

SC/68A/CMP/16

Gray whale research off northeastern Sakhalin Island and eastern Kamchatka, Russia, in 2018

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INTERNATIONAL
WHALING COMMISSION

GRAY WHALE RESEARCH OFF NORTHEASTERN SAKHALIN ISLAND AND EASTERN KAMCHATKA, RUSSIA, IN 2018

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ABSTRACT

In 2018 using photo-id and biopsy data from the Russian Gray Whale Project funded by IFAW (Burdin et al. 2016; 2017, 2018) the population assessment of gray whales feeding off Sakhalin and Kamchatka was updated (Cooke et al., 2017) using a population model that allows for multiple feeding and breeding areas. This report reviews findings from 2018 research activities and combines such with data from previous years, in some cases ranging back to an opportunistic survey in 1994. Photo-identification research conducted off Sakhalin Island in 2018 resulted in the identification of 23 whales, including five calves. Six previously unidentified non-calf whales were observed. One previously unidentified reproductive female was recorded in 2018, resulting in a minimum of 35 reproductive females being observed since 1995. A 2018 gray whale survey in Kronotsky Gulf (East Kamchatka) provided important information about the Kamchatka-Sakhalin subpopulation. Western gray whales are facing a number of difficulties like the large-scale offshore oil and gas development near their summer feeding ground, as well as fatal net entrapments off Japan during migration that pose significant threats to the survival of the population. Using the IUCN Red List criteria, the Sakhalin and Kamchatka populations, if assessed as a subpopulation, either separately or together, would be classified as Endangered, on the basis of there being between 50 and 250 mature individuals.

KEYWORDS: WESTERN GRAY WHALE; RUSSIA; POPULATION BIOLOGY; BEHAVIOR; CONSERVATION

INTRODUCTION

In 2018 the population assessment of gray whales feeding off Sakhalin and Kamchatka was updated using a population model that allows for multiple feeding and breeding areas (Cooke et al., 2017). The model is fit to photo-id data collected of Sakhalin during 1995-2017 (Burdin *et al.* 2017), tracking of whales from Sakhalin to the eastern North Pacific (Mate *et al.* 2015), photo-id matches of gray whales between the Sakhalin and Mexico catalogues (Urbán *et al.* 2013) and reported photo-id results from Kamchatka collected during 2004-2012 (Yakovlev *et al.* 2013). The results show that the Sakhalin and Kamchatka feeding populations have been increasing at 2-5% per year over 10 or 20 years to 2015. The number of non-calf whales in 2016 is estimated to be 320-410, of which 130-170 are predominantly Sakhalin-feeding whales or 180-220 are whales that feed at least occasionally off Sakhalin (Cooke et al., 2017).

The objective of our study is to better understand and monitor the population ecology of western gray whales through the identification of individuals. Since 1997, photo-identification surveys have been conducted annually during the western gray whale feeding season. These data are essential to understand the population status, reproductive/survival rates, spatial/behavioral ecology, life history parameters as well as factors that maybe influencing survival of this population. In this report, we summarize our 2018 research efforts on western gray whales observed off Sakhalin Island, Russia, and also integrate the recent data with data obtained from 1997-2017. We also summarize the current status of the population and review potential threats to its continued survival, including potential impacts associated with large-scale oil and gas development activities on the summer feeding ground, increasing fishing and tourist activities, and entrapments in trap nets off Japan during migration as well as recent entanglement observed in 2013 and 2016 off the northeastern Sakhalin coast.

METHODS

In order to perform inter-annual comparisons, in 2018 we maintained the overall consistency in research design, data collection techniques and data analysis. Additional information, collected during more limited surveys off Piltun in 1994 and 1995 (Brownell et al., 1997; Weller et al., 1999), is also presented here to better describe inter-annual trends and facilitate a long-term interpretation for some results. Data from these 1994 and 1995 studies include gray whale photographs obtained between 7-12 September 1994 during the filming of a wildlife documentary by H. Minakuchi (for description see Weller et al., 1999) and from 14-20 August 1995 during a pilot study to determine the feasibility of conducting boat- and shore-based research in the study area.

Study area

In 2018 we conducted research in the area of our primary interest of gray whale monitoring near Zaliv Piltun (referred to as Piltun Lagoon) on the northeastern coast of Sakhalin Island, Russia (Fig. 1). The lagoon is approximately 80-90 km long and 15 km across at its widest point. A single channel connecting the inner lagoon with the Okhotsk Sea occurs at 52° 50' N and 143° 20' E, and has considerable biological influence on the surrounding marine environment. The nearshore marine environment of the study site is mostly sand substrate, characterized by a gradually sloping and broad continental shelf. Water depths within 5 km of shore are mostly shallow and less than 25 m deep. Despite the similarity of Piltun Lagoon to the coastal lagoons used during the winter by eastern gray whales off Baja California, Mexico, whales do not enter this lagoon.

We also had the chance to expand our efforts to Eastern Kamchatka coast, where gray whales have been reported since the mid-1990s. We conducted a cetacean survey in Avachinsky and Kronotsky Gulf of Kamchatka Peninsula. The main gray whale concentration was location in Kronotsky Gulf is Olga Bay - the northward part of Kronotsky Gulf. This is a very limited area - mostly in close proximity to the shore, and about 20 km long.

Photo-identification surveys

Gray whales have distinctive body markings, such as natural coloration and pigmentation patterns, as well as scars, that are unique to an individual and can be used for individual recognition. Boat-based photo-identification surveys were conducted on all good weather days during the 2018 study period. Identical methodology was employed during each survey, with the primary objective of encountering and photographically identifying as many whales as possible. Previous photo-identification data gathered in the Piltun area between 1995 and 2017 used right-side dorsal flank markings for identification (Brownell et al., 1997; Weller et al., 1999, 2006a), and for the sake of intra- and inter-annual reliability, we continued this methodological approach. Attempts were made to photograph the right dorsal flank of each whale, followed by efforts to photograph the left dorsal flank and fluke. The majority of whales identified to date now have images of right and left flanks as well as ventral surface of flukes in the photo-identification catalog allowing for useful identification images to be collected from nearly any body region. Since May 2006, the western gray whale photo-identification catalog compiled by our Russia-U.S. research program (since 2015 renamed as the Russian Gray Whale project - RGWP) is available on request to all interested parties (Burdin et al., 2016).

Photographic surveys involved slow travel in a 4.5 m outboard-powered inflatable boat (Fig.1). To photograph whales, we used a Nikon D7000 digital camera with a 100-400 mm Nikon lens. Measures of environmental conditions, water depth, geographic position, and group size were recorded for each group photographed.

RESULTS

Survey effort and photo-identification

Compared with previous years, in 2018 our research was very limited by poor weather. Within two months of field work we were able to conduct only eight full photo-identification surveys, conducted between 08 July and 08 September, with a total of 34.2 hrs spent in direct observation of 42 whale groups (Table 1). Between 1994 and 2018, 280 western gray whales have been identified during 485 boat-based surveys off northeastern Sakhalin Island (Table 1).

The number of whales identified annually includes resightings of individuals from previous years, resulting in a total of 280 identified individuals (Tables 1 and 2). The number of whales identified does not correspond to the size of the population. Of the whales in the photo-catalog, 145 were animals first identified as calves, while the remaining 135 whales were considered non-calves (i.e. adults or subadults; Table 2). However, not all of these 280 individuals are alive.

Mother-calf pairs

Three mother-calf pairs were identified in 2018 (Table 3). Two females (#40 and #106) have been sighted in the study area and had multiple calves prior to 2018. One female - #111 was seen with a calf for the first time in 2018. This new mother contributes to the total number of known reproductive females adding it up to 35 females that have been documented since 1995. These females, including #111, were first identified as calves themselves in 1997, 2001 and 2002, respectively. One of these females (# 40) has now had eight calves.

Based on our photo-ID surveys, mother-calf pairs were observed in proximity to the Piltun lagoon entrance more often than in other parts of our study area compared to other (non-mother-calf) individuals. This distribution pattern has been observed in previous years as well.

The first sighting of a mother-calf pair in 2018 occurred on 18 July (Table 3). Because of the severe weather conditions and redistribution of whales in the study area we were unable to estimate the weaning time and did not register the mother-calf separation date. But according to the previous years of observation, usually calves separated in late July – early August. Possibility to identify calves every year of our study allowed us collecting information on age of many individuals, and especially important information on sexual maturity of females. We assume that they had their first calf at age ranging from 7 to 12. But female #111 in 2018 was observed with her calf for the first time at age 16, we assume it can be not her first calf, but we did not observe her with calves in previous years.

DISCUSSION

Shift of distribution

In addition to a dramatic reduction of gray whale numbers in the Piltun lagoon area, in our 2018 field observations we also found that the general distribution of gray whales in the Piltun lagoon area has changed compare with 2015 and 2016 and even 2017. Only a few whales were seen north on the close proximity on the Piltun lagoon mouth (Fig. 2). When our study started in 1997 and until 2015, whales were distributed mostly close or northward of the Piltun lagoon mouth. We suggest that in addition to the natural factors like possible changes in the benthic communities due to nature factors, such dramatic shift in whale distribution started in 2015, after intensive anthropogenic activity related with pier construction inside the Piltun lagoon (Exxon Neftegas) and oil development in the northeastern end on Sakhalin Island held by Russian developers. Unfortunately we have no complete information about this activity. In addition, in 2018 another seismic survey occurred.

In 2018, almost 100% of the whales were met south from the Piltun lagoon mouth. Despite significant survey efforts no whales were found in time of our observations in July- August 2018 in the northern part of the survey area. We suggest, that number of biological parameters in concert with a variety of human-related threats as identified during the current long-term study and discussed below, raise concern about the ability of the western gray whale population to rebound from its highly depleted state and highlight the importance of continuing the long-term research and monitoring program.

Kronotsky Gulf (Eastern Kamchatka) survey 2018

In June 24-30 2018 we conducted a photo-ID survey of gray whale and other cetaceans off the Eastern Kamchatka coast on a chartered vessel "Ashura". We surveyed Avachuskiy Gulf north from Petropavlovsk-Kamchatsky and Kronotsky Gulf up to Ogl Bay. A total of 874 km was covered. The purpose of this survey was to study the critical summer habitats of the Red Book species of cetaceans in the eastern coast of Kamchatka coastal waters.

In 2018 we logged a total of three days of photo-ID effort in Olga Bay (Kronotsky Gulf, SE Kamchatka) in late June, resulting in observation of 23 gray whales, of which 20 were individually identified. Like in previous years all gray whales were observed in the shallow waters, in close proximity to the shoreline. Three of them were matched to the Sakhalin catalogue and three to the combined Kamchatka-Sakhalin catalogue. The Olga Bay aggregation was dominated by young animals but some adult whales were also present. One mother-calf pair was observed in Olga Bay on 26 June and this same pair was observed in the area of Piltun Lagoon on 1 August.

All encounters with gray whales (23 encounters, 21 individuals) occurred in the area of Olga Bay, Kronotsky Gulf, which is a summer feeding habitat for this species. According for the latest modelling it appears that the Sakhalin aggregation cannot be considered as separate population, but that Sakhalin and Kamchatka together may be. If Sakhalin+Kamchatka is a separate subpopulation within NP gray whales, it would qualify as Endangered.

ACKNOWLEDGEMENTS

We were fortunate to work with a wonderful cast of characters during the 2018 field season, with special thanks to Alexander Anofriev, Tatiyana Pridorozhnaya, Denis Gavrichenkov, Larisa Moshonkina and our driver Aleksandr Likhanov.

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Table 1
Annual survey effort, groups encountered, and whales identified in 1994-2018.

Year	Sampling Period	Number of Surveys	Observation Hours	Group Encountered	Whales Identified
1994	09/07 - 09/12	1			9
1995	08/15 - 08/19	5	10:1	23	28
1997	07/09 - 09/08	22	33:4	114	47
1998	07/06 - 09/29	35	50:5	125	54
1999	06/29 - 10/13	56	122	434	69
2000	06/25 - 09/16	40	56:5	365	58
2001	06/25 - 09/25	49	101:8	448	72
2002	07/01 - 09/25	36	75:6	411	76
2003	07/15 - 09/13	22	41:7	219	75
2004	07/29 - 09/12	21	33:8	194	94
2005	07/04 - 09/09	20	40:9	160	93
2006	07/23 - 08/25	10	24:1	96	79
2007	07/26 - 09/09	20	32:2	187	83
2008	07/08 - 08/21	12	47:0	38	45
2009	06/24 - 08/26	17	67:0	126	82
2010	08/09 - 08/26	4	11:5	40	42
2011	06/28 - 08/26	14	32:7	83	82
2012	06/24 - 08/30	11	48:8	78	88
2013	07/07 - 08/24	16	54:4	148	94
2014	07/08 - 08/23	20	41:7	203	78
2015	07/02 - 08/14	16	38:8	114	60
2016	07/06 - 08/21	15	15:2	135	56
2017	07/04 - 08/25	15	18:3	118	49
2018	07/08 - 09/08	8	34:2	42	25
Overall		485	1063,9	3901	280

*The number of whales identified annually includes resightings of individuals from previous years, resulting in a total of 280 identified individuals. The number of whales identified does not correspond to the size of the population.

Table 2
Annual sighting trends and resighting percentages, 1994-2018

Year	Whales Identified	Number of Calves	New Non-Calves	% Non-Calves Previously Identified
1994	9			
1995	28	2	20	23.1%
1997	47	2	25	44.4%
1998	54	8	5	89.1%
1999	69	3	12	81.8%
2000	58	3	3	94.5%
2001	72	6	6	90.9%
2002	76	9	3	95.5%
2003	75	11	2	96.9%
2004	94	8	3	96.5%
2005	93	6	4	95.4%
2006	79	4	3	96.0%
2007	83	9	2	97.3%
2008	45	3	0	100.0%
2009	82	7	2	97.6%
2010	42	3	1	97.4%
2011	82	12	1	98.6%
2012	88	5	6	92.7 %
2013	94	9	3	96.5 %
2014	78	9	3	84.6 %
2015	60	8	2	96.1 %
2016	56	6	7	86.0 %
2017	46	7	5	87.2%
2018	23	5	6	66.6%

* Data from 1994 and 1995 were opportunistic and pilot in nature (respectively) and are thereby viewed as incomplete for some of the reported values.

Table 3
Dates of first sightings of mother-calf pairs in summer 2018.

Mother ID	Calf Field ID	First Time Seen Together
40	274	July 18
111	275	August 01
106	276	August 01

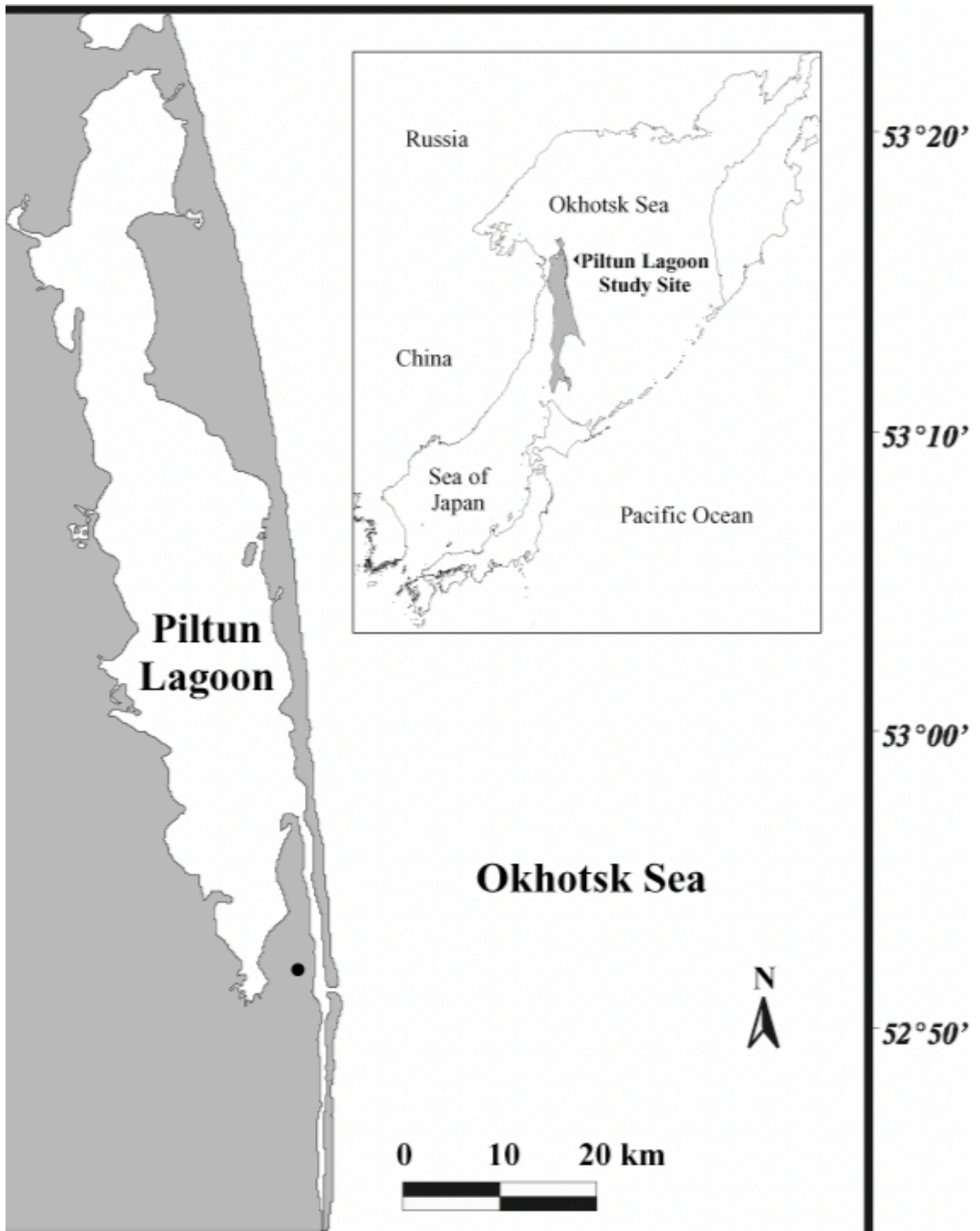
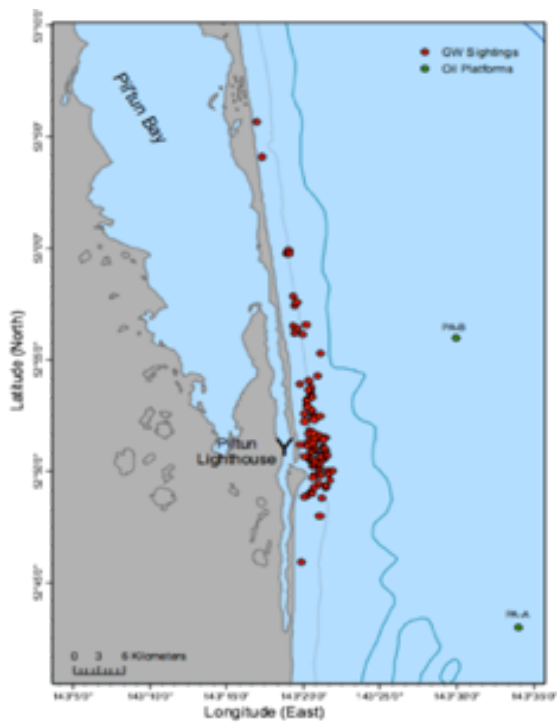
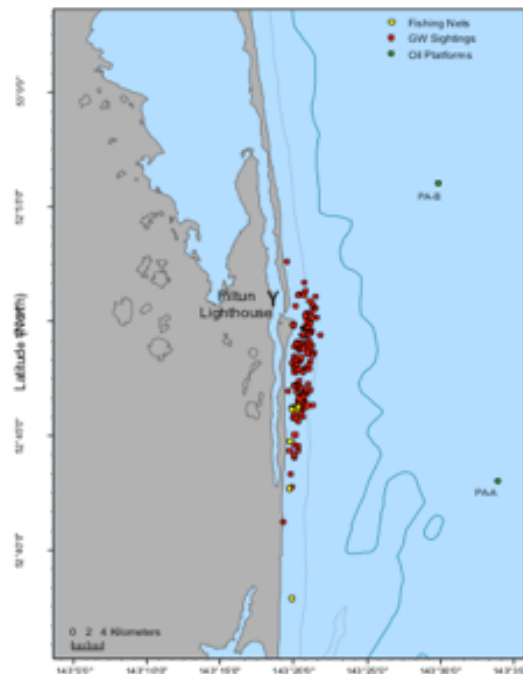


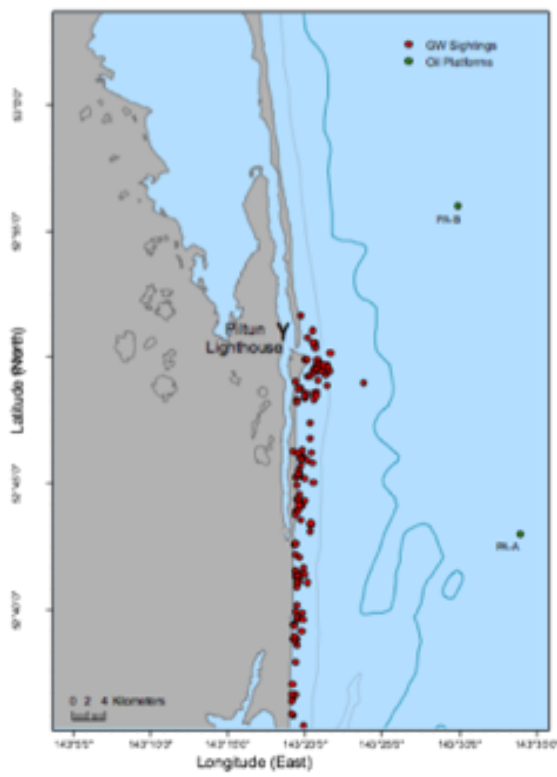
Fig.1 Study area. Black dot = Piltun Lighthouse .



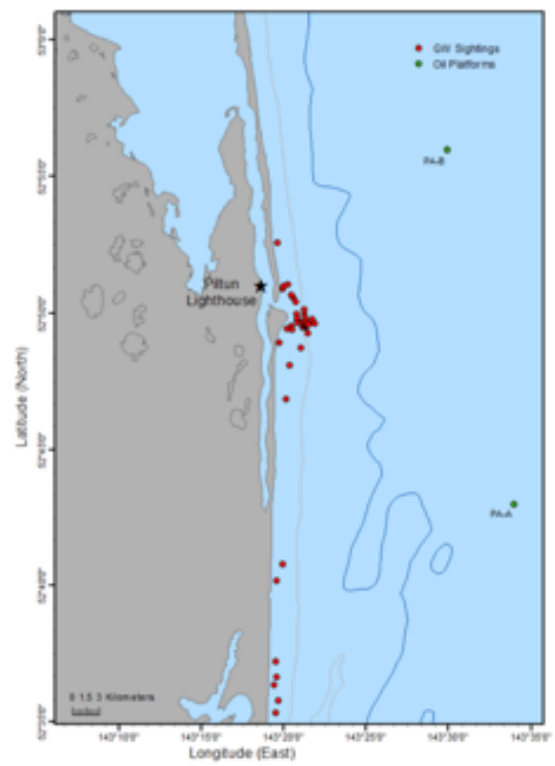
2015



2016



2017



2018

Fig 2. Changes in gray whale distribution in the Piltun study area 2015-2018.