A NOTE ON RECENT SURVEYS FOR RIGHT WHALES EUBALAENA JAPONICA IN THE WESTERN NORTH PACIFIC

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Abstract

The information of the North Pacific right whale in the western North Pacific was summarized based on the data collected by the Institute of Cetacean Research (ICR: 1994–2016) and the Fisheries Resources Institute (NRIFSF: 1982–2011 including recent Japanese and Russian joint cruise data) with a total of 599,596.7 nautical miles of research distance. North Pacific right whales were distributed north of 42°N in the western North Pacific, including 10 mother and calf pairs during April to September. Two main high-density areas were observed north of 45°N in the area to the far offshore southeast of Kamchatka Peninsula (north of 45°N to 51°N, between 158°E and 168°E) and the central part in the Sea of Okhotsk. There were no sightings in the Sea of Japan during 1982 to 2016. A total of 60 individuals were photographed and 28 biopsy samples were collected. It appears that this species has been showing signs of increase since 1990's, but it is necessary to carefully monitor this population in the future to check the trend. Further surveys, analysis and international collaboration are required to improve our understanding of this species.

Key words: western North Pacific, sighting survey, distribution, North Pacific right whale, *Eubalaena japonica*.

The North Pacific right whale (*Eubalaena japonica*) mainly feeds on copepods and other small invertebrates, such as krill and copepods and they migrate annually between low-latitude winter breeding grounds and colder summer feeding grounds (Nishiwaki, 1966; Kawamura, 1982). In the western North Pacific, according to the plotted spatial distribution of American whaling, based mainly on the original data in the studies of Maury (1852) and Townsend (1935), the right whales were concentrated on either side of the North Pacific, and there were also seasonal changes in distribution, with whales occurring on both sides of the North Pacific in the periods March–May and June–August (Smith *et al.*, 2012). Because they are a slow-swimming whale that floats after death and provided considerable quantities of commercially valuable whale oil and baleen, they were a highly desirable target species (Omura *et al.*, 1969; Omura, 1986). For this reason, they were taken extensively by whaling in the 19th and 20th centuries. Additionally, this species was targeted by illegal Soviet whaling in the 1960's (Ivashchenko *et al.*, 2017).

In the Sea of Okhotsk, according to earlier studies in the 1980's–90's, right whales occurred in small numbers in the central and northeastern parts, and also in few sightings to the southeast of Sakhalin Island and by the Sea of Okhotsk side of the central Kuril Islands (Berzin and Vladimirov, 1986). There have been no observations of right whales in the northern Sea of Japan by Russian vessels since the early the 1960's (Vladimirov, 1993).

In the western North Pacific outside of the Sea of Okhotsk, it was also noted that the Kuril Islands, the Kamchatka coasts and offshore areas are likely to be major summer feeding areas, based on his-



Fig. 1. Schematic map of oceanographic conditions around western North Pacific. The northern part of the ICR survey area is under the influence of the Oyashio (a subarctic western boundary current with cold, low-salinity water) whereas the southern part is under the influence of the Kuroshio and its extension (the sub-tropical western boundary current with warm, high-salinity water) (after Okazaki *et al.*, 2016).

Table 1. Summary of North Pacific right whale sightings during the JARPN/JARPNII (1994–2016) from April to September, describing the year in which the right whale was sighted. Sch.: Number of the primary sightings of schools. Ind.: Number of the primary sightings of individuals. Calf: Number of calves including Ind. Mss: observed mean school size (Ind./Sch.). SST: Range of surface temperature of the sighting position. Photo-ID: number of individuals, Biopsy sample: number of samples.

Year	Western North Pacific								
	Sch.	Ind.	Calf	Mss	SST (°C)	Photo-ID	Biopsy sample		
1994	1	2	1	2.00	17.0	2	0		
1995	2	2	0	1.00	6.8-13.2	1	0		
1997	2	3	0	1.50	3.5-7.5	1	0		
1998	4	6	2	1.50	3.3-13.3	5	0		
2001	2	3	1	1.50	12.0-16.9	3	0		
2002	2	2	0	1.00	13.4-16.0	0	0		
2003	5	6	1	1.20	3.0-15.7	4	1		
2004	2	4	0	2.00	10.3-12.7	3	2		
2005	2	4	2	2.00	12.3-16.6	2	2		
2006	11	15	0	1.40	7.8-10.3	11	2		
2007	1	1	0	1.00	13.3	0	0		
2008	5	6	1	1.20	8.8-15.1	4	4		
2009	1	1	0	1.00	7.5	1	0		
2011	13	20	2	1.54	2.7-4.2	18	14		
2012	2	2	0	1.00	8.3-13.9	2	1		
2013	1	1	0	1.00	13.4	1	0		
2014	1	1	0	1.00	13.5	1	0		
2015	3	4	0	1.33	2.3–2.4	1	2		
Total	60	83	10	1.38	2.3–17.0	60	28		

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torical records (e.g., Omura, 1986; Vladimirov, 1993; Brownell *et al.*, 2001; Clapham *et al.*, 2004; Josephson *et al.*, 2008). The distribution pattern was reported using the Japanese Scouting Vessel (JSV) data ($5^{\circ} \times 5^{\circ}$ square analyses), and there were no sightings outside the Sea of Okhotsk in August between 1964 and 1990 (Miyashita *et al.*, 1995). Recent sighting information has been limited (e.g., Matsuoka *et al.*, 2016). The *R/V Oshoro-Maru* also reported few sightings in the east of the Kurile Islands in June in 2012 and 2013 (Sekiguchi *et al.*, 2014). In this note, we examined the North Pacific right whale distribution pattern using a combination of two major sighting datasets in the western North Pacific and the Sea of Okhotsk covering the years 1982 to 2016.

The Institute of Cetacean Research (ICR) conducted the Japanese Whale Research Program under special Permit in the North Pacific (JARPN: 1994–1999), and JARPN Phase II (2000–2016) which included systematic whale sighting surveys with and without sampling activity. The research areas of this program were the western North Pacific waters north of 35°N (Fig. 1). All whale species were recorded during the sighting surveys. When a school that seemed to be of large cetacean was sighted, the ship approached to the school to identify the species, estimate the school size, and obtain other information (e.g., the number of calves, sea surface temperature at sighting position etc., and conducted opportunistically photo-ID and biopsy sampling). As for the results, North Pacific right whale is the rarest baleen whale sighted. Table 1 summarizes the primary whale sightings during the JARPN/JARPNII surveys from April to September. A total of 213,425.4 n.miles were surveyed and 60 schools (83 individuals including 10 calves, 16.6% of the schools were mother & calf pair during 23 years) were observed. The observed mean school size was 1.38 individuals (n=60). The surface temperature ranged from 2.3°C to 17.0°C.

The National Research Institute of Far Seas Fisheries (NRIFSF; formerly Far Seas Fisheries Re-

37	Sea of Okhotsk and western North Pacific					
Year	Sch.	Ind.	Mss	SST		
1984	2	4	2.00	16.9–17.3		
1990	2	5	2.50	8-12.9		
1991	1	1	1.00	17.0		
1992	17	26	1.53	8.9-11.8		
2003	13	16	1.23	3.8–13.4		
Total	35	52	1.49	3.8–17.3		

Table 2. Summary of North Pacific right whale sightings during the NRIFSF sighting surveys (1984–2003), describing the year in which the right whale was sighted. Sch.: Number of the primary sightings of schools. Ind.: Number of the primary sightings of individuals. Mss: observed mean school size (Ind./Sch.). SST: Range of surface water temperature of the sighting position. Data after 2004 are undergoing analysis.

Table 3.Summary of North Pacific right whale sightings during Japanese–Russian cruises listing the year the survey was conducted between 1998 and 2011 in the Sea of Okhotsk during May to September. Sch.: Number of the primary sightings of schools. Ind.: Number of the primary sightings of individuals. Calf: Number of calves including Ind. Mss: observed mean school size (Ind./Sch.). SST: Range of surface temperature of the sighting position.

Veer	Sea of Okhotsk						
Year	Sch.	Ind.	Calf	Mss	SST		
1998	2	2		1.00			
2000	3	3	_	1.00	_		
2003	16	20		1.25	_		
2009	17	29	0	1.71	7.4–15.7		
2010	3	4	1	1.33	8.4–14.3		
2011	1	1	0	1.00	5.8		

search Laboratory) started dedicated whale sighting surveys in the North Pacific in the early 1980's from July to September (1982–2012) including the Japanese–Russian cruises (1998–2011) in the Sea of Okhotsk (Tables 2 and 3). The sighting method and procedure were based on the International Whaling Commission (IWC) Southern Hemisphere cetacean sighting surveys (e.g., Miyashita and Kato, 1998). These procedures are almost the same as the JARPN/JARPNII II surveys described above, except that some vessels did not have a top barrel. A total of 386,171.3 miles were surveyed. Generally, right whales were distributed north of 50°N in the central part of the Sea of Okhotsk after April when the sea ice disappears, although there was not enough effort in the northern part for logistical reasons. The observed mean school size was 1.49 individual (n=35). The surface temperature ranged from 3.8° C to 17.3° C.

As a result, Fig. 2 shows the combined density index (by Lat.1°×Long.1°square analyses; number of primary sightings of individuals/100 n.miles) of North Pacific right whales by the JARPN/JARPNII and NRIFSF data (1982–2016) during April to October. A total of 599,596.7 n.miles were surveyed. New sightings confirm that there are two high-density areas observed north of 45°N in the far offshore southeast of the Kamchatka Peninsula (from north of 45°N to 51°N, between 158°E and 168°E), and north of 50°N in the Sea of Okhotsk. These high-density areas seemed to be their feeding grounds and coincided with previous large-scale distribution patterns based on catches (Smith *et al.*, 2012) and sightings (Miyashita *et al.*, 1995). On the other hand, there were no sightings in the Sea of Japan, although there were two migration routes along both sides of the main Japanese island, based on historical whaling data (Omura, 1986).

The low number of sightings compared to other baleen whales confirms the rarity of this species in the western North Pacific, and reinforces the belief that both historical and illegal whaling in the 1960's devastated the population. It appears that this species has been showing signs of recovery since the 1990's, but it is necessary to continue monitoring this population to assess its trend in the future. Photo-ID data and biopsy samples were collected opportunistically during JARPN/JARPNII surveys



Fig. 2. The map shows combined Density Index (primary sightings of individuals/100 n.miles) of North Pacific right whales comprising the whole ICR (1994–2016) and NRIFSF (1982–2003) datasets from April to October by Lat.1°×Long.1°square, including the Japanese and Russian joint cruises (1998–2011) in the Sea of Okhotsk.

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(Table 1, Figs. 3a–3c). Sixty individuals were photographed, and matching work is ongoing. Also, a total of 28 biopsy samples were collected and analyzed including the samples collected in the eastern side of the Pacific under international collaboration (Pastene *et al.*, in review). Further survey, analysis and international collaboration are required to improve our understanding on the seasonal distribution, migration pattern and abundance estimation of this rare species.



Fig. 3a. A head of North Pacific right whale sighted in the western North Pacific on 2 August 2006 (left), and a long white scars on the caudal peduncle keel of a right whale sighted in the western North Pacific on 1 August 2006 (right).



Fig. 3b. A North Pacific right whale mother and calf pair sighted in the western North Pacific on 2 August 2008 (left), and surfacing individual, sighted in the western North Pacific on 31 May 2012 (right).



Fig. 3c. A white spot on the right side of the lower jaw of a right whale sighted in the western North Pacific on 29 May 2011 (left), and scars on the back of an individual sighted in the western North Pacific on 6 June 2012 (right).

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References

- Berzin, A. A. and Vladimirov, V. L. 1986. Modern distribution and abundance of cetaceans in Far East seas. (Sovremennoye raspredeleniye i chislennost kitoobraznikh v dalnevostochnikh moryakh). Izucheniye, okhrana i ratsionalnoye ispolzovaniye morskikh mlekopitayuschikh: Tez. dokl. IX Vses. sovesch., Arkhangelsk, pp. 32–33.
- Brownell, R. L. Jr., Clapham, P. J., Miyashita, T. and Kasuya, T. 2001. Conservation status of North Pacific right whales. *J. Cetacean Res. Manage*. (Special issue) 2: 269–286.
- Clapham, P. J., Good, C., Quinn, S. E., Reeves, R. R., Scarff, J. E. and Brownell, R. L. Jr. 2004. Distribution of North Pacific right whales (*Eubalaena japonica*) as shown by 19th and 20th century whaling catch and sighting records. J. Cetacean Res. Manage. 6(1): 1–6.
- Ivashchenko, Y. V., Clapham, P. J., and Brownell, R. L. Jr., 2017. New data on Soviet catches of blue (Balaenoptera musculus) and right whales (Eubalaena japonica) in the North Pacific. J. Cetacean Res. Manage. 17: 15–22.
- Josephson, E., Smith, T. D. and Reeves, R. R. 2008. Historical distribution of right whales in the North Pacific. *Fish Fish.* 9: 155–168. doi: 10.1111/j.1467-2979.2008.00275.x.
- Kawamura, A. 1982. Food habits and prey distributions of three rorqual species in the North Pacific Ocean. Sci. Rep. Whales Res. Inst. Tokyo. 34: 59–91.
- Matsuoka, K., Hakamada, T. and Miyashita, T. 2016. Distribution of blue (*Balaenoptera musculus*), fin (*B. physalus*), humpback (*Megaptera novaeangliae*) and North Pacific right (*Eubalaena japonica*) whales in the western North Pacific based on JARPN and JARPN II sighting surveys (1994 to 2014). *In:* JARPNII Review Meeting; Paper SC/F16/J9 presented to the IWC Scientific Committee meeting, 2016 (unpublished). 24 pp. [Paper available from the Office of the IWC].
- Maury, M. F. 1852. Whale chart of the world. (the wind and current charts), Series F. National Observatory, Bureau of Ordnance and Hydrography, Washington, D.C.
- Miyashita, T., Kato, H. and Kasuya, T. (eds.) 1995. Worldwide Map of Cetacean Distribution based on Japanese Sighting Data (Volume 1). National Research Institute of Far Seas Fisheries, Shimizu, Shizuoka, Japan. 140 pp.
- Miyashita, T. and Kato, H. 1998. Recent data on the status of right whales in the NW Pacific Ocean. *In:* IWC Special Meeting of the Scientific Committee towards a Comprehensive Assessment of Right Whales Worldwide, Cape Town, South Africa. Paper SC/M98/RW11 presented to the IWC Scientific Committee meeting, 1998 (unpublished). 24 pp. [Paper available from the Office of the IWC].
- Nishiwaki, M. 1966. Distribution and migration of the larger cetaceans in the North Pacific as shown by Japanese whaling results. pp. 171–191. *In:* K. S. Norris (ed.). *Whales, Dolphins, and Porpoises*. University of California Press, Berkeley. i–xv+789 pp.
- Okazaki, M., Masujima, M., Murase, H. and Morinaga, K. 2016. Oceanographic conditions in the JARPNII survey area from 2000 to 2013 using FRA-ROMS data. Paper SC/F16/JR5 presented to the IWC Scientific Committee meeting, 2016 (unpublished). 25 pp. [Paper available from the Office of the IWC].
- Omura, H., Ohsumi, S., Nemoto, T., Nasu, K. and Kasuya, T. 1969. Black right whales in the North Pacific. Sci. Rep. Whales Res. Inst. 21: 1–67.
- Omura, H. 1986. History of right whale catches in the waters around Japan. Rep. Int. Whal. Comm. (Special issue) 10: 35-41.
- Pastene, L. A., Taguchi, M., Lang, A., Goto, M. and Matsuoka, K. Population genetic structure of North Pacific right whales. Paper submitted to the *Mar. Mammal. Sci.* (in review).
- Sekiguchi, K., Ohnishi, H., Sasaki, H., Haba, S., Iwahara, Y., Mizuguchi, D., Otsuki, M., Saijo, D., Nishizawa, B., Mizuno, H., Hoshi, N. and Kamito, T. 2014. Sightings of the western stock of North Pacific right whales (*Eubalaena japonica*) in the far southeast of the Kamchatka Peninsula. *Mar. Mammal Sci.* 30(3): 1199–1209. doi: 10.1111/mms.12105.
- Smith, T. D., Reeves, R. R., Josephson, E. A., & Lund, J. N. 2012. Spatial and seasonal distribution of American whaling and whales in the age of sail. *PLoS ONE*, 7(4): e34905. doi: 10.1371/journal.pone.0034905.
- Townsend, C. H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. *Zool. Scr.* 19(1): 1–50. doi: 10.5962/p. 203715.
- Vladimirov, V. L. 1993. The modern distribution, numbers and population structure of whales of Far East seas. (Sovremennoye raspredeleniye, chislennost i populyatsionnaya struktura kitov dalnevostochnikh morey) //Avtoref. disser. na soisk. uchenoy stepeni k.b.n. TINRO. Vladivostok. 28 pp.

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