# Updated summary of information on sighting survey procedures of the Japanese dedicated sighting surveys.

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**ABSTRACT**

This paper provides an updated summary of the information on survey procedure of the Japanese dedicated sighting surveys conducted by the Institute of Cetacean Research (ICR) and the National Research Institute of Far Seas Fisheries (NRIFSF). This summary is made in response to a recommendation from the First Intersessional Workshop for the *Implementation Review* of western North Pacific common minke whales. From this information it can be concluded that the sighting procedure of the ICR dedicated sighting surveys met the RMP requirements and guidelines for surveys, except that the surveys were not oversighted. It can be also concluded that the survey procedures of the NRIFSF dedicated sighting surveys met all the RMP requirements and guidelines for surveys.

## INTRODUCTION

The First Intersessional Workshop for the *Implementation Review* of western North Pacific common minke whales agreed that whether and how to use estimates with low coverage and the treatment of JARPN surveys that did not have Committee oversight at the 2012 Annual Meeting (IWC, 2012). To assist such discussion, the Workshop requested Japan and Korea to prepare documents for that meeting containing appropriate information on the surveys whose results were accepted for conditioning. This information should include:

(1) details of the basis used to design the cruise tracks, including selection of the starting points, and the survey mode(s) used;
(2) details of procedures used to complete cruise tracks, e.g. decision rules used to skip portions of the track because of delays caused by bad weather;
(3) plots of the achieved cruise track for each survey showing the position of minke whale sightings made; the direction of each cruise track and the sequence in which survey blocks were covered;
(4) a summary of the extent to which each cruise met the RMP requirements and guidelines for surveys extant at the time of the surveys (IWC, 1997;2005;2008).

This paper attempt to present information on survey procedures of Japanese dedicated sighting surveys conducted by Institute of Cetacean Research (ICR) and National Research Institute of Far Seas Fisheries (NRIFSF) of which data were used for abundance estimates by Hakamada and Kitakado (2011) and Miyashita and Okamura (2011).

## MATERIALS AND METHODS

### Dedicated sighting survey by ICR

Abundance estimate accepted for conditioning were based on JARPN II surveys from 2002 to 2007. Summary information of 2008 and 2009 JARPN II surveys are also provided in this paper.

*Sighting survey procedure*

Research hours during the cruise was from 6:00-18:00; begin 60 minutes after sunrise and end 60 minutes before sunset, with a maximum 12 hours per day. Activities onboard the ship are classified into two principal groups: on-effort and off-effort. On-effort activities are times when full search effort is being executed and conditions (such as weather and sea conditions, see below) are within acceptable parameters to conduct research. Off-effort activities are all activities that are not on-effort. All sightings recorded while the ship is on-effort are classified as primary sightings. All other sightings are secondary sightings.

The usual guidelines for acceptable conditions will apply, i.e. visibility is greater than 2.0 n.miles and wind speed is <21 knots; the sea state should be <Beaufort 6. On-effort sightings survey research is conducted by the closing mode and passing mode, respectively (see 'Survey modes). Two primary observers will be in the barrel whenever full searching effort by reticles binoculars with the angle board is conducted. Two primary observers (captain and helmsman) will be at the upper bridge by binoculars with reticles, regardless of the research mode. Also present on the upper bridge, whenever the sighting survey is conducted, will normally be the chief engineer (or an alternate).

*Selection of starting point and survey design*

Latitudinal or longitude line was selected so that sighting surveys can be conducted efficiently and starting point was chosen randomly on the selected latitudinal/longitudinal line. Regular zig-zag lines were established systematically in each sub-area so as to cover survey stratum uniformly. These lines were established independently from those for sampling surveys (*Nisshin-Maru* unit) (Kiwada, *et al*., 2009). Zig-zag lines are set west to east in coastal survey blocks (Most of survey blocks in sub-area 7) and north to south in offshore survey blocks (eastern part of sub-area 7 and sub-areas 8 and 9). During 2002-2005, the survey area was planned to be covered for two years whereas during 2006-2009 the survey area was planned to be covered for a year.

*Survey vessels*

Sighting survey was conducted by dedicated sighting vessel (SV) *Kyoshin-maru No. 2* (*KS2*) during JARPN II 2000-2007. Sighting survey was conducted by SVs *Kaiko-maru* (*KK1*) and *KS2* in 2008 and by SVs *KK1* and *Yushin-maru No.1* (*YS1*) in 2009. Specification of the vessels was provided in (Kiwada *et al*., 2009).

*Survey modes*

The sighting survey by the SV was conducted under the closing mode (ASP mode; see below) 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). Survey mode of NSP was conducted during transit survey and sighting data in this mode were not used for abundance estimation except 2009. In 2009, closing mode and passing with abeam closing mode were conducted.

Normal closing mode (ASP) was conducted by the following manner. Two topmen in top barrel observed from the top barrel at all times. There are open communications between the top barrel and the upper bridge by microphone. When a sighting is made, the topman (or upper bridge observer) gives an estimate of the distance and angle to the sighting and the ship turns immediately, regardless of the angle to the sighting. The whales are approached and the species and number of animals estimated. All subsequent sightings are regarded as secondary until normal search effort is resumed. When a sighting is made, the person who made the sighting provides the sighting information. The ship then changes course to the appropriate heading to approach the whale, and vessel speed is increased as fast as possible to hasten the closure. Ship speed is decreased when the group is neared, usually at a distance of 0.2-0.4 n.miles from the initial sighting position.

After the whale group has been approached, the species, number of animals in the group, estimated body lengths, number of calves present, and other observation such as behavior recorded. After as many data as possible have been collected, other activities might take place, such as natural marking or biopsy experiments. Until the ship resumes the transect with full search effort, any whale sightings made after the initial sighting are classified as secondary sightings. After observation is finished, the vessel returns to the position on the trackline where closing was begun and resumes the survey effort.

Passing mode (NSP) was conducted by the following manner. Two topmen on the top barrel and two topmen in the upper bridge observe at all time. There are open communications between the top barrel and the upper bridge by microphone. Immediately after a sighting is made from the barrel or upper bridge, the topman informs the upper bridge of his estimate of the distance and angle to the sighting, and after that, if possible, the species and number of animals present, but does not change his normal searching pattern in order to keep contact with the sighting. The observers on the upper bridge including the captain, the helmsman and researcher must attempt to locate the sighting made by the topman and decide whether it is possible for them to confirm the species and number before the sighting passes abeam of the vessel. After observation is finished, the vessel returns to the position of abeam of vessel where abeam closing was begun and resumes the survey effort.

*Procedures used to completion of cruise track*

Total research distance was determined according to survey period (number of the research days). When weather is bad sighting survey was not conducted. When early recovering weather was expected, the vessel drifts at the position where the survey was stopped. When it was not expected, the vessel proceeded along the track line without surveying.

*Planned and realized track lines and order of the survey area*

Figures 1-8 show planned track lines for JARPN II from 2002 to 2009. Figures 22-29 show order of the survey area for each survey. Figures 43-50 show track line surveyed actually and primary sighting positions of the minke whales. Red lines in each figure indicate the boundary for survey blocks to which estimate was applied.

**Dedicated sighting surveys by NRIFSF**

*Sighting survey procedure*

NRIFSF has made the sighting survey plan considering the results of the IWC Scientific Committee and/or the related domestic matters around cetacean resources management. Usually the rough plan was presented to the Government of Japan in autumn of the previous year. After discussion and arrangement in the previous year, the plan became concrete just after the start of the fiscal year in April. The unit of the survey period was usually one month or twenty days considering the navigation period without refueling or embarkation of foods and water.

Two types of research vessels were used by NRIFS. One is chartered vessel which is the past whaling catcher boats or fishing type vessel. All vessels have a top barrel and some vessels has plus IO platform. And another is the institute research vessel with a top barrel. For former, the vessel is determined by bidding under the conditions of ability and equipment of the vessel to conduct the survey.

The researchers on board were determined from the staff of the institute or the temporally employed scientists. Usually two researchers were on board, and one became senior scientist. Senior scientist has a responsibility for conducting surveys and is selected from the institute staff or the experienced scientists.

The survey plan is examined further and determined in the institute, and the pre-cruise meeting is held just before the start of the survey gathering the researchers and all staff of the vessel.

The survey starts at 6:00 a.m. or at the 30 minutes after the sunrise when the time is after 6:00 a.m. The survey was continued during the acceptable weather conditions when the visibility is longer than 2 n.miles and the wind force less than beaufort 4. The vessels steamed at 11.5 knots during searching and closed to the schools as fast as possible when closing mode.

When the survey is conducted, two top-men observed from a top barrel and researchers observed from the upper-bridge. When IO mode, additionally two top-men observed from the IO platform. The sighing information was recorded by researchers and the weather and effort recorded by officer in the bridge.

*Selection of starting point*

The research distance was determined considering the research period, the area of research area, the past results (expected number of sightings) and expected weather conditions. Basically zig-zag form of track line is used to cover each blocks uniformly. Starting point of the track line is tentatively at the corner of the block considering the convenience of coverage arrangement. Then the starting point is randomly selected on the border line of the block and the whole track lines are shifted in a paralle fashion.

*Survey mode*

Three modes were used since 2002 by NRIFSF. Those were normal closing mode, independent observer passing mode and independent observer with abeam closing mode.

Normal closing mode was conducted by the following manner. Two topmen observed from the top barrel at all times. There are open communications between the top barrel and the upper bridge by microphone. When a sighting is made, the topman (or upper bridge observer) gives an estimate of the distance and angle to the sighting and the ship turns immediately, regardless of the angle to the sighting. The whales are approached and the species and number of animals estimated. All subsequent sightings are regarded as secondary until normal search effort is resumed. When a sighting is made, the person who

made the sighting provides the sighting information. The ship then changes course to the appropriate heading to approach the whale, and vessel speed is increased as fast as possible to hasten the closure. Ship speed is decreased when the group is neared, usually at a distance of 0.2-0.4 n.miles from the initial sighting position.

After the whale group has been approached, the species, number of animals in the group, estimated body lengths, number of calves present, and other observation such as behavior recorded. After as many data as possible have been collected, other activities might take place, such as natural marking or biopsy experiments. Until the ship resumes the transect with full search effort, any whale sightings made after the initial sighting are classified as secondary sightings.

Independent observer passing mode was conducted by the following manner. Two topmen on the top barrel and two topmen in the independent observer platform (IOP) observe at all time. Communications are essentially one-directional, with the topmen reporting information to the upper bridge observers, but no information being exchanged between the top barrel and IOP. The observers on the upper bridge should communicate with the topmen only to clarify information on the sightings. Immediately after a sighting is made from the barrel or IOP, the topman informs the upper bridge of his estimate of the distance and angle to the sighting, and after that, if possible, the species and number of animals present, but does not change his normal searching pattern in order to keep contact with the sighting. The observers on the upper bridge including the captain and the helmsman must attempt to locate the sighting made by the topman and decide whether it is possible for them to confirm the species and number before the sighting passes abeam of the vessel and also confirm the duplicate sightings or not. The topman gives no further information to the upper bridge unless the whale group happens to surface again within the normal searching pattern of the topman.

Independent observer abeam closing mode was conducted by the following mode only in 2003 Okhotsk sighting survey in order to increase the possibility for color type identification of Dall's porpoises. Sighting method is same as the IO mode (two topmen on the barrel and two topmen on the IOP, no communication between two places), but when the sighting is Dall's porpoise and the abeam distance is less than two n.miles, the vessel closes the sighting just after pasting abeam of the vessel. If the color type of Dall's porpoises was identified before passing abeam, the vessel does not close the sighting and continue passing. After closing the sighting, the observation method was same as NCM. After observation is finished, the vessel returns to the position of abeam of vessel where abeam closing was begun and resumes the IO mode survey.

*Procedures used to completion of cruise track*

Before starting, the survey period was allocated to each block considering the pre-determined research distance. When the weather conditions are bad to conduct the survey and the early recovering of weather is expected, the vessel drifts at the position where the survey was stopped. However when the early recovering of weather is not expected, usually the vessel moves without survey (top down cruise) for some time. The duration of top down cruise is determined by the researcher and the captain considering the progress of the survey and the long term weather forecast. They try to cover the block as uniform as possible during the allocated period.

*Coverage on effort*

The track line traversed with sighting effort and the positions of primary sightings of common minke whales in recent years were shown in Figs 51 –58. There were low covered sub-blocks or blocks mainly because of the weather conditions. Those were off shore sub-block in 6ES in the Sea of Japan in 2002 (Fig. 51), ONW, OSW, and OE in the Sea of Okhotsk in 2003 (Fig. 57). Additional reason in the case in 2003, there was an injury accident of crew rescued by the Japan Coast Guard. In the offshore sub-block in 6EN in the Sea of Japan, there is vast training area of the Self-Defense Forces. Then the entrance was sometimes limited and the vessel did not enter (Fig. 52). In the case of entering the Russian 200 n.miles EEZ, the survey was continued in the waters as long as possible because it is necessary for passing the check point when the vessel enters and leaves the EEZ. Then sometimes there were not so much effort in the blocks outside the Russian EEZ such as the Sea of Japan in 2006 (Fig. 55) and the east of the Kuril archipelago in 2005 (Fig. 58).

## RESULTS AND DISCUSSION

### Dedicated sighting survey during ICR

It can be concluded that sighting procedure of the dedicated sighting surveys by ICR follows the

requirement and guideline except that the surveys were not oversighted. There were some survey blocks that there was not large number of sightings. This may be partly because coverage was poor due to bad weather condition in some block and partly because there were some difference between survey timing and migration peak. It may be difficult obtain appropriate abundance estimate using standard methodology.

**Dedicated sighting surveys by NRIFS**

The surveys conducted in the recent seasons were oversighted, it can be also concluded that the survey procedures of the NRIFSF dedicated sighting surveys met all the RMP requirements and guidelines for surveys. However, in some blocks in some years, the coverage was poor because of bad weather conditions and/or accident causing injury (e.g. 2003 Okhotsk survey). And in some areas, the number of sightings was not large because of some possible reasons such as difference in the timing of survey and migration of whales. In those areas, it is difficult to get the abundance estimate using the traditional analysis method. And it is known that minke whales are distributed in higher density in the vey coastal waters such as in small bay, and our surveys could not cover such area in the foreign territorial waters. Therefore when the results are used in RMP, those factors should be taken into considerations.

**REFERENCES**


Hakamada, T and Kitakado, T. 2011. Abundance estimation for the western North Pacific common minke whales based on sighting information from JARPN and JARPN II. Paper SC/63/RMP18 submitted to IWC Sceintific Committee, May, 2011. Tromso, Norway. (unpublished) 25pp.

International Whaling Commission. 1997. Report of the Scientific Committee, Annex K. Requirements and guidelines for conducting surveys and analysing data within the Revised Management Scheme. *Rep. int. Whal. Commn* 47:227-35.

International Whaling Commission. 2005. Report of the Scientific Committee. Annex D. Report of the sub-committee on the Revised Management Procedure. Appendix 3. Requirements and Guidelines for Conducting Surveys and Analysing Data within the Revised Management Scheme. *J. Cetacean Res. Manage. (Suppl.)* 7:92-101.

International Whaling Commission. 2008. Report of the Scientific Committee. Annex D. Report of the sub-committee on the revised management procedure. Appendix 7. New text for requirements and guidelines for conducting surveys and analysing data within the Revised Management Scheme (RMS). *J. Cetacean Res. Manage. (Suppl.)* 10:117.

International Whaling Commission. 2012. Report of the second 'First Intersessional Workshop' for the Implementation Review of western North Pacific common minke whales. SC/64/Rep2 submitted to this meeting.

Kiwada, H., Kumagai, S. and Matsuoka, K. 2009. Methodology and procedure of the dedicated sighting surveys in JARPN II - Offshore and coastal component of Sanriku and Kushiro -. Paper SC/J09/JR2 submitted to Workshop to review JARPN II. January, 2009. Yokohama, Japan. 16pp.

Miyashita, T and Okamura, H. 2011. Abundance estimates of common minke whales using the Japanese dedicated sighting survey data for RMP Implementation and CLA – Sea of Japan and Sea of Okhotsk. Paper SC/63/RMP11 submitted to IWC Sceintific Committee, May, 2011. Tromso, Norway. (unpublished) 34pp.

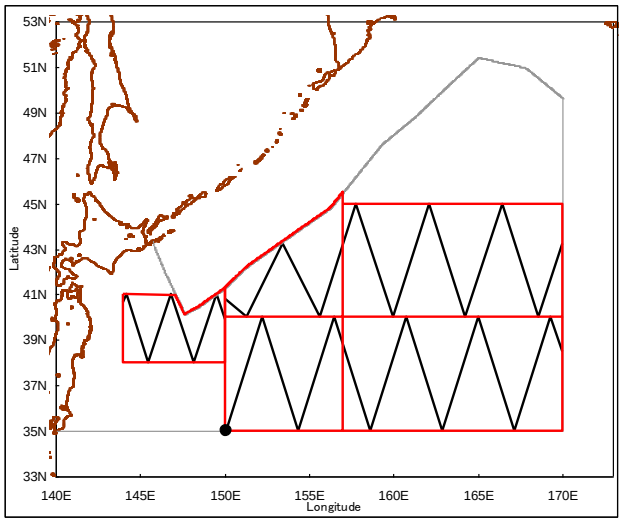


Figure 1. Pre-determined track lines and survey blocks for KS2 in 2002 JARPN II. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle.

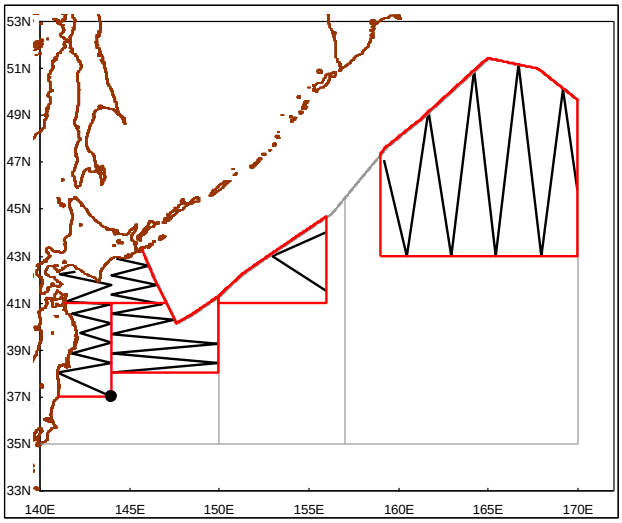


Figure 2. Pre-determined track lines and survey blocks for KS2 in 2003 JARPN II. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle.

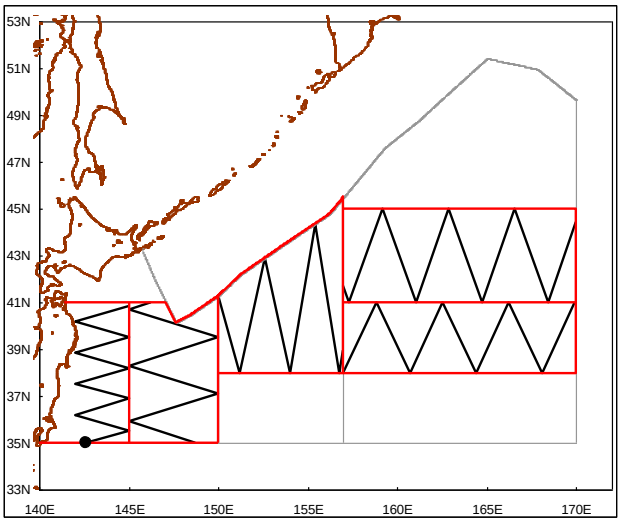


Figure 3. Pre-determined track lines and survey blocks for KS2 in 2004 JARPN II. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle.

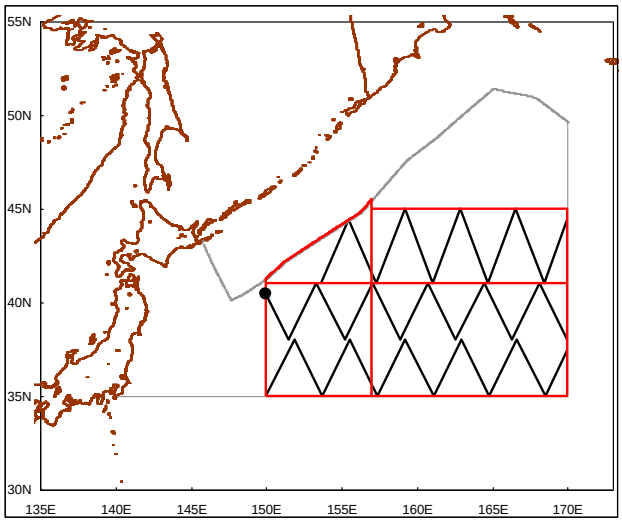


Figure 4. Pre-determined track lines and survey blocks for KS2 in 2005 JARPN II. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle.

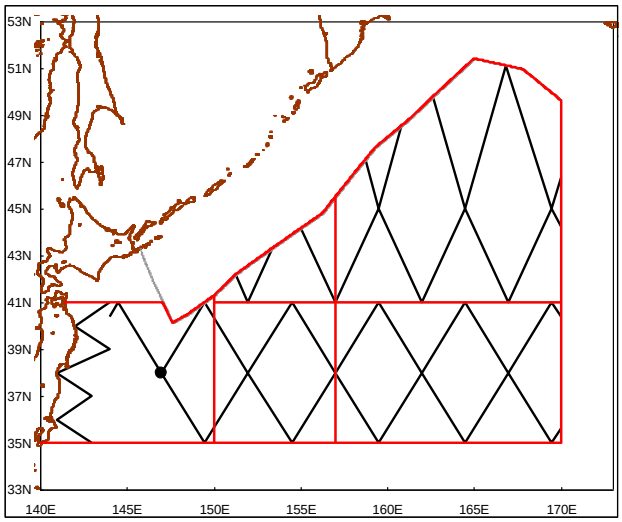


Figure 5. Pre-determined track lines and survey blocks for KS2 in 2006 JARPN II. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle.

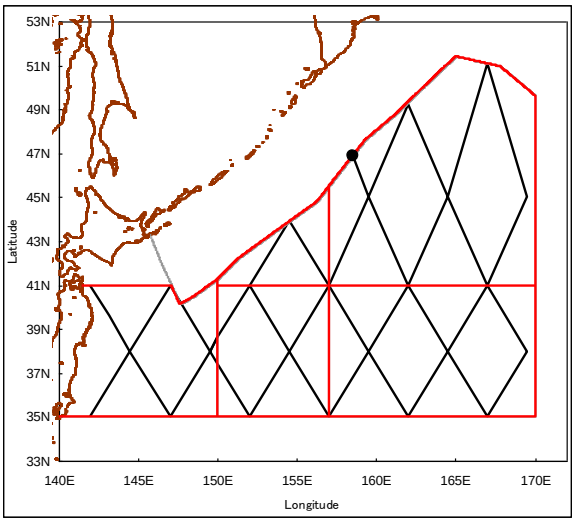


Figure 6. Pre-determined track lines and survey blocks for KS2 in 2007 JARPN II. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle.

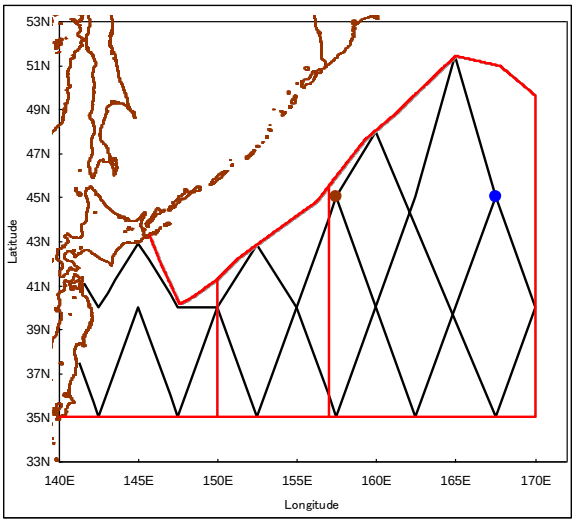


Figure 7. Pre-determined track lines for *KK1* and *KS2* in 2008 JARPN II survey. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position is indicated by black circle. Starting position of *KK1* is indicated by blue circle. Starting position of *KS2* is indicated by brown circle.

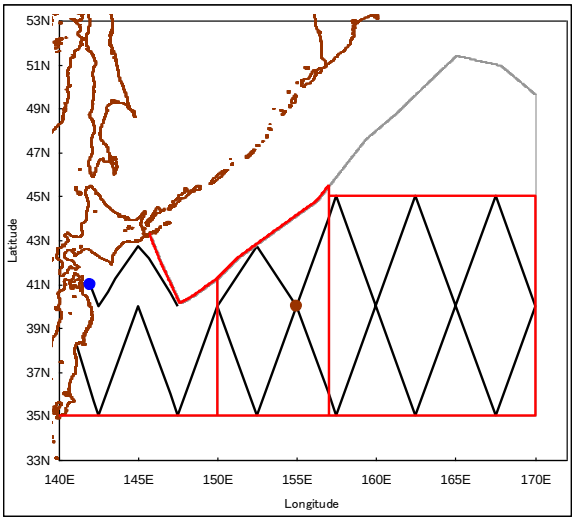


Figure 8. Pre-determined track lines for *KK1* and *YS1* in 2009 JARPN II survey. Bold black lines are pre-determined track lines and red bold lines are boundary for suvey blocks. Starting position of *KK1* is indicated by blue circle. Starting position of *YS1* is indicated by brown circle.

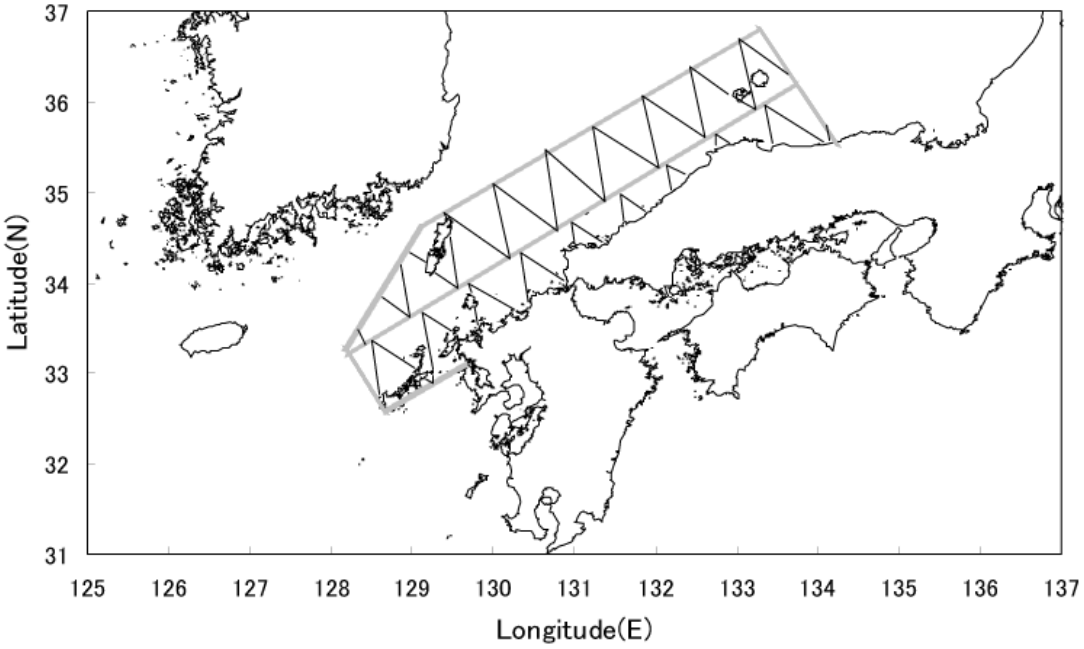


Fig. 9. Pre-determined track for *Kurosaki*, 10 April – 9 May in 2002.

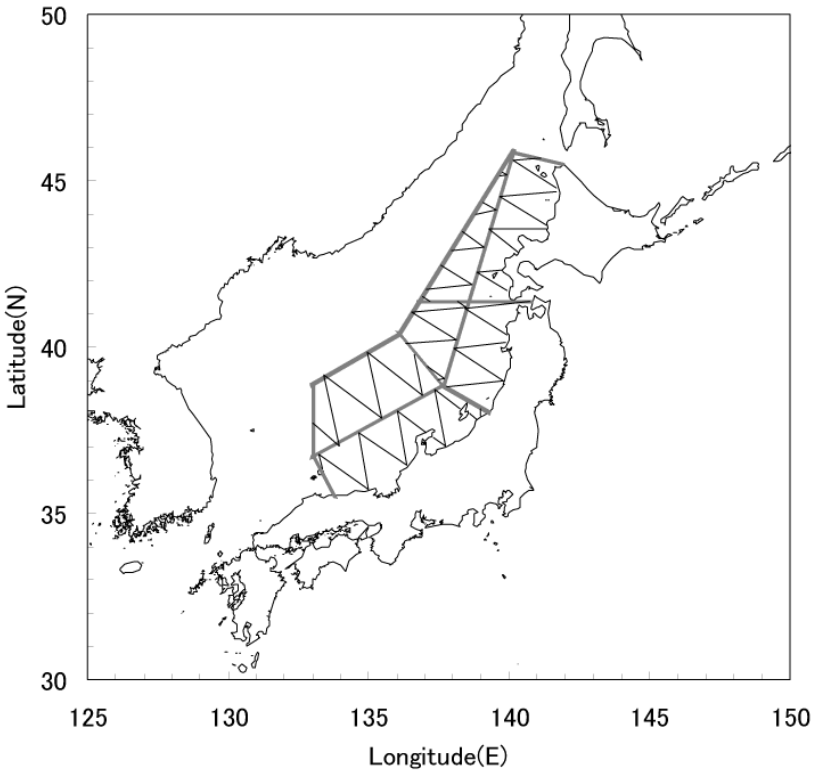


Fig. 10. Pre-determined track line for *Shonan-maru No.2*, 13 May – 1 July in 2002.

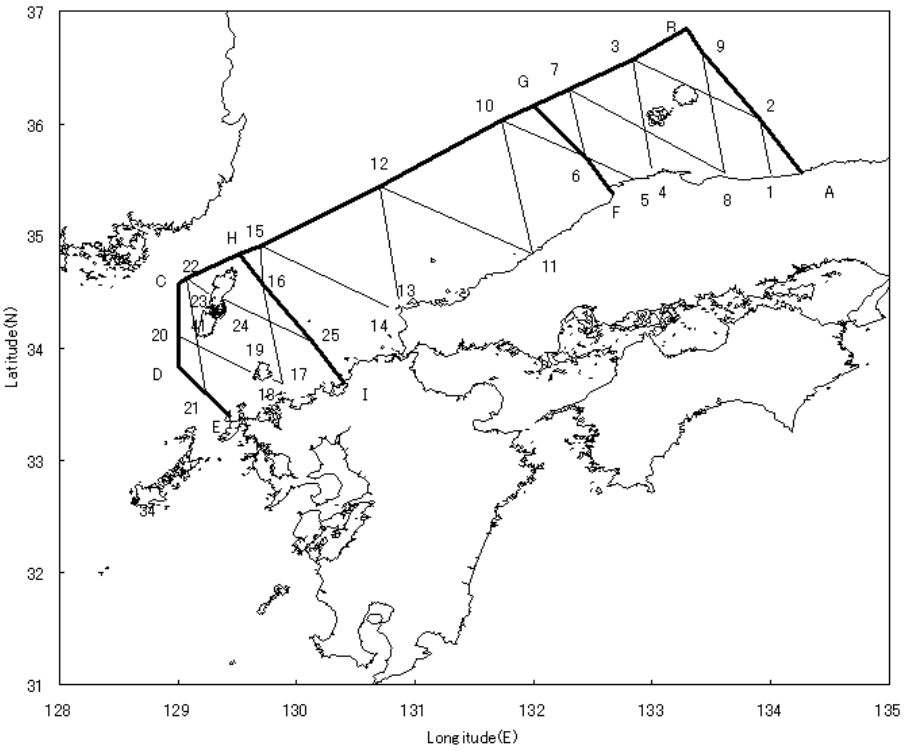


Fig. 11. Pre-determined track line for *Kurosaki*, 11 April – 10 May in 2003.

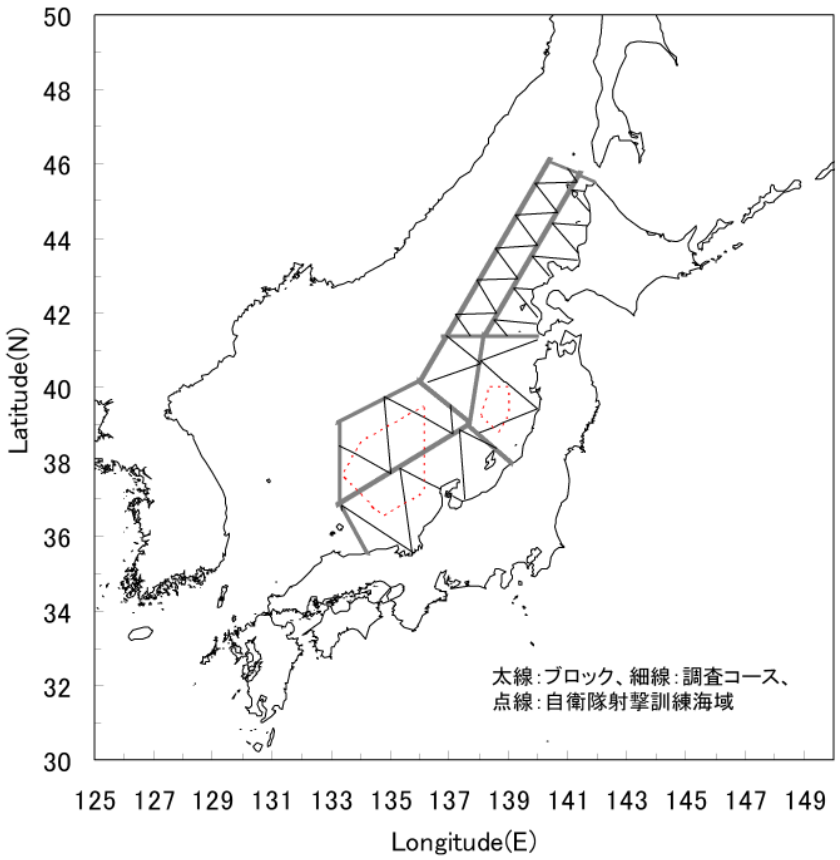


Fig. 12. Pre-determined track line for *Shoanan-maru No.2*, 12 May – 30 June in 2003. Dotted area shows the training area of the Self-Defense Forces.

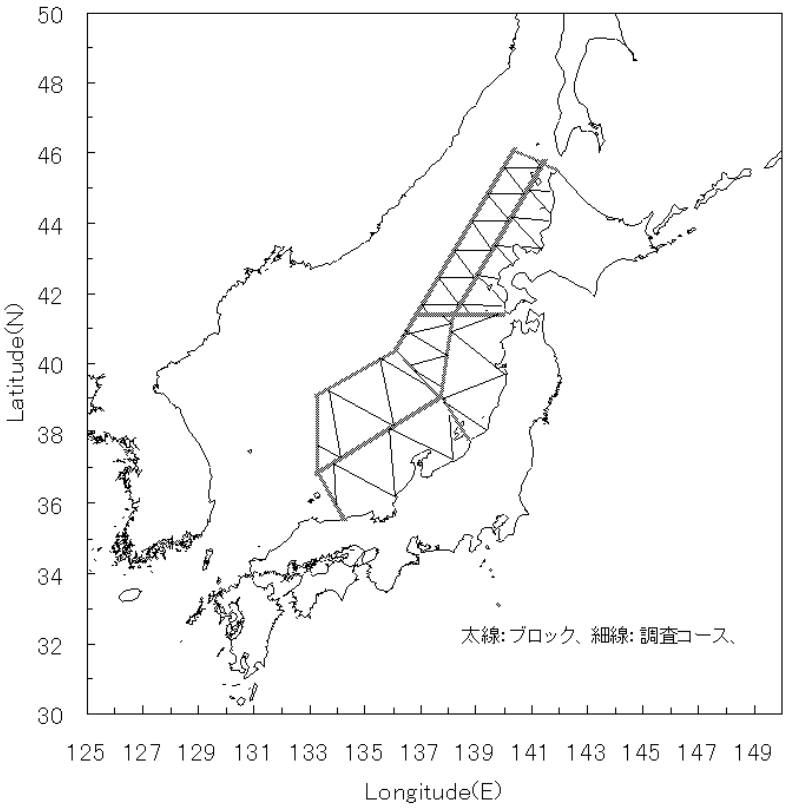


Fig. 13. Pre-determined track line for *Shoanan-maru No.2*, 11 May – 29 June in 2004.

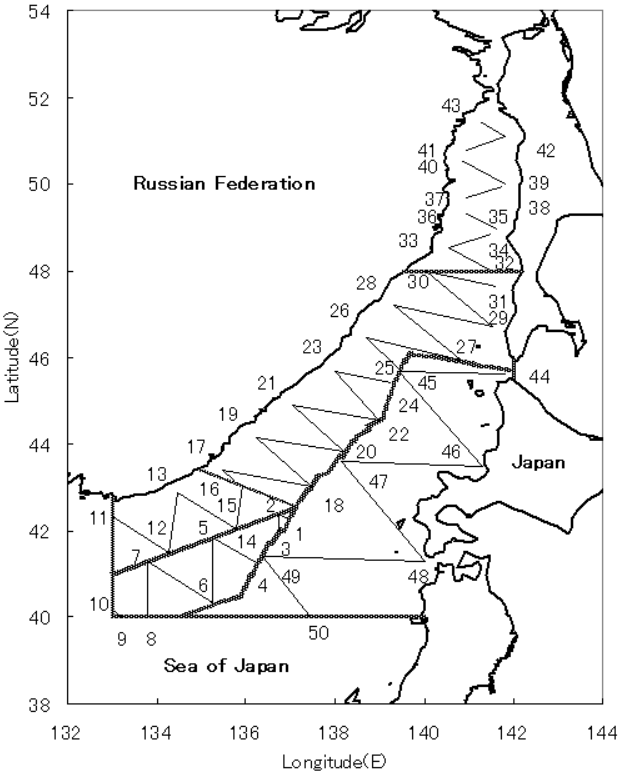


Fig. 14. Pre-determined track line for *Shonan-maru No.2*, 12 May – 30 June in 2005. Because the Russian permission to survey in the 200 n.mile EEZ was not issued, the vessel coveredonly in the Japanese side block in the first period, 12 May – 4 June in 2005.

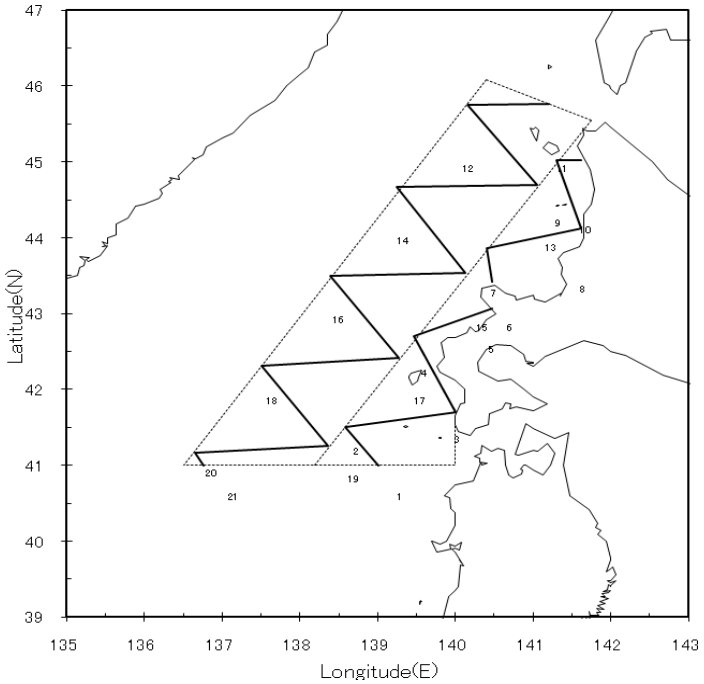

Fig. 15. Revised pre-determined track line for *Shonan-maru No.2* for the last period, 5 June – 30 June in 2005.

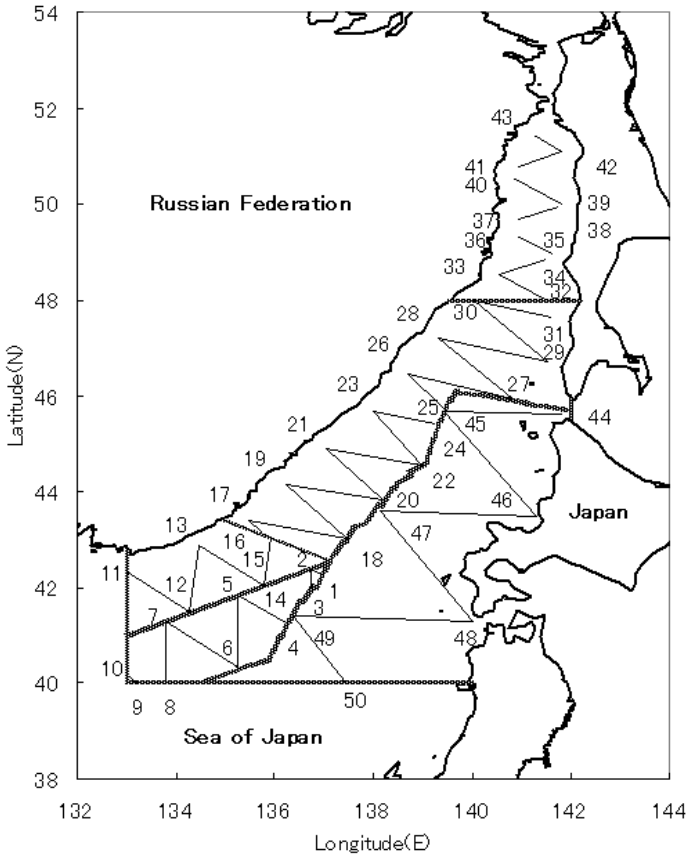


Fig. 16. Pre-determined track line for *Kaiko-maru,* 18 May – 28 June in 2006.

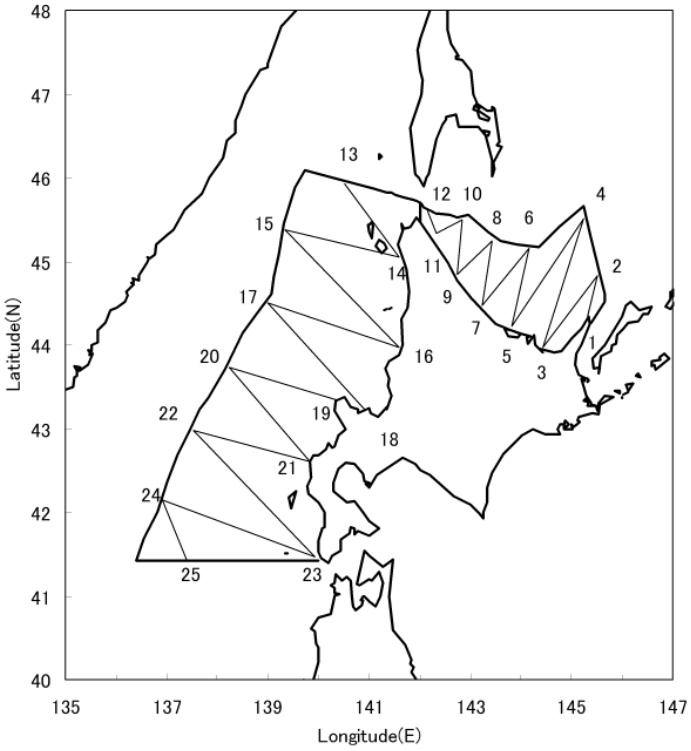


Fig. 17. Pre-determined track line for *Shonan-maru No.2*, 18 May – 28 June in 2007.

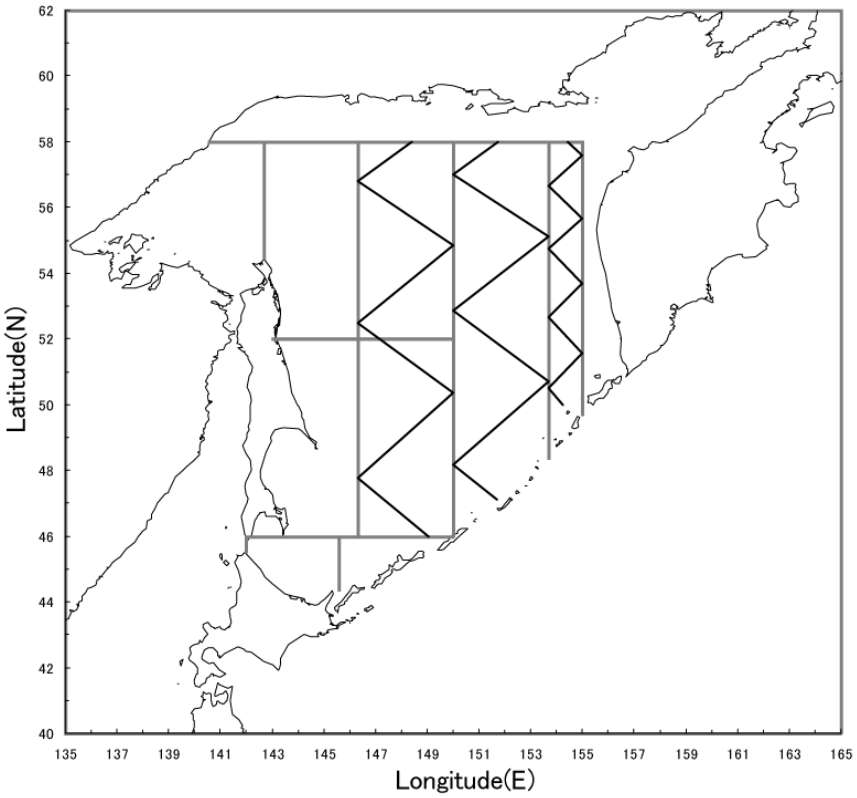


Fig. 18. Pre-determined track line for *Shonan-maru*, 22 July – 19 September in 2003.

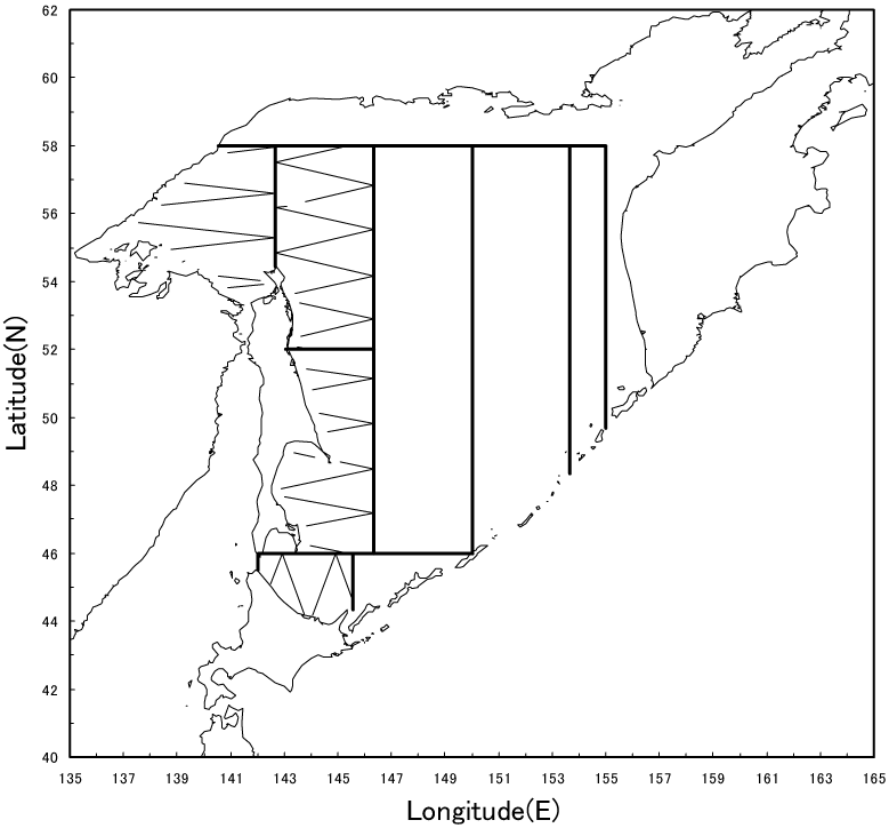


Fig. 19. Pre-determined track line for *Shonan-maru No.2*, 22 July – 19 September in 2003.

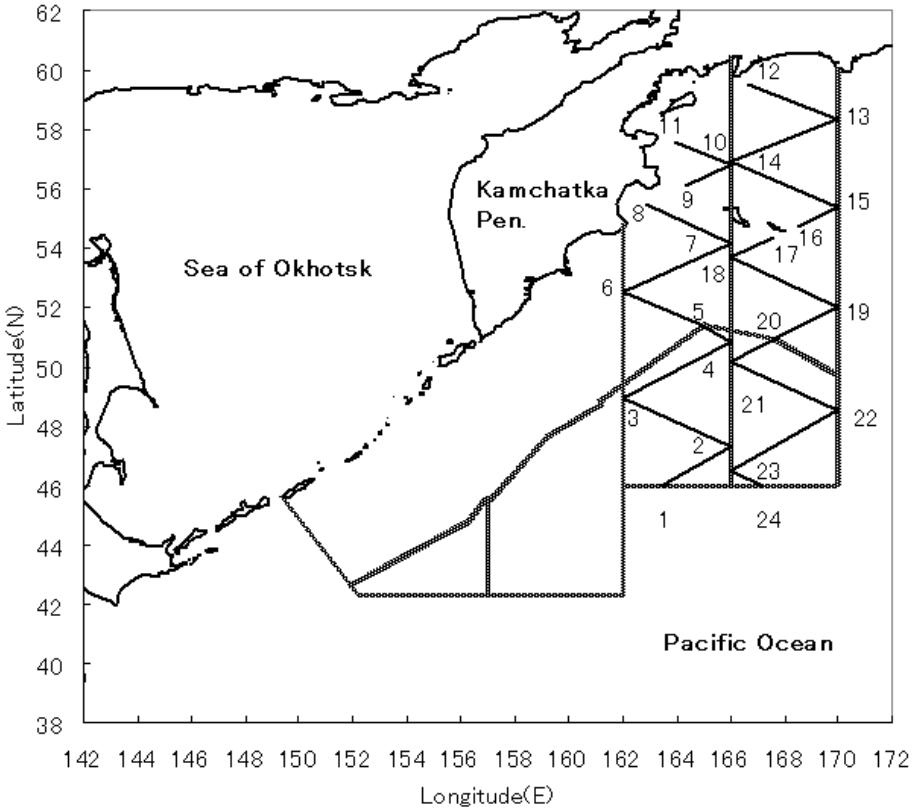


Fig. 20. Pre-determined track line for Shonan-maru, 29 July – 20 September in 2005.

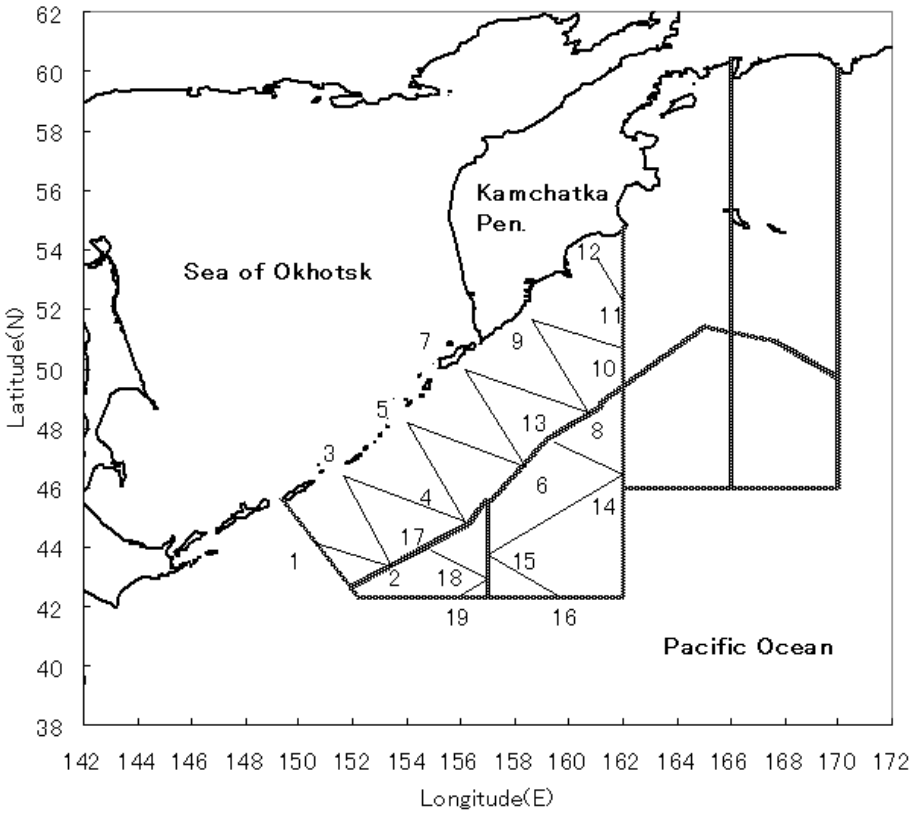


Fig. 21. Pre-determined track line for Shonan-maru No.2, 29 July – 20 September in 2005.

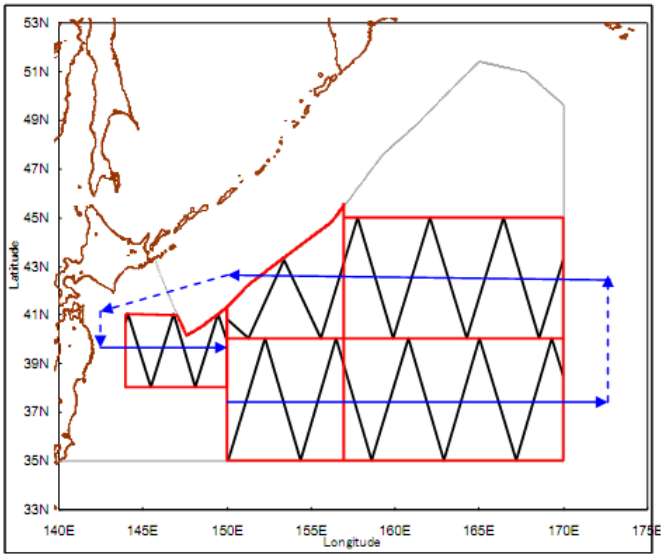


Figure 22. Survey order in 2002 JARPN II. Blue arrows indicate survey order by *KS2*. *KS2* started from the position (35°N 150°8′E)

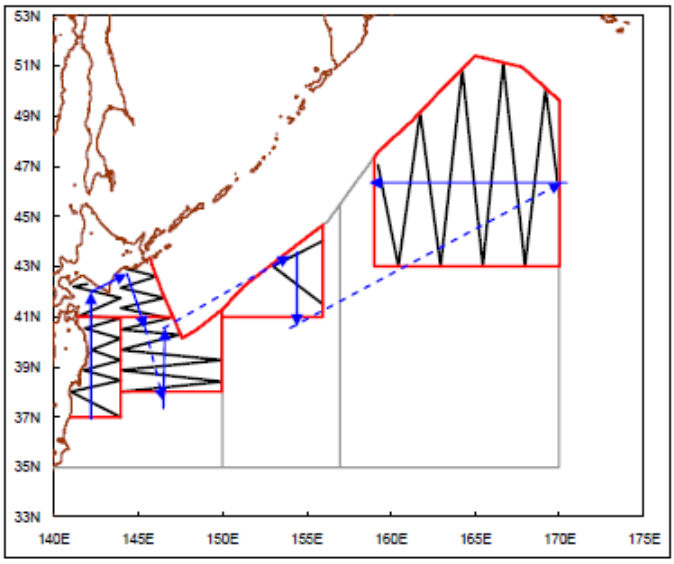


Figure 23. Survey order in 2003 JARPN II. Blue arrows indicate survey order by *KS2*. *KS2* started from the position (37°N 144°E)

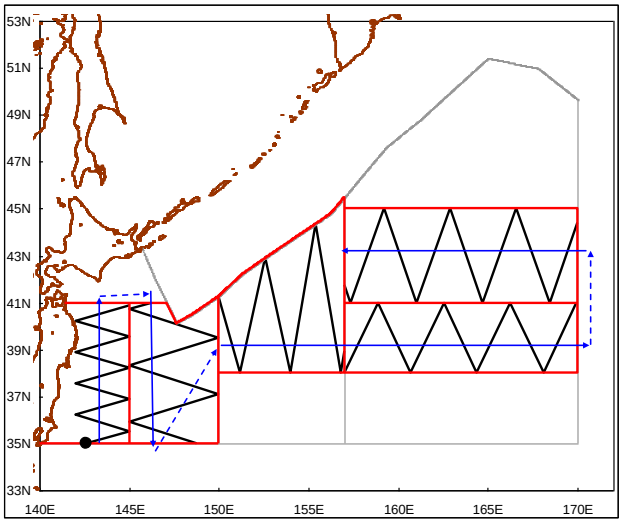


Figure 24. Survey order in 2004 JARPN II. Blue arrows indicate survey order by *KS2*. Starting position is indicated by black circle.

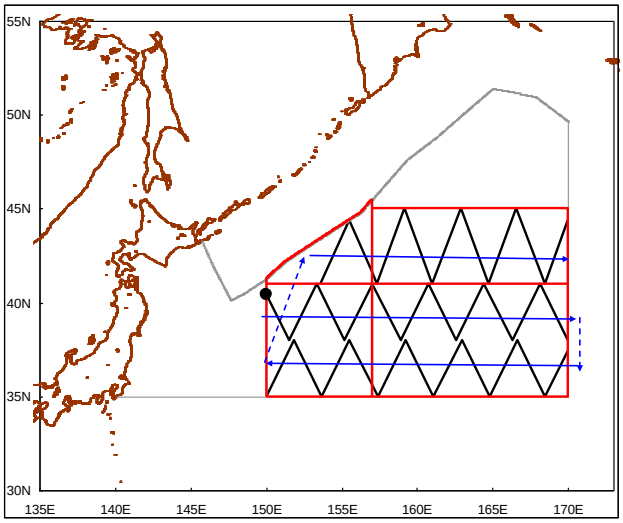


Figure 25. Survey order in 2005 JARPN II. Blue arrows indicate survey order by *KS2*. Starting position is indicated by black circle.

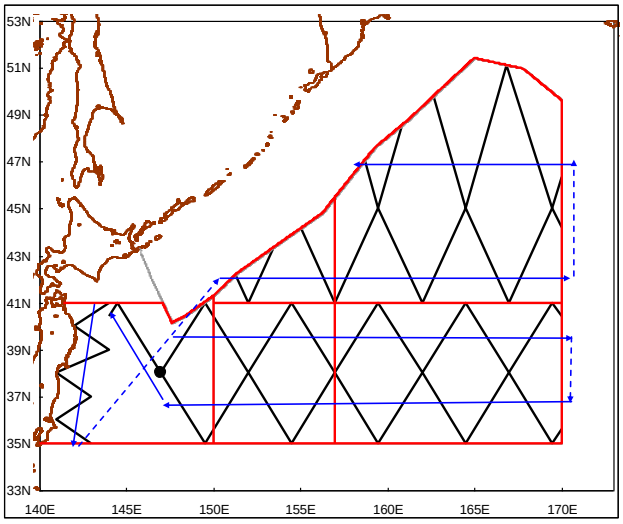


Figure 26. Survey order in 2006 JARPN II. Blue arrows indicate survey order by *KS2*. Starting position is indicated by black circle.

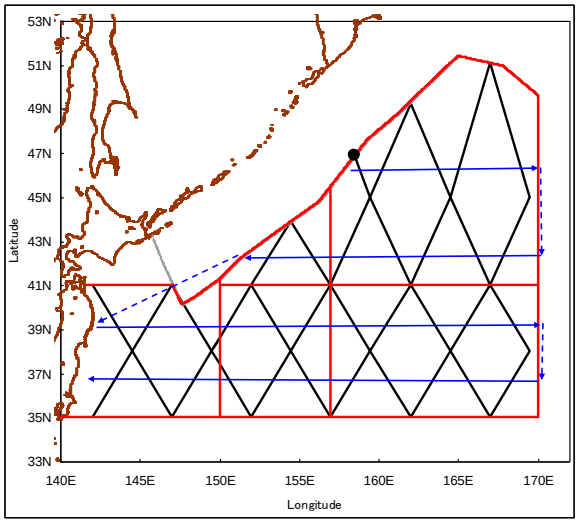


Figure 27. Survey order in 2007 JARPN II. Blue arrows indicate survey order by *KS2*. Starting position is indicated by black circle.

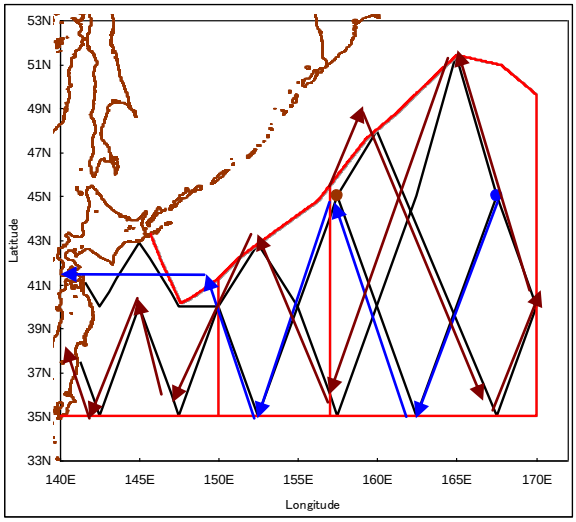


Figure 28. Survey order in 2008 JARPN II. Blue arrows indicate survey order by *KK1*. Blue circle indicates starting position of *KK1*. Brown arrows indicate survey order by *KS2*. Brown circle indicates starting position of *KS2*.

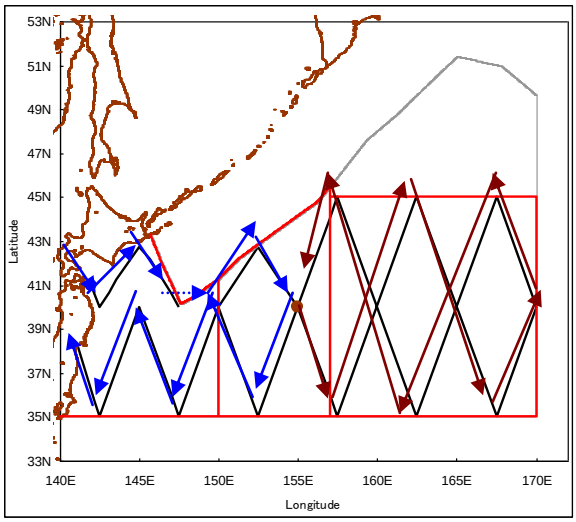


Figure 29. Survey order in 2009 JARPN II. Blue arrows indicate survey order by *KK1*. Blue circle indicates starting position of *KK1*. Brown arrows indicate survey order by *YS1*. Brown circle indicates starting position of *YS1*.

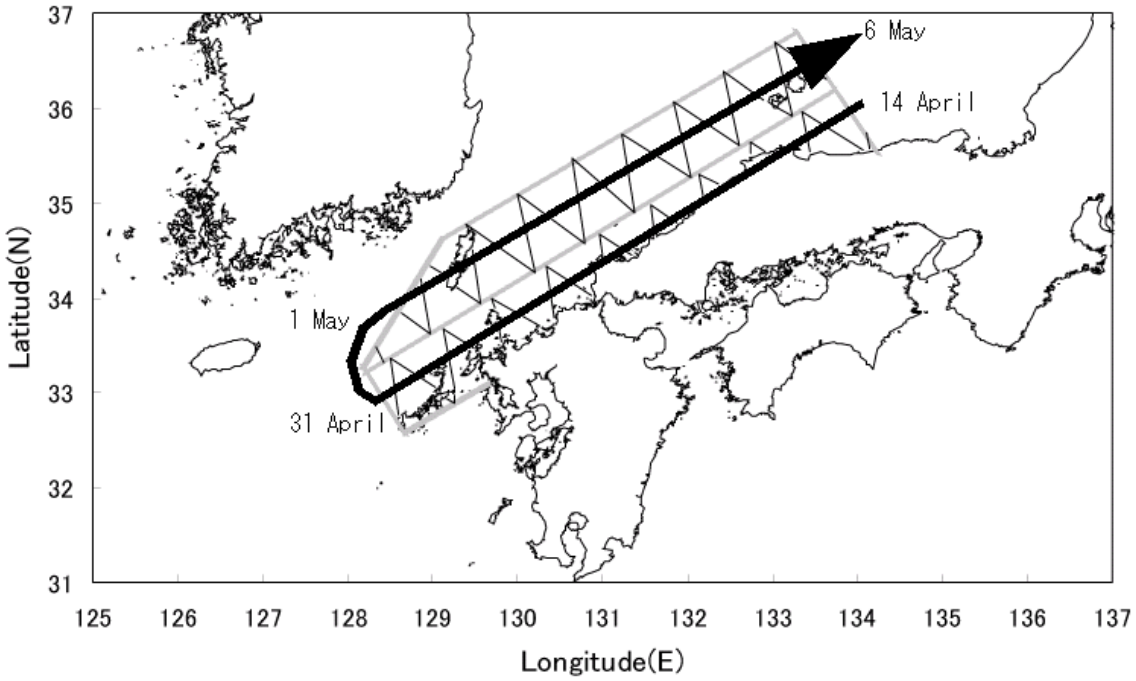


Fig. 30. Survey direction of *Kurosaki* in 2002.
Date shows the day to start/finish survey in each sub-block.

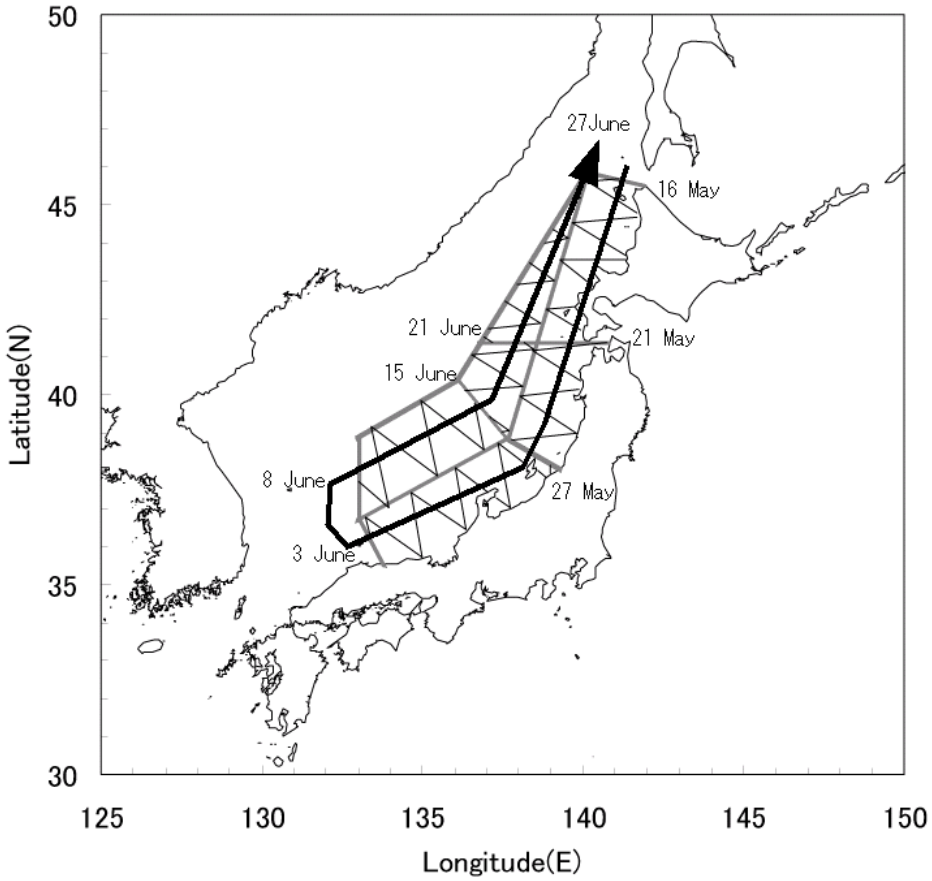


Fig. 31. Survey direction of *Shonan-maru No.2* in 2002.

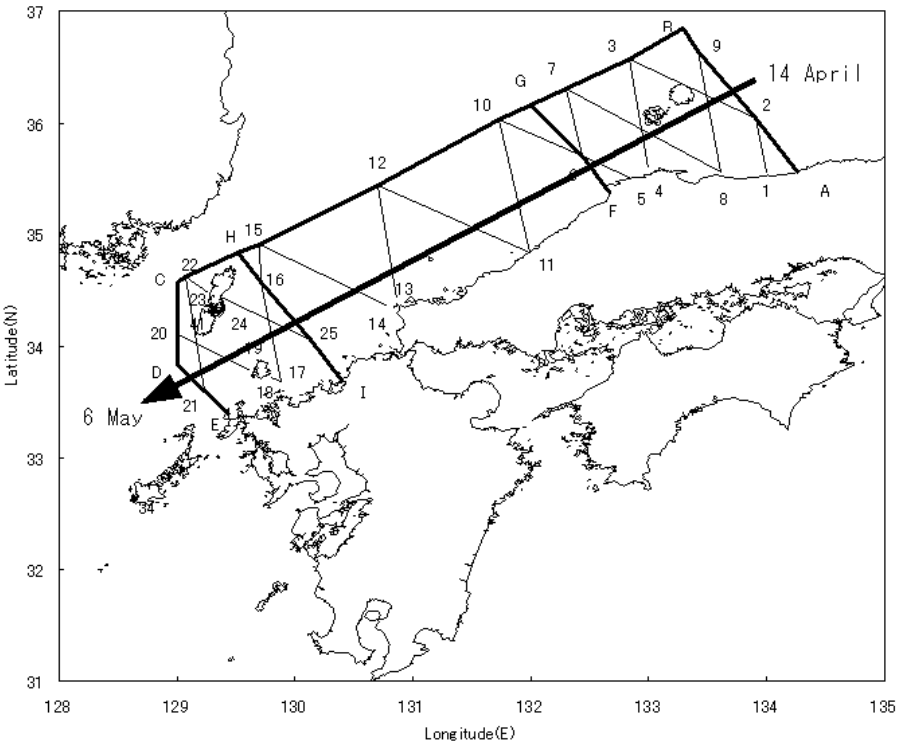


Fig. 32. Survey direction of *Kurosaki* in 2003.

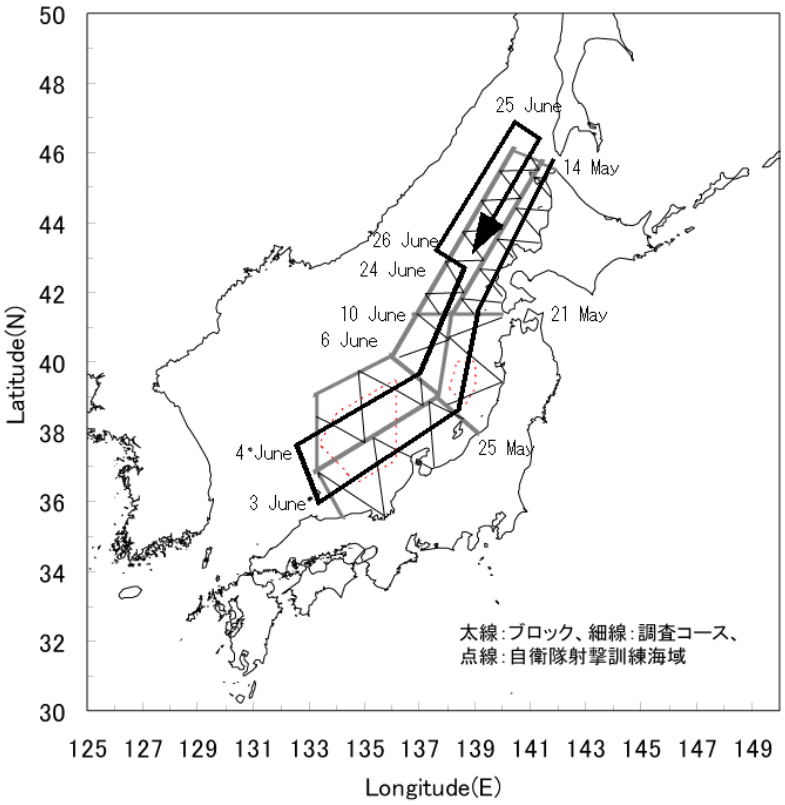


Fig. 33. Survey direction of *Shonan-maru No.2* in 2003.

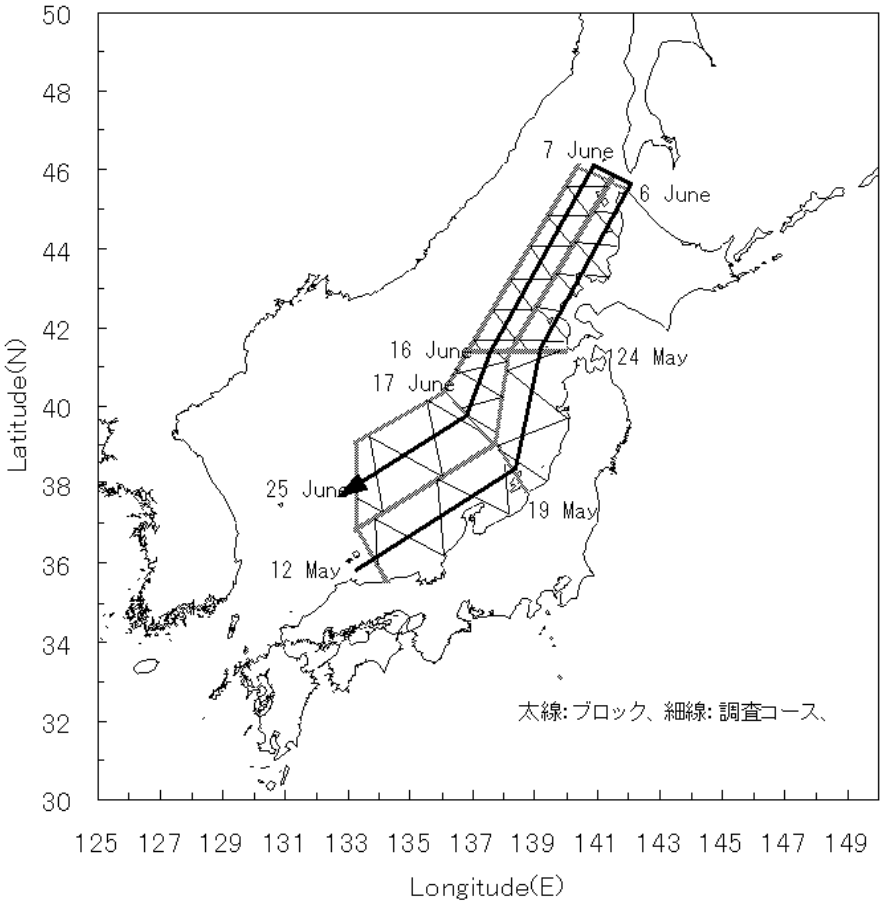


Fig. 34. Survey direction of *Shonan-maru No.2* in 2004.

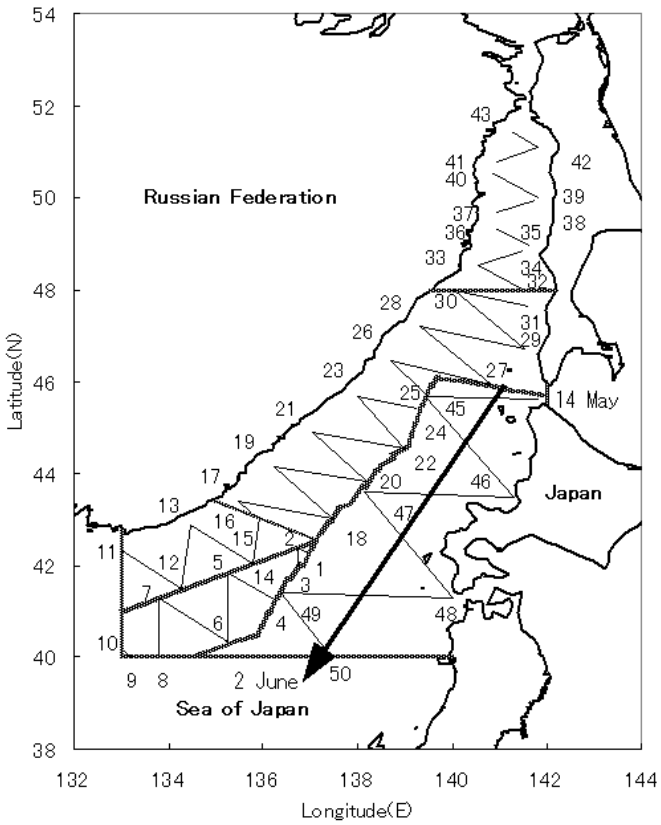


Fig. 35. Survey direction of *Shonan-maru No.2* in the first half of the cruise in 2005.

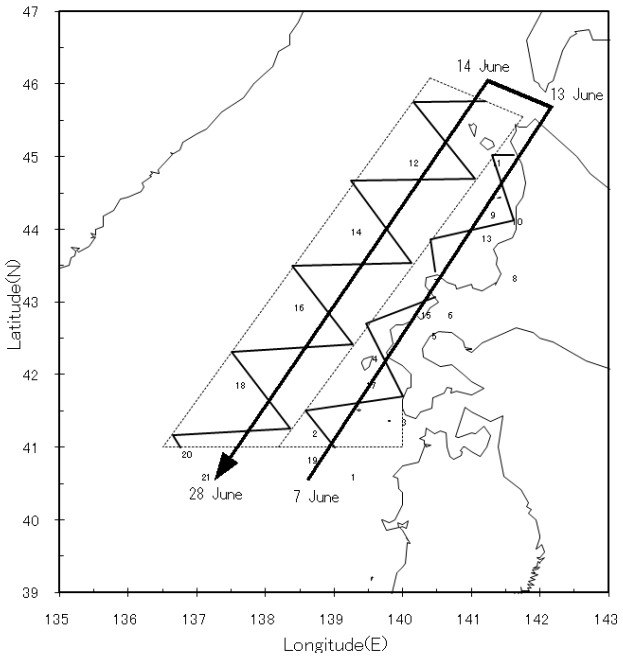


Fig. 36. Survey direction of *Shonan-maru No.2 i*n the last half of the cruise in 2005.

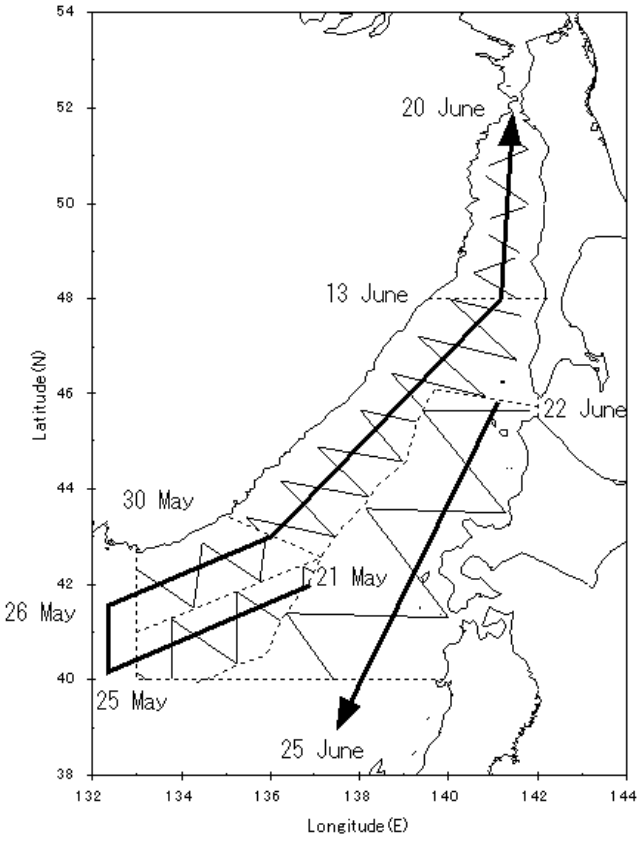


Fig. 37. Survey direction of *Kaiko-maru* in 2006.

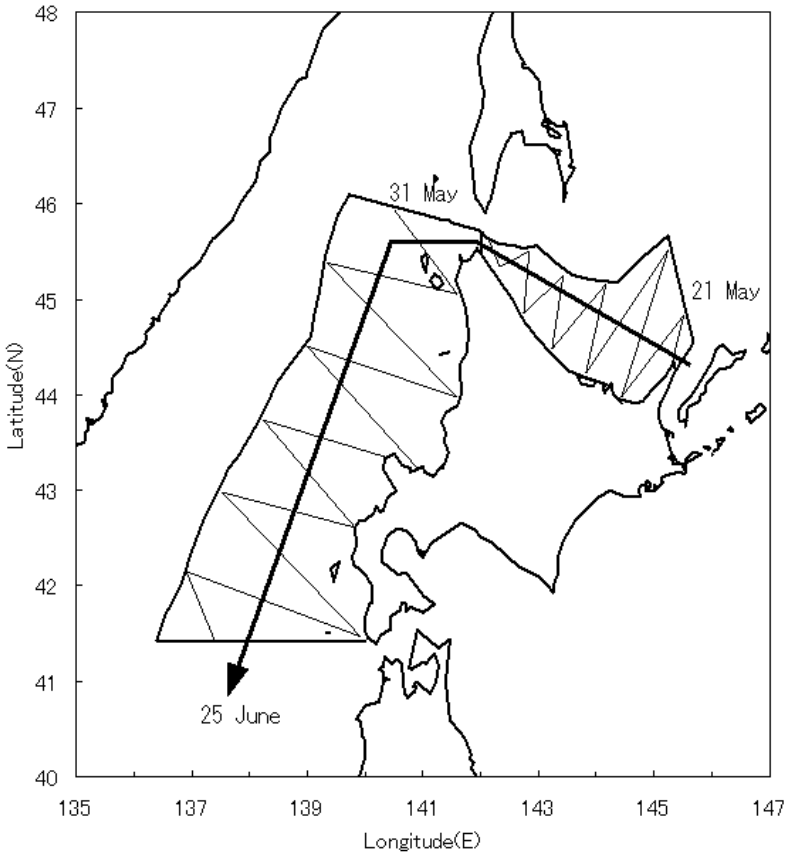


Fig. 38. Survey direction of *Shonan-maru No.2* in 2007.

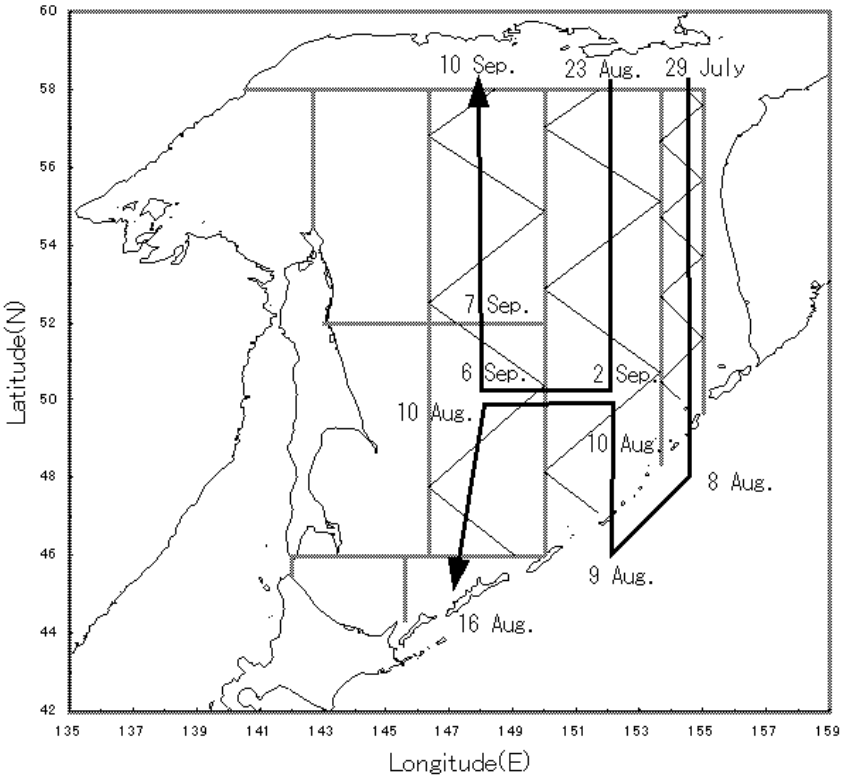


Fig. 39. Survey direction of *Shonan-maru* in 2003.

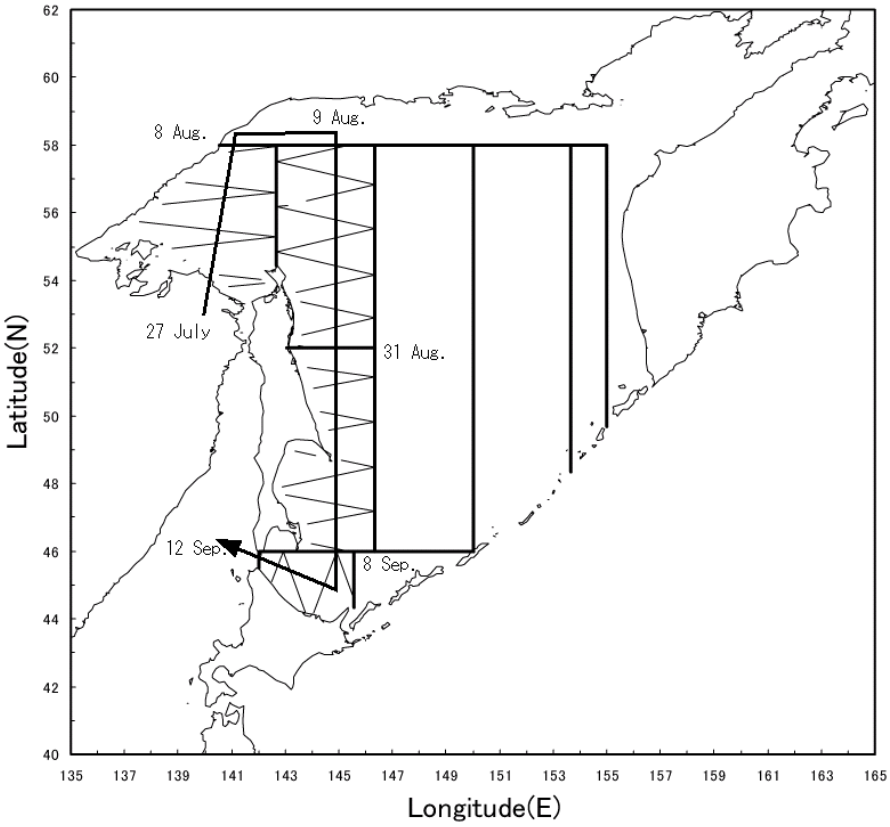


Fig. 40. Survey direction of *Shonan-maru No.2* in 2003.

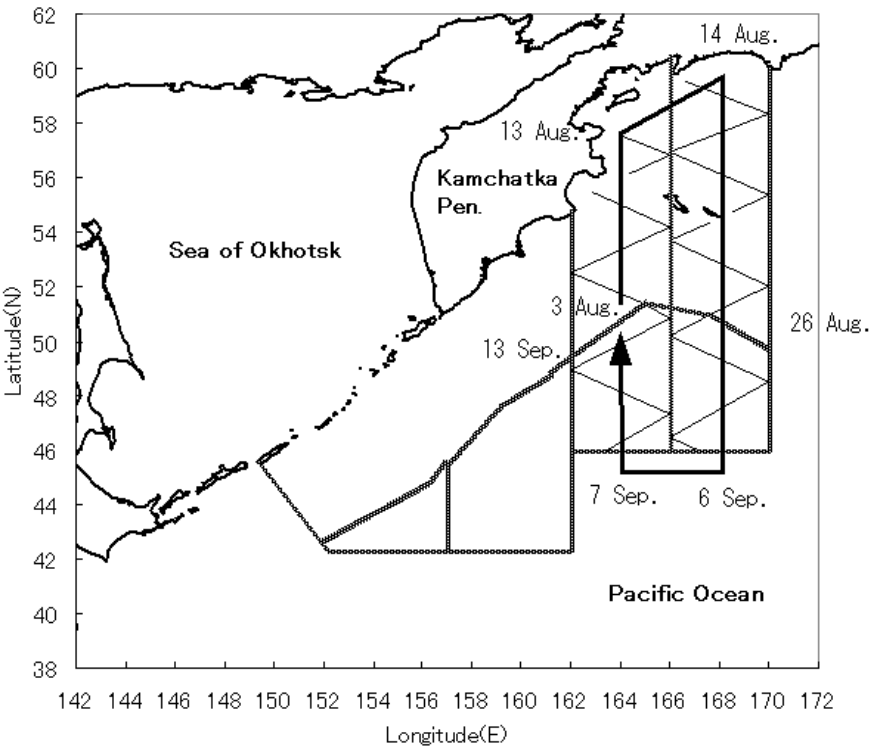


Fig. 41. Survey direction of *Shonan-maru* in 2005.

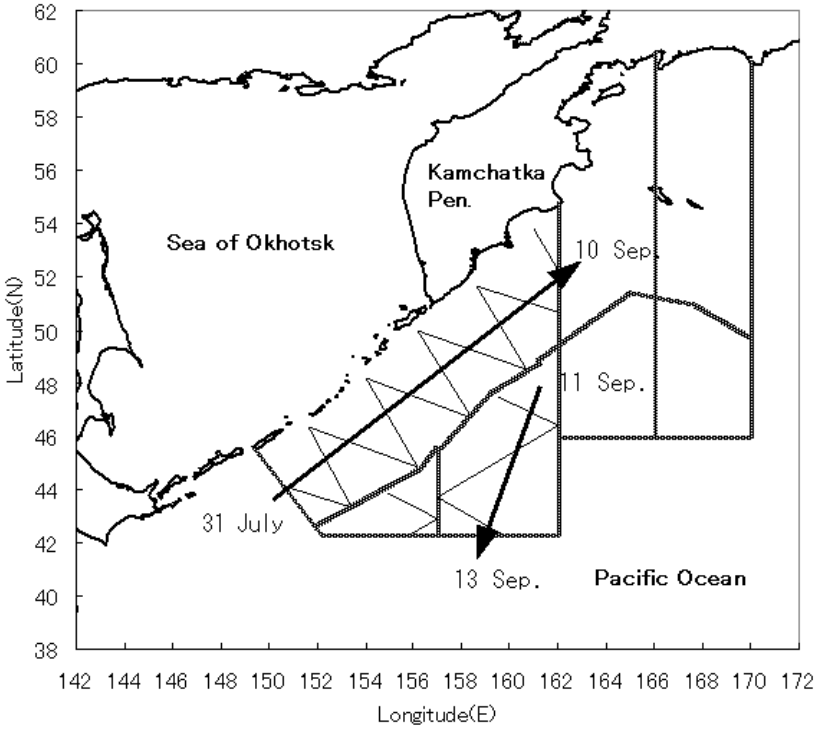


Fig. 42. Survey direction of *Shonan-maru No.2* in 2005.

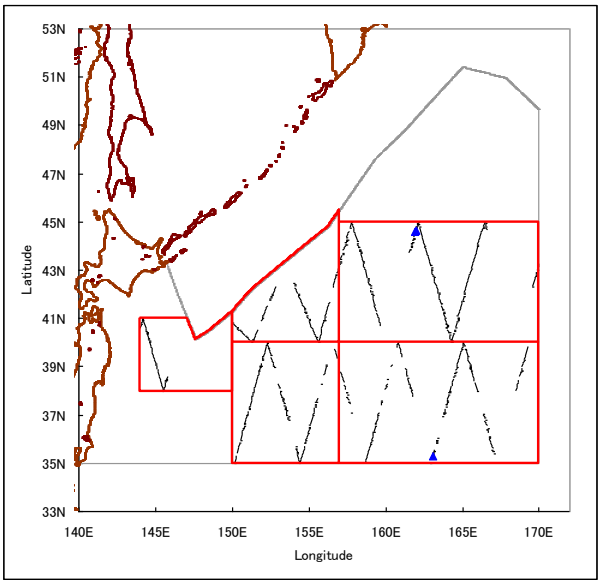


Figure 43. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2002 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

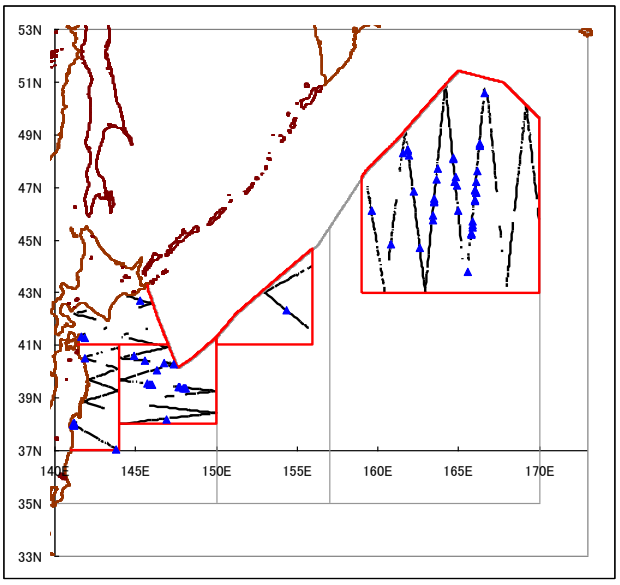


Figure 44. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2003 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

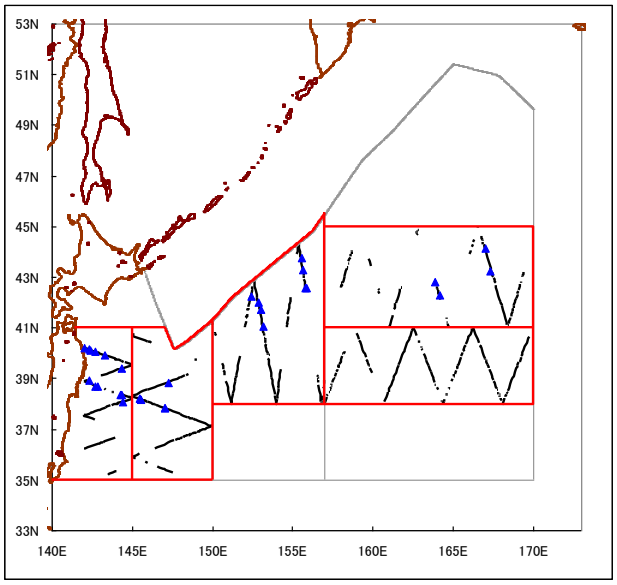


Figure 45. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2004 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

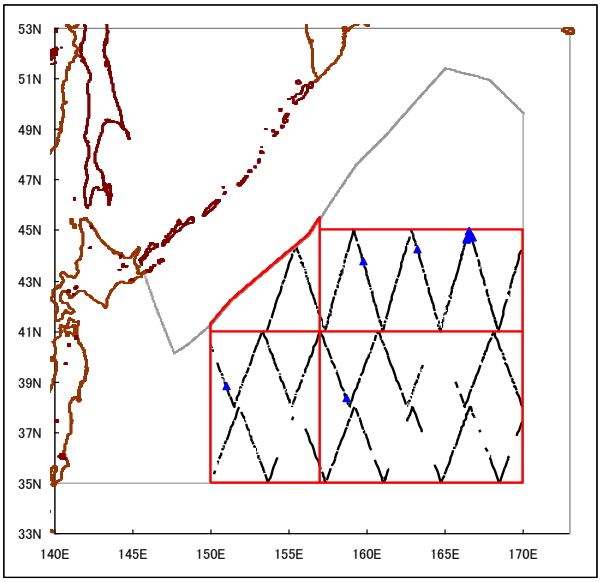


Figure 46. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2005 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

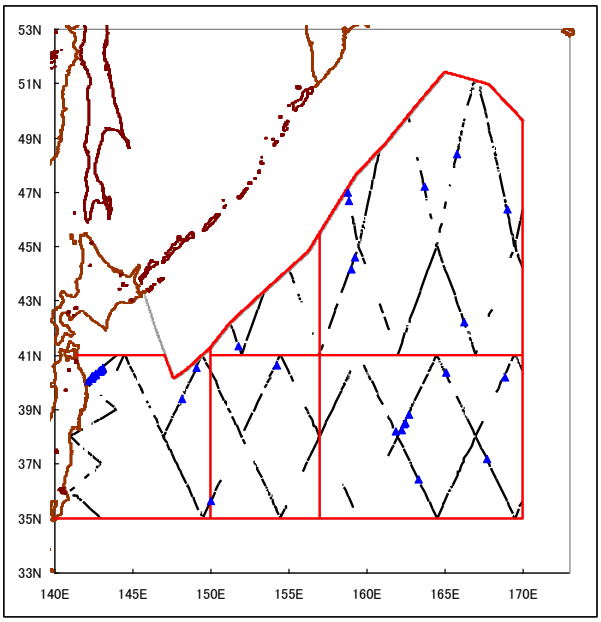


Figure 47. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2006 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

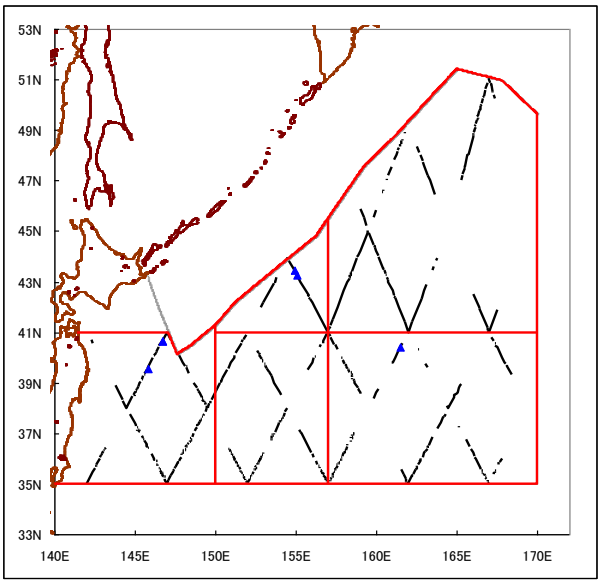


Figure 48. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2007 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

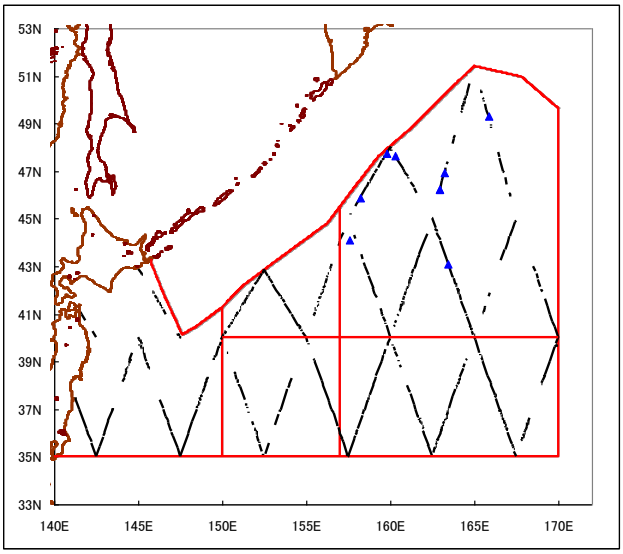


Figure 49. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2008 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

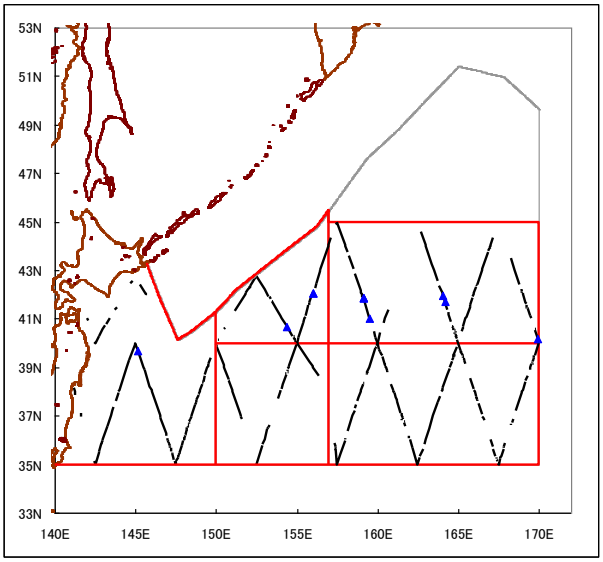


Figure 50. Track line actually surveyed and primary sighting positions of common minke whale schools in the 2009 JARPN II. Black lines indicate track line actually surveyd. Red lines indicates boundary for survey blocks. Blue triangle indicates primary sighting positions of the minke whales.

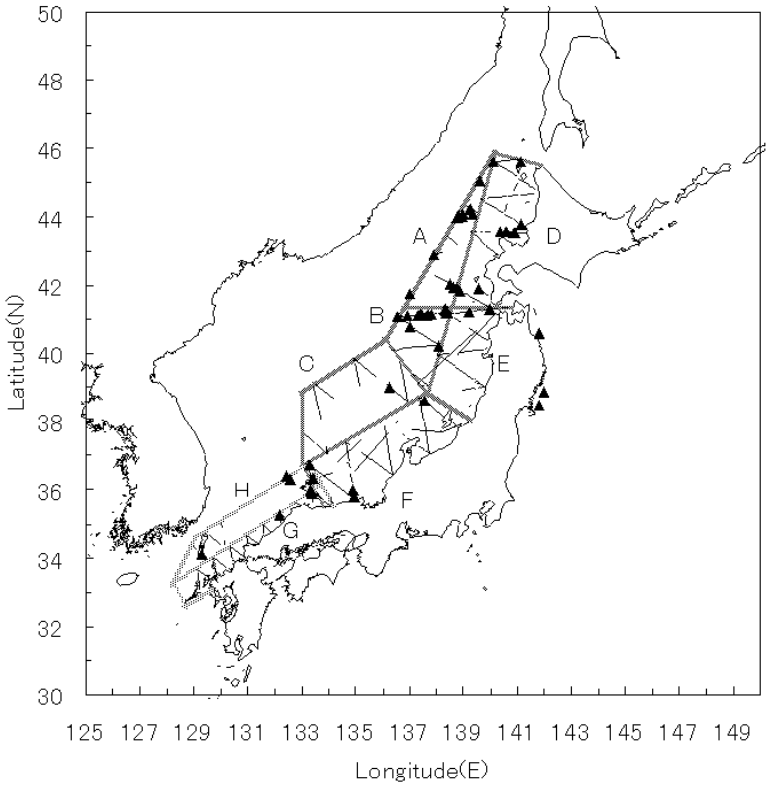


Fig. 51. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Japan in 2002.

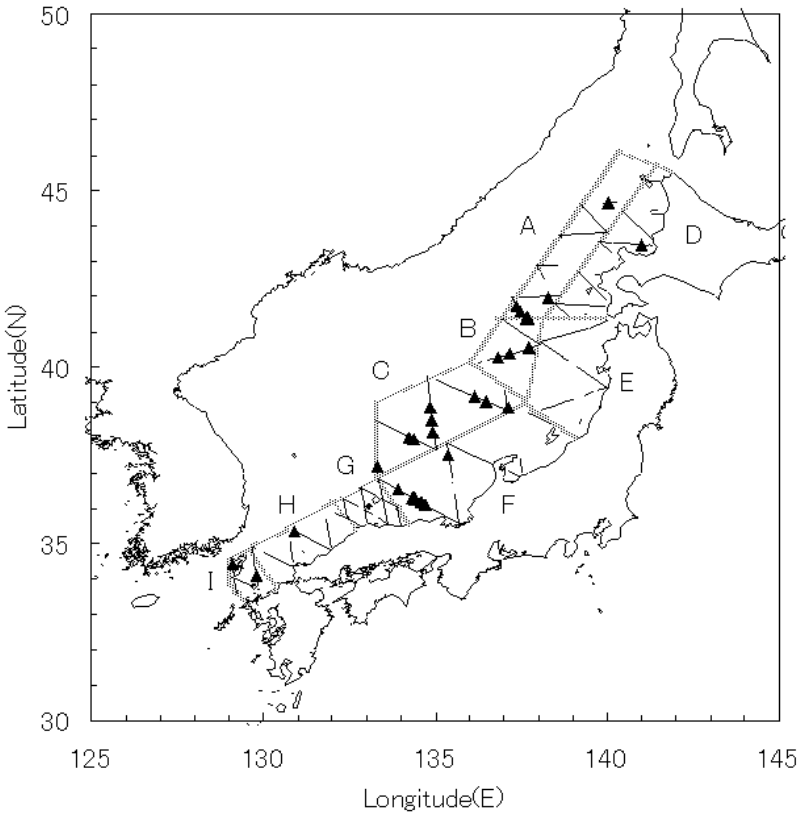


Fig. 52. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Japan in 2003.

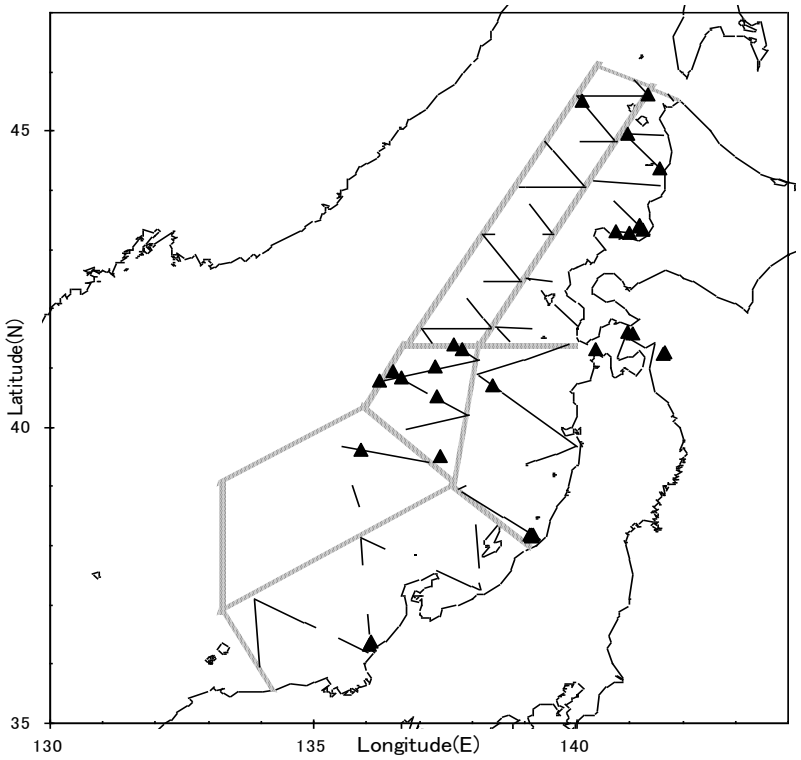


Fig. 53. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Japan in 2004.

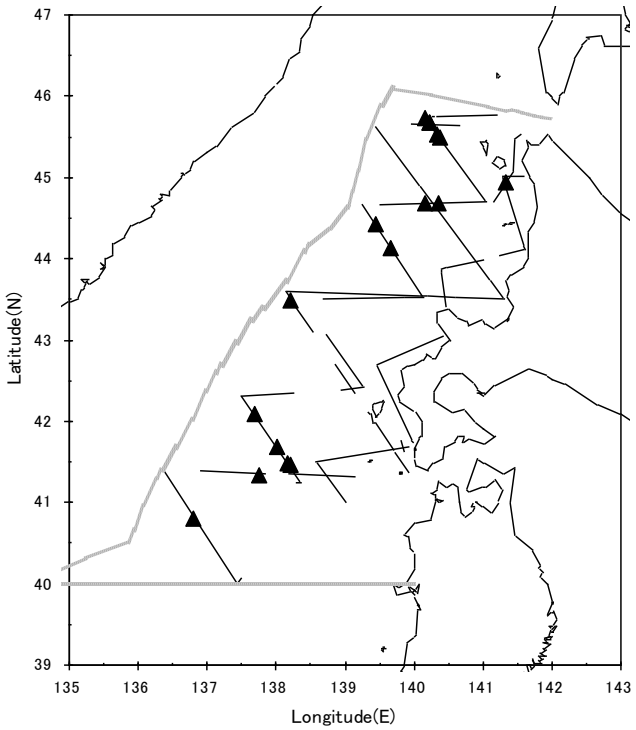


Fig. 54. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Japan in 2005.

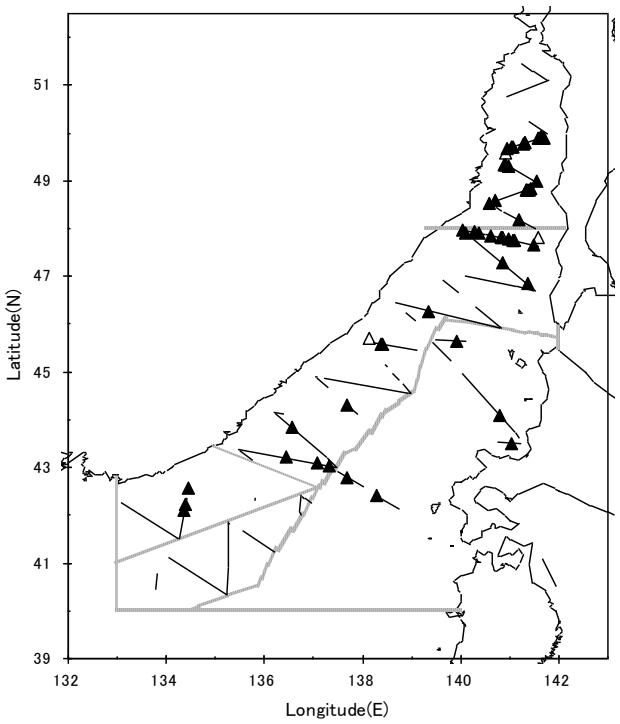


Fig. 55. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Japan in 2006.

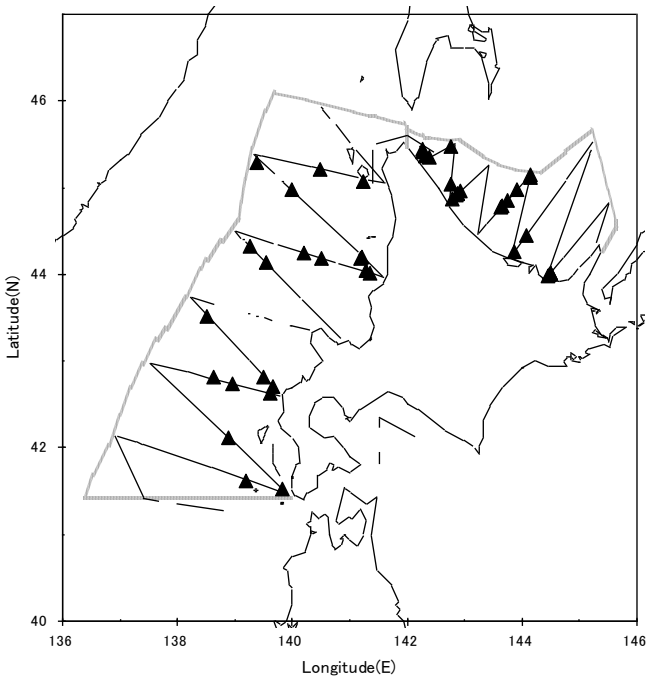


Fig. 56. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Japan and the Sea of Okhotsk in 2007.

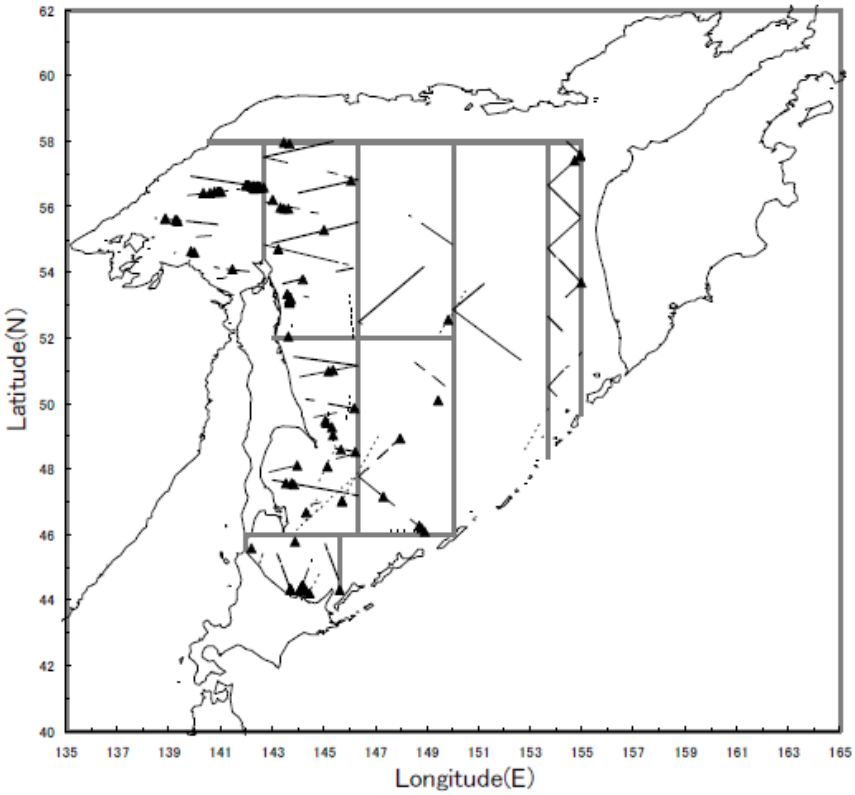


Fig. 57. Track line traversed on effort and sighting positions of common minke whale schools in the Sea of Okhotsk in 2003.

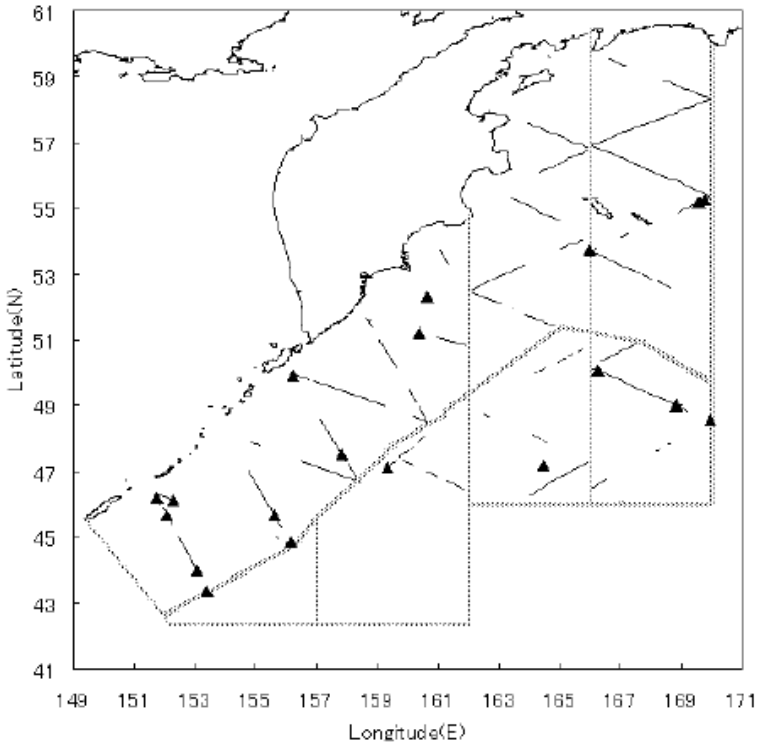


Fig. 58. Track line traversed on effort and sighting positions of common minke whale schools in the waters east of the Kuril archipelago and the Kamchatka peninsula in 2005.