

New Data on the Okhotsk Sea Bowhead Whales

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Abstract

The endangered Okhotsk Sea population of the bowhead whale is poorly studied. We present the recent data on bowhead whale summer distribution in the western Okhotsk Sea, different approaches to the size estimation of the Akademii Bay summer aggregation and discuss potential threats for the population.

INTRODUCTION

The information on the Okhotsk Sea bowhead whale (*Balaena mysticetus*) population is very limited and mostly out-of-date. At the IWC Scientific Committee annual meeting in 2013, we presented two unpublished working papers by O. Shpak and I. Meschersky describing our recent studies conducted in 2009, 2011 and 2012. The data were collected opportunistically, during the white whale project, in the Shantar region, western part of the Okhotsk Sea, mostly in Ulbansky Bay (Figure 1). We mapped the bowhead whale sightings, collected skin biopsies using crossbow and picking up the sloughed skin flaps, took photographs of individual whales, recorded behavior, and interviewed local people and workers. We discovered that in summer bowheads concentrate in Ulbansky Bay, but some individuals may also be found in other bays of the region. Mammal-eating killer whales were regularly encountered in the area of bowhead whale concentration. The photographs, recovered carcasses and information collected in interviews give evidence of killer whale predation on bowheads. Genetic analysis of skin biopsies was conducted at the Molecular Diagnostic Center, A.N. Severtsov Institute, RAS. Complete sequences of control region were obtained for 64 individuals, and complete sequences of cytochrome b gene – for 63 individuals. Allelic composition and heterozygosity level for a total of 62 individuals genotyped in 2011-2012 were similar to the samples from 1995-2000 presented in S. Maclean's thesis (2002) and lower than known for the same loci for bowhead whales of BCB stock. When all available data combined (1995-2012), five of 103 individuals marked in 1995-2011 were "recaptured" among 31 whales marked in 2012.

The paper on molecular genetic analysis of the Shantar summer group of bowhead whales has been recently published and is available in English (see Meschersky et al., 2014). The database of individual genotypes of the Okhotsk Sea bowhead whales is available at http://www.sevin.ru/menues1/index_rus.html?./news/676.html.

Based on 1995-2012 dataset from Konstantina and Ulbansky bays, the Shantar bowhead summer aggregation size was estimated as 554 ± 183 whales (Meschersky et al., 2014).

BOWHEAD WHALE SIGHTINGS

In July-August 2013, a coastal expedition from Udkaya to Ulbansky Bay was conducted using an inflatable motorized boat (Figure 1). As in previous years, bowhead whale data were collected under the white whale project. The summer of 2013 in the Shantar region was characterized by very late ice-retreat: the first commercial vessels came to Udkaya bay in late July; separate ice floes were encountered in the region until middle August. The ice-fogs often resulted in poor to zero visibility until August 14. Upon completion of the expedition, irregular coastal and boat observations were conducted from the town in the bottom of Udkaya Bay from early October until slush ice and floes covered the water surface on November 2.

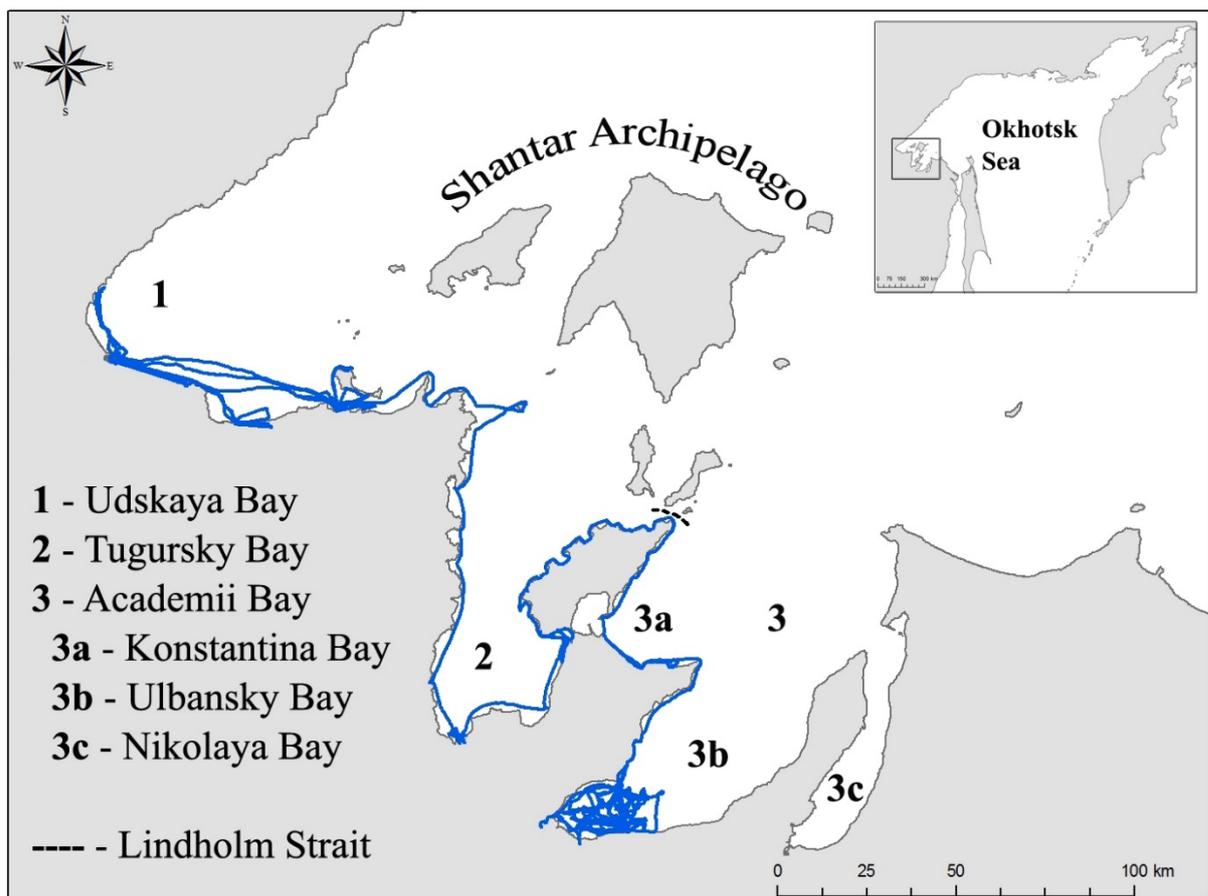


Figure 1. Map of the Shantar region with expedition route.

In Udskeya Bay, we observed a few bowheads in July and late in October (Figure 2, top); and according to interviews, the bowheads were observed there throughout the season. All individuals were of an “average” size, we did not encounter large animals. Most often, we observed the whales feeding. Two biopsy samples were collected from this area.

In Tugursky Bay, in the 19th century as the main place of the bowhead concentration, we did not encounter any whales. One carcass was recovered on the eastern coast (tissue samples collected). According to local people, the whales rarely visit the bay. Once a single individual was observed among belugas in the very bottom of the bay.

While doubling Tugursky peninsula, which divides Tugursky and Akademii bays, on August 11, we did not see any whales. In recent years, the harbors on the northern coast of peninsula and the Lindholm Strait have become whale-watching destinations for the tourist groups. In July 2012, during a platform-of-opportunity survey we encountered 36 whales in the strait and along the eastern coast of the peninsula (Figure 2, top). In 2013, very poor visibility due to the ice fog may have resulted in zero sightings during our passage, but it is also possible that unusual weather conditions have changed typical distribution pattern of bowheads.

In the western pocket of Akademii Bay – Konstantina Bay – we also did not find whales (August 12-13). In 1995-2001, Russian-American expeditions were based on the southern coast of this bay due to a high concentration of the bowheads there (Maclean, 2002). During a brief coastal search, we have found several whale-bones and baleen.

In Ulbansky Bay (August 14-26), we encountered bowhead whales daily. Their distribution and numbers were not different from previous years (Figure 2, bottom). The highest numbers counted in 2013 were:

- 54 whales observed during 4 hours passing the camp (August 18, afternoon),
- 54 and 56 whales counted during two scans on the water (August 22, visibility approx. 2 km due to fog)

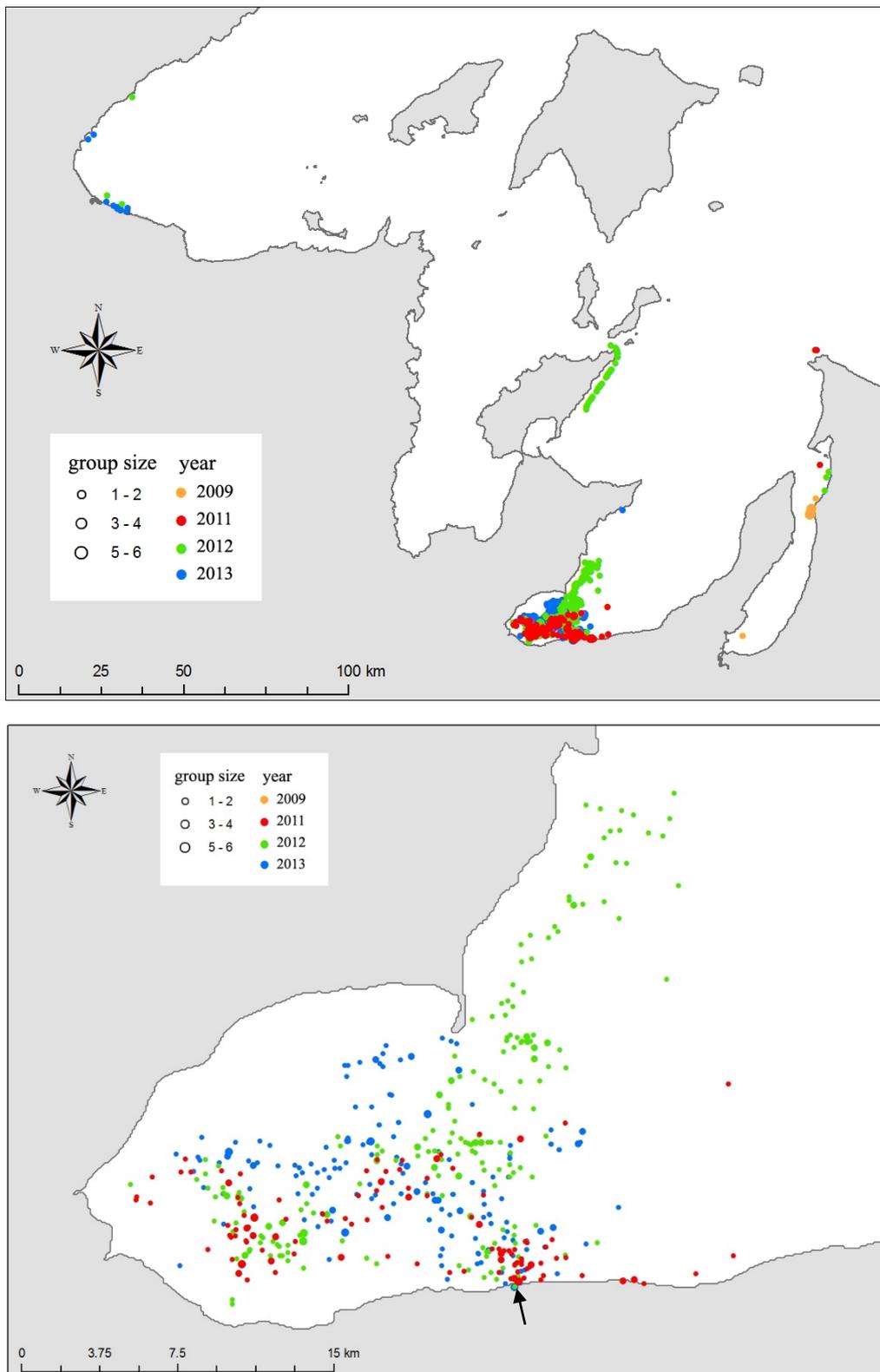


Figure 2. Bowhead whale sightings, 2009, 2011-2013 (our data):
top – the entire Shantar region, bottom – Ulbansky Bay only (camp location is marked with arrow).

GROUP SIZE ESTIMATION

In August 2013, 28 skin biopsies were collected from 25 different individuals. Five recaptures were found between 2011 and 2013 samples, and 1 recapture – with 1995 sample. It is interesting that within our dataset (2011-2013), recaptures were as following: 2011- 2012 (4), 2011- 2013 (5), but 2012-2013 (0). Presumably, in 2011 we sampled a larger aggregation, different subgroups of which we encountered in the next two years.

We attempted to re-estimate the size of the Shantar summer aggregation (further we prefer to call it Academii summer aggregation, because all samples were collected only in Academii Bay, and our recent observations suggest that the whales in Udkaya Bay may belong to a separate group), using different techniques. Similarly to Meschersky with co-authors (2014), we used Chapman formula (Chapman,1951): for the sample of 132 individuals marked in 1995-2012 and 6 of them recaptured within 25 marked in 2013, the groups size equals **493** ($SD=145$). Since different sample pools were analysed in two different genetic laboratories, we cannot exclude false negative matches until the analysis results are compared between the labs. Using only our samples 2011-2013 in calculation (from 64 individuals marked on the “first” visit, 5 were recaptured among 25 marked on the “second” visit), we have obtained a group of **281**($SD=89$) individuals.

Our dataset was collected during a three-year period, which considering a long lifespan of the bowhead whale allowed using of closed population models. Sex of all “marked” individuals was determined in genetic analysis. We used Estimation of Huggins closed population capture-recapture model (F.huggins.estim) in mra-package (Mc Donald, 2012) created for R (R Core Team, 2012). Incorporating sex of marked individuals in the model [M(h)] has increased the group size compared to the model that did not take into account additional parameters [M(0)] (Table 1). The value of Akaike information criterion (AIC) has not significantly differed between the two models.

Table 1. The Shantar bowhead aggregation size estimated using F.huggins.estim M(0) and M(h) models.

<i>Model</i>	<i>M(0)</i>	<i>M(h)</i>
Population size estimate (se)	283.12 (81.42)	327.58 (125.18)
95% ci	175.32 to 512.86	177.18 to 710.74
AIC	234.75	235.17

POTENTIAL THREATS

New information from local residents and employees of mining bases and fishing plants is obtained every year, and it suggests that killer whale predation on juvenile bowhead whales may be frequent and may have a significant impact on the bowhead population growth. In summer 2012, a group of tourists fought back a juvenile whale from a group of killer whales, who polished their hunting techniques on him; the whale almost beached himself while escaping; the killer whales let him free only to attack and kill another whale not far away (pers.comm. with tour leader). The helicopter pilots observed a killer whale attack on a bowhead whale near Ukurunru Cape (separates Konstantina and Ulbansky Bays, summer 2012).

Fishing activities may become a concern in the places of the whale concentration. In Ulbansky Bay, two days prior to our arrival in August 2013, a bowhead whale tore a salmon fishing net, cranked, and having a piece of net wrapped around his tail, swam away. On this day, the killer whales visited the bay, and according to the witnesses, many seals and whales “snuggled” to the shore. Another case of entanglement occurred in Udkaya Bay in August 2012: a female followed her dead baby-whale, the baby beach-casted near the fishing plant, while the female got entangled in the salmon fish net. According to the fishermen, they managed to cut the net and release the female.

A large base for a golden ore-mining company *Polymetal International PLC* was built on the southern coast of Konstantina Bay (N53 57.5’ E137 36.6’) in 2013. At the time of our presence, the construction continued, and there were plans to build a terminal for loading the ore, that is mined on Tugursky Peninsula, to transport it to the ore-processing plant. One of such plants belonging to *Polymetal - Albazino* - is located close to Nikolaya Bay, the eastern arm of Academii Bay.

A dedicated bowhead project is needed to monitor the summer stock in Academii Bay. In light of growing human activity in the region, it is important to define the local movements and key feeding grounds; closely monitor level of disturbance and potential risks of ship strikes and net entanglements. In Udkaya Bay, a throughout-summer observation and biopsy-sampling are required in order to understand if the whales there form a separate summer aggregation. Winter grounds and migratory routes of the Okhotsk bowhead whales remain unknown. There is a possibility that a part of the population spends summer in Shelikhov bay in the north-eastern Okhotsk Sea. Oil and gas development areas in the northern part of the sea may overlap with important for the bowhead whales feeding or breeding grounds. In addition to research, disclosure of marine mammal observers’ data obtained onboard seismic and other oil company vessels to the scientists could become a valuable source of information on present distribution of bowhead whales in the Okhotsk Sea.

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REFERENCES

Chapman. D.G. 1951. Some properties of the hypergeometric distribution with applications to zoological sample censuses. University of California. University of California Publication in Statistics. 1(7):131-160.

Maclean S.A. 2002. Occurrence, behavior and genetic diversity of bowhead whales in the western Sea of Okhotsk, Russia. MS thesis. Texas A&M University. College Station, Texas, USA. 114 p. <http://oaktrust.library.tamu.edu/handle/1969.1/ETD-TAMU-2002-THESIS-M33>

McDonald T. 2012. mra: Analysis of Mark-Recapture data. R package version 2.13. <http://CRAN.R-project.org/package=mra>

Meschersky I.G., Chichkina A.N., Shpak O.V., Rozhnov V.V. 2014. Molecular genetic analysis of the Shantar summer group of bowhead whales (*Balaena mysticetus* L.) in the Okhotsk Sea. *Russian Journal of Genetics* 50(4): 395-405

R Core Team. 2012. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org/>.