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Status of western north Pacific gray whales off northeastern Sakhalin Island and eastern Kamchatka, Russia, in 2016

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ABSTRACT

The western gray whale population is critically endangered and its continued ability to survive is of concern. On the assumption that Sakhalin whales constituted a separate population, Cooke et al. (2016), using photo-id and biopsy data from the Russian Gray Whale Project (Burdin et al. 2015) funded by IFAW, estimated that the feeding aggregation off Sakhalin contained about 175 non-calf individuals by 2016 (although not all of these would be present every year), and had been growing at 2-4% per year. Between 1994 and 2016, 258 western gray whales have been identified during 462 boat-based surveys off northeastern Sakhalin Island. This paper reviews findings from 2016 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 2016 resulted in the identification of 56 whales, including six calves. Seven previously unidentified non-calf were observed. No previously unidentified reproductive females were recorded in 2016, resulting in a minimum of 33 reproductive females being observed since 1995. In addition to a number of biological difficulties that western gray whales are facing, the large-scale offshore oil and gas development programs near their summer feeding ground, as well as rope entanglements off Sakhalin during the feeding season and fatal net entrapments off Japan during migration, pose significant threats to the survival of the population.

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

INTRODUCTION

The current status of the western gray whale population is listed as critically endangered by IUCN and the future survival of this population is uncertain (Weller et al., 2002). As a result of commercial whaling, western gray whales were hunted to extremely low numbers in the mid 20th century. In fact, the population was considered to be extinct until they were "re-discovered". Given the vulnerability of this population, the International Whaling Commission (IWC) and the International Union for Conservation of Nature (IUCN) have expressed serious concern about the status of this population and have called for urgent measures to be taken to help ensure the population's future survival.

The objective of the study described herein 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 understanding the population status, reproductive/survival rates, spatial/behavioural ecology, life history parameters as well as factors that may be influencing survival of this population. In this report, we summarize our 2016 research efforts on western gray whales observed off Sakhalin Island, Russia, and also integrate the recent data with data obtained from 1994-2015.

MATERIAL AND METHODS

In order to perform inter-annual comparisons, in 2016 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 (Brownell et al., 1997).

Study area

The study area is located near Zaliv Pil'tun (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. A lighthouse, near the lagoon channel, served as the base from which studies reported here were conducted. 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 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.

In addition to our research off Sakhalin Island, in 2016 we expanded our research efforts to the Eastern Kamchatka coast (Avachinsky and Kronotsky Gulf), where gray whales have been reported since the mid 1990s. Olga Bay is located at 54° 32' N and 161° 02' E in the northward part of Kronotsky Gulf on the East Kamchatka coast. The coastal morphology of Olga Bay is very similar to the Piltun area, characterized by sand-based shallow water substrate.

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 2016 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 2014 used right-side dorsal flank markings for identification (Weller et al., 1999), and for the sake of intra- and inter-annual reliability, we continued this methodological approach.

Photographic surveys involved slow travel in a 4.5 m outboard-powered inflatable boat. 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

Fifteen photo-identification surveys, with a total of 15.2 hrs spent in direct observation of 135 whale groups, were conducted between 6 July and 21 August in 2016 (Table 1). Between 1994 and 2016, 258 western gray whales have been identified during 462 boat-based surveys off northeastern Sakhalin Island (Table 1).

One hundred thirty-six of the whales in the photo-catalog were animals first identified as calves, while the remaining 122 whales were considered non-calves (i.e. adults or subadults). However, not all of these 258 individuals are considered to be alive.

Fifty-six naturally marked individual whales, including 6 calves, were identified during 2016 (Table 1, 2). Of the 50 non-calves identified in 2016, 43 whales (86%) had previous sightings in the Piltun area during 1994-2015 photographic efforts (Table 2). The mean pod size for all groups (n=135) encountered during 2016 was 1.62 ± 0.752 ranging from 1 (71 groups, or 53%) to 4 (2 groups) individuals per pod. In general, all whales observed in 2016 were distributed in water depths ranging from 2.6 to 16.5 m (average 8.4 ± 2.51 m). Sixteen (29%) individual gray whales were observed only once throughout the season. Two individuals, a calf of 2015 and previously known adult whale, were seen nine and eight times, respectively. Three individuals were photographed seven times within the 2016 season, all three have been observed in previous years. Out of eight calves identified in 2015, only four were observed in Piltun feeding area in 2016. Also, two whales identified as calves in 2014 were encountered this year seven times. Three individuals were photographed six times within the 2016 season. Two of these individuals were a mother-calf pair. Third individual was a famous male named "Ponchik" that has been observed in Piltun area almost every year. Out of nine calves identified in 2014, only two were observed in Piltun feeding area in 2016. Also, four whales identified as calves in 2013 were encountered in 2016.

The number of whales identified annually includes resightings of individuals from previous years, resulting in a total of 245 identified individuals. The number of whales identified does not correspond to the size of the population.

Mother-calf pairs

Six mother-calf pairs were identified in 2016. All six mothers have been sighted in the study area and had multiple calves prior to 2016. Thus, the total number of known reproductive females that have been documented since 1995 remains 33. Two females were first identified as calves themselves in 2000 and 2001, respectively. One of these

females has had two calves by now, the second one – one calf. The first sighting of a mother-calf pair in 2016 occurred on 7th July.

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.

Our sighting data showed that out of six mother-calf pairs, three separated sometime in late July - August. In three other pairs, calves remained with their mothers at our last sighting, and therefore, no information on weaning time for them was documented (Table 3). The possibility to identify calves every year of our study has allowed us to collect information on the age of many individuals, and especially important information on sexual maturity of females. Five females sighted as calves off Sakhalin in early years of our study, have already been observed with their own calves. We assume that they had their first calf at age ranging from 7 to 11.

Kronotsky Gulf survey 2016

Between 15-18 July 2016 we conducted a photo-ID survey of gray whales off Eastern Kamchatka coast. We surveyed Avachuskiy Gulf north from Petropavlovsk-Kamchatsky and Kronotskiy Gulf up to Ogla Bay.

In total, 23 individual gray whales were encountered with 21 of them in Olga Bay. Seventeen gray whales were photographed and fifteen of the whales were photo-identified. Four of the photographed whales were already known from Sakhalin our Sakhalin catalogue. One of them was known from the our Piltun catalogue to be two years old (born in 2014) and one was an individual previously seen in the Vostochny Refuge in 2015 (photos provided by D. Lisitsyn). Another of the Olga Bay whales had previously been photographed at Sakhalin in 2015 (O. Sychenko, pers. comm. to Burdin). Three of the whales photo-identified in 2016 were already in a Kamchatka photo-catalogue maintained by the Institute of Marine Biology in Vladivostok. The remaining 11 whales photo-identified off Kamchatka in 2016 were 'new' to the existing catalogues.

We also surveyed Kamchatka coastal waters south from Petropavlovsk-Kamchatsky in late July 2016 and no any gray whales were found in Vestnik Bay (SE Kamchatka). Usually some gray whales are observed in this area.

These data confirm that there is an intensive exchange of gray whales between the Eastern Kamchatka (Kronotsky Gulf, Olga Bay) and feeding grounds in NE Sakhalin (Piltun lagoon area) and future research in both areas is necessary. According for the latest modelling work by Cooke et al. it appears that the Sakhalin aggregation cannot be considered a separate population, but that Sakhalin and Kamchatka together may be.

DISCUSSION

Our 2016 field observations show that the general distribution of gray whales in the Piltun lagoon area had changed in 2016 compared with 2015 (Fig. 1,2). Most of the whales were encountered south from the Piltun lagoon mouth, and despite significant survey efforts no whales were found in the northern portion of the study area.

In 2016, we did not observe new (i.e. never been sighted with the calf before) reproductive females in the Piltun area, therefore the total number of known reproductive females still remains 33. Six mother-calf pairs were identified in 2016. All six mothers have been sighted in the study area and had multiple calves prior to 2016. The annual return of reproductive females while pregnant, resting and lactating indicates that the nearshore Sakhalin Island feeding area is of significant importance to the continued survival of this population. The behavior of these females indicates that this feeding ground is vital to population survival and growth.

On 12 September 2016, a whale in the Piltun area was observed to be entangled by a long rope with numerous floats on it. The line and floats were identified as part of a coastal salmon trap. The whale was seen and photographed in late afternoon and not seen and reported again afterwards (Re 2016). The entangled whale was tentatively identified in one of the WGW photo catalogues (WGWAP-17 report). It is important to note that 2016 was a 'low' year for salmon runs on eastern Sakhalin Island and the nearest salmon traps were set 30 km north and more than 40 km south of Piltun Lagoon (Re 2016).

CONCLUSIONS

This report summarizes the current population status of the western gray whale population as well as highlights several threats to their future survival. Currently, a reevaluation of the western gray whale population is being considered with a number of plausible hypotheses about population structure. However, an increasing amount of data would be needed to support these hypotheses.

In conclusion, given the vulnerability of the western gray whale population, potential impacts and future oil and gas activities, fisheries, and tourist activities off the northeastern Sakhalin Island need to be closely monitored with stringent mitigation measures to reduce disturbance to the lowest possible level. Protection of the Sakhalin Island feeding habitat, including the coastal lagoon systems that appear integrally related to the high benthic biomass used by the whales in the nearshore area, is clearly paramount to successful conservation of the western gray whale population.

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Table 1. Annual survey effort, groups encountered, and whales identified in 1994-2016.

Year	Sampling Period	Number of Surveys	Observation Hours	Groups 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
Overall		462	979.7	3741	258

Table 2. Annual sighting trends and resighting percentages 1994-2016.

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%

* 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 and last sightings, and separation dates of mother-calf pairs in summer 2016.

Mother ID	Calf Field ID	First Time Seen Together	Last Time Seen Together	First Time Seen Separated
040	01	7 July 16	17 July 16	19 July 16
099	02	16 July 16	19 July 16	-
081	03	16 July 16	16 July 16	20 August 16
011	04	17 July 16	19 July 16	11 August 16
106	05	7 August 16	9 August 16	20 August 16
08	06	8 August 16	21 August 16	-

Fig. 1 and 2. Gray whale sightings near Piltun lagoon in 2015 (left) and 2016 (right).

