

REVIEW ARTICLE

Resources of the Commercial Species of Cetaceans in the Russian Federation and Their Fishing in 2014-2021

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Abstract

Some information about populations condition of the commercial species of cetaceans in the Russian Federation and their fishery for the period 2014-2021 is presented. Commercial fishing in the Far Eastern seas was stopped in the mid-1990s, and is currently carried out only the traditional economic activities of the local indigenous population, but until 2019 also within the framework of fishing for scientific and cultural purposes too. In during the period of planned economic management, fishing for marine mammals was an integral part of the unified Soviet economy. In the early 1990s government support was stopped, the indigenous people begin to use traditional methods of marine fishing, while there is a significant reduction in both the volume of fishing and the amount of scientific information on fishing. Based on current data on the abundance of the Far Eastern populations of beluga whales, the cessation of killer whale catches and small species of cetaceans, using scientific approaches in estimating the value of quotas, the possible production of beluga whales in the Bering and Chukchi seas may amount to 74 individuals; in the Sea of Okhotsk - up to 100 individuals, in the White, Kara and Barents Seas - 150 individuals. The gray and bowhead whale fisheries are whaling is carried out in accordance with the recommendations of the Scientific Committee of IWC and there are currently no plans to increase existing quotas. In the event of an increase fishing of small commercial species of cetaceans, it is necessary to take into account the existing temporary ban on catching marine mammals in the framework of commercial fishing, as well as fishing for scientific and cultural purposes.

Keywords: Cetaceans, Beluga Whale, Bowhead Whale, Gray Whale, Killer Whale, Marine Mammals, Traditional Nature Management.

Introduction

Beluga whale (*Delphinapterus leucas*), killer whale (*Orcinus orca*), bottlenose dolphin (*Tursiops truncatus*), pilot whale (*Globicephala macrorhynchus*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) are considered commercial

cetacean species in Russia. In addition, within the framework of International agreements, the indigenous people of Chukotka hunt gray whales (*Eschrichtius robustus*) and bowhead whales (*Balaena mysticetus*) – the Red List of the IUCN species (International Union for Conservation of Nature) and the Red Book of the Russian Federation.

Since 2019, due to numerous appeals from peoples to the Government of the Russian Federation, as well as due to the fact that the Far Eastern "carnivorous" form of killer whale is listed in the latest edition of the Red Book of the Russian Federation, the catch of cetaceans, with the exception of species as the objects of aboriginal fishing (gray, bowhead, beluga whales) within the framework of fishing for educational and cultural purposes has been stopped. Also, due to the fact that the production (catch) of bottlenose dolphin, pilot whale, white-sided dolphin, despite the regular allocation of quotas for production (15-20 whales of each species annually), is not carried out in the aquatory of the Russia, we do not consider these species in this research.

Note that during the Soviet period, production (catch) marine mammals were conducted centrally, on the basis of scientifically based quotas, with the use of specialized vessels, while scientists had the opportunity to conduct studies to assess the number, distribution, birth rate, nutrition, morphological parameters and other indicators of populations. Currently, with the transition to commercial rails and the increased cost of marine fishing is carried out only within the framework and volumes of traditional nature management for the local indigenous population, and partly as part of the catch for educational and cultural and educational purposes [5,7].

There is a significant decrease in both the volume of traditional fishing and the flow of scientific information on fishing (with the exception of gray and bowhead whales, where fishing is conducted within the rules established by the IWC). This work is devoted to the analysis of the current state of the populations of commercial cetacean species and the problems of their fishing in the waters of the Russian Federation.

Materials and Methods

The assessment of commercial stocks of marine mammals up to 2021 was calculated based on current population data, which are presented in literary sources. We used official data on quotas of the Russian Federal Research Institute of Fisheries and Oceanography (VNIRO) and its branches (Polar, Magadan, Pacific, Kamchatka, Chukotka), as well as data on fishing statistics provided by the territorial departments of Rosrybolovstvo, the Department of Industrial and Agricultural Policy of the Administration of the Chukotka Autonomous District. During the assessment of the catch of cetaceans on the territory of the Chukotka (gray, bowhead whales), they adhered to the block quotas established for the Russian Federation by the IWC.

Production volumes for marine mammal populations were calculated using two methods: 1) using a methodology in which the volume of annual withdrawals for each species of marine mammals should not exceed the replenishment of the reproductive part of the population. The value of this indicator, depending on the specifics of each species, averages 3-5% of the population [12,25,14]; 2) the method of Potential Biological Removal (PBR) for populations of marine mammals with insufficient information support [34, 2, 35, 22]. The PBR indicator is the maximum number of animals that can be removed (without of natural mortality level) from the population of marine mammals, while maintaining an optimal level of reproduction capable of maintaining the population in a stable condition.

PBR is calculated using the following formula:

$PBR = NMIN \times 0.5 RMAX \times FR$, where:

NMIN is the minimum population (stock);

RMAX – half of the maximum theoretical or calculated indicator of stock reproduction with a small population size;

FR is the population recovery coefficient, which varies from 0.1 to 1.0 and is determined by experts. (for beluga, for example, $FR=0,5 [35,20, 1]$).

Results and Discussion

Grey and Bowhead whales In the West Bering Sea and Chukchi zones, in the zones of the Chukchi and East Siberian Seas too, traditional fishing by aboriginal peoples is conducted for three species of cetaceans - beluga, gray and bowhead whales. The extraction of the latter two species in the North Pacific and in the Arctic is regulated by the ICC and is allowed only to the indigenous peoples of Chukotka, Canada and the USA, although a ban on commercial fishing in Chukotka region has been established since 1946 [17].

It is believed that the state of the eastern (California-Chukchi) gray whale population inhabiting the Bering and Chukchi Seas is at an optimal level and its population number, according to various estimates, ranges from 17820 to 21200 and even 26960 individuals [24, 30, 10]. According to various researchers, the number of the Western Arctic (BeringChukchi-Beaufort) population of bowhead whales ranges from 16700 to 27133 [Vladimirov, 2000; Report of the Working Group., 2018]. These are general population for the Russian Federation and the USA, they are also taken as commercial reserves and are the basis for calculating the share of withdrawal for the needs of indigenous residents of Chukotka and Alaska.

In the mid- and late twentieth century, an average of 100 to 150 gray whales were harvested in Chukotka per year [5]. In accordance with the decisions of the 65th session of the IWC, interlocked (6-year) production quotas were set for the indigenous peoples of the North of Russia (Chukotka District) for the period 2013-2018 are 720 gray whales of the California-Chukchi population and 30 bowhead whales of the Western Arctic population. By agreement between the Russian and American sides, it is possible to redistribute quotas between gray and bowhead whales in the direction of changing the quotas of one of the sides.

Starting in 2019, the Russian block quota has been increased and currently stands at 980 whales for 7 years for the Russian and American sides. Quotas for the bowhead whale remained unchanged.

On the reason to traditional fishing the indigenous inhabitants of Chukotka region were able to survive the transition period from a planned to a market economy. From the 1980s to early 1990s (during in the Soviet period), whale hunting was organized through state farms, and the fishing itself was carried out using a whaling vessel ("Zvesdnyy"), the average weight of a whale during this period was about 18 tons. By the mid-1990s, state support was reduced to a minimum, state farms ceased to exist. The population is organized into whaling brigades and communities, switching to traditional methods of fishing, while hunting is carried out by small vessels - from whaleboats and kayaks. For this reason, the average weight of captured whales is reduced by almost half (to 8-9 tons) [5, 36].

Currently, the whaling in Chukotka is carried out by the hunters of 9 communities (14 whaling villages) in the traditional methods: from kayaks, whaleboats and motorboats using rifled hunting weapons, American grenade "datingans" (darting guns) and rotary harpoons. The main fishing load (about 70% of all production in Chukotka) falls on 4 settlements - Lorino village (an average of 64 whales per year), Inchoun village (an average of 12 whales per year), Lavrentia village (an average of 11 whales per year), Uelen village (an average of 9 whales per year; Figure 1).

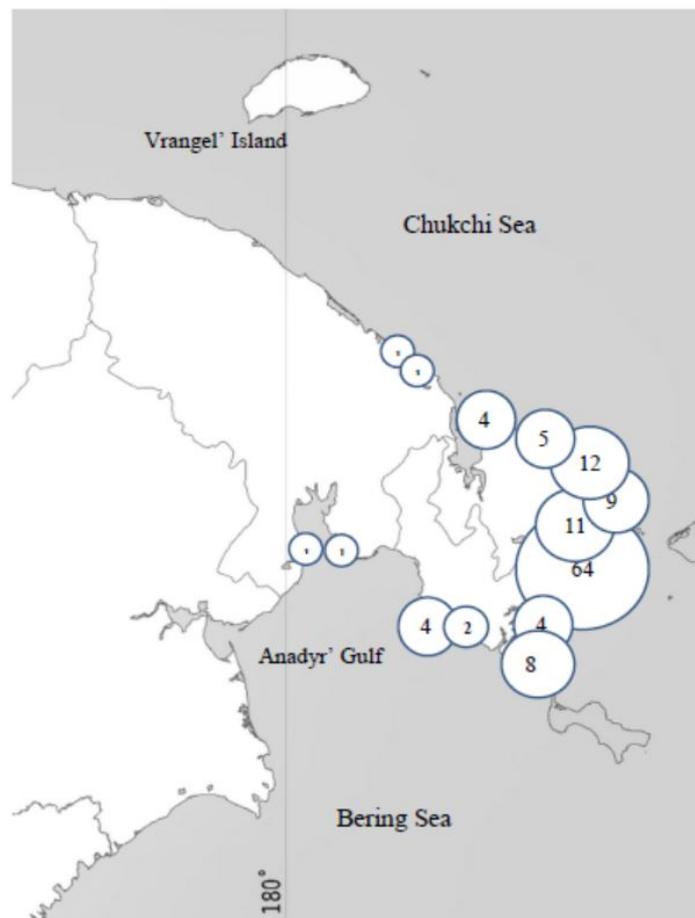


Figure 1: Production of gray whales per year for the settlements of the Chukotka Autonomous District (2014-2021)

At the moment, an average of 124 gray and 0-1 (very rarely 2) bowhead whales in Chukotka are annually withdrawn from the natural environment (Table 1). Despite such intensive coastal fishing, the traditional nature management of the local indigenous population, according to the IWC, does not affect the state of gray whale stocks [17].

Table 1: Development of quotas of gray and bowhead whale by natives of Chukotka in 2014-2021

	Quota, animals								Production, animals							
	2014	2015	2016	2017	2018	2019	2020	2021	2014	2015	2016	2017	2018	2019	2020	2021
Gray whale																
Summ	119	110	114	112	115	112	126	120	124	125	120	119	106	136	136	127
Bowhead whale																
Summ	2	2	2	2	2	2	2	2	0	0	2	1	0	1	0	0

Since 1994, this species of marine mammals has been listed in the IUCN Red List with the status of vulnerable. But in the Russian Federation, this is a common commercial species.

In the USSR, beluga whales were actively fished mainly on the southern and eastern shores of the White Sea, on the eastern coast of the Gulf of Ob' River, in the Yenisei Gulf, on the coast of the Sakhalin Gulf [8, 16]. In the 1950s and 1960s, the annual production of this species in the European north of Russia was approaching 3,000 individuals [23]. In the Far East, according to L.S. Bogoslovskaya, the average annual production of beluga whales usually did not exceed 100-150 heads [6], although

Kleinenberg and co-authors indicate that the fishing of beluga whales only in the Sea of Okhotsk in the mid-1950s was about 800 heads per year [15].

At the moment, beluga whales in the Russian Federation are mined mainly in the Chukotka Autonomous District, and only in the Magadan region. In the twentieth century, no more than 20-70 heads of animals per year were mined throughout Chukotka, including the East Siberian, Chukchi and Bering Seas. Significant volumes of fishing were only in the 1960s (600-800 heads per year; [17]) and in 1986 (506 heads), when a large herd of belugas was trapped by ice in the Senyavinsky Strait [21]. Currently, the production of belugas in Chukotka does not exceed 20 individuals (Table.2), while over a 20-year period in Alaska, the total production by the local population ranged from 208 to 494 individuals per year (an average of 323 belugas for 4 Alaskan populations [17,11]).

In 2016, 2 beluga whales were produced in the north of the Magadan region for the needs of the KMNS. In 2017 and 2018, the quotas for catching this species were 25 individuals; the official catch was not registered (Table 2).

Table 2: Development of the quotas of white whale in 2014-2021

Year	Fishing for cultural and educational purposes		Fishing for research purposes	
	Quotas (animals)	Production(animals)	Quotas (animals)	Production(animals)
Sea of Okhotsk				
2014	150	105	0	0
2015	150	87	0	0
2016	150	0	0	0
2017	150	0	0	0
2018	150	90	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
West-Kamchatian zone				
2014	0	0	0	0
2015	0	0	0	0
2016	25	0	0	0
2017	25	0	0	0
2018	25	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
White Sea				
2014	0	0	50	0
2015	0	0	50	0
2016	0	0	50	0

2017	0	0	0	0
2018	0	0	50	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
	Barents sea			
2014	0	0	200	0
2015	0	0	200	0
2016	0	0	200	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
	Kara sea			
2014	0	0	200	0
2015	0	0	200	0
2016	0	0	200	0
2017	0	0	0	0
2018	0	0	0	0
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0

Until 2019, belugas of the Sakhalin-Shantar population were the most in demand for keeping in dolphinariums and oceanariums, while approximately 30 – 40 individuals per year were caught for these purposes.

According to expert data, the current number of beluga whales in the Russian part of the Bering Sea can reach from 10,000 [Vladimirov, 2000] up to 15,127 (7,447 - 30,741; $C_i = 95\%$) individuals, taking into account the correction factor of surface visibility (2.86 ± 0.76) [18, 19].

Based on the precautionary approach, 200 animals were allocated for fishing until 2018 (less than 3% of the estimated total number of the Bering Sea population). Starting from 2019, the amount of withdrawal for beluga whales is calculated based on the PBR-model, for which all the required parameters are available: $N_{MIN} = 7,447$ belugas; $R_{MAX} = 0.048$; $FR = 0.5$ [35, 20,1]:

$$PBR = 7,447 \times 0.02 \times 0.5 = 74 \text{ belugas.}$$

However, due to the fact that the existing beluga fishery in Chukotka does not exceed 20 heads, the total catch for the indigenous population of Chukotka for 2021 and 2022 was proposed in the amount of 30 individuals (Table 3).

Table 3: Development of quotas of a white whale by natives of Chukotka in 2014-2021

	Quotas (animals)								Production (animals)							
	2014	2015	2016	2017	2018	2019	2020	2021	2014	2015	2016	2017	2018	2019	2020	2021
Summ	200	200	200	200	200	0	0	30	8	3	4	13	13	0	0	0

There are two populations of beluga whales in the Sea of Okhotsk – population of Shelikhov Bay and Sakhalin-Shantar Island population, while there is a high probability of exchange (crossing) between groups during the mating period in winter [26].

The direct registered number of beluga whales, according of air account results in the waters of the Sea of Okhotsk in 2010, amounted to 6113 animals in 2010 [26]. Using correction coefficients for under-accounting of animals under water ($\times 2$), the number of the Sakhalin–Shantar group (beluga of the Sakhalin Gulf, Amur Estuary, Shantar Islands, Uda Bay) in the summer period is approximately 9500 individuals, the number of the Shelikhov Bay group is about 2600 individuals, and the total number is close to assessment of the MCC (12,000 individuals; <https://iwc.int/estimate>). Due to the fact that the IUCN estimates the current status of these populations as "unknown", with these population estimates and a "recovery factor" of 0.65, taking into account the correction factor of visibility $\times 2.0$, the estimated PBR value is 100 belugas for the Sea of Okhotsk [26].

When calculating beluga production by the method of Fedoseev, Ognetrov and Gaydenok [12, 25, 14], the total volume of beluga production in the Sea of Okhotsk in 2021 and 2022 may be 360 individuals, which is approximately 3.5 times higher than when calculated using PBR.

1990, fishing has been discontinued due to economic inefficiency, but quotas are periodically allocated (but not extracted) for cultural, educational and research purposes (Table 2).

assessment of the total number of a single population of beluga whales of the Barents, White and Kara Seas may be 15-18 thousand individuals at the beginning of the XXI century [13,23]. According to the data of the 2005-2008 summer air surveys, the number of the Kara beluga population during this period was estimated at the level of 7010/7464, 4891/5533, 4527/5009 and 6432/6498 individuals, respectively (depending on the calculation method for the Distance / Beluga programs).

Based on the presented estimates of the number, the permissible size of prey may be 450 animals (using the calculation model according to the method of Fedoseev, Ognetrov and Gaydenok) [12, 25, 14]. With the use of PBR, the size of the annual production can be 150 whales.

The killer whale in the middle of the twentieth century was a secondary commercial object. The Aleut whaling flotilla in the seas of the Far East produced from 1 to 12 whales per year (on average 3 killer whales per year from 1933 to 1947; [31]). In the early 1960s, the killer whale in the Sea of Okhotsk ceased to be an industrial species, coastal whaling stations were closed, therefore, work on the study of the distribution, abundance, ecology of the species in Russian waters was limited to random observations and haphazard accounting. For this reason, estimates of the number of killer whales in the Sea of Okhotsk vary from 500-1500 [32,3,9] to 10.0 - 12.5 thousand individuals [Vladimirov, 1994; 2000; 9,27, 28, 29]. According to the data of the 2015-2019 expeditions, specialists of the Pacific branch of the VNIRO (Vladivostok) using the methods of accounting work of the IWC, the estimate of the number of killer whales of the Sea of Okhotsk is approximately 1629 individuals.

Until 2019, the catch of killer whales in the waters of the Russian Federation was conducted only for cultural and educational purposes (Table 4). Since 2019, the catch has been discontinued.

Table 4: Development of the quotas of orca whales in 2014-2018

Zone	Quotas (animals)					Production (animals)				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Sea of Okhotsk	4	6	2	0	5	3	6	0	0	5
West-Kamchatian zone	2	2	0	0	3	0	2	0	0	3
Kamchatka-Kuril Isl. zone	1	0	0	0	2	0	0	0	0	2
East Sakhalin zone	0	2	0	0	2	0	2	0	0	2

In conditions of a lack of information on the population parameters of sea-hunting killer whales, the theoretically permissible level of fishing load (PBR), using the available population estimate of 1629 animals in 2019, is 7 whales. The resulting value is no more than 0.4% of the total number, the catch was proposed to be carried out as part of cultural and educational trapping (currently prohibited).

Conclusion

In the 1980s and early 1990s, marine mammal fishing including cetaceans was an integral part of the unified Soviet economy, financed from the federal budget, organized through coastal state farms, and the fishing itself was conducted mainly with the use of whaling vessels. With the termination of state support in the mid-1990s, the cetaceans fishing, is reduced to a minimum level (in Chukotka region), but in some areas it stops altogether (in the European part of Russia, in the Bering and Okhotsk seas). As a result of this, the flow of scientific information has significantly decreased, including on the state of cetacean populations, their migratory activity, the level of sex and age-related births and deaths levels.

In Chukotka, where traditional nature management is important for residents and the economy of region, the local population is organized into groups and communities and switches to traditional methods of conducting whale hunting using traditional boats and kayaks, rifled weapons and harpoons. On the reason of such changes, the extraction and transportation of large adult whales for butchering to the shore is significantly more difficult, therefore, the average weight and linear dimensions of the animals produced are significantly smaller than during the Soviet period. (with the exception of gray and bowhead whales, where fishing is conducted within the rules established by the IWC).

At the moment, the state of commercial cetacean species in the marine area of the Russian Federation is quite stable, and in some species the number has increased over the past 20 years, including as a result of changes in the methodology of accounting work. therefore, it can be stated that in order to meet the needs of the indigenous population of the Far East and the North of the European part of Russia, there is a sufficiently high potential for fishing for small and large cetaceans.

Due to the almost complete cessation of beluga whale hunting and a fairly stable state of their populations, based on a cautious approach to estimating the size of quotas, it is possible to increase its prey in Chukotka by almost 10 times (up to 74 individuals), compared with how many are being hunted now; in the Sea of Okhotsk – up to 100 individuals, in the White, Kara and in the Barents Seas up to 150 individuals. Gray and bowhead whale fishing is conducted under the auspices of the International Whaling Commission and an increase in existing quotas is not currently envisaged. In the case of a return to ship fishing, including the opening of fishing for small cetacean species, it is necessary to take into account legislative restrictions and a ban on catching cetaceans for industrial, educational and cultural purposes in Russian Federation.

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