SC/66a/SP/7 Rev2

Cruise Report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2014 (Part III) - Coastal component off Kushiro -

Yoshida, H., Ito, N., Kishiro, T., Miyashita, T., Nakai, K., Nakamura, G., Maeda, H., Ishida, K., Takahashi, M., Ota, M., Furuyama, Y., Kato, K., Hayashi, R., Hiruda, H., Kumagai, S., Sakamoto, N., Kimura, Y., Teshima, I., and Kato, H.

INTERNATIONAL WHALING COMMISSION

Cruise Report of the Second Phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2014 (Part III) - Coastal component off Kushiro -

HIDEYOSHI YOSHIDA[1], NOBUYUKI ITO[2,] TOSHIYA KISHIRO[1], TOMIO MIYASHITA[1], KAZUYOSHI NAKAI[3], GEN NAKAMURA[4], HIKARI MAEDA[1], KOZUE ISHIDA[4], MEGUMI TAKAHASHI[4], MASAYOSHI OTA[4], YUSUKE FURUYAMA[4], KOICHIRO KATO[4], RYOTARO HAYASHI[4], HISOKA HIRUDA[2], SAEKO KUMAGAI[2], NAGISA SAKAMOTO[2], YUKA KIMURA[2], IKUTOMO TESHIMA[4], AND HIDEHIRO KATO[4].

[1] *National Research Institute of Far Seas Fisheries, Fisheries Research Agency, 2-12-4 Fukuura, Kanazawa-ku, Yokohama, Kanagawa 236-8648, Japan*
[2]*Association for Community-Based Whaling, Hakata-Kaiseki Building 2F, Hakata-Eki-Higashi, Hakata-ku, Fukuoka 812-0013, Japan*
[3] *The Institute of Cetacean Research, 4-5, Toyomi-cho, Chuo-ku, Tokyo, 104-0055, Japan.*
[4] *Tokyo University of Marine Science and Technology, 4-5-7 Konan, Minato-ku, Tokyo 108-0075, Japan*

Contact e-mail:hideka@fra.affrc.go.jp

ABSTRACT
The JARPN II coastal component off Kushiro, northeast Japan (middle part of the sub-area 7CN) was conducted from 4 to 24 September 2014, with additional period for sighting survey in 2-3 September. The survey was carried out using four small-type whaling catcher boats as sampling vessels in coastal waters within 50 nautical miles from Kushiro port. All the whales collected were landed at the JARPN II research station for biological examination. During the survey, a total of 3154.1 nautical miles (309.5 hours) was searched and the 110 schools (121 individuals) of common minke whales were encountered. Sightings of 15 schools (16 animals) of humpback whales and of three schools (four individuals) of fin whales and of six schools (8 individuals) of sperm whales were also obtained. Of 121 common minke whales encountered, 51 animals were collected. Average body length of males was 6.28m (SD=1.08, Range=4.51-7.66m, *n*=35) and 6.44m (SD=0.98, Range=4.88-8.21m, *n*=16) for females. The 16 animals of 35 males were sexually mature and 2 of 16 females attained to sexual maturity. The two mature females were both pregnant. Dominant prey species detected from whale forestomach was walleye pollock (*Theragra chalcogramma*, 58.8%), followed by Japanese sardine (*Sardinops melanostictus*, 35.3%), mackerels (*Scomber japonicus* and *S. australasicus*, 3.9%) and medusa fish (*Icichthys lockingtoni*, 2.1%). Japanese anchovy, which was one of the major prey species in the previous surveys off Kushiro, was not found from whale forestomach at the present survey. Japanese sardine, which was first found at the 2012 survey, was the second dominant species. The observation coincided with an increase in catch of Japanese sardine by fisheries around Kushiro, where the species was much caught after an interval of around 30 years.

KEYWORDS: COMMON MINKE WHALE; NORTH PACIFIC; COASTAL WATERS OF JAPAN; FOOD/PREY; ECOSYSTEM; SCIENTIFIC PERMITS.

BACKGROUND

The full-scale survey of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) was started in 2002. The survey mainly aimed at i) feeding ecology and ecosystem studies, involving prey consumption by cetaceans, prey preferences of cetaceans and ecosystem modeling, ii) monitoring environmental pollutants in cetaceans and the marine ecosystem, and iii) elucidation of stock structure of whales (Government of Japan, 2002a).

The full-scale JARPN II consists of two survey components, i.e., offshore and coastal components. The JARPN surveys (1994-1999) and the JARPN II feasibility study (2000-2001) revealed that common minke whales are widely distributed from offshore waters into coastal waters and feed on various prey species such as Japanese anchovy, Pacific saury, and walleye pollock (Government of Japan 2002b; Tamura and Fujise 2002). Both the waters are very important fishing grounds. Thus, it is thought that the waters are also very important area for the full-scale JARPN II program. However, the *Nisshin Maru* research vessels can

not be operated in near shore areas, because of their movement restrictions in shallow waters and the presence of fishing gear and many boats. Furthermore, the research vessels are not available from autumn to early spring. In order to cover the temporal and spatial gap of these vessels, in the full-scale JARPN II, sampling of common minke whales in coastal waters using small-type whaling catcher boats was planned (Government of Japan, 2002a).

In the first two years of the full-scale JARPN II, feasibility studies were conducted, to examine the logistic aspects of the methodology in the coastal component. The first feasibility study was carried out in coastal waters off Kushiro in autumn 2002 and the second one was in coastal waters off Sanriku in spring 2003 (Kishiro *et al.* 2003, Yoshida *et al.* 2004). Since no logistic problem occurred in the studies, it was concluded that the coastal survey could be continued as the component of the full-scale JARPN II, using the same methodology (Government of Japan 2004b, Kato *et al*. 2004), while the survey was revised to be conducted twice a year and to collect 60 common minke whales in each of spring and autumn (Government of Japan 2004a).

The first revised full-scale survey was carried out in coastal waters off Kushiro in autumn 2004 (Kishiro *et al*. 2005), then the coastal survey was conducted annually from 2005 to 2008 (Kishiro *et al*. 2006, 2008, Yoshida *et al*. 2007, 2009). In January 2009, the JARPN II review workshop was carried out in Japan under the IWC/SC, where the progress made in the first six years of the full-scale JARPN II (2002-2007) was reviewed by the scientific specialists. Because there was no critical problem in the survey methodology, the coastal components were continued from 2009 to 2013 (Kishiro *et al*. 2010, 2012, 2014, Yoshida *et al*. 2011, 2013), under the original research plan (Government of Japan 2004a).

Following the March 31, 2014 Judgment of the International Court of Justice (ICJ) in the case Whaling in the Antarctic (Australia v. Japan: New Zealand intervening), the Government of Japan voluntarily reviewed the state of JARPN II. Overall research objectives, the research area and research methodology remain the same as those specified in the original JARPN II research plan (Government of Japan, 2004a). This voluntary review resulted in the reprioritization of research focus as well as recalculation of sample sizes. The survey concentrated on the study of interactions between whales and fisheries in the coastal area as well as a contribution to the management of whales. Sample size of 57 (as recalculated with the latest information) of which 6 were studied using only non-lethal means. A study for verifying the feasibility of using non-lethal methods was carried out.

Here, we show results of the 2014 survey conducted off Kushiro. The National Research Institute of Far Seas Fisheries (NRIFSF) of the Fisheries Research Agency planned and conducted the survey, under cooperation of the ICR, Tokyo University of Marine Science and Technology, and the Association for Community-Based Whaling.

MATERIALS AND METHODS

Research area

Research area was set in the same waters where the previous JARPN II coastal surveys off Kushiro were conducted in 2002-2013 (Kishiro *et al*. 2003, 2005, 2006, 2008, 2010, 2012, 2014, Yasunaga *et al*. 2012, Yoshida *et al*. 2007, 2009, 2011, 2013): the area was in coastal waters within 50 nautical miles from Kushiro port, southeastern Hokkaido (Fig. 1). The area is included in the middle part of the sub-area 7CN, established by the IWC.

Research vessels, station, and period

Four small-type whaling catcher boats were used as sampling vessels: *Taisho Maru* No. 28 (47.3GT), *Koei Maru* No. 8 (32.0GT), *Katsu Maru* No.7 (32.0GT), and *Sumitomo Maru* No.51 (30.0GT). All the common minke whales collected were landed at the JARPN II research station established in the Kushiro port, for biological examination. Research period was set for 50 days, from 5 September to 24 October, 2010. Additional period for the sighting survey was set in 2-3 September.

Searching and sampling methods

Searching and sampling methods were almost same with those for the first coastal survey off Kushiro in 2002 (Kishiro *et al*. 2003). The research head office established in the research station controlled the sampling vessels during the survey. In order to avoid concentration of searching effort in an area, searching

areas and direction of vessels were determined by the office, from weather conditions, whale distribution, and information on fishing grounds of coastal fisheries. After vessels left the port, they principally continued to cruise along the predetermined direction until arriving at 15-30 n. miles from the port, then change their direction chosen by themselves and continued searching within the research area. Searching was carried out in the daytime and vessels returned to the port every night. A researcher was on board each of vessels and recorded sighting and sampling information, e.g., coordinates and time of common minke whale sighting and sampling made, weather conditions, and vessel activity. Sighting information was also recorded for other baleen whales and sperm whales. Searching was conducted by crews and researchers from the top barrel and upper bridge of vessels running at around 11 knots. All common minke whales sighted were targeted for sampling, except cow-calf pair. When a school consisted of more than 1 animal, an individual was selected randomly from the school and then collected. Once a vessel caught a whale, it returned to the Kushiro port, to transport the animal to the research station. While returning to the port, other common minke whales encountered were also targeted for sampling, if the situation allowed. At the port, animals were lifted from the vessel by the crane, using a wire net and then carried to the station by the 11-ton freight trailer. At that time, body weight of animals was measured using the truck scale.

Practicability survey for biopsy and faecal sampling from the vessel
Practicability survey for biopsy and faecal sampling were also conducted to common minke whales encountered.

Biological research on common minke whales collected
All the whales collected were examined by biological researchers at the research station. Research items are listed in Table 2. These items were related to studies on feeding ecology, stock structure, life history and pollutions.

RESULTS

Searching effort made by sampling vessels
The sampling survey was started on 5 September and finished on 24 September. Before that, sighting survey was conducted in 2-3 September. Of the 22 days, vessels conducted searching for 17 days (77.3%). The remaining five days were not suitable for survey, from bad weather conditions, e.g., low atmospheric pressure and thick fog. Cruise tracks made by the vessels are shown in Figure 2. Searching distance and time are given in Table 1. Searching distance and time are defined as distance and time recorded under searching activity conducted by crews from the top barrel of the vessels. During the survey, a total of 3154.1 nautical miles (309.5 hours) was searched.

Sightings made by vessels
All the 110 schools (121 individuals) of common minke whales were sighted during the searching (Table 1, Fig. 2). No cow-calf pairs were encountered. Cruise tracks were widely distributed in coastal waters within 30 nautical miles from Kushiro port, and sightings of common minke whales were recorded in searching area with concentration on continental slope southeast and southwest of Kushiro. Density index of common minke whales was calculated as 3.30 for DI (the number of primary sightings of schools per 100 nautical miles searching) and 0.34 for SPUE (the number of primary sightings of schools per 1 hour searching). During the survey, 15 schools (16 animals) of humpback whales, three schools (four individuals) of fin whales and 6 schools (8 animals) of sperm whales were also observed (Table 1, Fig. 3).

Sampling of common minke whales
Of the 121 common minke whales encountered, 51 animals were collected for biological examination. In the sampling process, struck and lost was not occurred. Sighting positions of animals collected are shown in Figure 2.

Practicability survey for biopsy and faecal sampling from the vessel
Biopsy sampling was tried for 8 common minke whales. A sample was collected from each of 5 animals. To 89 animals encountered during the survey, observation of excretion and vomiting behaviour was conducted for 58.4 hours. A case of excretion was observed, but faecal sample could not be collected. No vomiting behaviour was encountered.

Body length, sex ratio, and maturity of animals caught

Research items of biological examination for the 51 animals collected are summarized in Table 2, with the number of data and samples obtained. The individuals consisted of 35 males and 16 females. Sex ratio of males to all animals was 68.6%. Average body length was 6.28m (SD=1.08, range=4.51-7.66m) for males and 6.44m (SD=0.98, range=4.88-8.21m) for females (Table 3). In males, the most dominant length class was 6.5 m (Fig. 4). It was 5.5 m for females. Male with a single testis weight of 290g or more and female having at least one corpus luteum or albicans in their ovaries were determined as sexually mature. In males, 16 of 35 individuals (45.7%) were sexually mature (Table 4). In females, two of 16 individuals (12.5%) were sexually mature. The two mature females were both pregnant. The foetus were male and body lengths were 132.0cm and 77.1cm.

Prey species found from common minke whale forestomach

Stomach contents of the 51 animals were examined. Following the same methods used in the JARPN II feasibility survey conducted in 2001 (Fujise, *et al*., 2002), stomach contents were weighed to the nearest 0.1 kg, by each of four chambers. Weights were recorded both including and excluding liquid contents. A small quantity of stomach contents was collected and frozen for laboratory analysis. Weight of forestomach contents including liquid ranged from 5.5 kg to 59.7 kg. Average weight was 28.1 kg. Forestomach contents found from the whales are listed in Table 5 and Figure 5. Empty stomach was not observed. Dominant prey species detected from whale forestomach was walleye pollock (*Theragra chalcogramma*, 58.8%), followed by Japanese sardine (*Sardinops melanostictus*, 35.3%), mackerels (*Scomber japonicus* and *S. australasicus*, 3.9%), and medusa fish (*Icichthys lockingtoni*, 2.1%). Walleye pollock and Japanese sardine were observed from forestomach throughout the survey period. Mackerels and medusa fish were detected at early and late stage of the survey, respectively. Japanese anchovy (*Engraulis japonicas*) and Pacific saury (*Cololabis saira*) were not detected.

Figure 6 shows major prey species found in forestomach of common minke whales by their sexual maturity stage. Of the 30 animals having walleye Pollock, 20 were sexually immature (66.7%). The 18 animals had Japanese sardine, of which 11 were immature (61.1%). Two animals having mackerel were both mature. Medusa fish was had by an immature whale.

Observation of marine debris

Marine debris was detected from stomach of four animals. Each of them swallowed a small piece of plastic products.

DISCUSSION

In the coastal component off Kushiro, bad weather conditions, e.g., low atmospheric pressure and thick fog, often prevented sampling vessels from research activities. At the last 2013 survey, sampling vessels could conduct searching only for 20 days of the 50 days survey period (40.0%). While this ratio was almost same in the previous surveys (e.g., 46.0% in 2013 and 50.0% in 2012), it was higher in the present survey. Vessels could search for 17 days (77.3% of all days). Density index of common minke whales was also higher in the present 2014 survey (DI = 3.30) than that of the previous ones (e.g., 2.48 in 2013 and 1.71 in 2012). The index suggests that, in the present survey, more animals migrated into the research area. The good weather condition and higher density of whales would result in early completion of the present survey in September.

Figure 4 shows body length compositions of common minke whales caught in 2014, with results of the previous surveys. In the last 2013 survey, large males in 7m length class were most frequently collected. This length distribution was same with the first five years from 2002 to 2007, in comparison with the recent years (2008-2013), where smaller animals were more sampled. In the present survey, large males were not collected so frequently, but animals with various body lengths were obtained.

Kasamatsu and Tanaka (1992) studied prey species of common minke whales taken by commercial whaling off Kushiro. From late 1960's to late 1970's, mackerel was major prey species, then, Japanese sardine was found dominantly until 1987, where last catch of commercial whaling was conducted. Dominant species taken by commercial fisheries around Kushiro during the period shown by Torisawa (2004) was consistent with the dominant prey species. After 1992, however, catches of the Japanese sardine rapidly decreased. When the JARPNII coastal component off Kushiro was started in 2002, commercial catch of Japanese

sardine was extremely low. While no Japanese sardine was detected from stomach of whales collected at the 2002 survey, Japanese anchovy was found most frequently (Figure. 5). In 2012, Japanese sardine and mackerels were first detected form whale stomach, since the JARPNII survey started. After that, the sardine is one of the major prey species, replacing the Japanese anchovy. The change of prey species in recent years coincide with fisheries catch off Kushiro. In autumn 2012, the Japanese sardine and mackerels were much caught after an interval of around 30 years and the high catch level was kept in 2013 and 2014. These results suggest that the stomach contents of whales reflect the large-scale regimes of the Japanese sardine and anchovy.

Pacific saury was detected from whale stomach in early stages of the JARPNII. But, it has been disappear from whale stomach since the 2008 survey (Figure. 5). The fish is reported to be mainly distributed in waters with sea surface temperature (SST) in a range of 10-18°C (Tameishi, 2000). In the present survey, mean SST of sighting positions of common minke whales was 17.0°C (range=13.3-22.9°C). It was 14.8°C (11.4-16.9 °C) in September 2002, where Pacific saury was found from whale stomach. The SST in the recent surveys seems to be higher for Pacific saury distribution. From these, possibly, migration of Pacific saury into the research area off Kushiro was limited, which resulted in no observation of the fish from whale stomach.

The present survey with results of the previous ones revealed apparent change of dominant prey species of common minke whales from the Japanese anchovy to sardine. Such information is valuable for the whale feeding studies for a long period and contributes to the JARPN II objectives.

ACKNOWLEDGMENTS

We acknowledge Drs. Hiroshi Hatanaka (ICR), Seiji Ohsumi (ICR) and Yoshihiro Fujise (ICR), and Messrs. Yukito Narisawa and Shinichi Tashiro (the Fisheries Agency of Japan), for their guidance in the survey design and support. Crew of research vessels, staff of the research station in Kushiro, and the Association for Community-Based Whaling assisted in important aspects of the survey. We also thank the Kushiro fisheries cooperative association, the municipal office of Kushiro, Hokkaido government Kushiro sub-prefectural office, and Hokkaido government office, for their kind assistance. The medusa fish (*Icichthys lockingtoni*) was identified by Orio Yamamura and his colleagues (Hokkaido National Fisheries Research Institute, Fisheries Research Agency).

REFERENCES

Fujise, Y., Tamura, T., Bando, T., Watanabe, H., Kiwada, H., Otani, S., Kanda, N., Yasunaga, G., Mogoe, T., Konishi, K., Inamori, M., Shigemune, H. and Tohyama, D. 2002. Cruise report of the feasibility study of the Japanese Whale Research Program under Special Permit in the western North Pacific-Phase II (JARPN II) in 2001. Paper SC/54/O16 submitted to the 54th IWC Scientific Committee, 51pp.

Government of Japan, 2002a. Research plan for cetacean studies in the western North Pacific under special permit (JARPN II). Paper SC/54/O2 submitted to the 54th IWC Scientific Committee.

Government of Japan (Fujise, Y., Kawahara, S., Pastene, L.A. and Hatanaka, H. eds.), 2002b. Report of 2000 and 2001 feasibility study of the Japanese Whale Research Program under Special Permit in the western North Pacific-Phase II (JARPN II). Paper SC/54/O17 submitted to the 54th IWC Scientific Committee, 202pp.

Government of Japan, 2004a. Revised research plan for cetacean studies in the western North Pacific under special permit (JARPN II). Paper SC/56/O1 submitted to the 56th IWC Scientific Committee, 14pp.

Government of Japan (Fujise, Y., Tamura, T., Kato, H. and Kawahara, S. eds.), 2004b. Some considerations of the feasibility components of the JARPN II research plan. Paper SC/56/O2 submitted to the 56th IWC Scientific Committee, 36pp.

Kasamatsu, F. and Hata, T. 1985. Notes on minke whales in the Okhotsk Sea-West Pacific Area. Report of International Whaling Commission, 35:299-304.

Kasamatsu, F. and Tanaka, T. 1992. Annual changes in prey species of Minke whales taken off Japan 1948-1987. Nippon Suisan Gakkaishi 58:637-651.

Kishiro, T., Kato, H., Ohizumi, H., Yoshida, H., Saito, T., Isoda, T., Tabata, S., Sakakibara, M., Saino, S., Hara, T., Hayashi, T., Miyashita, T., Fukudome, K., Kiwada, H., and Kawahara, S. 2003. Report of the 2002 JARPN II survey in the western North Pacific. Part II: Coastal component - Coastal Survey off Kushiro, northeast Japan. Paper SC/55/O8 submitted to the 55th IWC Scientific Committee, 26pp.

Kishiro, T., Kato, H., Yoshida, H., Miyashita, T., Ryono, T., Tabata, S., Okamoto, R., Yasui, K., Sato, H., Morita, Y., Saino, S., Hara, T., Ebisui, T., Kuroishi, H., Nishiwaki, S., and Kawahara, S. 2005. Cruise

report of the coastal survey on common minke whales off Kushiro, northeast Japan: the 2004 JARPN II survey (Part II) - Coastal component. Paper SC/57/O4 submitted to the 57th IWC Scientific Committee, 37pp.

Kishiro, T., Kato, H., Yoshida, H., Miyashita, T., Ryono, T., Tabata, S., Yasui, K., Sato, H., Morita, Y., Kumagaya K., Tokuda, D., Nakai, K., Funabashi, N., Ebisui, T., Wakatsuki, T., Sakaguchi, M., Houhana, T., Nishiwaki, S., and Kawahara, S. 2006. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific - Coastal component off Kushiro in 2005. Paper SC/58/O10 submitted to the 58th IWC Scientific Committee, 32pp.

Kishiro, T., Kato, H., Yoshida, H., Miyashita, T., Iwasaki, T., Kanaji, Y., Ryono, T., Tabata, S., Morita, Y., Okamoto, R., Maeda, H., Nagatsuka, S., Ogawa, N., Nakai, K., Ebisui, T., Matsumoto, A., Gokita, A., Kiwada, H. and Kawahara, S. 2008. Cruise report of the Second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2007 - Coastal component off Kushiro. Paper SC/60/O7 submitted to the 60th IWC Scientific Committee, 33pp.

Kishiro, T., Yoshida, H., Tamura, T., Konishi, K., Kanda, N., Okamoto, R., and Kato, H. 2009. Relationship between body size, maturity, and feeding habit of common minke whales off Kushiro in autumn season, from 2002-2007 whale sampling surveys under the JARPN II coastal components off Kushiro. Paper SC/J09/JR13 submitted to the JARPN II Review Workshop, Tokyo, January 2009, 25pp.

Kishiro, T., Kato, H., Yoshida, H., Yasunaga, G., Tabata, S., Nakamura, G., Maeda, H., Inoue, S., Miyagawa, N., Okamoto, R., Oikawa, H., Watanabe, H., Iwasaki, T., Kanaji, Y., Minamikawa, S., Otani, S., Ishikawa, H., Kanda, N., Gokita, A., Yamazaki, K., and Yonehara, Y. 2010. Cruise report of the Second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2009 - Coastal component off Kushiro. Paper SC/62/O6 submitted to the 62th IWC Scientific Committee, 13pp.

Kishiro, T., Kato, H., Ito, N., Yasunaga, G., Hara, T., Nakamura, G., Maeda, H., Inoue, S., Miyakawa, N., Ishida, K., Kadowaki, I., Oikawa, H., Miyashita, T., Iwasaki, T., Kanaji, Y., Minamikawa, S., Watanabe, H., Kumagai, S., Sato, H., and Kitayama, K. 2012. Cruise report of the Second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2011 (Part III) - Coastal component off Kushiro, autumn survey. Paper SC/64/O5 submitted to the 64th IWC Scientific Committee, 14pp.

Kishiro, T., Yoshida, H., Ito, N., Nakamura, G., Miyakawa, N., Tamai, N., Kadowaki, I., Fukumoto, A., Takahashi, M., Furuyama, Y., Oota, Y., Maeda, H., Miyashita, T., Kumagai, S., Hara, T., Kimura, Y., Sakamoto, N., Kobayashi, N., Suzuki, N., Kanaji, Y., Mogoe, T., Nakai, K., and Kato, H. 2014. Cruise report of the Second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2013 (Part III) - Coastal component off Kushiro. Paper SC/65b/SP04 submitted to the 65bth IWC Scientific Committee, 13pp.

Kato, H., Kishiro, T., Yoshida, H. and Kawahara, S. 2004. Feasibility of coastal surveys in the JARPN II, from the viewpoint of logistics. Appendix 1, pp4-12. *In*: Government of Japan (Fujise, Y., Tamura, T., Kato, H. and Kawahara, S. eds.), Some considerations of the feasibility components of the JARPN II research plan. Paper SC/56/O2 submitted to the 56th IWC Scientific Committee, 36pp.

Tameishi, H. 2000. Migration and fishing ground of Pacific saury, Nihon Suisan Gakkaishi, 66:304-305. (In Japanese)

Tamura, T. and Fujise, Y. 2002. Geographical and seasonal changes of the prey species on minke whale in the Northwestern Pacific. ICES Journal of Marine Science, 59:516-528.

Torisawa, M. 2004. Changes in commercial fisheries off Kushiro. Hokusuishi Dayori, 63:1-7. (In Japanese) http://www.fishexp.hro.or.jp/exp/central/report/DAYORI/dayori63/kusiro.pdf

Yasunaga, G., Ito, N., Wada, A., Kiwada, H., Sato, H., Maeda, H., Nakamura, G., Inoue, S., Miyakawa, N., Kitayama, K., Ishikawa, Y., Suzuki, N., Tsutusmi, T., Kadowaki, I. and Kato, H. 2012. Cruise report of the Second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2011 (Part II) - Coastal component off Kushiro, spring survey. Paper SC/64/O4 submitted to the 64th IWC Scientific Committee, 12pp.

Yoshida, H., Kato, H., Kishiro, T., Iwasaki, T., Miyashita, T., Ryono, T., Tabata, S., Sakakibara, M., Saino, S., Hara, T., Hayashi, T., Tomizawa, Y., Tamai, K., Okamoto, R., Fukuoka, M., Watanabe, H., Tsunekawa, M. and Kawahara, S. 2004. Report of the coastal survey on common minke whales off Sanriku coast, northeast Japan: the Japanese whale research program under special permit in the western North Pacific – Phase II (JARPN II) in 2003 (Part II) – Coastal component. Paper SC/56/O14 submitted to the 56th IWC Scientific Committee, 31pp.

Yoshida, H., Kato, H., Kishiro, T., Miyashita, T., Iwasaki, T., Minamikawa, S., Ryono, T., Tabata, S., Morita, M., Sato, H., Okamoto, R., Toyoda, Y., Nakamura, G., Ebisui, T., Nakai, K., Matsumoto, A.,

Nishiwaki, S., and Kawahara, S. 2007. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2006 - Coastal component off Kushiro. Paper SC/59/O7 submitted to the 59th IWC Scientific Committee, 43pp.

Yoshida, H., Kato, H., Kishiro, T., Miyashita, T., Iwasaki, T., Kanaji, Y., Yasunaga, G., Oikawa, H., Ryono, T., Tabata, S., Okamoto, R., Maeda, H., Matsumoto, A., Ogawa, N., Nagatsuka, S., Inoue, S., Hiruda, H., Gokita, A., Matsunaga, H., and Yamasaki, K., 2009. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2008 (Part II) - Coastal component off Kushiro. Paper SC/61/O5 submitted to the 61th IWC Scientific Committee, 10pp.

Yoshida, H., Ito, N., Kishiro, T., Miyashita, T., Iwasaki, T., Minamikawa, S., Kanaji, Y., Oikawa, H., Tabata, T., Kumagai, S., Nakamura, G., Maeda, H., Inoue, S., Miyakawa, N., Ishikawa, Y., Shimizu, K., Yonehara, Y., Kitayama, K., Tsutsumi, T., and Kato, H. 2011. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2010 (Part III) - Coastal component off Kushiro. Paper SC/63/O4 submitted to the 63th IWC Scientific Committee, 10pp.

Yoshida, H., Ito, N., Kishiro, T., Miyashita, T., Yasunaga, G., Hara, T., Nakamura, G., Maeda, H., Inoue, S., Tsutsumi, T., Ishida, K., Tamai, N., Kadowaki, I., Oka, S., Takahashi, M., Fukumoto, A., Kumagai, S., Sato, H., Sakamoto, N., Kitayama, K., Kobayashi, N. and Kato, H. 2013. Cruise report of the Second phase of the Japanese Whale Research Program under Special Permit in the western North Pacific (JARPN II) in 2012 (Part III) - Coastal component off Kushiro. Paper SC/65a/O6 submitted to the 65ath IWC Scientific Committee, 12pp.

Table 1. Searching days, distances, hours, and number of cetacean sightings made during the 2014 JARPN II coastal component off Kushiro.

Period	Days	Distances (n. miles)	Hours	Number of sightings*			
				Species	Primary (Ind/Sch)	Secondary (Ind/Sch)	Total (Ind/Sch)
9/2 - 24	22	3154.1	309.5	Common minke whale	115/104	6/6	212/110
				Like minke whale	20/20	4/3	24/23
				Fin whale	4/3	0/0	4/3
				Humpback whale	12/11	4/4	16/15
				Sperm whale	5/5	3/1	8/6

*: The number probably includes some duplicated sightings made by plural vessels.

Table 2. Summary of biological data and samples collected during the 2014 JARPN II coastal survey off Kushiro.

Samples and data	Number of animals		
	Male	Female	Total
Body length and sex	35	16	51
External body proportion	35	16	51
Photographic record and external body character	35	16	51
Diatom film record	35	16	51
Body scar record	35	16	51
Measurements of blubber thickness (five points)	35	16	51
Body weight	35	16	51
Skin tissues for DNA analysis	35	16	51
Muscle, liver, kidney, spleen, blubber, and heart for various analysis	35	16	51
Urine for various analysis	11	5	16
Muscle, liver, kidney, and blubber for heavy metal analysis	35	16	51
Muscle, liver, kidney, and blubber for organochlorine analysis	35	16	51
Collection of blood plasma	25	12	37
Mammary grand; lactation status, measurement and histological sample	-	16	16
Uterine horn; measurements and endometrium sample	-	16	16
Collection of ovary	-	16	16
Photographic record of foetus	2	0	2
Foetal length and weight	2	0	2
External body measurements of foetus	2	0	2
Skin tissues for DNA study of foetus	2	0	2
Muscle, liver, kidney, heart, blubber and skin tissues of foetus	2	0	2
Eye lens of foetus for age determination	2	0	2
Collection of foetus	2	0	2
Testis and epididymis; weight and histological sample	35	-	35
Stomach contents, convenient record	35	16	51
Volume and weight of stomach content in each compartment	35	16	51
Observation of marine debris in stomach	35	16	51
Collection of stomach contents for feeding study	34	16	50
Record of external parasites	35	16	51
Earplug for age determination	35	16	51
Eye lens for age determination	35	16	51
Baleen plate with V-shape notch on its outer edge for age determination	0	0	0
Baleen plate measurements (length and breadth)	35	16	51
Photographic record of baleen plate series	35	16	51
Length of baleen series	35	16	51
Vertebral epiphyses sample	21	9	30
Number of ribs	35	16	51
Skull measurement (length and breadth)	34	16	50
Content of large intestine	3	3	6
Sampling of pelvic bone	0	4	4
Measurement of flipper white patch	34	16	50

Table 3. Body length (m) of common minke whales collected in the 2014 JARPNII coastal component off Kushiro.

Period	Male					Female				
	Mean	S.D.	Min.	Max.	*n*	Mean	S.D.	Min.	Max.	*n*
9/5-9/11	6.99	0.75	5.31	7.66	9	7.14	0.94	6.03	8.21	4
9/12-9/18	5.96	1.12	4.51	7.62	13	6.26	0.81	5.35	7.81	8
9/19-9/24	6.10	1.06	4.66	7.34	13	6.11	1.23	4.88	7.81	4
Total (9/5-9/24)	6.28	1.08	4.51	7.66	35	6.44	0.98	4.88	8.21	16

Table 4. Composition of sexual maturity of common minke whales collected in the 2014 JARPNII coastal component off Kushiro.

Period	Male				Female						
	Im	M	Total	Maturity*	Im	R	P	Total	Pregnancy*	Maturity*	Sex ratio (%males)
9/5-9/11	3	6	9	66.7	3	0	1	4	100.0	25.0	69.2
9/12-9/18	9	4	13	30.8	8	0	0	8	-	0.0	61.9
9/19-9/24	7	6	13	46.2	3	0	1	4	100.0	25.0	76.5
Total (9/5-9/24)	19	16	35	45.7	14	0	2	16	100.0	12.5	68.6

Im: Immature; M: Mature; R: Resting; P: Pregnant; *: %.

Table 5. Number of common minke whales by major prey species found in forestomach, collected in the 2014 JARPN II coastal component off Kushiro.

Period	Number of whales (%)				All
	Walleye pollock	Japanese sardine	Mackerels	Medusa fish	
9/5-9/11	7 (53.8)	4 (30.8)	2 (15.4)	0 (-)	13 (100.0)
9/12-9/18	9 (42.9)	12 (57.1)	0 (-)	0 (-)	21 (100.0)
9/19-9/24	14 (82.4)	2 (11.8)	0 (-)	1 (5.9)	17 (100.0)
All (9/5-9/24)	30 (58.8)	18 (35.3)	2 (3.9)	1 (2.1)	51 (100.0)

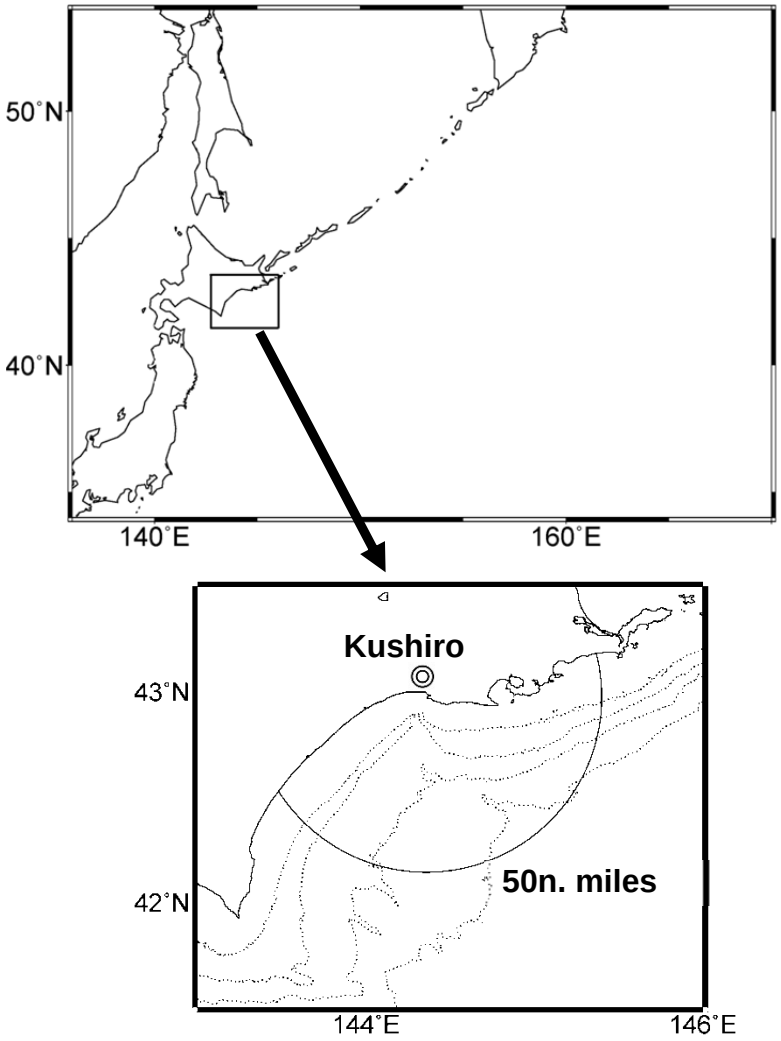

Figure 1. Research area set for the 2014 JARPN II coastal survey off Kushiro. Isobaths are 100m, 200m, 1000m, and 2000m.

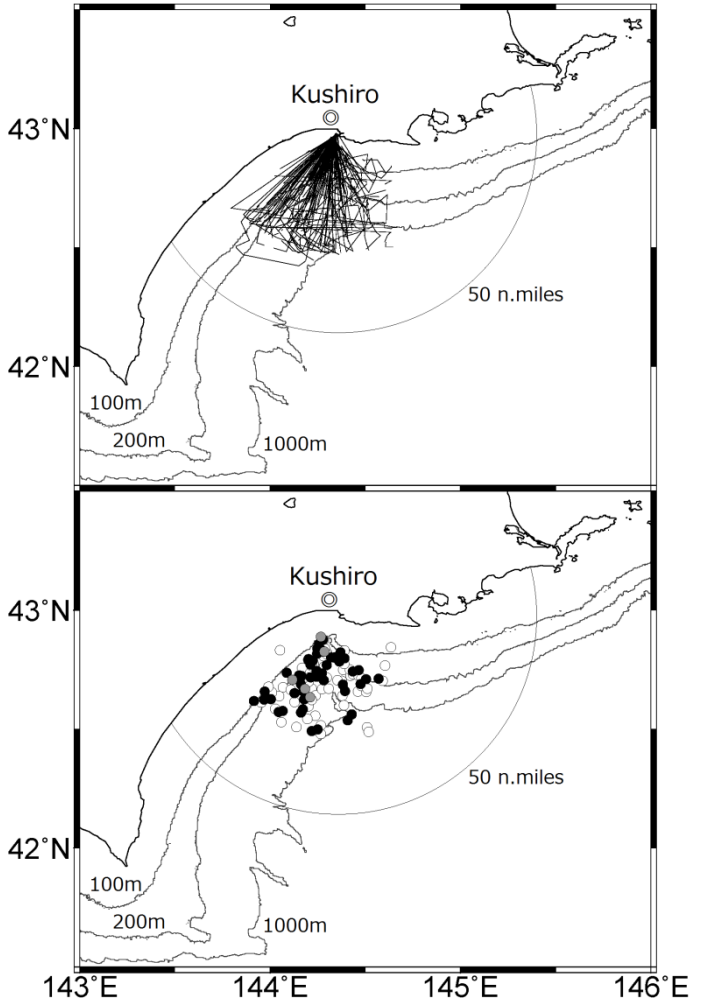

Figure 2. Cruise tracks (upper) and sighting positions (lower) of common minke whales made by sampling vessels during the 2014 JARPN II coastal survey off Kushiro. Black and gray circles are sighting positions of common minke whales collected and biopsy sampled, respectively. Isobaths are 100m, 200m, and 1000m.

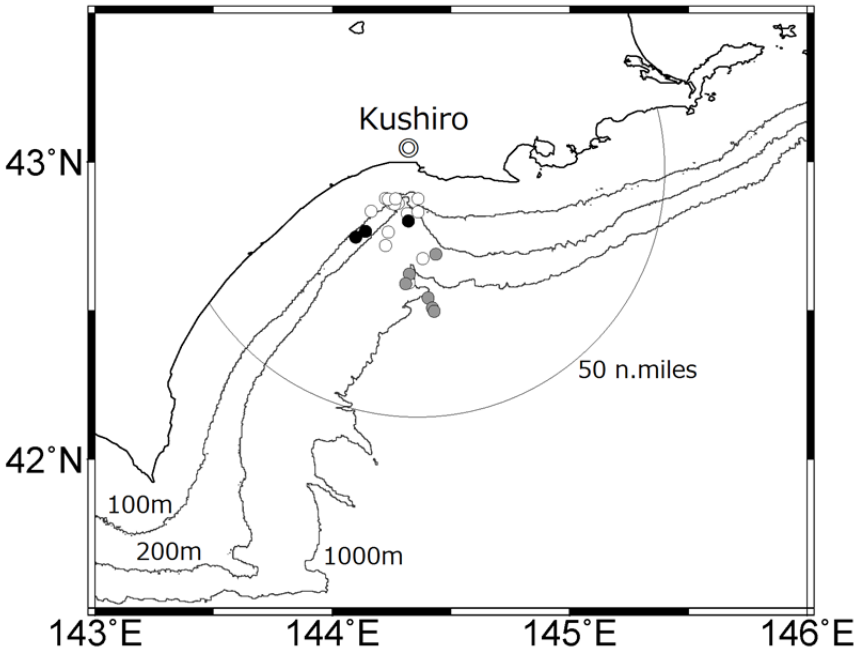

Figure 3. Sighting positions of humpback (white circle), fin (black) and sperm (gray) whales made by sampling vessels during the 2014 JARPN II coastal survey off Kushiro. Isobaths are 100m, 200m, and 1000m.

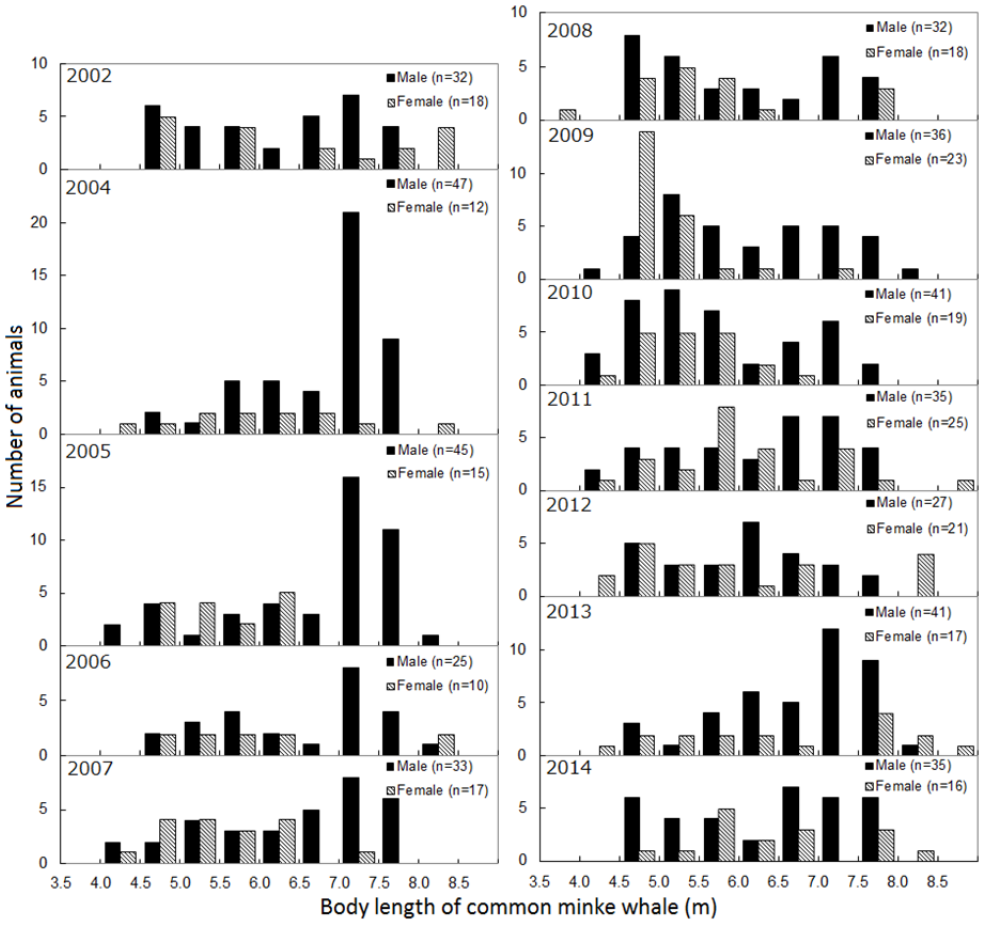

Figure 4. Body length frequency of common minke whales sampled during the 2014 JARPN II coastal survey off Kushiro, with results of the previous 2002-2013 surveys.

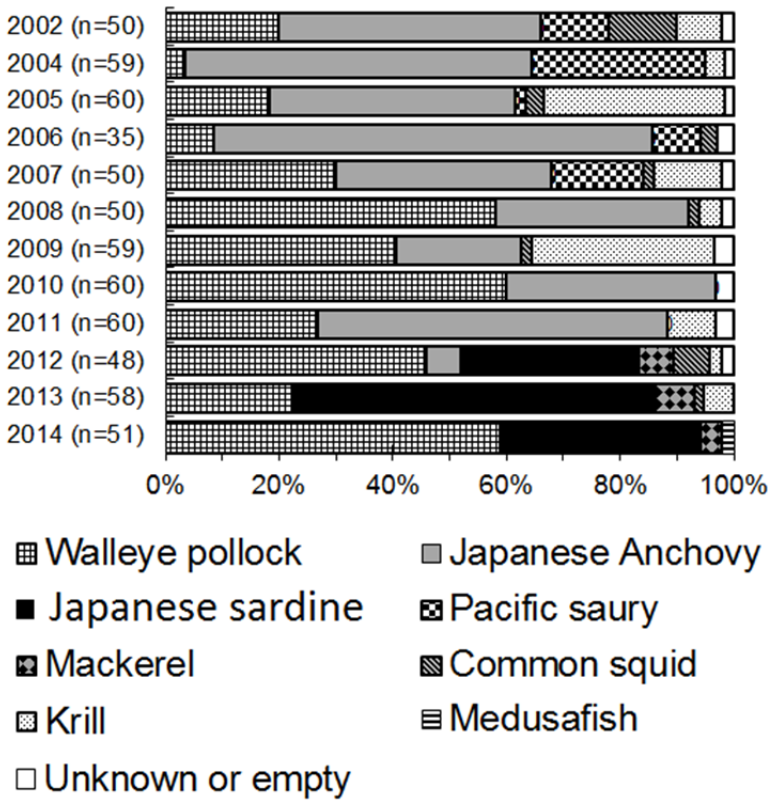

Figure 5. Composition of prey species of common minke whales sampled during the 2014 JARPN II coastal survey off Kushiro, with results of the previous 2002-2013 surveys.

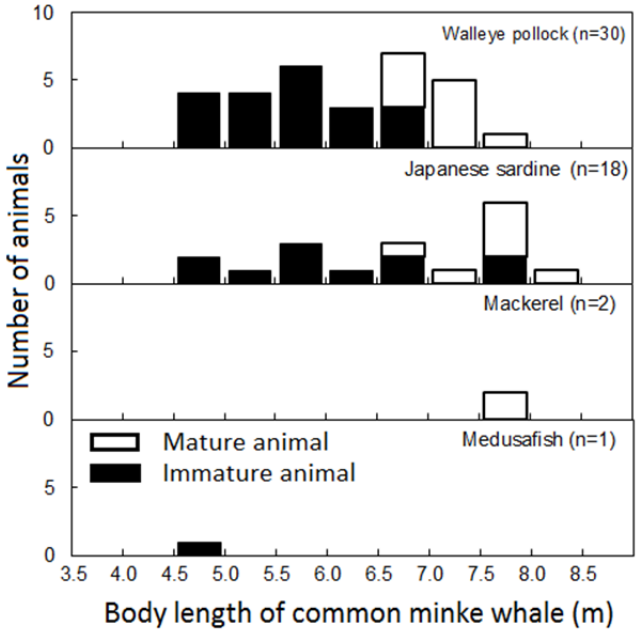

Figure 6. Sexual maturity and body length frequency of common minke whales by their prey species found in forestomach in the 2014 JARPN II coastal survey off Kushiro.

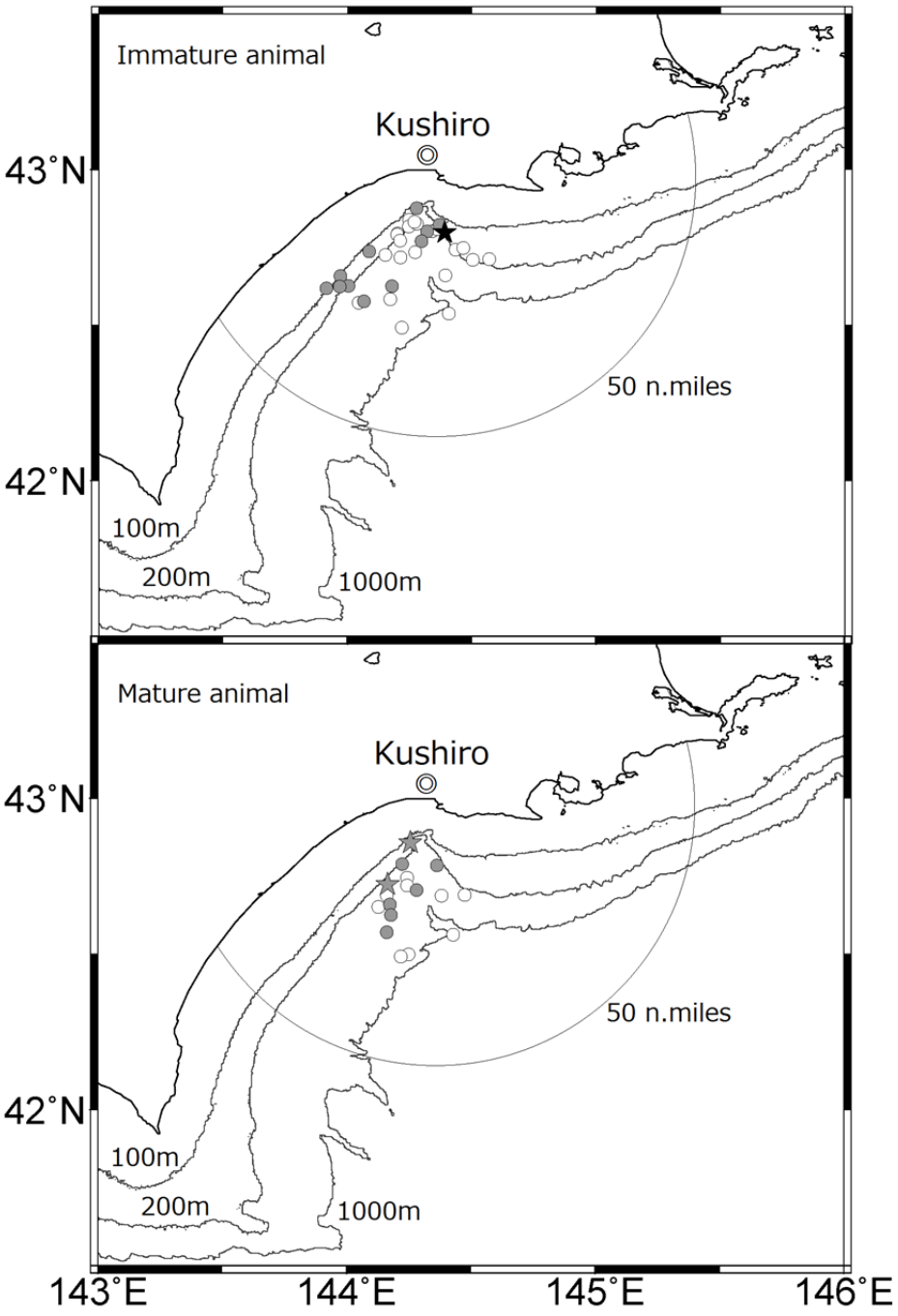

Figure 7. Sighting positions of common minke whales collected during the 2014 JARPN II coastal survey off Kushiro, shown by their maturity stage and prey species. Walleye Pollock (white circle), Japanese sardine (gray circle), mackerel (gray star), medusa fish (black star). Isobaths are 100m, 200m, and 1000m.