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PUBLIC

REPORT
ON GRAY WHALE MONITORING PROGRAM
OFF NORTHEAST SAKHALIN ISLAND
IN 2017

Photo: Yu. M. Yakovlev

Exxon Neftegas Limited

and

Sakhalin Energy Investment Company Ltd

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EXPLANATORY NOTE

North Pacific gray whales feeding on north-east Sakhalin shelf (also known as the Okhotsk-Korean gray whales, or the Western gray whales (WGW)), have been the subject of scientific investigations sponsored by Exxon Neftegas Limited (ENL) and Sakhalin Energy Investment Company Ltd. (Sakhalin Energy) since 1997. The Companies combined their efforts in 2002 with the establishment of a joint program for monitoring gray whales and their habitat in the Sea of Okhotsk off northeast Sakhalin Island. The joint program implemented by the scientists from leading Russian research institutes is comprised of four key research areas: photoidentification of gray whales; study of their distribution within the feeding areas; study of benthos communities constituting the food resources for these animals; as well as the acoustic monitoring of underwater natural and anthropogenic noise. The joint program efforts have resulted in acquiring information that aids in conservation of the gray whales and their habitat, and enables the Companies to mitigate the potential effect of conducted activities on the gray whales. This report includes the results of work of gray whale monitoring off the northeastern coast of Sakhalin Island, carried out as part of the of the joint program implementation in 2017.

From June to November gray whales are sighted off the northeastern coast of Sakhalin Island where two primary feeding areas of these animals are located. The feeding areas are characterized by high biomass of benthic food organisms, which include amphipods, isopods, the sand lance, and polychaetes. The gray whales show great affinity for the feeding areas, with the majority of the whales observed arriving there every year. Since the discovery of approximately 20 gray whales off northeast Sakhalin in the early 1980s, their numbers off northeast Sakhalin have steadily increased each year. In 2002, the first year of the joint program, 47 animals were identified. A total of 72 gray whales were identified in 2017, including 9 calves. The total number of gray whales recorded in the Sakhalin catalog during the implementation of the program reached 283 individuals.

The winter habitats and migration routes of Sakhalin gray whales were unknown until satellite tagging sponsored by the Companies established the migration of three animals to coastal North America in 2010-2012. The overlap of the habitats of the Western and Eastern gray whale aggregations established by satellite tracking was further verified by other scientists through comparisons of photo-ID catalogs and genetic matches. As of today, more than 30 individuals have been documented in the joint habitat of the Western and Eastern gray whales. Based on these data, the conclusion can be drawn that all gray whales inhabiting

the Pacific Ocean most likely belong to a single large North Pacific population. These data could be very important for the development and implementation of measures to protect all gray whales.

The factors threatening the North Pacific gray whales include both natural threats (e.g., predation, disease and food insufficiency due to the limited feeding areas and competition) and anthropogenic threats (aboriginal subsistence whaling, entanglement in fishing gear, vessel strikes, sea pollution, and anthropogenic noise). ENL and Sakhalin Energy developed their own Marine Mammal Protection Plans (MMPPs) that specify methods for conducting operations in a manner protective of gray whales and other marine mammals. Measures implemented by the Companies have significantly reduced the potential risks and made it possible to avoid incidents involving gray whales over the entire period of companies' operations. Additionally, the implemented measures were instrumental in reducing the noise impact to a level believed not to affect the gray whales.

1. INTRODUCTION

Exxon Neftegas Limited (ENL), Operator of the Sakhalin-1 project, and Sakhalin Energy Investment Company, Ltd. (Sakhalin Energy), Operator of the Sakhalin-2 project (the Companies), have been developing oil and gas reserves on the continental shelf area of the Sea of Okhotsk off northeast Sakhalin Island (Russian Federation).

The projects are located in direct proximity to habitats used by the North Pacific gray whale (*Eschrichtius robustus*) during ice-free months. Gray whales were believed to be extinct in the western Pacific Ocean until approximately 20 individuals were sighted off the northeastern coast of Sakhalin in the early 1980s. The occurrence of gray whales within their previous western Pacific Ocean habitat range led to the conclusion that these whales were the survived representatives of the Okhotsk-Korean or "western" gray whale population inhabiting this region in the past. Following the discovery of these individuals, the Okhotsk-Korean gray whale population was listed under Category 1 as "on the verge of extinction" in the Russian Federation Red Book and as CR ("critically endangered") by the International Union for the Conservation of Nature (IUCN).

The Environmental Impact Assessments (EIAs) and the State Ecological Expert Reviews (SEERs) conducted for the Sakhalin-1 and Sakhalin-2 Projects identified the endangered gray whale as being of primary concern for each company's offshore operations. Following the SEER recommendations, each company have been conducting monitoring studies of the Sakhalin gray whale population and their feeding conditions since 1997. In 2002, ENL and Sakhalin Energy combined their efforts and financing with the establishment of the joint program for monitoring gray whales and their habitats off northeast Sakhalin Island (Joint Program). The Joint Program includes four primary areas: photoidentification surveys, studies of distribution within the feeding areas, studies of the structure and indicators of the abundance of benthic communities and the state of the food supply, the acoustic monitoring of underwater natural and anthropogenic noise. Biopsy samples are also taken for genetic and biochemical studies. Satellite tagging and observations of gray whales in the waters off the Kamchatka peninsula were also conducted in certain years to study migration routes and features.

The monitoring program is one of the few long-term multi-disciplinary research programs that focuses on a specific area and marine mammal species (Figure 1).

Prior to initiating the Joint Program, there were insufficient reliable scientific data about gray whales feeding off northeast Sakhalin Island. The understanding of these animals

at that time was based on unproven secondary information, questionable historical data, and often unsubstantiated assumptions and conclusions. The Joint Program has established a scientific framework for obtaining the information necessary to expand the knowledge about the gray whales, their range, and potential threats to them.

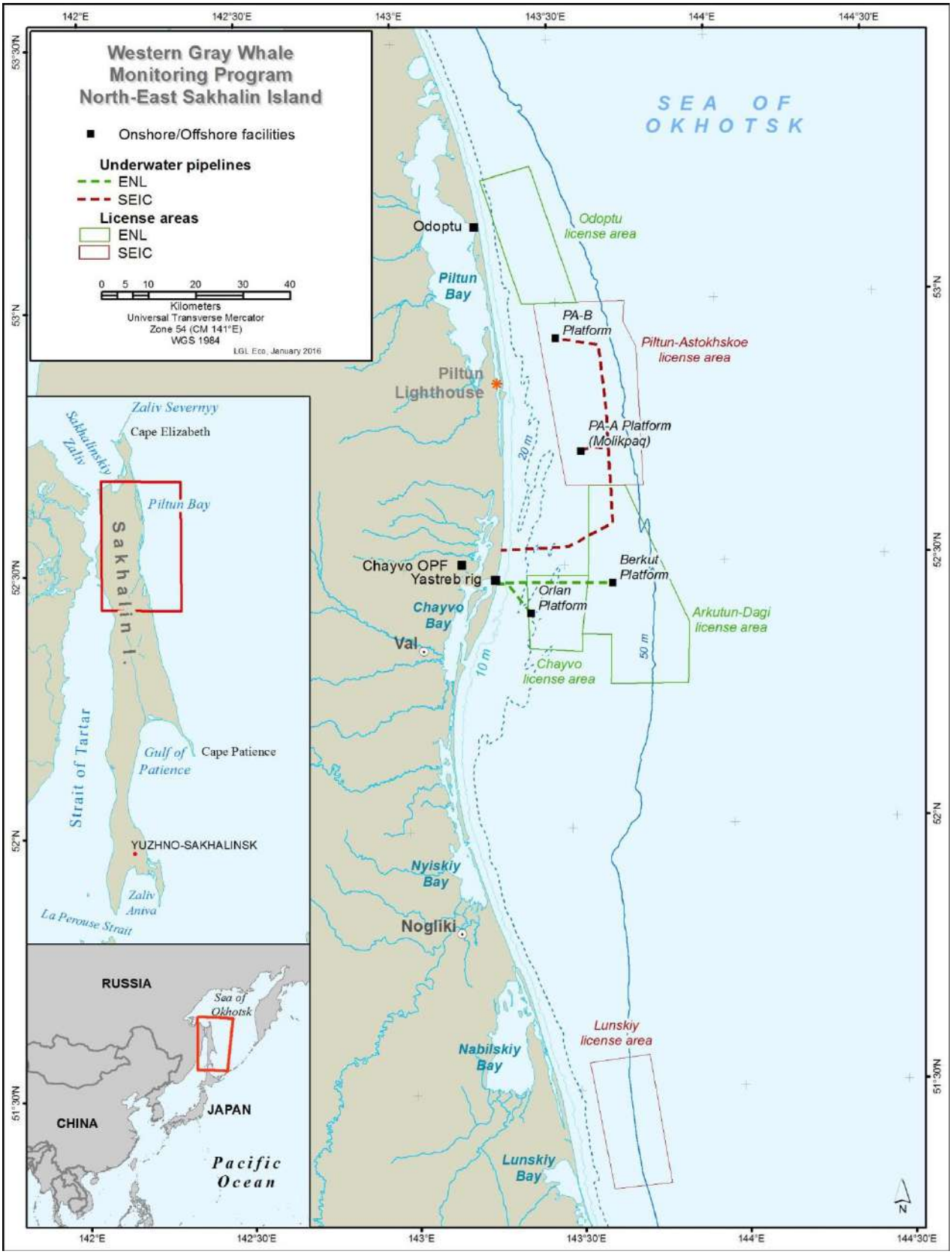

Figure 1. Area of Joint Program Implementation – Sea of Okhotsk Shelf off Northeast Sakhalin Island

1.1. Joint Program Objectives

The main objective of the Joint Program is the implementation of comprehensive monitoring observations of the gray whale population and its habitat in the waters off the northeastern coast of Sakhalin Island to develop and implement measures for the protection of this feeding aggregation by the Companies.

The implementation of the Joint Program makes it possible to expand the scientific knowledge about gray whales and the environment, as well as factors impacting the status of the feeding aggregation; to assess the status of the gray whales – abundance, distribution, demographic and individual features, as well as their feeding conditions.

The information gathered under the Joint Program is used by the Companies to develop measures for the preservation of the habitat of protected animal species during their commercial operations pursuant to the requirements of Russian laws, and to conduct and revise the monitoring program and environmental protection measures aimed at mitigating the risks for the gray whales and their feeding areas during process operations.

1.2. Joint Program Components

The Joint Program is conducted by Russian specialists from leading Russian research institutes in the Far East and Moscow. The Joint Program components, the institutes and lead researchers involved in the program implementation are presented below:

Photo-ID Studies of Gray Whales

Photo-ID studies have been conducted annually since 2002 to identify and assess the condition of individual gray whales. The identification provides information on population dynamics and demography, social structure, and individual life cycles. In addition, the photo-ID data is used for long-term assessments of the population abundance and health status. The studies are carried out under the guidance of the research associates of the National Scientific Center for Marine Biology with the Far Eastern Branch of the Russian Academy of Sciences in Vladivostok, led by Y. M. Yakovlev, Ph. D. (Biology) and O. Yu. Tyurneva.

Use of Unmanned Drones for Gray Whales Photo-ID in the Piltun Area

In 2016, the South Piltun photo ID team experimentally used an Unmanned Aerial Vehicle equipped with a camera (UAV or drone). The experiment turned out promising when good quality images of gray whales were received, which were suitable for identification. In 2017, the two onshore vehicle-based teams were provided with drones, which were used for taking photographs and videos of gray whales.

Based on the collected video material, a new catalog for future identification and behavior studies was created with video imagery of 35 observed individuals. The drones allowed the onshore photo-ID teams to obtain quality imagery in unfavorable light, adverse atmospheric conditions (backlight or while working in turbulent or cloudy weather) and at distances up to 2 km from the shore. The operator was able to maneuver the UAV and find the optimal camera position in order to improve the quality of photographs and videos — something that could not be done in similar conditions in previous years.

This equipment is an excellent addition to the data collection methods used previously. Photographing from a height allows getting images of whale bodies from a new perspective for further identification, as well as identifying whales underwater, provided that the sea water has a sufficient degree of transparency. This new advantage point makes it possible to accurately identify mother/calf pairs and calves encountered without mothers, since the difference in the size of the animals is clearly visible from the height.

Gray Whale Distribution Study

Beginning in 2002 and through 2016, the joint program studied whale distribution and abundance in the Piltun and Offshore feeding areas, and observations were conducted in the Odoptu, Piltun-Astokh, Chayvo and Arkutun-Dagi license areas (Figure 1). The gray whale distribution studies were conducted by shore-based and vessel-based teams of researchers. The gray whale distribution studies were conducted by the experts under the guidance of the Senior Research Associate V. A. Vladimirov, Ph. D. (Biology) and with the coordination of work by the Sakhalin State University.

Study of Food Supply

Benthic studies were conducted from 2002 to 2016 to evaluate the status of the gray whale food supply in the feeding areas. Samples of benthos and bottom sediments were

collected for study in the two main feeding areas – Piltun and Offshore, or in the immediate vicinity of them. Benthic studies were carried out by the staff of the National Scientific Center for Marine Biology under the guidance of V. I. Fadeev, Ph.D. (Biology) and V. V. Ivin, Ph.D. (Biology).

Acoustic Monitoring

Acoustic studies, which record both natural (intrinsic) and anthropogenic underwater noises in the gray whale feeding areas, were a component of the monitoring program from 2003 to 2016. In addition to measuring sound levels, hydrology data were collected that allow the modeling and understanding of sound propagation in the gray whale feeding areas. The acoustic monitoring was conducted by the Pacific Oceanological Institute with the Far Eastern Branch of the Russian Academy of Sciences in Vladivostok (POI) under the leadership of Doctor of Physical and Mathematical Sciences Alexander N. Rutenko.

2. METHODS OF JOINT PROGRAM IMPLEMENTATION

The methods used in each specific study have been developed and refined over the course of the program implementation. Today, these methods are state-of-the-art and, as needed, they are refined each year to meet the current tasks of the Joint Program, technical and logistical requirements, and to minimize the impact on gray whales. The methods used in 2017 are described in the "2012 Methods Report" (Joint Program, 2013). Any revisions made to these during the implementation of Program components are described in the individual component reports provided in the appendices.

3. JOINT PROGRAM RESULTS

This report presents the primary results of the monitoring program. Appendix I to this report contains the list of all program publications from peer-reviewed scientific journals and the proceeding of scientific conferences. The detailed results, methods for conducting field surveys, a description of the data gathered, processing of the samples and instrumental data of the 2017 joint program, as well as the comparative results for the entire period of the Joint Program implementation (2002-2017), are provided in the scientific reports prepared separately for each component in Appendix II to this report.

4. SUMMARY OF CURRENT UNDERSTANDING ABOUT GRAY WHALES OF SAKHALIN

Since the commencement of the gray whale (GW) studies in 1997 and initiation by the Companies of their collaboration under the joint program (in 2002), a great deal of new information has been acquired about the gray whales and their habitat, including their distribution, movements, behaviors, and food supplies. This section of the report provides a discussion of the current understanding of the Sakhalin feeding aggregation of gray whales and its habitat, and includes a discussion of the potential threats to the population, and the mitigations implemented by ENL and Sakhalin Energy that reduce potential risks posed by the Companies' operations.

4.1. Gray Whale Population

Gray whales of the northern part of the Pacific Ocean traditionally have been divided into two populations or groups: (1) "Okhotsk-Korean" or "Western" gray whales (WGW) inhabiting the northern part of the Pacific coast of Asia (Russia, Japan, China, Korea), and (2) "Chukchi-Californian" or "Eastern" gray whales (EGW), living in the Pacific coastal waters of North America (Canada, USA, Mexico) and Chukotka (Russia) (Figure 2). During the 19th and 20th centuries, the numbers of Pacific gray whales were significantly reduced by commercial whaling. In 1938, the US government established a moratorium on commercial whaling for EGW, and in 1948 the International Whaling Commission (IWC) extended the moratorium to all gray whales. These actions resulted in a gradual recovery of the gray whale numbers. The latest EGW population estimate is 27,000 whales (Durban et al., 2017) and presently is not considered endangered.

The population of the Okhotsk-Korean gray whales was estimated to have numbered about 1000-1500 individual prior to 1910 (Berzin & Vladimirov, 1981) but then believed to have been essentially hunted to extinction by the mid-20th century. However, in 1983, approximately 20 gray whales were observed off northeast Sakhalin (Blokhin et al., 1985) and at the time, it was concluded that these whales were the remnant survivors of the Okhotsk-Korean gray whale population.

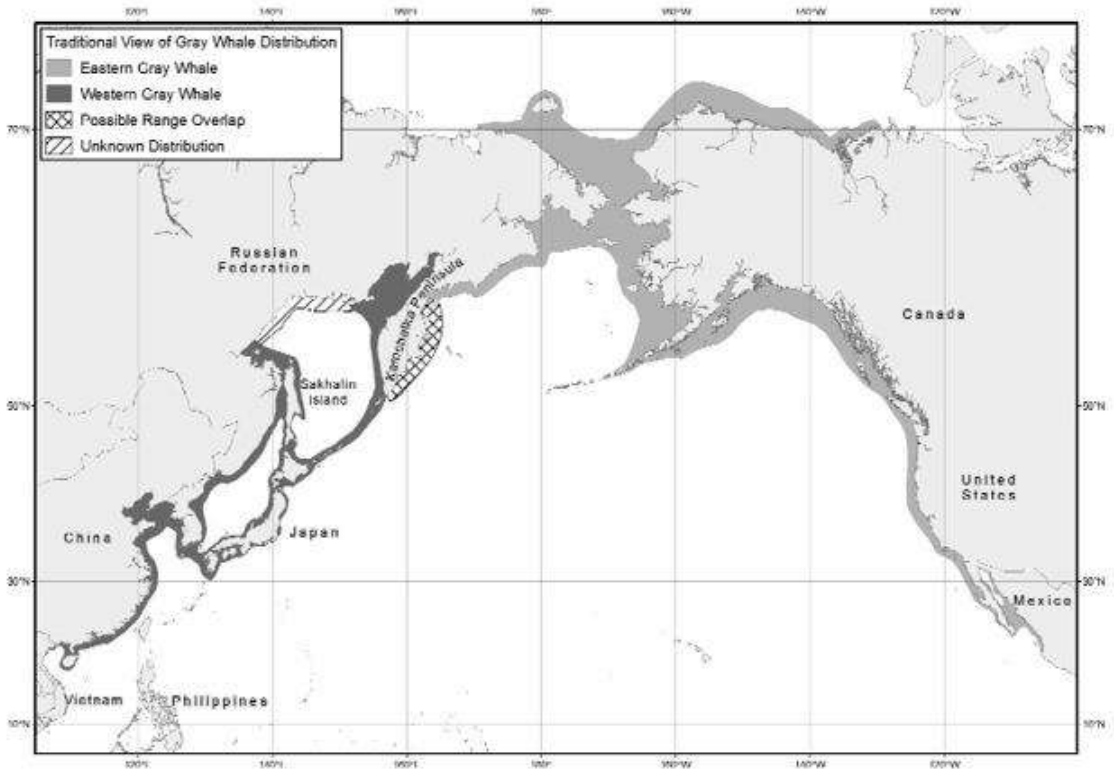

Figure 2. Distribution of Two Currently Recognized Aggregations of North Pacific Gray Whales (IUCN, 2008)

Since the sighting of the gray whales in Sea of Okhotsk waters off northeast Sakhalin in the 1980s, the cumulative total number of whales has invariably increased. In 2002, the first year of the joint program of photo-ID studies, 47 individual gray whales were identified. In 2003, there were 92 whales in the waters adjacent to Piltun Bay and in the Offshore feeding area. , During the 2017 field surveys, 9 calves were discovered bringing the total number included in the NSCMB catalog to 283 individuals.

4.1.1. Population Growth

The growth and sustainability of any population is dependent upon a multitude of factors, including successful reproduction and survival of offspring. Two key issues related to population growth of the Sakhalin gray whales are: 1) to obtain an accurate estimate of the annual rate of increase, and 2) to estimate the degree to which any observed increase is due to internal reserves (calves born to cows of the population) or external reserves (immigrants from other populations).

Population modeling utilizing the gray whale photo-ID data of the Russian-American team collected from the Piltun feeding area. The latest population assessment for the Sakhalin non-calf gray whale feeding aggregate is 180-220 individuals, and the rate of growth of that feeding aggregate is approximately 2-5% a year (Cooke et al., 2017). Precise estimation of the growth rate is dependent on several key assumptions of the model (e.g., number of females of reproductive age; calf mortality rate; and the closedness of the system) that are not known, uncertain, and may be inaccurate (e.g., the population may not to be a closed system, since new non-calf whales are identified each year).

One can say with certainty that the number of WGW discovered to the northeast of Sakhalin has been increasing every year since the sighting of about 20 individuals here in 1983. For the period of 2006 to 2017, the number of identified gray whales (both calves and adults) added to the NSCMB catalog increased annually by an average of 6.3% (ranging from 3.1% to 9.6%). To a certain extent, the increase in the early years of the study was due to the increased effort and/or expanded area of coverage. Nonetheless, the consistent growth in the number of whales sighted each year and documented calf births over the past decade confirm both a growing population and the fact that it is not solely dependent upon external factors for recovery.

4.1.2. Cows with Calves

The Joint Program has recorded cow/calf pairs in Sakhalin and Kamchatka waters through sightings by photo-ID. Although the number of these pairs varies from year to year (between 3 and 17 in 2003–2017), it is evidence of the healthy state of the population and reproductive success. Obtaining an accurate count of the number of new calves each year is challenging, since a calf is often difficult to identify when separated from its mother. Cow/calf separation can happen anytime throughout the summer, but accelerates by late August, with most calves in the Piltun feeding area believed to be independent from their mothers by mid-September. The number of cow/calf pairs, obtained from the results of the photo identification, is usually considered to be the most accurate, since only a photographic analysis allows us to determine a cow/calf pair, as well as individual calves.

In the Piltun feeding area, cow/calf pairs were most often observed around the mouth of Piltun Bay. Although such pairs have also been observed feeding in other parts of the Piltun feeding area and in Olga Bay off southeast Kamchatka (the first pairs were observed there in 2008), the area near the mouth of Piltun Bay seems to be the preferred area for the WGW

calves, since this is where they are most often observed. Over the entire monitoring period of the joint program, calves have never been recorded in the Offshore feeding area. It is hypothesized that calves may require shallow waters (11 m or less) to learn to feed independently, and that at the greater depths (40-60 m in the Offshore feeding area) it would be physically difficult for calves and yearlings to feed.

A total of 9 calves were identified in 2017.

Olga Bay off southeast Kamchatka may be much more important for cow/calf pairs than data from earlier years suggested. Since the first observations in 2008, cow/calf pairs have been observed in Olga Bay annually (seven in 2009, three in 2010, two in 2011, and three in 2012). From 2013 to 2017, no studies were conducted in Kamchatka. Most of the cows (55%) sighted with the calves in Kamchatka were also photographed in the water area off Sakhalin Island - either in the same year or in previous years, and were included in the Sakhalin gray whale catalog. Three cows observed in 2009 in Olga Bay were never seen off Sakhalin, but were observed in Kamchatka before and after 2009.

It is believed that one of the important reasons for cow/calf pairs to concentrate in coastal shallow waters such as the mouth of Piltun Bay is that they are more protected here from attacks of transient killer whales typical for east Sakhalin waters. In cases of such attacks, gray whales can escape to coastal shallow waters where the cow can successfully protect the calf. The potential predation of gray whale calves by killer whales could explain the absence of cow/calf pairs in deep waters of the Offshore feeding area, where they would be more vulnerable to killer whale attacks. Cases of predatory behavior of killer whales towards gray whales have been observed within the Piltun feeding area, although rarely. It is difficult to assess if such attacks is an important factor affecting calf survival during the feeding season in Sakhalin waters.

4.1.3. Gray Whale Physical Condition

Based on photographs, it was observed that some individual gray whales appear to be thin or in poor physical condition, at least early in the feeding season. During the past 14 years, the photo-ID data for each year showed 10-20% of whales in poor physical condition, in most cases early in the feeding season. According to the physical condition of the whales during the feeding season two main trends emerged: (1) the physical condition of most whales, estimated as poor at the beginning of the feeding season, improved by the end of the

feeding season, and (2) most of the whales in poor physical condition were nursing mothers (i.e. cows with calves). Both trends make sense considering the biological cycle of gray whales. In early spring, gray whales migrate from their winter habitat to feed in areas rich in food resources. It is believed that during the migration period whales barely eat anything, thus depleting their fat resources during migration (Nerini, 1984).

4.2. Annual Gray Whale Migration

Prior to 2010, little was known of the winter migrations of the gray whales observed annually off the northeastern coast of Sakhalin during the ice-free months (June-November). Each year as the sea ice clears in late May to early June, gray whales begin to appear here. During June and July the number of whales observed increases, and by August most of the sighted whales are concentrated in the two primary feeding areas, the Piltun and Offshore areas (Figure 3). Gray whales are observed until ice begins to form (November-December), when they begin their winter migration, and by mid-December nearly all whales have departed from the waters off northeast Sakhalin.

Based on historical records of gray whale sightings in the waters of Japan, Korea and China by whalers and seamen, it has been assumed by many scientists that the Sakhalin gray whales migrate to winter breeding grounds at undetermined locations in the South China Sea. This assumption was bolstered by infrequent gray whale sightings and reports of gray whales tangled in fishing nets or stranded on beaches in Japan and China. However, due to the lack of regular gray whale sightings in intensive shipping areas and the small amount of data from special gray whale monitoring efforts in the South China Sea and other areas along their assumed Asian migration route (e.g., Japan, Korea, and China), scientists remained uncertain as to where the Sakhalin gray whales go each winter when they leave the ice-bound waters of Sakhalin.

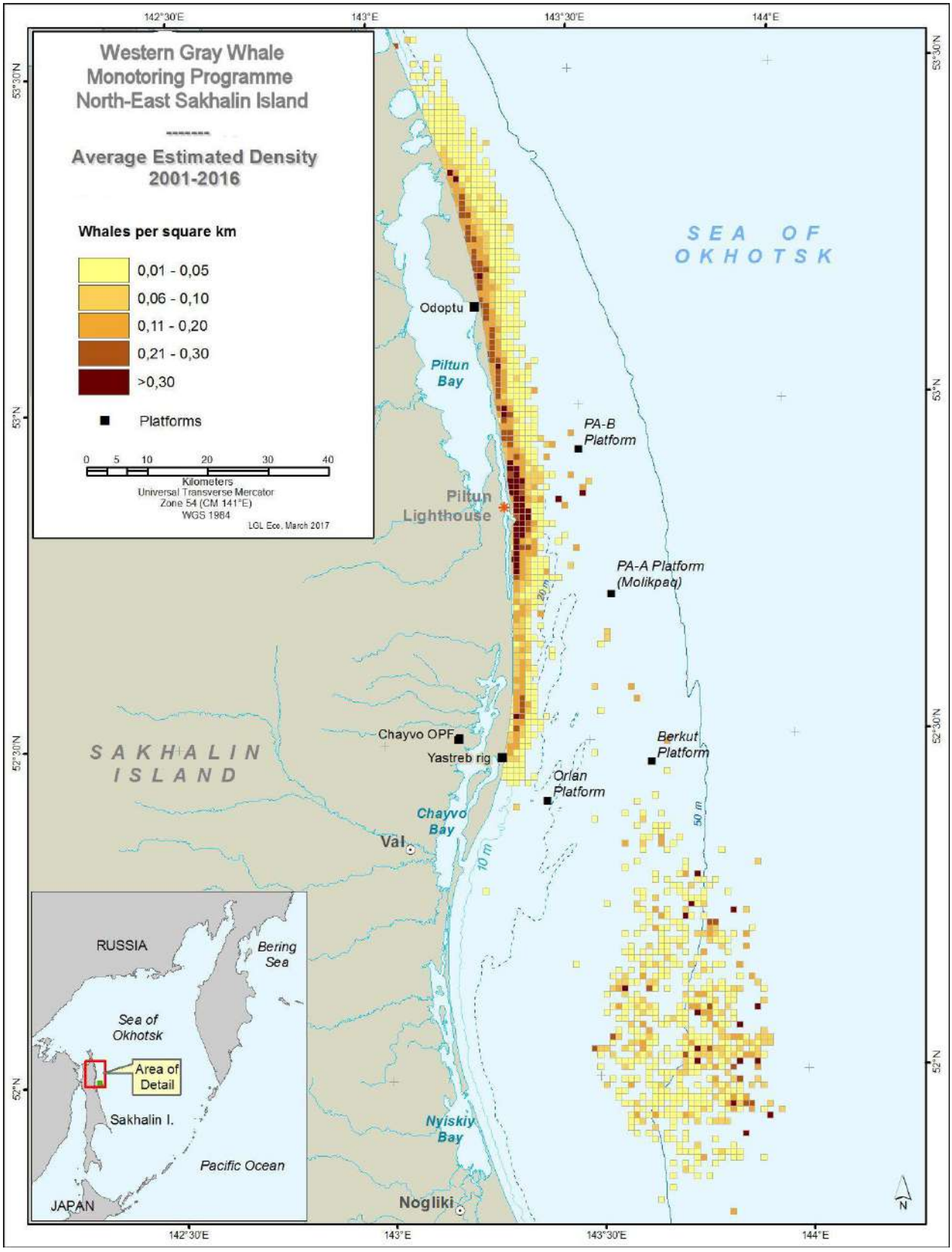

Figure 3. Distribution of Gray Whales in Piltun and Offshore Feeding Areas in 2001-2016

The sightings of a single gray whale in 2010 in the Mediterranean Sea near Spain and Israel (Scheinin et al., 2011) and the sighting of another gray whale in 2013 in the Atlantic

Ocean off the coast of Namibia provide evidence that gray whales are capable of covering significant distances. Thus, the occasional sightings of gray whales off Japan's coast and in other areas south of Sakhalin are not more surprising than the encounters in Arctic waters. The Atlantic Ocean sightings hold promise that gray whales have the potential of repopulating areas such as the North Atlantic Ocean from which they have been extirpated by whaling. Such a repopulation may be an explanation for the occurrence of gray whales in the Sea of Okhotsk and off of Sakhalin after the western population was assumed to be extinct.

4.3. Gray Whale Distribution off Northeast Sakhalin

Gray whales are known to migrate to the Sea of Okhotsk each spring and summer, and spend much of the ice-free months in the two identified feeding areas off northeast Sakhalin where they have access to abundant benthic food resources. The data collected by the joint program distribution and photo-ID teams since 2002 has facilitated the understanding of gray whale abundance, distribution, and movements in these waters. However, the distribution and abundance of whales in other areas of the Sea of Okhotsk remains uncertain, since monitoring conducted by the joint program is limited to the area off northeast Sakhalin that includes the Piltun and Offshore feeding areas.

During the implementation of the joint program two areas were identified north-east of Sakhalin as the main feeding areas for gray whales: Piltun, or "near-shore," and Offshore feeding areas. Each year, most whales observed by joint program monitoring teams were encountered within these two primary feeding areas. However, in addition to these two areas, gray whales have also been observed in other locations in the Sea of Okhotsk and near Kamchatka.

The Joint Program photo-ID and distribution studies indicate that individual gray whales move back and forth between the two primary feeding areas during each feeding season, and that their relative abundance within each feeding area varies in both space and time.

4.3.1. Piltun Feeding Area

The Piltun or "near-shore" feeding area adjacent to Piltun Bay extends along the coast from 52°20' to 53°30' N, with an area of slightly less than 1000 km^2 (Figure 3). Gray whales within the Piltun feeding area are sighted along a 120 km stretch of shoreline and prefer

depths of less than 15-20 m, at a distance of no more than 4-5 km from the shore. Based on the observation data, it can be concluded that the boundaries of the area defined as the Piltun feeding area have remained stable for more than 30 years (i.e., 1984-2017).

Each year, gray whales begin arriving in the Piltun feeding area in May as ice begins to break up along the coast of northeast Sakhalin. Due to ice and fog conditions typical of May and early June, whales are not easily sighted from shore; therefore, their abundance and distribution within the Piltun feeding area during the early season are not well documented. In 2012, satellite-tagged whale Varvara was recorded in the Piltun feeding area on May 18 following her migration from Mexico through Kamchatka prior to the complete breakup of the ice cover.

It can be concluded from the 2002-2016 data that the greatest abundance and concentration of gray whales are typically observed near the mouth of Piltun Bay (Figure 4). At the same time, the concentration of the gray whale in the northern and southern parts of the Piltun feeding area vary considerably. At the end of summer, an aggregation of gray whales was also observed in the northern part of the Piltun feeding area, and in some years (for example, in 2004 and 2005) whales gathered there in large groups and stayed in them almost until the end of the season. In some years, small groups of gray whales were also sighted south of the mouth of Piltun Bay. The number of whales sighted within the Piltun feeding area by the shore-based survey teams varies from year to year. Based on shore-based survey data, the number of gray whales observed during single-day synchronized counts were highest in 2004-2006 (sample size of 128-138 individuals) and lowest in 2007-2010 (sample size of 47-73 individuals). In 2016, the maximum number of whales sighted in the Piltun feeding area in a single day was 40 whales (August 9). The variations in the numbers of whales observed in the Piltun feeding area within a single year and between years are believed to be due to a redistribution of whales among the feeding areas (i.e., Piltun, Offshore, and Kamchatka).

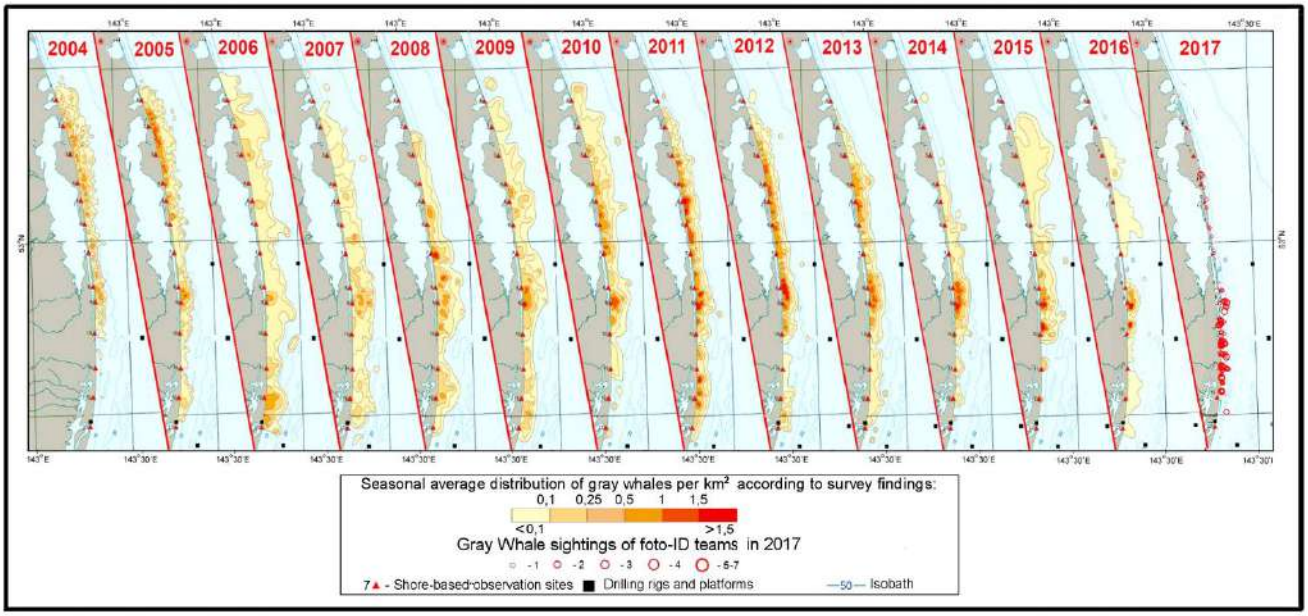

Figure 4. Distribution of gray whales in Piltun feeding ground

Distance from Shore

Based on the joint program monitoring data, it appears that gray whales tend to stay closer to shore during the early months of the feeding season (i.e., June-August) as compared to the rest of the season (September). Up to the end of August, approximately 80% (in 2007-2010) of the whales sighted in the Piltun feeding area were within two kilometers from shore at water depths of less than 10 meters. Cow/calf pairs and single calves were observed even closer to shore (less than 1 kilometer) that adult individuals.

The greater abundance and distribution of both adults and calves in the Piltun feeding area during June and July may be explained by a combination of high biomass of benthic food resources and the shallow water depths. Cow/calf pairs have only been observed off Sakhalin in the shallow, near-shore areas and have not been sighted in deeper areas of the Piltun feeding area or the Offshore feeding area. Yearling calves may have limited abilities to dive to depth, thus it would be advantageous for calves to remain in shallow areas to feed. In addition, the calves as well as adults would have to exert less effort feeding in shallow water. As benthic biomass is probably easier to harvest at shallower depths, whales start feeding here upon arrival in the coastal waters of Sakhalin. Another factor explaining why the whales appear to prefer shallow areas during the early feeding season is that protection of the calves (and adults) from predation would be much easier in the shallow waters, where their primary predator, the killer whales, can be more readily fended off.

Later (in September), some whales move to the deeper waters of the Piltun area; they can be observed two to five kilometers from the shore, where the water depth is approximately 10 to 20 meters. Gray whales are believed to make the movement to deeper areas of the Piltun and Offshore feeding areas in search for the higher biomass of their preferred prey which may be somewhat reduced in near-shore areas by intense consumption (feeding). However, the majority of whales observed in the Piltun feeding area through the entirety of the feeding season were sighted in the near-shore zone of less than two kilometers from shore.

4.3.2. Offshore Feeding Area

The Offshore feeding area, located about 40-50 kilometers south-southeast of the Piltun feeding area and eastward of Chayvo and Nyiskiy Bays, extends from ~25 to 50 kilometers from shore at approximate latitude of 51°40' to 52°20' and covers an area of ~1400 km^2 (Figure 3). Prior to the discovery of the Offshore feeding area by the joint program scientists in 2001, it was assumed that the Piltun feeding area was the sole Sakhalin feeding area for gray whales. The importance of the Offshore feeding area to the whales is now well established. The Offshore feeding area is characterized by water depths ranging from 35 to 60 meters and benthic biomass that has remained high and stable over the years of monitoring. Importantly, the Offshore feeding area provides a source of preferred benthic food resources (i.e., amphipods) that can supplement the Piltun feeding area. (Demchenko et al., 2016). Due to the greater depths of the Offshore feeding area, feeding is more energy intensive than feeding in the shallow Piltun feeding area.

There has been considerably less survey effort in the Offshore feeding area than that in the Piltun feeding area. Typically, four to six vessel-based surveys of the feeding area were done each year during the August-September timeframe (Figure 5). The feeding area surveys require the use of vessels, which were not available every day since the vessels were used for other activities. These surveys were dependent on hydrometeorological conditions; due to poor conditions (fog, wind, waves) surveys are not typically conducted during June, July, or October. Nevertheless, the vessel-based surveys conducted in the Offshore feeding area make it possible to assess both the inter-seasonal and intra-seasonal variability in the use of the feeding areas (Figure 6). At the end of the feeding season, the number of gray whales in the Offshore area goes up. Such increase typically corresponds with an observed decrease in

numbers of animals in the Piltun feeding area toward the end of the feeding season (i.e., September), suggesting a preference for feeding in the Offshore area at this time.

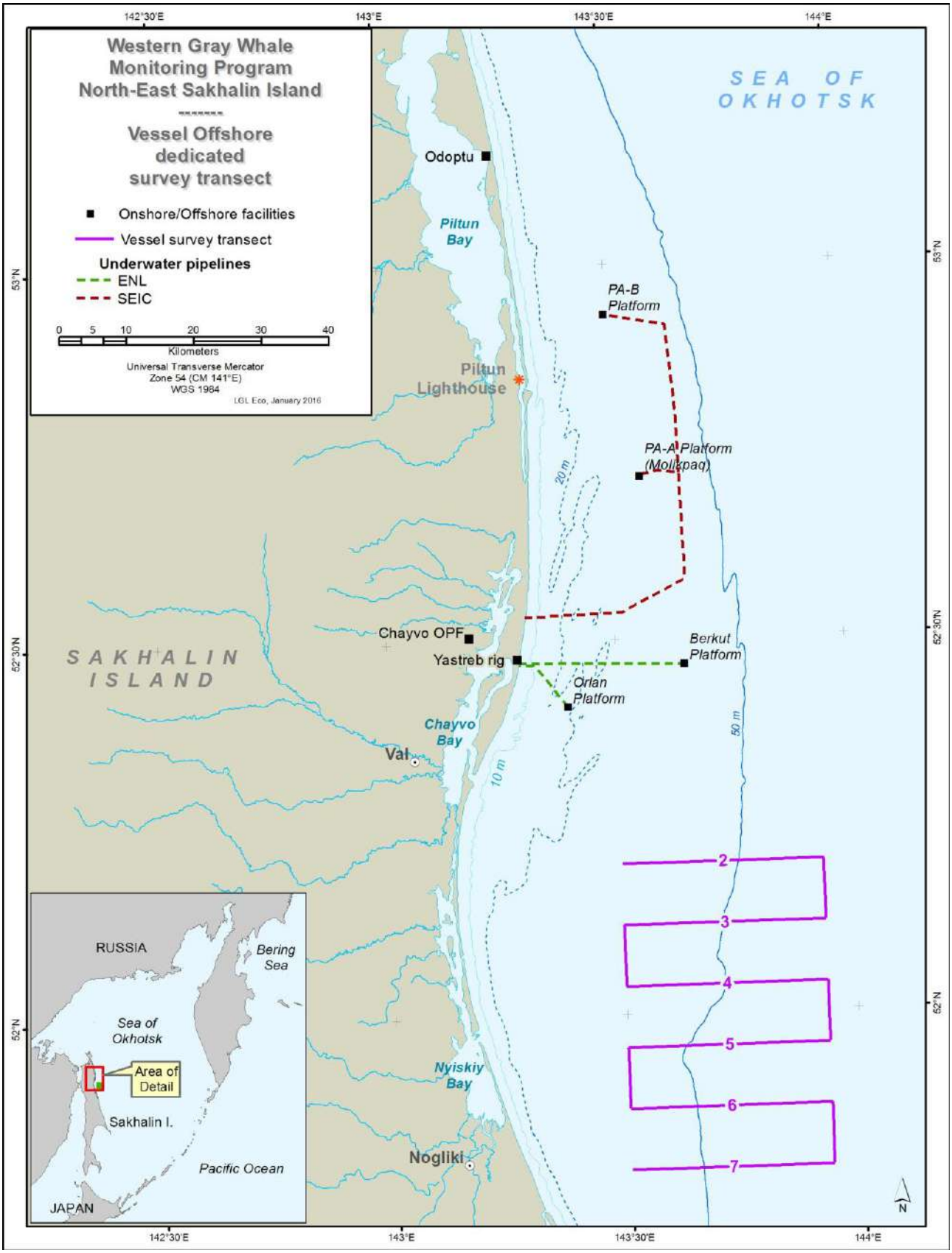

Figure 5. Transects of Vessel-Based Gray Whale Counts

As in the Piltun feeding area, substantial inter-seasonal variation in the distribution and abundance of sighted gray whales is observed in the Offshore feeding area. Since 2004, there has been a gradual expansion of the Offshore feeding area southward, with more frequent sightings of gray whales along the eastern portion of the survey grid. In 2009, a considerable number of whales (11 individuals) were sighted in the northeastern part of the Offshore feeding area where whales had not been previously sighted. This eastward shift toward deeper waters was also observed in 2010. In 2012 the gray whales shifted to the central, shallower part of the Offshore feeding area; while in 2013 - to the southeastern part of the Offshore feeding area with depths of about 50 meters.

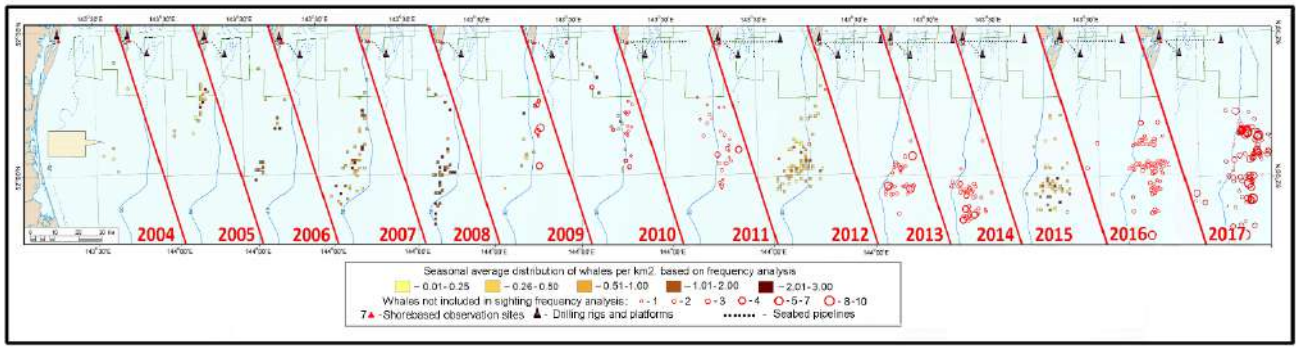

Figure 6. Distribution of gray whales in Offshore feeding ground

Summary data on the changes in gray whale abundance off the northeast coast of Sakhalin Island in 2001-2017 are provided in Figure 7.

Actively feeding gray whales were noted not only in the Piltun and Offshore areas, which suggests that there are suitable feeding grounds for gray whales within a much larger area of both northeastern Sakhalin and the entire shelf of the Sea of Okhotsk, which remains to be fully established.

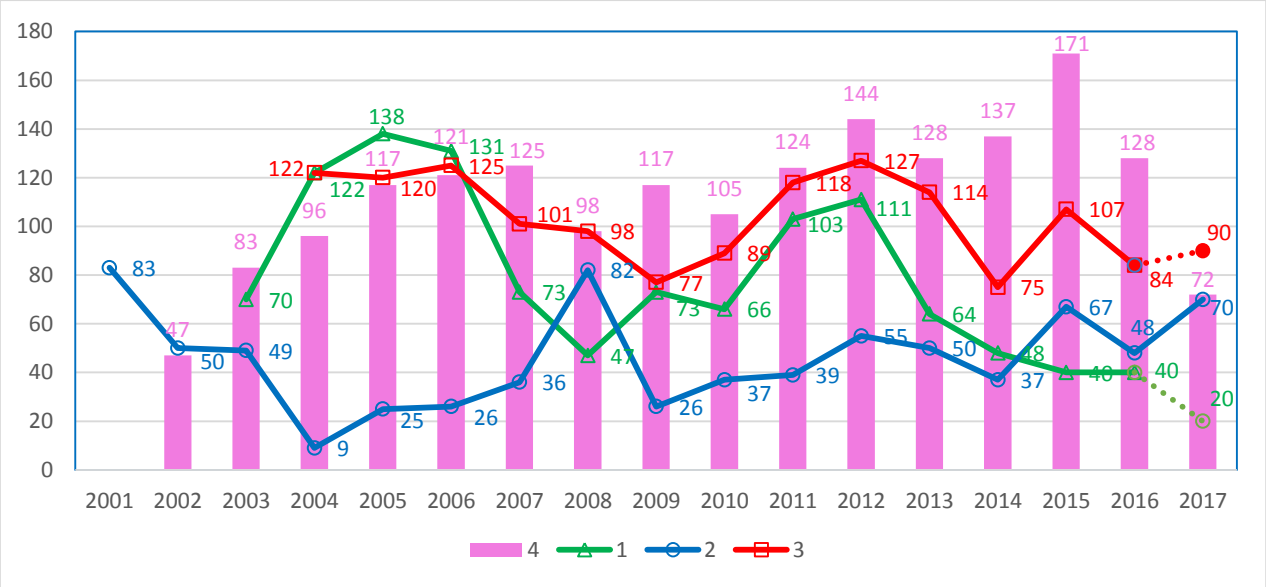

Figure 7. Summary Data on Changes in Gray Whale Abundance Offshore Northeast Sakhalin Island in 2001-2017.
1 – maximum simultaneous number of whales recorded in the Piltun feeding area; 2 - maximum simultaneous number of whales recorded in the Offshore feeding area; 3 – maximum total number of gray whales recorded simultaneously in both feeding areas; 4 – total number of whales recorded by photo-identification (per Yakovlev/Tyurneva).

4.4. Gray Whale Food Sources

The gray whales feed primarily on benthic (bottom) and epibenthic (near-bottom) invertebrates (Fadeev, 2011). From 2002 to 2016, the Joint Program monitored the benthic communities off NE Sakhalin believed to serve as a food supply for gray whales, studying the spatial and temporal structure variations (Figure 8). Since gray whales migrate each year to coastal waters of Sakhalin to feed, examination of the benthos that could serve as a food resource for gray whales provides important information for understanding gray whale ecology, abundance, distribution, movement, and behavior within the Sakhalin feeding areas. High benthic biomass that can serve as a food supply for gray whales in the Piltun and Offshore feeding areas provides a compelling explanation as to why gray whales return to Sakhalin year after year (i.e., exhibiting high site affinity). Monitoring of benthic communities has significantly added to the knowledge of gray whale food supplies, including species composition of benthic communities, numbers and biomass of individual species, and of the influence of environmental parameters (e.g., hydrology and type of sediment) on these benthic communities.

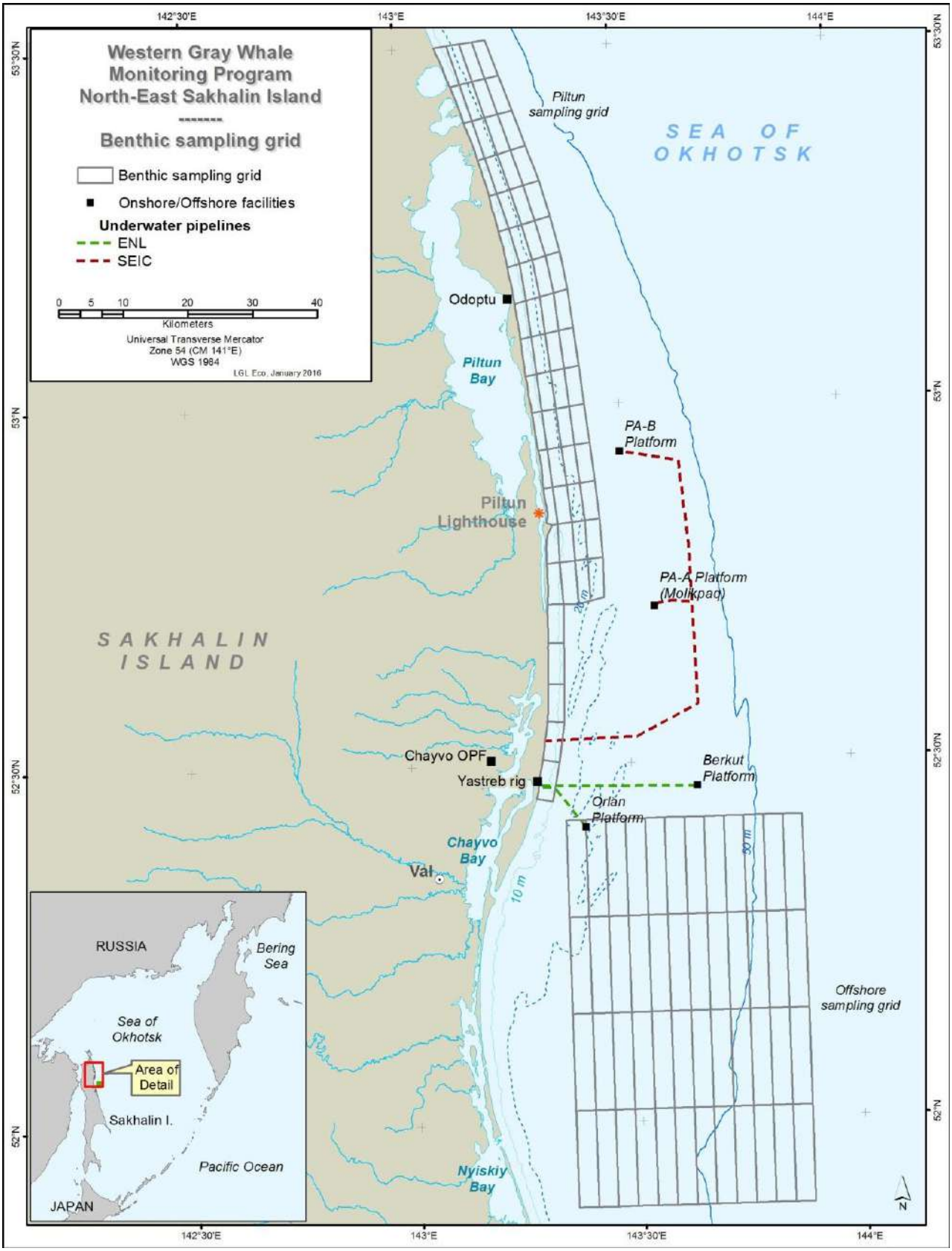

Figure 8. Station Grid for Benthos Sampling in Piltun and Offshore Feeding Areas

4.4.1. Benthos in Piltun Feeding Area

The average total biomass of benthos in the Piltun feeding area measured in 2002-2016 has remained relatively stable from year to year. In 2016, the value of this indicator was 621.1 ± 133.7 g/m^2 (n=43); for comparison, average total biomass of benthos in 2015 was 571.4 ± 119.2 g/m^2 (n=55), in 2014 - 599.8 ± 151.5 g/m^2 (n=56), and in 2013 - 614.1 ± 132.2 g/m^2 (n=58). Year-to-year variations of biomass are not statistically significant (t-test, $p > 0.05$). Amphipods and isopods are believed to be the most important food supply for gray whales (Fadeev, 2011). Other benthic organisms, such as sand lance (a fish), also contribute to the total benthic biomass and are prey. Although sea urchins dominated the overall biomass, they are believed to have little food value for gray whales.

Two complexes of benthic organisms inhabit most of the Piltun feeding water area: a shallow, coastal crustacean complex, with a large portion of biomass formed from amphipods and isopod species, and a deep sea complex of flat sea urchins, with a low content of biomass, food organisms of gray whales (i.e. amphipods and isopods). The provisional boundary between these two complexes lies at depths of about 20 m. In the Piltun feeding area, gray whales do not commonly feed at depths greater than 25 m, probably because crustaceans comprise on average less than 2% of benthos biomass and sea urchins commonly comprise greater than 90% of the benthos biomass at these depths.

The biomass of the sand lance *Ammodytes hexapterus* in the Piltun area in 2016 ranged from 0 to 323.2 g/m^2 (st. 4-1S, depth 18.4 m) and averaged 32.8 ± 10.5 g/m^2 at a frequency of occurrence throughout the study area >63% (n=43) which is higher than in previous years. For comparison, in 2015, the average biomass of this species was 27.1 ± 5.2 g/m^2 (n=55); in 2014 – 5.35 ± 1.51 g/m^2 (n=56), and in 2013 – 7.04 ± 1.49 g/m^2 (n=58). Accumulations with the greatest density of this species were found on sections of sandy bottoms mixed with gravel.

The results of previous studies show both significant year-to-year variations of the sand lance (*A. hexapterus*) abundance and its frequency of occurrence (the percentage of samples where sand lance was found) in the Piltun area (Ivin and Demchenko, 2016).

The average benthos biomass in the Chayvo subarea in 2016 ranged from 21.6 (st. In12, depth 11.4 m) to 108.5 g/m^2 (st. Ch02, depth 11.5 m) and averaged 43.3 ± 10.1 g/m^2 (n=8). For comparison, in 2015 this indicator was 66.8 ± 10.0 g/m^2 (n=12); in 2014 – 52.4 ± 5.9 g/m^2 (n=12) and in 2013 - 62.9 ± 6.8 g/m^2 (n=12). Year-to-year variations of biomass is not a statistically significant indicator (t-test, $p > 0.05$).

4.4.2. Benthos in the Offshore Feeding Area

The average benthos biomass in the Offshore area in 2016 ranged from 99.7 (st. B1-2, depth 30.1 m) to levels above 4400 g/m^2 (st. B5-4, depth 32.5 m), and averaged 878.9 ± 140.1 g/m^2 (n=34). For comparison, in 2015 this indicator was 879.3 ± 92.5 g/m^2 (n=48), in 2014 – 963.8 ± 125.7 g/m^2 (n=48), in 2013 – 896.2 ± 112.9 g/m^2 (n=48), in 2012 – 469.7 ± 112 g/m^2 (n=48), in 2011 – 435 ± 178 g/m^2 (n=38), and in 2010 – 578.6 ± 123.3 g/m^2 (n=48). Considerable increase of the average benthos biomass since 2013 is related to the increase of sea urchin biomass. Year-to-year variations of biomass is not a statistically significant indicator (t-test, p>0,05).

4.4.3. Factors Affecting Benthos Abundance and Distribution

The abundance and distribution of benthos are affected by a variety of abiotic and biotic factors. As part of the Joint Program, hydrological parameters – temperature, salinity, and bottom sediment characterization were measured to help determine factors that influence benthos abundance and distribution in the Sakhalin gray whale feeding areas.

Bottom sediments

Sediments at most sampling locations are characterized by predominance of sand fractions. Of the 223 samples analyzed in 2012, 86% were predominantly sands, while 14% consisted of gravel-pebble soils containing some sands of various grain sizes. The fine sand fraction exceeded 70% almost at all locations. For the monitoring period (2002–2016), fine sands predominated at depths up to 10–15 m throughout the Piltun feeding area. With increasing depth, fine sands are replaced by medium- and coarse-grained sands and areas with gravel–pebble soils containing some sands of varying size.

In the Offshore feeding area the content of silt-clay in the sediment increased with water depth. Overall, fine sands predominate at more than 85% of the stations in the Offshore area. Gravel soils and coarse-grained sands occur in patches mainly in shallower parts along the western area.

Hydrology

The Piltun feeding area can be characterized as a shallow-water coastal area with a 20-meter isobath at 5-10 km from the shore and the 50-meter isobath at 20-30 km from shore. The Piltun feeding area receives freshened water from the Amur Estuary and water from Piltun and Chayvo Bays.

During upwelling (this phenomenon occurs in these waters when there are seaward winds), the near-shore zone is filled with deep waters that have lower temperature and higher salinity than the relatively warm freshened surface waters, which are mixed further out to sea.

The upwelling is considered to be a significant factor in phytoplankton primary production in some parts of the Sea of Okhotsk (Shuntov, 2001). In summer, upwelling is observed on the NE shelf when winds blow from the south (Borisov et al., 2008) and/or from the southeast. Hydrological observations indicate that prolonged upwelling may occur over large areas of the NE Sakhalin shelf, and for long periods in some parts (Krasavtsev et al., 2000).

Ice Cover

Early or late breakup of the ice cover offshore NE Sakhalin significantly impacts the onset of the phytoplankton growth process, which may subsequently impact benthic organisms.

Influx from Amur River, and Piltun and Chayvo Bays

Benthos is also influenced by the influx of freshwater and detritus from the Amur River and water from Piltun and Chayvo Bays. This shallow water influx appears to be constant and steady with no significant variations from year to year. Therefore, ice (during cover breakup), biogenic and organic substances from the Amur River waters, summer influx from Piltun and Chayvo Bays during flooding, and incursion of deep waters full of biogenic substances from the Sea of Okhotsk in the event of upwelling are variable factors potentially affecting biological productivity of the area. Apparently, these very processes ensure high biological productivity in this area of the Sea of Okhotsk and make this area a primary feeding area for WGW in the summer-autumn season.

4.5. Threats to Gray Whales

Gray whales face potential threats throughout their range of habitat from both natural and anthropogenic sources. Threats to gray whales include aboriginal subsistence whaling entanglement in fishing nets and gear, collisions with vessels, pollution, habitat damage, oil spills, and disturbance or displacement from key habitats.

4.5.1. Natural Threats

Natural threats to gray whales include predation (by killer whales), disease, epizootic mass mortality, climate change followed by the ecosystem degradation, and insufficient food resources. The killer whale (*Orcinus orca*) is the only non-human predator of gray whales. Predation of gray whale calves by killer whales is perhaps the most significant threat to the gray whales, and is a threat not unique to the Sea of Okhotsk. Although the degree of losses from predation is not known, the calves during the first two years of life are the most vulnerable. Attacks on gray whales by pods of killer whales are well known and have been witnessed by Joint Program scientists (which fortunately did not result in loss of a gray whale calf).

Threats to gray whales from disease are still not completely understood. However, the decrease in Eastern gray whales that occurred during the 1980s-1990s (estimated decrease from 30,000 to 20,000 individuals), is believed to be the result of the numbers of gray whales exceeding the feeding productivity of the environment, which could have led to disease and/or insufficient food resources to support the large number of whales.

4.5.2. Anthropogenic Threats

Potential anthropogenic threats to gray whales arise from traditional Chukotka aboriginal subsistence whaling activities fishing, shipping, offshore production operations, as well as military and tourist activities. The main threats of anthropogenic nature that could have a negative impact on gray whales include: loss of individual species during traditional Alaska and Chukotka aboriginal fishing activities, entanglement, leading to injury and possible death in fishing, primarily, drift nets, potential collisions with ships, pollution, potential oil spills and noise. In recent years, cruise ships offering tourists the chance to see gray whales up close have regularly visit the Piltun feeding area. For example, cruise ships have stopped in

the Piltun feeding area at least 4 times from 2014-2017. During the visit on September 2, 2014, nine inflatable boats carrying 10 tourists each approached whales and followed them so take photographs could be taken. On September 1, 2017, ten inflatable boats with a total of 70 tourists spent several hours approaching whales near the mouth of Piltun Bay.

Environmental Impact Assessments (EIAs) conducted by each company for their respective offshore developments identified three main threats to gray whales as a result of the companies' operations: collisions with ships, noise that could affect hearing and cause disturbance / behavioral changes, including abandonment by the gray whales of their traditional feeding areas, and potential oil spills. A risk assessment has been performed for each of these threats, and measures have been developed to reduce the threats to an acceptable level.

Collisions with Ships

Each company has implemented mitigation measures through their Marine Mammal Protection Plans (MMPPs) to reduce risk to whales.

MMPPs proved to be effective, and during the period that the Companies have been working off Sakhalin, neither ENL nor Sakhalin Energy have had any vessel collision or near misses with gray whales or other cetaceans in direct proximity to each other over the entire project period.

MMPPs establish special vessel operation criteria that minimize the likelihood of vessel collisions with gray whales. Key MMPP mitigations include use of Marine Mammal Observers (MMOs) and Watch Standers, vessel speed restrictions, use of defined navigation corridors, limiting vessels to operate at a minimum distance to gray whales, and the prohibiting of companies' vessels in feeding areas, except when conducting the components of the Joint Program and in case of emergencies. Bottom sediment contaminant monitoring to identify potential changes in pollutant concentrations and grain-size-distribution is conducted as part of both the individual companies' environmental monitoring programs around their facilities and the Joint Program benthic studies. Analytical results have consistently shown that pollutant levels (e.g., hydrocarbons, metals) in the sediments in the monitored areas are not above background level.

The impact of a potential oil spill on gray whales would depend upon a variety of factors, including the distance of a spill source to gray whales and their habitat, the size and

timing of the spill, and current environmental conditions (e.g., wind, rough seas, ice, etc.). Spilled oil may directly impact a whale through contact to skin and other surfaces, causing irritation and other reactions; indirectly result in damage to gray whale habitat and food resources.

It has long been recognized that anthropogenic noise from main and associated oil and gas production activities such as seismic exploration, construction and operation of offshore facilities has the potential to disturb whales. Noise disturbance of whales could possibly result in behavioral changes, displacement from critical habitat and in extreme cases, physiological injury to hearing organs. In 2003, under the Joint Program, a standardized annual acoustic monitoring was implemented to further study noise levels, both of natural origin (storm) and generated during the company operations (e.g. seismic surveys, construction and production) (Figure 9). As necessary, measures were taken to reduce the impact, including changes in work schedules (timelines) and/or equipment upgrades.

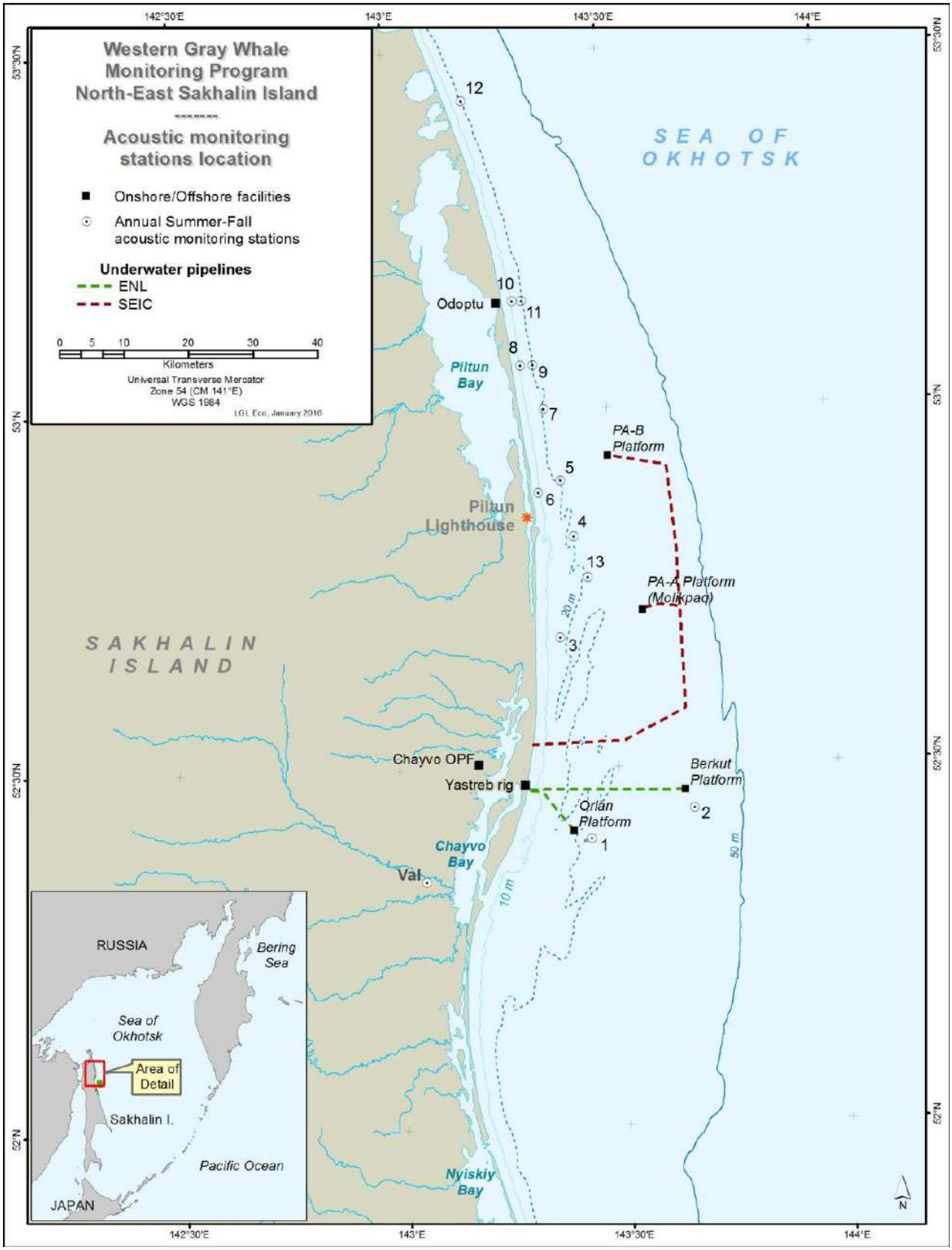

Figure 9. Locations of Acoustic Monitoring Stations

5. CONCLUSION

The implementation of the Joint Monitoring Program by the Companies and their special investigations involving research institutes significantly improved the understanding of the gray whales of Sakhalin and their habitat. Annual reports on the results of the Joint Program (2002-2017), based on a large amount of representative data, give the Companies and other stakeholders a basis for an objective assessment of the status of the Sakhalin gray whales and their habitats. Below are key conclusions from the results of the Joint Program and other Company-sponsored studies.

5.1. Gray Whale Feeding Aggregation

Since 1983, when whales were sighted off NE Sakhalin, the number of known whales has steadily increased from about 20 to over 200 individuals. As of 2017, the total number of WGW amounted to 283 individuals included in the catalog of the Institute of Marine Biology with the Far Eastern Branch of the Russian Academy of Sciences. During the 2017 field season, 9 new individuals were added to the photo-identification catalog.

Typically each year, but not in 2017, there are three to five adult gray whales sighted for the first time off NE Sakhalin. It is unknown whether these individuals are new to the region or have visited the Sakhalin area in previous years, but have not been photographed and identified.

Typically, 50-60% of individual gray whales identified in the NSCMB Sakhalin catalog are sighted each year by the Joint Program photo-ID team. The number of whales sighted each year is positively correlated to the scope of the photo-ID effort and extent of good weather.

5.2. Gray Whale Migration

Whales migrate each spring and summer (roughly in May-July) to the Sea of Okhotsk to feed, where, according to monitoring data, they are recorded throughout the ice-free months off the coast of NE Sakhalin.

Winter migration routes and winter habitats of gray whales remained unknown until the satellite tagging of whales off the coast of Sakhalin conducted in 2010 and 2011 helped determine the periods and routes of winter migrations. Three individuals with satellite tags

were tracked during their winter migration from Sakhalin to Kamchatka and eastward to North America.

The satellite transmitter on one female whale (Varvara) was tracked throughout the entire annual migratory cycle from Sakhalin to the known wintering habitat of gray whales in the Gulf of California (Mexico), and subsequently back to Sakhalin, arriving in the Piltun feeding area on May 18, 2012 (Mate et al., 2015). Interestingly, she was not identified by the photo-ID teams in 2012 even though her transmitter showed that she was in the Piltun feeding area until it quit transmitting on October 12.

The North American migration for more than 30 Sakhalin whales has been confirmed by scientists with matches between photographic catalogs, genetic matching and satellite tagging (Urbán et al., 2012; Urbán et al., 2013, unpublished data).

5.3. Gray Whale Distribution and Abundance

Gray whales are observed off the northeast coast of Sakhalin Island during all ice-free periods that occur from late May to early December. The peak gray whale abundance in the Piltun feeding area is observed annually in August. Abundance in the Offshore feeding area peaks at the end of the summer season (i.e., September-October).

In the Piltun feeding area, whales are routinely seen throughout the Piltun feeding area, but the highest concentration of whales is usually found in a 30 km stretch of coastline centered on the mouth of Piltun Bay. Juvenile whales, age 5 and under, are exclusively found in this area, as are cow-calf pairs.

The annual maximum number of gray whales sighted during simultaneous distribution surveys of the Piltun feeding area (i.e., scans at 13 locations conducted at the same time) ranged from 40 to 138 whales with an average of 80. In the Offshore feeding area from 2002 to 2017, the annual maximum number ranged from 7 to 82 whales with an average of 44. Years with lower maximum counts are typically due the lack of available vessel time in the Offshore area, resulting in only 2-3 surveys. The program focused it effort in most years on the Piltun feeding area.

Coordinated distribution surveys over both feeding areas are rare due to difficulties of covering the vast area and routinely uncooperative weather. The annual maximum number of gray whales observed during simultaneous surveys of both feeding areas has ranged from 77 to 127 with an average of 103.

5.4. Gray Whale Feeding Areas

Two primary feeding areas for gray whales are known in the continental shelf of the Sea of Okhotsk off the coast of NE Sakhalin: the Piltun or near-shore feeding area and the Offshore feeding area.

It is known that some gray whales regularly move between these two Sakhalin feeding areas during the feeding season. Cow-calf pairs have not been recorded in the Offshore feeding area.

Prior to the Offshore feeding area discovery in 2001, it was assumed that the Piltun feeding area was the primary feeding area off NE Sakhalin and that gray whales only feed at depths of no more than 20 m. Adult (including sub-adult) gray whales are found in both areas and their feeding is not restricted by depth (up to ~50-60 m).

According to observations, in certain years some whales were at a depth of over 20 meters in the northern part of the Piltun feeding area, which coincided with the high density of sand lance in this location.

Gray whales were observed feeding in other areas outside of the two primary feeding areas, including Severny Bay north of Sakhalin, and Olga and Vestnik Bays off southeast Kamchatka. It is highly likely that whales use other undetermined feeding areas, since many whales listed in the Sakhalin NSCMB catalog have not been sighted for several years.

5.5. Gray Whale Physical Condition

Each year, some whales arriving to the Sakhalin area appear emaciated (gaunt) or in poor physical condition. The occurrence of the gaunt condition is believed to be a natural result of individuals having depleted a large portion of their body fat over the course of their winter migrations. About 10 to 20% of the gray whales off Sakhalin each year have been observed in various levels of poor physical condition.

Many whales arriving in poor physical condition off Sakhalin (at the beginning of the feeding season) have turned out to be nursing mothers, but their calves have appeared to be well-nourished.

It is believed that that there is little to no feeding during the winter migration from the Sakhalin feeding areas. Whales spend the ice-free months off the NE Sakhalin coast consuming

large quantities of prey and building up fatty tissue. During the feeding period, the physical condition of most gray whales improves, and, according to observations, by the end of September the physical condition of approximately 80-91% of the initially emaciated whales becomes normal. It should be noted that the feeding season lasts until late November-early December.

5.6. Gray Whale Food Sources

Gray whales are known to feed on benthic organisms. Amphipods and isopods are the primary food source for gray whales off northeast Sakhalin. Gray whales accumulate in Sakhalin feeding areas each year due to the large biomass of their preferred prey.

The overall percentage of amphipods in the benthos biomass within the Piltun feeding area is highest in the near-shore zone in water depths of 5 to 15 meters and decreases sharply at depths greater than 20 meters. The community with the amphipod *Monoporea affinis* as a dominant species is predominant.

The amphipod *Ampelisca eschrichtii* is the main food item in the Offshore feeding area. Average amphipod biomass in the Offshore feeding area is rather stable from year to year. Whales in the Offshore feeding area have been observed to feed at depths of 40 to 60 meters. The sand lance is a possible food source for gray whales and a component of the benthic biota that occasionally reaches high abundance. The highest densities of sand lance accumulations were recorded in northern and middle parts of Piltun Bay at depths greater than 20 m. Observed variability in sand lance density are believed to influence the distribution of gray whales within their feeding areas.

The content of amphipods and isopods in the total biomass in the feeding areas is over 50% and the volume exceeds 100 g/m^2. When comparing these numbers with the total amphipod biomass in the samples, it is clear that gray whales are attracted to areas with relatively high food biomass.

Olga Bay in Kamchatka has amphipod biomass slightly lower or similar to the values found in the Chayvo Bay area.

5.7. Environmental Pollutants in Gray Whale Feeding Areas

Pollutant concentrations in bottom sediments of the monitoring areas off NE Sakhalin do not exceed background levels.

The content of petroleum hydrocarbons in the bottom sediments of the gray whale feeding areas do not exceed the average values for the NE Sakhalin coast. Sediments closer to shore had lower petroleum hydrocarbon concentrations.

The concentration of heavy metals in the sediments in the study area did not exceed the background levels for the NE Sakhalin coast prior to the beginning of active industrial activities and they were substantially below the values of the Probable Active Concentration (PAC) at which an adverse impact on benthic organisms can be expected. Heavy metal concentrations in polychaetes in the Piltun feeding area confirmed that heavy metals were not above the background content.

5.8. Noise in Gray Whale Feeding Areas

Since 2003, the Companies have conducted environmental acoustic monitoring, including of anthropogenic noise, through the Joint Program and with activity-specific monitoring in the feeding areas and offshore work areas to ensure that levels do not exceed prescribed thresholds.

Natural noise levels vary significantly depending on atmospheric phenomena (wind and rain), which can elevate the background by more than 20 dB; noise levels can be near 100 dB from wave activity during storms.

Offshore construction activities by the Companies generally induced broadband sound pressure levels within 120 dB re 1 μPa at the nearest boundary of a feeding area except for brief surges lasting a few hours. This was largely achieved through the planning of activities with the aid of forecasting tools to avoid scenarios that could lead to aggregation of noise sources.

Ships are the most significant sources of predominant noise of anthropogenic nature as a result of the activities of the Companies, with the exception of seismic surveys or piling works. Noise levels from moving vessels are generally transient in time and are unlikely to cause sustained disturbance to whales in the area.

Systematic monitoring of anthropogenic noise from company activities makes it possible to identify noise, which in turn provides an opportunity to revise practices or make engineering alterations to minimize acoustic output.

Multivariate analyses of behavioral data collected during seismic survey operations have indicated that even at higher sound exposure levels, no significant changes were observed.

5.9. Gray Whale Conservation

ENL and Sakhalin Energy maintain their commitments to conduct their operations in the coastal area of Sakhalin Island in a manner that does not adversely affect the environment and the gray whales.

ENL and Sakhalin Energy interact with leading scientists, international organizations, and other stakeholders during public forums through participation in their meetings and scientific publications in order to promote and facilitate efforts to conserve gray whales and their habitats.

The Joint Monitoring Program provides a scientific basis for assessing the status of gray whales that feed off the northeast Sakhalin coast every year. Joint Program results demonstrate that the number and distribution of gray whales in the feeding areas have not been adversely affected by the Companies' activities.

The Companies' facilities have been designed and constructed to the highest standards in order to minimize the risk of adverse environmental impacts. Rigorous operating, services, monitoring, and auditing procedures are adhered to by each company to mitigate potential risks to the environment and the gray whales.

The Marine Mammal Protection Plans implemented by each company proved to be highly effective at eliminating and/or mitigating the potential impacts of offshore operations on gray whales and other species, with has resulted in no incidents with gray whales related to the Companies' activities.

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APPENDICES

APPENDIX I. Joint Program Publications.

APPENDIX II. Photo-Identification of Gray Whales (*Eschrichtius robustus*) off the Northeast Coast of Sakhalin Island in 2017.

APPENDIX I. Joint Program Publications

Photo Identification

- Yakovlev, Yu. M. and O. Yu. Tyurneva, 2004. Photo-identification of the western gray whale (Eschrichtius robustus) on the northeastern Sakhalin shelf, Russia, 2002-2003. **IWC** SC/56/BRG47.
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