

## Gray Whale re-inhabits former species area

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Historic range of gray whale - *Eschrichtius robustus* Lillijeborg, 1861, is located in the Northern hemisphere. Gilmore (1955) proposed that in the interglacial period, there was a channel of swapping between stocks of gray whales in the North Atlantic and North Pacific. The gray whale is described on subfossil remnants from Sweden. These whales were feeding in the North Atlantic during summertime in the Baltic Sea and off Iceland and wintered off the coast of South-Western Europe or North-West Africa and south of 50° NE off the Atlantic coast of North America. The gray whale disappeared in Atlantic as a result of whaling at the beginning of the XVIII century (Mead & Mitchell, 1984; Sokolov, Arseniev, 1994). Gray whales are also distributed in North Pacific coastal waters. During the glacial period when the feeding areas moved South, the whales from West and East coasts could have mixed (Swartz *et al.*, 2006). The gray whale stocks were undermined by whaling in the North Pacific in XIX century.

There are two populations of gray whales in the Pacific Ocean which are considered by some researchers as divided into two substocks in each of them.

Some gray whales were reportedly occurring year round at the border of the USA and Canada (Pike, 1954; Wilke, Fiscus, 1961). In the summer here there are about two hundred such individuals known as the Pacific Coast Feeding Aggregation. These whales are not significantly different genetically or demographically from the rest of the Eastern population. It is suggested that panmixia between the main Eastern stock and Southern substock is not presented. Most of the whales of the Southern substock are observed in the feeding on a regular basis, while the other whales do not come every year and only in some areas (Calambokidis *et al.*, 2010).

**The whales of main Eastern (or Chukotka-California) population** feed along the mainland coast of the Eastern Siberian, Chukchi and Bering Seas, and winter mainly along the Baja California, Mexico coast. By examining whaling records Henderson (1984) made a qualitative conclusion that the population did not exceed 15.0 – 20.0 thousand whales before the initiation of commercial exploitation in the middle of the 19-th century. By 1900, the eastern population abundance had declined to 2.8 thousand individuals as a result of large-scale whaling. The population was restored after the ban of whaling in 1938 by the end of 1950-s were 6.0-8.0,

by 1968 had reached 13.5, in 1975 - 17.4, 1980 - 19.8, 1985 - 23.5 1988 - 26.9 thousand individuals. Thereafter, it declined by 1993 to 15.8 and by 1998 again reached the peak of 21.1 thousand individuals. In 2000 the number fell to 16.4 in 2002 - 16.0, and by 2007 had increased again to 19.1 thousand individuals (Laake *et al.*, 2009). This indicates that Eastern population abundance reached or even exceeded the initial pre-whaling abundance in 1980-88, 1998 and in 2007. Seemingly, the decennial abundance fluctuations were balanced by carrying capacity around 15.0-22.0 thousand whales. The above is believed to be caused by whale's prey species abundance, temperature regime and other factors (Rugh *et al.*, 2005).

**Western population** contains Okhotsk-Korean and Japanese substocks, which before 1910 jointly numbered about 1.0 -1.5 thousand individuals (Berzin & Vladimirov, 1981). Area of wintering and breeding of the small Japanese substock (knocked by the end of the XIX) were situated in the straits between the islands of Honshu, Kyushu and Shikoku, and summer feeding areas were situated at the North waters of Hokkaido (Andrews, 1914; Mizue, 1951).

The whales of the Okhotsk-Korean substock are fattening primarily in the coastal waters of the Okhotsk Sea, and they were sighted off the coast of Korea and China in winter time. The last whales were hunted at the southern coast of Sakhalin in 1926, at the northern Kuril Islands in 1942 (Mizue, 1951), off the coast of Korea sporadically and not annually the gray whales were hunted until 1966 (Brownell and Chun, 1977). Since that time, most researchers suggested that the western population had gone extinct. Nonetheless until early 1980-s some singles, couples sometimes and three whales once were sighting off the coast of South China Sea, Japanese Sea (near to Vladivostok) and Okhotsk Sea (Kuril Islands, South of Kamchatka) only in 1965, 1968, 1977, 1978 and 1979. In 1970 population estimated as 100-200 individuals (Berzin and Yablokov, 1978). Since the early 1980s the whales has began more common in groups: 1982 - 4 whales, 1983 - 8 (in the South of Kamchatka) and 3 (near Shantar Islands), 1982 - 14 whales and 1985 - group (in the south of Sakhalin Island), 1983 - 20 whales (in the northeast of Sakhalin Island), 1987 - 18 whales (the mainland coast opposite the South of Sakhalin), 1988 - 3 whales (Middle Kuril Islands) (Maminov, Blokhin, 2004; Nambu *et al.*, 2010). In the area of the Piltun lagoon (south-west of Sakhalin Island) were observed 34 whales in September and in the sea near to Cape of Kril'on the five whales in January, 1989 (Berzin *et al.*, 1990). It was believed that the spatial separation of Bering and Okhotsk Seas and lack of gray whales sightings in the northern part of the Okhotsk Sea and off Western Kamchatka provide enough evidence to consider the Western North Pacific population of gray whales completely independent (Vladimirov, 1994).

In late 1990-s early 2000-s based on systematic data collected by Russia-US Program off NE Sakhalin (Piltun lagoon) population's abundance was re-assessed around 100 whales (Weller *et*

*al.*, 1999). The population was listed as Critically Endangered by the IUCN in 2000. In 2001 additional feeding location located south-east from Piltun nearshore feeding area was discovered and population was estimated to number at least 120 whales (Vladimirov, 2002). After applying the method of photo identification, including the 2002 Russian programs in other areas off Sakhalin and Kamchatka in 2004, the number was evaluated from 130 (Cooke *et al.*, 2008) to 140-150 individuals (Yakovlev and Tyurneva, 2004). From 1995 to 2009 were identified about 180 whales, about 80 of which about were first sighted as calves (Bradford *et al.*, 2010; Tyurneva *et al.*, 2009). Other researchers suggested that animals sighted at feeding grounds do not represent the whole population (Zemsky, Smelova, 2004), it's survival rates overestimated while abundance - underestimated (Vladimirov, 2004; Kanda *et al.*, 2010).

In 2005 IWC Scientific Committee noted, that about half of the year Western gray whales spend in waters of East Asia: Japan, Republic of Korea, Korean Democratic People's Republic and Peoples Republic of China and that additional removal of one reproductive female per year is likely to drive population extinct by 2050 (IWC, 2006, pp.10, 67). In 2009 it was noted that from 2005 population slowly increases and numbers about 130 (IWC, 2010, p.1, 17).

The contemporary **migration routes and wintering places** are unknown. Researchers suggest that they may pass from the Okhotsk Sea to the shores of Korea and China, through the Laperouse Strait (Czapski, 1963) and the Tatar Strait (Yablokov and Bogoslovskaya, 1984). Whales found off the coast of Eastern Kamchatka and the Commander Islands, and they can come here from the East coast of Japan along the Kuril Islands and are owned to "Japanese" substock of Western population (Maminov, Blokhin, 2004). It was also supposed that some of the whales may remain in the Sea of Okhotsk for winter in polinyas (Blokhin, 2004; Reeves *et al.*, 2008).

Some single gray whales have been noted at the **South-Eastern coast of Kamchatka** in the summer since the early 1980-s. (Blokhin *et al.*, 1985). In following years the number of the gray whale sightings and their numbers have been continually increasing off the central part of Kamchatka. The regular observations were not allowed to suppose whether these are due to the expansion of the Eastern population or as the result of special attention of scientists. It was believed that whales of Eastern population inhabit in the Northern waters off Kamchatka and the Commander Islands, and Western population is in the Southern Kamchatka. Some supposed that the northward extension of the Western North Pacific gray whales population range could have been caused by impacts of oil and gas development at Sakhalin shelf (Vertyanin *et al.*, 2004). **The lacks of isolation between Western and Eastern gray whales** are discussed many times.

Some authors discussed a possibility of western gray whales reaching feeding grounds of Eastern population (Omura, 1974; Vertyanin *et al.*, 2004). On the other hand, some authors

suggested considering whales migrating along eastern Japan as transients from Eastern population (Nishiwaki and Kasuya, 1970; Bowen, 1974).

Some authors believed that eastern gray whales migrate northward; leaving Alaska Gulf along south side of Aleutian chain and only around Commander Islands they turn to the North and enter into the Bering Sea (Gilmore, 1955). But this is not confirmed by the direct observations (Berzin, Rovnin, 1966). The researchers are not leave out the scattered migration of Eastern whales in North-West across the Bering Sea and turn around on St. Lawrence Island in the South-West direction along the Koryak coast. A stranded whale was found at the Commander Islands (Medny Island) in 1978, and in 1983 were met 55 gray whales in the northern border of Kamchatka Peninsula (Votrogov, Bogoslovskaya, 1986). They are occurred almost every year at the Bering Island since 1995. Nonetheless, in 2000 a whale, first sighted as a calf off Sakhalin in 1997, was photographed offshore Bering Island. The same whale was later identified off Sakhalin in 2002 (Weller *et al.*, 2003). The Institute of Marine Biology of the Far East Branch of Russian Academy of Sciences photocatalog of gray whaled identified off Kamchatka in 2004-2008 holds 78 whales [the catalog is a subject to annual updates]. Roughly half of the animals in this catalog, including females with calves, were at least once sighted off Sakhalin (Tyurneva *et al.*, 2009).

It is believed that the gray whales copulate in the winter areas and for them are characterized with polygamous relationships (Hubbs, 1962). The other researchers believe that the gray whales are likely to gravitate toward a monogamy (Calambokidis *et al.*, 2010). However, there are some records of mating being observed in April and September in Bering and Chukchi Seas (Tomilin, 1957; Clarke *et al.*, 1989). Some behavior with obvious mating features have been recorded in fall off Sakhalin (Vladimirov, 2004) and in the area of two population ranges overlap off Kamchatka (Vertyanin, pers. comm.).

There are some data that the distance from the tip of the rostrum to the base of the pectoral flippers, from the tip of the rostrum to the eye, the maximum width of the pectoral flipper, and the length of the baleen plates were statistically greater in the western gray whales, and that western gray whales had fewer baleen plates and fewer throat grooves (Zimushko, Ivashin, 1980). It was concluded analyzing data of size for more than 30 whales caught in 1925 off the North-East coast of Kamchatka that the young whales have come from the waters of Korea (Risting, 1928). The study the size of whales caught in 1980 in the Bering and Chukchi Seas has led to the same conclusion (Blokhin, 1982). Contrary, D.W. Rice (1998) summarized several studies that found no clear differences in skeletons of gray whales from the Atlantic Ocean and from the western and eastern pacific populations.

Populations of gray whales with respect to markers of mitochondrial and nuclear DNA have revealed that the western and eastern populations have been isolated, and, presumably, over a long time (LeDuc *et al.*, 2002; Brownell *et al.*, 2009; Burdin *et al.*, 2009; Lang *et al.*, 2010). Migration of whales of two populations towards to each other or unilateral migration of whales of one population - both hypotheses may be suggested, but none can be ruled out for gray whales migrating and feeding in the Russian seas based on mtDNA haplotypes distribution (Meschersky *et al.*, 2011). The study of whales ran aground in Japan showed that there may be gene flow between the two populations, because of the long life and historically large abundance, the western population may still retains considerable amount of genetic diversity after severe, but recent, population reduction (Kanda *et al.*, 2010). While previous studies have supported genetic differentiation between eastern and western populations of gray whales, the relatively low level of genetic differences observed at nuclear markers suggests that some dispersal between the two populations could be occurring. The finding of two whales apparently sampled on both sides of the North Pacific, although subject to numerous caveats, provides support for that possibility (Lang, 2010).

**The scenario of gray whale recovering its own natural history area** has also been proposed (Ilyashenko, 2009), but without sufficient arguments and has been criticized (Brownell *et al.*, 2009). In favor of this scenario have been analyses the following information.

As marked above, there is no consensus that the Eastern and Western populations infallibly distinguished on any remarks.

Since the mid XX century individual whales of Western population were observed only in 1965, 1966, 1968, 1977, 1978 and 1979. The groups of whales were seen from the beginning of 1980, when the number of Eastern population exceeded the initial pre-whaling abundance.

It could be assumed that there had been the simultaneous growth of both populations. However, it should be noted that the period of completion of the next growth of the Eastern population in the late 1990-s there was the period of biggest mortality due to the stranded of 274 whales in 1999 and 368 in 2000 at the shores from California to Alaska (Brownell, 2010). The number of the Western population in these years was estimated at about 100 individuals, while in 1999 on Sakhalin were 19 skinny whales in 2000 - 30, 2001 - 21, further decreased the number of observing of whales. This phenomenon is recorded for the Eastern population (Burdin *et al.*, 2004). It means that the negative processes were synchronous in the Eastern and Western populations with different phases of population dynamics.

Exactly during the years previous to the peaks of the Eastern population in 1998 and 2007 were recorded, stranded or accidentally bycaught in nets the individual whales in 1996 near to

Hainan Island in Southern China (Zhu, 1998), 1995, 1996, 2005 and 2007. Hokkaido and Honsu. And only one of them were found on the West coast of Japan (Kanda *et al.*, 2010).

It is noted that the whales arrive to the coast of Sakhalin Island in late of May, usually from the North, and in November again shift to the North (Blokhin, Burdin, 2001). The similar migration patterns are observed for the Eastern Kamchatka (Vertyanin, pers. Comm.).

It is suggested that the daily consumption of food by the adult gray whale is about 1.0 - 1.2 thousand kilos (Zimushko, Lenskaya, 1970). The whales are spotty distributed in areas of summer feeding, and the changing of the feeding areas takes place not only for the years but also during the season (Bogoslovskaya *et al.*, 1981). Photo identification confirmed that a significant number of whales move from one station to another. For example, there were identified 77 of Sakhalin whales in 2009, and taking into account the photo identification data from Kamchatka the total amount are 117 individuals (Vladimirov *et al.*, 2010). In recent years, each year photocatalogues replenished with new adult whales, and some of whales do not meet the 5 - 7 years (Tyurneva *et al.*, 2009).

There is reason to believe that even the gray whale is considered as homing animal to the places of feeding and breeding, however, at the same the gray whale is a nomadic animal. In the 1980-s the gray whales of Eastern population have rarely came into the East Siberian Sea, and in 1990 they have becoming more common in Wrangel Island, where in some areas were met up to 7 individuals per 10 km (Kochnev, 2001). At the same time the whales have been met in the Eastern parts of the Beaufort Sea. The unique example of long-distance migrations was recorded meetings of a gray whale off the coast of Israel and Spain in May 2010 within the area of extinct Atlantic population (<http://www.epochtimes.ru/content/view/37236/5/>). The thirteen years old male was tagged in October 2010 with satellite transmitter near to Sakhalin have reached off Oregon US state coast in February 2011.

It is clear that in hundred years after the destructive whaling and as a result the measures of protection, the gray whale began to restore its habitat. The satellite telemetry is a priority and will promote measures for its recovery at the national level in the range states and international cooperation.

**Protection measures.** The above evidence suggests that the western part of the species range in the Pacific is being re-inhabited not by (or *not only by*) potentially survived whales of the relict Western population, but by Eastern animals re-inhabiting historic parts of the species range. At the same time, some individuals have continued or just started to use the historical winter areas to the South of the Sea of Okhotsk. Taking into account intensive exploitation of the continental shelf: fisheries and mariculture in Japan, Korea and China, oil and gas development in the Okhotsk Sea, it is critical to identify key habitats of the Western North Pacific population

of gray whales. Implementation of the Western Gray Whale Rangewide Conservation Plan recommended by IUCN (Western Gray Range Wide Workshop, September 2008, Tokyo) is needed, including consideration of Canada, USA and Mexico as range states.

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### Literature

- Andrews, R.C. 1914. Monograph of the Pacific Cetacea. I. The California gray whale (*Rhachianectectes glaucus* Cope) // Mem. Amer. Mus. Nat. Hist., n.s.1: 227-287.
- Berzin, A.A. 1995. New results and challenges in whales research // Sb. TINRO-70. Vladivostok: 154-158. [in Russian]
- Berzin, F.F., Rovnin, A.A. 1966. Distribution and migrations of whales in the North-East pacific, Bering and Chukchi Seas // Izvestiya TINRO, 58:179-206. [in Russian]
- Berzin, A.A. and Yablokov, A.V. 1978. Abundance and population structure of main exploited cetacean species of the World ocean // Zool. journal. 57(12): 1771-1785. [in Russian]
- Berzin, A.A. & Vladimirov, V.L. 1981. Changes in the abundance of whalebone whales in the Pacific and the Antarctic since the cessation of their exploitation. Report of the International Whaling Commission, 31, 495-499.
- Berzin, A.A., Vladimirov, V.L., Doroshenko N.V. 1990. Results of aerial surveys on distribution and abundance of bowhead, gray and white whales in Okhotsk Sea in 1985-89. Izvestiya TINRO. 112: 52-60. [in Russian]
- Blokhin, S.A. 1982. Investigation on gray whales taken off Chukotka in 1980 // Rep. Intern. Whal. Commiss. 32:375-377.
- Blokhin, S.A. 1986. Investigation of gray whales taken off Chukotka in 1984 // Rep. Intern. Whal. Commiss. 36: 287-290.
- Blokhin, S.A. 2004. Terms of grey whales (*Eschrichtius robustus*) appearance near the northeastern Sakhalin, their abundance and behavior in the beginning and in the end of their stay in the area of Piltun Bay // Marine Mammals of the Holarctic, Collection of Scientific Papers. Moscow. KMK:78-82.
- Blokhin, S.A., Maminov, M.K. and Kosygin, G.M. 1985. On the Korean-Okhotsk population of gray whales // Rep. Intern. Whal. Comm. 35: 375-376.
- Blokhin, S.A., Burdin, A.M. 2001. Results of the studies of gray whales of Okhotsk-Korean stock off north-east Sakhalin in 1998//Results of marine mammal studies at the Far East in 1991-2000: Materials to XVI meeting of the working group on the project 02.05-61 «Marine mammals» of Russia-US agreement on collaboration in environment conservation. M.: VNIRO: 58-65. [in Russian]
- Bogoslovskaya, L.S., Votrogov, L.M., Semenova, N.T. 1981. Feeding habits of gray whale off the Chukotka peninsula // Rep. Intern. Whal. Commiss. 31: 507-510.
- Bowen, S.L. 1974. Probable extinction of the Korean stock of the gray whale (*Eschrichtius robustus*). Journal of Mammalogy, 55, 208-209.
- Bradford, A.L., Weller, D.W., Lang, A.R., Tsidulko, G.A. Burdin, A.M. and Brownell, R.L., Jr. 2010. Comparing Observation of Age at First Reproduction in Western Gray Whales to Estimates of Age at Sexual Maturity in Eastern Gray Whales // Paper SC/62/BRG2 presented to the International Whaling Commission Scientific Committee:6pp.

- Brownell, R.L., Jr. 2010. Summary Gray Whale Strandings in 2010: California, Oregon, and Washington // Paper SC/62/BRG35 presented to the International Whaling Commission Scientific Committee.3pp.
- Brownell, R. L. Jr. and Chun, C.I. 1977. Probable existence of the Korean stock of the gray whale (*Eschrichtius robustus*) // J. Mamm.58: 237-239.
- Brownell, R.L. Jr., Lang, A.R., Burdin, A.M., Bradford, A.B. and Weller, D.W. 2009. The western gray whale population is distinct: a response to SC/61/BRG22 // Paper SC/61/BRG30 presented to the International Whaling Commission Scientific Committee.4 pp.
- Burdin, A.M., Weller, D.W., Brownell, R.L. Jr. 2004. Western population of Gray Whale (*Eschrichtius robustus*): Modern status, problems of research and conservation // Marine Mammals of the Holarctic, Collection of Scientific Papers. Moscow. KMK:102-105.
- Calambokidis, J., Laake, J.L., Klimck, A. 2010. Abundance and population structure of seasonal gray whales in the Pacific Northwest, 1998-2008 // Int. Whaling Com., 62-th meeting, doc. SC/62/BRG32 presented to the International Whaling Commission Scientific Committee. 50pp.
- Chapsky, K.K. 1963. Order Pinnipedia // Mammals of USSR fauna. M.-L.: publ. AN USSR. 3. [in Russian]
- Clarke, J.T., Moore Sua, E., Ljung Blad, D.K. 1989. Observation on gray whales (*Eschrichtius robustus*) utilization patterns in the northeastern Chukchi Sea, July – October 1982 – 1987 // Canad. J. Zool.62: 436-441.
- Cooke, J.G., Weller, D.W., Bradford, A.L., Burdin, A.M. and Brownell, R.L., Jr. 2008. Population assessment of western gray whales in 2008 // Paper SC/60/BRG 11 presented to the International Whaling Commission Scientific Committee. 9pp.
- Fadeev, V.I. 2009. Benthos studies in feeding grounds of western gray whales off the northeast coast of Sakhalin Island (Russia), 2004-2008 // Paper SC/61/BRG 24 presented to the International Whaling Commission Scientific Committee,9pp.
- Gilmore, R.M. 1955. The return of the gray whale // Sci. Amer. 192(1): 62-67.
- Henderson, D.A. 1984 Nineteenth century gray whaling: grounds, catches and kills, practices and depletion of the whale population. In: *The Gray Whale, Eschrichtius Robustus* (Ed. by M.L. Jones, S.L. Swartz & S. Leatherwood), Academic Press, Inc., Orlando, FL.:159–186.
- Hubbs, C.L. 1962. Natural history of gray whale // Proc. XV Intern. Congr. Zool. L.: 313-316.
- Ilyashenko, V.Yu. 2009. How Isolated is the “Western” Gray Whale Population? // Paper SC/61/BRG22 presented to the International Whaling Commission Scientific Committee. 3 pp.
- Ivashin, M.V., Votrogov, L.M., 1982. The marking of Gray Whales (*Eschrichtius robustus*) // Rep. Intern. Wal. Commiss. 32: 343.
- IWC, 2006. Annual Report of the International Whaling Commission 2005. Cambridge.
- IWC, 2010. Annual Report of the International Whaling Commission 2009. Cambridge.
- Kanda, N., Goto, M., Ilyashenko V.Yu., Pastene L.A. 2010. Preliminary mtDNA analysis of gray whales from Japan and Russia // Paper SC/62/BRG5 presented to the International Whaling Commission Scientific Committee,7 pp.
- Kochnev, A.A. 2001. On sightings of gray whales off vrangel Island // Results of marine mammal studdies at the Fra East in 1991-2000: Materials to XVI meeting of the working group on the project 02.05-61 «Marine mammals» of Russia-US agreement on collaboration in environment conservation. M.:VNIRO:68. [in Russian]
- Laake, J., Pund, F., Hoobs, R., Ferguson, M., Rugh, D. and Breiwick. 2009. Re-analysis of gray whale southbound migration surveys 1967-2006. NOAA Tech. Mem. NMFS-AFSC 203. SC/62/ForInfo 2 presented to the International Whaling Commission Scientific Committee. 55 pp.
- Lang, A.R., Weller, D.W., Leduc, R.G., Burdin, A.M., Brownell, R.L. Jr. 2010. Genetic differentiation between western and eastern gray whale (*Eschrichtius robustus*) populations



- using Microsatellite Markers // Paper SC/62/BRG11 presented to the International Whaling Commission Scientific Committee, 18 pp.
- Lang, A.R. 2010. The population genetics of gray whales (*Eschrichtius robustus*) in the North Pacific. Ph.D. thesis, University of California San Diego, 202 pp.
- LeDuc, R.G., Weller, D.W., Burdin, A.M., Hyde, J., Wursing, B., Brownell, R.L. Jr., and Dizon, A.E. 2002. Genetics differences between western and eastern North Pacific gray whales // J. Cetacean res. manage. 4(1):1-5.
- Maminov, M.K., Blokhin, S.A. 2004. Gray whales (*Eschrichtius robustus*) in coastal waters of southern Far East // Marine Mammals of the Holarctic, Collection of Scientific Papers. Moscow. KMK:362-368.
- Mead, J.G. & Mitchell, E.D. 1984. Atlantic gray whales. In: The Gray Whale *Eschrichtius robustus*. Academic Press, Orlando, FL., pp. 33–53.
- Meschersky, I.G., Burkanov, V.N., Litovka, D.I., Andrews, R. D., Tsidulko, G.A., Rozhnov, V.V., and Ilyashenko V. Yu. 2011. Diversity of mtDNA lines of gray whale (*Eschrichtius robustus*) in Russian eastern seas (in press).
- Mizue, K. 1951. Gray whales in the east sea area of Korea // Sci. Rep. Whale Res. Inst. 5: 71-79.
- Nambu, H., Ishikawa, H., and Yamada, T.K. 2010. Records of the western gray Whale *Eschrichtius robustus*: its distribution and migration // Japan Cetology (20):21-29.
- Nishiwaki, M. and Kasuya, T. 1970. Recent record of gray whales in the adjacent waters of Japan and consideration on its migration. Sci. Rep. Whales Res. Inst. 22:29-37.
- Omura, H. 1974. Possible migration route of the gray whale on the coast of Japan. Sci. Rep. Whales Res. Inst. 26: 1-14.
- Pike, G.C. 1954. Whaling on the coast British Columbia // Norsk hvalfangsttidende. 3:117-127.
- Reeves, R.R., Smith, T.D. and Josephson, E.A. 2008. Observations of western gray whales by ship-based whalers in the 19-th century // J. Cetacean Res. Wanag.10:247-256.
- Rice, D.W. 1998. Marine Mammals of the World Systematics and Distribution. Special Publication No. 4. The Society for Marine Mammalogy, Allen Press Inc, Lawrence, KS.
- Risting, S. 1928. Whales and fetuses // Rapp.et proc. Cons. Explor. Mer. 50. 122 pp.
- Rugh, D.J., Hobbs, R.C., Lerczak, J.A. and Breiwick, J.M. 2005. Estimates of abundance of the eastern North Pacific stock of gray whales (*Eschrichtius robustus*) 1997-2002 // J.Cetacean Res. Manag. 7(1):1-12.
- Sokolov V.E., Arsen'ev V.A. 1994. Baleen whales ( in mammals of Russia and adjacent regions. M.:Nauka: 208 p. [in Russian].
- Swartz, S.L., Taylor, B.L. and Rugh, D.J. 2006. Gray whale population and stock identity. Mammal Society, Mammal Review, 36, 66–84.
- Tomilin, A.G. 1957. Cetaceans (Animals of USSR and adjacent countries): 9. 765 p. [in Russian]
- Tyurneva, O.Yu., Yakovlev, Yu.M., Vertyankin, V.V. 2009. Photographic identification of the Korean-Okhotsk Gray whale (*Eschrichtius robustus*) offshore northeast Sakhalin island and southeastern Kamchatka peninsula (Russia), 2008. Paper SC/61/BRG26 presented to the International Whaling Commission Scientific Committee. 9 pp.
- Vertyankin, V.V., Nikulin V.S., Bednykh A.M., Kononov A.P.. 2004. Sightings of gray whales (*Eschrichtius robustus*) near southeastern Kamchatka. Marine mammals of the Holarctic (collect. of scient. papers after the 3<sup>rd</sup> Int'l conf. - Koktebel, Crimea, Ukraine, 11-17 October 2004). P. 126-128
- Vladimirov, V.L. 1994. Current distribution and abundance of whales in Far East seas // Biologiya morya, 20(1): 3-13.[in Russian]
- Vladimirov, V.A. 2002. Contemporary status of the Okhotsk-Korean gray whale population, actual tasks of its study and conservation // Marine Mammals in the Holarctic (Abstract of reports of the 2-nd Int. Conf. – Baikal, Russia< 10-15 Sept. 2002. P. 69-71.
- Vladimirov, V.A. 2004. Contemporary state of our knowledge of the Okhotsk-Korean gray whale population. In book: Marine Mammals in the Holarctic. Collection of scientific

- papers of International Conference Koktebel, Krimea, Ukraine, October 11-17, 2004. P. 129-132.
- Vladimirov, V.A., Starodymov, S.P., Kornienko, M.S., and Muir, J.E. 2010. Distribution and abundance of western gray whales in the waters off northeast Sakhalin Island (Russia), 2004-2009 // Paper SC/62/BRG4 presented to the International Whaling Commission Scientific Committee: 15 pp.
- Votrogov, L.W., Bogoslovskaya, L.S. 1986. A note on gray whales off Kamchatka, the Kuril Islands and Peter the Great Bay // Rep. Intern. Whal. Commiss. 36: 281-288.
- Weller, D.W., Wursig, B., Burdin, A.B., Reeve, S.H., Bradford, A.L., Blokhin, S.A., and Brownell, R.L. 1999. The occurrence, distribution and site fidelity of western gray whales off Sakhalin Island, Russia // Abstr. Of the 13-th Biennial Conf. on the Biology of Marine Mammals: 199.
- Weller, D.W., Burdin, A.M., Ivashchenko, Y.I., Tsidulko, G.A., Bradford, A.L. and Brownell, R.L. Jr. 2003. Summer sightings of western gray whales in the Okhotsk and western Bering Seas. Paper SC/55/BRG9 presented to the International Whaling Commission Scientific Committee. 10pp.
- Weller, D.W., Burdin, A.M., Bradford, A.L., Ivashchenko, Y.I., Tsidulko, G.A., Lang, A.R. & Brownell, R.L. Jr. 2005. Status of western gray whales off northeastern Sakhalin Island, Russia, in 2004. Paper SC/57/BRG1 presented to the International Whaling Commission Scientific Committee. 10pp.
- Wilke F., Fiscus C.H., 1961. Gray whale observation // J. Mammal. Vol. 42, № 1: 108-109.
- Yablokov, A.V. and Bogoslovskaya, L.S. 1984. A review of Russian research on the biology and commercial whaling of the gray whale // The Gray Whale, *Eschrichtius robustus* - Academic Press, Inc., Orlando, FL.: 465-485.
- Yakovlev, Y.M. and Tyurneva, O.Y. 2004. Photo-identification of the western gray whale (*Eschrichtius robustus*) on the northeastern Sakhalin shelf, Russia, 2002-2003 // Paper BRG47 presented to the International Whaling Commission Scientific Committee. 40pp.
- Zemsky, V.A., Smelova, I.V. 2004. On assessment of the impact of marine oil and gas facilities on the Okhotsk-Korean population of gray whales // Marine Mammals of the Holarctic, Collection of Scientific Papers. Moscow. KMK: 229-231.
- Zhu, Q. 1998. Strandings and sightings of the western Pacific stock of the gray whale *Eschrichtius robustus* in Chinese coastal waters. Paper SC/50/AS5 presented to the International Whaling Commission Scientific Committee.
- Zimusko, V.V., Lenskaya, S.A. 1970. Feeding of the western gray whale (*Eschrichtius gibbsus* Erx.) at foraging grounds // Ecology, N.Y.: 205-212.
- Zimushko, V.V., Ivashin, M.V. 1980. Some results of Soviet investigations and whaling of gray whales (*Eschrichtius robustus* Lilljeborg, 1861) // Norsk hvalfangsttidende. 30: 219-225.