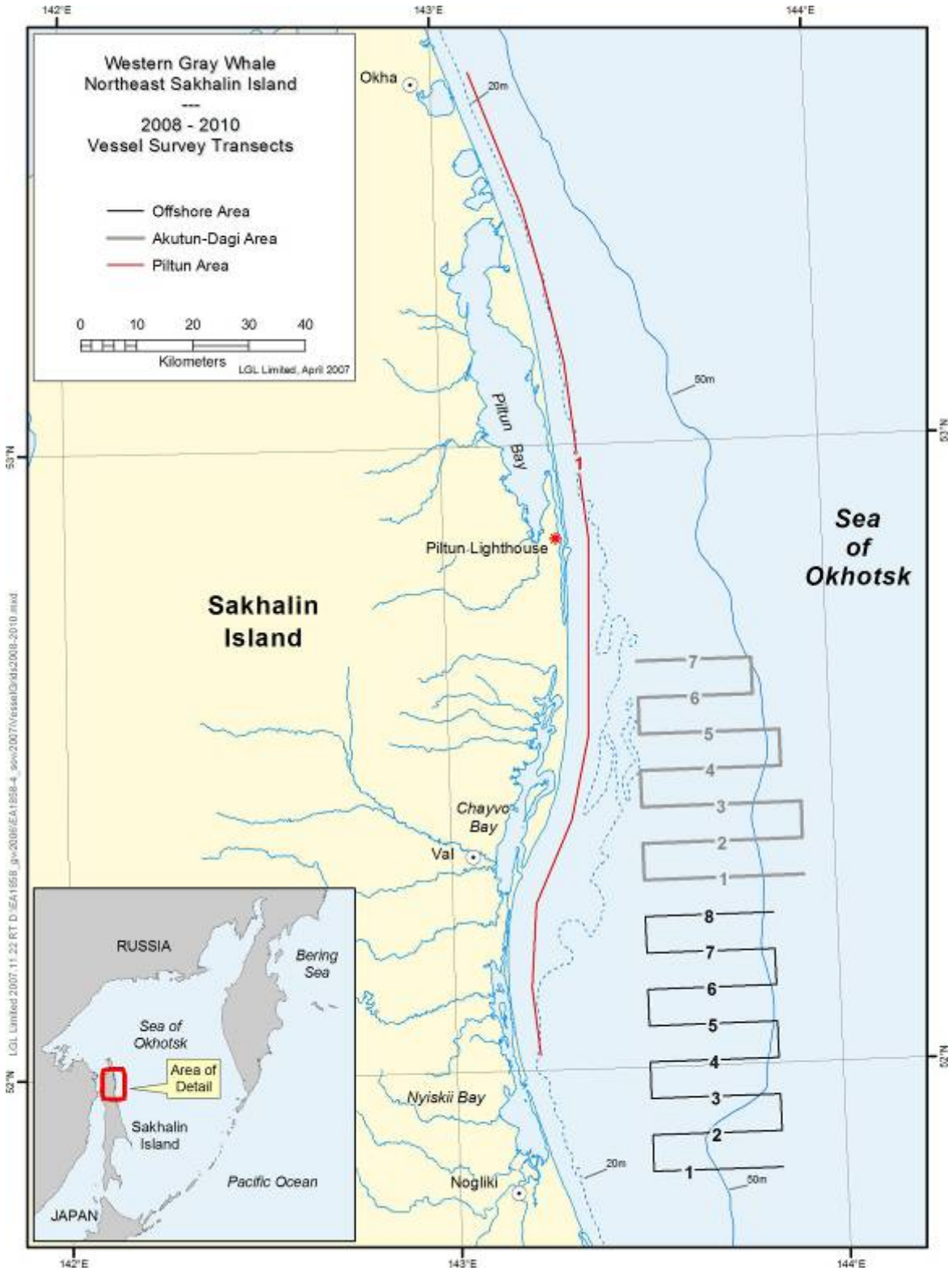


Figure 2 Transects for vessel-based surveys of Gray whales and other marine mammals on the northeast shelf of Sakhalin Island in 2008-2010.

4 SHORE-BASED SURVEYS

4.1 Goals and Objectives

The goal of onshore, vehicle-based surveys is to obtain detailed information on the nature of the distribution and abundance of Gray whales of the Okhotsk-Korean population in and adjacent to the feeding area located off Piltun Bay (the so called Piltun feeding area). The information obtained during the studies will be important to monitor the distribution and abundance of the Gray whale population along the shore of the Piltun Bay and south of it during the development of oil and gas deposits on the Sakhalin shelf by Sakhalin-1 and Sakhalin II projects. Data on the distribution of the animals obtained from shore-based surveys and the vessel-based surveys will be analyzed to estimate the densities of Gray whales summering along the northeastern coast of Sakhalin Island in 2008-10. Data will be compared with those from previous years (vessel-based surveys, aerial surveys, onshore, vehicle-based surveys) to address the following specific objectives:

- the distribution of Gray whales in the Piltun area during the feeding season and over a period of years;
- to obtain data on the distribution of other cetacean species observed during the surveys;

The program of systematic onshore, vehicle-based surveys will be conducted along the shore adjacent to the Piltun feeding area (Figure 3).

4.2 Contractor

The All-Russian Research Institute of Fisheries and Oceanography (VNIRO), Moscow will conduct the program of onshore, vehicle-based surveys. Lead research scientist, PhD of Biological Science -V.A. Vladimirov

4.3 Methods

4.3.1 Survey Area

Shore-based surveys of Gray whales of the Okhotsk-Korean population and other marine mammals will be conducted by two specialist teams north and south of the mouth of Piltun Bay on a ~100 km long section of the coast from 53°24’45" N in the north to 52°28’55" N in the south. This range corresponds to the most northerly and southerly point accessible to vehicles provided that the groups are based on the shore in the Piltun Bay area.

4.3.2 Survey Schedule

Shore-based surveys of Gray whales will be conducted within the period between mid June and October when visibility is good and conditions are safe.

4.3.3 Survey Organization and Data Logging Procedure

This work will only be performed in favorable weather, with good visibility and acceptable sea state (≤ 3 on Beaufort Scale). In conducting shore-based surveys, the survey personnel will use two 4x4 SUVs and follow a specified route along the shoreline. The surveys will be conducted from the predefined stations shown in Figure 3. The survey stations are elevated points along the coast between 5 and 8 km apart, depending on the terrain. There are 8 observation stations north of the mouth of Piltun Bay and 5 observation stations south of it.

At each survey station, two survey personnel will concurrently scan the entire visible sea area, at a scanning rate of 10 degrees/minute, according to the protocol used since 2004. The data obtained in the surveys will be recorded on a standard form (Figure 4).

After returning to the base camp, each team will enter the data into a computer.

4.3.4 Post-Expedition Data Processing and Analysis

Specific formulas (Lerzak and Hobbs, 1998;) will be used to calculate coordinates of Gray whales sighted during the survey based on the distance to Gray whales obtained using the binocular reticles and azimuth data from the built-in compass. Beginning in 2006 the data were plotted for average density calculation per square kilometer using a new method developed by LGL Limited and St. Andrew's University. The density-analysis method facilitates joint analysis of shore- and vehicle-based survey data and addresses the potential double counting of the same whales from neighboring shore stations, as well as from shore and vessel. Whale distribution maps based on the calculation results are then produced using ArcView GIS.

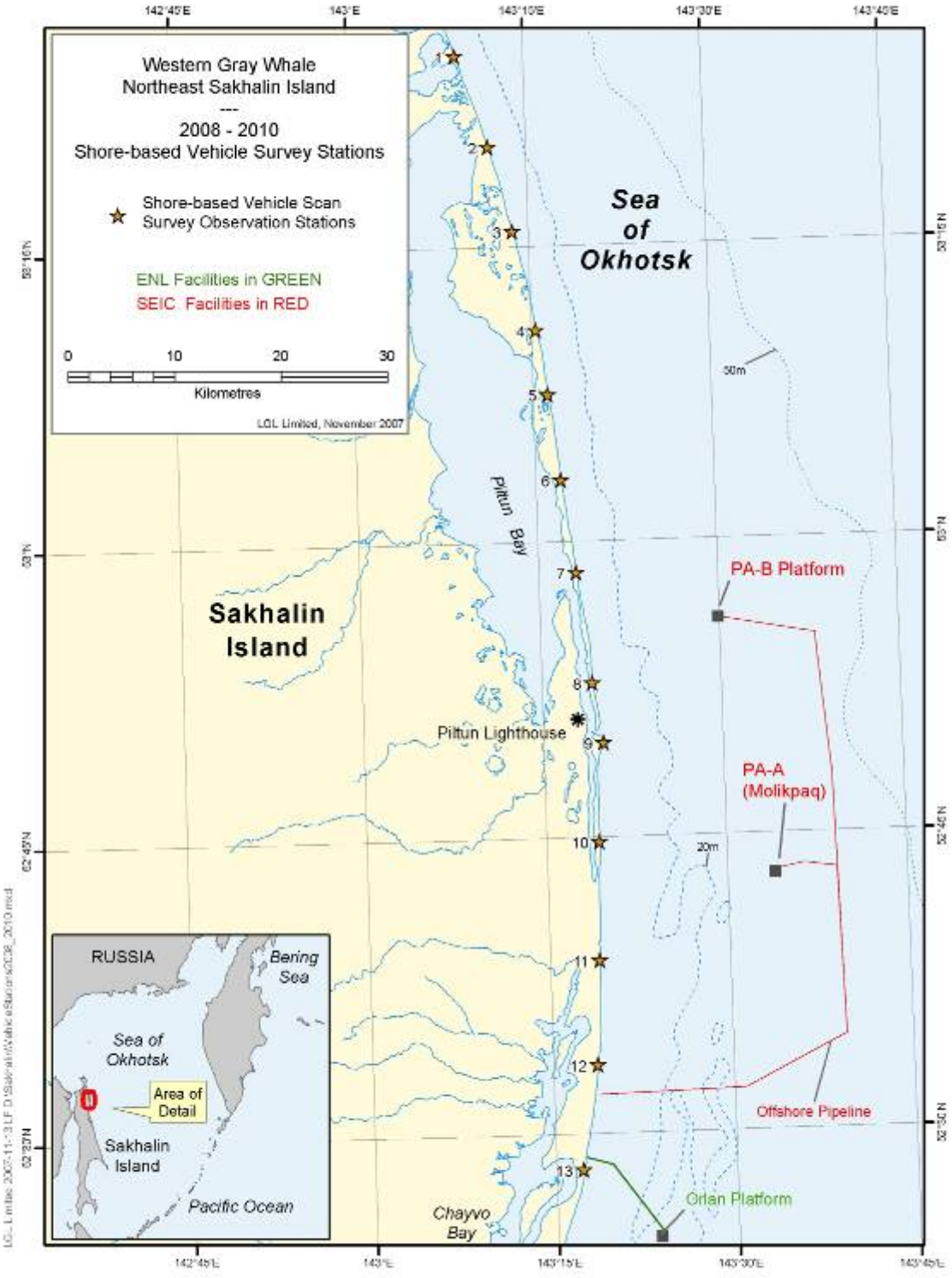
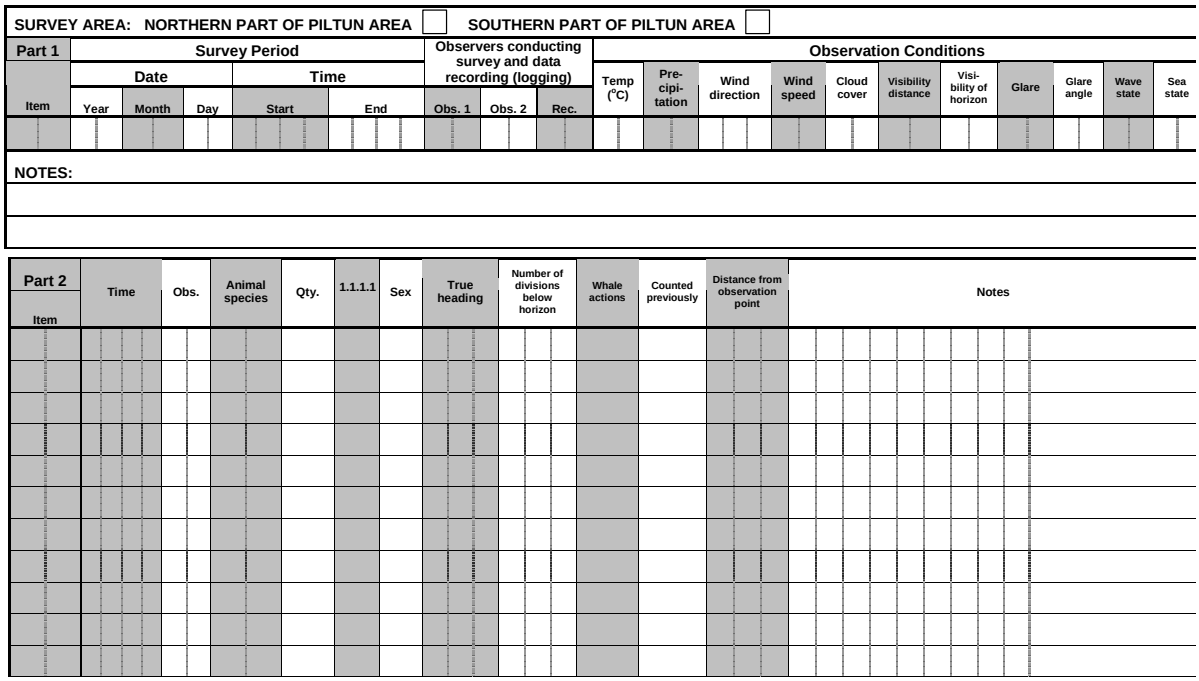


Figure 3 Locations of shore-based stations for surveys of the Okhotsk-Korean Gray whale population in 2008-2010.



SURVEY AREA: NORTHERN PART OF PILTUN AREA ☐ SOUTHERN PART OF PILTUN AREA ☐

Part 1	Survey Period					Observers conducting survey and data recording (logging)			Observation Conditions										
	Date			Time															
Item	Year	Month	Day	Start	End	Obs. 1	Obs. 2	Rec.	Temp (°C)	Pre-cipi-tation	Wind direction	Wind speed	Cloud cover	Visibility distance	Visi-bility of horizon	Glare	Glare angle	Wave state	Sea state

NOTES:

Part 2	Time	Obs.	Animal species	Qty.	1.1.1.1	Sex	True heading	Number of divisions below horizon	Whale actions	Counted previously	Distance from observation point	Notes
Item												

Figure 4 Form for recording data at shore-based survey stations in 2008-2010.

5 PHOTO-IDENTIFICATION OF GRAY WHALES AND STUDY OF THEIR ATTACHMENT TO SPECIFIC HABITATS

5.1 Goals and Objectives

The main objective of the photo-identification (hereafter referred to as Photo-ID) work is individual photo-identification of Korean-Okhotsk Gray whales for the purpose of defining patterns of the annual return of animals to feeding habitats off the northeastern shores of Sakhalin and the attachment of identified individuals to specific waters, in order to determine the size, structure and status of the population. The studies cover the Piltun and the Offshore feeding areas. Whales will also be photographed along the northeast coast of Sakhalin outside the main feeding areas if they are encountered. Photo-ID can be used to determine various aspects of the biology of Gray whales of the Korean-Okhotsk population, including:

- Number and status of cow/calf pairs (birth rate and survival rate of calves);
- Habitat Utilization:
  - Individual feeding areas and their selection,
  - The overall feeding habitat used by the population.
  - Attachment to specific feeding waters;
  - Evidence of movement between feeding areas
- Health of the population;
  - Physical condition of individuals – recording of “skinny whales” and long-term monitoring of such individuals to identify the predisposition to “emaciation” and/or recovery to normal condition;
- Data needed for population estimates using mark-recapture methods
  - Number of repeated sightings of individuals (within a single season and over a period of years);
  - Demographic structure of the population;
- Size of feeding groups;
- Patterns of formation of groups of individuals;

5.2 Contractor

The photo-ID program will be conducted by the Photo-ID team from the Institute of Marine Biology of the Far East Branch of the Russian Academy of Sciences (IMB FEB RAS), Vladivostok (team leader – PhD of Biological Science Yu.Yakovlev).

5.3 Methods

5.3.1 Survey Area

Photo-ID methods have proven extremely useful for Gray whale studies (Darling, 1984; Weller et al., 1999; Calambokidis et al., 2002; Yakovlev et al., 2007), since these whales have distinct light spots of various shapes and sizes on their flanks,

backs and flukes by which they can be distinguished. Vessel-based photo-ID studies will be conducted on days with favorable weather during the summer-fall period in 2008-2010. As in the studies in 2002–2007, photo-ID work will be conducted from an inflatable boat (Zodiac) with outboard motor, deployed from a larger research vessel. The base vessel will always remain more than 1 km from the Gray whales being photographed.

The identification team will include a videographer, photographer, data recorder and driver. Upon initial sighting of a whale, the driver will slow down the inflatable boat to a maximum of 4-5 km/h (the speed of the pedestrian) while approaching the whales to the approximate distance of 500 m. At this speed the boat approaches animals keeping the distance of 100 m, but no closer than 50 m if the weather conditions are not very favourable (light fog, heave). When the above-mentioned distance is reached, the boat stops without stalling the engine (flitting run). The whale's position (fixed by GPS), the time, and the activity and number of whales will be recorded from this position. Mud plumes that appear when whales are feeding on benthic organisms, which may be observed both near whales and when the whales themselves are not visible, will also be recorded. Information on the place/time/distance/azimuth of any outside vessel within visibility range will also be recorded in a manner similar to the information about sighted whales every time the vessel is seen. The data will be recorded on waterproof sheets and entered in MS Excel spreadsheets on a portable computer at the end of the day.

The inflatable boat will then approach the whale(s) to within 50 m and attempts will be made to photograph and video the dorsal view and left and right flanks of each whale, with subsequent photographing of the dorsal (spinal) and ventral (abdominal) surfaces of the tail fluke. Although photographs of the head area are not normally used for identifying Gray whales (Calambokidis et al., 2000; Weller et al., 2002), photographs of the front part of the body (i.e., immediately behind the nostrils, and the back) are very important for documenting the characteristics of "skinny" whales. All photo-ID work will be conducted in accordance with the Whale safety protocols (Appendix). A Nikon D2X digital camera equipped with a 100-300 mm zoom lens will be used for photography. A Canon Optura 20 digital video camera will be used for video photography. The inflatable boat will leave a group of whales at minimum speed, until the distance between the boat and the whale/whales is about 500 m. This procedure will be repeated every time a group of whales is observed.

Inflatable boat and whale behavior should be observed from vessel. If visible signs of whale disturbance appear, the inflatable boat crew should be informed immediately for a decision of work termination. This kind of event should be noted for future analysis.

5.3.2 Post-Expedition Data Processing and Analysis

Standard photographic matching procedures for pattern-based matching of flanks and flukes will be followed as described in the International Whaling Commission Special Issue No. 12 (Hammond et al., 1990) and also taking into consideration recent work by other specialists

studying Gray whales and other large whales (Calambokidis et al., 2002; Weller et al., 2004).

Only if high-quality photographs of the right side of an un-matched individual are available will it be assigned a new identification number. Identification numbers will not be assigned on the basis of fluke photos that could not be matched to corresponding right or left flank images of known whales.

Once the annual pre-catalogue matching is deemed reliable, the whales will be given permanent identification numbers and transferred to the final catalogue. After the annual catalogue is complete, discrepancies between the current catalogue and the master catalogue will be corrected. Any new information and photographs obtained during the last field season will be added to the master catalogue and any updates to catalogue information marked within the database. Special attention will be devoted to identifying whales with various deviations from the “physiological norm,” including: (1) whales with poor body condition (BC); and (2) whales with obvious sloughing of skin.

6 STUDY OF GRAY WHALE BEHAVIOR

6.1 Goals and Objectives

This work is intended to assess the status of the Korean-Okhotsk Gray whale population and the potential impact of commercial activity on the behavior and biology of these animals in their summer-fall feeding grounds off the northeast coast of Sakhalin Island. The detailed information obtained on the whales' behavior and the nature of their movements will provide a better understanding of natural features of the biology of these animals, as well as identifying leading indicators of potential impacts on the whales. Small perturbations in behavior that do not result in significant impacts on feeding would not be expected to create biologically significant effects. Natural variations in behavior including those manifested in annual or seasonal cycles, in geographic areas or in connection with prey availability will also be noted. Data collected during years of low anthropogenic activity establish baseline ranges of measured parameters.

The program is a continuation of the behavior studies conducted in 2001-2007. Over the past few years observations were conducted concurrently from two theodolite stations (three in 2006) to enhance temporal and spatial monitoring throughout the study area. Various statistical models will be used to evaluate the impacts of anthropogenic activities on whale behavior by evaluating the effects of natural environmental parameters, sound levels and anthropogenic activities. These analyses will help determine if mitigation plans have been effective in limiting behavioral reactions. Data collected by this team will provide important information on the behavior and distribution (several scans taken in one day at one location) data. Such data help the assessment of the effectiveness of measures to protect the Korean-Okhotsk Gray whale population and its key habitats along the shores of Sakhalin.

The study of distribution and relative abundance of Gray whales at given locations over the course of a day, while they remain on their feeding grounds off the north-eastern coast of Sakhalin Island, is planned for the survey period. These two issues are important not only for preservation and monitoring of the species, especially in connection with anthropogenic impact, but also for understanding how western Gray whales utilize their habitats depending upon particular features of the environment. Correlation with other analyses will make it possible to explore whether observed variations in the animals' behavior are related to anthropogenic impact or disturbance of the environment or simply a manifestation of known natural variability by comparison with previous baseline data collected during years of no anthropogenic activity (2002-2004).

Mother-calf pairs will be another focus of the studies, since they are the most vulnerable element of the population and most likely to be affected by anthropogenic activities. The capability of identifying individual whales will yield valuable information about mother-calf pairs, weaning times, individual preferences in habitat use, and associations among individuals.

The combination of various methodological approaches (scanning, focal observation of the animals' behavior, theodolite tracking, and shore-based photo-identification) and detailed long-term observations will increase our knowledge about the population its behavior and

the spatial and temporal dynamics of these animals at an individual, group and population level.

6.2 Work Content

The specific objectives of the planned work are:

1) assessment of the spatial and temporal dynamics of the movements of Gray whales in relation to natural environmental parameters and potential anthropogenic impact;
2) investigation of the animals' behavior, especially their feeding behavior, and identification of behavioral characteristics that could be disrupted as a result of human related activity;
3) assessment of the abundance and spatial distribution of Korean-Okhotsk Gray whales;
4) identification of possible differences in behavior, movement and the nature of area use by mother-calf pairs;
5) development of a database that will combine data on the state of the environment, areas used by the whales, food resources and the effects of anthropogenic activity.

The overall goal of the study is to use each of the aforementioned objectives for better understanding of the biological characteristics and natural parameters of the behavior, distribution, abundance and movements of the Korean-Okhotsk Gray whales for further improvement of environmental impact mitigation and environmental protection measures in connection with existing and planned commercial activity off the northeast coast of Sakhalin Island.

6.3 Contractor

The set of ethological studies will be performed by specialists from Texas A&M University (Galveston, Texas, USA). Students with biological background from the Far East State University (DVGU) and Sakhalin State University (SSU) will also be involved in the research.

Team leaders are G.Gailey and O.Sychenko

6.4 Methods

Three main study methods (scanning, focal observations of the animals' behavior, and theodolite tracking) are planned for use in the Korean-Okhotsk Gray whale population monitoring program.

6.4.1 Survey Area

Six observation stations (Figure 5) have been selected to monitor the behaviour of Gray whales off the coast of Piltun Bay. The location of each station will allow the shore-based observer team to monitor Gray whales along 66 km of shoreline. Two of the six onshore stations will be used for monitoring each day; i.e., about 20 kilometers of the coast will be

covered each day. All the observation stations will be used in turn, moving from south to north.

6.4.2 Theodolite Tracking

Monitoring of the movement of individual whales and groups of whales will be conducted at each station using 30-power Lietz/Sokkisha DT5A theodolites with angular accuracy to 5 seconds. This method will allow converting horizontal and vertical angles to geographic coordinates (latitude and longitude) for each theodolite observation record. The tracking of the movement of groups of whales over specific time will provide data on the relative speed and direction of movement of the animals under “normal” conditions and in the presence of anthropogenic activity in the sea (Würsig et al., 1991; Gailey and Ortega-Ortiz, 2002). Theodolite tracking will begin when a group of whales comes sufficiently close to the shore station (within 5 km). Each group of animals will be tracked continuously until the animals get out of visual range by moving more than 5 km away, or until environmental conditions render further observation impossible. If a vessel passes relatively close (5 km) to the group under observation, the theodolite operation will track both targets and record the speed and direction of movement of the whales relative to the movement of the vessel (or vessels).

6.4.3 Focal Observations of Behavior

Behavioral observations (Altmann, 1974; Martin and Bateson, 1993) will be conducted for mother-calf pairs and individuals to determine their natural behavior and possible impact on the nature of the behavior and/or respiration of Gray whales of the Korean-Okhotsk population. At least one observer will monitor individual whales with binoculars (7x50) recording each element of behavior that they notice, and the computer operator will record the data and the observation time into the *Pythagoras* program (Gailey and Ortega-Ortiz, 2000).

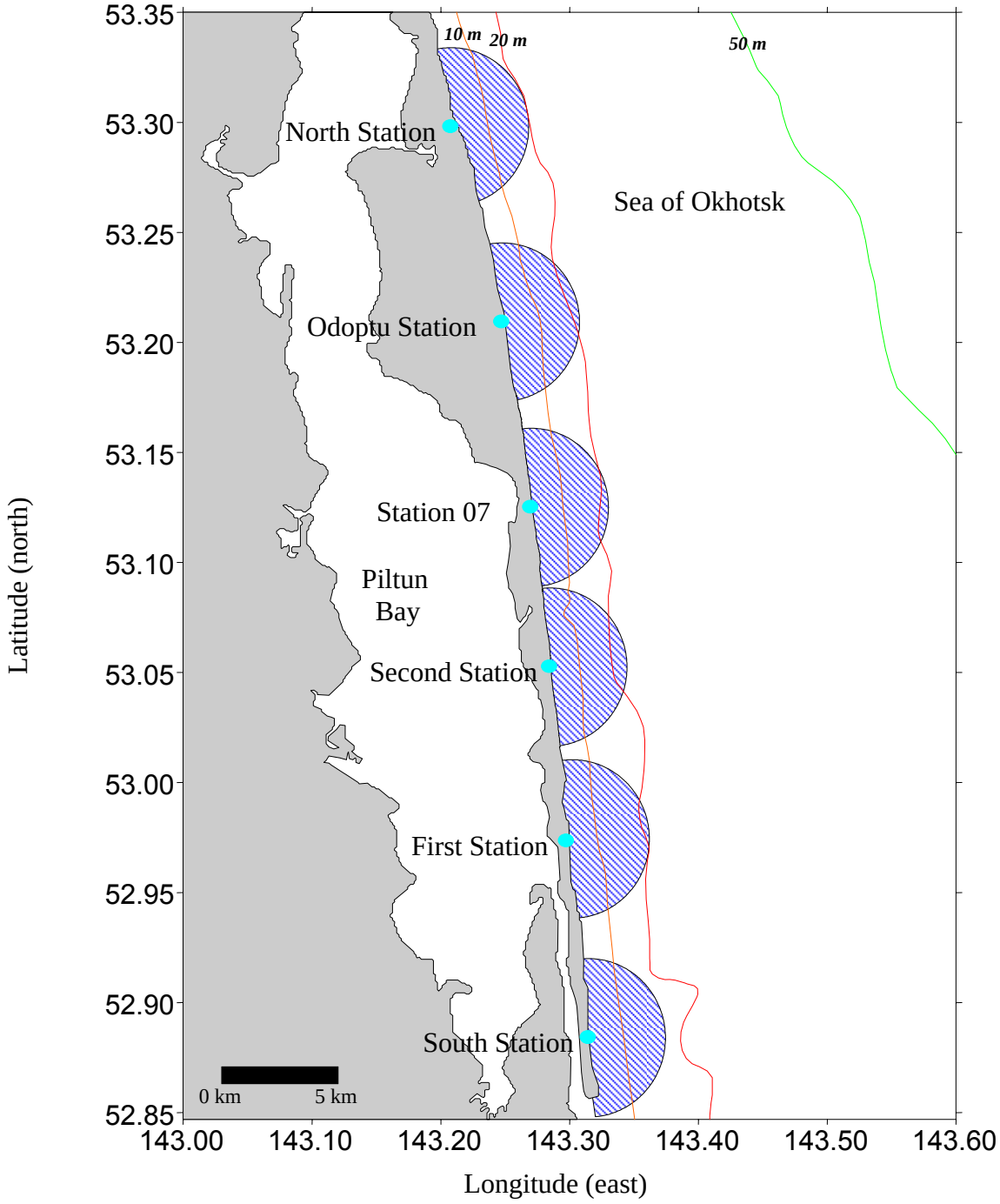


Figure 5 Locations of six onshore stations for observation of the behavior of Gray whales in the Piltun Area in 2008-2010.The shaded half circles indicate approximate observation zones (4 km) for each onshore station.

6.4.4 Scan Sampling

To monitor the relative abundance of Gray whales in each observation area, scan sampling methods will be employed every hour, unless focal observations are being conducted at that time. Two observers scan a predefined section of the observation area in a sector from 0° to 180° relative to the north magnetic pole using binoculars (7x50). If the observers see a

whale or whales, they will record the number of animals, the magnetic azimuth and the approximate distance from the observation point.

6.4.5 Shore-Based Photo-Identification of Individual Gray Whales

A photo-identification system will be used to identify individual Gray whales from photographs that approach within a reasonable distance (<2 km) from the shore-based observation station. Nikon D1x and Nikon D2x digital cameras in combination with a 300-800mm lens with a 2x extender will be used to photographically capture identifiable features of western Gray whales. The date, time, group number and geographic position will be recorded for each photographic image. The capability of identifying individual whales will yield valuable information about mother-calf pairs, weaning times, individual preferences in habitat use, and associations among individuals.

6.5 Data Analysis Methods

To assess the data collected on the natural distribution and the possible anthropogenic impact on the distribution, movement and behavior of Gray whales of the Korean-Okhotsk population and their use of the feeding area, it will be necessary to use several types of data analysis.

6.5.1 Theodolite Tracking

Information gathered by theodolite observations will be evaluated in terms of relative speed and direction of movement, dispersion and movement of individual animals in the monitoring zone. New analysis techniques will be used to assess the characteristics of movement represented as uncorrelated random walks (Turchin, 1998). Each path line will be divided into separate “steps,” and temporal interpolation will be performed for the line to minimize the possibility of over- or under-sampling and the lack of correlation of coordinates within the scope of a single tracking line. The individual step unit will be based on the frequency distribution of step length, rotation angles and number of fixes (Turchin, 1998). After repeated sampling from a tracking line, the linear velocity of the group of whales between fixed points, linearity, frequency of changes in direction, average trend, degree of dispersion and movement distance will be calculated (Gailey and Ortega-Ortiz, 2002; Würsig et al., 2002; Turchin, 1998).

6.5.2 Behavioral/Respiration Data

Data of focal observations of the behavior of the animals are categorized into the following six parameters: 1) respiration interval (time between two successive inhalations at the surface); 2) number of blows per surfacing (number of exhalations (spouts) at the surface); 3) surface time (time each animals spends at or near the surface); 4) dive time (time each animals spends under water); 5) surface blow rate (number of exhalations per surface time); 6) dive-surface blow rate (number of exhalations per duration of the surfacing-diving cycle). These parameters are also subject to analysis in terms of animal’s movement, if theodolite tracking observation of the animals was performed concurrently. A data series with a length

of about 10.5 minutes will be taken from each observation of the behavior of an animal by the random sampling method, and an analysis will be performed on each of the six parameters.

6.5.3 Data Sampling by the Scanning Methods

Analyses of the abundance and distribution of Gray whales will be performed to define and assess habitats being utilized by Gray whales, which may prove to be exceptionally important feeding areas. Regression models including the year, date, time, environmental conditions, position, depth and parameters of the anthropogenic impact that can occur in the area in question will be developed. The model will include a correction for visibility to provide standardization of survey counts under different environmental conditions and standardization of the observation distance from shore.

7 STUDIES OF THE STATUS OF FOOD RESOURCES AND TROPHIC ECOLOGY OF GRAY WHALES

7.1 Rationale for the Work

Recent monitoring studies organized with funding from the Sakhalin-1 and Sakhalin II projects have documented seasonal and year-to-year changes in the distribution of Gray whales of the Korean-Okhotsk population along the northeast coast of Sakhalin Island (Weller et al., 2000, 2001a, 2004, 2007; Blokhin et al., 2003, 2004; Meier et al. 2007; Vladimirov et al. 2005, 2006, 2007). Variations in the distribution of whales are possibly due to the whales depleting their feeding areas, fluctuations of the prey biomass and quality during the season, or due to anthropogenic activities. US and Canadian scientists are actively researching the role of these processes in the movements of the Californian-Chukchi (eastern) population of Gray whales (Dunham and Duffus, 2001, 2002; Meier 2003; Moore et al. 2003). It is clearly important to gather information to understand the causes of seasonal and year-to-year movements of Korean-Okhotsk Gray whales along the northeast coast of Sakhalin Island.

7.2 Goals and Objectives

The goal of this long-term prey sampling program is to obtain information with respect to the feeding area of Gray whales, which will help to determine (1) the colony density of prey organisms and the distribution and availability of food for Gray whales, and (2) whether the local and regional movements of Gray whales of the Korean-Okhotsk population are related more closely to prey availability or anthropogenic activity. This information will be useful to both scientists studying the whales and to industry representatives to interpret whale movement and develop plans to mitigate potential negative impact from activities.

The goals of this feeding ecology study are as follows:

- To characterize the distribution and abundance (colony density and biomass) of prey organisms in actively used feeding areas and outside these areas;
- To define and characterize the feeding range of Gray whales of the Okhotsk-Korean population within the zone in question;
- To compare the distribution of Gray whales during the season and from year to year to the prey distribution to understand the movements that occur.

7.3 Contractor

The prey studies will be conducted by the Institute of Marine Biology of the Far East Branch of the Russian Academy of Sciences (IMB FEB RAS), Vladivostok (team leader – PhD of Biological Science V.Fadeev).

7.4 Methods

This section describes the methods for field studies for:

- Taking samples using a standard long-term sampling grid of benthic stations and monitoring of select stations in the Piltun and Offshore feeding area;
- Taking samples at whale feeding sites both near feeding areas concurrently with photo-ID studies, including scuba diving in waters less than 12 m deep;
- Taking samples in zones outside the main feeding areas (control zones and shallow feeding sites such as Chayvo and Lunsky Bay)

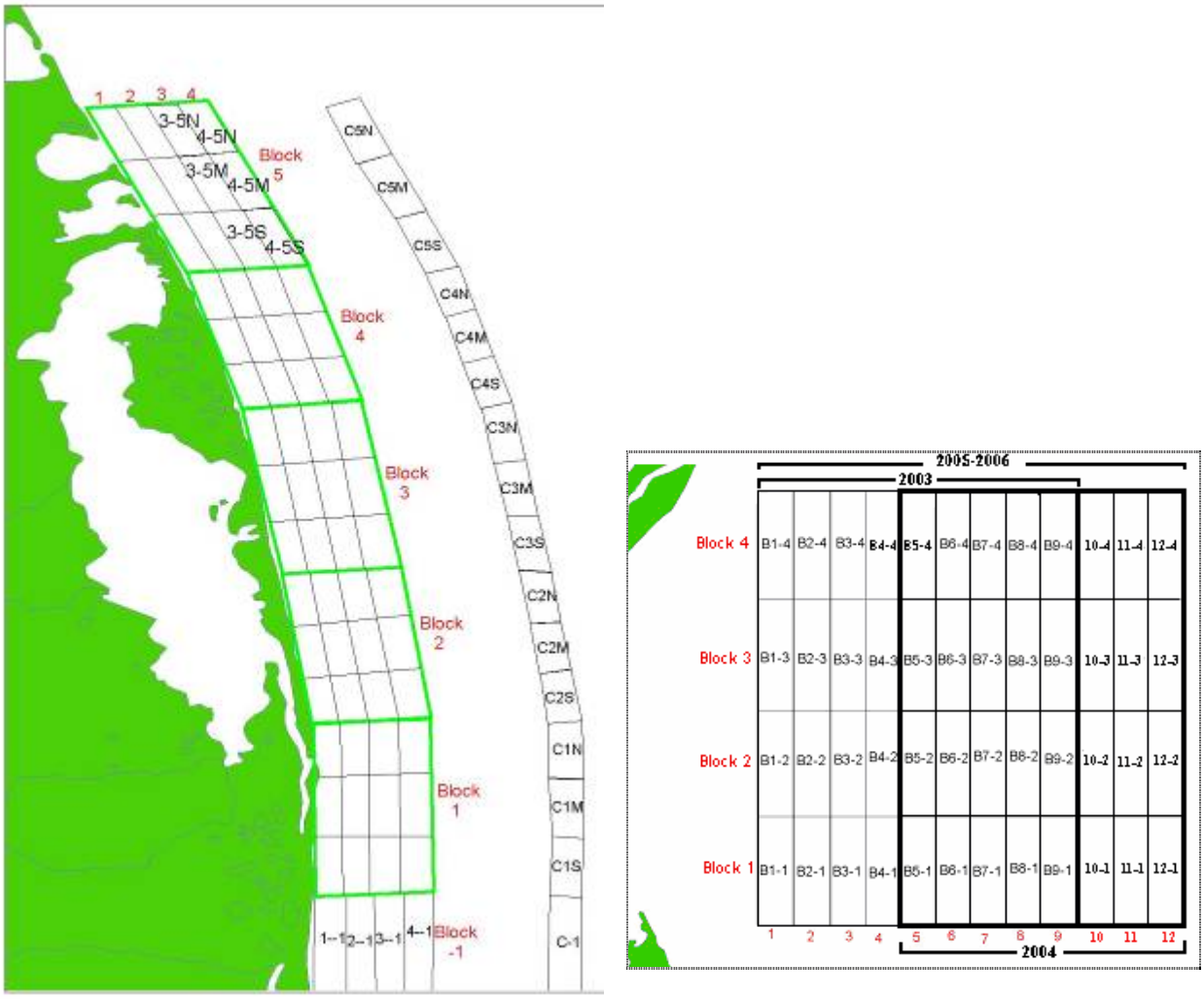
7.4.1 Long-Term Benthic Monitoring on Standard Station Grid

The grid cells used in sampling from 2002-2007 corresponded to the intensive aerial survey lines used in prior years. The sampling grid consisted of total of 60 cells (982 km^2) in the Piltun area (Figure 6A) and 48 cells (2160 km^2) in the Offshore Area (Figure 6B). The cells in control zones A and B (Figure 6B) totaled 252.5 km^2, and another 4 cells were laid out in the control zone along the coast of the island opposite the Offshore feeding area (186.6 km^2).

Triplicate samples will be taken at each sampling station with a Van Veen bottom grab sampler. To assess the presence and density of epibenthic prey (such as crustaceans and amphipods inhabiting near bottom layer) at each station, an underwater video camera will be used. If significant epibenthos accumulations are discovered, a plankton Bongo net and an epibenthic net will be used to take appropriate samples.

The results of previous surveys have shown that most of the whales feed in waters less than 20 m deep in the feeding zone off Piltun Bay. Benthic sampling in waters < 12 m (where the research vessel cannot reach) will be performed by divers using a benthic diving sampler.

It is recommended that the entire grid of stations (Piltun Bay area, Offshore area and all control areas) be used for sampling in 2008-2010 to assess long-term changes in the composition, distribution and abundance of prey invertebrate communities.



(A) (B)

Figure 6 Grid of stations for sampling prey of Gray whales (A) in the Piltun and (B) Offshore feeding areas in 2002-2006 (A, B, C = reference sites).

7.4.2 Prey Sampling at Gray Whale Feeding Points

Prey sampling at Gray whale feeding points will be performed from a research vessel and inflatable boat. Whale feeding site locations will be determined during photo-ID of the whales. An underwater video camera will be used for visualization of the water column and the bottom area where the whales are feeding; this will make it possible to identify prey type (benthic, epibenthic, planktonic) and assess its abundance. A bottom grab sampler will be used to take benthos samples, and plankton and epibenthic nets will be used for epibenthos sampling. Three duplicate samples will be taken at each station.

Beside the benthos samples the faecal samples and samples from whales “feeding spots” (suspended material plume) will be taken. The double plankton net Bongo and epibethos net will be used for collecting the samples of the suspended materials and the scoop-net made of fine-meshed webbing will be employed for faecal sampling.

The minimum distance between the base research vessel and the whales under observation shall be 1 km. Before the vessel approaches commercial development sites, the expedition leader reports to ENL and SEIC representatives concerning sampling plans to coordinate the work to be done in those areas.

7.4.3 Environmental Baseline Studies

Hydrologic data (temperature in surface and near bottom water layers, and water salinity) will be collected at each benthic station using Valleport 606 oceanographic sonde. Additionally, seabed sediments will be sampled for particle size, organic matter and pollutant (petroleum hydrocarbons and toxic metals) concentration analyses. Such analysis results will then be used to assess environmental factors affecting spatial and temporal distribution and abundance of western Gray whale prey.

7.4.4 Laboratory Analysis Methods

Organisms not potentially included in the Gray whales' food resources and accounting for only an insignificant part of total biomass will not be taken into account. Data on the composition of the Gray whale prey invertebrate population will include:

- Body length frequency distribution;
- Number of groups;
- Maximum size of adult individuals; and
- Proportion of the population capable of reproducing

The invertebrates will be broken down by species and by size classes (1 mm discretion). The epibenthos and plankton samples will be studied first for individual taxa and then separated using a Folsom plankton divider. One part of the sample will then be used for analysis, and the other part will be stored. Amphipods and other benthic invertebrates will be separated into individual categories: 0-5.9 mm in length (small) and 6-11 mm (large) according to the Rice and Wolman analysis (1971) used in studying the stomach contents of Gray whales.

8 ACOUSTIC & HYDROLOGIC STUDIES

8.1 Goals and Objectives

Research studies for this program to be carried out on the northeast shelf of Sakhalin Island will be designed to accomplish the following tasks:

- Measurement of ambient sound levels and the variation in sound levels in the western Gray whale feeding areas resulting from anthropogenic activities, such as oil and gas exploration and production. Acoustic monitoring is conducted using Autonomous Underwater Acoustic Recorders that are deployed every year at the same locations within the western Gray whale feeding areas or at their edges. Simultaneous ambient noise level measurements are taken at a 'control' site that is located at sufficient distance from any proposed or existing industrial developments to ensure unbiased comparison of data.
- Real time Transmission Loss (spectral) along profiles from the major facilities (existing or proposed) to the edges of the Piltun and Offshore feeding areas. Results of such studies make it possible to predict the potential change in sound levels in the feeding areas should a facility generating a known sound spectrum be installed at a specific location.
- Hydrological data needed for estimation of sound transmission.

8.2 Contractor

Pacific Oceanological Institute (POI), Far East Branch of Russian Academy of Science, Vladivostok, Russia. The team leader will be Dr.Sc. Alexander Rutenko, head of Acoustic Ocean Probing Laboratory, POI.

8.3 Methods

8.3.1 Survey Area

These studies will take place off the northeast coast of Sakhalin Island. The acoustic program will involve vessel-based deployment of Autonomous Underwater Acoustic Recorders (AUAR) and key acoustic and hydrologic measurements from a research vessel. The acoustic monitoring will continue to be conducted at locations designated during the 2003 to 2007 acoustic programs. The stations and their coordinates are listed in Table 2 and graphically presented in Figure 7.

Table 2 Acoustic monitoring station descriptions, numbers and coordinates

#	Stations		Latitude, N	Longitude, E	Depth
1	Lunskoye	Лунское	51° 51' 45"	143° 37' 27.3"	50 m
2	OFA (Offshore Feeding area)	ГЗК (Глубоководная зона кормления)	52° 10' 18"	143° 36' 1.8"	40 m
3	Orlan	Орлан	52° 21` 36``	143° 35'	32 m
4	Arkutun-Dagi	Аркутун-Даги	52° 19' 9.6"	143° 44' 4.6"	40 m
5	Piltun-S	Пильтун-Ю	52° 40' 51"	143° 22' 34"	10 m
6	Piltun	Пильтун	52° 49` 18``	143° 24` 54``	20 m
7	PA-B-10	ПА-Б-10	52° 53' 2.1"	143° 20' 10.6"	10 m
8	PA-B-20	ПА-Б-20	52° 54' 00"	143° 23' 20.5"	20 m
9	Odoptu-PA-B	Одопту-ПА-Б	53° 00' 00"	143° 21' 18"	20 m
10	Odoptu-S-10	Одопту-Ю-10	53° 03` 42``	143° 18` 18``	10 m
11	Odoptu-S-20	Одопту-Ю-20	53° 03' 42"	143° 19' 58"	20 m
12	Odoptu-N-10	Одопту-С-10	53° 09` 06``	143° 17` 24``	10 m
13	Odoptu-N-20	Одопту-С-20	53° 09' 06"	143° 18' 42``	20 m
14	Control	Контрольная	53° 25' 57``	143° 11` 06``	20 m
15	Molikpaq	Моликпак	52° 45' 52"	143° 26' 38"	24 m
A9	#9 (BEH-Odoptu)	#9 (Пов-Одопту)	53° 12' 33.1"	143° 15' 51"	10 m
A10	#10 (BEH-north)	#10 (Пов-север)	53° 17' 52.4"	143° 13' 25.4"	10 m
A11	#11 (Chayvo-4)	#11 (Чайво-4)	52° 34' 00"	143° 23' 00"	18 m

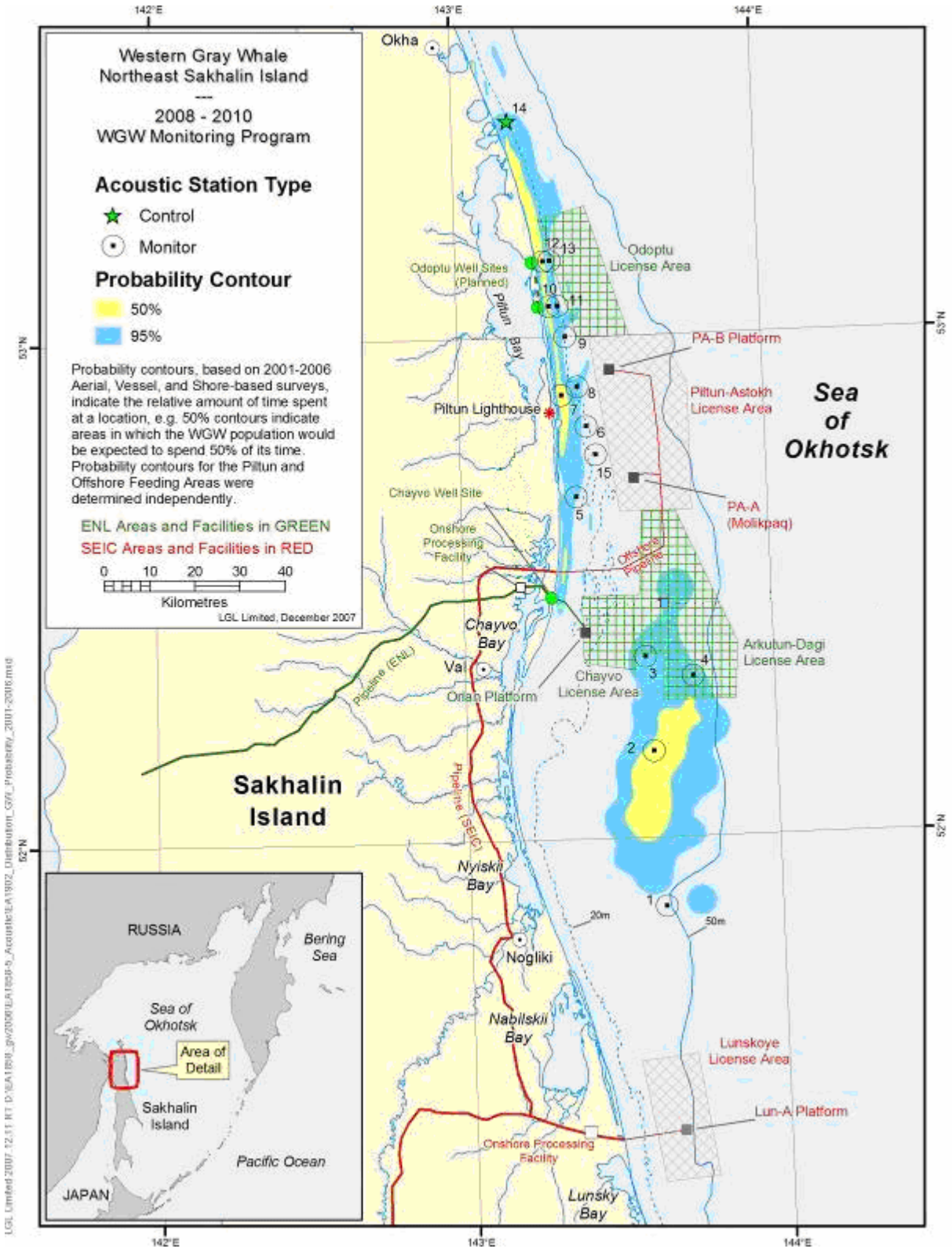


Figure 7 Locations of acoustics monitoring stations in 2008-2010 northeastern Sakhalin Island.

8.3.2 Survey equipment

Ten AUARs with the capability of 28 days of continuous recording, and six AUARs with 18 days of duration will be used to collect acoustic data. For real time monitoring four Telemetry-AUARs (T-AUARs) having an additional radio-telemetry channel may be used (the capability of at least 18 days of continuous recording). Additionally, autonomous acoustic measurements will be taken using six mini-AUAR's (with a reduced (72 hours) record time) designed for real time measurements, such as real time Transmission Loss studies. All types of the AUAR's will have a dynamic range of >72 dB and a flat frequency response from 1 to 15,000 Hz (16 bit).

In addition, two digital and four analog acoustic sonobuoys will be used to measure acoustic signals in real time. The analog sonobuoys will record frequencies from 10 Hz to 10 kHz and the digital sonobuoys from 1 Hz to 2.6 kHz. An autonomous (7 days record time) vertical acoustic-hydrologic acquisition system (Mollusk-07) will be used to take stationary measurements (at eight water depths) of the vertical structure of the acoustic field within a frequency range of 10 to 5,000 Hz formed in water column 31.5 m deep and of the temperature fields (with the resolution of 0.005°C).

A low frequency (LF) resonant electromagnetic transducer and piezoelectric high-frequency (HF) broadband transducer will be used for acoustic and elastic (seismic) signal Transmission Loss studies along the specified profiles. All the above listed equipment was designed and developed by the POI.

Hydrologic measurements will be obtained using Valeport SV EXTRA autonomous combination sonde measuring pressure, temperature, sound velocity and electrical conductivity (salinity).

8.3.3 Survey organization and schedule

Acoustic survey organization and schedule depends on specific tasks set for the upcoming field season.

The measurement taken by AUARs deployed every year at the same acoustic monitoring stations are a key element of the acoustic program. Such stations are located both close to major industrial facilities (existing or proposed) and to the edges of the western Gray whale feeding areas and within such feeding areas. Only such data ensure unbiased assessment of cumulative acoustic effects of anthropogenic sound generated in the area as a result of the industrial activities of the companies. For the purposes of comparison, a 'control' station located far from the area where no industrial activities are planned in the future is re-occupied each year starting from 2003 to measure acoustic baseline levels.

The deployment and retrieval of the AUARs (see Section 8.3.2) offshore is conducted by an acoustic team stationed onboard a research vessel.

New stations may be added to the ones listed in table 2 following statistical analysis of long-term data on Gray whale distribution acquired as a result of shore, vehicle and air surveys to ensure that noise levels within the 95% probability contour are annually monitored.

9 MINIMIZATION OF IMPACT ON WESTERN GRAY WHALES AS A RESULT OF THE MONITORING PROGRAM IMPLEMENTATION

Since no direct or indirect impact is anticipated on critically endangered Korean-Okhotsk Gray whale population as a result of shore-based observations, implementation of special mitigation measures will not be required.

In the course of the offshore work, research vessels will adhere strictly to the requirements set forth in the **Whale Safety Protocol** developed by the companies in 2004 (Appendix), which minimize the potential impact of movements of the vessel on the western Gray whale population during vessel-based studies.

10 FIELD COMMUNICATION PROTOCOL

During the field study period, each of the contractors will maintain constant communication with the other teams working on Sakhalin within the scope of this program and coordinate their activities with the other teams insofar as possible to obtain the most comprehensive and detailed information possible on the western Gray whale biology and distribution trends, and also on acoustic monitoring.

Depending upon logistics, weather conditions, safety considerations and/or other factors, the need may arise for changes in the priorities and schedule for the performance of work during the field season. In such cases, a flexible approach will be adopted in determining the top-priority tasks for the field studies and the deadlines for completing them, and ENL/SEIC, and all the contractors will make every effort to reach mutual agreement on such changes as quickly as possible.

11 REPORTING

At the end of the field season every contractor shall submit to the companies and to VNIRO a brief preliminary report on the basic preliminary results of the studies and main conclusions based on the field survey work. The preliminary reports will form the basis of a summary informational report to be submitted to the Russian Federation Ministry of Natural Resources (MNR), the State Environmental Inspection Service (Rosprirodnadzor), and Russian Fishery Agency by December 31 of each reporting year.

Final report shall be prepared by each contractor in accordance with accepted scientific standards and will serve as the main report document on the studies performed. The final annual reports will be submitted to the Russian Federation Ministry of Natural Resources (MNR), the State Environmental Inspection Service (Rosprirodnadzor), and Rosrybolovstvo (Russian Fishery Agency) in the spring of each year.

12 AMENDMENT TO THE PROGRAM

In case of acceptance of new information during the period of preparing the Program that indicates organization of additional (not mentioned in the Program) researches or wide scope of work, these corrections would be approved by Russian governmental agencies.

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Appendix

Whale Safety Protocols - Vessel-Based Monitoring Teams

Sakhalin Energy Investment Company Ltd. and Exxon Neftegas Ltd. are committed to minimize any potential impact of its offshore research and monitoring activities on the marine environment and specifically on the western Gray whale.

The purpose of this document is to outline specific protection measures related to vessel based western Gray whale research in order to help minimize any potential disturbance to these whales.

In 2008-2010 research activities conducted from the industry-sponsored research vessels and inflatable boats will include marine mammal distribution surveys, Gray whale prey sampling, photo-identification, and acoustic studies. The boats will be equipped with the quietest four stroke boat engines. These research activities have the potential to disturb western Gray whales while in their summer feeding grounds along the northeast coast of Sakhalin Island.

Some visible signs of whale disturbance could include:

- "Fleeing" or rapidly traveling away from the vessel
- Changes in direction or speed of swimming
- Hasty dives
- Changes in respiration patterns
- Surface behaviors such as tail slashes/slaps/breeches
- Changes in activity, i.e., from resting to traveling or from foraging to traveling

Some potential results of disturbance include:

- Displacement from feeding areas
- Disruption of feeding
- Disruption of nursing
- Stress
- Injury (primarily from ship strikes)

This document describes general protection measures to be applied to all surveys conducted from the research vessels and inflatable boats and survey specific protection measures for activities relevant to distribution surveys, acoustic works, prey sampling and photo-identification. These guidelines are based on compliance with Russian law, the Sakhalin Energy Marine Mammal Protection Plan and the incorporation of good international practice in the field of marine mammal protection, such as the current restrictions for whale-watching vessels outlined by the scientific committee of the International Whaling Commission (IWC) with regard to the approaching distance for vessels including boats with the whales. On an annual basis the protection measures in this document are evaluated using most recent data of Gray whale ecology and/or feedback from scientists working in the field, and are adapted if required.

General Protection Measures

a) **Priorities: Crew safety first, whale safety second, data LAST**

b) Vessels, engines and other equipment should be maintained and operated during vessel activities to minimize any additional sounds, and as such to reduce, as far as practicable, adverse impacts on Gray whales

c) At least two marine mammal observers (MMOs) should be present on the vessel to maintain a continuous watch during daylight hours in order to keep track of all western Gray whales or other marine mammals that occur in the proximity of the vessel.

d) MMOs recording whale sightings during any surveys and vessel movements have the ability to communicate immediately with the vessel captain and have the authority to advise the captain to slow speeds, change course to deflect from a whale(s), or stop the vessel. During vessel surveys in cases where the research vessel deflects course to avoid (a) whale(s), it should always deflect toward offshore.

e) The research vessels are required to keep within navigational corridors and comply with associated speed limits when on transit to the research area, unless essential for safety or specifically required for conducting a certain research activity.

f) The large research vessels will remain at or offshore of the 20m depth line while research is taking place in the Piltun feeding area, unless specifically required to perform a certain activity (see specific protection measures).

g) When traveling between areas, the research vessels should transit outside of known feeding areas. Where feasible, the research vessels should remain outside the boundaries of known feeding areas during periods of reduced visibility (<1 km) and during the night. If traveling through the feeding areas in reduced visibility (<1 km), the speed limit should be up to a maximum of 5kts.

h) Avoid sudden changes in speed and course

i) Do not pursue, head off, encircle whales, or cause groups of whales to separate

j) Vessels will not cross directly in front of or in the immediate vicinity of moving or stationary whales. When moving parallel to whales, vessels will maintain a constant speed and course.

k) The research vessels should maintain a 1000m separation from Gray whales or other large whales when they are in transit or not performing a specific research activity.

Vessel-Based Distribution Surveys

l) Due to the nature of the distribution surveys, the research vessel may need to be in closer proximity to whales in feeding areas than 1000m. If any whale is observed heading for the vessel, the captain should take all necessary action to avoid a collision or close-quarter situation with the whale and attempt to **maintain at least a 500m minimum distance between the vessel and the whale**.

m) If (a) whale(s) surface(s) in the vicinity of the research vessel all necessary measures need to be taken to avoid collisions. This may include stopping, slowing down, and/or steering away from the whale.

n) Speed limits should apply during vessel surveys. The research vessel should travel no faster than 10kts (~18.5 km/hr) during the Piltun vessel survey and 11 kts (~20 km/hr) during the Offshore survey. In both areas, speeds should be reduced to 4-5kts (~9 km/hr) when groups of Gray whales are expected to enter the 1 km safety zone. This speed (4-5 kts) was the speed of the 82-m-long seismic ship during the Odoptu seismic survey in 2001, thus these vessel speeds are reasonable within the feeding areas and when traveling near Gray whales or during conditions of reduced visibility, without seriously disrupting the scientific goals of the vessel-based program.

Research vessel as support of small boat operations

o) When small workboats are in the Piltun feeding area, the research vessel should remain ***parallel and offshore*** of the workboat activities at a distance of ~1 km, i.e., away from aggregations of feeding Gray whales. In the Offshore area, the research

vessel should maintain a position parallel to workboats activities and remain ~1 km from aggregations of whales. **Under no circumstances** should the research vessel follow *behind* the workboats through a group of feeding whales. The research vessel should not approach whales, feeding or otherwise within 1 km.

Deployment or retrieval of acoustic buoys from the research vessel

p) When deploying and retrieving acoustic buoys in the Piltun feeding area, the vessel should travel parallel to shore seaward of the 20 m depth contour and slow to max. 4-5 kts (max. ~9.3 km/hr) when a buoy is directly perpendicular between the vessel and shore. At this time, MMOs should report any sightings of Gray whales visible from the research vessel.

q) If Gray whales are NOT SIGHTED within one (1) km shoreward of the 20 m depth contour, the research vessel may then slowly (max. 4-5 kts, or slower if necessary) travel directly perpendicular to shore to deploy or retrieve a buoy. Once the decision is made to enter the <20 m depth zone the research vessel should maintain a 1 km distance from observed Gray whales. This may include stopping, slowing down, and/or steering away from the whale. The research vessel will then travel slowly (max. 4-5 kts or slower if necessary) perpendicular from shore back to the 20 m depth contour and then may continue at 7-10 kts (13-18.5 km/hr) along a course parallel to the 20 m contour.

r) If Gray whales ARE SIGHTED within 1 km shoreward of the research vessel at the 20 m depth contour, then an inflatable boat may be deployed from the research vessel at the 20 m depth contour and travel perpendicular to shore to deploy or retrieve the buoy. The inflatable boat will then travel perpendicular to shore at max 4-5 kts (or slower if necessary) back to the 20 m depth contour, be retrieved by the research vessel and the research vessel could continue at 7-10 kts along a course parallel to the 20 m depth contour to the proximity of the next acoustic station, and repeat this procedure.

s) Deployment and retrieval of buoys in the Piltun area in waters <20m deep should only be conducted during daylight hours in periods of good visibility (>1 km).

Prey Sampling from the research vessel

t) During Gray whale prey sampling missions, the research vessel should not approach whales, feeding or otherwise, closer than 1 km. Prey sampling should only be conducted in an area after the whale has moved at least 1 km from the ship. While prey samples are being collected, the vessel should anchor and not use bow thrusters to maintain position.

u) Control length of exposure to ~1 hour. Limit sampling near whales with calves or whales with visible health indicators, such as skin sloughing and thinness.

v) Speed limits should apply during prey sampling. When traveling within the Piltun feeding area in waters <20 m deep, the research vessel should not travel faster than max. 4-5 kts (max. ~9.3 km/hr), or slower if necessary, during daylight hours when visibility is at least 1 km. The research vessel should not enter waters <20 m deep during night time, during periods of reduced daytime visibility (<1 km), or when whales are expected to come within 1 km of the vessel.

Photo-ID from inflatable boats

w) Inflatable boats should be in regular contact with the research vessel to relay information on all whales visible in the area

x) Always drive the inflatable boat in such a manner to maintain crew and whale safety. Keep photographic gear protected from water exposure at all times.

y) Avoid sudden changes in inflatable boat speed, direction (except in an emergency where there is risk to crew)

z) Do not pursue, head off, encircle whales, or cause groups to separate

aa) Do not drive into or through a group of whales (do not separate a mother-calf pair)

bb) Do not drive in circles around animals (keep the parallel course)

cc) Do not reverse outboard motor near whales (except in emergency or risk to crew)

dd) Avoid excess outboard motor use, gear changes, maneuvering or backing up near whales

ee) Control length of exposure (i.e. during inflatable boat sessions, prey sampling), especially in the presence of mother/calf pairs, juveniles, and whales with visible health indicators, such as skin sloughing and thinness, to a maximum 30 minutes to photograph 1st side, and an additional 15-20 minutes for the second side and flukes.

ff) Approach whales from an oblique angle, i.e., parallel to and slightly from the rear and do not approach whales from directly behind (except briefly during a photo-identification fluke shot) and never drive towards a whale from the front. Travel parallel to whales matching its speed and do not approach the animal closer than 50m for a photo-identification shot.

gg) Alternately, position the inflatable boat in neutral ahead and to the side of the whale and let it approach you

hh) Never approach animals at speeds faster than the slowest whale

ii) If a calf approaches the inflatable boat, keep the outbound motor in neutral until the whale is a safe distance from the boat (~50m)

jj) When first approaching a group of whales, gradually slow to neutral at a distance of 500m and assess group size, and activity patterns before attempting photo-id

kk) After initial assessment at 500m, slowly increase to “no wake” speed to position boat for initiating photo-id

ll) When approaching a whale(s), slow down and try to maintain minimum distance of 100m

mm) When within 300m move at constant slow “no wake” speed (max. 4-5 kts), except during set-up for photo-identification shots, when the inflatable boat should travel no faster than the slowest whale

nn) When the inflatable boat is stationary the outboard motors should be put in neutral

oo) Do not turn motor off – stay in neutral/idle – the noise lets the whale know where the vessel is

pp) The inflatable boat should be in neutral when stopped and when whales are at the surface in proximity to the boat

qq) Before moving out of neutral, wait for the whale(s) to come to the surface and then dive to gain an understanding of where they are. Once this is established, engage motors when the whales are in a feeding dive

rr) Ensure that the inflatable boat does not drift too close to the whale(s) when in neutral

ss) If disturbance of a whale(s) is observed, withdraw immediately at slow “no wake” speed (max. 4-5 kts)

tt) When leaving a whale or group of whales, move at slow “no wake” speed (max. 4-5 kts) to the outer limit of the caution zone (500 m) before *gradually* increasing speed

uu) Avoid engaging propellers within 100 m of whales – only engage outboards with extreme caution and awareness of the location of the whales

vv) If a whale approaches the inflatable boat, place engines in neutral and let whale come to you; or slow down and continue on course avoiding potential collisions; or steer a straight course away from the whales

ww) There should be communication between photo-id teams (shore-based, vehicle and behavior teams and US-Russian photo-ID team) to minimize double disturbance to the whales on the same day in the same area