Methodology and procedure of the dedicated sighting surveys in JARPN II - Offshore and coastal component of Sanriku and Kushiro -

HIROSHI KIWADA, SAEKO KUMAGAI AND KOJI MATSUOKA

The Institute of Cetacean Research; 4-5, Toyomi-cho, Chuo-ku, Tokyo, 104-0055 Japan

Contact E-Mail: kiwada@cetacean.jp

ABSTRACT

We describe the survey procedures used by dedicated sighting vessels of JARPN II. The full-scale JARPN II involved two survey components, "offshore" and "coastal"(Sanriku and Kushiro) surveys. In both components, sighting surveys are conducted by SSV (Sighting and Sampling Vessel) and SV (Sighting Vessel). The sighting surveys by the SV were conducted under the limited closing mode and the passing mode. The survey timing and surveying order of strata were changed every year in order to investigate how abundance estimates changed with seasonal migration of whales. Analyses of JARPNII sighting surveys are described in the Hakamada et al. 2009a and 2009b papers prepared for this meeting.

INTRODUCTION

At the 2002 SC meeting, Japan presented the results of feasibility study of the Second phase of Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) which was conducted in 2000 and 2001 (Government of Japan, 2002a). Japan also announced new research plan for the full-scale JARPN II (Government of Japan, 2002b) at the 2002 SC meeting and began the program in 2002 in compliance with Article VIII of the International Convention for the Regulation of Whaling.

The objectives of the full-scale JARPN II are: i) to collect data on feeding ecology and ecosystem studies, including cetacean prey consumption and preferences, to build ecosystem models, ii) to monitor environmental pollutants in cetaceans and the marine ecosystem, and iii) to reveal stock structure of whales (Government of Japan, 2002b).

There are two components in JARPNII, offshore and coastal. In both components, sighting surveys are conducted by SSVs and SV. Sighting surveys by SSVs are operated concurrently with sampling surveys, therefore, sighting data might have some biases. On the other hand, SVs conduct dedicated sighting survey independently and their sighting data are used for abundance estimates.

This paper describes the dedicated sighting survey procedure of JARPN II both offshore and coastal components. Methodologies of whole JARPNII surveys are described in Tamura *et al.* (2009) for offshore component and in Kishiro *et al.* (2009) for coastal component.

SIGHTING SURVEY METHODOLOGY

JARPNII has been conducted with the consistent research methods. Table 1 and 2 shows an outline of all JARPNII sighting survey cruises from 2002 to 2007. The full-scale JARPN II plan involved two survey components, the "offshore" survey operated by the Nisshin-Maru research unit, and the "coastal" survey operated by small type whaling catcher boats.

Sighting surveys in offshore components are designed to explore the entire survey area in two years (2002-2003 and 2004-2005) and one year (2006 and 2007). Coastal components were consisted of spring (April-May) Sanriku survey and autumn (September-October) Kushiro survey. Coastal components also employed the same methodologies with offshore components.

Research area
The research area for the offshore survey component was sub-areas 7, 8 and 9. These areas were further stratified into blocks based on oceanographic information (particularly of Kuroshio and Oyashio effects) (Fig. 1).

Sub-area 7: Five small blocks (7N, 7MI, 7MO, 7SI, 7SO) were stratified based on the satellite water temperature information.

Sub-areas 8 and 9: These sub-areas were stratified into four small blocks at latitude of 40N (8N and 8S, 9N and 9S).

A part of sub-area 7 (off the Pacific coast of northern Japan) was covered by the coastal survey component. Spring Sanriku survey was conducted in blocks 7SI and 7MI, while autumn Kurhiso survey covered block 7N.

Research Vessels
There were five research vessels used for dedicated sighting survey from 2002 to 2007 JARPNII. Among them, one or two vessels were operated in each season in offshore components. The Kyoshin-Maru No.2 (KS2: 372GT), Shonan-Maru (SM1: 712GT) and Shonan-Maru No.2 (SM2: 712GT) have been used as a SV (Table 3). The Kaiko-Maru (KK1: 860.25 GT) was engaged in the whale sighting and cetacean prey species surveys in 2006 and 2007. These vessels also conducted various experiments.

Although one vessel participated every season as SV in coastal components in principle, two vessels (KS2 and KK1) operated in the coastal component of Kushiro 2006 (Table 3). It was a feasibility study for KK1 that sighting surveys and prey species surveys conducted by one vessel simultaneously.

Design of track lines
Track lines and allocation of vessels were made in the same manner as in previous JARPN (Fujise *et al*., 1995, 1996, 1997, 2000, 2001, 2002, 2003; Ishikawa *et al*., 1997; Zenitani *et al*., 1999; Tamura *et al*., 2004, 2005, 2006 and 2007). The zigzag-shaped track line was established on an arbitrary basis in each sub-area and month. These lines were established independently from those for sampling surveys (Nisshin-Maru unit).

Since the survey area was small, zigzag track lines for coastal components were set at smaller width. It is still follow the offshore methods and designed randomly for abundance estimates.

Survey route and stratum
Spatial and temporal distribution of our target species, sei whales and Bryde's whales in North Pacific Ocean, had not been known well. Therefore, we surveyed their distributions focusing on each smaller area at various timing, such as early summer or mid-summer.

Originally, sighting surveys in offshore components were planned to cover the entire research area in two years as pairs (2002-2003 and 2004-2005, Fig. 2a-d). As for 2004 and 2005, some parts of Area 8 (8N and 8S) and 9 (9N and 9S) were not performed in 2004 and those were covered in 2005, so that surveys were conducted efficiently to cover the entire area.

For the purpose of abundance estimates, however, it was preferred to collect sighting data of whole area in one year. Therefore, lines have been switched to run all areas in a single year since 2006. In 2006 and 2007, surveys were conducted with four strata based on latitude lines, regardless of the sub-areas and blocks; north of 45N, 41-45N, 38-41N, and 35-38N. These years completed survey in one year, but they surveyed each stratum at different timing by reversing survey routes from south to north in 2006 to north to south in 2007 (Fig.2e-f). These results should be therefore taken into account for analysis.

Survey routes in each area were determined taking into consideration of the whale migration paths based on the sighting and distribution data from previous years. For example, the surveying order of strata was followed the shift of whales (i.e. from south to north) in 2006, while it was against (i.e. north to south) in 2007. Thus surveying order of strata was different by year so that sighting data in one area were collected at different month of the year. We anticipated to evaluating the effects of double counts of whales and mismatch of both timings of whale migration and survey.

Procedure of sighting surveys
Sighting procedure of the offshore and coastal components for the dedicated sighting survey was similar

to the previous surveys of JARPN. The sighting survey by the SV was conducted under the limited closing mode (ASP mode; same manner as "NSC" without sampling of whales) and the passing mode (NSP mode; even if sighting was made on the predetermined track line, the vessel did not approach the whale directly and searching from the top barrel was uninterrupted). Closing was performed mainly on sightings of common minke, Bryde's, sei and sperm whales. Furthermore closing was made on sightings of large whales in order to confirm species and school size, and to conduct experiments if they are blue, humpback, right or fin whales.

The dedicated sighting vessels proceeded on the predetermined track lines at a standard speed of 10.5 knots during the sighting survey. To ensure an accuracy of sighting survey, the survey was operated under optimal research conditions (when the wind speed was below 17 knots and visibility was over 2.0 n.miles) .

Sightings of whales were classified as primary and secondary sightings. The primary sightings were those seen in normal searching mode (on-effort), i.e. ASP or NSP (two or three primary observers searched from the top barrel of the vessel on the predetermined track-line). The secondary sightings were those seen during off-effort (e.g. during confirming whales, no observer in the top barrel or the vessel engages in other work) or off the research time.

Research hour was from an hour after sunrise to an hour before sunset while the maximum research hours were set at 12 hours. Generally, the survey started at 06:00 or 07:00 and ended at 18:00 or 19:00 (local time).

Researcher on board recorded all sighting information. The sighting record includes date and time of the sighting, position of the vessel, classification of the survey mode and the sightings (primary or secondary), angle and distance from the vessel, species and school size, estimated body length, etc. Since 2006 survey, most of these data have been recorded semi-automatically by using whale research data acquisition systems on board research vessels.

Non-lethal survey

Besides collecting whale sighting data, JARPN II conducted a variety of non-lethal biological survey. These surveys contributed to accumulate knowledge thus further understand large baleen whales, prey species and oceanography.

Photo-identification and biopsy sampling

The following species were targeted for photographic record of natural markings by SV; blue, humpback and right whales. In addition to the species targeted for photo-identification, blue, fin, humpback, right and sperm whales were also targeted for biopsy sampling. Cross bows and air guns developed by ICR (Kasamatsu *et al*, 1991) were used.

Prey species and oceanographic survey

KS2 and KK1 conducted the following surveys; 1) hydro-acoustic survey using a passive acoustic system (EK500 38kHz, 120kHz, 200kHz(only KS2), SIMRAD, Norway) elucidation of distribution and abundance of cetacean prey species, 2) consecutive measuring of surface water temperature, conductivity, surface chlorophyll, dissolved oxygen and surface particle by Electric Particle Counting and Sizing System (EPCS: only KS2), 3) XBT, XCTD and CTD survey. Details are described in Murase *et al* (2009), Watanabe *et al* (2009) and Yonezaki *et al* (2009) prepared for this meeting.

Other experiments

Sighting distance and angle experiments were conducted on each cruise/vessel to examine the precision of sighting data. Following experiments including those at the developing stage were also conducted; observation of feeding behavior of large whales, air and sea water sampling for environmental monitoring, satellite tagging for baleen whales, acoustic monitoring for large baleen whales, and so on..

Outline of the each sighting survey

Details are described in each cruise report of JARPNII (see References, Table 1&2).

2002 season (Fig. 2a)

In June and July 2002, KS2 surveyed counterclockwise from block 7SO through sub-areas 8S, 9S, then southern section of 9N and 8N (south of 45N) to block 7MO.

Block 7N was explored by Kushiro survey in September.

2003 season (Fig. 2b)
2003 survey filled the area where 2002 survey left (7MI and 9N), thus regular area category was ignored. KS2 surveyed northward in the area of north of 37N and west of 145E in May, and northward in the remaining sub-area 7, north of 38N in June. KS2 then proceeded northward in the area north of 38N and 156-159E. KS2 resumed a survey heading west from 170E north of 43N in sub-area 9N. SM1 took a part in the sub-area 8 survey in May. Combining 2002 and 2003, all survey areas were explored.

This year, the first time Sanriku survey conducted in April, blocks 7SI and 7MI. Kushiro survey searched in block 7N in September. Sanriku survey trackline was experimental design because of first time survey. Kushiro survey trackline was a continuation of offshore component. Therefore, both surveys design were different from other year's surveys.

2004 season (Fig. 2c)
Areas 7 and 8 were studied in early summer of 2004. From May to June 2004, the survey was conducted clockwise starting from block 7SI in the sub-area 7. Following the sub-area 7, survey was continued in sub-area 8 eastward in the area north of 38N line. KS2 finished 2004 survey with the counterclockwise survey in the area between 38N and 45N in the sub-area 9. Due to the lack of research time, southern parts of Areas 8 and 9 were left as unsurveyed.

Block 7 was filled during coastal components in Kushiro, September.

2005 season (Fig. 2d)
Areas left in 2004 (southern parts of Areas 8 and 9) were filled by 2005 survey. SM1 joined the sighting survey in 2005 searching in the sub-area 7 clockwise in May. Concurrently, KS2 started a survey in the area between 38N and 41N from western edge of sub-area8 (150E) to 170E. KS2 then kept going westward from 170E in the area between 35N and 38N. Survey was subsequently succeeded eastward in the area between 41N and 45N. We were unable to some of the area in Area 9 (north of 45N) due to the lack of research time as well as bad weather. Nevertheless, combining 2004 and 2005 surveys, all survey areas were completed.

Blocks 7SI and 7MI were surveyed by Sanriku survey from April to May, while 7N was so by Kushiro survey in September.

2006 season (Fig. 2e)
2006 survey covered the entire research area by proceeding south to north. In May 2006, sighting survey began from 144E longitude line in block 7SO eastward to 170E longitude line in sub-area 9S. KS2 then moved northern stratum, 38-41N starting from 170E longitude line in sub-area 9S headed west in June. After reaching at 145E line (western edge of block 7MO or eastern edge of block 7MI), KS2 searched southward in blocks 7MI and 7SI. Following the survey in the southern strata, KS2 proceeded to the northern strata, from eastward in 41-45N then westward in the north of 45N from July to August.

As in 2005, blocks 7N, 7SI and 7MI were studied by coastal components of Kushiro and Sanriku, respectively.

2007 season (Fig. 2f)
2007 was different from previous years in that sighting survey started from far north area of the research area, north of 45N in May, followed by 41-45N survey in June. KS2 then searched from block 7MI to block 9S in the area between 38-41N. Survey was continued in the southernmost research area, 35-38N, from 170E heading to Japan in August.

Kushiro survey was carried out in block 7N from September to October.

DISCUSSION

Abundance estimates by past surveys fluctuate substantially depending on the timing and coverage of each survey. Therefore, we intended to grasp seasonal distributions and movements of whales and to understand why abundance estimates were extremely different in cruise by cruise.

Changing survey route and timing every year have merits as well as demerits. The greatest merit is that we obtained information on seasonal distribution, abundance and movement of whales while we are unable to obtain annual trends in abundance estimates. In JARPNII, abundance estimates of whales were

significant in calculating how much whales eat food in ecosystem models. Therefore, the annual trend in abundance estimate is less important than the seasonal trends in abundance estimates. Our experiment of changing survey routes and timing will provide us better information necessary for JARPNII goals. Furthermore, it will shed light on causes why the number of whales in this area show a discrepancy survey by survey.

From 2002-2007 results, it will be possible to establish the best survey design. In 2008 survey, we carried out new research plan which two SVs simultaneously survey southern part and northern part of the research area.

ACKNOWLEDGMENT

The authors are greatly indebted to Dr. Hiroshi Hatanaka, and Mr. Shigetoshi Nishiwaki for their help in the preparation of this paper. We also thank all Captains, officers and crew of the research vessels and the staff of the ICR, Kyodo-Senpaku Co. Ltd. and Kaiko-Senpaku K.K.

REFERENCES

Fujise, Y., Iwasaki, T., Zenitani, R., Araki, J., Matsuoka, K., Tamura, T., Aono, S., Yoshida, T., Hidaka, H., Nibe, T., Tohyama, D. 1995. Cruise report of the Japanese Whale Research Program under a Special Permit in the North Pacific (JARPN) in 1995 with the result of a preliminary analysis of data collected. SC/48/NP13

Fujise, Y., Shimada, H., Zenitani, R., Goto, M., Tamura, T., Lindstrom, U., Uchida, A., Yoshida, H., Shimamoto, K., Yuzu, S., Kasai, H., Kinoshita, T., Iwata, T., Tohyama, D. 1996. Cruise report of the Japanese Whale Research Program under a Special Permit in the North Pacific (JARPN) in 1996 with some preliminary analyses of data collected during the 1994-1996 JARPN surveys. SC/49/NP8

Fujise, Y., Zenitani, R., Tamura, T., Bando, T., Ohtani, S., Takeda, S., Kitajima, A., Kimura, T., Masaki, T. and Tohyama, D. 2000. Cruise report of the Japanese whale research program under special permit in the North Pacific (JARPN) in 1999. Paper SC/F2K/J9 presented to the JARPN review meeting, February 2000 (unpublished). 32pp.

Fujise, Y., Pastene, L.A, Tamura, T., Bando, T., Murase, H., Kawahara, S., Watanabe, H., Ohizumi, H., Mogoe, T., Kiwada, H., Nemoto, K. and Narita, H. 2001. Progress Report of the Feasibility study of the Japanese whale research program under special permit in the western North Pacific-Phase II (JARPN II) in 2000. Paper SC/53/O10 presented to the IWC Scientific Committee, July 2001 (unpublished). 77pp.

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 (JARPNII) in 2001. Paper SC/54/O16 presented to the IWC Scientific Committee, May 2002 (unpublished). 51pp.

Fujise, Y., Tamura, T., Bando, T., Yasunaga, G., Konishi, K., Murase, H., Yoshida, T., Itoh, S. Ogawa, R., Oka, T., Sasaki, T., Fukutome, K., Isoda, T., Birukawa, N., Horii, N., Zharikov, K.A., Park, K.J., Tohyama, D. and Kawahara, S. 2003. Cruise report of the Japanese whale research program under special permit in the western North Pacific . Phase II (JARPNII) in 2002 (Part I). Paper SC/55/O7 presented to the IWC Scientific Committee, May 2003 (unpublished). 41pp.

Goto, M., Kato, H., Zenitani, R., Yoshida, H., Saito, T., Tabata, S., Morita, Y., Sato, H., Okamoto, R., Maeda, H., Odagawa, A., Ebisui, T., Nakai, K., Matsumoto, A., Fujimori, S., 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 Sanriku. Paper SC/59/O6 submitted to the 59th IWC scientific Committee, 34pp.

Government of Japan. 1994. Research Program for clarification of minke whale stock structure in the northern part of the North Pacific. Paper SC/46/NP1 presented to the IWC Scientific Committee, 1994 (unpublished).34pp.

Government of Japan. 2000. Research Plan for Cetacean Studies in the Western North Pacific under Special Permit (JARPN II) (Feasibility Study Plan for 2000 and 2001). Paper SC/52/01 presented to the IWC Scientific Committee, 2000 (unpublished). 68pp.

Government of Japan. 2002a. Report of the 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 presented to the IWC Scientific Committee, May 2002 (unpublished). 202pp.

Government of Japan. 2002b. Research Plan for Cetacean Studies in the Western North Pacific under Special Permit (JARPN II) Paper SC/54/O2 presented to the IWC Scientific Committee, May 2002 (unpublished). 115pp.

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

Government of Japan. 2004b. Some considerations of the feasibility components of the JARPN II research plan. Paper SC/56/O2 presented to the IWC Scientific Committee, May 2004 (unpublished). 36pp

Hakamada, T., Matsuoka, K. and Miyashita, T. 2009a. The number of western North Pacific common minke whales (*Balaenoptera acutorostrata*) distributed in JARPN II coastal survey areas. Paper SC/J09/JR8 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 12pp.

Hakamada, T., Matsuoka, K. and Miyashita, T. 2009b. Distribution and the number of western North Pacific common minke, Bryde's, sei and sperm whales distributed in JARPN II Offshore component survey area. Paper SC/J09/JR15 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 18pp.

International Whaling Commission. 2001. Report of the workshop to review the Japanese Whale Research Programme under Special Permit for North Pacific minke whales (JARPN), Tokyo, 7-10 February 2000. J. Cetacean Res. Manage. (Suppl.) 3: 377-413.

Ishikawa, H., Yuzu, S., Shimamoto, K., Bando, T., Ohshima, K., Kasai, H., Kinoshita, T., Mizushima, Y., Iwakami, H., Nibe, T., Hosoyama, T., Kuramochi, T., Numano, K., Miyamoto, M. 1997. Cruise report of the Japanese Whale Research Program under a Special Permit in the North Pacific (JARPN) in 1997. SC/49/NP9

Kasamatsu F., Iwata S. and Nishiwaki S. 1991. Development of biopsy skin sampling system for fast swimming whales in pelagic waters. Rep. Int. Whal. Commn 41. 555-557.

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.

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., Ebiui, 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 (JARPN II) in 2005 . Coastal component off Kushiro. Paper SC/58/O10 submitted to the 58th IWC Scientific Committee, 32pp.

Kishiro, T., Yoshida, H., Goto, M., Bando, T. and Kato, H. 2009. Methodology and survey procedure under the JARPN II – coastal component of Sanriku and Kushiro-, with special emphasis on whale sampling procedures. Paper SC/J09/JR3 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 27pp.

Matsuoka, K., Otani, S., Isoda, T., Wada, A., Kumagai, S., Ohshima, T., Yoshimura, I., Sugiyama, K., Aki, M., Kato, K., Bhuiyan M.M.U., Funasaka, N., Suzuki, Y., Sudo, R., Motohashi, Y., Mori, M., Tsunekawa, M., Inagake, D., Murase, H., and Ogawa, T. 2008. Cruise report of the second phase of the Japanese Whale Research Program under special permit in the Western North Pacific (JARPNII) in 2007 - Offshore component-. Paper. SC/60/O5 submitted to the 60th IWC Scientific Committee,40pp.

Matsuoka, K., Kiwada, H., Fujise, Y. and Miyashita, T. 2009. 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 2007). Paper SC/J09/JR35 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 12pp.

Murase, H., Watanabe, H., Yonezaki, S., Tamura, T., Matsuoka, K., Fujise, Y. and Kawahara, S. 2009. Methodology and procedures of cetacean prey surveys in JARPN II –Offshore Component-. Paper SC/J09/JR7 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 11pp.

Tamura, T., Fujise, Y., Bando, T., Yasunaga, G., Konishi, K., Kiwada, H., Isoda, T., Itoh, S. Machida, S., Tsunekawa, M., Konagai, T., Takamatsu, T., Ohshima, T., Honjo, K., Matsuoka, T., Zharikov, K.A., Yong, Rock AN, Tohyama, D. and Kawahara, S. 2004. Cruise Report of the Japanese Whale Research Program under Special Permit in the western North Pacific -Phase II (JARPN II) in 2003 (part I) - Offshore component .. Paper SC/56/O13 presented to the IWC Scientific Committee, June 2004 (unpublished). 46pp.

Tamura, T., Fujise, Y., Mogoe, T., Kanda, N., Yasunaga, G., Konishi, K., Kiwada, H., Ogihara, M., Hasegawa, A., Kitajima, M, Sugiyama, T., Sasaki, T., Mori, M., Teraoka, T., Tsunekawa, M., Fukutome, K., Zharikov, K.A, NA, Jong-Hun., Tohyama, D, Inagake, D. and Kawahara, S. 2005. Cruise Report of the Japanese Whale Research Program under Special Permit in the western North Pacific -Phase II (JARPN II) in 2004 (part I) - Offshore component .. Paper SC/57/O3 presented to the IWC Scientific Committee, June 2005 (unpublished). 33pp.

Tamura, T., Otani, S., Kiwada, H., Mori, M., Konishi, K., Isoda, T., Wada, A., Ogihara, M., Hasegawa, A., Kumagai, S., Komatsu, W., Hayasaka, K., Fukutome, M., Siozaki, M., Zharikov, K.A, NA, Jong-Hun., Ogawa, T, Watanabe, H., Yonezaki, S, Inagake, D. and Kawahara, S. 2006. Cruise report of the second phase of the Japanese Whale Research Program under Special Permit in the Western North Pacific (JARPN II) in 2005. Offshore component .. Paper SC/58/O8 presented to the IWC Scientific Committee, June 2006 (unpublished). 52pp

Tamura, T., Matsuoka, K., Bando, T., Mogoe, T., Konishi, K., Mori, M., Tsunekawa, M., Okamoto, K., Funasaka, N., Sakajiri, H., Yoshida, Y., Kumagai, S., Kimura, K., Takamatsu, T., Konagai, T., Sasaki, T., Kuwaoka, J. and Ogawa, T., 2007. Cruise Report of the Japanese Whale Research Program under Special Permit in the western North Pacific -Phase II (JARPN II) in 2006 (part I) - Offshore component. Paper SC/59/O5 presented to the IWC Scientific Committee, June 2007 (unpublished). 26pp.

Tamura, T., Matsuoka, K. and Fujise, Y. 2009. Methodology and survey procedure under the JARPN II - offshore component- with special emphasis on whale sampling procedures. Paper SC/J09/JR4 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 16pp.

Watanabe, H., Yonezaki, S., Kiwada, H., Kumagai, S., Kishiro, T., Yoshida, H. and Kawahara, S. 2009. Methodology and procedures of common minke whale's prey surveys in JARPN II –Coastal component of Kushiro-. Paper SC/J09/JR6 presented to the JARPNII Review Workshop, Tokyo, January 2009 (unpublished). 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., Iwasaki, T., Miyashita, T., Saito, T., Tabata, S., Morita, Y., Sato, H., Okada, A., Tomizawa, Y., Saino, S., Kuroishi, H., Ebisui, T., Nakai, K., 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 (JARPN II) in 2005- Coastal component off Sanriku. Paper SC/58/O9 submitted to the 58th IWC scientific Committee, 30pp.

Yoshida, H., Kato, H., Kishiro, T., Miyashita, T., Iwasaki, T., Minamikawa, S., Ryono, T., Tabata, S., Morita, Y., Sato, H., Okamoto, H., Toyoda, Y., Nakamura, G., Ebisui, T., Nakai, K., Matumoro, A., Nishiwaki, S., Kawahara, S. 2006. Cruise report of the second phase of the Japanese whale Research Program under special permit in the Western North Pacific (JARPNII) in 2006 - Coastal component off Kushiro- Paper SC/59/O7 submitted to the 59th IWC Scientific Committee, 43 pp.

Yonezaki, S., Nagashima, H., Murase, H., Yoshida, H., Bando, T., Goto, M., Kawahara, S. and Kato, H. 2009. Methodology and procedures of surveys of prey of common minke whales JARPN II - Coastal component of Sanriku. Paper SC/J09/JR5 presented to the JARPNII Review Workshop,

Tokyo, January 2009 (unpublished). 6pp.
Zenitani, R., Fujise, Y., Matsuoka, K., Tamura, T., Bando, T., Ichihashi, H., Shimokawa, T., Krasnenko, A.S., Taguchi, F., Kinoshita, T., Mori, M., Watanabe, M., Ishinomiya, D., Nakamura, M., Sakai, K., Matsuzaka, K., Kamei, H., Toyhama, D. 1998. Cruise report of the Japanese Whale Research Program under a special permit in the North pacific in 1998. SC/51/RMP7

Table 1. Summary of JARPNII dedicated sighting surveys – Offshore component.

Year	Research vessel	7 N	7 MI	7 SI	7 MO	7 SO	8 N	8 S	9 N	9 S	Researchers	Reference IWC/SC Rep.
2002	KS2				●	●	●	●	●	●	Shin Ito, Kazuki Fukutome	SC/55/O7
2003	SM1						●	●			Masaomi Tsunekawa	SC/56/O13
2003	KS2	●	●	●	●		●	●	●	●	Shin Ito, Sumito Machida	SC/56/O13
2004	KS2		●	●	●	●	●	●	●	●	Masakatsu Mori, Takuya Teraoka	SC/57/O3
2005	KS2						●	●	●	●	Hiroshi Kiwada, Atsushi Wada, Masahiko Nagamine, Saeko Kumagai	SC/58/O8
2006	KS2		●	●	●	●	●	●	●	●	Saeko Kumagai, Takahiro Konagai, Keisuke Kimura	SC/59/O5
2007	KS2		●	●	●	●	●	●	●	●	Saeko Kumagai, Motonori Aki, Keisuke Kato	SC/60/O5
2007	KK1				●	●	●	●	●	●	Hiroto Murase, Shiroh Yonezaki, Ryuichi Matsukura	SC/60/O5

Table 2. Summary of JARPNII dedicated sighting surveys – Coastal component.

Year	Research vessel	Kushiro	Sanriku	Researchers	Reference IWC/SC Rep.
2002	KS2	●		Kazuki Fukutome	SC/55/O8
2003	SM1		●	Masaomi Tsunekawa	SC/56/O14
2003	KS2	●		Shigetoshi Nisiwaki, Atsushi Wada	SC/56/O13
2004	KS2	●		Masakatsu Mori, Takuya Teraoka	SC/57/O4
2005	SM1		●	Isamu Yoshimura	SC/58/O9
2005	KS2	●		Masahiko Nagamine, Saeko Kumagai	SC/58/O10
2006	SM2		●	Kazuki Fukutome, Keisuke Kimura	SC/59/O6
2006	KS2	●		Keisuke Kimura	SC/59/O7
2006	KK1	●		Hiroshi Kiwada, Hikaru Watanabe, Saeko Kumagai	SC/59/O7
2007	KK1	●		Hiroshi Kiwada, Hikaru Watanabe, Keisuke Kato	SC/60/O7

Table 3. Principal particulars of research vessels.

Name	*Kyoshin-Maru No.2*	*Kaiko-Maru*	*Shonan-Maru*	*Shonan-Maru No.2*
Code	KS2	KK1	SM1	SM2
Signal letter	JFHR	JGDW	JFBW	JFCF
Launched	Oct. 1987	Jul. 1974	Jan. 29, 1972	Jan. 29, 1972
Gross tonnage (Register)	372	860.25	712	712
Gross tonnage (International)	1158	-	1015	1015
Length overall (m)	68.18	61.90	70.55	70.55
Breadth moulded (m)	10.8	11.0	10.2	10.2
Barrel height (m)	17.0	19.5	21.0	21.0
IOP height (m)	10.5	14.5	14.5	14.5
Upper bridge height (m)	8	9	11	11
Main engine type	Diesel engine	Diesel engine	Diesel engine	Diesel engine
Main engine output (kW)	1544	1471	4045	4045
Photo	Fig.3	Fig.4	Fig.5 (same type vessels)	

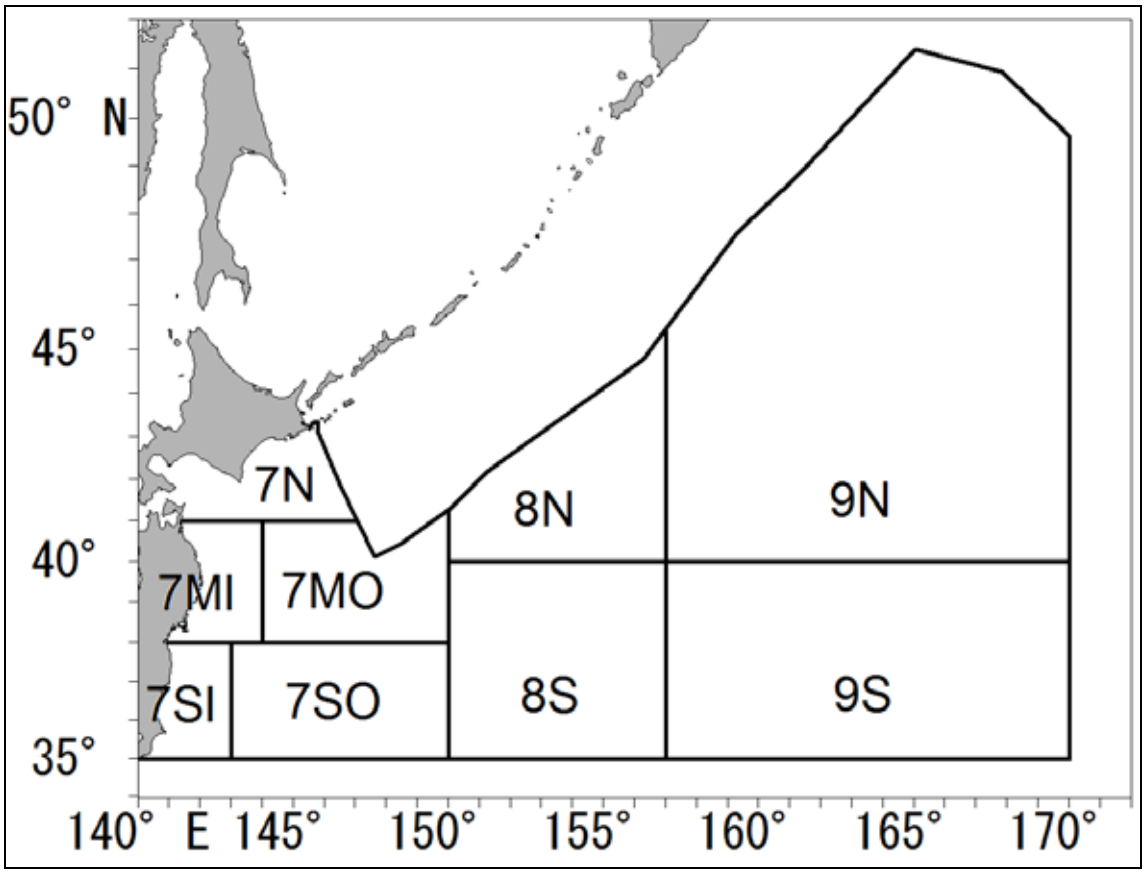

Figure 1. Research area.

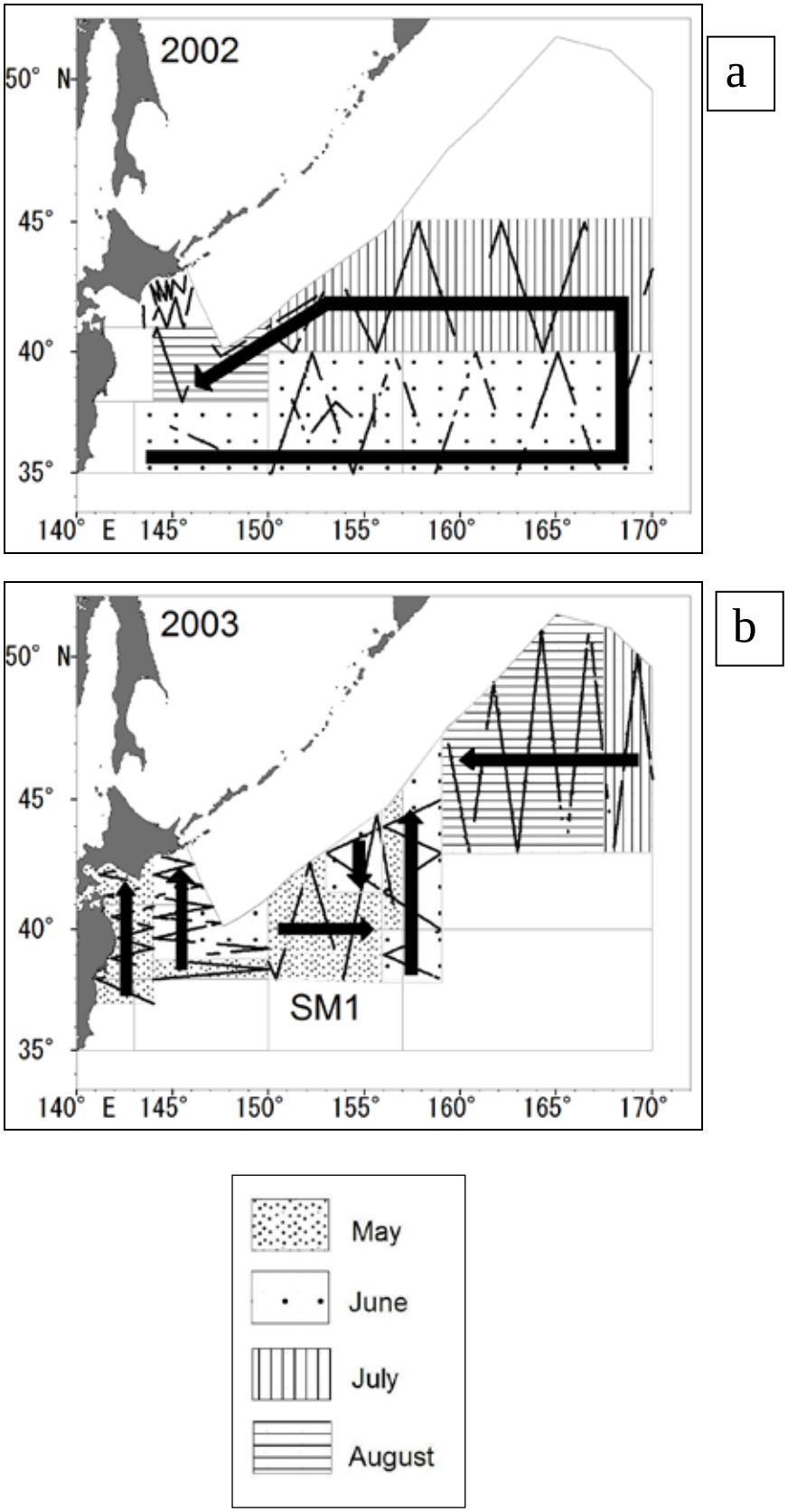

Figure 2. Survey route for off-shore component and effort (2002-2007).

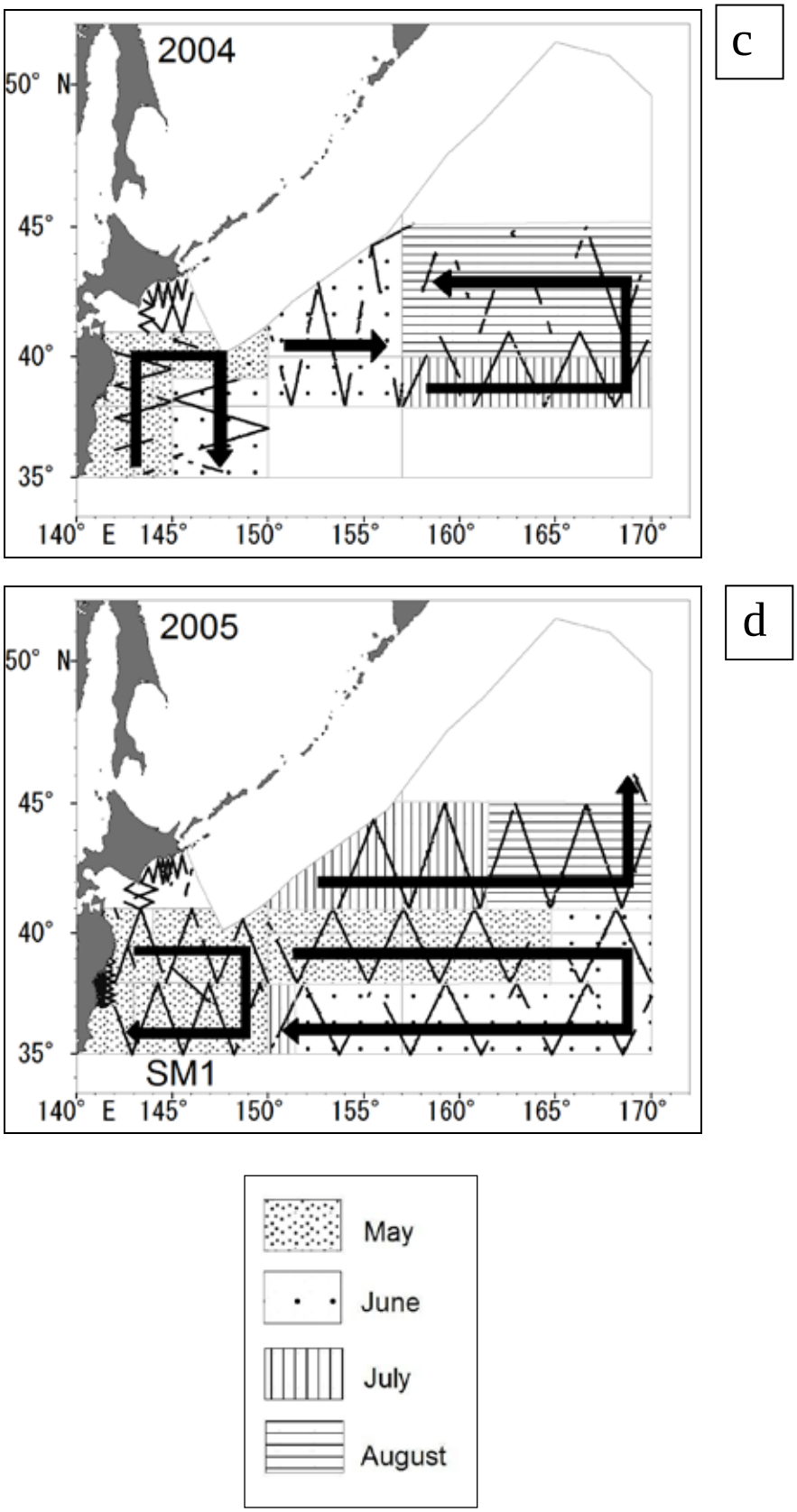

Figure 2. Survey route for off-shore component and effort (2002-2007).

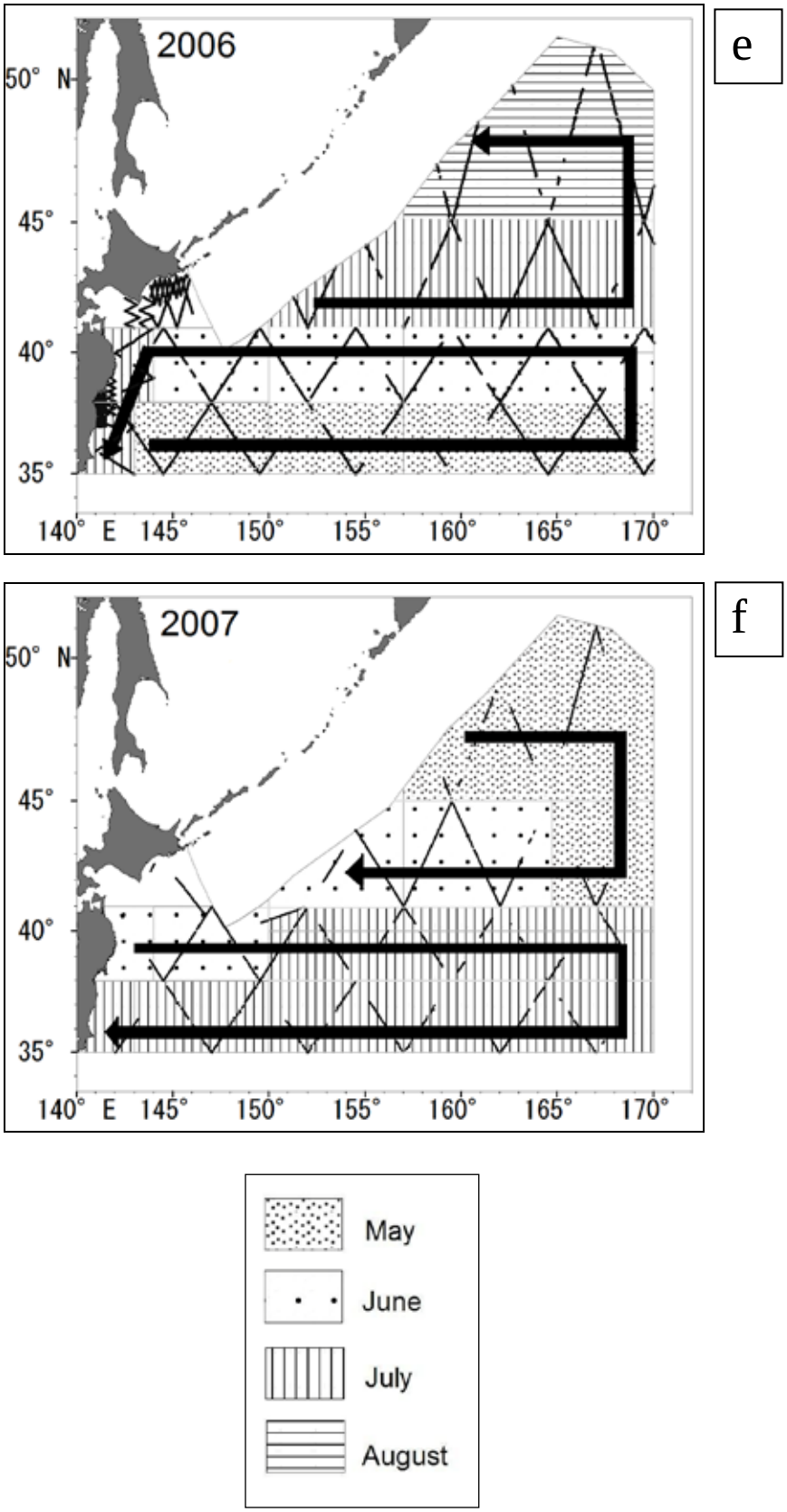

Figure 2. Survey route for off-shore component and effort (2002-2007).

Figure 3 Dedicated sighting survey vessel: *Kyoshin-Maru No.2 JFHR*

Figure 4 Dedicated sighting survey and prey survey (Trawl-type) vessel: *Kaiko-Maru JGDW*

Figure 5 Dedicated sighting survey vessel: *Shonan-Maru No.2 JFCF*