PHOTOGRAPHIC IDENTIFICATION OF THE KOREAN-OKHOTSK GRAY WHALE (*ESCHRICHTIUS ROBUSTUS*) OFFSHORE NORTHEASTERN SAKHALIN ISLAND, 2007

Final Report

Prepared for:

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REPORT ON THE RESEARCH PROJECT

PHOTOGRAPHIC IDENTIFICATION OF WESTERN GRAY WHALES (*ESCHRICHTIUS ROBUSTUS*) ON THE NORTH-EAST SHELF OF SAKHALIN ISLAND, RUSSIA, 2007

Final Report

VLADIVOSTOK

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8 INTRODUCTION

Although gray whales (*Eschrichtius robustus*) are considered among the best studied marine mammals in the Pacific Ocean, data on two remaining populations: eastern (California-Chukchi or Eastern North Pacific) and western (Korean-Okhotsk or Western North Pacific) are very disparate (Jones and Swartz 2006; Tyurneva et al. 2007a). The potential overlap of both populations beyond the boundaries of their well known ranges offshore eastern Kamchatka has also been hypothesized (Vertyankin et al. 2004). In recent years the environmental status of the Korean-Okhotsk gray whale population has drawn increasingly close attention as the petrochemical sector of Sakhalin Island's economy continues to grow (Webster 2003).

Today, these two populations are considered separate (LeDuc et al. 2002; Swartz et al. 2006). Photo-identification studies conducted during general feeding seasons offshore Sakhalin Island and the eastern coast of the Kamchatka Peninsula have shown that the western population during the feeding season is not confined to offshore Sakhalin alone. Individual whales move between these areas both during the feeding season and between years (Yakovlev et al. 2007; Vertyankin et al. 2007; Tyurneva et al. 2007b).

The western gray whale population is critically endangered due to extremely low numbers. This gray whale population has been classified as endangered (Category I) in the Russian Federation Red Book (Perlov et al. 1996; Russian Federation Red Book 2000). The United States government also classifies the western population as an endangered species (U.S. Fish and Wildlife Service [USFWS] 1997). The World Conservation Union (IUCN) also considers western gray whales to be critically endangered (Hilton-Taylor 2000; Weller and Brownell 2000; Baillie et al. 2005).

The IUCN criteria used to support this classification are as follows: (1) the population in question is both geographically and genetically isolated; and (2) there are probably fewer than 50 animals in the population capable of reproduction (Hilton-Taylor 2000; Weller and Brownell 2000; Bradford, 2003). Population estimates have been calculated predicting the future status of the population (Cooke et al. 2006, 2007). In contrast, the eastern gray whale population reached its peak in 1999, when it exceeded 26,000 individuals (Rugh et al. 1999), although some evidence from recent studies conducted in 2001 and 2002 suggests that the population has since declined to approximately 18,000 (Rugh et al., 2005). In November 1991, by resolution of the U. S. National Oceanic and Atmospheric Administration (NOAA), the eastern gray whale was removed from the endangered species list, where it had been listed since 1967.

Photographic identification (hereafter referred to as "photo-ID") of marine mammals has proven to be a useful tool for monitoring wild populations of animals while minimizing the impact on individuals. When incorporated into a long-term monitoring program, photo-ID can be a valuable tool used to answer many ecological questions about populations of marine mammals. For small or isolated populations, photo-ID can be used effectively in assessing population size and variation over time (Whitehead et al. 1997; Cerchio 1998; Stevick et al. 2001; Bradford 2003; Weller et al. 2003, 2004; Calambokidis and Barlow 2004). For large whale populations, photo-ID has been used to identify long migration routes (Best et al. 1993; Darling et al. 1996; Craig and Herman 1997; Salden et al. 1999; Weller at al. 2002), feeding ranges, and interannual changes in whale distribution (Calambokidis et al. 2002, Clapham et al. 1993). For these large whale species, photo-ID can be used as an effective method of examining health indicators of individuals as well as the overall health of groups or populations (Pettis et al. 2004; Bradford et al. 2005; Yakovlev and Tyurneva 2005a,b,c; 2006). Photo-ID has proven to be an especially useful tool in gray whale studies (Darling 1984; Würsig et al. 1999; Calambokidis et al. 2002), as individuals are distinctly distinguishable by characteristic markings on their sides, backs and flukes.

9 Purpose and Objectives

Sakhalin Energy Investment Company Ltd. (SEIC) and Exxon Neftegas Limited (ENL) are currently operators of projects participating in the development of oil and gas reserves in the Sea of Okhotsk offshore NE Sakhalin Island, Russia, while a number of other companies are poised to begin developing reserves in the region. These oil and gas developments are in proximity to gray whale feeding areas offshore NE Sakhalin Island. Data are required to monitor the status and design appropriate measures to minimize potential effects on the western gray whale population. Photo-ID

work is a key tool in effective monitoring studies necessary for providing data and input into mitigation development strategies and in monitoring their effectiveness.

The technical objective of this study was to continue photo-ID studies to further assess the whales' annual return rates and patterns of site fidelity for known individuals and to further define the size, structure and status of the population. More specifically, photo-ID information can be used to determine:

- abundance estimates for small and isolated populations;
- inter- and intra-annual fidelity of individual whales to specific feeding areas, individual foraging patterns and movement between feeding and migration areas;
- individual associations and group stability;
- number, status and habitat use of cow-calf pairs (calf birth and survival rates) and timing of cow-calf separation (weaning);
- physical status and individual health indicators; and
- population demographics and structure.

10 Background

Historically, the distribution of gray whales in the Sea of Okhotsk has included Sakhalin Bay (on the west side of the NW end of Sakhalin Island), Akademiya and Tugurskiy bays south of the Shantarskiy Islands (in the far western part of the Sea of Okhotsk, west of the NW end of Sakhalin Island), offshore NE Sakhalin Island, Shelikhova, Penzhinskaya and Gizhiginskaya bays in the far northeastern part of the Sea of Okhotsk, and the waters west of the Kamchatka Peninsula (Krupnik 1984; Yablokov and Bogoslovskaya 1984; Sokolov and Arseniev 1994; Perlov et al. 1996).

Much of the gray whale life cycle takes place in the coastal waters of densely populated countries with intensive fishing and shipping. Western gray whales are likely exposed to anthropogenic activity during all three stages of their life cycle: (1) during whale reproduction in the southern part of their range, the location of which is currently unknown; (2) during prolonged north-south migrations, the route which is currently unknown; and (3) in their known feeding areas off the northeast coast of Sakhalin Island and southeast Kamchatka, Russia.

The long-held belief that the whales' wintering grounds were along the southern coast of the Korean Peninsula (Rice 1998) has not been substantiated to date. The gray whales' wintering grounds are now believed to be located in the South China Sea, possibly along the coast of Guangdong province and/or around Hainan Island (Rice 1998). However, specific calving sites have never been observed. In addition to potential impacts on whales from increased vessel traffic associated with commercial and recreational navigation, the countries of Southeast Asia still have strong traditions involving the consumption of whale meat (Lento et al. 1998; Wang 1998). Furthermore, from 2005 to 2007, four deaths of western gray whales by accidental entanglement in fishing nets of the west coast of Japan were reported and the fishing industry poses a significant threat to the survival of this species (Brownell et al. 2007).

10.1 Distribution along Sakhalin Island

Two primary gray whale feeding areas have been identified off Sakhalin Island. A shallow-water (generally <20 m) feeding area is located along the coast adjacent to Piltun Bay (Brownell and Chun 1977; Sobolevsky 2000; Weller et al. 2004; Blokhin et al. 2003, 2004; Yakovlev and Tyurneva 2003, 2004, 2005a,b,c, 2006; Yakovlev et al. 2007; Vladimrov et al. 2005, 2006, 2007, 2008). Another deeper water "Offshore" feeding area is located about 30-40 km off of Chayvo Bay, in waters of 35-60 m deep (Miyashita et al. 2001; Maminov and Yakovlev 2002; Blokhin et al. 2003, 2004; Yakovlev and Tyurneva 2003, 2004, 2005a,b,c; 2006; Yakovlev et al. 2007; Meier et al. 2007) (Figure 1). However, whales are also observed along the entire northeast coast of Sakhalin Island (Würsig et al. 1999; Sobolevsky 2000; Blokhin et al. 2004, Vladimirov et al. 2008). Gray whales begin arriving off northeast

Sakhalin Island in late May when the sea ice has cleared; with some whales remaining until early December, when ice formations reappear.
Large numbers of gray whales were present in the Offshore area in 2002 and 2003 (Yakovlev and Tyurneva 2003, 2004; Blokhin et al. 2003, 2004; Maminov 2003; Weller et al. pers. comm. May 2004) and numbers each summer from 2004 to 2006 were lower than in earlier seasons (Yakovlev and Tyurneva 2005, 2006; Yakovlev et al. 2007).

10.2

10.3 History of Photo-ID along Sakhalin Island

Photo-ID of gray whales belonging to the western population is currently carried out by two groups of investigators. The Russian-US group has worked in the Piltun feeding area between 1994 and 2007 (Würsig et al. 1999; Weller et al. 2000, 2001, 2003, 2004, 2005, 2006, 2007). Specialists from the Institute of Marine Biology (IBM) of the Far East Branch of the Russian Academy of Science (DVO RAN) began working in both (Piltun and Offshore) feeding areas in 2002 and had been active each year since (Yakovlev and Tyurneva 2003, 2004, 2005a,b,c, 2006; Yakovlev et al. 2007).
The discovery in September 2001 of a new primary gray whale feeding area, the Offshore area (Maminov and Yakovlev 2002; Meier et al. 2007), offered IBM researchers the opportunity to study whales in detail in this area for the first time in 2002, to determine whether there were movements of whales between the two feeding areas.

10.4 Population Size

According to the results of work conducted by the Russian-US group, 150 whales had been identified by the end of 2005. However, not all of these individuals may still be alive, and taking into consideration various assumptions and criteria, the size of the present population had been recently estimated to be approximately 120 individuals (Weller et al. 2006; Cooke et al. 2007). The Russian-US group has noted that a high proportion of the population returns to the area each year indicating a high degree of seasonal fidelity to the Piltun feeding area among most of the identified individuals (Weller et al. 2004). It has also been noted that some individuals revisit the area irregularly, skipping some seasons; their absence in the coastal waters may be partly explained by discovery of the Offshore feeding area in 2001.

10.5 Movement between Feeding Areas

There have been reports of previous observations in the Offshore feeding area (Sobolevsky 2000; Miyashita et al. 2001), and it is quite probable that the area was used by gray whales prior to 2001. Any data on whale sightings in the Offshore area prior to 2001 are incidental and survey effort was low. Photo-ID of gray whales in the Offshore area in 2002 (Yakovlev and Tyurneva 2003) confirmed that some individuals observed there were also present in the Piltun feeding area; inter- and intra-year interchange of whales between feeding areas was also confirmed. These results suggest that the whales travel between their summer feeding sites, most likely in search of their preferred prey. Photo-ID during subsequent years recorded this intra- and inter-annual movement between feeding areas (Yakovlev and Tyurneva 2004, 2005abc, 2006; Yakovlev et al. 2007).

10.6 Other Feeding Areas

Over the past few decades, researchers have become aware of the presence of gray whales in coastal waters off SE Kamchatka during the summer-autumn and early winter months (Appendix Figure A2) (Blokhin et al. 1985; Vladimirov 1994, Vertyankin et al. 2004, Tyurneva et al. 2007b). According to ship-based surveys conducted on an annual basis by the Kamchatka Regional Fisheries Management Agency (Kamchatrybvod), whales had been sighted in coastal waters SE of the tip of the peninsula since 1979. It has also been pointed out that since the mid-1980s, lone whales started appearing near the SE coast of Kamchatka during the summer months (Blokhin et al. 1985; Vladimirov 1994; Tyurneva et al. 2007b).
It has been assumed that after whaling was discontinued in 1946, gray whales became more abundant and started visiting the waters along the east coast of Kamchatka from Dezhnev Bay in the north to Cape Tri Sestry in the south. In addition to Avachinskaya Bay (one whale in December 2003), other sightings offshore eastern Kamchatka include: Vestnik Bay (six whales on 30 June 1994, near Cape Nalychev (seven or eight whales on 11 September 2002) and in Olga Bay (11 whales on 10 June 2002) (Nikulin et al. 2004).
Since whales were first sighted in coastal waters off SE Kamchatka in 1983 near Tri Sestry Bay (51°20’ N, 157°26’ E), they have been observed farther north each subsequent year. For nearly eight

years, up to seven whales congregated near Vestnik Bay. Gray whales were then recorded in the area of Khalaktyrsky Beach near Petropavlovsk-Kamchatsky, where as many as six individuals were sighted. Since 1995, gray whales have been encountered in Olga Bay and 10 years later, 13 to 15 animals were sighted during a single helicopter survey (Burkanov, unpublished data).
Gray whales have also been observed in coastal waters around the Komandorsky Islands. Similar to the gray whales off Kamchatka, sightings of gray whales near the Bering Island at a remote distance from the mainland is becoming a regular occurrence (Mamaev 2002; Vertyankin et al. 2004).
According to Blokhin (1996) no gray whales were sighted on the west coast of Kamchatka over many years of observations. However in 2000, a small gray whale was seen entering the Bolshaya River (Nikulin et al. 2004). As Maminov and Blokhin have noted (2004), fewer gray whales have been sighted along the west coast of Kamchatka, as compared to sightings on the east coast.
In 2004, gray whales were sighted and photographed during surveys near Khalaktyrsky Beach on the east coast of Kamchatka. An attempt was made to compare these photographs with the 2002-2005 Western Gray Whale IBM catalogue from offshore NE Sakhalin Island (Tyurneva et al. 2006).

10.7 Feeding Ecology

Large-scale studies of whale food resources offshore NE Sakhalin Island funded by ENL and SEIC began in 2001 and have continued each summer from 2002-2007 (Fadeev 2002, 2003, 2004, 2005, 2006, 2007, 2008). The shallow waters (5-15 m) in the Piltun feeding area include an abundance of potential prey for gray whales, including epibenthic amphipods (Demchenko 2007), isopods, bivalve mollusks and worms that form concentrations along the ocean bottom in benthic and epibenthic layers. Furthermore, in 2004 and 2005, concentrations of sand lance (*Ammodytes hexapterus*), a potential gray whale prey item, were found off Piltun in waters more than 20 m deep (Fadeev 2005, 2006).
The Offshore feeding area is characterized by high concentrations of tube-dwelling ampeliscid amphipods. Shifts in the gray whale distribution in both the Piltun and the Offshore feeding areas within and between feeding seasons have been noted by a number of authors (Johnson 2002; Weller et al. 2004; Perlov et al. 2003; Blokhin et al. 2003, 2004; Vladimirov et al. 2005, 2006, 2007, 2008; Meier et al. 2007) and are considered to be at least partly a reaction to seasonal changes in the distribution and abundance of prey (Fadeev 2003, 2004, 2005, 2006, 2007, 2008).
Higher whale population density has been reported in some parts of feeding areas compared to others. For example, a high whale population density has been reported, as a rule, (1) in the southern part of the Piltun feeding area near the mouth of Piltun Bay (Maminov 2004; Weller et al. 2004; Blokhin et al. 2004; Vladimirov et al. 2005, 2006, 2007, 2008), where cow/calf pairs were often observed (Vladimirov et. al. 2005, 2006, 2007, 2008), and (2) in the northern part of the Piltun feeding area (Blokhin et al. 2003, 2004; Gailey et al. 2004; Maminov 2004; Vladimirov et. al. 2006, 2007). Uneven distribution of gray whale prey may explain the congregations or seasonal changes in the distribution the whales and the movement of individual animals both within feeding areas and between the Piltun and Offshore feeding areas (Fadeev 2004, 2005, 2006, 2007, 2008).

10.8 Body Condition

Seasonal fluctuations in blubber fat reserves in baleen whales are normal after winter periods of fasting and during migration (Perryman and Lynn 2002), and cows can be significantly thinner during years in which they are nursing calves (Pettis et al. 2004; Weller et al. 2004). Other studies indicate that there is a relationship between reproductive success and body condition of North Atlantic right whales (Pettis et al. 2004); photo-ID methods can be used to examine the relationship between the birth rate and physical condition at individual and population levels.

Photo-ID methods can also be used to detect abnormal changes in body condition due to disease or starvation (Thompson and Hammond 1992; Pettis et al. 2004). In 1999, the Russian-US photo-ID team noted that some of the western gray whales they observed off NE Sakhalin were abnormally thin, or emaciated (Weller et al. 2000); 16 of 69 whales identified that year (23.2%) displayed deficient body condition. During similar surveys in 2000, 30 of 58 identified gray whales (51.7%) were classified as emaciated, while in 2001, this ratio decreased to 21 of 72 (29.9%); in 2002, 9 out of 76 (11.8%); and in 2003, 3 of 75 (4%) (Weller et al. 2007). It should be noted, however, that some whales that were emaciated during one year had restored their body condition within the subsequent year, whereas some emaciated whales had been previously recorded with good body condition (Weller et al. 2004). Until 2004, all cows with calves were considered abnormally thin by the Russian-US photo-ID team. The definition of abnormally thin whale follows the parameters described in "Results".
The current study monitored the number of individuals in the population and the number of cows with calves, determined features of their physiological condition, and provided data on the whales' seasonal and daily movements in both the Piltun and Offshore feeding areas, as well as their movement

between areas.

11 stuDY AREAS AND METHODS

11.1 Field Methods

The study area covered the entire northeast coast of Sakhalin Island, including the Piltun feeding area (52°40' N to 53°30' N) along the shore of Piltun Bay, and the Offshore feeding area located offshore from Chayvo Bay (51°50' N to 52°25' N) at depths of 35-60 m. Photo-ID effort was concentrated in these two feeding areas, but whales were also photographed opportunistically if encountered outside of these regions.

The research vessels *Professor Bogorov* and *Akademik Oparin* were the base ships for photo-ID as well as for other parts of the multidisciplinary monitoring program that included also marine mammal visual surveys, benthos and acoustic studies).

Photo-ID of gray whales in 2002 and 2003 had been performed using a Zodiac with a two-stroke outboard motor. From 2004 to 2007, a 3.8 m long Zodiac was equipped with a 40 HP four-stroke Mercury outboard motor to reduce noise. As safety is the primary concern for everybody involved in the project, photo-ID work from the Zodiac was halted in unfavourable weather conditions (e.g. fog; high winds; heavy rain; large swells; and poor light).

Visual observations of marine mammals were conducted from the research vessel during daylight hours in all types of weather. Information about the locations of gray whales gathered in the course of these continuous observations, conducted concurrently with other vessel research monitoring tasks, allowed the photo-ID team to travel directly to gray whale aggregations and reduce search time. This was particularly important in the Offshore feeding area, where the distance between groups of whales or individuals was relatively large, and the whales' movements were less predictable.

When the vessel approached within approximately 2 km of a group of gray whales the vessel was brought to a full stop. The bridge then informed the photo-ID team members of the whale sighting, and after a safety briefing, the Zodiac was launched from the vessel. In the Piltun area, procedures were implemented to ensure the safety of whales and vessels, with Zodiacs being used as the primary platforms for whale observations. The vessel sailed parallel to the shoreline at the required safety distance to support the Zodiac crew. Observers onboard the vessel kept constant track of the identified whale locations and reported data on whale movements to the Zodiac, in part to ensure the safest approach to the whales, since observation of the surrounding waters from the ship's bridge was better than from the Zodiac.

The Zodiac was equipped with a digital depth finder and a portable global positioning system (GPS) navigator. Each Zodiac was also outfitted with all safety equipment required for sea safety procedures. The research team consisted of a boat driver, a data recorder, a digital video camera operator and a digital camera photographer.

Upon sighting of the whales, the driver slowed the Zodiac to idling speed approximately 500 m from the animals and maneuvered to a vantage point at a distance between 50-100 from them. From that point, the whales' position (as determined by the GPS), the time, behavior, number of whales in the area, direction of their movement, the presence of killer whales, and passing vessels, airplanes or helicopters in the observation area were noted. The presence of mud plumes, both at whale feeding sites near the launch and when no whales were visible, was also recorded. Secondary indicators of whale feeding, such as circling or diving birds or shoaling fish, were also recorded. If whale foraging was observed (confirmed by mud plumes or assumed from typical movements and behavior), the exact GPS position of the whales was recorded and communicated to the vessel via VHF radio. Upon completion of the photo-ID mission, and only after the Zodiac and the whales had vacated the area in question, the vessel would return to the previously transmitted GPS coordinates to obtain benthic prey samples using a Van Veen bottom grab sampler (see results of benthic sampling in Fadeev 2008). All data were recorded on waterproof data sheets and entered into a laptop computer at the end of each photo-ID mission.

To minimize potential impacts on whales, the Zodiac would slowly approach to a distance of

approximately 50-100 m from the whale to take pictures if the weather permitted. While photographing, the team tried to minimize the time spent near the whale, particularly while photographing a cow and calf pair. The Zodiac never traveled between a cow and a calf. Whenever the crew spotted signs of whales trying to avoid contact, the crew stopped the photography session and retreated. While maneuvering during a session, the crew avoided abrupt speed changes. During stops, the engine was idled and left running so that the animals remained informed of the Zodiac's position. When the Zodiac approached a whale, the driver sought a position perpendicular to the whale's line of movement or else slightly behind. The crew never approached a whale head on or chased it from behind, always trying to stay on a parallel path to the whales. When photographing, they first gave preference to the right side of a whale's body, then to the left side. Only then – depending on water depth in the survey area - did they take pictures of the tail fluke. When counter light conditions and glare were intense, the bright side of the body was photographed first, before retreating and waiting for an opportunity to photograph the whale's other side after its turning during multiple dives. No chasing of a whale to encourage it to change direction was allowed. Where necessary, the team settled for less informative counterlight pictures.

The frame and video-recording counter numbers in reference to the whales, the position (as determined by GPS), the depth (according to digital depth finder data), the temperature (at the sea surface) and salinity of the water, the distance to the whale, and the course according to compass readings were recorded on data sheets. The data was recorded during each mission and each photo session as the parameters changed.

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 use of a high-quality digital camera alowed rapid data acquisition and reduced the time spent on image processing and archiving at the end of the survey season. The photographs were recorded at a high resolution setting in large RGB JPEG format. Video footage was recorded using a Canon Optura 20 miniDV digital video camera.

Video footage was particularly important for documenting body condition characteristics of the whales (e.g., protruding scapulae, depressions behind the blowhole), that are often difficult to distinguish in a still photograph.

Contact with a group of whales was maintained until all the individuals sighted had been photographed, or after approximately one hour, regardless of the number of aspects photographed, to avoid potential disturbance of the animal over an extended time period. These procedures were repeated each time additional whale groups were sighted and photographed. A sighting reference number was given to each of these encounters.

A photo-ID "sighting" is defined as the observation and photography of a solitary individual or a group of whales swimming in proximity to each other (within 10 body lengths) with coordinated dive and surfacing times and directions of movement relative to other individuals in the group.

Group size estimates were based on a consensus of the observers aboard the Zodiac and were later confirmed by photographic matching. A "calf" was defined as an individual up to one year old (current year's offspring) as established by their small body size (about one-third a mature adult) and demonstrating a close association with a particular adult whale (Wells and Scott 1990; Weller et al. 2004).

An attempt was made to photograph all aspects of each whale (flanks, flukes, head). Whales were 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 right and left sides of each whale, as fluking tendencies vary with individual behavior and foraging depth. Traditionally the right and left flanks have been considered for standard identification in photo-ID of gray whales. The ventral surface of the flukes was considered as a supplemental view to aid in identification (Weller et al. 2002; Calambokidis et al. 2002; Yakovlev and Tyurneva 2006).

Since the likelihood of repeated recognition of an individual (via matching) increases as more information for that individual is accumulated in the catalogue, a fourth view – the dorsal fluke surface – was added as supplemental information for the identification process. The dorsal fluke surface of individual whales can often be displayed even in shallow feeding areas, when deeper diving may not be feasible. The method of adding aspects in an attempt to improve recognition accuracy, especially

during the early years of data collection and catalogue preparation has been used successfully in work with other marine mammal species (McConkey 1999; Bannister 2000; Glockner-Ferrari and Ferrari 2000).

After each photo-ID mission was completed, the Zodiac would return to the vessel. Digital images were downloaded from the camera memory cards (CF Transcend 4 Gb 120x and Lexar 2 Gb 40x) to a notebook computer and backed up onto an external hard drive, and archived on CD and DVD. The information recorded on data sheets was entered into a MS Access database and archived in Excel. Backup copies of the information were made and also archived on external hard drive, CD and DVD. Thus, digital data was stored on three different digital media. Archival data CDs were also duplicated and the backups were stored at various offsite locations whenever possible.

Although photography from the Zodiac was the main method of gathering data, photographs taken from the deck of the vessel may serve as valuable ancillary material for the main photo-ID effort; although highly informative photographs from the research vessel deck are more difficult due to the distance of whales from the vessel, digital processing of photographs using the Photoshop 7 makes it possible to upgrade the quality of some shots from “fair” to “good”. Since photographs are taken from the vessel deck when the expedition members are busy doing other work or else in transit and during stops, such photography can yield valuable, albeit limited, additional data on daily and seasonal movements of whales within their feeding areas. This method of photography makes it possible to gather more data on repeat sightings of known individuals within any given field season (Yakovlev and Tyurneva 2003, 2004, 2005c, 2006; Yakovlev et al. 2007).

11.2 Laboratory Methods

IMatch software has been used for storage and processing of the 2002-2007 database. Digital photographs of whales were processed for subsequent identification work and updating the gray whale database using the Adobe Photoshop 7.0 and Adobe Illustrator 10 software packages.

Standard photographic matching procedures for pattern-based matching of flanks and flukes were followed as described in the International Whaling Commission Special Issue No. 12 (Hammond et al. 1990) and according to improvements of these procedures (Calambokidis et al. 2002; Weller et al. 2004).

Whale aspects that were selected to create the catalogue were (in order of priority): (1) right (RS) and (2) left (LS) sides of the body, and (3) ventral (VF) and (4) dorsal (DF) fluke surfaces. For each sighting, the photographs and associated mission data were reviewed, and the best photographs of the same animal, were selected to be included in the annual pre-catalogue (sighting catalogue), which contains the best aspect photos of each individual from every sighting for that season. Each new sighting was compared to previous sightings obtained during that year. If a match was made to an existing image, the photograph was grouped with other photographs of that individual.

After the current year’s photographs had been grouped according to individual animals based on available aspects, the pictures were compared to the catalogue images from previous years. In the event of discovery of a new whale, and if high-quality photographs of the right side of the individual were available, it would be assigned a new identification number. If a suitable RS photograph was not available, the whale would be given a temporary identification number to avoid situations with composite whales. (A composite whale is defined as single individual with a separate catalogue number assigned to each side (right and left sides) with the result that the whale is incorrectly counted as two individuals).

Identification numbers were not assigned on the basis of fluke photos that could not be matched to corresponding right or left side images of known whales.

All images were then cross compared to all of the “best” type-specimen photographs of existing whales from the 2002-2007 period to establish the recurrence of sightings of the same whales and to ensure that no duplicate whales were included in either the previous years’ catalogues or the current pre-catalogue.

A confident match was not made unless the photographs were considered to be of good or excellent quality (poor-quality photographs were used for supplemental information only, or were digitally

archived for potential future use). Trash photos (or 'other' photos) were archived.

Side-to-fluke matches were considered reliable when taken in sequential order, and when each successive frame contained parts of the animal visible in the previous frame. Digital photography greatly assisted during the side to fluke matching process.

Confident left-to-right side matches were established based on the following criteria: 1) the whale was photographed as a solitary individual; (2) two sequences 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 (Calambokidis et al. 1999; S. Swartz & M.L. Jones pers. comm. 2007).

This process was conducted at least three times before left-to-right matches could be assigned a probability of 90% or higher, after which the images were transferred from the pre-catalogue to the annual catalogue. Whale body pigmentation was the primary feature used to distinguish individuals, with scars and barnacle patches supplementing the matching process.

If the annual pre-catalogue matching appeared reliable, the whales would be given permanent identification numbers and transferred to the master catalogue. After the annual catalogue was complete, discrepancies between the current catalogue and the main catalogue were corrected. Any new information and photographs obtained during the last expedition were added to the main catalogue and any updates to catalogue information were marked within the database. Special attention was devoted to identifying whales with various deviations from the "physiological norm," including: (1) dividing whales with deviations in body physical conditions (BC) into categories; and (2) whales with obvious sloughing of skin or anomalous skin conditions.

Complete analysis of video footage had not been performed at the time this report was prepared. Video data to date has only been used as an ancillary aid to assist in solving any discrepancies with whale sightings and questions about body condition.

12 RESULTS

Photography and video photography of whales were conducted from 10 July through 5 October 2007. Photo-ID work was performed by Zodiac from the base vessels *Professor Bogorov* (3 July – 17 July) and *Akademik Oparin* (18 July –– 10 October). The effectiveness of the photo-ID team was largely dependent on weather conditions. Work was often interrupted not only by periods of vessel travel to perform other tasks, but also by storm layovers. A summary of dates and activities aboard the vessels during 2002 to 2007 is shown in Table 1.

Table 1. Photo-ID effort (days) during expeditions to Sakhalin Island, 2002-2007.

Year	Dates	Duration of expedition (days)	Number of working days covering all activities	Time in transit (days)	Vessel sheltered because of storm (days)	Photo ID days from Zodiac/ from vessel and Zodiac	Number of missions	Number of groups encountered from Zodiac (field data)	Number of whales sighted from Zodiac/fro m vessel (field dat)	Total number of photos
2002	30 Aug-25 Oct	57	27	17 including stormy days	11	13/-	24	72	93/-	2602
2003	21 Jul - 27 Sep	69	40	16 including call at Nikolaevsk-na-Amure and stormy days	13	17/22	35	86	146/37	7482
2004	30 Jul - 07 Oct	70	56	9 including stormy days	5	16/24	27	113	209/57	9647
2005	12 Jul - 07 Oct	88	75	6 including stormy days	5	32/34	56	186	384/58	17600
2006	03 Aug -14 Oct	73	60	7 including stormy days	6	19/33	26/52	109	238/150	16703
2007	03 July - 10 Oct	100	74	13 including call at Korsakov due	13	31/62	55/86	229	503/198	24230

				to storm						

A survey day was counted if any whale (or group of whales) was photographed, from either the Zodiac or main vessel deck, either during a dedicated photo-ID survey or opportunistically while the vessel was anchored performing other research tasks. Table 2 indicates the effort and number of photographs taken from the Zodiac in 2007.

Although weather variability somewhat limits the comparison of effort among the seasons, a multiannual statistical data set may help reveal patterns of field effort. Field effort and other aspects of field photo-ID of gray whales are detailed in Table 2 and Appendix Tables A1 and A2.

Table 2. Photo-ID effort and number of photographs taken from the Zodiac in 2007.

N	Date	Area	Number of Zodiac missions per day	Number of Zodiac sightings per day	Duration of each mission (hours:minutes)				Number of photos			
					Mission 1	Mission 2	Mission 3	Total	Mission 1	Mission 2	MIssion 3	Total
1	7/10/2007	Piltun	2	8	3:00	1:45		4:45	554	191		745
2	7/26/2007	Piltun	2	7	2:10	2:55		5:05	434	502		936
3	7/27/2007	Piltun	1	5	2:20			2:20	281			281
4	7/29/2007	Piltun	1	7	2:55			2:55	616			616
5	8/1/2007	Piltun	1	0	0:30			0:30				
6	8/3/2007	Piltun	2	11	1:45	2:50		4:35	460	540		1000
7	8/4/2007	Piltun	1	6	4:20			4:20	774			774
8	8/6/2007	Piltun	2	5	2:50	1:05		3:55	207	32		239
9	8/7/2007	Piltun	2	7	3:10	3:05		6:15	141	464		605
10	8/8/2007	Piltun	2	4	1:10	2:00		3:10	39	145		184
11	8/14/2007	Piltun	2	4	1:55	1:45		3:40	106	139		245
12	8/17/2007	Offshore	2	12	3:20	5:15		8:35	693	730		1423
13	8/18/2007	Offshore	1	2	1:35			1:35	79			79
14	8/19/2007	Offshore	1	7	5:35			5:35	925			925
15	8/21/2007	Piltun	2	8	1:30	2:20		3:50	116	441		557
16	8/26/2007	Piltun	2	12	3:05	3:15		6:20	587	349		936
17	8/28/2007	Piltun	2	6	2:55	2:18		5:13	166	558		724
18	8/29/2007	Piltun	1	2	2:00			2:00	190			190
19	8/30/2007	Piltun	2	11	3:09	2:24		5:33	530	247		777
20	8/31/2007	Piltun/Chayvo	3	13	3:10	2:55	1:47	7:52	641	616	583	1840
21	9/8/2007	Piltun	3	6	1:35	0:51	2:05	4:31	142	133	385	660
22	9/9/2007	Piltun	3	21	3:19	3:18	1:34	8:11	489	481	90	1060
23	9/10/2007	Chayvo	1	2	1:40			1:40	199			199
24	9/13/2007	Offshore	2	7	3:10	1:37		4:47	835	294		1129
25	9/17/2007	Piltun	3	15	3:45	2:38	1:20	7:43	541	443	45	1029
26	9/18/2007	Piltun	1	5	3:05			3:05	404			404
27	9/20/2007	Piltun	1	7	3:35			3:35	605			605
28	9/25/2007	Piltun	2	8	3:09	2:40		5:49	186	192		378
29	9/26/2007	Piltun/Chayvo	2	5	3:05	0:32		3:37	361	43		404
30	9/27/2007	Piltun	1	2	3:07			3:07	56			56
31	10/5/2007	Offshore	2	14	2:49	6:05		8:54	294	1085		1379
	Total:		55	229				143:02:00				20379

Improvements in camera technology have enabled researchers to take large numbers of photographs at each whale sighting; the photo-matching process is facilitated by more, and better quality photographs. These additional photographs of individual flukes and various body parts without the characteristic dorsal hump in the center of the image (the standard photo-ID shot) could then be matched with whale aspects that were not seen in previous years. This improved the effectiveness of each photo-ID mission and increasing the likelihood of accurate identification.

In 2007, whales were photographed from a Zodiac, with variable duration and intensity, during a total of 31 days, including 25 days in the Piltun feeding area, five days in the Offshore feeding area, and three days in the Chayvo Bay area. The latter is located at the southern edge of the Piltun Area where

a stable whale aggregation had been discovered the year earlier (Yakovlev et. al. 2007).

In 2007, a total of 24,230 photographs were taken during 701 gray whale sightings (field data) (Table 1) including 14,619 zodiac-based photographs in the Piltun feeding area, 4,935 in the Offshore feeding area, and 825 near Chayvo Bay. From the vessel deck, 3,851 photographs were taken of 198 sightings.

Table 3. Descriptive statistics of photo-ID work, NE Sakhalin Island (field data), 2007.

Zodiac Operating Parameters	Piltun area	Offshore area	Chayvo area	Total
Number of whale photography days	25	5	3	31 *
Number of sightings	181	42	6	229
Total number of whales sighted from Zodiac	414	76	13	503
Average number of whales sighted per survey day Zodiac	16,56	15,20	4,33	16,23
Average number of whales sighted per sighting Zodiac	2,29	1,80	2,17	2,20
Total duration of sightings (hours:minutes)	61:43 109:37	20:00 29:26	2:23 3:59	84:06 143:02
Average sighting duration (hours:minutes)	20,5	28,6	23,8	22,0
Total number of whale photographs Zodiac	14619	4935	825	20379
Average number of whale photographs per day	584,8	987,0	275,0	657,3
Average number of whale photographs per sighting	80,8	117,5	137,5	89,0
Average number of photographs per sighted whale	35,3	64,9	63,5	40,5

** On some days, photographs were taken in different areas.*

Summarized data on photographic effort is also provided in Appendix Tables A1 and A2. Depths were measured from the Zodiac at whale diving points in the Piltun, Offshore and Chayvo areas (Table 3). Average depths were:

- Piltun area, 14.00 m
- Offshore area, 51.41 m
- Chayvo area, 11.17 m

12.1 Results of Photo-Identification Analysis

Data on the numbers of whales identified in six years of study are summarized in Table 4.

Table 4. Numbers of whales identified during 2002-2007.

Year	Number of whales (annual total)	From 2002	From 2003	From 2004	From 2005	From 2006	Number of new whales during a year	Number of whales from previous years, not encountered this year	Number of whales in the catalogue
A	B=C+D+E+F+G+I	C	D	E	F	G	I	J	H=B+J
2002	45(1)*						45(1)		45(1)*
2003	82	35					47	10(1)	92(1)*
2004	95(1)*	39	32(1)				24	21(1)	116(2)*
2005	117(1)*	41	39(1)	18			19	18(1)	135(2)*
2006	120(6)*	42	37	15	14		12(6)	27(1)	147(7)*
2007	126(5)	40	39	16	10	7	14(5)	35(6)	161(11)*

* *Numbers in parentheses are counts of individuals with temporary identification numbers.*

Photographing all four aspects of whales proved useful not only for creating the pre-catalogue (sighting catalogue), but also for updating the images of whales in the final master catalogue: (1) with additional aspects that were not photographed during the 2002-2006 period and (2) with photographs showing any changes in body markings that had occurred during the study years, such as the appearance or disappearance of scars and camouflaging of natural pigmentation by barnacle spots.

Each year we obtain a more comprehensive description of each animal and a more comprehensive catalogue of gray whales of the Korean-Okhotsk population. Such annual updating of the catalogue aids in streamlining the matching process as the number of known individuals in the catalogue increases each year, and the annual discovery rate of new animals declines.

The complete capture of all four aspects of each individual (right side, left side, dorsal fluke, and ventral fluke), also increases each year as more photographs are added to the catalogue. Table 5 and Appendix Table A3 present data for all the study years and the total number of aspects captured per individual.

Table 5. Assessment of photographic coverage of four standard aspects of gray whale sightings identified from 2002-2007.

12.1.1.1 Year		Photographed aspects				Total
		4	3	2	1	
2002	number	17	3	9	17	**46**[a]
	%	36.96	6.52	19.57	36.96	
2003	number	42	11	21	8	**82**
	%	51.22	13.41	25.61	9.76	
2004	number	52	12	26	6	**96**[b]
	%	54.17	12.50	27.08	6.25	
2005	number	53	13	47	5	**118**[c]
	%	44.92	11.02	39.83	4.24	
2006	number	59	16	40	11	**126**[d]
	%	46.83	12.70	31.75	8.73	
2007	Number	75	15	36	5	**131**[e]
	%	57.25%	11.45%	27.48%	3.82%	
2002-2007	number	115	11	35	11*	**172**[f]
	%	66.86%	6.4%	20.35%	6.40%	

[a] *One whale photographed in 2002 was a temporary whale for a total of 46 whales sighted with 45 individuals included in the catalogue.*
[b] *One whale photographed in 2004 was a temporary whale for a total of 96 whales sighted with 95 individuals included in the catalogue.*
[c] *One whale photographed in 2005 was a temporary whale for a total of 118 whales sighted with 120 individuals included in the catalogue.*
[d] *Six whales photographed in 2006 were temporary whales for a total of 126 whales sighted with 120 individuals included in the catalogue.*
[e] *Five temporary whales photographed in 2007 for a total of 131 whales sighted during 2007 and a total of 126 individuals included in the catalogue for that year..*
f Eleven temporary whales were photographed in 2002-2007 for a total of 172 whales sighted during these years and 161 individuals were included in the catalogue for these years.
** Of these 11 whales in the catalogue that have only one photographed aspect, five individuals had their right side photo included in the annual catalogue. The other six individuals were catalogued with only their left side photographs. All of them have been assigned temporary numbers because of the lack of a high-quality right side photo.*

Whales identified only by a left side photo or by a right side photo of poor quality received temporary identification numbers (TEMP0No.) for subsequent identification. Such whales are not placed in the master catalogue, being included instead in the respective annual catalogue and mentioned in the annual report as sighted individuals. This procedure of assigning temporary identification numbers and classification of whale sides and flukes is common practice among photo-ID specialists worldwide and has been adapted to our methods (Calambokidis et al. 1994, 2002; Clapham et al. 1993; Weller et al. 1999, 2000).

Calves rarely showed their flukes, hence typically only their sides were photographed (Yakovlev and Tyurneva 2003). No cow/calf pairs were observed in the Offshore feeding area during any of the study years. It has been noted that whales feeding in deeper waters show their flukes more frequently than whales in the shallow-water Piltun area.

As a result of photography during 2002-2007, the current IBM catalogue of western gray whales recorded offshore NE Sakhalin contains 161 fully (with all four aspects) and well (two or three aspects) described, identified individuals, and 11 “temporary” whales (Table A3).

Table 6. Whale group size and percentage in relation to the total number of recorded groups across different areas over the 2007 season based on photos taken from Zodiac only.

Group size	All groups sighted	%	Groups sighted in Offshore	%	Groups sighted in Piltun	%	Groups sighted in Chayvo	%
1	**96**	41.92	16	6.99	78	34.06	2	0.87
2	**60**	26.20	6	2.62	52	22.71	2	0.87
3	**36**	15.72	9	3.93	26	11.35	1	0.44
4	**19**	8.30	5	2.18	13	5.68	1	0.44
5	**12**	5.24	1	0.44	11	4.80	0	
6	**4**	1.75	3	1.31	1	0.44		
7	**1**	0.44	1	0.44	0			
8	**-**	0.00			0			
9		0.00						
10		0.00						
11		0.00						
12	**1**	0.44	**1**	0.44				
Total	**229**		**42**		**181**		**6**	

Relative to previous years, higher numbers of whales were recorded in 2007 in the Offshore feeding area and in the shallow waters adjacent to Chayvo Bay. The sizes of whale groups were also different compared to previous years. The percentage of solitary individuals increased in comparison with 2006 and increased substantially in comparison with previous years. Meanwhile, group size also increased in 2007; in the Offshore feeding area, we recorded a group that comprised 12 individuals. Group size data for 2007 and previous years are compared in Table 7, in Figure 1 and in Appendix Table A5.

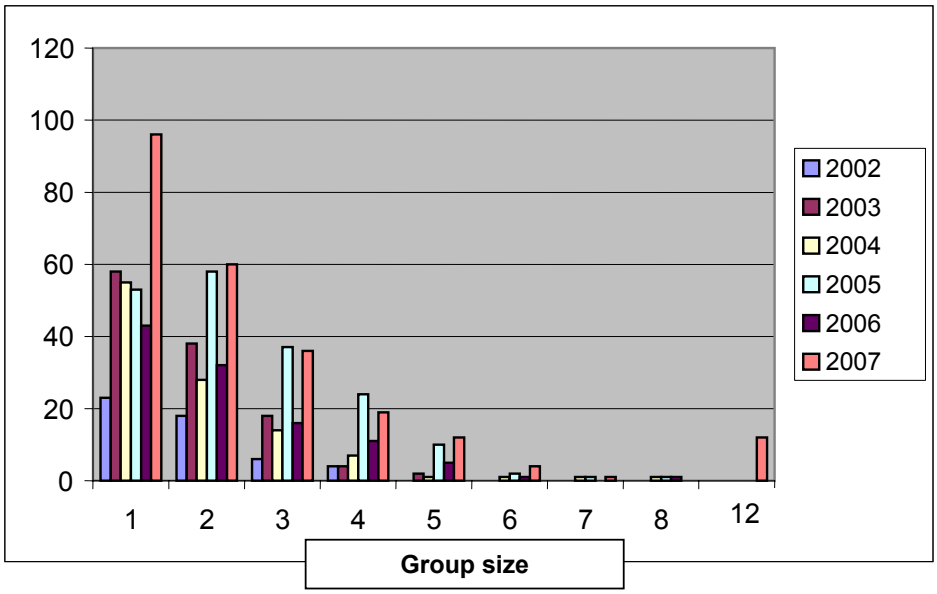


Figure 1. Ratio of group sizes to the total number of sighted and photographed whales, 2002-2007 (field data).

Table 7. Gray whale group size and encounter rates in known feeding areas, based on photographs taken only from a Zodiac, 2003-2007.

Group Size	Groups sighted in 2003	% sighted in 2003	Groups sighted in 2004	% sighted in 2004	Groups sighted in 2005	% sighted in 2005	Groups sighted in 2006	% sighted in 2006	Groups sighted in 2007	% sighted in 2007
All areas										
1	58	48.33	55	50.93	52	28.11	43	39.45	96	41.92
2	38	31.67	28	25.93	57	30.81	32	29.36	60	26.20
3	18	15.00	14	12.96	37	20.00	16	14.68	36	15.72
4	4	3.33	7	6.48	25	13.51	11	10.09	19	8.30
5	2	1.67	1	0.93	10	5.41	5	4.59	12	5.24
6	0	0.00	1	0.93	2	1.08	1	0.92	4	1.75
7	0	0.00	1	0.93	1	0.54	0	0.00	1	0.44
8	0	0.00	1	0.93	1	0.54	1	0.92	-	0.00
12									1	
Total:	120		108		185		109		229	0.44
Offshore area										
1	33	56.89	4	100	1	50.00	8	50.00	16	
2	13	22.41	0	0 .00	1	50.00	2	12.50	6	38.10
3	10	17.24	0	0 .00	0	0.00	3	18.75	9	14.29
4	2	3.44	0	0 .00	0	0.00	1	6.25	5	21.43
5	0	0.00	0	0 .00	0	0.00	1	6.25	1	11.90
6	0	0	0	0.00	0	0.00	1	6.25	3	2.38
7									1	
12									1	
Total:	58		4		2		16		42	7.14
Piltun area										
1	25	40.32	51	50.00	51	28.02	33	37.93	78	2.38
2	25	40.32	28	26.42	56	30.77	30	34.48	52	
3	8	12.9	14	13.21	37	20.33	13	14.94	26	
4	2	3.22	7	6.73	24	13.19	8	9.20	13	43.10
5	2	3.22	1	0.94	10	5.49	2	2.30	11	28.73
6	0	0.00	1	0.94	2	1.10	0	0.00	1	14.36
7	0	0.00	1	0.94	1	0.55	0	0.00	0	7.18
8	0	0.00	1	0.94	1	0.55	1	1.15	0	6.08
Total:	62		104		182		87		181	0.55
Cape Elizabeth										
1					1	50.00				
2					1	50.00				
Total:					2					
Northern										
4					4	100				
Total:					0					33.33
Chayvo Bay area										33.33
1							2	33.33	2	16.66
2							0	0.00	2	16.66
3							0	0.00	1	0.00
4							2	33.33	1	
5							2	33.33	0	
Total:							6		6	

12.2 Frequency of Sightings and Movements of Identified Whales between Known Feeding Areas Offshore NE Sakhalin Island

Movement between the shallow-water Piltun feeding area and the deeper-water Offshore feeding area was examined using data for repeat sightings of identified individuals in both areas during the survey period (Figure A1, A2; Tables 7, 8 and Appendix Tables A5, A6).

More whale groups were observed in the Offshore feeding area in 2006-2007 compared to 2004 and 2005 (Tables 2 and 3, Appendix Tables A1 and A2). Sixteen (16) days were spent in the Offshore area during the entire 2007 survey period with photographs being taken both from the Zodiac (five days) and deck of the mother ship (11 days), documenting 222 individuals including re-sightings. Another seven whales were observed in the field and given field numbers, but photos were of poor quality, therefore these could not be identified (Table 3, Table A4). A total of 70 individual whales were observed in the Offshore area and, 25 of these individuals were only recorded in this area.
The team worked 43 days in the Piltun area, including 25 days on the Zodiac and 18 days from the vessel documenting 423 individuals including re-sightings.The photos were taken of an additional 17 whales which were given field numbers but were of poor quality, therefore the whales could not be identified and matched to known individuals or determined to be new individuals. A total of 93 individuals were observed in the Piltun feeding area and 48 of them were only recorded in this area.

In the Chayvo Bay area, the team spent eight work days, three on the Zodiac and five onboard the ship. A total of 28 whales were identified, including re-sightings. The photos of another two whales were taken which were given numbers in the field, were of poor quality therefore they could not be confirmed as known or new individuals. A total of 20 individuals were recorded, and all of them were also encountered in other areas during 2007 (Tables 3, 10, Figure 2, Appendix Tables A5, A6 and Appendix Figure A1, A2).

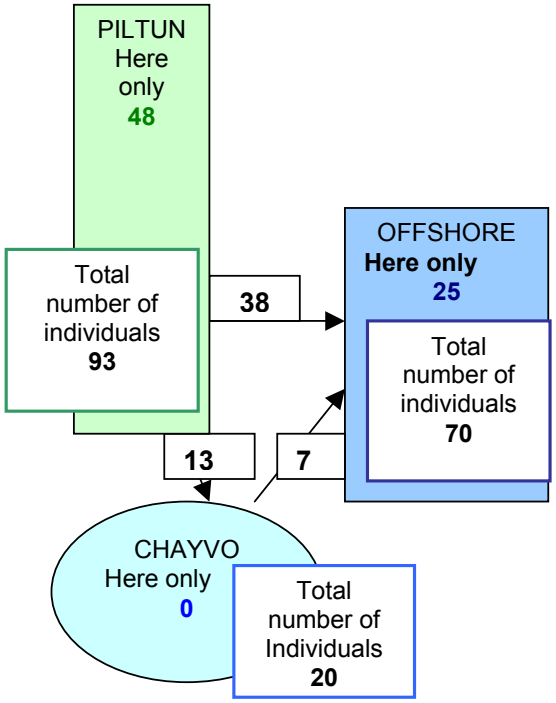


Figure 2. Movement of individuals within known feeding areas along NE Sakhalin Island during the summer-fall feeding season 2007.

In 2005, whales were encountered in two new areas offshore northern Sakhalin (Yakovlev and Tyurneva 2006):

- In the first area, north of the town of Okha, four whales were identified, of which one was new to the catalogue and had been seen earlier in the season in the Piltun feeding area. Two

whales from this group were observed in the Piltun area earlier and later in the season and also had been sighted in the Piltun and Offshore feeding areas during previous years. One animal of the group, first identified in 2002, was sighted once in 2005 in the new (northern) area.

- In the second area, west of Cape Elizabeth in Severny Bay, two whales were sighted, but only one could be photographed and identified. It proved to be new to the catalogue and was not sighted later (Appendix Tables A5, A6, A7).

In 2006 and 2007, no gray whales were encountered offshore northern Sakhalin in the areas north of Okha and west of Cape Elizabeth. Data for all the study years are summarized in Table 8.

Table 8. Whale movements between feeding areas, 2002-2007.

Year	Number of whales identified in Piltun Area	Number of whales identified in Offshore Area	Number of whales identified in Offshore and Piltun areas	Number of whales identified in Chayvo area	Number of whales identified in Chayvo /Piltun and Chayvo / Offshore	Number of whales identified in Northern areas	Number of whales identified in Chayvo /Piltun/Offshore
2002	12(11)	35(34)	1				
2003	51(47)	35(31)	4				
2004	95(89)	7(1)	6				
2005	115 (112)	7 (2)	5			5 (1)	4
2006	105 (67)	33 (14)	16	28 (7)	19 (1)		2
2007	93(48)	70(25)	38	20(0)	13/0		7

Values in parenthesis indicate number of animals reported only in the specified area and not sighted in other surveyed areas.

During the five years of photo-ID effort, use of the Offshore feeding area by gray whales varied in intensity. In 2002 and 2003, there were significantly more animals in the area as compared to 2004 and 2005 (Table 8, Appendix Table A5, A6).

In 2006, gray whales began appearing in the Offshore feeding area at the end of August, during which five individuals were identified. By mid-September, the number of sightings increased and we were able to photograph and identify 33 animals (Table 8 and Appendix Table A5).

In the nearshore waters adjacent to Chayvo Bay, 33 sightings were recorded of 28 individual gray whales in 2006. Seven of the identified animals that year were sighted in this area only. (Tables 8 and Appendix Table A5). In 2007, lower numbers of whales were recorded in the Chayvo area compared to 2006 (Table 8).

Over all years of effort (2002-2007), 82 whales were sighted in both the Piltun and Offshore feeding areas during one or over several years, and 20 whales were sighted in both Piltun and Chayvo areas over two study years. Three areas (Piltun, Offshore and Chayvo) were used by 31 whales over two study years. The teams identified 61 whales sighted only in the Piltun area and seven whales signed only in the Offshore area. Five whales were photographed north of the town of Okha, including one sighted only in that area and not encountered again elsewhere. (Appendix Tables A5 and A6).

12.3 Movement between Sakhalin Island and Other Feeding Areas

Six whales identified off southwest Kamchatka in 2006 were previously encountered offshore NE Sakhalin from 2002-2006. Two individuals were sighted in the two regions during the same season (Yakovlev et al. 2007; Tyurneva et al. 2007b; Vertyankin et al. 2007). These whales were assigned double catalog numbers (KOGW№ - the catalog of whales sighted offshore Sakhalin Island and KamGW№ - the catalog of whales sighted offshore Kamchatka Peninsula).

In 2007, three western gray whales that have been previously observed both along Sakhalin Island and Kamchatka, were sighted offshore Sakhalin Island (Appendix Table A4).

In 2006, the photo-ID team was asked to process data gathered in the north of the Sea of Okhotsk in Kekurny Bay dated 13 July 2006, and in Babushkin Bay dated 28 July 2006. We identified three whales, which were assigned catalog ID numbers NOGW№ (Vladimirov et al. 2007). In 2007, Whale NOGW003 was sighted in Piltun (five sightings) and was given catalog ID number KOGW160 (Appendix Table A5, A6).

A better understanding is needed of whale movements within and between feeding areas offshore Sakhalin Island and in various regions in the Sea of Okhotsk and Pacific Ocean. This can only be obtained after accumulation of additional photo-ID data, and comparison with benthos data to determine the role of intra- and interseasonal prey distribution of prey among the different feeding areas, which has been shown to be linked with the distribution of feeding whales (Dunham and Duffus 2001, 2002; Fadeev 2002, 2003, 2004, 2005, 2006, 2007, 2008).

12.4 Repeat Sightings of Whales Sighted along the Northeast Coast of Sakhalin Island

Repeat sightings of identified whales during 2007 are presented in Table 9. This information together with other data provides additional detail to understand whale movements, more information for accurate matching, and allows monitoring of physical body condition of whales through the season.

Table 9. Frequency of repeat sightings of photo-identified gray whales (IDW) in 2007.

Number of individual whales	Number of repeat sightings per whale	Total number of IDW sightings
1	6(5)*	6(5)*
2	10	20
3	18	54
4	19	76
5	19	95
6	19	114

7	10	70
8	9	72
9	4	36
10	6	60
11	3	33
12	2	24
13	1	13
Total	126(5)	673(5)

**Values in parentheses indicate the number of temporary whales*

Analysis of the inter- and intra-year frequency of sightings of identified whales in 2002-2007 is of particular interest (Table 10, Appendix Tables A5 and A6).

Table 10. Inter- and intra-year frequency of sightings of identified gray whales (IDW), 2002-2007.

Year	2002	2003	2004	2005	2006	2007
Number of IDW sightings	66	154	228	384	390	678
Number of IDW per year*	46	82	96	118	126	131
Average frequency of IDW sightings	1.43	1.88	2.38	3.25	3.10	5.17

These values include temporary whale sightings.

The presence or absence of whales by years during the 2002-2007 period is shown in Appendix Table A6.

Resightings and repeated photography of whales during a certain day, as well as resightings of whales during a season, provide important information on whale movements within feeding areas and the timing of the visitation of these areas.

12.5 Cow-Calf Pairs

In addition to monitoring the size of this population, it is very important to determine the number of cows with calves, and indications of their health status using such visual clues as body and skin condition. In 2007, six cow-calf pairs were recorded. The first three pairs were sighted on 3 August. The last pair was recorded on 26 August. Later in 2007, calves were sighted separately from the cows (Appendix Table A6, A7). One of the photo-identified cows (KOGW064) was a nursing mother in 2004 and one (KOGW062) was recorded as a mother in 2005. Cow KOGW027 was reported as a nursing mother in 2003, 2005 and 2007 (Appendix Table A7). Two whales that were photographed in 2007 looked like first year calves and were observed in calf groups, but were not observed as cow-calf pairs. We qualified them as “possible” calves (Appendix Tables A6 and A7). One of them was assigned a temporary number, TEMP010, for lack of a high-quality picture of its right side. Because of the late start of the photo-ID data collection due to inclement weather, it is very likely that incomplete data on cow-calf pairs has been collected.

All recorded calves were well fed and did not exhibit any signs of skinniness.

12.6 Physical Condition

12.6.1 Body Weight

A system for classification of gray whale body condition was developed by IBM. A whale is considered

to have a deficient body condition if it displays one or more of the following features (Weller et al. 2001):

- an obvious subdermal protrusion of the scapulae from the body with associated thoracic depressions at the anterior and posterior insertions of the pectoral flipper;
- the presence of noticeable depressions around the blowhole and head with a post-cranial "hump" on the dorsal surface;
- a pronounced ridge of lumbar and caudal vertebrae along the spine giving the body a bell shape (frontal view) with bulging along the lateral flanks; and
- the presence of protruding ribs and vertebrae along the dorsal surface and/or lateral flanks or ribcage.

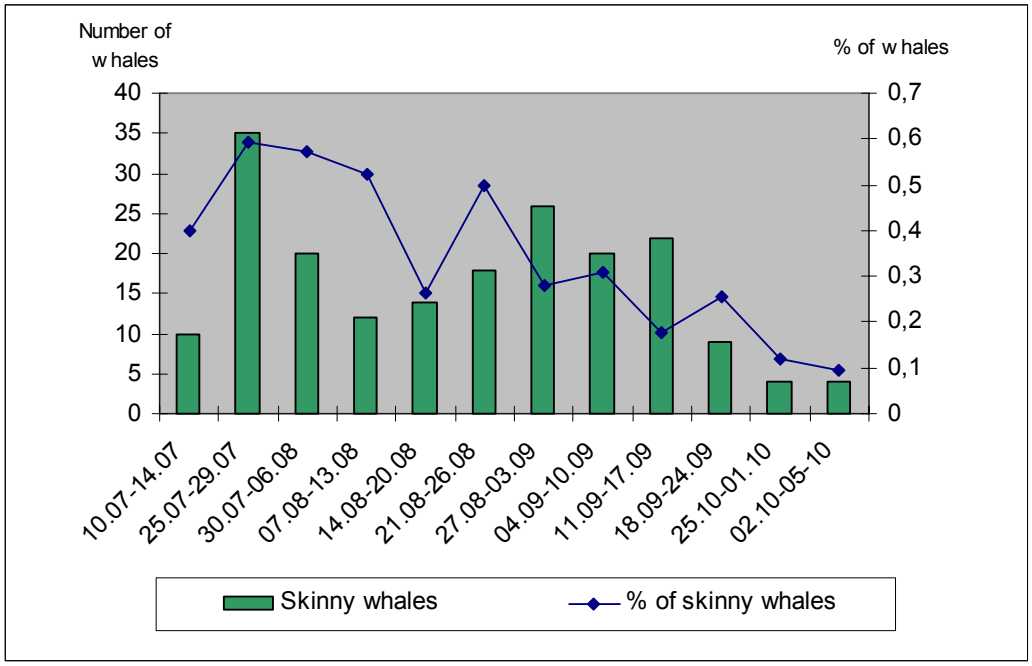
If any one or more of the above criteria were observed and noted in photographs or video data, the subject animal was classified based on the body condition as of the time of that sighting. The final classification given to a subject animal was the highest class number based on analysis of all available photographs for that sighting. The body condition (BC) classes for whales are defined as follows:

Class 0: standard body condition whale shows none of the four criteria listed above;
Class I: whale shows any of the four criteria listed above to a mild degree, but not more than two criteria;
Class II: whale shows any of the four criteria listed above to a moderate degree, but not more than two criteria;
Class III: whale shows more then two of the four criteria listed above to a moderate degree or whale shows any of the four criteria listed above to an extreme degree, but not more than two criteria; and

Class IV: whale exhibits more than two of the four criteria listed above to an extreme degree.

The subjective terminology of "mild," "moderate", and "extreme" degrees of the criteria was agreed upon within the photo-ID team by comparison of photographic and video samples. Underweight whales were defined as those in BC classes II to IV (Yakovlev and Tyurneva 2003).

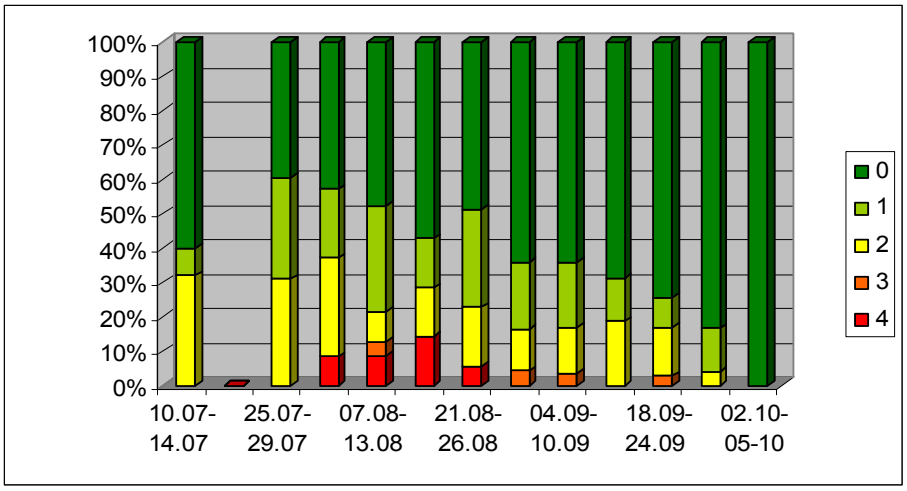
Our first opportunities to observe individual whales with suboptimal body condition over an extended period of time were in 2005 and 2006. The body condition in most underweight whales was observed to improve over the course of the season (Yakovlev and Tyurneva 2006; Yakovlev et al. 2007). In 2007 we also recorded stable improvement in the whales' body condition during the course of the field season (Appendix Table A7). Data on decreasing numbers of sightings of underweight whales in 2007 are given in Figure 3.



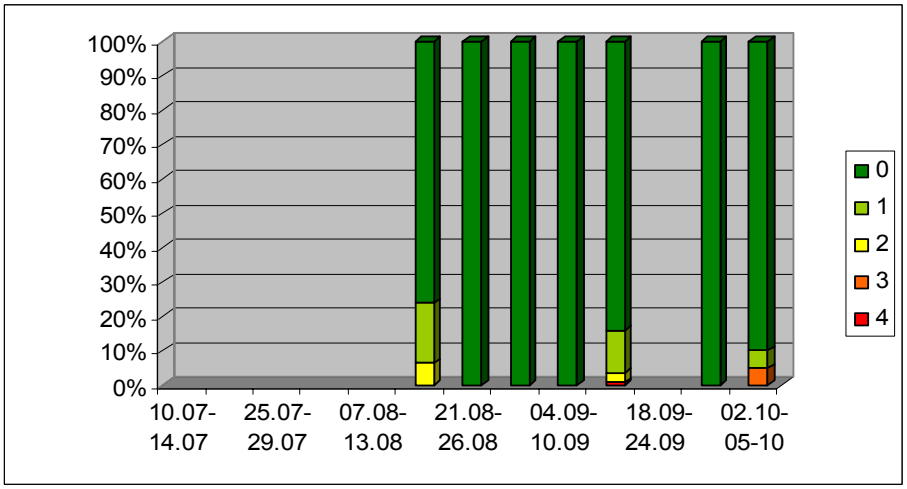
Date	Number of skinny whales	Number of identified whales	% of skinny whales	Date	Number of skinny whales	Number of identified whales	% of skinny whales
10.07-14.07	**10**	**25**	**0,40**	**27.08-03.09**	**26**	**93**	**0,28**
25.07-29.07	**35**	**59**	**0,59**	**04.09-10.09**	**20**	**65**	**0,31**
30.07-06.08	**20**	**35**	**0,57**	**11.09-17.09**	**22**	**125**	**0,18**
07.08-13.08	**12**	**23**	**0,52**	**18.09-24.09**	**9**	**35**	**0,26**
14.08-20.08	**14**	**53**	**0,26**	**25.10-01.10**	**4**	**33**	**0,12**
21.08-26.08	**18**	**36**	**0,50**	**02.10-05-10**	**4**	**43**	**0,09**

Figure 3. Percentage of photo-identified underweight gray whales relative to the total number of whales sighted offshore Sakhalin Island over 7-day periods during the 2007 field season.

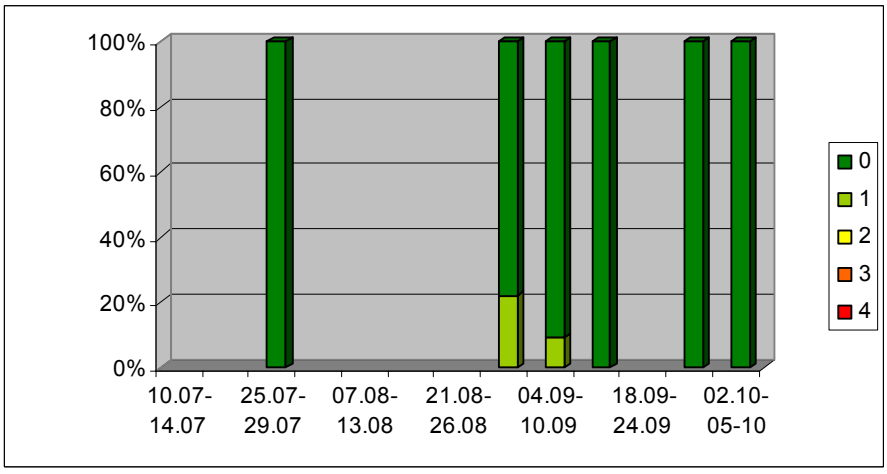
Besides general information on the body condition of whales in 2007 we attempted to separate the data from different feeding areas, because the presence of cows with calves (cows, when with calves, are usually thin) influences the overall body condition status of the population.



Piltun



Offshore



Chayvo

Figure 4. Percentages of physical body condition classes reported across three areas offshore northeast Sakhalin Island during the 2007 feeding season.

According to the data presented in Figure 4, the proportion of underweight whales in the Piltun feeding

area was higher than in the Offshore or Chayvo areas. (It should be noted that the slight increase in underweight whales in the Offshore feeding area in October 2007 was due to records of two underweight cows which were sighted as cow-calf pairs earlier during the same season in Piltun).

During the period from 10 July to 10 October, 67 whales showed improvements in their BC class (Appendix Tables A7; Figures 3, 4), displaying most likely a recovery of vitality as the animals accumulate energy reserves during the main feeding season.

A summary of body condition data collected over the entire study period is given in Table 11.

Table 11. Body condition (BC) classes for whales sighted, 2003-2007.

Classes	Number of whales in each BC class in 2003[a]	% ratio of whales in each BC class in 2003	Number of whales in each BC class in 2004[b]	% ratio of whales in each BC class in 2004	Number of whales in each BC class in 2005[c]	% ratio of whales in each BC class in 2005	Number of whales in each BC class in 2006[d]	% ratio of whales in each BC class in 2006	Number of whales in each BC class in 2007[e]	% ratio of whales in each BC class in 2007
0	**61**	**74.4**	**70**	**72.9**	**100**	**84.8**	**88**	**69.0**	102	77.9
1	**6**	**7.3**	**15**	**15.6**	**8**	**6.8**	**18**	**14.3**	15	11.5
2	**12**	**14.6**	**8**	**8.3**	**5**	**4.2**	**19**	**15.1**	9	6.9
3	**2**	**2.4**	**3**	**3.1**	**2**	**1.7**	**1**	**0.8**	4	3.1
4	**1**	**1.2**	**-**	**-**	**3**	**2.5**	**0**	**0.0**	1	0.8
TOTAL	**82**	**100**	**96**	**100**	**118**	**100**	**126**	**100**	131	100

Note that temporary whales in the catalogue are included in the number of whales in each body class. Classes 2, 3 and 4, highlighted in grey, correspond to underweight animals.
[a] Nine whales classified as skinny were nursing cows.
[b] Two whales classified as skinny were nursing cows.
[c] Four whales classified as skinny were nursing cows.
[d] Three whales classified as skinny were nursing cows.
[e] Six whales classified as skinny were nursing cows.

If an animal was observed with a higher BC class during the first sightings and the indices improved in subsequent sightings, we used the latest data in calculating the total number of underweight whales.

In 2007, 14 underweight animals, including six nursing cows, accounted for 10.68% of the total number of identified whales (131). All calves observed during all years had normal body condition and were assigned to class 0 (Appendix Table A7).

In 2007, we were able to observe the condition of animals that in 2006 had been identified as cows with calves. The comparative data are presented in Table 12.

Table 12. Inter-annual comparison of the body condition (BC) of the 2006 cows and calves observed in 2007.

	Number of cows and	Number of underweight	Number of whales that	Changes in BC from 2006 to 2007

	calves observed in 2006	cows and calves observed in 2006	were identified in 2006 as cows/calves and that were observed in 2007	Improvement in BC	Deterioration of BC
Cows	3	3	3	3	0
Calves	3(2)*	0(0)*	0(2)*	0	0(0)*

**Values in parentheses are given for calves identified as "possible calves".*

As can be seen from the Table 12 and Appendix Table A7 all cows with poor BC in 2006 showed improvement when sighted in 2007.

Of the three 2006 calves that were observed in pairs, none was sighted in 2007. Two whales recorded as "possible calves" in 2006 exhibited normal body condition when sighted in 2007.

12.6.2 Skin Sloughing

Skin sloughing was noted in nine whales during 2003. No skin sloughing was observed in 2002 (Appendix Table A7). With the exception of one animal, all the whales with various degrees of skin sloughing in 2003 were observed in the Piltun area. In two cases, skin sloughing appeared to begin at the dorsal ridge and progressed noticeably on one whale within 24 hours (between 24 and 25 August 2003). A few days later, the whale did not show any sign of skin sloughing. The sloughing process was similar for another whale. Such sloughing or skin-shedding process progressed in stages starting again at the dorsal ridge (m1, or molt stage 1) and progressing downward on the body toward the ventral surface (m2) until all dead or damaged skin was sloughed and the whale was observed with no sign of skin sloughing (m3). The largest number of sightings of individuals with severe skin sloughing were observed in August (Yakovlev and Tyurneva 2004; Yakovlev and Tyurneva 2005; Tombach Wright et al. 2007). In 2004, we were able to identify two whales with similar skin sloughing (m1) (Appendix Table A7). One of them, a nursing cow KOGW050, had displayed a more advanced stage (m2). Of the nine whales with skin sloughing sighted in 2003, we were able to re-identify seven during the 2004 season. Of these seven individuals, six showed no signs of skin sloughing), and one whale (KOGW050) had skin sloughing. In 2005, when we were processing photo-ID data, four whales were observed with skin sloughing (m1-2); however, we were not able to capture the beginning and end of the process. In 2006, four individuals with skin sloughing in stage 1 were found without any signs of further deterioration.

In 2007, 28 individuals were identified with varying degrees of skin sloughing, representing a significant increase over incidence in previous years. Of these, 20 whales exhibited skin sloughing in stage 1, seven in stage 2 and one in stage 3 (Appendix Table A7).

12.6.3 Other Skin Conditions

Over many years of observations of skin sloughing, we did not notice any visible changes in their health condition during subsequent sightings. In 2006, whale KOGW028 identified in 2003 (this whale was described above) with pronounced skin sloughing displayed white patches of irregular shape on the body. The exact nature of these patches is not known but they are highly unlikely to be a photography artifact in view of the fact that the whale in question was identified three times on different days and every photograph showed the same patches. In 2007, this whale was sighted again, showing skin sloughing and patches of the same shape as in 2006, but this time they were less pronounced (Figure 5).

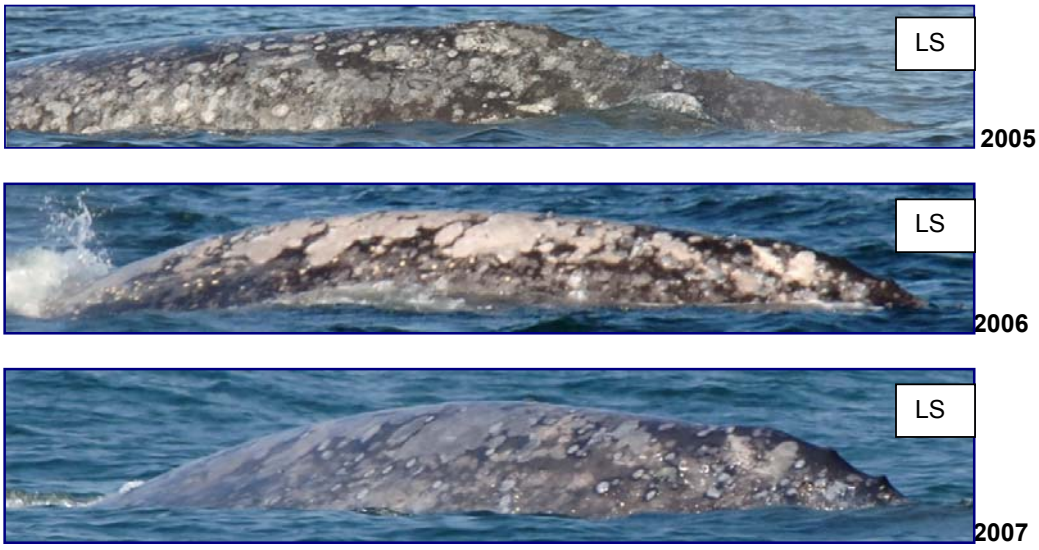


Figure 5. White patches of unknown origin on whale KOGW028 observed in 2005, 2006 and 2007 along the northeast coast of Sakhalin Island.

In 2005, whale KOGW128 displayed several white patches that did not exist in 2004 (Yakovlev and Tyurneva 2006; Tombach Wright et al. 2007). However, these patches seem to be different from those on the body of whale KOGW028. Unfortunately, KOGW128 was not sighted in later years.

In 2007, in addition to whale KOGW128, another three individuals with white patches were sighted of which this condition had not been sighted previously.

As Figure 6 shows, white patches of considerable size are not only present on the skin surface but tend to grow in size over a short period of time, as in the case of KOGW022.

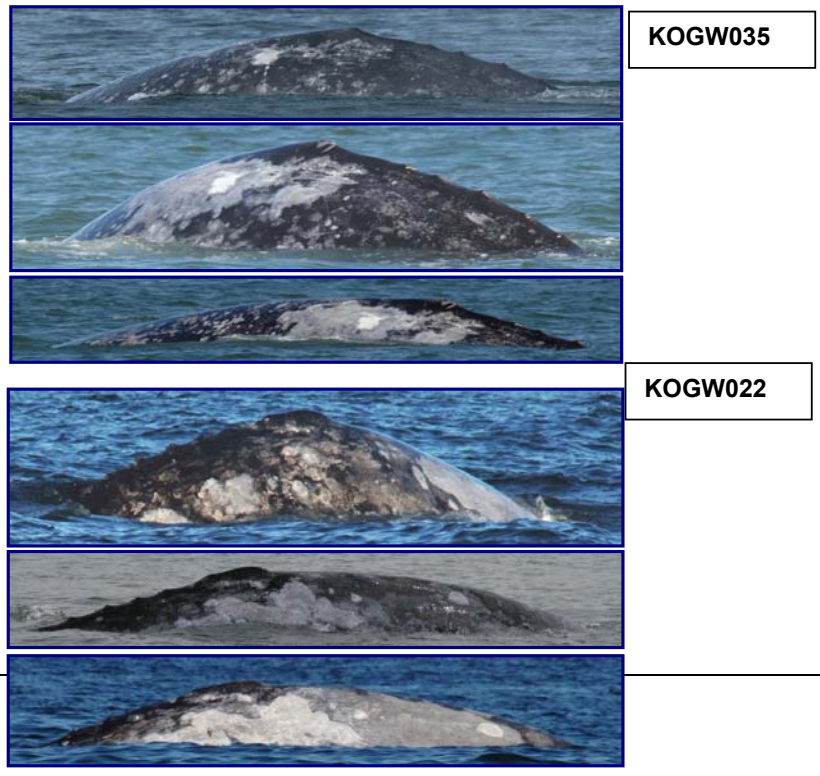


Figure 6. Cases of large-size white patches observed on gray whales KOGW022 and KOGW035 in 2007 along the northeast coast of Sakhalin Island.

13 Discussion

13.1 Movement between Feeding Areas

The geographical shift of utilization of the Offshore feeding area in 2002, 2003, 2006 and 2007, and the Piltun feeding area in 2004 and 2005, demonstrates that continuous monitoring of the whales and their movements is needed to track these spatial and temporal patterns (Meier et al. 2007; Vladimirov 2005, 2006, 2007, 2008).

Photo-identification analysis of the 2002-2007 data point to inter- and intra-year movements of gray whales, both within the Piltun and Offshore areas and between these areas, and, as discovered in 2005 and 2006, movements into areas farther north and south along the northeast coast of Sakhalin Island.

Incorporation of new data into the catalogue on a continuous basis makes it possible to keep the information on known individuals and groups of whales up to date, which provides an important information for comparative analyses of potential spatial or temporal changes in feeding areas or migration routes in the future.

13.2 Movement between Southeast Kamchatka and Sakhalin Island

According to 2004 and 2006 photo-ID data, 16 gray whales have been identified in the surveyed areas offshore SE Kamchatka. Six of these 16 gray whales were also photographed offshore Sakhalin in different areas and years. Whether the other 10 individuals sighted in the same groups offshore Kamchatka, but not listed in the catalogue of Sakhalin whales, were western or eastern gray whales, is yet to be determined.

In 2006, two of these six animals were identified in both southeast Kamchatka and northeast Sakhalin during the same feeding season. Three whales out of six were identified offshore Sakhalin Island in 2007, showing that whales may travel between NE Sakhalin and the Kamchatka Peninsula both within and between summer-fall feeding seasons.

The reasons why some animals from the extremely small western population of gray whales leave Sakhalin feeding areas, with likely sufficient prey resource, and cross the Sea of Okhotsk to Kamchatka where they might encounter competition for resources at the southern boundary of the eastern population's likely range are yet to be discovered.

According to historical records, the range of the western population in the Sea of Okhotsk likely included Sakhalin Bay (in the western part of the NW tip of the island), waters offshore NE Sakhalin, Shelikhov Bay, mouths of the Gizhiga and Penzhina rivers in the farthest NE corner of the sea, as well as waters offshore western Kamchatka (Sleptsov 1955; Krupnik 1984; Yablokov and Bogoslovskaya 1984).

Sokolov and Arseniev (1994) and Jones and Swartz (2002) present the gray whale range encompassing the entire Far Eastern basin where the western population inhabits waters along eastern shores of Asia from the Korean Peninsula all the way to the Sea of Okhotsk and marking paths of migration of the species toward SE shores of Kamchatka. The current state of both gray whale populations and ranges of their distribution are covered in an exhaustive review (Swartz et al. 2006).

The population affiliation of whales sighted along Kamchatka shores with one or the other population was never discussed to any significant extent since it was always believed that the vast spaces of the northwestern part of the Pacific separating the Chukchi and Bering seas from the seas of Okhotsk and Japan were sufficient to consider these whale populations as totally separate entities (Vladimirov 1994).

If the western population of gray whales is truly isolated in geographic and genetic terms (LeDuc et al. 2002), changes in abundance in one region must be accompanied by inversely proportional changes in other regions. Recent observations of foraging gray whales south of Piltun Bay, near Lunsky Bay (unpublished SEIC data), and identification of individual gray whales in other areas of the Sea of Okhotsk indicate that seasonal changes in gray whale range call for additional studies.

Seasonal changes in whale distribution have been described in numerous studies and are considered to be a response to seasonal variations in the habitats and movements of whale prey (Payne et al. 1986; Calambokidis et al. 1989; Calambokidis and Quan 1997; Weinrich et al. 1997; Wilson et al. 1997; Forney and Barlow 1998; Karczmarski et al. 1999). Eastern gray whales feeding along the west coast of Vancouver Island, Canada, rotate feeding areas and prey types within and between summer feeding seasons as a function of distribution and abundance of their prey (Bass 2000; Dunham and Duffus 2001, 2002; Meier 2003).

The distribution of feeding eastern gray whales along the west coast of North America is variable within and between years with whales utilizing areas from northern California to southeast Alaska from spring to fall involving significant interchange of individuals between areas with variable use of habitat within and between years (Calambokidis et al. 2002).

Recent research has indicated that eastern gray whales are not exclusively benthic foragers but are rather dynamic and selective foragers capable of utilizing a variety of prey types and foraging tactics, switching between prey species and techniques rapidly in order to take advantage of short-term availability of food resources (Dunham and Duffus 2001, 2002; Moore et al. 2003). Eastern gray whales are multi-scale animals that can show site-fidelity at a regional scale (e.g. offshore NE Sakhalin) but also range over a larger area to use smaller sites or “nodes” within the region as a function of distribution and abundance of prey over time.

In addition to their responding to the distribution and abundance of prey, there is some evidence that eastern gray whales, like other apex predators, can significantly influence the distribution and abundance of their prey through foraging (Bowen 1997). These “top-down” effects can alter a prey community to the extent that whales will abandon it for months or years while it recovers to a richness that can be utilized again, thereby influencing the seasonal distribution of the whales. Although western gray whales are genetically isolated from eastern gray whales (LeDuc et al. 2002), it is likely that the manner in which eastern and western gray whales make foraging decisions in response to the distribution and abundance of prey, even in different ecological contexts, is similar.

13.3 Cow/calf Pair Separation

Our observations support Weller’s hypothesis (Weller et al. 2000) that calves make the transition to swimming independently during the period between July and September. According to Bogoslovskaya's data (1966) on gray whales offshore Chukchi Peninsula, age differentiation of the groups begins in July and August, when the calves leave their mothers and gather into groups in the shallowest waters rich in food. Shore-based vehicle surveys conducted in 2005 (Vladimirov et. al. 2006) indicate that the separation of mother from calf was completed by early September, with the last mother-calf pair observed from shore on 11 September.

13.4 Body Condition

The presence of emaciated WGW remains unexplained. The causes of emaciation in both Pacific gray whale populations are also unclear, but a rather extensive body of evidence suggests that over-exploitation of the available food supply and/or a possible large scale climatic/oceanographic regime shift affecting productivity in the North Pacific region have been at least partially responsible for emaciation observed in eastern gray whales. As the population of eastern gray whales increases to levels estimated to exceed the levels prior to the period of commercial whaling, intraspecific competition pressures in the subarctic feeding grounds may be increasing (LeBoeuf et al. 2000; Moore

et al. 2001, 2003).

Other authors believe that changes in the extent and consolidation of sea ice in the Arctic Ocean, triggered by global warming over the past 20 or 30 years, may affect the seasonal distribution and geographic boundaries of habitats, migration paths, body condition or reproductive status of whales (Tynan and DeMaster 1997; Perryman et al. 2002), which has potentially led to more intensive use of sub-Arctic zones.

Grebmeier and Barry (1991) argue that due to global warming the primary production in surface waters in the feeding areas of the eastern gray whales may be inhibited, thereby depleting benthic food resources. LeBoeuf et al. (2000) have assumed that dwindling of food resources as a result of lower productivity in the North Pacific may be a limiting factor as far as feeding of whales in sub-Arctic waters is concerned. It is quite possible that such large-scale climatic and/or oceanographic changes may have affected the entire North Pacific region, thereby impacting both western and eastern gray whale populations at the same time and in a similar way (Brownell and Weller 2001).

However, recent western gray whale prey studies have identified the Piltun area and, in particular, the Offshore feeding area as very rich prey sources (Fadeev 2002, 2003, 2004, 2005, 2006, 2007, 2008), therefore it is unlikely that food resources are limited, although this issue requires further study. It is also possible that some other factor(s), such as diseases or man-made impact in the course of winter migration and/or summer feeding may have affected one or both populations simultaneously and to the same extent.

Seasonal fluctiations in blubber thickness are common among whales after winter fasting period or duting migrations (Perryman and Lynn, 2002). Cows may be considerably thinner during the seasons when they are nursing (Pettis et al., 2004; Weller et al., 2004). Some whales that showed signs of emaciation in previous years did not exhibit such signs in subsequent years. This seasonal ability of 'thin' whales to recover to normal body condition was also noted previously (Yakovlev and Tyurneva 2003, 2004, 2005c, 2006; Yakovlev et al. 2007; Weller et al. 2004). The energetics of gray whale foraging within a fasting and feasting life-cycle of migrating, feeding, and breeding, are dynamic. The recovery and decline in body condition for both lactating and non-lactating whales does not seem to have any obvious explanation at present. The temporal scale of this process changes with each individual and demographic group, and continued long-term monitoring is needed to form a solid basis for understanding.

In addition to the unexplained appearance of thin individuals, skin sloughing was observed among some of the animals for the first time in 2003. When these individuals were re-encountered in 2004-2007, it appeared that the skin sloughing has had no lasting visible effect on the external physical condition of the whales' skin. The skin sloughing phenomenon remains unexplained, but may be a result of several factors including bacterial, viral or fungal diseases (Gaydos et al. 2004), internal or external parasites (Dailey et al. 2000), or excessive exposure to fresh water. The occurrence of tumors and skin lesions among some sea mammals may be due to organic pollutants, which may disrupt hormonal balance (Béland et al. 1992). Shedding of skin has been observed among blue (Sears et al. 2000) and beluga whales (Pettis et al. 2004), although it had not been reported previously among eastern or western gray whales.

Our earlier observations suggest that such skin sloughing is similar to natural yearly molting in spite of the fact that until recently it was believed that white whales (belugas) are the only cetacean species that molt on an annual basis (Boily 1995). The yearly molting of belugas is triggered by changes in water temperature and salinity. The documented examples of skin sloughing showed that the skin recovers quickly after sloughing, and no subsequent pathological consequences were observed on the surface of the whales' skin (Tyurneva and Yakovlev 2005c).

This phenomenon continues to require further study to understand the duration and significance of skin sloughing events before conclusions can be drawn as to the causes of the molting or sloughing process. It is especially important to track changes in skin sloughing in whales to continue to observe the affected group of animals for long-term patterns.

The appearance of white patches, observed on some western gray whales since 2005, has yet to be explained. It is possible that all reported cases have different origin.

14 CONCLUSIONS

From 2002-2007, 161 individual gray whales have been identified along the northeast coast of Sakhalin Island, although this number might not represent the population size since some individuals have not been seen for several years. The final consolidation of the results of six years' work into a single current master catalogue and the development of a protocol for a minimum population count, i.e., a count of only the right or left sides of individuals (Darling 1984; Weller et al. 2001; Weller et al. 2004) have made it possible to achieve higher reliability of least count totals for the current IBM 2002-2007 Master Catalogue. To continue to increase the accuracy of the total population estimate, a comprehensive statistical model incorporating mark-recapture methodologies and a systematic sampling procedure is being incorporated into future work.

Sightings of previously unidentified whales continues to increase the total count of individuals with each new study season, thus improving confidence levels and facilitating the photographic matching process. Data obtained annually on known individuals are valuable to continue monitoring any changes in physical characteristics or markings that may have occurred since the last recorded sighting. Annual photoID data of known whales and whale groups are important information for analysis of geographical or temporal shifts occur in the whales feeding areas or feeding patterns.

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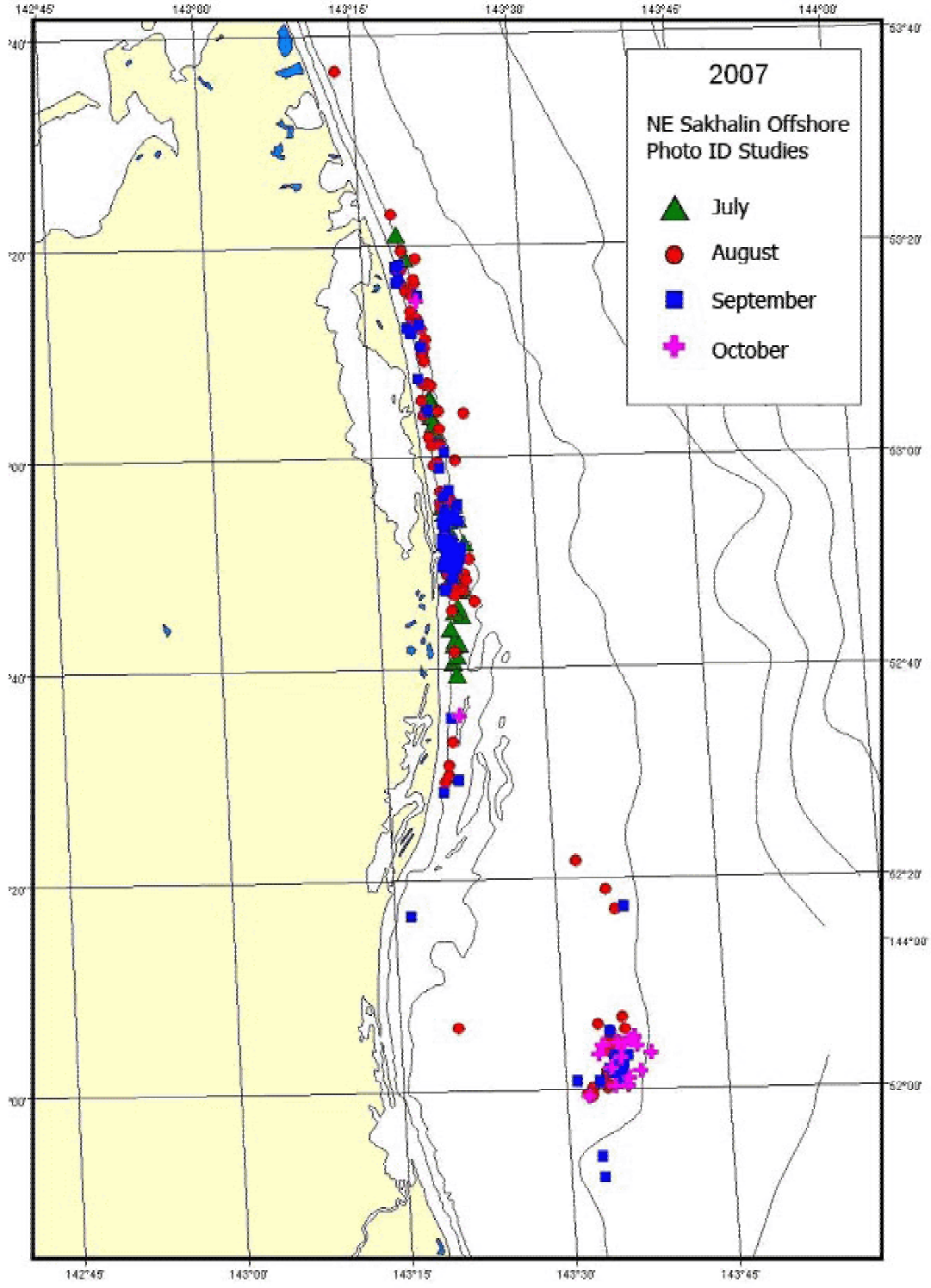
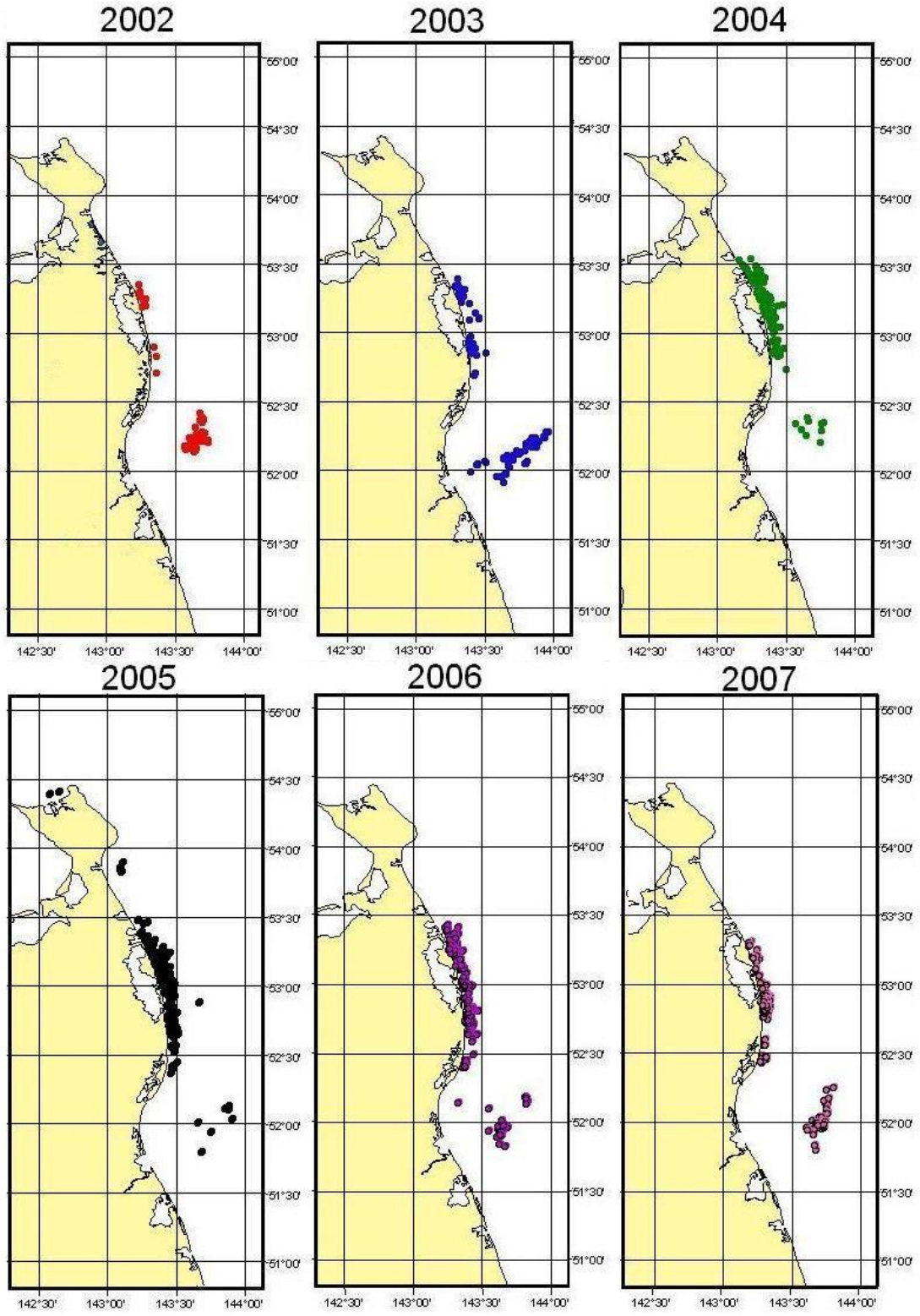
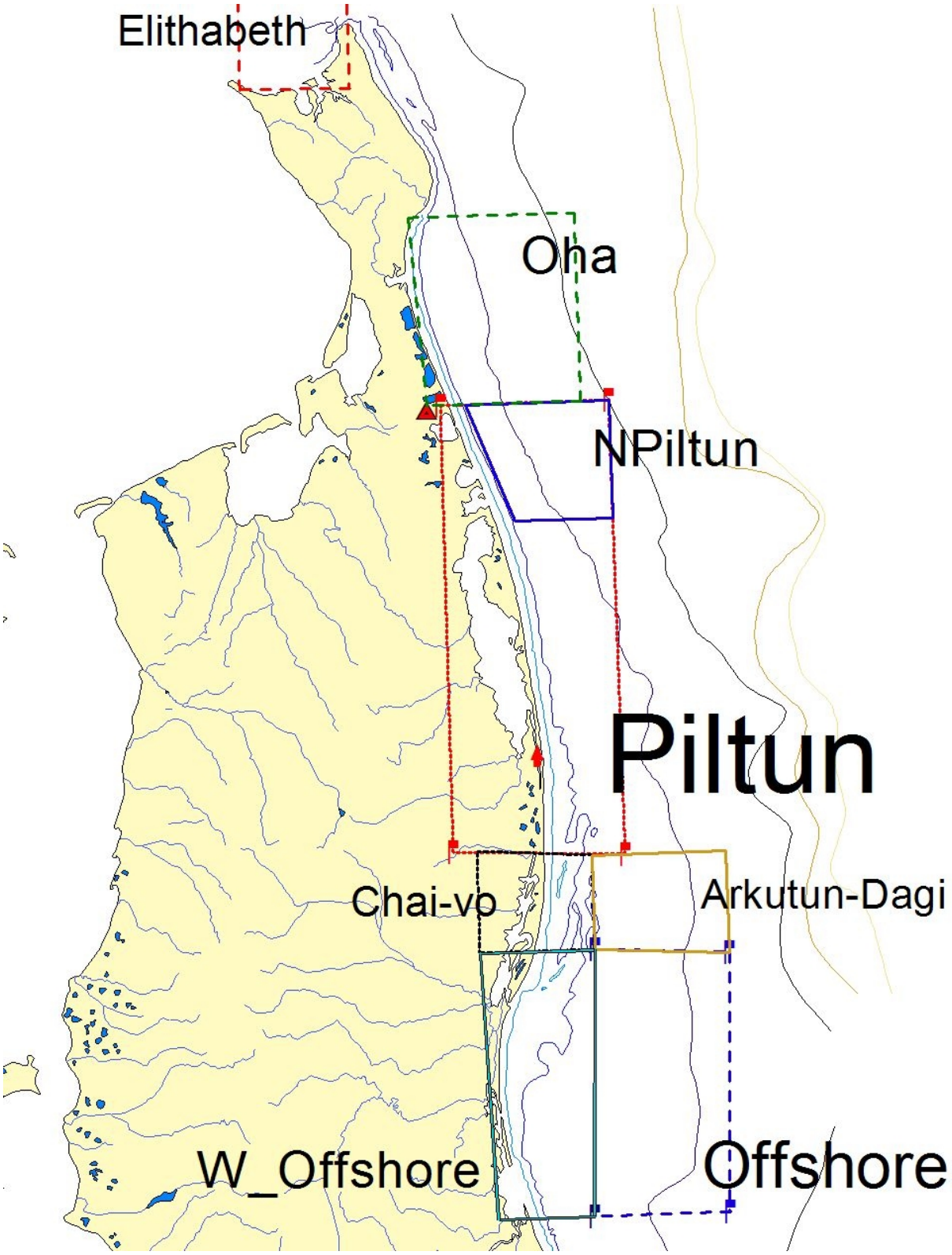
APPENDIX FIGURES



Appendix Figure A1. Gray whale photo-ID sites along the NE coast of Sakhalin Island, 2007.



Appendix Figure A2. Gray whale photo-ID sightings along the NE coast of Sakhalin Island in September throughout the study years, 2002 to 2007.



Appendix Figure A3. Definition of area boundaries outlined in Appendix Table 6.

APPENDIX TABLES

Table A1. Time spent at each gray whale sighting during photo-identification conducted from a Zodiac, 2007.

N	Date	Number of missions per day	Duration of each sighting in minutes																				Total
			N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21	
1	07/10/2007 F	2	15	12	36	34	3	20	36	8														164
2	07/26/2007 F	2	43	26	12	29	14	25	16															165
3	07/27/2007 F	1	12	7	10	29	10																	68
4	07/29/2007 F	1	13	11	26	41	12	5	3															111
5	08/01/2007 F	1	no																					
6	08/03/2007 F	2	21	19	22	3	8	37	15	25	8	9	16											183
7	08/04/2007 F	1	4	28	49	19	31	49																180
8	08/06/2007 F	2	14	16	19	8	45																	102
9	08/07/2007 F	2	23	10	36	56	15	10	35															185
10	08/08/2007 F	2	33	12	20	26																		91
11	08/14/2007 F	2	48	26	20	35																		129
12	08/17/2007 C	2	17	73	6	71	22	35	51	23	28	9	23	44										402
13	08/18/2007 C	1	26	15																				41
14	08/19/2007 C	1	52	8	56	24	28	21	55															244
15	08/21/2007 F	2	22	7	12	18	8	10	6	26														109
16	08/26/2007 F	2	16	63	45	20	17	8	6	10	8	15	23	10										241
17	08/28/2007 F	2	42	15	20	6	75	34																192
18	08/29/2007 F	1	41	15																				56
19	08/30/2007 F	2	19	40	22	18	23	17	14	9	41	10	7											220
20	08/31/2007 F	3	28	70	37	11	18	9	27	7	12	20	43	4	35									321
21	09/08/2007 F	3	13	17	5	11	29	34																109
22	09/09/2007 F	3	21	12	9	11	5	7	5	6	12	12	2	11	20	6	5	17	13	8	17	10	16	225
23	09/10/2007 C	1	7	45																				52
24	09/13/2007 C	2	43	50	8	14	10	20	55															200
25	09/17/2007 F	3	15	34	21	14	16	50	4	9	11	23	20	20	5	9	12							263
26	09/18/2007 F	1	16	29	13	17	39																	114
27	09/20/2007 F	1	10	26	31	8	25	20	17															137
28	09/25/2007 F	2	11	9	38	55	14	6	52	6														191
29	09/26/2007 F	2	50	20	21	38	9																	138
30	09/27/2007 F	1	14	9																				23
31	10/05/2007 C	2	6	14	24	44	17	27	10	29	12	38	32	16	27	17								313
	Total	55																						4969

Table A2. Gray whale group size at each sighting in the course of photo-ID efforts from the Zodiac during the 2007 expedition.

Date	Number of whales registered from Zodiac at each sighting																					Number of whales in Piltun Area	Number of whales in Offshore Area	Number of whales in Chayvo Area
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21			
07/10/2007 P	1	2	5	2	1	2	3	2														18		
07/26/2007 P	3	2	1	4	3	2	1															16		
07/27/2007 P	3	1	1	3	2																	10		
07/29/2007 P	1	1	5	4	1	2	1															15		
08/01/2007 P	no																					0		
08/03/2007 P	2	3	2	**2**	1	3	1	3	2	1	1											21		
08/04/2007 P	1	2	2	2	3	4																14		
08/06/2007 P	1	1	1	1	1																	5		
08/07/2007 P	3	1	1	4	2	4	4															19		
08/08/2007 P	3	2	1	2																		8		
08/14/2007 P	2	2	1	5																		10		
08/17/2007 O	1	6	3	3	2	4	4	1	1	1	3	3											32	
08/18/2007 O	1	1																					2	
08/19/2007 O	4	1	5	3	2	6	3																24	
08/21/2007 P	1	1	1	2	1	1	2	4														13		
08/26/2007 P	2	6	5	1	2	1	1	1	1	1	1	2										24		
08/28/2007 P	1	1	1	1	5	2																11		
08/29/2007 P	3	1																				4		
08/30/2007 P	1	5	2	2	2	1	1	1	3	1	1											20		
08/31/2007 P/Ch	1	5	3	1	3	2	3	1	1	5	3	1	4											33
09/08/2007 P	2	2	1	2	3	5																15		
09/09/2007 P	3	2	3	2	2	1	2	2	2	1	1	1	4	1	1	2	2	1	1	1	2	37		
09/10/2007 Ch	1	2																						3
09/13/2007 O	3	6	1	2	1	3	2																18	
09/17/2007 P	2	3	3	1	2	3	1	2	1	4	1	2	1	1	2							29		
09/18/2007 P	1	4	1	5	4																	15		
09/20/2007 P	1	2	4	2	1	3	3															16		
09/25/2007 P	1	1	2	1	2	1	3	2														13		
09/26/2007 P/Ch	5	1	1	4	2																			13
09/27/2007 P	3	1																				4		
10/05/2007 O	1	1	1	2	1	7	1	3	1	4	12	2	4	1								41		
Total																						378	76	49

Table A3. Water depth at gray whales sightings by feeding area, offshore northeast Sakhalin, 2007.

N	Date	Depth in meters measured from Zodiak at each sighting																					Average depth (Piltun)	Average depth (Offshore)	Average depth (Chayvo)
		N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21			
1	07/10/2007 P	n/a	n/a	n/a	n/a	n/a	n/a	17	n/a														17.00		
2	07/26/2007 P	12	13	15	10	12	14	18															13.43		
3	07/27/2007 P	нд	13	14	16	14																	14.25		
4	07/29/2007 P	14	13	16	14	16	14	16															14.71		
5	08/01/2007 P																								
6	08/03/2007 P	13	11	9	15	17	11	14	11	14	30	10											14.09		
7	08/04/2007 P	13	24	14	13	21	19																17.33		
8	08/06/2007 P	18	15	14	13	15																	15.00		
9	08/07/2007 P	13	20	23	15	7	7	20															15.00		
10	08/08/2007 P	13	9	18	5																		11.25		
11	08/14/2007 P	22	29	17	7																		18.75		
12	08/17/2007 O	52	52	52	53	52	52	52	51	52	52	52	52											52.00	
13	08/18/2007 O	50	45																					47.50	
14	08/19/2007 O	54	52	53	54	53	52	50																52.57	
15	08/21/2007 P	23	11	12	12	11	12	12	12														13.13		
16	08/26/2007 P	19	13	10	3	15	18	12	6	11	15	20	10										12.67		
17	08/28/2007 P	20	17	17	23	10	15																17.00		
18	08/29/2007 P	23	29																				26.00		
19	08/30/2007 P	11	10	13	18	17	15	7	11	7	10	12											11.91		
20	08/31/2007 P/Ch	21	12	20	12	11	10	9	14	14	8	12/Ch	13/Ch	9/Ch									13.10		11.33
21	09/08/2007 P	19	7	17	8	14	13																13.00		
22	09/09/2007 P	8	9	14	15	14	15	14	14	8	8	14	20	18	20	22	19	14	10	7	13	12	13.71		
23	09/10/2007 Ch	16	10																						13.00
24	09/13/2007 O	52	55	55	56	52	54	42																52.29	
25	09/17/2007 P	14	14	12	11	13	6	21	14	7	10	12	11	15	12	9							12.07		
26	09/18/2007 P	15	17	12	9	16																	13.80		
27	09/20/2007 P	12	12	14	13	6	14	8															11.29		
28	09/25/2007 P	16	15	12	4	11	9	11	9														10.88		

N	Date	Depth in meters measured from Zodiak at each sighting																					Average depth (Piltun)	Average depth (Offshore)	Average depth (Chayvo)
		N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	N19	N20	N21			
29	09/26/2007 P/Ch	14	12	11	8	11/Ch																	11.25		11
30	09/27/2007 P	7	4																				5.50		
31	10/05/2007 O	51	50	50	51	51	51	51	51	56	57	56	57	52	54									52.71	
	Total																						14.00	51.41	11.165

Table A4. Aspects photographed of gray whale individuals off the NE coast of Sakhalin Island and offshore the Kamchatka Peninsula in 2002-2007.

№ KOGW	№KamGW	2002					2003					2004					2005					2006					2007						Qas for
		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF			02-07
KOGW001		Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW002		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW003		Y	Y	Y	Y	Y																											4
KOGW004		Y	Y			Y	Y	Y	Y	Y	Y																						4
KOGW005		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	4
KOGW006		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW007		Y	Y	Y	Y	Y			Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW008		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW009		Y	Y	Y	Y	Y					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW010		Y	Y			Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y	4
KOGW011		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW012		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	4
KOGW013		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW014		Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y		Y	4
KOGW015		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW016		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y			Y	Y	Y				Y	4
KOGW017			Y			N											Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW018		Y	Y	Y	Y	Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						4
KOGW019		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW020		Y				N	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	4
KOGW021		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW022		Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW023		Y	Y			Y						Y	Y	Y	Y	Y						Y	Y	Y	Y	Y							4
KOGW024		Y				N											Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW025		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW026		Y	Y			Y	Y	Y			Y						Y	Y			Y	Y	Y			Y							2
KOGW027			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y			Y	Y				Y	4
KOGW028		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	4
KOGW029		Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y				Y	Y			Y	Y	Y				Y	2
KOGW030		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW031		Y				N		Y	Y	Y	Y	Y		Y		Y						Y		Y	Y	Y	Y	Y				Y	4
KOGW032		Y	Y		Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y	4
KOGW033		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	4
KOGW034		Y	Y			Y							Y			Y	Y	Y			Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW035		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	4
KOGW036		Y				N	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW037		Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW038		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4

№ KOGW	№KamGW	2002					2003					2004					2005					2006					2007						Qas for
		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF			02-07
KOGW039		Y				N	Y	Y		Y	Y						Y	Y			Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW040		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y								Y	Y		Y	4
KOGW041		Y	Y			Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y	Y	Y		Y	4
KOGW042		Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW043			Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW044		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y		Y	Y	Y			Y	Y	Y	Y			Y	4
KOGW045		Y	Y	Y		Y		Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	4
KOGW046							Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW047	KamGW013						Y	Y	Y	Y	Y											Y	Y	Y	Y	Y	Y	Y		Y		Y	4
KOGW048							Y	Y			Y	Y	Y		Y	Y	Y	Y			Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW049							Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	4
KOGW050							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y				Y	4
KOGW051							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y		Y	4
KOGW052							Y	Y			Y																						2
KOGW053							Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW054							Y	Y	Y	Y	Y			Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW055							Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW056							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW057							Y	Y	Y	Y	Y											Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW058							Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y				Y	4
KOGW059							Y	Y			Y						Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW060							Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW061							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW062							Y	Y			Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y				Y	4
KOGW063							Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	4
KOGW064							Y	Y	Y		Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y				Y	4
KOGW065							Y	Y			Y																						2
KOGW066							Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y		Y	4
KOGW067							Y	Y			Y		Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW068							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW069							Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y				Y	2
KOGW070							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW071							Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y			Y	4
KOGW072							Y	Y			Y	Y	Y			Y	Y	Y			Y		Y			N	Y	Y	Y	Y		Y	4
KOGW073							Y	Y			Y																Y	Y	Y	Y		Y	4
KOGW074							Y	Y	Y	Y	Y			Y		N			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW075							Y	Y			Y																						2
KOGW076							Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y	Y	Y	Y							2
KOGW077	KamGW010						Y	Y			Y											Y	Y	Y	Y	Y							4

№ KOGW	№KamGW	2002					2003					2004					2005					2006					2007						Qas for
		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF			02-07
KOGW078							Y	Y			Y	Y	Y	Y		Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW079							Y	Y			Y						Y	Y	Y		Y												3
KOGW080							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y		Y	Y	Y	Y	Y		Y	4
KOGW081							Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y		Y	4
KOGW082							Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y			Y	Y	Y				Y	2
KOGW083							Y	Y			Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y			Y							4
KOGW084							Y	Y	Y	Y	Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW085							Y				N	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y	Y	Y				Y	4
KOGW086							Y	Y			Y	Y	Y	Y		Y	Y	Y	Y	Y	Y						Y	Y	Y	Y		Y	4
KOGW087								Y			N	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y				Y	Y	Y	Y		Y	4
KOGW088							Y	Y	Y	Y	Y																					4
KOGW089								Y			N											Y	Y			Y	Y	Y	Y			Y	3
KOGW090	KamGW001							Y			N							Y	Y	Y	N	Y	Y			Y							3
KOGW091							Y				N											Y	Y			Y	Y	Y	Y			Y	3
KOGW092								Y			N	Y	Y			Y		Y	Y		Y	Y	Y			Y	Y	Y				Y	2
KOGW093												Y	Y			Y	Y	Y	Y		Y	Y	Y			Y	Y	Y	Y			Y	3
KOGW094												Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW095	KamGW008											Y	Y	Y	Y	Y						Y	Y			Y							4
KOGW096												Y	Y			Y	Y	Y			Y	Y				Y	Y	Y	Y	Y		Y	4
KOGW097												Y		Y	Y	Y											Y	Y				Y	4
KOGW098												Y	Y			Y																2
KOGW099												Y	Y			Y	Y	Y	Y		Y	Y	Y				Y	Y				Y	3
KOGW100												Y	Y			Y																2
KOGW101												Y	Y			Y																2
KOGW102												Y	Y			Y	Y	Y			Y	Y	Y					Y		Y		3
KOGW103												Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW104												Y	Y	Y	Y	Y	Y	Y			Y											4
KOGW105												Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW106												Y	Y			Y	Y	Y			Y	Y	Y			Y						2
KOGW107												Y				N	Y	Y			Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW108												Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW109												Y	Y			Y						Y	Y	Y	Y	Y						4
KOGW110												Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW111												Y	Y	Y	Y	Y	Y	Y			Y											4
KOGW112												Y	Y			Y	Y				Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW113												Y	Y			Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y		Y	4
KOGW114												Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW115													Y		Y	N	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW116													Y		Y	N	Y	Y	Y		Y	Y	Y			Y	Y	Y	Y	Y		Y	4

№ KOGW	№KamGW	2002					2003					2004					2005					2006					2007						Qas for
		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF			02-07
KOGW117																	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW118																	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW119																	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW120																	Y	Y			Y												2
KOGW121																	Y	Y	Y	Y	Y	Y	Y			Y							4
KOGW122																	Y	Y	Y	Y	Y												4
KOGW123																	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y		Y	4
KOGW124																	Y	Y			Y	Y				Y	Y	Y				Y	2
KOGW125																	Y	Y			Y	Y	Y	Y		Y	Y	Y	Y			Y	3
KOGW126																	Y	Y			Y												2
KOGW127																	Y	Y			Y	Y	Y			Y	Y	Y				Y	2
KOGW128																	Y	Y			Y												2
KOGW129																	Y	Y			Y	Y	Y			Y	Y	Y	Y	Y		Y	4
KOGW130																	Y	Y			Y												2
KOGW131																	Y	Y			Y												2
KOGW132	KamGW002																Y	Y			Y	Y	Y				Y	Y				Y	2
KOGW133																	Y	Y			Y	Y	Y	Y									3
KOGW134																	Y	Y	Y	Y	Y												4
KOGW135																						Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW136	KamGW016											Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y			Y	4
KOGW137																						Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW138																						Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW139																						Y	Y	N	N	Y							2
KOGW140																						Y	Y	N	Y	Y							3
KOGW141																						Y	Y	N	N	Y							2
KOGW142																						Y	Y	N	N	Y							2
KOGW143																						Y	Y	N	N	Y							2
KOGW144																						Y	Y	Y	N	Y	Y	Y				Y	3
KOGW145																						Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	4
KOGW146																						Y	N	N	N	N	Y	Y				Y	2
KOGW147																						Y	Y	N	N	Y	Y	Y	Y	Y		Y	4
KOGW148																											Y	Y	Y	Y		Y	4
KOGW149																											Y	Y				Y	2
KOGW150																											Y	Y				Y	2
KOGW151																											Y	Y				Y	2
KOGW152																											Y	Y				Y	2
KOGW153																											Y	Y	Y	Y		Y	4

№ KOGW	№KamGW	2002					2003					2004					2005					2006					2007						Qas for
		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF		RS	LS	DF	VF			02-07
KOGW154																											Y	Y				Y	2
KOGW155																											Y	Y				Y	2
KOGW156																											Y	Y				Y	2
KOGW157																											Y	Y				Y	2
KOGW158																											Y	Y	Y	Y		Y	4
KOGW159																											Y	Y	Y	Y		Y	4
KOGW160																											Y	Y	Y	Y		Y	4
KOGW161																											Y	Y				Y	2
TEMP01		Y				N							Y			N																	1
TEMP02								Y			N		Y			N		Y			N												done
TEMP03																							Y			N							1
TEMP04																						Y				N							1
TEMP05																						Y				N							1
TEMP06																						Y				N							1
TEMP07																						Y				N							2
TEMP08																		Y				Y	Y			Y	KOGW161						
TEMP09																												Y				N	1
TEMP10																											Y					N	1
TEMP11																												Y				N	1
TEMP12																												Y				N	1
TEMP13																												Y				N	1

Table A5. Sighting locations of identified gray whales off NE Sakhalin Island, 2002-2007.

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW001	2002	0	0	1	0	0	0	0	0
KOGW001	2003	0	0	0	0	0	0	0	0
KOGW001	2004	1	1	1	0	0	0	0	0
KOGW001	2005	1	0	0	0	0	0	0	0
KOGW001	2006	1	0	0	0	0	0	0	0
KOGW001	2007	1	0	1	0	0	0	0	0
KOGW002	2002	0	0	1	0	0	0	0	0
KOGW002	2003	0	0	1	0	0	0	0	0
KOGW002	2004	0	1	0	0	0	0	0	0
KOGW002	2005	1	1	0	0	0	0	0	0
KOGW002	2006	1	0	1	0	0	0	0	0
KOGW002	2007	1		0	1	1	0	0	0
KOGW003	2002	0	0	1	0	0	0	0	0
KOGW003	2003	0	0	0	0	0	0	0	0
KOGW003	2004	0	0	0	0	0	0	0	0
KOGW003	2005	0	0	0	0	0	0	0	0
KOGW003	2006	0	0	0	0	0	0	0	0
KOGW003	2007	0	0	0	0	0	0	0	0
KOGW004	2002	0	0	1	0	0	0	0	0
KOGW004	2003	0	0	1	0	0	0	0	0
KOGW004	2004	0	0	0	0	0	0	0	0
KOGW004	2005	0	0	0	0	0	0	0	0
KOGW004	2006	0	0	0	0	0	0	0	0
KOGW004	2007	0	0	0	0	0	0	0	0
KOGW005	2002	1	0	1	0	0	0	0	0
KOGW005	2003	1	0	0	0	0	0	0	0
KOGW005	2004	1	0	0	0	0	0	0	0
KOGW005	2005	1	0	0	0	0	0	0	0
KOGW005	2006	0	0	0	0	1	0	0	0
KOGW005	2007	1	0	1	0	0	0	0	0
KOGW006	2002	0	0	1	0	0	0	0	0
KOGW006	2003	1	0	0	0	0	0	0	0
KOGW006	2004	0	1	0	0	0	0	0	0
KOGW006	2005	1	0	0	0	0	0	1	0
KOGW006	2006	0	0	1	0	0	0	0	0
KOGW006	2007	1	0	1	0	0	0	0	0
KOGW007	2002	0	0	0	0	0	0	0	0
KOGW007	2003	0	0	1	0	0	0	0	0
KOGW007	2004	1	0	0	0	0	0	0	0
KOGW007	2005	1	1	0	0	0	0	0	0
KOGW007	2006	1	1	0	0	1	0	0	0
KOGW007	2007	1	0	1	0	0	0	0	0
KOGW008	2002	0	0	1	0	0	0	0	0
KOGW008	2003	1	0	0	0	0	0	0	0
KOGW008	2004	1	0	0	0	0	0	0	0
KOGW008	2005	1	0	0	0	0	0	1	0
KOGW008	2006	1	0	1	0	0	0	0	0
KOGW008	2007	0	0	1	0	0	0	0	0
KOGW009	2002	0	0	1	0	0	0	0	0
KOGW009	2003	0	0	0	0	0	0	0	0
KOGW009	2004	1	0	0	0	0	0	0	0
KOGW009	2005	1	0	0	0	0	0	0	0
KOGW009	2006	1	0	0	0	0	0	0	0
KOGW009	2007	1	0	1	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW010	2002	0	0	1	0	0	0	0	0
KOGW010	2003	0	0	0	0	0	0	0	0
KOGW010	2004	1	0	0	0	0	0	0	0
KOGW010	2005	1	1	0	0	0	0	0	0
KOGW010	2006	1	0	0	0	0	0	0	0
KOGW010	2007	1	0	1	1	1	0	0	0
KOGW011	2002	0	0	1	0	0	0	0	0
KOGW011	2003	0	0	1	0	0	0	0	0
KOGW011	2004	1	1	0	0	0	0	0	0
KOGW011	2005	1	1	0	0	1	0	0	0
KOGW011	2006	1	0	0	0	0	0	0	0
KOGW011	2007	1	0	1	0	0	0	0	0
KOGW012	2002	0	0	1	0	0	0	0	0
KOGW012	2003	1	0	1	0	0	0	0	0
KOGW012	2004	1	0	0	0	0	0	0	0
KOGW012	2005	1	0	0	0	1	0	0	0
KOGW012	2006	1	0	1	0	0	0	0	0
KOGW012	2007	1	0	1	1	0	0	0	0
KOGW013	2002	0	0	1	0	0	0	0	0
KOGW013	2003	0	0	1	1	0	0	0	0
KOGW013	2004	1	1	0	0	0	0	0	0
KOGW013	2005	1	1	0	0	0	0	0	0
KOGW013	2006	1	0	1	0	0	0	0	0
KOGW013	2007		0	1	0	0	0	0	0
KOGW014	2002	0	0	1	0	0	0	0	0
KOGW014	2003	0	0	0	0	0	0	0	0
KOGW014	2004	1	0	0	0	0	0	0	0
KOGW014	2005	1	0	0	0	0	0	0	0
KOGW014	2006	1	0	1	0	0	0	0	0
KOGW014	2007	0	0	1	0	0	0	0	0
KOGW015	2002	0	0	1	0	0	0	0	0
KOGW015	2003	0	0	1	0	0	0	0	0
KOGW015	2004	0	0	0	0	0	0	0	0
KOGW015	2005	1	1	0	0	0	0	0	0
KOGW015	2006	1	1	0	0	0	0	0	0
KOGW015	2007	1	0	1	0	0	0	0	0
KOGW016	2002	0	0	1	0	0	0	0	0
KOGW016	2003	1	0	0	0	0	0	0	0
KOGW016	2004	1	0	0	0	0	0	0	0
KOGW016	2005	1	0	0	0	0	0	0	0
KOGW016	2006	0	0	1	0	0	0	0	0
KOGW016	2007	1	1	0	0	0	0	0	0
KOGW017	2002	1	0	0	0	0	0	0	0
KOGW017	2003	0	0	1	0	0	0	0	0
KOGW017	2004	1	1	0	0	0	0	0	0
KOGW017	2005	1	0	0	0	0	0	0	0
KOGW017	2006	1	0	1	0	0	0	0	0
KOGW017	2007	1	1	1	0	0	0	0	0
KOGW018	2002	1	0	0	0	0	0	0	0
KOGW018	2003	1	0	0	0	0	0	0	0
KOGW018	2004	1	1	0	0	0	0	0	0
KOGW018	2005	1	0	0	0	0	0	0	0
KOGW018	2006	1	1	0	0	0	0	0	0
KOGW018	2007	0	0	0	0	0	0	0	0
KOGW019	2002	0	0	1	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW019	2003	0	0	1	1	0	0	0	0
KOGW019	2004	1	1	1	0	0	0	0	0
KOGW019	2005	1	0	1	0	0	0	0	0
KOGW019	2006	0	0	1	0	0	0	0	0
KOGW019	2007	0	0	1	0	0	0	0	0
KOGW020	2002	0	0	1	0	0	0	0	0
KOGW020	2003	0	0	1	1	0	0	0	0
KOGW020	2004	1	0	0	0	0	0	0	0
KOGW020	2005	1	0	0	0	1	0	0	0
KOGW020	2006	1	0	1	0	1	0	0	0
KOGW020	2007	1	0	1	0	0	0	0	0
KOGW021	2002	0	0	1	0	0	0	0	0
KOGW021	2003	0	0	1	0	0	0	0	0
KOGW021	2004	1	1	0	0	0	0	0	0
KOGW021	2005	1	1	0	0	0	0	0	0
KOGW021	2006	1	0	0	0	0	0	0	0
KOGW021	2007	0	0	1	0	0	0	0	0
KOGW022	2002	1	0	0	0	0	0	0	0
KOGW022	2003	1	0	0	0	0	0	0	0
KOGW022	2004	1	0	0	0	0	0	0	0
KOGW022	2005	1	0	0	0	1	0	0	0
KOGW022	2006	1	0	0	0	1	0	0	0
KOGW022	2007	1	0	0	0	0	0	0	0
KOGW023	2002	1	0	0	0	0	0	0	0
KOGW023	2003	0	0	0	0	0	0	0	0
KOGW023	2004	1	0	0	0	0	0	0	0
KOGW023	2005	0	0	0	0	0	0	0	0
KOGW023	2006	1	0	0	0	1	0	0	0
KOGW023	2007	0	0	0	0	0	0	0	0
KOGW024	2002	1	0	0	0	0	0	0	0
KOGW024	2003	0	0	0	0	0	0	0	0
KOGW024	2004	0	0	0	0	0	0	0	0
KOGW024	2005	1	0	0	0	0	0	0	0
KOGW024	2006	1	0	0	0	1	0	0	0
KOGW024	2007	1	0	1	0	0	0	0	0
KOGW025	2002	1	0	1	0	0	0	0	0
KOGW025	2003	1	0	1	1	0	0	0	0
KOGW025	2004	1	0	0	0	0	0	0	0
KOGW025	2005	1	1	1	0	0	0	0	0
KOGW025	2006	0	0	1	0	0	0	0	0
KOGW025	2007	1	0	1	0	0	0	0	0
KOGW026	2002	1	0	0	0	0	0	0	0
KOGW026	2003	1	0	0	0	0	0	0	0
KOGW026	2004	0	0	0	0	0	0	0	0
KOGW026	2005	1	0	0	0	1	0	0	0
KOGW026	2006	1	0	0	0	0	0	0	0
KOGW026	2007	0	0	0	0	0	0	0	0
KOGW027	2002	1	1	0	0	0	0	0	0
KOGW027	2003	1	0	0	0	0	0	0	0
KOGW027	2004	1	0	0	0	0	0	0	0
KOGW027	2005	1	0	0	0	0	0	0	0
KOGW027	2006	0	0	0	0	1	0	0	0
KOGW027	2007	1	0	0	0	0	0	0	0
KOGW028	2002	0	0	1	0	0	0	0	0
KOGW028	2003	1	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW028	2004	1	0	0	0	0	0	0	0
KOGW028	2005	1	1	0	0	0	0	0	0
KOGW028	2006	1	1	0	0	0	0	0	0
KOGW028	2007	1	0	0	0	0	0	0	0
KOGW029	2002	1	0	0	0	0	0	0	0
KOGW029	2003	1	0	0	0	0	0	0	0
KOGW029	2004	1	1	0	0	0	0	0	0
KOGW029	2005	1	0	0	0	0	0	0	0
KOGW029	2006	1	0	0	0	0	0	0	0
KOGW029	2007	1	0	1	0	0	0	0	0
KOGW030	2002	1	0	0	0	0	0	0	0
KOGW030	2003	1	0	0	0	0	0	0	0
KOGW030	2004	1	1	0	0	0	0	0	0
KOGW030	2005	1	1	0	0	0	0	0	0
KOGW030	2006	1	1	0	0	0	0	0	0
KOGW030	2007	1	1	1	1	0	0	0	0
KOGW031	2002	1	0	0	0	0	0	0	0
KOGW031	2003	0	0	1	0	0	0	0	0
KOGW031	2004	0	1	0	0	0	0	0	0
KOGW031	2005	0	0	0	0	0	0	0	0
KOGW031	2006	1	1	0	0	0	0	0	0
KOGW031	2007	1	1	0	0	0	0	0	0
KOGW032	2002	0	0	1	0	0	0	0	0
KOGW032	2003	1	0	0	0	0	0	0	0
KOGW032	2004	1	1	0	0	0	0	0	0
KOGW032	2005	1	1	0	0	0	0	0	0
KOGW032	2006	1	1	0	0	0	0	0	0
KOGW032	2007	1	0	1	0	0	0	0	0
KOGW033	2002	0	0	1	0	0	0	0	0
KOGW033	2003	0	0	1	0	0	0	0	0
KOGW033	2004	1	0	0	0	0	0	0	0
KOGW033	2005	1	0	0	0	1	0	0	0
KOGW033	2006	0	0	1	0	0	0	0	0
KOGW033	2007	0	0	1	0	0	0	0	0
KOGW034	2002	0	0	1	0	0	0	0	0
KOGW034	2003	0	0	0	0	0	0	0	0
KOGW034	2004	1	0	0	0	0	0	0	0
KOGW034	2005	1	0	0	0	0	0	0	0
KOGW034	2006	1	0	0	0	0	0	0	0
KOGW034	2007	1	0	0	0	0	0	0	0
KOGW035	2002	0	0	1	0	0	0	0	0
KOGW035	2003	1	0	1	0	0	0	0	0
KOGW035	2004	1	0	0	0	0	0	0	0
KOGW035	2005	1	0	0	0	0	0	0	0
KOGW035	2006	1	0	0	0	0	0	0	0
KOGW035	2007	1	0	1	0	0	0	0	0
KOGW036	2002	0	0	1	0	0	0	0	0
KOGW036	2003	0	0	1	0	0	0	0	0
KOGW036	2004	1	0	0	0	0	0	0	0
KOGW036	2005	1	0	0	0	0	0	0	0
KOGW036	2006	1	1	1	0	0	0	0	0
KOGW036	2007	1	0	1	0	0	0	0	0
KOGW037	2002	0	0	1	0	0	0	0	0
KOGW037	2003	1	0	0	0	0	0	0	0
KOGW037	2004	1	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW037	2005	1	0	0	0	0	0	0	0
KOGW037	2006	1	0	0	0	0	0	0	0
KOGW037	2007	1	0	1	0	0	0	0	0
KOGW038	2002	0	0	1	0	0	0	0	0
KOGW038	2003	1	0	0	0	0	0	0	0
KOGW038	2004	1	0	0	0	0	0	0	0
KOGW038	2005	1	0	0	0	1	0	0	0
KOGW038	2006	1	0	0	0	0	0	0	0
KOGW038	2007	1	0	0	0	0	0	0	0
KOGW039	2002	0	0	1	0	0	0	0	0
KOGW039	2003	1	0	0	0	0	0	0	0
KOGW039	2004	0	0	0	0	0	0	0	0
KOGW039	2005	1	0	0	0	0	0	0	0
KOGW039	2006	1	0	0	0	1	0	0	0
KOGW039	2007	1	0	1	0	0	0	0	0
KOGW040	2002	1	0	0	0	0	0	0	0
KOGW040	2003	0	0	1	0	0	0	0	0
KOGW040	2004	0	1	0	0	0	0	0	0
KOGW040	2005	0	1	0	0	0	0	0	0
KOGW040	2006	0	0	0	0	0	0	0	0
KOGW040	2007	0	0	1	0	0	0	0	0
KOGW041	2002	0	0	1	0	0	0	0	0
KOGW041	2003	0	0	0	0	0	0	0	0
KOGW041	2004	1	0	0	0	0	0	0	0
KOGW041	2005	1	1	0	0	0	0	0	0
KOGW041	2006	0	0	1	0	0	0	0	0
KOGW041	2007	1	0	1	0	0	0	0	0
KOGW042	2002	1	0	0	0	1	0	0	0
KOGW042	2003	0	0	0	0	0	0	0	0
KOGW042	2004	1	1	0	0	0	0	0	0
KOGW042	2005	1	0	0	0	0	0	0	0
KOGW042	2006	0	0	1	0	0	0	0	0
KOGW042	2007	1	0	1	0	0	0	0	0
KOGW043	2002	0	0	1	0	0	0	0	0
KOGW043	2003	1	0	1	0	0	0	0	0
KOGW043	2004	1	0	0	0	0	0	0	0
KOGW043	2005	1	0	0	0	1	0	0	0
KOGW043	2006	0	0	1	0	0	0	0	0
KOGW043	2007	1	0	0	0	0	0	0	0
KOGW044	2002	0	0	1	0	0	0	0	0
KOGW044	2003	1	0	0	0	1	0	0	0
KOGW044	2004	1	1	0	0	0	0	0	0
KOGW044	2005	1	0	0	0	0	0	0	0
KOGW044	2006	0	0	0	0	1	0	0	0
KOGW044	2007	1	0	0	0	0	0	0	0
KOGW045	2002	0	0	1	0	0	0	0	0
KOGW045	2003	0	0	1	0	0	0	0	0
KOGW045	2004	0	0	1	0	0	0	0	0
KOGW045	2005	1	0	0	0	0	0	0	0
KOGW045	2006	0	0	0	0	1	0	0	0
KOGW045	2007	0	0	1	0	0	0	0	0
KOGW046	2002	0	0	0	0	0	0	0	0
KOGW046	2003	0	0	1	0	0	0	0	0
KOGW046	2004	0	1	0	0	0	0	0	0
KOGW046	2005	1	0	1	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW046	2006	1	0	1	0	0	0	0	0
KOGW046	2007	1	0	0	0	0	0	0	0
KOGW047	2002	0	0	0	0	0	0	0	0
KOGW047	2003	1	0	0	0	0	0	0	0
KOGW047	2004	0	0	0	0	0	0	0	0
KOGW047	2005	1	1	0	0	0	0	0	0
KOGW047	2006	1	0	0	0	0	0	0	0
KOGW047	2007	1	0	0	0	1	0	0	0
KOGW048	2002	0	0	0	0	0	0	0	0
KOGW048	2003	1	0	0	0	0	0	0	0
KOGW048	2004	1	0	0	0	0	0	0	0
KOGW048	2005	1	1	0	0	0	0	0	0
KOGW048	2006	1	0	0	0	0	0	0	0
KOGW048	2007	1	0	1	0	0	0	0	0
KOGW049	2002	0	0	0	0	0	0	0	0
KOGW049	2003	1	0	0	0	0	0	0	0
KOGW049	2004	0	1	0	0	0	0	0	0
KOGW049	2005	1	1	0	0	1	0	1	0
KOGW049	2006	0	1	1	0	0	0	0	0
KOGW049	2007	1	0	1	0	0	0	0	0
KOGW050	2002	0	0	0	0	0	0	0	0
KOGW050	2003	1	1	0	0	0	0	0	0
KOGW050	2004	1	1	0	0	0	0	0	0
KOGW050	2005	1	1	0	0	0	0	0	0
KOGW050	2006	1	0	0	0	0	0	0	0
KOGW050	2007	1	0	0	0	0	0	0	0
KOGW051	2002	0	0	0	0	0	0	0	0
KOGW051	2003	0	0	1	1	0	0	0	0
KOGW051	2004	1	0	1	1	0	0	0	0
KOGW051	2005	1	0	0	0	0	0	0	0
KOGW051	2006	0	0	0	0	0	0	0	0
KOGW051	2007	1	0	1	0	0	0	0	0
KOGW052	2002	0	0	0	0	0	0	0	0
KOGW052	2003	1	0	0	0	0	0	0	0
KOGW052	2004	0	0	0	0	0	0	0	0
KOGW052	2005	0	0	0	0	0	0	0	0
KOGW052	2006	0	0	0	0	0	0	0	0
KOGW052	2007	0	0	0	0	0	0	0	0
KOGW053	2002	0	0	0	0	0	0	0	0
KOGW053	2003	1	0	0	0	0	0	0	0
KOGW053	2004	0	0	0	0	0	0	0	0
KOGW053	2005	1	0	0	0	0	0	0	0
KOGW053	2006	1	0	0	0	0	0	0	0
KOGW053	2007	1	1	0	0	0	0	0	0
KOGW054	2002	0	0	0	0	0	0	0	0
KOGW054	2003	0	0	1	0	0	0	0	0
KOGW054	2004	1	0	0	0	0	0	0	0
KOGW054	2005	1	1	0	0	0	0	0	0
KOGW054	2006	0	0	1	0	0	0	0	0
KOGW054	2007	1	0	1	0	0	0	0	0
KOGW055	2002	0	0	0	0	0	0	0	0
KOGW055	2003	1	0	0	0	0	0	0	0
KOGW055	2004	0	0	0	0	0	0	0	0
KOGW055	2005	1	0	0	0	0	0	0	0
KOGW055	2006	1	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW055	2007	1	1	1	0	0	0	0	0
KOGW056	2002	0	0	0	0	0	0	0	0
KOGW056	2003	1	0	0	0	0	0	0	0
KOGW056	2004	1	0	0	0	0	0	0	0
KOGW056	2005	1	0	0	0	0	0	0	0
KOGW056	2006	1	0	0	0	0	0	0	0
KOGW056	2007	1	0	0	0	0	0	0	0
KOGW057	2002	0	0	0	0	0	0	0	0
KOGW057	2003	0	0	1	1	0	0	0	0
KOGW057	2004	0	0	0	0	0	0	0	0
KOGW057	2005	1	0	0	0	0	0	0	0
KOGW057	2006	1	1	1	1	0	0	0	0
KOGW057	2007	1	0	1	0	0	0	0	0
KOGW058	2002	0	0	0	0	0	0	0	0
KOGW058	2003	0	0	1	1	0	0	0	0
KOGW058	2004	1	1	0	0	0	0	0	0
KOGW058	2005	1	0	0	0	1	0	0	0
KOGW058	2006	0	0	0	0	1	0	0	0
KOGW058	2007	1	0	1	0	1	0	0	0
KOGW059	2002	0	0	0	0	0	0	0	0
KOGW059	2003	1	0	1	0	0	0	0	0
KOGW059	2004	0	0	0	0	0	0	0	0
KOGW059	2005	1	0	0	0	1	0	0	0
KOGW059	2006	1	0	1	0	0	0	0	0
KOGW059	2007	1	0	1	0	0	0	0	0
KOGW060	2002	0	0	0	0	0	0	0	0
KOGW060	2003	1	0	0	0	0	0	0	0
KOGW060	2004	1	0	0	0	0	0	0	0
KOGW060	2005	1	1	0	0	0	0	0	0
KOGW060	2006	1	0	0	0	0	0	0	0
KOGW060	2007	0	0	1	0	0	0	0	0
KOGW061	2002	0	0	0	0	0	0	0	0
KOGW061	2003	1	0	0	0	0	0	0	0
KOGW061	2004	1	1	0	0	0	0	0	0
KOGW061	2005	1	1	0	0	0	0	0	0
KOGW061	2006	0	0	0	0	1	0	0	0
KOGW061	2007	1	0	1	0	0	0	0	0
KOGW062	2002	0	0	0	0	0	0	0	0
KOGW062	2003	1	0	0	0	0	0	0	0
KOGW062	2004	1	0	1	0	0	0	0	0
KOGW062	2005	1	1	0	0	0	0	0	0
KOGW062	2006	1	0	1	0	0	0	0	0
KOGW062	2007	1	0	1	0	0	0	0	0
KOGW063	2002	0	0	0	0	0	0	0	0
KOGW063	2003	1	0	0	0	0	0	0	0
KOGW063	2004	1	0	0	0	0	0	0	0
KOGW063	2005	1	0	0	0	1	0	0	0
KOGW063	2006	1	0	0	0	0	0	0	0
KOGW063	2007	1	0	0	0	0	0	0	0
KOGW064	2002	0	0	0	0	0	0	0	0
KOGW064	2003	0	0	0	0	0	0	0	0
KOGW064	2004	1	0	0	0	0	0	0	0
KOGW064	2005	1	1	0	0	1	0	0	0
KOGW064	2006	1	0	0	0	0	0	0	0
KOGW064	2007	1	0	0	0	1	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW065	2002	0	0	0	0	0	0	0	0
KOGW065	2003	1	0	0	0	0	0	0	0
KOGW065	2004	0	0	0	0	0	0	0	0
KOGW065	2005	0	0	0	0	0	0	0	0
KOGW065	2006	0	0	0	0	0	0	0	0
KOGW065	2007	0	0	0	0	0	0	0	0
KOGW066	2002	0	0	0	0	0	0	0	0
KOGW066	2003	0	0	1	1	0	0	0	0
KOGW066	2004	0	1	0	0	0	0	0	0
KOGW066	2005	1	0	0	0	0	0	0	0
KOGW066	2006	1	0	0	0	1	0	0	0
KOGW066	2007	1	0	0	0	0	0	0	0
KOGW067	2002	0	0	0	0	0	0	0	0
KOGW067	2003	1	0	0	0	0	0	0	0
KOGW067	2004	0	1	0	0	0	0	0	0
KOGW067	2005	1	0	0	0	0	0	0	0
KOGW067	2006	1	0	0	0	0	0	0	0
KOGW067	2007	1	0		0	0	0	0	0
KOGW068	2002	0	0	0	0	0	0	0	0
KOGW068	2003	1	0	0	0	0	0	0	0
KOGW068	2004	1	1	0	0	0	0	0	0
KOGW068	2005	1	0	0	0	0	0	0	0
KOGW068	2006	1	1	0	0	0	0	0	0
KOGW068	2007	1	0	0	0	0	0	0	0
KOGW069	2002	0	0	0	0	0	0	0	0
KOGW069	2003	1	0	1	0	0	0	0	0
KOGW069	2004	1	0	0	0	0	0	0	0
KOGW069	2005	1	0	0	0	0	0	0	0
KOGW069	2006	1	0	1	0	1	0	0	0
KOGW069	2007	1	0	0	0	1	0	0	0
KOGW070	2002	0	0	0	0	0	0	0	0
KOGW070	2003	0	0	1	0	0	0	0	0
KOGW070	2004	1	0	0	0	0	0	0	0
KOGW070	2005	1	1	0	0	0	0	0	0
KOGW070	2006	1	0	0	0	1	0	0	0
KOGW070	2007	0	0	1	0	0	0	0	0
KOGW071	2002	0	0	0	0	0	0	0	0
KOGW071	2003	1	0	0	0	0	0	0	0
KOGW071	2004	1	1	0	0	0	0	0	0
KOGW071	2005	1	0	0	0	0	0	0	0
KOGW071	2006	1	0	0	0	0	0	0	0
KOGW071	2007	1	0	0	0	1	0	0	0
KOGW072	2002	0	0	0	0	0	0	0	0
KOGW072	2003	1	0	0	0	0	0	0	0
KOGW072	2004	1	0	0	0	0	0	0	0
KOGW072	2005	1	0	0	0	0	0	0	0
KOGW072	2006	1	0	0	0	0	0	0	0
KOGW072	2007		0	1	0	0	0	0	0
KOGW073	2002	0	0	0	0	0	0	0	0
KOGW073	2003	1	0	0	0	0	0	0	0
KOGW073	2004	0	0	0	0	0	0	0	0
KOGW073	2005	0	0	0	0	0	0	0	0
KOGW073	2006	0	0	0	0	0	0	0	0
KOGW073	2007	1	0	0	0	0	0	0	0
KOGW074	2002	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW074	2003	1	0	0	0	0	0	0	0
KOGW074	2004	1	0	0	0	0	0	0	0
KOGW074	2005	1	1	0	0	0	0	0	0
KOGW074	2006	1	1	0	0	1	0	0	0
KOGW074	2007	1	0	0	0	0	0	0	0
KOGW075	2002	0	0	0	0	0	0	0	0
KOGW075	2003	1	0	0	0	0	0	0	0
KOGW075	2004	0	0	0	0	0	0	0	0
KOGW075	2005	1	0	0	0	0	0	0	0
KOGW075	2006	0	0	0	0	0	0	0	0
KOGW075	2007	0	0	0	0	0	0	0	0
KOGW076	2002	0	0	0	0	0	0	0	0
KOGW076	2003	1	0	0	0	0	0	0	0
KOGW076	2004	1	0	0	0	0	0	0	0
KOGW076	2005	1	0	0	0	0	0	0	0
KOGW076	2006	1	0	1	0	0	0	0	0
KOGW076	2007	0	0	1	0	0	0	0	0
KOGW077	2002	0	0	0	0	0	0	0	0
KOGW077	2003	1	0	0	0	0	0	0	0
KOGW077	2004	0	0	0	0	0	0	0	0
KOGW077	2005	0	0	0	0	0	0	0	0
KOGW077	2006	0	0	0	0	0	0	0	0
KOGW077	2007	0	0	0	0	0	0	0	0
KOGW078	2002	0	0	0	0	0	0	0	0
KOGW078	2003	1	0	0	0	0	0	0	0
KOGW078	2004	1	0	0	0	0	0	0	0
KOGW078	2005	1	0	0	0	0	0	0	0
KOGW078	2006	1	0	0	0	0	0	0	0
KOGW078	2007	1	0	1	0	1	0	0	0
KOGW079	2002	0	0	0	0	0	0	0	0
KOGW079	2003	1	0	0	0	0	0	0	0
KOGW079	2004	0	0	0	0	0	0	0	0
KOGW079	2005	1	0	0	0	0	0	0	0
KOGW079	2006	0	0	0	0	0	0	0	0
KOGW079	2007	0	0	0	0	0	0	0	0
KOGW080	2002	0	0	0	0	0	0	0	0
KOGW080	2003	1	1	0	0	0	0	0	0
KOGW080	2004	1	1	0	0	0	0	0	0
KOGW080	2005	0	0	0	0	0	0	0	0
KOGW080	2006	1	1	0	0	1	0	0	0
KOGW080	2007	1	0	1	0	1	0	0	0
KOGW081	2002	0	0	0	0	0	0	0	0
KOGW081	2003	1	0	0	0	0	0	0	0
KOGW081	2004	1	1	0	0	0	0	0	0
KOGW081	2005	1	1	0	0	0	0	0	0
KOGW081	2006	1	0	0	0	1	0	0	0
KOGW081	2007	1	0	0	0	1	0	0	0
KOGW082	2002	0	0	0	0	0	0	0	0
KOGW082	2003	1	0	0	0	0	0	0	0
KOGW082	2004	0	1	0	0	0	0	0	0
KOGW082	2005	0	0	0	0	0	0	0	0
KOGW082	2006	1	0	0	0	1	0	0	0
KOGW082	2007	1	0	0	0	0	0	0	0
KOGW083	2002	0	0	0	0	0	0	0	0
KOGW083	2003	1	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW083	2004	1	1	0	0	0	0	0	0
KOGW083	2005	1	1	0	0	0	0	0	0
KOGW083	2006	1	0	0	0	0	0	0	0
KOGW083	2007	0	0	0	0	0	0	0	0
KOGW084	2002	0	0	0	0	0	0	0	0
KOGW084	2003	0	0	1	0	0	0	0	0
KOGW084	2004	1	1	0	0	0	0	0	0
KOGW084	2005	0	0	1	0	0	0	0	0
KOGW084	2006	0	0	1	0	0	0	0	0
KOGW084	2007	0	0	1	0	0	0	0	0
KOGW085	2002	0	0	0	0	0	0	0	0
KOGW085	2003	0	0	1	0	0	0	0	0
KOGW085	2004	1	0	0	0	0	0	0	0
KOGW085	2005	1	0	0	0	0	0	0	0
KOGW085	2006	1	0	0	0	0	0	0	0
KOGW085	2007	1	0	1	0	0	0	0	0
KOGW086	2002	0	0	0	0	0	0	0	0
KOGW086	2003	0	0	1	0	0	0	0	0
KOGW086	2004	1	0	0	0	0	0	0	0
KOGW086	2005	1	0	0	0	0	0	0	0
KOGW086	2006	0	0	0	0	0	0	0	0
KOGW086	2007	0	0	1	0	0	0	0	0
KOGW087	2002	0	0	0	0	0	0	0	0
KOGW087	2003	1	0	0	0	0	0	0	0
KOGW087	2004	1	1	0	0	0	0	0	0
KOGW087	2005	1	0	0	0	0	0	0	0
KOGW087	2006	1	0	0	0	0	0	0	0
KOGW087	2007	0	0	1	0	0	0	0	0
KOGW088	2002	0	0	0	0	0	0	0	0
KOGW088	2003	0	0	0	1	0	0	0	0
KOGW088	2004	0	0	0	0	0	0	0	0
KOGW088	2005	0	0	0	0	0	0	0	0
KOGW088	2006	0	0	0	0	0	0	0	0
KOGW088	2007	0	0	0	0	0	0	0	0
KOGW089	2002	0	0	0	0	0	0	0	0
KOGW089	2003	1	0	0	0	0	0	0	0
KOGW089	2004	1	0	0	0	0	0	0	0
KOGW089	2005	1	0	0	0	0	0	0	0
KOGW089	2006	1	0	0	0	1	0	0	0
KOGW089	2007	1	0	1	0	1	0	0	0
KOGW090	2002	0	0	0	0	0	0	0	0
KOGW090	2003	0	0	0	1	0	0	0	0
KOGW090	2004	0	0	0	0	0	0	0	0
KOGW090	2005	1	0	0	0	0	0	0	0
KOGW090	2006	0	0	0	0	0	0	0	0
KOGW090	2007	0	0	0	0	0	0	0	0
KOGW091	2002	0	0	0	0	0	0	0	0
KOGW091	2003	0	0	0	0	0	0	0	0
KOGW091	2004	1	0	0	0	0	0	0	0
KOGW091	2005	1	0	0	0	0	0	0	0
KOGW091	2006	1	1	0	0	0	0	0	0
KOGW091	2007	1	0	0	0	0	0	0	0
KOGW092	2002	0	0	0	0	0	0	0	0
KOGW092	2003	0	0	0	1	0	0	0	0
KOGW092	2004	1	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW092	2005	1	0	0	0	0	0	0	0
KOGW092	2006	1	1	0	0	0	0	0	0
KOGW092	2007	1	0	0	0	1	0	0	0
KOGW093	2002	0	0	0	0	0	0	0	0
KOGW093	2003	0	0	0	0	0	0	0	0
KOGW093	2004	1	0	0	0	0	0	0	0
KOGW093	2005	1	0	0	0	0	0	0	0
KOGW093	2006	1	0	0	0	1	0	0	0
KOGW093	2007	1	0	1	0	1	0	0	0
KOGW094	2002	0	0	0	0	0	0	0	0
KOGW094	2003	0	0	0	0	0	0	0	0
KOGW094	2004	1	1	0	0	0	0	0	0
KOGW094	2005	1	1	0	0	0	0	0	0
KOGW094	2006	1	0	0	0	0	0	0	0
KOGW094	2007	1	0	0	0	0	0	0	0
KOGW095	2002	0	0	0	0	0	0	0	0
KOGW095	2003	0	0	0	0	0	0	0	0
KOGW095	2004	1	1	0	0	0	0	0	0
KOGW095	2005	0	0	0	0	0	0	0	0
KOGW095	2006	0	0	0	0	0	0	0	0
KOGW095	2007	0	0	0	0	0	0	0	0
KOGW096	2002	0	0	0	0	0	0	0	0
KOGW096	2003	0	0	0	0	0	0	0	0
KOGW096	2004	1	1	0	0	0	0	0	0
KOGW096	2005	1	0	0	0	0	0	0	0
KOGW096	2006	0	1	0	0	0	0	0	0
KOGW096	2007	1	0	0	0	1	0	0	0
KOGW097	2002	0	0	0	0	0	0	0	0
KOGW097	2003	0	0	0	0	0	0	0	0
KOGW097	2004	1	0	1	0	0	0	0	0
KOGW097	2005	0	0	0	0	0	0	0	0
KOGW097	2006	0	0	0	0	0	0	0	0
KOGW097	2007	0	0	1	0	0	0	0	0
KOGW098	2002	0	0	0	0	0	0	0	0
KOGW098	2003	0	0	0	0	0	0	0	0
KOGW098	2004	1	0	0	0	0	0	0	0
KOGW098	2005	0	0	0	0	0	0	0	0
KOGW098	2006	0	0	0	0	0	0	0	0
KOGW098	2007	0	0	0	0	0	0	0	0
KOGW099	2002	0	0	0	0	0	0	0	0
KOGW099	2003	0	0	0	0	0	0	0	0
KOGW099	2004	1	0	0	0	0	0	0	0
KOGW099	2005	1	0	0	0	0	0	0	0
KOGW099	2006	1	0	0	0	0	0	0	0
KOGW099	2007	1	0	0	0	0	0	0	0
KOGW100	2002	0	0	0	0	0	0	0	0
KOGW100	2003	0	0	0	0	0	0	0	0
KOGW100	2004	1	0	0	0	0	0	0	0
KOGW100	2005	0	0	0	0	0	0	0	0
KOGW100	2006	0	0	0	0	0	0	0	0
KOGW100	2007	0	0	0	0	0	0	0	0
KOGW101	2002	0	0	0	0	0	0	0	0
KOGW101	2003	0	0	0	0	0	0	0	0
KOGW101	2004	1	0	0	0	0	0	0	0
KOGW101	2005	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW101	2006	0	0	0	0	0	0	0	0
KOGW101	2007	0	0	0	0	0	0	0	0
KOGW102	2002	0	0	0	0	0	0	0	0
KOGW102	2003	0	0	0	0	0	0	0	0
KOGW102	2004	1	1	0	0	0	0	0	0
KOGW102	2005	1	0	0	0	0	0	0	0
KOGW102	2006	1	0	0	0	0	0	0	0
KOGW102	2007	1	0	0	0	0	0	0	0
KOGW103	2002	0	0	0	0	0	0	0	0
KOGW103	2003	0	0	0	0	0	0	0	0
KOGW103	2004	1	1	0	0	0	0	0	0
KOGW103	2005	1	0	0	0	0	0	0	0
KOGW103	2006	1	0	1	0	0	0	0	0
KOGW103	2007	1	0	1	0	0	0	0	0
KOGW104	2002	0	0	0	0	0	0	0	0
KOGW104	2003	0	0	0	0	0	0	0	0
KOGW104	2004	1	1	1	0	0	0	0	0
KOGW104	2005	1	0	0	0	0	0	0	0
KOGW104	2006	0	0	0	0	0	0	0	0
KOGW104	2007	0	0	0	0	0	0	0	0
KOGW105	2002	0	0	0	0	0	0	0	0
KOGW105	2003	0	0	0	0	0	0	0	0
KOGW105	2004	0	1	0	0	0	0	0	0
KOGW105	2005	1	0	0	1	1	0	0	0
KOGW105	2006	1	0	0	1	0	0	0	0
KOGW105	2007	1	0	0	0	0	0	0	0
KOGW106	2002	0	0	0	0	0	0	0	0
KOGW106	2003	0	0	0	0	0	0	0	0
KOGW106	2004	1	0	0	0	0	0	0	0
KOGW106	2005	1	0	0	0	0	0	0	0
KOGW106	2006	1	0	0	0	0	0	0	0
KOGW106	2007	0	0	0	0	0	0	0	0
KOGW107	2002	0	0	0	0	0	0	0	0
KOGW107	2003	0	0	0	0	0	0	0	0
KOGW107	2004	1	0	0	0	0	0	0	0
KOGW107	2005	1	0	0	0	0	0	0	0
KOGW107	2006	1	0	0	0	0	0	0	0
KOGW107	2007	1	0	0	0	0	0	0	0
KOGW108	2002	0	0	0	0	0	0	0	0
KOGW108	2003	0	0	0	0	0	0	0	0
KOGW108	2004	1	0	0	0	0	0	0	0
KOGW108	2005	1	0	0	0	0	0	0	0
KOGW108	2006	1	0	0	0	1	0	0	0
KOGW108	2007	1	0	1	0	0	0	0	0
KOGW109	2002	0	0	0	0	0	0	0	0
KOGW109	2003	0	0	0	0	0	0	0	0
KOGW109	2004	1	1	0	0	0	0	0	0
KOGW109	2005	1	0	0	0	0	0	0	0
KOGW109	2006	1	0	0	0	0	0	0	0
KOGW109	2007	0	0	0	0	0	0	0	0
KOGW110	2002	0	0	0	0	0	0	0	0
KOGW110	2003	0	0	0	0	0	0	0	0
KOGW110	2004	1	1	0	0	0	0	0	0
KOGW110	2005	1	0	1	0	0	0	0	0
KOGW110	2006	0	0	1	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW110	2007	0	0	1	0	0	0	0	0
KOGW111	2002	0	0	0	0	0	0	0	0
KOGW111	2003	0	0	0	0	0	0	0	0
KOGW111	2004	1	0	0	0	0	0	0	0
KOGW111	2005	1	0	0	0	0	0	0	0
KOGW111	2006	0	0	0	0	0	0	0	0
KOGW111	2007	0	0	0	0	0	0	0	0
KOGW112	2002	0	0	0	0	0	0	0	0
KOGW112	2003	0	0	0	0	0	0	0	0
KOGW112	2004	1	0	0	0	0	0	0	0
KOGW112	2005	1	0	0	0	0	0	0	0
KOGW112	2006	1	1	0	0	0	0	0	0
KOGW112	2007	1	0	0	0	1	0	0	0
KOGW113	2002	0	0	0	0	0	0	0	0
KOGW113	2003	0	0	0	0	0	0	0	0
KOGW113	2004	1	0	0	0	0	0	0	0
KOGW113	2005	1	0	0	0	0	0	0	0
KOGW113	2006	1	0	0	0	0	0	0	0
KOGW113	2007	1	0	0	0	0	0	0	0
KOGW114	2002	0	0	0	0	0	0	0	0
KOGW114	2003	0	0	0	0	0	0	0	0
KOGW114	2004	1	0	0	0	0	0	0	0
KOGW114	2005	1	0	0	0	0	0	0	0
KOGW114	2006	0	0	1	0	0	0	0	0
KOGW114	2007	0	0	1	1	0	0	0	0
KOGW115	2002	0	0	0	0	0	0	0	0
KOGW115	2003	0	0	0	0	0	0	0	0
KOGW115	2004	1	0	0	0	0	0	0	0
KOGW115	2005	1	1	0	0	0	0	0	0
KOGW115	2006	1	0	0	0	1	0	0	0
KOGW115	2007	0	0	1	0	0	0	0	0
KOGW116	2002	0	0	0	0	0	0	0	0
KOGW116	2003	0	0	0	0	0	0	0	0
KOGW116	2004	0	1	0	0	0	0	0	0
KOGW116	2005	1	0	0	0	0	0	0	0
KOGW116	2006	1	0	0	0	0	0	0	0
KOGW116	2007	1	1	1	0	0	0	0	0
KOGW117	2002	0	0	0	0	0	0	0	0
KOGW117	2003	0	0	0	0	0	0	0	0
KOGW117	2004	0	0	0	0	0	0	0	0
KOGW117	2005	1	0	0	0	0	0	0	0
KOGW117	2006	1	0	0	0	1	0	0	0
KOGW117	2007	1	0	0	0	1	0	0	0
KOGW118	2002	0	0	0	0	0	0	0	0
KOGW118	2003	0	0	0	0	0	0	0	0
KOGW118	2004	0	0	0	0	0	0	0	0
KOGW118	2005	1	0	0	0	0	0	0	0
KOGW118	2006	1	0	0	0	0	0	0	0
KOGW118	2007	0	0	1	0	0	0	0	0
KOGW119	2002	0	0	0	0	0	0	0	0
KOGW119	2003	0	0	0	0	0	0	0	0
KOGW119	2004	0	0	0	0	0	0	0	0
KOGW119	2005	1	0	0	0	0	0	0	0
KOGW119	2006	0	1	1	0	0	0	0	0
KOGW119	2007	0	0	1	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW120	2002	0	0	0	0	0	0	0	0
KOGW120	2003	0	0	0	0	0	0	0	0
KOGW120	2004	0	0	0	0	0	0	0	0
KOGW120	2005	1	0	0	0	0	0	0	0
KOGW120	2006	0	0	0	0	0	0	0	0
KOGW120	2007	0	0	0	0	0	0	0	0
KOGW121	2002	0	0	0	0	0	0	0	0
KOGW121	2003	0	0	0	0	0	0	0	0
KOGW121	2004	0	0	0	0	0	0	0	0
KOGW121	2005	1	0	0	0	0	0	0	0
KOGW121	2006	1	0	0	0	0	0	0	0
KOGW121	2007	0	0	0	0	0	0	0	0
KOGW122	2002	0	0	0	0	0	0	0	0
KOGW122	2003	0	0	0	0	0	0	0	0
KOGW122	2004	0	0	0	0	0	0	0	0
KOGW122	2005	0	0	0	0	0	1	0	0
KOGW122	2006	0	0	0	0	0	0	0	0
KOGW122	2007	0	0	0	0	0	0	0	0
KOGW123	2002	0	0	0	0	0	0	0	0
KOGW123	2003	0	0	0	0	0	0	0	0
KOGW123	2004	0	0	0	0	0	0	0	0
KOGW123	2005	0	1	0	0	0	0	1	0
KOGW123	2006	0	0	1	0	0	0	0	0
KOGW123	2007	0	0	1	0	0	0	0	0
KOGW124	2002	0	0	0	0	0	0	0	0
KOGW124	2003	0	0	0	0	0	0	0	0
KOGW124	2004	0	0	0	0	0	0	0	0
KOGW124	2005	1	0	0	0	0	0	0	0
KOGW124	2006	1	0	0	0	0	0	0	0
KOGW124	2007	1	0	0	1	0	0	0	0
KOGW125	2002	0	0	0	0	0	0	0	0
KOGW125	2003	0	0	0	0	0	0	0	0
KOGW125	2004	0	0	0	0	0	0	0	0
KOGW125	2005	1	0	0	0	0	0	0	0
KOGW125	2006	1	0	0	0	0	0	0	0
KOGW125	2007	1	0	0	0	0	0	0	0
KOGW126	2002	0	0	0	0	0	0	0	0
KOGW126	2003	0	0	0	0	0	0	0	0
KOGW126	2004	0	0	0	0	0	0	0	0
KOGW126	2005	1	0	0	0	0	0	0	0
KOGW126	2006	0	0	0	0	0	0	0	0
KOGW126	2007	0	0	0	0	0	0	0	0
KOGW127	2002	0	0	0	0	0	0	0	0
KOGW127	2003	0	0	0	0	0	0	0	0
KOGW127	2004	0	0	0	0	0	0	0	0
KOGW127	2005	1	0	0	0	0	0	0	0
KOGW127	2006	1	0	0	0	0	0	0	0
KOGW127	2007	1	0	0	0	0	0	0	0
KOGW128	2002	0	0	0	0	0	0	0	0
KOGW128	2003	0	0	0	0	0	0	0	0
KOGW128	2004	0	0	0	0	0	0	0	0
KOGW128	2005	1	0	0	0	0	0	0	0
KOGW128	2006	0	0	0	0	0	0	0	0
KOGW128	2007	0	0	0	0	0	0	0	0
KOGW129	2002	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW129	2003	0	0	0	0	0	0	0	0
KOGW129	2004	0	0	0	0	0	0	0	0
KOGW129	2005	1	0	0	0	0	0	0	0
KOGW129	2006	1	0	0	0	0	0	0	0
KOGW129	2007	1	0	0	0	1	0	0	0
KOGW130	2002	0	0	0	0	0	0	0	0
KOGW130	2003	0	0	0	0	0	0	0	0
KOGW130	2004	0	0	0	0	0	0	0	0
KOGW130	2005	1	0	0	0	0	0	0	0
KOGW130	2006	0	0	0	0	0	0	0	0
KOGW130	2007	0	0	0	0	0	0	0	0
KOGW131	2002	0	0	0	0	0	0	0	0
KOGW131	2003	0	0	0	0	0	0	0	0
KOGW131	2004	0	0	0	0	0	0	0	0
KOGW131	2005	1	0	0	0	0	0	0	0
KOGW131	2006	0	0	0	0	0	0	0	0
KOGW131	2007	0	0	0	0	0	0	0	0
KOGW132	2002	0	0	0	0	0	0	0	0
KOGW132	2003	0	0	0	0	0	0	0	0
KOGW132	2004	0	0	0	0	0	0	0	0
KOGW132	2005	1	0	0	0	0	0	0	0
KOGW132	2006	1	0	0	0	0	0	0	0
KOGW132	2007	1	0	0	0	1	0	0	0
KOGW133	2002	0	0	0	0	0	0	0	0
KOGW133	2003	0	0	0	0	0	0	0	0
KOGW133	2004	0	0	0	0	0	0	0	0
KOGW133	2005	1	0	0	0	0	0	0	0
KOGW133	2006	1	0	0	0	1	0	0	0
KOGW133	2007	0	0	0	0	0	0	0	0
KOGW134	2002	0	0	0	0	0	0	0	0
KOGW134	2003	0	0	0	0	0	0	0	0
KOGW134	2004	0	0	0	0	0	0	0	0
KOGW134	2005	1	1	0	0	0	0	0	0
KOGW134	2006	0	0	0	0	0	0	0	0
KOGW134	2007	0	0	0	0	0	0	0	0
KOGW135	2002	0	0	0	0	0	0	0	0
KOGW135	2003	0	0	0	0	0	0	0	0
KOGW135	2004	0	1	0	0	0	0	0	0
KOGW135	2005	0	1	0	0	0	0	0	0
KOGW135	2006	1	0	0	0	0	0	0	0
KOGW135	2007	0	1	1	0	0	0	0	0
KOGW136	2002	0	0	0	0	0	0	0	0
KOGW136	2003	0	0	0	0	0	0	0	0
KOGW136	2004	0	0	0	0	0	0	0	0
KOGW136	2005	0	0	0	0	0	0	0	0
KOGW136	2006	1	0	0	0	1	0	0	0
KOGW136	2007	1	0	0	0	1	0	0	0
KOGW137	2002	0	0	0	0	0	0	0	0
KOGW137	2003	0	0	0	0	0	0	0	0
KOGW137	2004	0	0	0	0	0	0	0	0
KOGW137	2005	0	0	0	0	0	0	0	0
KOGW137	2006	1	1	0	1	0	0	0	0
KOGW137	2007	1	1	0	0	1	0	0	0
KOGW138	2002	0	0	0	0	0	0	0	0
KOGW138	2003	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW138	2004	0	0	0	0	0	0	0	0
KOGW138	2005	0	0	0	0	0	0	0	0
KOGW138	2006	1	1	0	0	0	0	0	0
KOGW138	2007	1	0	0	0	0	0	0	0
KOGW139	2002	0	0	0	0	0	0	0	0
KOGW139	2003	0	0	0	0	0	0	0	0
KOGW139	2004	0	0	0	0	0	0	0	0
KOGW139	2005	0	0	0	0	0	0	0	0
KOGW139	2006	1	0	0	0	0	0	0	0
KOGW139	2007	0	0	0	0	0	0	0	0
KOGW140	2002	0	0	0	0	0	0	0	0
KOGW140	2003	0	0	0	0	0	0	0	0
KOGW140	2004	0	0	0	0	0	0	0	0
KOGW140	2005	0	0	0	0	0	0	0	0
KOGW140	2006	1	0	0	0	0	0	0	0
KOGW140	2007	0	0	0	0	0	0	0	0
KOGW141	2002	0	0	0	0	0	0	0	0
KOGW141	2003	0	0	0	0	0	0	0	0
KOGW141	2004	0	0	0	0	0	0	0	0
KOGW141	2005	0	0	0	0	0	0	0	0
KOGW141	2006	1	0	0	0	0	0	0	0
KOGW141	2007	0	0	0	0	0	0	0	0
KOGW142	2002	0	0	0	0	0	0	0	0
KOGW142	2003	0	0	0	0	0	0	0	0
KOGW142	2004	0	0	0	0	0	0	0	0
KOGW142	2005	0	0	0	0	0	0	0	0
KOGW142	2006	1	0	0	0	0	0	0	0
KOGW142	2007	0	0	0	0	0	0	0	0
KOGW143	2002	0	0	0	0	0	0	0	0
KOGW143	2003	0	0	0	0	0	0	0	0
KOGW143	2004	0	0	0	0	0	0	0	0
KOGW143	2005	0	0	0	0	0	0	0	0
KOGW143	2006	1	0	0	0	0	0	0	0
KOGW143	2007	0	0	0	0	0	0	0	0
KOGW144	2002	0	0	0	0	0	0	0	0
KOGW144	2003	0	0	0	0	0	0	0	0
KOGW144	2004	0	0	0	0	0	0	0	0
KOGW144	2005	0	0	0	0	0	0	0	0
KOGW144	2006	1	0	0	0	0	0	0	0
KOGW144	2007	1	0	0	0	0	0	0	0
KOGW145	2002	0	0	0	0	0	0	0	0
KOGW145	2003	0	0	0	0	0	0	0	0
KOGW145	2004	0	0	0	0	0	0	0	0
KOGW145	2005	0	0	0	0	0	0	0	0
KOGW145	2006	1	0	0	0	0	0	0	0
KOGW145	2007	0	1	1	0	0	0	0	0
KOGW146	2002	0	0	0	0	0	0	0	0
KOGW146	2003	0	0	0	0	0	0	0	0
KOGW146	2004	0	0	0	0	0	0	0	0
KOGW146	2005	0	0	0	0	0	0	0	0
KOGW146	2006	1	0	0	0	0	0	0	0
KOGW146	2007	1	0	0	0	0	0	0	0
KOGW147	2002	0	0	0	0	0	0	0	0
KOGW147	2003	0	0	0	0	0	0	0	0
KOGW147	2004	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW147	2005	0	0	0	0	0	0	0	0
KOGW147	2006	1	0	0	0	0	0	0	0
KOGW147	2007	1	1	0	0	0	0	0	0
KOGW148	2002	0	0	0	0	0	0	0	0
KOGW148	2003	0	0	0	0	0	0	0	0
KOGW148	2004	0	0	0	0	0	0	0	0
KOGW148	2005	0	0	0	0	0	0	0	0
KOGW148	2006	0	0	0	0	0	0	0	0
KOGW148	2007	1	0	0	0	0	0	0	0
KOGW149	2002	0	0	0	0	0	0	0	0
KOGW149	2003	0	0	0	0	0	0	0	0
KOGW149	2004	0	0	0	0	0	0	0	0
KOGW149	2005	0	0	0	0	0	0	0	0
KOGW149	2006	0	0	0	0	0	0	0	0
KOGW149	2007	1	0	0	0	0	0	0	0
KOGW150	2002	0	0	0	0	0	0	0	0
KOGW150	2003	0	0	0	0	0	0	0	0
KOGW150	2004	0	0	0	0	0	0	0	0
KOGW150	2005	0	0	0	0	0	0	0	0
KOGW150	2006	0	0	0	0	0	0	0	0
KOGW150	2007	1	0	0	0	0	0	0	0
KOGW151	2002	0	0	0	0	0	0	0	0
KOGW151	2003	0	0	0	0	0	0	0	0
KOGW151	2004	0	0	0	0	0	0	0	0
KOGW151	2005	0	0	0	0	0	0	0	0
KOGW151	2006	0	0	0	0	0	0	0	0
KOGW151	2007	1	0	0	0	0	0	0	0
KOGW152	2002	0	0	0	0	0	0	0	0
KOGW152	2003	0	0	0	0	0	0	0	0
KOGW152	2004	0	0	0	0	0	0	0	0
KOGW152	2005	0	0	0	0	0	0	0	0
KOGW152	2006	0	0	0	0	0	0	0	0
KOGW152	2007	1	0	0	0	0	0	0	0
KOGW153	2002	0	0	0	0	0	0	0	0
KOGW153	2003	0	0	0	0	0	0	0	0
KOGW153	2004	0	0	0	0	0	0	0	0
KOGW153	2005	0	0	0	0	0	0	0	0
KOGW153	2006	0	0	0	0	0	0	0	0
KOGW153	2007	1	0	0	0	0	0	0	0
KOGW154	2002	0	0	0	0	0	0	0	0
KOGW154	2003	0	0	0	0	0	0	0	0
KOGW154	2004	0	0	0	0	0	0	0	0
KOGW154	2005	0	0	0	0	0	0	0	0
KOGW154	2006	0	0	0	0	0	0	0	0
KOGW154	2007	1	0	0	0	0	0	0	0
KOGW155	2002	0	0	0	0	0	0	0	0
KOGW155	2003	0	0	0	0	0	0	0	0
KOGW155	2004	0	0	0	0	0	0	0	0
KOGW155	2005	0	0	0	0	0	0	0	0
KOGW155	2006	0	0	0	0	0	0	0	0
KOGW155	2007	1	0	0	0	0	0	0	0
KOGW156	2002	0	0	0	0	0	0	0	0
KOGW156	2003	0	0	0	0	0	0	0	0
KOGW156	2004	0	0	0	0	0	0	0	0
KOGW156	2005	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW156	2006	0	0	0	0	0	0	0	0
KOGW156	2007	1	0	0	0	0	0	0	0
KOGW157	2002	0	0	0	0	0	0	0	0
KOGW157	2003	0	0	0	0	0	0	0	0
KOGW157	2004	0	0	0	0	0	0	0	0
KOGW157	2005	0	0	0	0	0	0	0	0
KOGW157	2006	0	0	0	0	0	0	0	0
KOGW157	2007	1	0	0	0	0	0	0	0
KOGW158	2002	0	0	0	0	0	0	0	0
KOGW158	2003	0	0	0	0	0	0	0	0
KOGW158	2004	0	0	0	0	0	0	0	0
KOGW158	2005	0	0	0	0	0	0	0	0
KOGW158	2006	0	0	0	0	0	0	0	0
KOGW158	2007	0	0	1	0	0	0	0	0
KOGW159	2002	0	0	0	0	0	0	0	0
KOGW159	2003	0	0	0	0	0	0	0	0
KOGW159	2004	0	0	0	0	0	0	0	0
KOGW159	2005	0	0	0	0	0	0	0	0
KOGW159	2006	0	0	0	0	0	0	0	0
KOGW159	2007	1	0	1	0	0	0	0	0
KOGW160	2002	0	0	0	0	0	0	0	0
KOGW160	2003	0	0	0	0	0	0	0	0
KOGW160	2004	0	0	0	0	0	0	0	0
KOGW160	2005	0	0	0	0	0	0	0	0
KOGW160	2006	0	0	0	0	0	0	0	0
KOGW160	2007	1	0	0	0	0	0	0	0
KOGW161	2002	0	0	0	0	0	0	0	0
KOGW161	2003	0	0	0	0	0	0	0	0
KOGW161	2004	0	0	0	0	0	0	0	0
KOGW161	2005	0	0	0	0	0	0	0	0
KOGW161	2006	0	0	0	0	1	0	0	0
KOGW161	2007	1	0	0	0	0	0	0	0
KOGW0T1	2002	1	0	0	0	0	0	0	0
KOGW0T1	2003	0	0	0	0	0	0	0	0
KOGW0T1	2004	0	0	0	0	0	0	0	0
KOGW0T1	2005	0	0	0	0	0	0	0	0
KOGW0T1	2006	0	0	0	0	0	0	0	0
KOGW0T1	2007	0	0	0	0	0	0	0	0
KOGW0T3	2002	0	0	0	0	0	0	0	0
KOGW0T3	2003	0	0	0	0	0	0	0	0
KOGW0T3	2004	0	0	0	0	0	0	0	0
KOGW0T3	2005	0	0	0	0	0	0	0	0
KOGW0T3	2006	1	0	0	0	0	0	0	0
KOGW0T3	2007	0	0	0	0	0	0	0	0
KOGW0T5	2002	0	0	0	0	0	0	0	0
KOGW0T5	2003	0	0	0	0	0	0	0	0
KOGW0T5	2004	0	0	0	0	0	0	0	0
KOGW0T5	2005	0	0	0	0	0	0	0	0
KOGW0T5	2006	0	1	0	0	0	0	0	0
KOGW0T5	2007	0	0	0	0	0	0	0	0
KOGW0T6	2002	0	0	0	0	0	0	0	0
KOGW0T6	2003	0	0	0	0	0	0	0	0
KOGW0T6	2004	0	0	0	0	0	0	0	0
KOGW0T6	2005	0	0	0	0	0	0	0	0
KOGW0T6	2006	0	1	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
KOGW0T6	2007	0	0	0	0	0	0	0	0
KOGW0T7	2002	0	0	0	0	0	0	0	0
KOGW0T7	2003	0	0	0	0	0	0	0	0
KOGW0T7	2004	0	0	0	0	0	0	0	0
KOGW0T7	2005	0	0	0	0	0	0	0	0
KOGW0T7	2006	0	1	0	0	0	0	0	0
KOGW0T7	2007	0	0	0	0	0	0	0	0
KOGW0T9	2002	0	0	0	0	0	0	0	0
KOGW0T9	2003	0	0	0	0	0	0	0	0
KOGW0T9	2004	0	0	0	0	0	0	0	0
KOGW0T9	2005	0	0	0	0	0	0	0	0
KOGW0T9	2006	0	0	0	0	0	0	0	0
KOGW0T9	2007	1	0	0	0	0	0	0	0
KOGW0T10	2002	0	0	0	0	0	0	0	0
KOGW0T10	2003	0	0	0	0	0	0	0	0
KOGW0T10	2004	0	0	0	0	0	0	0	0
KOGW0T10	2005	0	0	0	0	0	0	0	0
KOGW0T10	2006	0	0	0	0	0	0	0	0
KOGW0T10	2007	0	0	0	0	0	0	0	0
KOGW0T11	2002	0	0	0	0	0	0	0	0
KOGW0T11	2003	0	0	0	0	0	0	0	0
KOGW0T11	2004	0	0	0	0	0	0	0	0
KOGW0T11	2005	0	0	0	0	0	0	0	0
KOGW0T11	2006	0	0	0	0	0	0	0	0
KOGW0T11	2007	0	0	1	0	0	0	0	0
KOGW0T12	2002	0	0	0	0	0	0	0	0
KOGW0T12	2003	0	0	0	0	0	0	0	0
KOGW0T12	2004	0	0	0	0	0	0	0	0
KOGW0T12	2005	0	0	0	0	0	0	0	0
KOGW0T12	2006	0	0	0	0	0	0	0	0
KOGW0T12	2007	0	0	1	0	0	0	0	0
KOGW0T13	2002	0	0	0	0	0	0	0	0
KOGW0T13	2003	0	0	0	0	0	0	0	0
KOGW0T13	2004	0	0	0	0	0	0	0	0
KOGW0T1	2005	0	0	0	0	0	0	0	0

KOGW000	Year	Piltun		Offshore		Chayvo	Elizabeth	Okha	Arkutun-Dagi
		Piltun	NPiltun	Offshore	W_Offshore				
3									
KOGW0T13	2006	0	0	0	0	0	0	0	0
KOGW0T13	2007	0	0	1	0	0	0	0	0

Table A6. Number of sightings of identified gray whales by site off NE Sakhalin Island, 2007

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW001	20070803	Piltun				
KOGW001	20070814	Piltun				
KOGW001	20070821	Piltun				
KOGW001	20070903	Offshore				
KOGW001	20070913	Offshore				
KOGW001	20070913	Offshore				
KOGW001	20071005	Offshore	4	3		7
KOGW002	20070726	Chayvo				
KOGW002	20070727	Piltun				
KOGW002	20070804	Piltun				
KOGW002	20070807	W_Offshore				
KOGW002	20070814	Piltun	1	3	1	5
KOGW005	20070917	Piltun				
KOGW005	20071005	Offshore	1	1		2
KOGW006	20070828	Piltun				
KOGW006	20070828	Piltun				
KOGW006	20070916	Offshore	1	2		3
KOGW007	20070815	Offshore				
KOGW007	20070818	Offshore				
KOGW007	20070825	Offshore				
KOGW007	20070830	Piltun	3	1		4
KOGW008	20070819	Offshore				
KOGW008	20070901	Offshore				
KOGW008	20070903	Offshore				
KOGW008	20070911	Offshore				
KOGW008	20070916	Offshore				
KOGW008	20071005	Offshore	6			6
KOGW009	20070710	Piltun				
KOGW009	20070726	Piltun				
KOGW009	20070729	Piltun				
KOGW009	20070826	Piltun				
KOGW009	20070826	Piltun				
KOGW009	20070809	Piltun				
KOGW009	20070831	Piltun				
KOGW009	20070909	Piltun				
KOGW009	20070911	Offshore				
KOGW009	20070916	Offshore	2	8		10
KOGW010	20070807	Piltun				
KOGW010	20070808	Piltun				
KOGW010	20070821	Piltun				
KOGW010	20070831	Chayvo				
KOGW010	20070913	Offshore				
KOGW010	20071001	W_Offshore				
KOGW010	20071005	Offshore	3	3	1	7
KOGW011	20070807	Piltun				
KOGW011	20070908	Piltun				
KOGW011	20071005	Offshore	1	2		3
KOGW012	20070714	Piltun				
KOGW012	20070815	Offshore				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW012	20070817	Offshore				
KOGW012	20070819	Offshore				
KOGW012	20070911	Offshore				
KOGW012	20070916	Offshore				
KOGW012	20071001	W_Offshore				
KOGW012	20071005	Offshore	7	1		8
KOGW013	20070901	Offshore				
KOGW013	20070911	Offshore				
KOGW013	20070913	Offshore				
KOGW013	20071005	Offshore	4			4
KOGW014	20070817	Offshore				
KOGW014	20070819	Offshore				
KOGW014	20070911	Offshore				
KOGW014	20070913	Offshore	4			4
KOGW015	20070807	Piltun				
KOGW015	20070826	Piltun				
KOGW015	20070830	Piltun				
KOGW015	20070831	Piltun				
KOGW015	20070916	Offshore				
KOGW015	20071005	Offshore	2	4		6
KOGW016	20070807	Piltun				
KOGW016	20070804	Piltun				
KOGW016	20070828	Piltun				
KOGW016	20070908	Piltun				
KOGW016	20070828	Piltun				
KOGW016	20070909	Piltun				
KOGW016	20070917	Piltun		7		7
KOGW017	20070710	Piltun				
KOGW017	20070711	NPiltun				
KOGW017	20070815	Offshore				
KOGW017	20070817	Offshore				
KOGW017	20070817	Offshore				
KOGW017	20070819	Offshore				
KOGW017	20070916	Offshore				
KOGW017	20071005	Offshore	6	2		8
KOGW019	20070817	Offshore				
KOGW019	20070819	Offshore				
KOGW019	20070903	Offshore				
KOGW019	20070916	Offshore	4			4
KOGW020	20070725	Piltun				
KOGW020	20070726	Piltun				
KOGW020	20070727	Piltun				
KOGW020	20070903	Offshore				
KOGW020	20070906	Offshore				
KOGW020	20070916	Offshore				
KOGW020	20071005	Offshore				
KOGW020	20071005	Offshore	5	3		8
KOGW021	20070817	Offshore				
KOGW021	20070819	Offshore				
KOGW021	20070911	Offshore				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW021	20070912	Offshore	4			4
KOGW022	20070917	Piltun	1			1
KOGW024	20070807	Piltun				
KOGW024	20070808	Piltun				
KOGW024	20070729	Piltun				
KOGW024	20070804	Piltun				
KOGW024	20070913	Offshore				
KOGW024	20070916	Offshore	2	4		6
KOGW025	20070727	Piltun				
KOGW025	20070729	Piltun				
KOGW025	20071005	Offshore	1	2		3
KOGW027	20070803	Piltun				
KOGW027	20070828	Piltun				
KOGW027	20070830	Piltun				
KOGW027	20070908	Piltun				
KOGW027	20070917	Piltun		5		5
KOGW028	20070804	Piltun				
KOGW028	20070821	Piltun				
KOGW028	20070826	Piltun				
KOGW028	20070908	Piltun				
KOGW028	20070909	Piltun				
KOGW028	20070917	Piltun				
KOGW028	20070918	Piltun				
KOGW028	20070920	Piltun		8		8
KOGW029	20070807	Piltun				
KOGW029	20070727	Piltun				
KOGW029	20070803	Piltun				
KOGW029	20070826	Piltun				
KOGW029	20070831	Piltun				
KOGW029	20070909	Piltun				
KOGW029	20071005	Offshore	1	6		7
KOGW030	20070807	Piltun				
KOGW030	20070711	NPiltun				
KOGW030	20070804	Piltun				
KOGW030	20070806	Piltun				
KOGW030	20070817	Offshore				
KOGW030	20070817	Offshore				
KOGW030	20070911	Offshore				
KOGW030	20070912	Offshore				
KOGW030	20070913	Offshore				
KOGW030	20070916	Offshore				
KOGW030	20071001	W_Offshore	7	4		11
KOGW031	20070821	Piltun				
KOGW031	20070908	Piltun				
KOGW031	20070828	NPiltun				
KOGW031	20070920	Piltun		4		4
KOGW032	20070815	Offshore				
KOGW032	20070819	Offshore				
KOGW032	20070821	Piltun				
KOGW032	20070903	Offshore				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW032	20070912	Offshore				
KOGW032	20070913	Offshore				
KOGW032	20070913	Offshore				
KOGW032	20070916	Offshore	7	1		8
KOGW033	20070903	Offshore				
KOGW033	20070912	Offshore				
KOGW033	20071005	Offshore	3			3
KOGW034	20070803	Piltun				
KOGW034	20070826	Piltun				
KOGW034	20070830	Piltun				
KOGW034	20070831	Piltun				
KOGW034	20070909	Piltun				
KOGW034	20070917	Piltun				
KOGW034	20070918	Piltun		7		7
KOGW035	20070727	Piltun				
KOGW035	20070729	Piltun				
KOGW035	20070814	Piltun				
KOGW035	20070831	Piltun				
KOGW035	20070909	Piltun				
KOGW035	20070917	Piltun				
KOGW035	20071005	Offshore	1	6		7
KOGW036	20070803	Piltun				
KOGW036	20070817	Offshore				
KOGW036	20070819	Offshore				
KOGW036	20070912	Offshore				
KOGW036	20070916	Offshore	4	1		5
KOGW037	20070817	Offshore				
KOGW037	20070821	Piltun				
KOGW037	20070903	Offshore				
KOGW037	20070913	Offshore	3	1		4
KOGW038	20070710	Piltun				
KOGW038	20070803	Piltun				
KOGW038	20070826	Piltun				
KOGW038	20070904	Piltun				
KOGW038	20070830	Piltun				
KOGW038	20070917	Piltun				
KOGW038	20070831	Piltun				
KOGW038	20070918	Piltun				
KOGW038	20070920	Piltun				
KOGW038	20070926	Piltun		10		10
KOGW039	20070726	Piltun				
KOGW039	20070807	Piltun				
KOGW039	20070821	Piltun				
KOGW039	20070826	Piltun				
KOGW039	20070830	Piltun				
KOGW039	20070911	Offshore				
KOGW039	20070913	Offshore				
KOGW039	20070916	Offshore				
KOGW039	20071005	Offshore	4	5		9
KOGW040	20071005	Offshore	1			1

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW041	20070726	Piltun				
KOGW041	20070804	Piltun				
KOGW041	20070806	Piltun				
KOGW041	20070909	Piltun				
KOGW041	20070909	Piltun				
KOGW041	20070917	Piltun				
KOGW041	20071005	Offshore	1	6		7
KOGW042	20070710	Piltun				
KOGW042	20070727	Piltun				
KOGW042	20070912	Offshore				
KOGW042	20070916	Offshore				
KOGW042	20071005	Offshore	3	2		5
KOGW043	20070828	Piltun				
KOGW043	20070829	Piltun				
KOGW043	20070831	Piltun				
KOGW043	20070909	Piltun		4		4
KOGW044	20070821	Piltun				
KOGW044	20070826	Piltun				
KOGW044	20070830	Piltun				
KOGW044	20070917	Piltun				
KOGW044	20070918	Piltun				
KOGW044	20070920	Piltun		6		6
KOGW045	20070815	Offshore				
KOGW045	20070903	Offshore				
KOGW045	20070912	Offshore				
KOGW045	20070913	Offshore				
KOGW045	20070913	Offshore				
KOGW045	20070916	Offshore	6			6
KOGW046	20070903	Offshore				
KOGW046	20070911	Offshore				
KOGW046	20070912	Offshore				
KOGW046	20070913	Offshore				
KOGW046	20070916	Offshore	5			5
KOGW047	20070909	Piltun				
KOGW047	20070916	Chai-vo				
KOGW047	20070926	Piltun		2	1	3
KOGW048	20070804	Piltun				
KOGW048	20070909	Piltun				
KOGW048	20071005	Offshore	1	2		3
KOGW049	20070804	Piltun				
KOGW049	20070817	Offshore				
KOGW049	20070911	Offshore				
KOGW049	20070913	Offshore	3	1		4
KOGW050	20070711	Piltun				
KOGW050	20070828	Piltun				
KOGW050	20070828	Piltun				
KOGW050	20070926	Piltun		4		4
KOGW051	20070729	Piltun				
KOGW051	20070912	Offshore				
KOGW051	20070916	Offshore	2	1		3

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW053	20070807	Piltun				
KOGW053	20070808	Piltun				
KOGW053	20070710	Piltun				
KOGW053	20070725	Piltun				
KOGW053	20070726	Piltun				
KOGW053	20070727	Piltun				
KOGW053	20070729	Piltun				
KOGW053	20070803	Piltun				
KOGW053	20070826	Piltun				
KOGW053	20070828	Piltun				
KOGW053	20070829	Piltun		12		12
KOGW054	20070725	Piltun				
KOGW054	20070726	Piltun				
KOGW054	20070727	Piltun				
KOGW054	20070803	Piltun				
KOGW054	20070817	Offshore				
KOGW054	20070817	Offshore				
KOGW054	20070817	Offshore				
KOGW054	20070903	Offshore				
KOGW054	20070912	Offshore				
KOGW054	20070913	Offshore				
KOGW054	20070916	Offshore				
KOGW054	20071005	Offshore	7	4		11
KOGW055	20070727	Piltun				
KOGW055	20070729	Piltun				
KOGW055	20070826	Piltun				
KOGW055	20070826	Piltun				
KOGW055	20070908	Piltun				
KOGW055	20070828	Piltun				
KOGW055	20070829	Piltun				
KOGW055	20070909	Piltun				
KOGW055	20070920	Piltun				
KOGW055	20071005	Offshore	1	9		10
KOGW056	20070727	Piltun				
KOGW056	20070908	Piltun				
KOGW056	20070831	Piltun				
KOGW056	20070917	Piltun				
KOGW056	20070917	Piltun				
KOGW056	20070920	Piltun		6		6
KOGW057	20070711	Piltun				
KOGW057	20070727	Piltun				
KOGW057	20070911	Offshore				
KOGW057	20070912	Offshore				
KOGW057	20070913	Offshore				
KOGW057	20070913	Offshore				
KOGW057	20070916	Offshore				
KOGW057	20071005	Offshore	6	2		8
KOGW058	20070803	Piltun				
KOGW058	20070804	Piltun				
KOGW058	20070830	Piltun				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW058	20070910	Chai-vo				
KOGW058	20071005	Offshore	1	3	1	5
KOGW059	20070807	Piltun				
KOGW059	20070729	Piltun				
KOGW059	20070803	Piltun				
KOGW059	20070826	Piltun				
KOGW059	20070826	Piltun				
KOGW059	20070828	Piltun				
KOGW059	20070830	Piltun				
KOGW059	20070831	Piltun				
KOGW059	20070916	Offshore				
KOGW059	20071005	Offshore	2	8		10
KOGW060	20070913	Offshore				
KOGW060	20070916	Offshore	2			2
KOGW061	20070831	Piltun				
KOGW061	20070911	Offshore				
KOGW061	20070913	Offshore				
KOGW061	20070913	Offshore				
KOGW061	20070916	Offshore				
KOGW061	20071005	Offshore	5	1		6
KOGW062	20070803	Piltun				
KOGW062	20070806	Piltun				
KOGW062	20071005	Offshore	1	2		3
KOGW063	20070821	Piltun				
KOGW063	20070831	Piltun				
KOGW063	20070909	Piltun				
KOGW063	20070909	Piltun				
KOGW063	20070918	Piltun				
KOGW063	20070926	Piltun				
KOGW063	20071003	Piltun		7		7
KOGW064	20070826	Piltun				
KOGW064	20070909	Piltun				
KOGW064	20070916	Chayvo		2	1	3
KOGW066	20070917	Piltun				
KOGW066	20070920	Piltun		2		2
KOGW067	20070821	Piltun				
KOGW067	20070917	Piltun				
KOGW067	20070918	Piltun				
KOGW067	20070920	Piltun				
KOGW067	20070925	Piltun		5		5
KOGW068	20070727	Piltun				
KOGW068	20070803	Piltun				
KOGW068	20070909	Piltun				
KOGW068	20070917	Piltun				
KOGW068	20070917	Piltun				
KOGW068	20070918	Piltun				
KOGW068	20070920	Piltun				
KOGW068	20070920	Piltun				
KOGW068	20070920	Piltun		9		9
KOGW069	20070710	Piltun				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW069	20070831	Chayvo				
KOGW069	20070925	Piltun				
KOGW069	20070925	Piltun				
KOGW069	20070926	Chayvo		2	2	4
KOGW070	20070911	Offshore				
KOGW070	20070912	Offshore				
KOGW070	20070913	Offshore				
KOGW070	20070916	Offshore				
KOGW070	20071005	Offshore	5			5
KOGW071	20070804	Piltun				
KOGW071	20070908	Piltun				
KOGW071	20070831	Piltun				
KOGW071	20070909	Piltun				
KOGW071	20070909	Piltun				
KOGW071	20070916	Chayvo		5	1	6
KOGW072	20070817	Offshore				
KOGW072	20070819	Offshore				
KOGW072	20070903	Offshore				
KOGW072	20070913	Offshore				
KOGW072	20071001	Offshore				
KOGW072	20071005	Offshore	6			6
KOGW073	20070803	Piltun				
KOGW073	20070826	Piltun				
KOGW073	20070826	Piltun				
KOGW073	20070909	Piltun				
KOGW073	20070920	Piltun				
KOGW073	20070926	Piltun		6		6
KOGW074	20070729	Piltun				
KOGW074	20070726	Piltun				
KOGW074	20070804	Piltun				
KOGW074	20070830	Piltun				
KOGW074	20070907	Piltun				
KOGW074	20070909	Piltun				
KOGW074	20070918	Piltun				
KOGW074	20070924	Piltun		8		8
KOGW076	20071005	Offshore	1			1
KOGW078	20070729	Piltun				
KOGW078	20070907	Chayvo				
KOGW078	20070830	Piltun				
KOGW078	20070831	Chayvo				
KOGW078	20070910	Chayvo				
KOGW078	20071005	Offshore	1	2	3	6
KOGW080	20070725	Piltun				
KOGW080	20070726	Piltun				
KOGW080	20070726	Piltun				
KOGW080	20070727	Piltun				
KOGW080	20070729	Piltun				
KOGW080	20070808	Piltun				
KOGW080	20070821	Piltun				
KOGW080	20070903	Offshore				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW080	20070831	Chayvo				
KOGW080	20070911	Offshore				
KOGW080	20070913	Offshore				
KOGW080	20070916	Offshore				
KOGW080	20071005	Offshore	5	7	1	13
KOGW081	20070710	Piltun				
KOGW081	20070710	Piltun				
KOGW081	20070727	Piltun				
KOGW081	20070821	Piltun				
KOGW081	20070907	Chayvo				
KOGW081	20070831	Piltun				
KOGW081	20070831	Piltun				
KOGW081	20070926	Chayvo		6	2	8
KOGW082	20070917	Piltun		1		1
KOGW084	20070916	Offshore				
KOGW084	20071001	Offshore				
KOGW084	20071005	Offshore	3			3
KOGW085	20070727	Piltun				
KOGW085	20070817	Offshore				
KOGW085	20070817	Offshore				
KOGW085	20070817	Offshore				
KOGW085	20070819	Offshore				
KOGW085	20070916	Offshore				
KOGW085	20071005	Offshore	5	1		6
KOGW086	20070817	Offshore	1			1
KOGW087	20070817	Offshore				
KOGW087	20070819	Offshore				
KOGW087	20070911	Offshore				
KOGW087	20070916	Offshore	4			4
KOGW089	20070710	Piltun				
KOGW089	20070710	Piltun				
KOGW089	20070725	Piltun				
KOGW089	20070726	Piltun				
KOGW089	20070729	Piltun				
KOGW089	20070908	Piltun				
KOGW089	20070831	Chayvo				
KOGW089	20070917	Piltun				
KOGW089	20070918	Piltun				
KOGW089	20071005	Offshore	1	8	1	10
KOGW091	20070807	Piltun				
KOGW091	20070727	Piltun				
KOGW091	20070729	Piltun				
KOGW091	20070828	Piltun				
KOGW091	20070909	Piltun		5		5
KOGW092	20070711	Piltun				
KOGW092	20070814	Piltun				
KOGW092	20070821	Piltun				
KOGW092	20070831	Chayvo				
KOGW092	20070917	Piltun				
KOGW092	20070925	Piltun		5	1	6

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW093	20070726	Piltun				
KOGW093	20070727	Piltun				
KOGW093	20070729	Piltun				
KOGW093	20070828	Piltun				
KOGW093	20070908	Piltun				
KOGW093	20070828	Piltun				
KOGW093	20070831	Piltun				
KOGW093	20070917	Piltun				
KOGW093	20070920	Piltun				
KOGW093	20070926	Chayvo				
KOGW093	20071005	Offshore	1	9	1	11
KOGW094	20070826	Piltun				
KOGW094	20070908	Piltun				
KOGW094	20070831	Piltun				
KOGW094	20070909	Piltun				
KOGW094	20070920	Piltun		5		5
KOGW096	20070727	Piltun				
KOGW096	20070907	Chayvo				
KOGW096	20070831	Chayvo				
KOGW096	20070910	Chayvo				
KOGW096	20070917	Piltun		2	3	5
KOGW097	20070807	Piltun				
KOGW097	20070814	Piltun				
KOGW097	20070828	Piltun				
KOGW097	20070830	Piltun				
KOGW097	20070831	Piltun		5		5
KOGW099	20070710	Piltun				
KOGW099	20070726	Piltun				
KOGW099	20070727	Piltun				
KOGW099	20070830	Piltun				
KOGW099	20070909	Piltun				
KOGW099	20070917	Piltun				
KOGW099	20071004	Piltun		7		7
KOGW102	20070917	Piltun				
KOGW102	20070920	Piltun				
KOGW102	20070920	Piltun		3		3
KOGW103	20070808	Piltun				
KOGW103	20070817	Offshore				
KOGW103	20070817	Offshore	2	1		3
KOGW105	20070710	Piltun				
KOGW105	20070710	Piltun				
KOGW105	20070726	Piltun				
KOGW105	20070908	Piltun				
KOGW105	20070831	Piltun		5		5
KOGW107	20070908	Piltun				
KOGW107	20070831	Piltun				
KOGW107	20070917	Piltun				
KOGW107	20070920	Piltun				
KOGW107	20070925	Piltun		5		5
KOGW108	20070710	Piltun				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW108	20070815	Offshore				
KOGW108	20070817	Offshore				
KOGW108	20070817	Offshore				
KOGW108	20070903	Offshore				
KOGW108	20070911	Offshore	5	1		6
KOGW110	20070818	Offshore				
KOGW110	20070911	Offshore				
KOGW110	20070916	Offshore				
KOGW110	20071005	Offshore	4			4
KOGW112	20070726	Piltun				
KOGW112	20070729	Piltun				
KOGW112	20070729	Piltun				
KOGW112	20070826	Piltun				
KOGW112	20070907	Chayvo				
KOGW112	20070830	Piltun				
KOGW112	20070909	Piltun				
KOGW112	20070917	Piltun				
KOGW112	20070920	Piltun				
KOGW112	20070925	Piltun				
KOGW112	20070925	Piltun				
KOGW112	20070926	Piltun				
KOGW112	20071004	Piltun		11	1	12
KOGW113	20070710	Piltun				
KOGW113	20070710	Piltun		2		2
KOGW114	20070817	Offshore				
KOGW114	20070819	Offshore				
KOGW114	20070916	Offshore				
KOGW114	20071001	W_Offshore	4			4
KOGW115	20070815	Offshore				
KOGW115	20070817	Offshore				
KOGW115	20070911	Offshore				
KOGW115	20070913	Offshore				
KOGW115	20071005	Offshore	5			5
KOGW116	20070710	Piltun				
KOGW116	20070727	Piltun				
KOGW116	20070729	Piltun				
KOGW116	20070803	Piltun				
KOGW116	20070908	Piltun				
KOGW116	20070831	Piltun				
KOGW116	20070909	Piltun				
KOGW116	20070918	Piltun				
KOGW116	20071005	Offshore	1	8		9
KOGW117	20070804	Piltun				
KOGW117	20070806	Piltun				
KOGW117	20070806	Piltun				
KOGW117	20070807	Piltun				
KOGW117	20070831	Chayvo				
KOGW117	20070907	Piltun				
KOGW117	2007083	Chayvo				
KOGW117	20070909	Piltun		6	2	8

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW118	20070817	Offshore				
KOGW118	20070817	Offshore				
KOGW118	20070903	Offshore				
KOGW118	20070911	Offshore				
KOGW118	20070913	Offshore				
KOGW118	20070916	Offshore	6			6
KOGW119	20070911	Offshore				
KOGW119	20070913	Offshore	2			2
KOGW123	20070819	Offshore				
KOGW123	20070912	Offshore				
KOGW123	20071005	Offshore	3			3
KOGW124	20070830	Piltun				
KOGW124	20070831	Piltun				
KOGW124	20070709	W_Offshore				
KOGW124	20070920	Piltun	1	3		4
KOGW125	20070726	Piltun				
KOGW125	20070803	Piltun				
KOGW125	20070808	Piltun				
KOGW125	20070821	Piltun				
KOGW125	20070826	Piltun				
KOGW125	20070908	Piltun				
KOGW125	20070909	Piltun				
KOGW125	20070917	Piltun				
KOGW125	20070918	Piltun		9		9
KOGW127	20070803	Piltun				
KOGW127	20070831	Piltun				
KOGW127	20070918	Piltun		3		3
KOGW129	20070831	Chayvo				
KOGW129	20070909	Piltun				
KOGW129	20070917	Piltun				
KOGW129	20070920	Piltun		3	1	4
KOGW132	20070918	Piltun				
KOGW132	20070926	Piltun				
KOGW132	20070926	Chai-vo		2	1	3
KOGW135	20070711	NPiltun				
KOGW135	20070817	Offshore				
KOGW135	20070817	Offshore				
KOGW135	20070903	Offshore				
KOGW135	20070912	Offshore				
KOGW135	20070916	Offshore	5	1		6
KOGW136	20070710	Piltun				
KOGW136	20070907	Chayvo				
KOGW136	20070830	Piltun				
KOGW136	20070831	Piltun				
KOGW136	20070726	Piltun				
KOGW136	20070910	Chayvo				
KOGW136	20070917	Piltun		5	2	7
KOGW137	20070710	Piltun				
KOGW137	20070711	NPiltun				
KOGW137	20070727	Piltun				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW137	20070826	Piltun				
KOGW137	20070828	Piltun				
KOGW137	20070907	Chayvo				
KOGW137	20070908	Piltun				
KOGW137	20070828	Piltun				
KOGW137	20070909	Piltun				
KOGW137	20070917	Piltun		9	1	10
KOGW138	20070803	Piltun				
KOGW138	20070826	Piltun				
KOGW138	20070909	Piltun				
KOGW138	20070917	Piltun				
KOGW138	20070918	Piltun		5		5
KOGW144	20070908	Piltun				
KOGW144	20070909	Piltun		2		2
KOGW145	20070711	NPiltun				
KOGW145	20070817	Offshore				
KOGW145	20070819	Offshore				
KOGW145	20070903	Offshore				
KOGW145	20070913	Offshore				
KOGW145	20071005	Offshore	5	1		6
KOGW146	20070828	Piltun				
KOGW146	20070831	Piltun				
KOGW146	20070917	Piltun				
KOGW146	20070925	Piltun		4		4
KOGW147	20070814	Piltun				
KOGW147	20070828	Piltun				
KOGW147	20070828	Piltun				
KOGW147	20070829	Piltun		4		4
KOGW148	20070808	Piltun				
KOGW148	20070726	Piltun				
KOGW148	20070729	Piltun				
KOGW148	20070808	Piltun		4		4
KOGW149	20070803	Piltun				
KOGW149	20070828	Piltun				
KOGW149	20070809	Piltun				
KOGW149	20070830	Piltun				
KOGW149	20070925	Piltun				
KOGW149	20070926	Piltun		6		6
KOGW150	20070803	Piltun				
KOGW150	20070926	Piltun		2		2
KOGW151	20070807	Piltun				
KOGW151	20070925	Piltun				
KOGW151	20070926	Piltun		3		3
KOGW152	20070807	Piltun				
KOGW152	20070814	Piltun				
KOGW152	20070828	Piltun				
KOGW152	20070830	Piltun				
KOGW152	20070831	Piltun				
KOGW152	20070909	Piltun		6		6
KOGW153	20070826	Piltun				

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
KOGW153	20070920	Piltun				
KOGW153	20070925	Piltun				
KOGW153	20070926	Piltun				
KOGW153	20070927	Piltun		5		5
KOGW154	20070826	Piltun				
KOGW154	20070925	Piltun				
KOGW154	20070927	Piltun		3		3
KOGW155	20070808	Piltun				
KOGW155	20070826	Piltun		2		2
KOGW156	20070831	Piltun				
KOGW156	20070917	Piltun		2		2
KOGW157	20070909	Piltun				
KOGW157	20070917	Piltun		2		2
KOGW158	20070817	Offshore				
KOGW158	20070817	Offshore				
KOGW158	20070819	Offshore				
KOGW158	20070911	Offshore				
KOGW158	20070912	Offshore	5			5
KOGW159	20070714	Piltun				
KOGW159	20070911	Offshore				
KOGW159	20070916	Offshore	2	1		3
KOGW160	20070909	Piltun				
KOGW160	20070917	Piltun				
KOGW160	20070920	Piltun				
KOGW160	20070920	Piltun				
KOGW160	20070925	Piltun		5		5
KOGW161	20070909	Piltun		1		1
	20070807	Piltun		1		1
	20070710	Piltun		1		1
	20070710	Piltun		1		1
	20070726	Piltun		1		1
TEMP10	20070803	Piltun		1		1
	20070803	Piltun		1		1
	20070806	Piltun		1		1
	20070806	Piltun		1		1
	20070807	Piltun		1		1
	20070817	Offshore	1			1
	20070821	Piltun		1		1
	20070828	Piltun		1		1
	20070907	Chayvo			1	1
	20070829	Piltun		1		1
TEMP13	20070830	Piltun		1		1
	20070831	Piltun		1		1
	20070831	Chayvo			1	1
TEMP12	20070912	Offshore	1			1
	20070913	Offshore	1			1
	20070913	Offshore	1			1
TEMP11	20070916	Offshore	1			1
	20070917	Piltun		1		1
TEMP09	20070918	Piltun		1		1

KOGW#	Date of sighting	Area	Number of sightings per area			Total sightings
			Offshore	Piltun	Chayvo	
	20070920	Piltun		1		1
	20071001	W_Offshore	1			1
	20071005	Offshore	1			1
			229	440	30	699
total sightings of identified individuals			229(222)	440(423)	30(28)	699(673)

Table A7. Sightings of cow-calf pairs, physical body condition (PCB) class and skin condition, 2002-2007.

Whale No.	Years		Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin
	2002	2003	calf	Class	condition	2004	calf	Class	condition	2005	calf	Class	condition	2006	calf	Class	condition	2007	calf	Class	condition
KOGW001	x			0	0	x		0	0	x		0	0	x		1		x		1-0	
KOGW002	x	x		1	0	x		1	0	x		0	0	x		2		x		2-1	
KOGW003	x																				
KOGW004	x	x		0	0																
KOGW005	x	x	cow	2-3	0	x		0	0	x	cow	4	0	x				x			
KOGW006	x	x		0	0	x		2	0	x		0	0	x		1		x			
KOGW007	x	x		0	0	x		0	0	x		0	0			1-4		x		1-0	
KOGW008	x	x		3	0	x		0	0	x		0	0	x		2		x		1-0	
KOGW009	x					x		0	0	x		0	0	x				x		2	1
KOGW010	x					x		1	0	x		1	1	x				x		1-0	
KOGW011	x	x		1	0	x		0	0	x		0	0	x				x		1-0	
KOGW012	x	x		1	0	x		1	0	x		1	0	x				x		1-0	
KOGW013	x	x		2	0	x		0	0	x		2	0	x				x			
KOGW014	x					x		1	0	x		0	0	x				x			
KOGW015	x	x		0	0					x		0	0	x				x	cow	4-3	
KOGW016	x	x		0	0	x		0	0	x		0	0	x				x		2-0	?
KOGW017	x	x		0	0	x		1	0	x		0	0	x		2-1-0		x		1-0	
KOGW018	x	x	cow	2	0	x		0	0	x		0	0	x		2-1					
KOGW019	x	x		2	0	x		0	0	x		3	0	x		3-2		x		1	
KOGW020	x	x		0	0	x		0	0	x		0	0	x		1-0		x		1-0	
KOGW021	x	x		0	0	x		2	0	x		0	0	x	cow	2-3		x			
KOGW022	x				0	x		0	0	x		0	0	x				x		2	
KOGW023	x					x		0	0				0	x		2-0					
KOGW024	x									x		0	0	x				x			
KOGW025	x	x		1	0	x		0	0	x		0	0	x				x		2-0	
KOGW026	x	x	cow	2	2					x		0	0	x		2					
KOGW027	x	x	cow	4	2	x		2	0	x	cow	3-4	0	x		2		x	cow	4-3	
KOGW028	x	x		0	1- 3	x		0	0	x		0	0	x		2		x		2	1-2
KOGW029	x	x		0	0	x		1	0	x		0	0	x		1-0		x		1-0	1
KOGW030	x	x		0	0	x		0	0	x		0	0	x				x			

Whale No.	Years		Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin
	2002	2003	calf	Class	condition	2004	calf	Class	condition	2005	calf	Class	condition	2006	calf	Class	condition	2007	calf	Class	condition
KOGW031	x	x		0	0	x		0	0					x				x		2-0	1
KOGW032	x	x	cow?	0	1	x		1	0	x		0	0	x				x		2-0	
KOGW033	x	x		0	0	x		0	0	x		0	0	x		2		x			
KOGW034	x					x		0	0	x		0	2	x		2-0		x		2-0	1
KOGW035	x	x		0	0	x		0	0	x		0	0	x		1		x		2-1-0	
KOGW036	x	x		0	0	x		0	0	x		1	0	x		2		x			
KOGW037	x	x	cow	2	0	x		0	0	x	cow	3	0	x		1		x			
KOGW038	x	x		0	0	x		0	0					x				x		2-0	
KOGW039	x	x	cow	3	0					x		0	0	x		3-0		x		2-1-0	1
KOGW040	x	x	cow	2	0	x		0	0	x		0	0					x			
KOGW041	x					x		0	0	x		0	0	x				x		2-0	
KOGW042	x					x		0	1	x		0	1	x		1-0		x		1-0	
KOGW043	x	x		1	0	x		0	0	x		1	0	x		1-0		x		2	
KOGW044	x	x		2	0	x		3	0	x		4	0	x				x		4-3	
KOGW045	x	x		0	0	x		0	0	x		0	0	x				x			
KOGW046		x		0	0	x		2	0	x		0	0	x	cow	2-1-0		x		1	1
KOGW047		x		0	1	x		0	0	x		0	0	x				x			
KOGW048		x		0	0	x		0	0	x		0	0	x		4-1		x		1-0	
KOGW049		x		2	2	x		0	0	x		0	0	x		2		x		2-0	
KOGW050		x		0	2	x	cow	3	1	x		0	0	x	cow	2		x		2-1-0	
KOGW051		x		0	0	x		2	0	x		0	0	x		2		x			
KOGW052		x	calf	0	0																
KOGW053		x		0	0					x		0	0	x		1		x		2-1-0	
KOGW054		x		0	0	x		0	0	x		0	0	x		1-0		x		2-0	
KOGW055		x		0	0					x		0	0	x				x		1-0	1
KOGW056		x		0	1- 3	x		1	0	x		0-1	0	x		2-0		x		2-1	1
KOGW057		x		0	0									x		1		x		2-0	
KOGW058		x		0	0	x		0	0	x		1	0	x				x		2-1-0	
KOGW059		x		0	0					x		0	0	x		1		x		3-0	1
KOGW060		x		0	0	x		0	0	x		0	0	x		2-0		x		1-0	
KOGW061		x		0	0	x		0	0	x		0	0	x		2-0		x		1-0	2

Whale No.	Years		Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin
	2002	2003	calf	Class	condition	2004	calf	Class	condition	2005	calf	Class	condition	2006	calf	Class	condition	2007	calf	Class	condition
KOGW062		x		0	0	x		0	0	x	cow	2	0	x		1-0		x	cow	4-3	
KOGW063		x	cow	2	0	x		1	0	x		0	0	x				x	cow	2-0	
KOGW064		x		0	0	x	cow	2	0	x		2	0	x				x	cow	3	
KOGW065		x		0	0																
KOGW066		x		0	0	x		0	0	x		0	0	x		1-0		x			
KOGW067		x		0	0					x		0	0	x		2-1		x		2-1	
KOGW068		x		2	1	x		0	0	x		0	0	x		2		x		1-0	1-2-3
KOGW069		x	calf	0	0	x		1	0	x		0	0	x		1-0		x			
KOGW070		x		2	0	x		1	0	x		0	0	x		1-0		x			
KOGW071		x		0	0	x		0	0	x		1	0	x				x		2	1
KOGW072		x		0	0	x		0	0	x		0	0	x				x		1	
KOGW073		x	calf	0	0													x	?	2-1	
KOGW074		x		0	0	x		0	0	x		0	0	x				x		1-0	1
KOGW075		x	calf	0	0																
KOGW076		x	calf	0	0	x		0	0	x		0	0	x				x			
KOGW077		x	calf	0	0																
KOGW078		x	calf	0	0	x		0	0	x		0	0	x				x		1-0	
KOGW079		x	calf	0	0					x		0	0								
KOGW080		x	calf	0	0	x		1	0					x		1-0		x		1-0	
KOGW081		x	calf	0	0	x		0	0	x		0	0	x		2-0		x		2-1-0	
KOGW082		x	calf	0	0	x		0	0	x		0	0	x				x		2	
KOGW083		x	calf?	0	0	x		0	0	x		0	0	x							
KOGW084		x		1	0	x		0	0					x		2		x			
KOGW085		x		0	0	x		1	0	x		0	0	x				x		2-1	
KOGW086		x		0	0	x		0	0	x		0	0					x			
KOGW087		x		0	0	x		0	0	x		0	0	x				x			
KOGW088		x		0	0			0	0												
KOGW089		x	calf?	0	0	x		0	0	x		0	0	x		2-1-0		x		2-1-0	
		x																			
KOGW090		x		0	0			0	0	x		0									
KOGW091		x		0	0	x		0	0					x		1-0		x		1	

Whale No.	Years		Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin
	2002	2003	calf	Class	condition	2004	calf	Class	condition	2005	calf	Class	condition	2006	calf	Class	condition	2007	calf	Class	condition
KOGW092		x		0	0	x		2	0	x			0	x		2		x		2-1	
KOGW093						x		0	0	x		0	0	x		2-0		x		1-0	
KOGW094						x		0	0	x		0	0	x		1-0		x		1-0	
KOGW095						x	calf	0	0												
KOGW096						x		1	0	x		0	0	x				x		1	
KOGW097						x		0	0									x	cow	4-2	
KOGW098						x		0	0												
KOGW099						x		0	0	x		0	0	x				x		2-1-0	
KOGW100						x		3	0												
KOGW101						x	calf	0	0												
KOGW102						x		0	0	x		0	0	x				x			
KOGW103						x		0	0	x		0	0	x				x		2	
KOGW104						x		0	0	x		1	0								
KOGW105						x		0	0	x		0	0	x		1-0		x		2-1-0	
KOGW106						x		0	0	x		0	0	x		1-0					
KOGW107						x		0	0	x		0	0	x		1		x			
KOGW108						x		1	0	x		0	0	x		2-1		x		2-0	
KOGW109						x		0	0					x							
KOGW110						x		2	0	x		0	0	x		1-0		x			
KOGW111						x		0	0	x		0	0								
KOGW112						x		0	0	x		0	0	x		2-1-0		x		2-1-0	
KOGW113						x		0	0	x		0	0	x				x		2	
KOGW114						x		0	0	x		0	0	x				x		1-0	
KOGW115						x		0	0	x		0	0	x				x		1	
KOGW116						x		0	0	x		0	0	x				x		2-0	1
KOGW117										x		0	0	x				x		1-0	
KOGW118										x		0	0	x		1		x			
KOGW119										x		1	0	x		2-0		x			
KOGW120										x		2	0								
KOGW121										x		0	0	x		1-2					
KOGW122										x		1	0								

Whale No.	Years		Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin
	2002	2003	calf	Class	condition	2004	calf	Class	condition	2005	calf	Class	condition	2006	calf	Class	condition	2007	calf	Class	condition
KOGW123										x		0	0	x				x			
KOGW124										x	calf	0	0	x				x		1	
KOGW125										x	calf	0	0	x		1		x		2-1-0	
KOGW126										x	calf	0	0								
KOGW127										x	calf	0	0	x		2		x			2
KOGW128										x		0	0								
KOGW129										x		0	0	x		1		x		2-0	
KOGW130										x		0	0								
KOGW131										x		0	0								
KOGW132										x		2	0	x				x		1	
KOGW133										x		0	0	x							
KOGW134										x		0	0								
KOGW135										x		0	0	x				x			
KOGW136														x		1-0		x		1	
KOGW137														x		1-0		x		1-0	
KOGW138														x		2-0		x		1-0	
KOGW139														x		2					
KOGW140														x		1-0					
KOGW141														x	calf						
KOGW142														x	calf						
KOGW143														x	calf						
KOGW144														x	calf?			x			
KOGW145														x				x			
KOGW146														x	calf?			x		1-0	2-1
KOGW147														x		1-2		x		1	
KOGW148																		x		2-1-0	
KOGW149																		x	calf		
KOGW150																		x	calf		
KOGW151																		x	calf		
KOGW152																		x	calf		
KOGW153																		x	calf		

Whale No.	Years		Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin	Year	Cow	PCB	Skin
	2002	2003	calf	Class	condition	2004	calf	Class	condition	2005	calf	Class	condition	2006	calf	Class	condition	2007	calf	Class	condition
KOGW154																		x	calf		
KOGW155																		x	calf		
KOGW156																		x	calf?		
KOGW157																		x		1	
KOGW158																		x		1	
KOGW159																		x		1	
KOGW160																		x		2-1-0	
KOGW161																		x			
TEMP1	x																				
TEMP2						x		0	0	x		0	0	identified as KOGW135							
TEMP3														x							
TEMP4														x							
TEMP5														x							
TEMP6														x							
TEMP7														x							
TEMP8														x	identified as KOGW159						
TEMP9																		x			
TEMP10																		x	calf?		
TEMP11																		x			
TEMP12																		x			
TEMP13																		x			