

PHOTOGRAPHIC IDENTIFICATION OF THE KOREAN-OKHOTSK GRAY WHALE (*Eschrichtius robustus*) OFFSHORE NORTHEAST SAKHALIN ISLAND AND SOUTHEAST KAMCHATKA PENINSULA (RUSSIA), 2009

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Abstract

Photo-ID studies of gray whales have been performed annually in the Piltun and Offshore feeding areas off northeast Sakhalin during the period 2002-2009 as part of an industry sponsored monitoring program. Simultaneously conducted benthic studies have shown that both Sakhalin feeding areas are abundant in potential prey for gray whales. During the eight years of the study, the intensity of use of the Piltun and Offshore feeding areas by gray whales varied from year to year.

Over the past few decades, researchers also have become aware of the presence of gray whales in the coastal waters offshore southeast Kamchatka during the summer-autumn and early winter months. Photo-ID studies conducted offshore southeast Kamchatka in 2004 (Nalycheva Bay), 2006-2009 (Olga and Vesnik Bays) revealed that some of the Kamchatka whales belong to the Western gray whale population, while the population affiliation of others (i.e. Eastern or Western) remains unknown. Thus, data indicate that the Western gray whale population is not confined to their feeding grounds offshore Sakhalin during their summer-to-fall feeding season.

During the 2009 photo-ID effort, 100 individuals from the Sakhalin catalogue were identified only offshore Sakhalin. One whale from the Sakhalin catalogue was identified only in Vestnik Bay offshore southeast Kamchatka, and ten whales were recorded both in Vestnik Bay and offshore Sakhalin in 2009. Twenty whales from the Sakhalin catalogue were identified only in Olga Bay offshore Kamchatka, and eight were seen both in Olga Bay and on the Sakhalin shelf, in 2009. One of the gray whales that was identified in Olga Bay was subsequently found dead on a sandy beach near Chayvo Bay, Sakhalin. Thus, a total of 138 whales from the Sakhalin catalogue (139 minus one dead whale) were photo-identified offshore Sakhalin and Kamchatka in 2009. An additional 36 gray whales were seen only offshore southeast Kamchatka, these whales have not been seen previously offshore Sakhalin, and therefore are not recorded in the Sakhalin catalogue.

In 2008, a mother-calf pair was registered in Olga Bay (Kamchatka) for the first time. The earlier start of the survey season in Olga Bay in 2009 compared to previous years allowed more comprehensive data to be collected about mother-calf pairs; seven pairs were identified in 2009. Four of these mothers identified in Olga Bay had been observed on the Sakhalin shelf in previous years. Two of the seven calves were also observed later in the Piltun area during the 2009 season, one of them with its mother. In addition, five mother-calf pairs and one calf without mother were identified only in the Piltun area on the Sakhalin shelf. Thus, a total of ten calves that have mothers in the Sakhalin catalogue were recorded in 2009. These results indicate that the Piltun area offshore Sakhalin is not the only feeding area for mother-calf pairs of the Western gray whale population, but that a second “nursery ground” exists in Olga Bay, offshore southeast Kamchatka.

KEY WORDS: WESTERN GRAY WHALE, PHOTO-ID, DISTRIBUTION, COW-CALF, SAKHALIN, PILTUN, KAMCHATKA, OIL-GAS PROJECT.

Introduction

Photo identification (photo-ID) has proven to be a useful and non-invasive technique for monitoring free-ranging populations of many marine mammal species. Especially when incorporated into a long-term monitoring program, photo-ID can help answer ecological questions about the population dynamics and status of the observed key species. Photo-ID is a valuable tool in gray whale studies (Darling 1984; Würsig *et al.* 1999, Calambokidis *et al.* 2002; Yakovlev *et al.*, 2010), because individual gray whales bear uniquely distinguishable markings on their sides, backs and flukes. Individuals can be passively “tracked” over space and time by

photographically “capturing” then subsequently “re-capturing” the same whale while recording the location and time at which photographs are taken.

From 2002-2009, photo-ID studies of the critically endangered population of western gray whales (*Eschrichtius robustus*) have been conducted annually offshore northeast Sakhalin Island as part of an industry-sponsored monitoring program jointly funded by the Sakhalin-1 (ENL) and Sakhalin-2 (Sakhalin Energy) oil and gas development projects. Two main feeding areas that are utilized during the ice-free season have been identified along the northeast Sakhalin coast: the Piltun feeding area adjacent to Piltun Bay (52°40' N to 53°30' N), where whales predominantly feed in shallow waters <20 m depth, and the Offshore area approximately 30-40 km east of Chayvo Bay (51°50' N. to 52°25' N), where whales feed in greater water depths of 35-60 m.

More recently, western gray whales have also been identified feeding on the southeast coast of the Kamchatka Peninsula. Western gray whales were observed offshore southeast Kamchatka in Nalycheva Bay (2004) in water depths of about 30 m, in Vestnik Bay (2006, 2007, 2009) in water depths of about 15-24 m, and in Olga Bay (2006-2009) in water depths of about 5-17 m. Gray whales also repeatedly have been sighted in other far-eastern seas. For example, three gray whales were photographed in the northern parts of the Okhotsk Sea in Kekurny Bay and Babuskin Bay in 2006; one of them was sighted later in the Piltun feeding area, Sakhalin and then in Olga Bay, Kamchatka in 2007 (Vertyankin *et al.*, 2007). Due to the limited data and lack of evidence of feeding it is hard to determine if these locations in the northern Okhotsk Sea are potential feeding areas, or if the whales were photographed during transit between foraging sites.

In the summer and fall of 2009, photo-ID studies were conducted in the two primary feeding areas offshore Sakhalin Island (Piltun and Offshore) and in Olga Bay and Vestnik Bay offshore southeast Kamchatka (Olga Bay and Vestnik Bay). (Fig. 1).

Methods

The field procedure for the photo-ID work used by the IBM team offshore Sakhalin Island since 2002 is based on recommendations for photo-ID work with marine mammals, set forth in the International Whaling Commission Special Issue No. 12 (Hammond *et al.* 1990). The research vessel *Akademik Oparin* was the base ship for the photo-ID effort, with the actual work conducted from a 3.8 m long Zodiac when weather and sea conditions allowed. On specified photo-ID days, when conditions permitted, the Zodiac was deployed from the mother vessel whenever gray whales were sighted. The whales' position (determined by the GPS), the time, whale behavior, number of whales in the group¹, direction of their movement, the presence of other groups of gray whales, killer whales and passing vessels, and airplanes or helicopters in the observation area were also noted. The presence of mud plumes, both at whale feeding sites and when no whales were visible was recorded near the locations where the Zodiac was launched.

A Nikon D2X digital camera with a fixed 300 mm f/4 telephoto lens or a Nikkor 80-400 mm zoom lens with image stabilizer (IS) was used for photography. The photographs were recorded at a high resolution setting in large RGB JPEG and RAW format. An attempt was made to photograph all aspects (head, back flanks and flukes) of each whale. A whale was photographed in sequence, from head to fluke on both the right and left sides, and the dorsal and ventral fluke surfaces. Priority was given to photographing the flanks of the whale, as fluking frequency varies with individual behavior and foraging depth. Preference was given to photographing the right side (flanks) of the subject animal as right sides have been arbitrarily chosen among western gray whale researchers as a baseline identifier. Matchable right side photographs are required for an individual whale to be included in the photographic identification catalogues. A matchable quality photograph for photo-identification of gray whales is any photograph of the appropriate region of the body (aspect) that can be readily identified as belonging to a particular individual whale when compared to other photos of the same target region of that same whale.

¹ Group size estimates were based on a consensus of the observers aboard the Zodiac and were later confirmed in the laboratory via photo-matching.

The photo-ID effort was conducted in Olga Bay and Vestnik Bay, Kamchatka Peninsula (Fig. 1) using vessel-based field procedures similar to those used in the Offshore feeding area along Sakhalin Island. A Canon 40D digital camera equipped with Canon 75-300 mm zoom lens with image stabilizer was used for photography. All photos were taken at the highest possible resolution and saved in JPEG format.

Shore-based photography has been a part of behavioral monitoring research on western gray whales in Sakhalin, since 2004. This research was conducted in the nearshore Piltun Feeding Area, one of the primary known feeding habitats of the western gray whale. Observations covered 66 km of coastal region in the northern portion of the nearshore feeding area. Behavioral observations are described in more detail in Yakovlev et al., 2010. The shore-based photo ID effort supplements the vessel-based, Sakhalin, photo ID program by sampling near shore waters where gray whale mothers and calves are typically found. Vessel based photo-ID efforts were conducted over a larger area and therefore do not sample the nearshore feeding area as frequently. In addition, the shore-based approach may conduct photo ID during inclement weather conditions (for example when Beaufort > 3) when it is not possible to conduct photo-ID work from the Zodiac.

To recognize whales by their distinguishing marks on their sides and flukes, standard photo-recognition methods specified by the International Whaling Commission were applied (Hammond et al., 1990). Confident left-to-right side matches were established based on the following criteria: (1) the whale was photographed as a solitary individual; (2) sequences of the left and right side were compared with flukes in common for a single sighting; and (3) as a final check to compare matches and assist with right to left matches, whale knuckle height, spacing and ratios were considered. Whale body color served as the basic feature for whale identification; scars and barnacle spots were used as additional features for comparison. Whales identified offshore of the Kamchatka Peninsula were assigned catalogue numbers, KamGW# in the Kamchatka catalogue, and whales identified offshore Sakhalin Island were assigned catalogue numbers, KOGW# in the Sakhalin catalogue. Whales identified in both regions carry two (KamGW# and KOGW#) catalogue numbers and appear in both the Kamchatka and Sakhalin catalogues. Whales which had matchable quality photographs of other aspects, but were missing a quality right side image in the catalogue, were given a Temporary number (TEMP#) until an matchable right side photograph could be obtained and added to the sighting history for that individual. The whale is then issued the appropriate sequential catalogue number, retaining its TEMP# for historical reference.

Analysis of photo-ID data also incorporated the identification of whales with deviations from the “physiological norm”. Such deviations included: (1) emaciation (“skinny” whales); and (2) obvious sloughing of skin or other anomalous skin conditions.

Results

The main results of the photo identification studies in 2009, combined with results from previous years, are as follows:

1. Identified whales in the Sakhalin and Kamchatka gray whale catalogues: The 2002-2009 catalogue of photo-identified western gray whales offshore Sakhalin Island currently includes 177 fully identified, individual whales. Some of these individuals have been recorded repeatedly in separate years, while others are new to the catalogue or have not been recorded for some time. The catalogue of gray whales photo-identified off southeast Kamchatka currently contains 116 fully identified whales observed in three areas: at Khalaktyrsky Beach in Nalycheva Bay (2004), in Vestnik Bay (2006, 2007, 2009) and in Olga Bay (2006-2009). Sixty one of these whales from the Kamchatka catalogue also were on the Sakhalin shelf during various years, and are most likely Western gray whales. The population affiliation (Eastern or Western) of the remaining 55 whales is still unclear.

2. Identified western gray whales in 2009 (Sakhalin and Kamchatka): In 2009 a total of 117 Western gray whales (excluding temporary whales) were identified offshore Sakhalin; 111 of these were identified by vessel-based photo-ID team and 6 by the shore-based behavior team (Table 1). The number of identified whales in 2009 was higher than in 2008 (98 whales), but lower than in 2006 (121) and 2007

(125). Photo-ID effort in 2008 and 2009 was lower than in 2006 and 2007 due to unfavorable weather conditions.

Out of the 117 whales identified on the northeast Sakhalin shelf twelve gray whales were new to the Sakhalin catalogue (i.e. were identified off northeast Sakhalin for the first time), including four adults and eight calves. One of the adult animals previously had been identified at Khalaktyrsky Beach (Kamchatka) in 2004. Another adult whale had been observed in Olga Bay (Kamchatka) in 2008. The remaining two adult whales had not been observed anywhere during earlier years.

Kamchatka: From May 30 to June 14 of 2009, a total of eleven whales were identified off the Kamchatka Peninsula in Vestnik Bay (Fig 2). All of these eleven whales had been registered in previous years in the Sakhalin catalogue. Field observations showed that the animals stayed in Vestnik bay for a short period of time (from several hours to two days) and then left the region.

From July 11 to September 2, 2009, 64 + 2 Temp whales were observed in Olga Bay, Kamchatka of which 28 + 1 Temp whale were registered in the Sakhalin catalogue (one whale remains a temporary whale because non-standard aspects (i.e. head shots) were used to match this whale between catalogues). Thirty-four of the 64+2 Temp whales already were included in the Kamchatka catalogue since they had been observed previously in Olga Bay. The other 30 + 2 Temp whales were new to Olga Bay (Fig. 2).

Since 2006, the number of identified whales in Olga Bay has grown every year (Table 1). One likely explanation for this result is differences in the start date and duration of the observation seasons between years. The observation season was longest in 2009, when the largest number of whales was recorded. Results show that the number of new whales that were identified in Olga Bay strongly depended on the observation dates. On July 11, at the beginning of the observation season, 24 whales were observed. The maximum number of registered whales was 30 individuals on July 21; after that date the number of whales recorded on any given day dropped. By the beginning of September the number of observed whales during one day had decreased to ten.

Since the start of the surveys in Olga Bay (Kamchatka) in 2006, researchers have identified some whales that had been registered as calves in Piltun area (Sakhalin) in the previous year. Three of the five calves identified in the Sakhalin shelf in 2008 were recorded in Olga Bay in 2009.

Sakhalin and Kamchatka: In 2009, 138 of the 177 western gray whales from the IBM DVO RAN Sakhalin catalogue were observed off of both Sakhalin and Kamchatka combined. The total number of identified gray whales from both the Kamchatka and Sakhalin catalogues in 2009 was 174 +1 TEMP whale. One hundred of these whales were recorded only on the Sakhalin shelf, 56 + 1 TEMP whales were recorded only offshore Kamchatka (21 of which have been registered in the Sakhalin catalogue in previous years), and 18 + 1 TEMP whales were seen in both locations. At present, it is unknown whether all of the animals observed in the Olga Bay, Kamchatka belong to the western gray whale population, or whether some of them belong to the eastern gray whale population (Fig. 2).

3. Dead gray whale.: On September 5, 2009, a dead male gray whale was discovered on a sandy beach near Chayvo Bay (Sakhalin). This whale was identified as KOGW126 from the Sakhalin catalogue and KAMGW078 from the Kamchatka catalogue. He was first observed as a calf with his mother in the Piltun area on the Sakhalin shelf in 2005. Later, in 2008, he was identified in Olga Bay (Kamchatka). On July 16, 2009 the same animal was observed in Olga Bay displaying a body condition that was considered normal for the early feeding season (BC 2). The cause of death of this whale could not be determined.

4. Survey effort offshore Sakhalin in 2008 (compared to 2007): Fewer individual whales were identified offshore Sakhalin in 2008 (98) than in 2007 (125), and less effort was expended on photo-ID offshore Sakhalin in 2008 (29 days) than in 2007 (62 days). Consequently, there were about 2.5 times fewer Sakhalin records on which to perform photo-identification in 2008 than in 2007. Therefore, it is possible that the lower number of whales recorded offshore Sakhalin in 2008 than in 2007 may, in part, have been due to the difference in effort between the two years.

5. Movement between feeding areas: Photo-ID studies are useful to help understand how whales utilize different feeding areas within the same year (i.e., intra-annually) and between years (i.e., inter-annually):

Intra-annual movement between feeding areas: Of the 117 whales seen in Sakhalin waters in 2009, 79 were identified in the Piltun area (excluding the area nearshore Chayvo Bay); 60 of these whales were not observed anywhere else on the Sakhalin shelf in 2009 (Table 2). Fourteen individual whales were photographed in the shallow waters off Chayvo Bay immediately to the south of the Piltun area; six of these whales were not observed anywhere else on the Sakhalin shelf in 2009. Thirty-nine gray whales were identified in the Offshore area located to the southeast of Chayvo Bay at a distance of about 30-40 km from shore; 24 of these whales were not observed anywhere else on the Sakhalin shelf in 2009. Thirteen whales were observed in both the Piltun and Offshore areas, six were observed in both the Chayvo and Piltun areas, and two were observed in both the Chayvo and Offshore areas.

Of the 98 whales seen in Sakhalin waters in 2008, 36 were seen only in the Piltun feeding area, and 36 were seen only in the Offshore feeding area (Table 2). One whale was seen only near Chayvo Bay. The remaining 25 whales were seen in both the Piltun and Offshore areas (including one whale that was also seen near Okha).

These data demonstrate that some whales utilize several feeding areas during the same season. Intra-annual movement of whales between the Piltun and Offshore feeding areas was also observed in 2007, 2006 and during earlier years. In 2007 for example, 38 whales seen in the Piltun feeding area were also recorded in the Offshore feeding area. During all these years, cow-calf pairs were registered only in the Piltun area (Table 2).

It also has been found that some whales feed offshore Kamchatka and Sakhalin during the same season. In 2009, 10 out of 11 whales photographed in Vestnik Bay (Kamchatka) were registered off the Sakhalin shore later in the season. Eight out of 64 +2 TEMP whales identified in Olga Bay (Kamchatka) were spotted near Sakhalin later in the season (one of them was found dead there). In 2008 one whale was first observed in Kamchatka and later during the season was recorded offshore Sakhalin. In 2007, 13 whales recorded offshore southeast Kamchatka were observed feeding offshore Sakhalin later that same season. Similarly, two whales sighted offshore southeast Kamchatka in 2006 also were observed offshore Sakhalin in 2006..

Inter-annual movement between feeding areas: Over the length of the study from 2002-2009, a total of 88 whales were observed to use both the Piltun and Offshore feeding areas either during the same season or over the course of several seasons. In addition, 71 individuals were sighted only in the Piltun area and four used only the Offshore area. It seems that the use of the near- and offshore feeding areas on the Sakhalin shelf by gray whales is normal foraging behavior, which is likely linked to food availability.

Some of the whales (28 out of 64 + 2 TEMP) seen offshore southeast Kamchatka in 2009 have been recorded offshore Sakhalin in previous years, and 11 whales that had been recorded offshore southeast Kamchatka in 2008 were sighted offshore Sakhalin in 2009. Half of the whales (25 out of 50) seen offshore southeast Kamchatka in 2008 have been recorded offshore Sakhalin in previous years, and ten whales that had been recorded offshore southeast Kamchatka in 2007 were sighted offshore Sakhalin in 2008. In 2007, 20 out of 37 whales sighted offshore southeast Kamchatka had been sighted offshore Sakhalin in previous years. Similarly, five out of 13 whales sighted offshore southeast Kamchatka in 2006 were observed offshore Sakhalin Island during either previous or subsequent years.

During the length of the study, (2002-2009), 88 whales were identified in both the Piltun and Offshore feeding areas during both one and over several years. In addition, 71 individual whales were sighted only in the Piltun area and four used only the Offshore area. It seems that the use of the

monitored feeding areas on the Sakhalin shelf by gray whales is a normal event, linked with food availability.

6. Other potential feeding areas: Limited data exist which suggest that areas other than northeast Sakhalin and southeast Kamchatka also are visited by members of the western gray whale population. However, due to the lack of evidence of feeding, it is difficult to determine if these locations are potential feeding areas or whether whales are traveling through these areas in search for food.

The IBM photo ID laboratory was asked to process data gathered in Kekurny Bay on July 13, 2006 and Babushkin Bay July 28, 2006 in the northern part of the Sea of Okhotsk. From these data, three whales were identified and assigned catalogue ID numbers, NOGW#. In 2007, one of these three whales was sighted in the Piltun feeding area and also in Olga Bay and given catalogue ID numbers KOGW#/KamGW# for the Sakhalin and Kamchatka catalogues respectively.

In 2008, a joint survey expedition from PIBOC DVO RAN and IBM DVO RAN took photos of one whale in Zakatny Bay offshore Shishkotan Island (Kurile chain) that had been previously identified the year before in Olga Bay offshore Kamchatka in 2007. This whale was sighted in 2008 in Olga Bay later during the same feeding season. On June 6, 2008 researchers photographed a whale offshore Medny Island (Aleutian chain) that had been identified in Olga Bay and offshore Sakhalin in 2007. This whale was sighted the following year in Olga Bay in August 2008. On July 8, 2008 researchers photographed 4 whales offshore Karaginsky Island (northeast Kamchatka) that had not been sighted anywhere previously.

7. Cow-calf pairs: Until 2008, cow-calf pairs had only been recorded in the Piltun feeding area, and often near the mouth of Piltun Bay, where prey abundance is high and water is shallow, giving mothers & calves ideal foraging opportunities. In 2008, for the first time, one cow-calf pair was recorded in the shallow waters of Olga Bay, Kamchatka. The mother had been recorded previously offshore Sakhalin in 2002-2006 and in Olga Bay in 2007; she also had been seen with a calf offshore Sakhalin in 2003.

In 2009, 6 cow-calf pairs and 2 solitary calves (recorded without mothers) were identified on the Sakhalin shelf. Separation of the pairs started in the end of August and lasted until the middle of September, which is consistent with long-term observations. One of the photo-identified mothers was recorded with calves in both 2004 and 2006. Two other whales identified as mothers in 2009 were previously seen in 2007. Three females were observed with calves for the first time. Two calves were observed without mothers, but identified in calf groups. All registered calves were in good physical body condition for their age class and did not show signs of emaciation.

The early start of the 2009 survey season in Olga Bay allowed for the collection of more comprehensive data about mother-calf pairs in this region. A total of seven mother-calf pairs were identified in Olga Bay in 2009. Four of the seven cows had been observed in previous years on the Sakhalin shelf, one of them was also photo-identified in the Piltun area during the 2009 season. This particular animal had been identified as a mother with a calf on the Sakhalin shelf for the first time in 2007. The remaining three mothers were observed only in Olga Bay and never before had been registered as mothers; one of them already had been observed in the Olga Bay during previous years and the two others were new to the Kamchatka catalogue.

Three of the seven mother-calf pairs seen in Olga Bay in 2009 were observed there only during the month of July; one of these three pairs, one was later observed off Sakhalin on August 25 and subsequently was seen there many times during the 2009 feeding season. One other calf was photographed near Sakhalin on August 19 and 20 without its mother, together with another calf registered in the Sakhalin catalogue. The third calf was registered as a transient whale in Vestnik Bay in November during pilot surveys. Its whereabouts during the feeding season are still unknown. In total, two out of the seven calves registered in Olga Bay in 2009 were observed in the Piltun area during the same season, one of them with its mother. The obtained data suggests that the Piltun area

of the Sakhalin shelf is not the only feeding area for mother calf pairs and that at least a second “nursery ground” for foraging whales is located in Olga Bay, Kamchatka.

Starting around the middle of August, calves near the Kamchatka shores began to appear without mothers in calf groups. If these calves had not been previously identified as such with their mothers earlier in the season, identification of these whales as first-year calves would have been difficult. The early timing of the field season offshore Kamchatka in 2009 allowed for early surveys and photographic capture of mother-calf pairs prior to separation of the calves from their mothers. It is quite possible that cow-calf pairs were present in this area even before 2008, but that they were not identified as such because the calves had already separated from their mothers prior to the beginning of the season’s field studies.

In total 10 calves with mothers registered in Sakhalin catalogue were observed in 2009 in two distinct regions, i.e., near the northeastern shores of Sakhalin Island and the southeastern shores of Kamchatka.

8. Movement between feeding areas by young whales: Every year during the photo-ID studies, yearling whales were recorded that had been previously identified either in the Piltun area, Sakhalin or in Olga Bay, Kamchatka. Of 5 calves registered on the shelf of Sakhalin Island in 2008, three were seen in Olga Bay in 2009. A total of eight whales that were sighted in Olga Bay offshore Kamchatka in 2008 had been recorded as calves offshore Sakhalin in 2007. One of the whales identified offshore Kamchatka in 2006, 2007 and 2008 had been recorded as a calf in the Piltun area in 2004, and was not sighted offshore Sakhalin in subsequent years. Two whales identified offshore Kamchatka in 2006, 2007 and 2008 had been recorded as calves in the Piltun area in 2003, and were not sighted offshore Sakhalin in subsequent years. One whale sighted offshore Kamchatka in 2007 and 2008 had been recorded as a calf offshore Sakhalin in 2005 and has also been sighted offshore Sakhalin in 2006 and 2007.

9. Emaciated whales: Photography can also be used to record the nutritional and pathological body condition of gray whales. The suboptimal, and occasionally, emaciated body weight of some whales arriving offshore Sakhalin Island in spring generally improves during the summer feeding season. In 2006-2009, the condition of most underweight whales was observed to improve over the course of the season.

In 2009, 19 whales (including four cows with calves) were under-weight at their last sighting for the research season offshore Sakhalin. Over the season, the body weight of 21 other whales improved to optimal classes. Furthermore, three of the three cows that had calves and suboptimal body condition in 2008, were again photographed in 2009; all had regained optimal body weight. As in previous years, the body weight condition of all calves during 2009 was considered to be within optimal range.

10. Whales with abnormal skin conditions: Photographs were also used to assess abnormal skin conditions. No whales were recorded with skin sloughing in 2008 or 2009; this condition was recorded in previous years. The development of new white patches on the skin of two individuals was recorded in 2008, but not in 2009; it is not yet clear what these conditions signify.

Conclusions

The results presented here clearly indicate that both adult as well as calf members of the gray whale population move between feeding areas (Piltun, Offshore and southeast Kamchatka) both inter-annually and intra-annually. These behaviors are likely foraging related and one possible explanation is fluctuations in prey resource abundance and availability.

More than half of the whales presently contained in the Kamchatka gray whale catalogue (61 + 1 TEMP) out of 116 + 2 TEMP) have been identified as western gray whales, while the affiliation of

the remaining individuals remains unknown. Similarly, a portion of the whales observed offshore southeast Kamchatka in 2009 (40 out of 77 including temporary whales) are known from the Sakhalin catalogue, while the rest are not. These results suggest two possibilities: a whale with unknown affiliation may be a western gray whale that has not yet been sighted offshore Sakhalin Island, or a whale with unknown affiliation may belong to the eastern population. In the first case, the reason why some western gray whales have not yet been observed offshore Sakhalin would remain to be investigated. In the second case, the logical conclusion would be that the eastern and western gray whale populations are not completely geographically isolated, but that their feeding grounds overlap and some mixing of the two populations occurs in the northern-most portion of their ranges.

Recent identification of mother-calf pairs from the western gray whale population on the southeastern shelf Kamchatka suggests that the Piltun area of the Sakhalin shelf is not the only feeding area for calves and that a second “nursery ground” for foraging whales is located in Olga Bay, Kamchatka.

A better understanding of the western gray whales’ movements between feeding areas and their degree of site fidelity (e.g., how many feeding areas exist, how frequently are they visited and under which conditions) can be obtained only after accumulation of additional data in further studies.

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Table 1: Number of whales identified during photo-ID studies offshore northeast Sakhalin Island and southeast Kamchatka Peninsula for all years of studies.

A	B	C	D	E	F
Year	GW identified off the Kamchatka coast	GW identified only off the Kamchatka coast and unknown in Sakhalin Catalogue, 2002-2009	GW identified off the Kamchatka coast and Already known in Sakhalin Catalogue, 2002-2009	GW identified off the Sakhalin coast, 2002-2009	Numbers of GW known in Sakhalin Catalogue (2002-2009) Identified in both regions during one year
2002	No data	No data	No data	47	47
2003	No data	No data	No data	82	82
2004	3	1	2	96	98
2005	No data	No data	No data	117	117
2006	13	8	5	121	128
2007	37	18	19	125	132
2008	50	25	24	98	122
2009	75	36	39	117(111+6)	138(132+6)

Table 2: Whale movement among the feeding areas 2002-2009 offshore north-east Sakhalin. *Values in parenthesis indicate number of animals reported only in the specified area and not sighted in other surveyed areas.*

Year	Number of whales identified in the Piltun Area	Number of whales identified in the Offshore area	Number of whales identified in both the Offshore and Piltun areas	Number of whales identified in the Chayvo area	Number of whales identified in the Chayvo/Piltun and Chayvo/Offshore	Number of whales identified in northern areas	Number of whales identified in the Chayvo/Piltun/Offshore
2002	13(12)	35(34)	1				
2003	51(47)	35(31)	4				
2004	95(89)	7(1)	6				
2005	115(105)	7(1)	6			5(1)	
2006	105(67)	33(14)	17	28(7)	19(0)		2
2007	103(45)	71(25)	38	20(0)	12(0)		7
2008	61(35)	62(36)	25	1(1)		1	
2009	79+6(60+6)	39(24)	13	14(6)	6/2	-	-

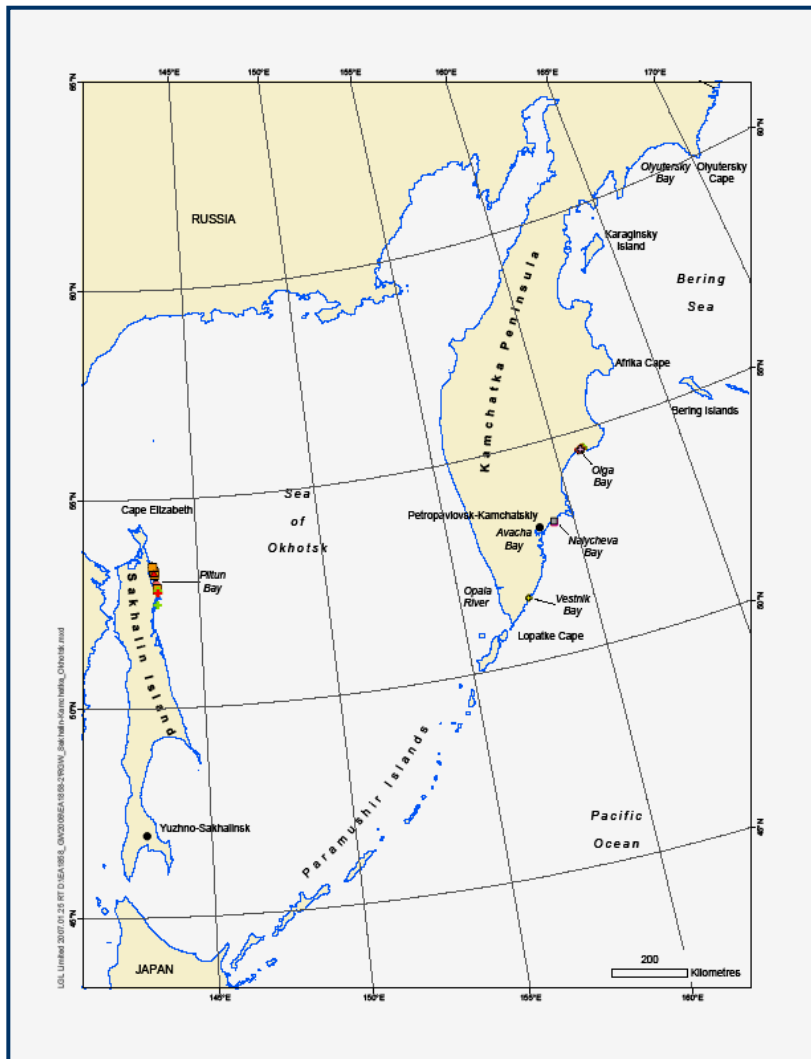


Figure 1. Map showing the recoding of photo-identified whales in known feeding areas offshore NE Sakhalin Island, southeast Kamchatka in the summer-fall season of 2009.

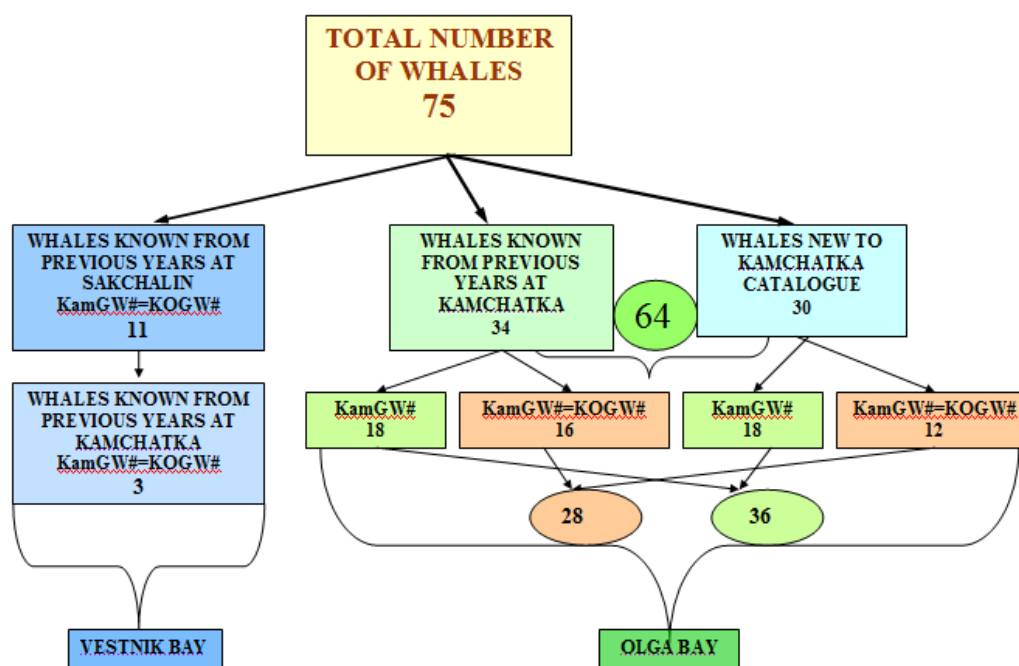


Figure 2. Diagram of gray whales recorded in Olga Bay and Vestnik Bay (Kamchatka) in 2009. Catalogue numbers KamGW# indicate whales observed offshore Kamchatka, and catalogue numbers KOGW# indicate whales seen offshore Sakhalin. Whales seen in both areas appear in both catalogues.