# Sighting survey activities of Japan and Korea for the western North Pacific common minke whales

TOMIO MIYASHITA[1] AND YONG-ROCK AN[2]

1: *National Research Institute of Far Seas Fisheries*
*2-12-4 Fukuura, Kanazawa-ku, Yokohama, Kanagawa 236-8648, Japan*
2: *Cetacean Research Institute,*
*139-29, Maeam-dong, Nam-gu, Ulsan 680-050, Korea*

*Contact e-mail: miyachan@fra.affrc.go.jp*

**ABSTRACT**

Japan and Korea have conducted sighting surveys for common minke whales in the related waters in the western North Pacific since 1990's. The survey period for J-stock was April – June, and that for O-stock July – September. The area covered for J-stock assessment was the Korean EEZ and the Japanese EEZ in the sub-area 5, 6 and 10 and the Russian EEZ in the sub-area 10. For O-stock assessment, the area covered was the Sea of Okhotsk (sub-area 11 and 12), east of the Kurile archipelago and the Kamchatka (sub-areas 8,9 and 12). During the research distance of 27,045 n.miles, a total of 505 schools (560 animals) of common minke whales was primarily sighted.

KEY WORD: COMMON MINKE WHALE, SIGHTING SURVEY, WESTERN NORTH PACIFIC

## INTRODUCTION

Japan and Korea have conducted a series of sighting surveys for the abundance estimate of the East China Sea, Yellow Sea and the Sea of Japan/East Sea stock of common minke whales (J-stock) under the cooperative project since 1994 (Iwasaki *et al*., 1995; Miyashita, 2001, 2002, 2004a, 2005, 2007; Miyashita and Yoshida, 2003; Sohn et al. 2001; Kim *et al.* 2003a, 2003b, 2003c, 2004, 2005; An et al., 2006, 2008, 2009). Based on these survey data, Kitakado *et al.* (2009) presented the integrated abundance estimate for the J-stock. On the other hand, for the Okhotsk Sea – western North Pacific stock (O-stock), Japan has conducted the sighting surveys (Miyashita *et al.* 1990, 1991, 2004b, 2006). Buckland *et al.* (1993) estimated the abundance of the O-stock from the surveys conducted in 1989 and 1990. This document summarized recent sighting survey activities for the population assessment for the J and O stocks by Japan and Korea since 2000.

## MATERIALS AND METHOD

### Japanese sighting activities

### Sub-areas 6 and 10

The season of surveys in the waters was set from April to June when the Japanese small-type coastal whaling mainly caught the minke whales in this area. In 2002 and 2003, *Kurosaki* (KSK) covered block 6ES from mid-April to mid-May, and *Shonan-maru No.2* (SM2) covered 6EN and 10E from mid-May to late-June (Table 1). In 2004, SM2 covered in block 6EN and 10E from mid-May to late-June. In 2005, we tried to enter the Russian EEZ (10W) first time, but no permission was issued from Russia. Then SM2 has covered twice 10E and accumulated the sighing information from mid-May to late-June (Table 1). And in 2006, we got the Russian permission to enter the EEZ (10W) and *Kaiko-maru* (KKM) covered there from late-May to mid-June (Table 1). In 2007, SM2 conducted the IO passing mode survey north of Hokkaido (10E and sub-area 11 in the Sea of Okhotsk) and 10E was covered in June (Table 1).The track line traversed with sighting effort and the sighting positions of common minke whale school were shown in Figs 3 to 8 from 2002 to

2007, respectively.

All vessels have a top-barrel and are suitable for whale observation of which height from the sea level were about 20m. KKM and SM2 have also an IO platform. Two top men were primary observers and scientists on the upper bridge conducted the record of sighting. The sighting method was followed the Guideline for sighting survey under RMP and the survey design was presented to the past SC and Miyashita was appointed to have oversight. Based on the distance and angle estimation experiments, if the correction is necessary, the angle and distance was corrected.

The surveys were conducted under the weather when the visibility better than 2 n.miles and the wind force less than four. The survey mode in the research area was normal closing mode from 2002 to 2005 and IO passing mode in 2006 and 2007.

## Sea of Okhotsk (sub-areas 11 and 12)

The recent sighting survey was conducted in both sub-areas in 2003 (Miyashita *et al*, 2004). The research period was set between July to September (mainly in August) because mid-summer was assumed to be in the northward migration peak of O-stock common minke whales. The survey was conducted using two research vessels, SM2 and SM1 (*Shonan-maru*) (Table 1). Two sighting modes, IO passing mode and IO passing mode with delayed closing to Dall's porpoise school, were used by track line which was presented in the cruise plan (Miyashita and Kato, 2003). Delayed closing mode was used to increase the accuracy for color type identification of Dall's porpoise because two color types of the species migrate into the area.
The principle of the IO passing mode survey was presented to the 50$^{th}$ IWC Scientific Committee (Miyashita, 1998). The vocal recording system was used to identify the duplicate sightings in the field when the sightings were made.

The survey area was restricted and the following areas were not permitted to be surveyed , a) north of 58$^{o}$N, b) east of 155$^{o}$E, c) southern coastal waters of the Kurile archipelago. The eight blocks were set up taking into consideration of the past sighting results, topographic information and sub-area definition. The western four blocks (11W, CSW, CNW and SHA) were covered by SM2 and the eastern four blocks (OSW, ONW, OE and CE) by SM1.

Sightings were made by naked eyes when the visibility is better than 1.5 n.miles and the wind force is less than 3 in beaufort scale. All information from four observers was recorded independently using voice recording system and monitored at the upper bridge. The scientists at the upper bridge confirmed whether the sighting was duplicate sighting or not and also time lag of duplicate sightings.

## East of the Kurile archipelago and the Kamchatka (sub areas 8, 9 and 12)

The survey was conducted in the Russian EEZ in 2005 (Miyashita, 2006). The research season was same as in the Sea of Okhotsk in 2003, July – September (mainly in August). The vessels used were SM1 and SM2. IO passing mode was used through these cruises.

The survey area was divided into blocks based on the Russian EEZ and high seas in order to facilitate reportings to enter and leave the Russian EEZ (Fig. 8). The survey was conducted by block unit, then the vessel could continue surveying without frequent reporting to the Russian Federation. A total research distance for the Kamucahtka and the Krile cruise was set as 2,520 n.miles and 2,544 n.miles for SM2 and SM1, respectively.

The survey mode in the research area was the IO passing mode, and for photo-identification or species identification if necessary, the vessel closed to the sightings after passing abeam the sighting. The primary observers were two both on the top barrel and the IO platform, who used naked eyes for observation, and the a 7x50 binocular was used for species confirmation and school size estimation. On the upper-bridge, the scientists observed and recorded the sighting information.

The survey was conducted during the good weather condition in principle when the visibility was two n.miles or better and the wind force was three or smaller in Beaufort scale, but when the sea is calm but the visibility of one n.milees or better, the survey was also conducted. The daily survey started at 06:00 a.m. or 30 minutes after sunrise and finished at 30 minutes before the sunset, but the daily research duration was set as shorter than 12 hours.

**Korean sighting activities**

## Sub-areas 5 and 6

The Korean sighting surveys were conducted in the waters of sub-areas 5 and 6 from mid April to late May except in the surveys 2000 and 2002 performed from early May to early June (Table 2). The surveys in 2001, 2004 and 2008 were operated in the sub-area 5 and those in 2000, 2002, 2003, 2005, 2006, 2007 and 2009 in the sub-area 6.

In every survey, two observers performed sighting surveys in a top barrel mounted on the research vessel of the NFRDI, *Tamgu 3* (stem trawler, 360 GT and 1,600 HP) at the height of 11.5m from the sea level in 2-hour-interval rotations. Sighting of observers were confirmed by two researchers from the top bridge where researchers and rest of observers also conducted whale sightings during the survey.

The vessel was navigated at 10~13 knots in accordance with sea states and weather conditions. The closing mode was applied for identification of species, estimation of school size, taking photos and videos. All information on position, time and weather condition was recorded in the bridge at the same time when the animal was found. Position data and weather information were also recorded every one hour during the cruise.

Whale observers were trained and tested to estimate the distance and angle during the survey. The sighting method was followed the guideline for sighting survey under RMP and the survey design was presented to the past SC and Miyashita, Shon and An were appointed to have oversight.

The track line traversed with sighting effort and the sighting positions of common minke whale school were shown in Fig. 9 from 2000 to 2009.

# SIGHTING RESULTS

**Japanese sighting activities**

**Sub-area 6 and 10**

During the research distance of 12,934.2 n.miles, a total of 203 animals in 183 schools was sighted as primary sightings (Table 1). They were distributed widely in the sub-areas 6 and 10, but higher density was observed in the latter (Figs. 1- 6).

In the northern sub-area 10 (Russian EEZ), many animals were observed, which suggests the possibility of more animals can be found if we could conduct in the Russian territorial waters. It may cause the downward bias in the abundance estimation in the area. The sighting survey in the Russian territorial waters is necessary in the future.

**Sub-aera 11 and 12**

During the research distance of 2,500.7 n.miles, a total of 72 animals in 79 schools was sighted as primary sightings in 2003 survey. Dense fog and strong wind were problems through the surveys, especially in the central waters, then the coverage in the central blocks became poor. High density area was observed in the blocks north of the Sakhalin (Fig. 7)

Because there has been the prohibited area to enter in the north-eastern sub-area Sea of Okhotsk where is abundant of minke whales, the coverage of the Sea of Okhotsk is about 80% in the recent surveys. Also by the same reason of the sub-areas 6 and 10 (no coverage in the Russian territorial waters), those cause the downward bias in the abundance estimate.

**East of the Kurile archipelago - the Kamuchatk**

In 2005, the research vessels traversed with sighting effort of1,865.0 n.miles in the Russian EEZ, and found 10 schools (10 animals) as primary sightings. It is well known that the dense fog is popular in summer in this area, especially in the waters south of the Kurile archipelago and the Kamchatka. Then the vessels had consumed much time to wait the clear of fog. In the original plan, the research area included the high seas waters, but the area could not be covered because of consuming much time in the Russian waters by dense fog. Sighting positions were shown in Fig. 8.

Because there was no coverage in the Russian territorial waters, it causes the downward bias in the abundance estimate.

**Korean sighting activities**

**Sub-areas 5 and 6**

During the surveys, 11,344 n. miles were navigated and 268 minke whales in 240 schools were observed on primary sightings. In sub-area 5, the animals were evenly dispersed in the northern part of the survey block while the animals in sub-area 6 segregated in the coastal waters. A shift in the distribution pattern of minke whales in sub-area 6 was found. In the earlier surveys in 2000, 2002 and 2003, animals were gathered in the southern part of the survey area while the animals in 2006, 2007 and 2009 surveys were swarming more northerly which revealed the potential annual changes in distribution of minke whales.

Seasonally prevailing southeasterly winds and fogs shortened the number of days favorable to conduct sighting surveys and left the surveys unfinished except 2009 survey.

During the survey, several toothed cetacean animals were sighted including killer whales, false-killer whales, Risso's dolphins, common dolphins, bottlenose dolphins, Pacific white-sided dolphins, Dall's porpoises and finless porpoises. However, other species of baleen whales were not sighted during the surveys.

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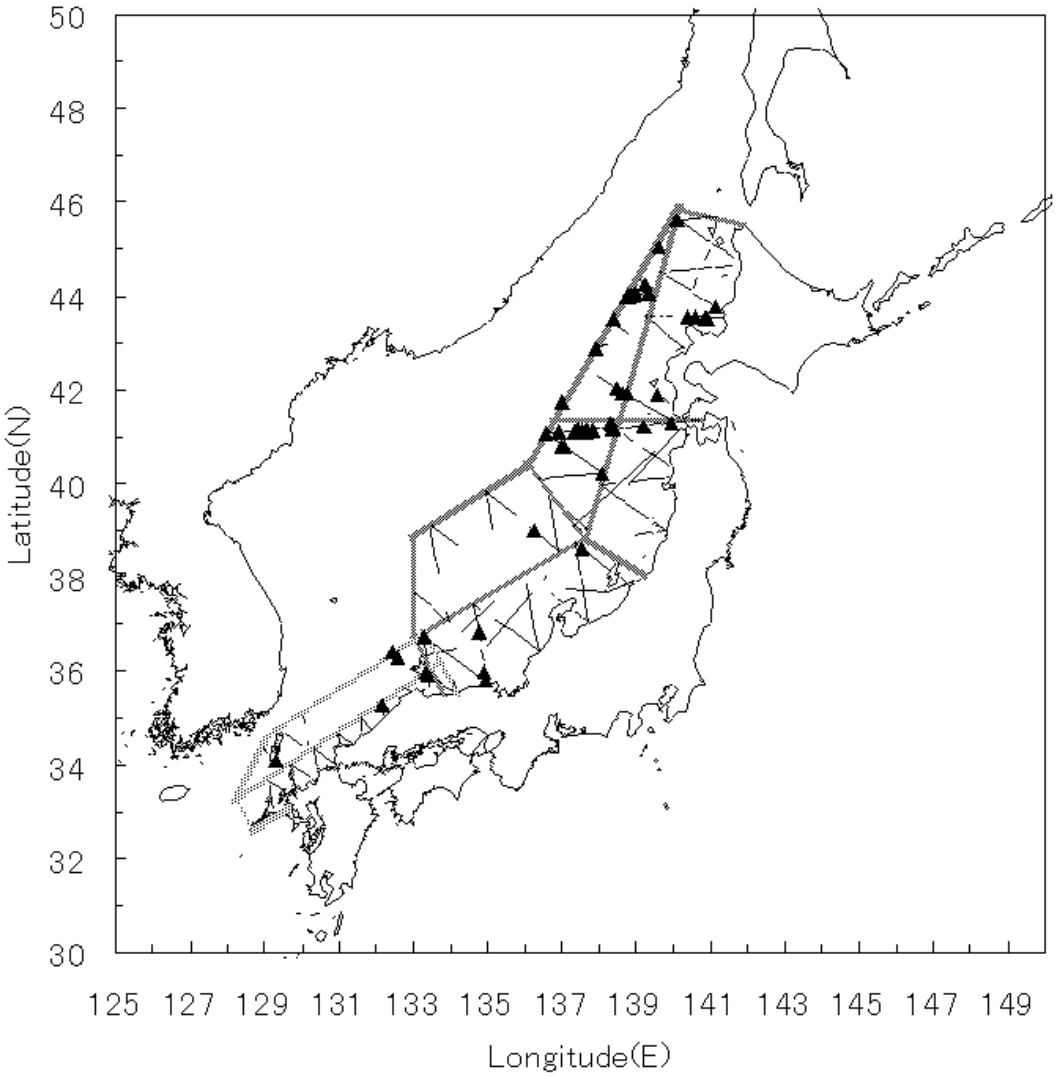



Fig. 1. Track line traversed with sighting effort and sighting positions of common minke whale schools in 2002. Thick line: block, thin line : track line traversed on effort, black triangle : sighting position (primary sightings). Most western block west of 134ºE was covered by *Kurosaki*, and others by *Shonan-maru No.2*.

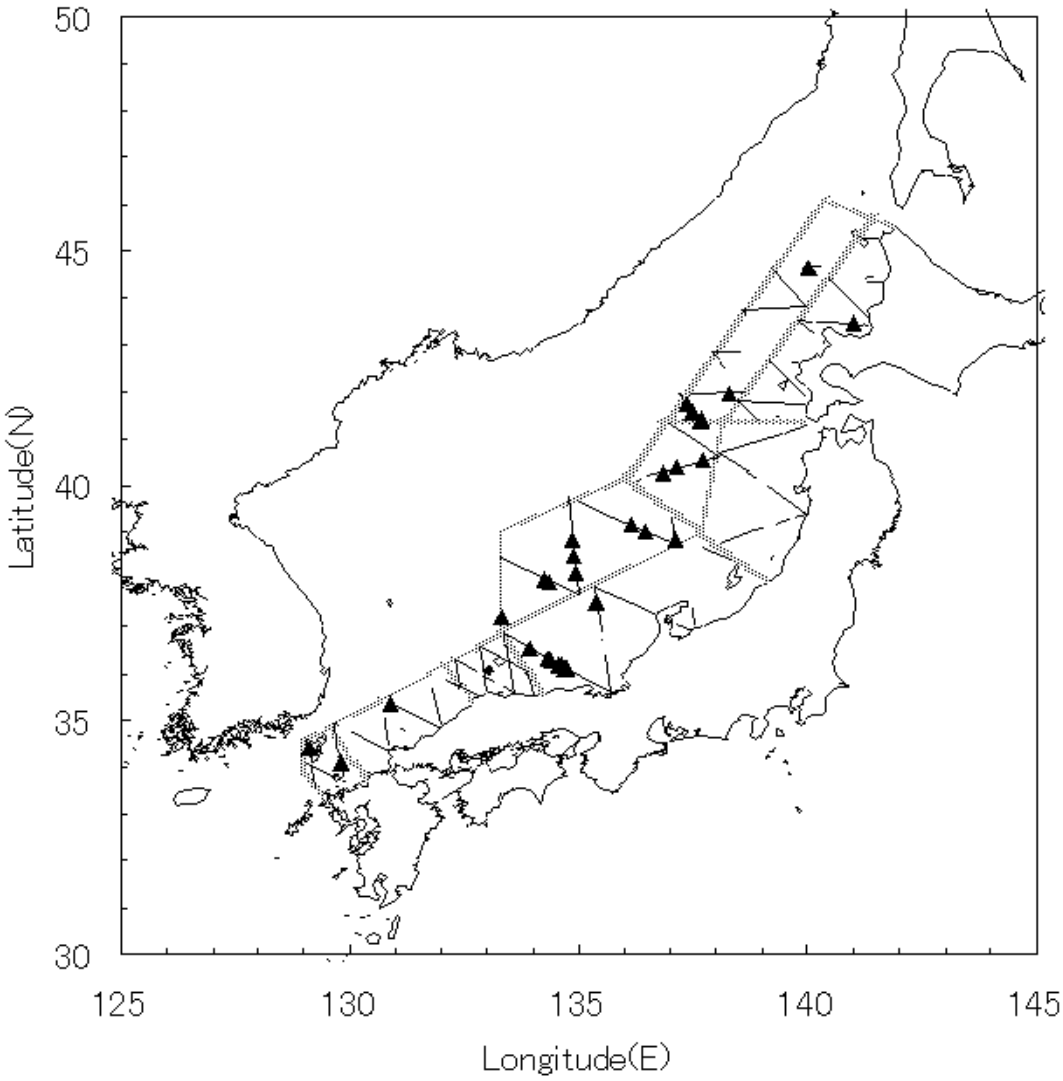



Fig. 2. Track line traversed with sighting effort and sighting positions of common minke whale schools in 2003. Thick line: block, thin line : track line traversed on effort, black triangle : sighting position (primary sightings). Western most block west of 134°E was covered by *Kurosaki*, and others by *Shonan-maru No.2*.

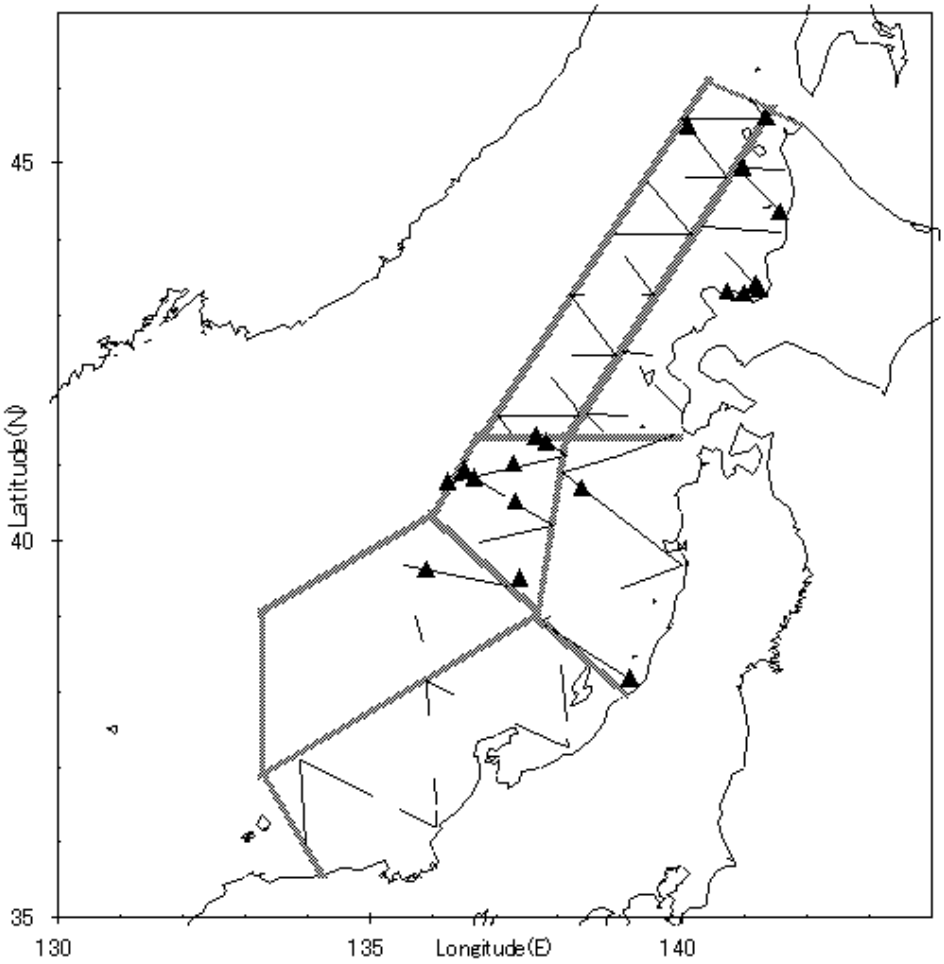



Fig. 3. Track line traversed with sighting effort and sighting positions of common minke whale schools (primary sightings ) in 2004.
All sub-block covered by *Shonan-maru No.2*.

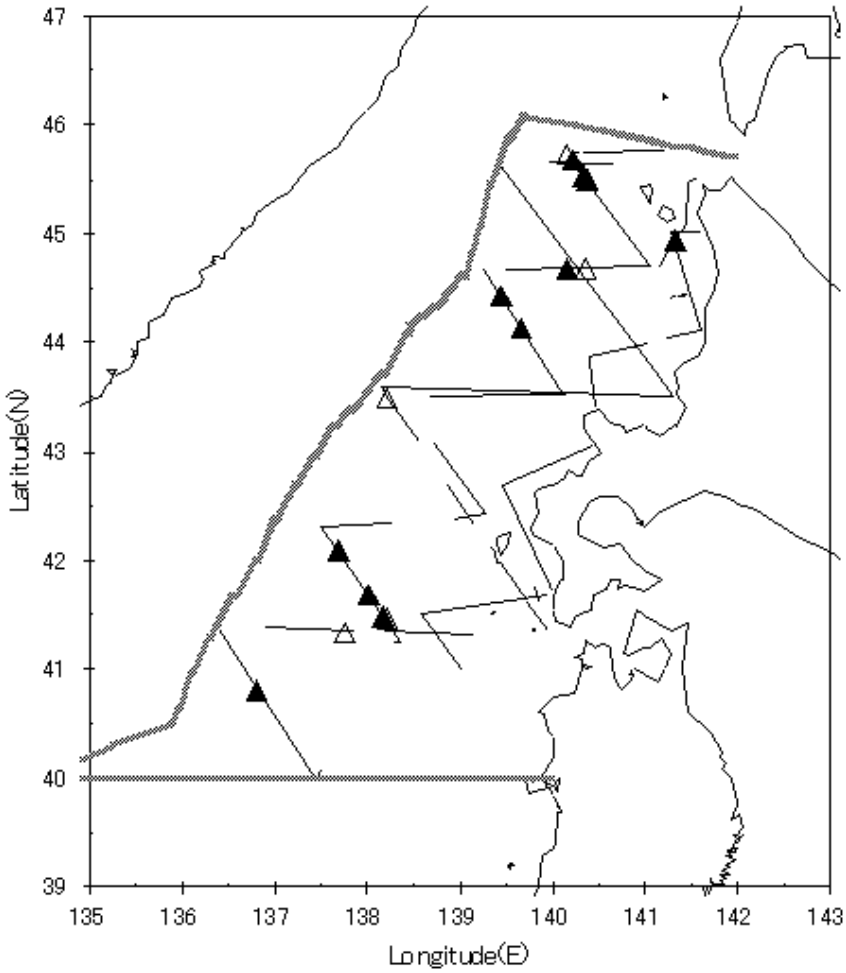



Fig. 4. Track line traversed with sighting effort and sighting positions of common minke whale schools in 2005. Black triangle : primary sightings, white triangle : secondary sightings. All sub-block covered by *Shonan-maru No.2*.

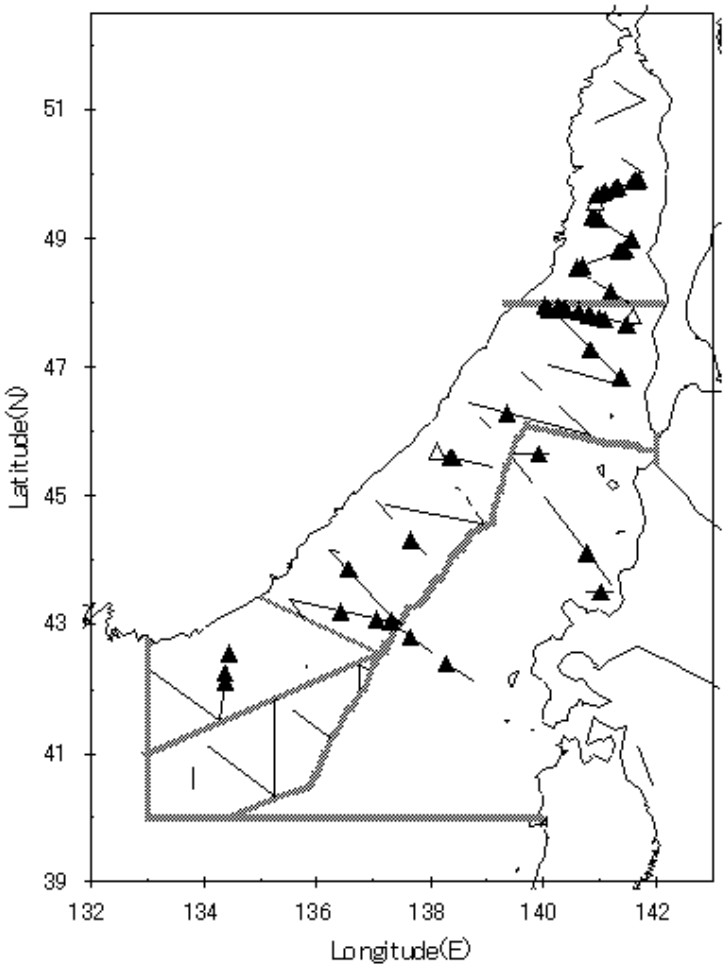



Fig. 5. Sighting positions of common minke whale school
during the *Kaiko-maru* IO sighting survey in the northern Sea of Japan in 2006.
Black triangle : primary sightings, white triangle : secondary sightings.

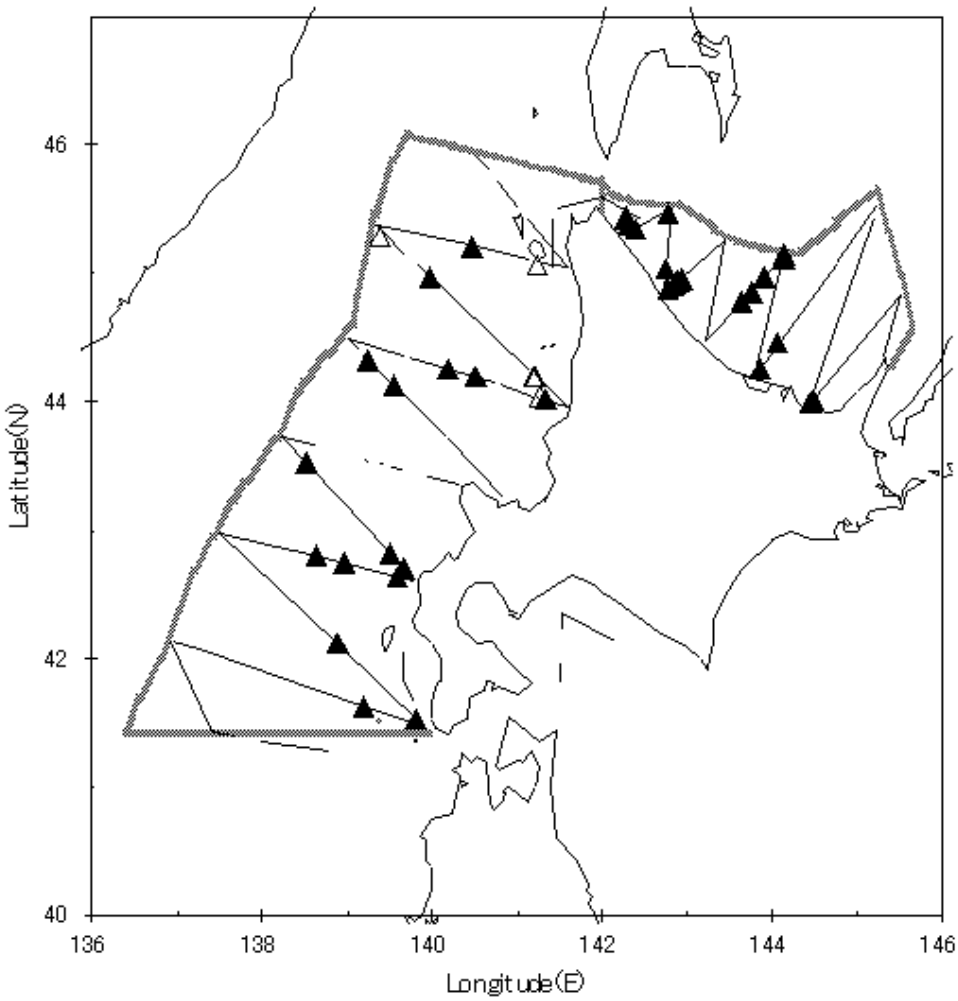



Fig. 6. Sighting positions of common minke whale school during the *Shonan-maru No.2* IO sighting survey in the Sea of Japan and the Sea of Okhotsk in 2007.
Black triangle : primary sightings, white triangle : secondary sightings.

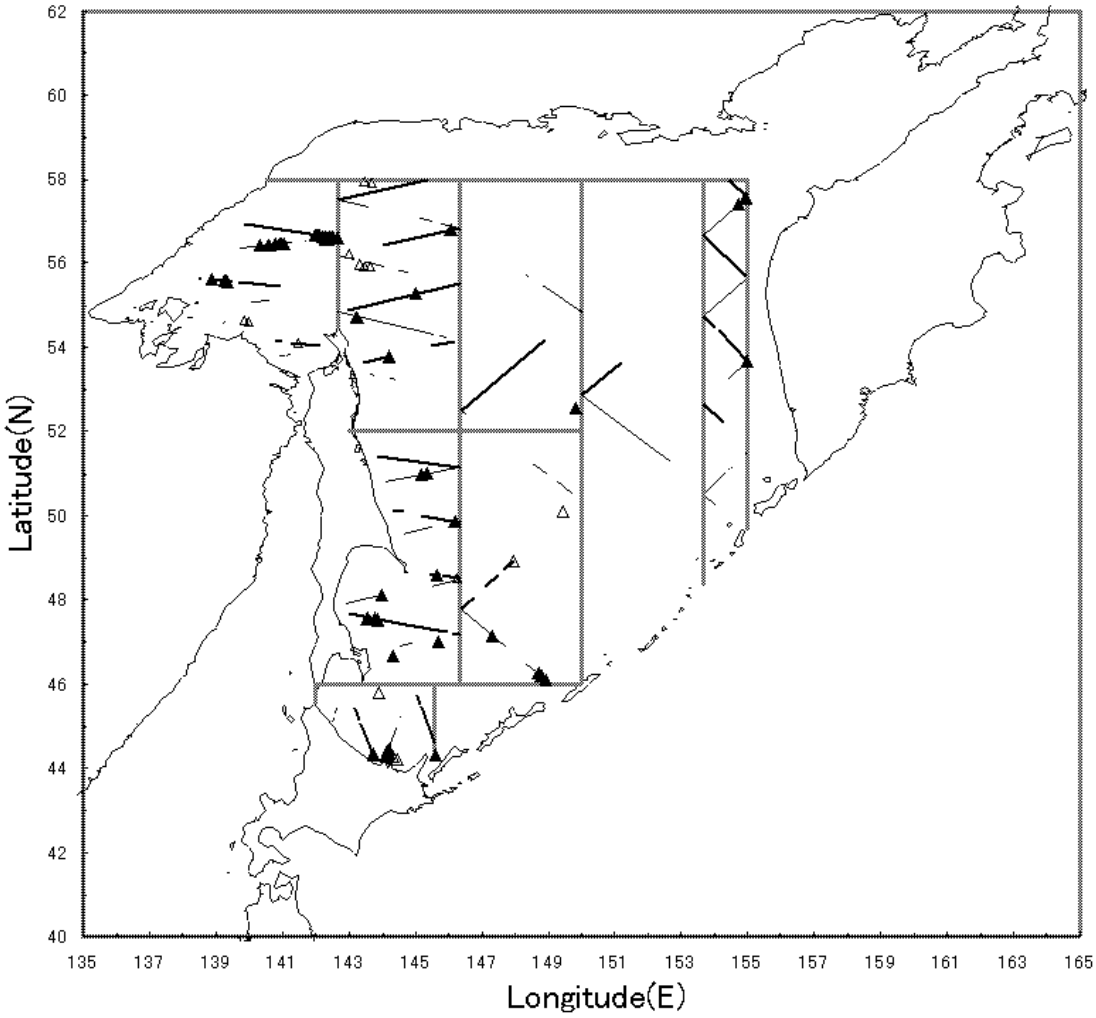



Fig. 7. Sighting positions of common minke whale school during the sighting survey in the Sea of Okhotsk in 2007. Blocks west of 146ºE were covered by *Shonan-maru No.2* and those east of 146oE by *Shonan-maru.* Black thick line : traversed by delayed closing mode for Dall's porpose, light thin line: traversed on IO passing mode. Black triangle : primary sightings, white triangle : secondary sightings.

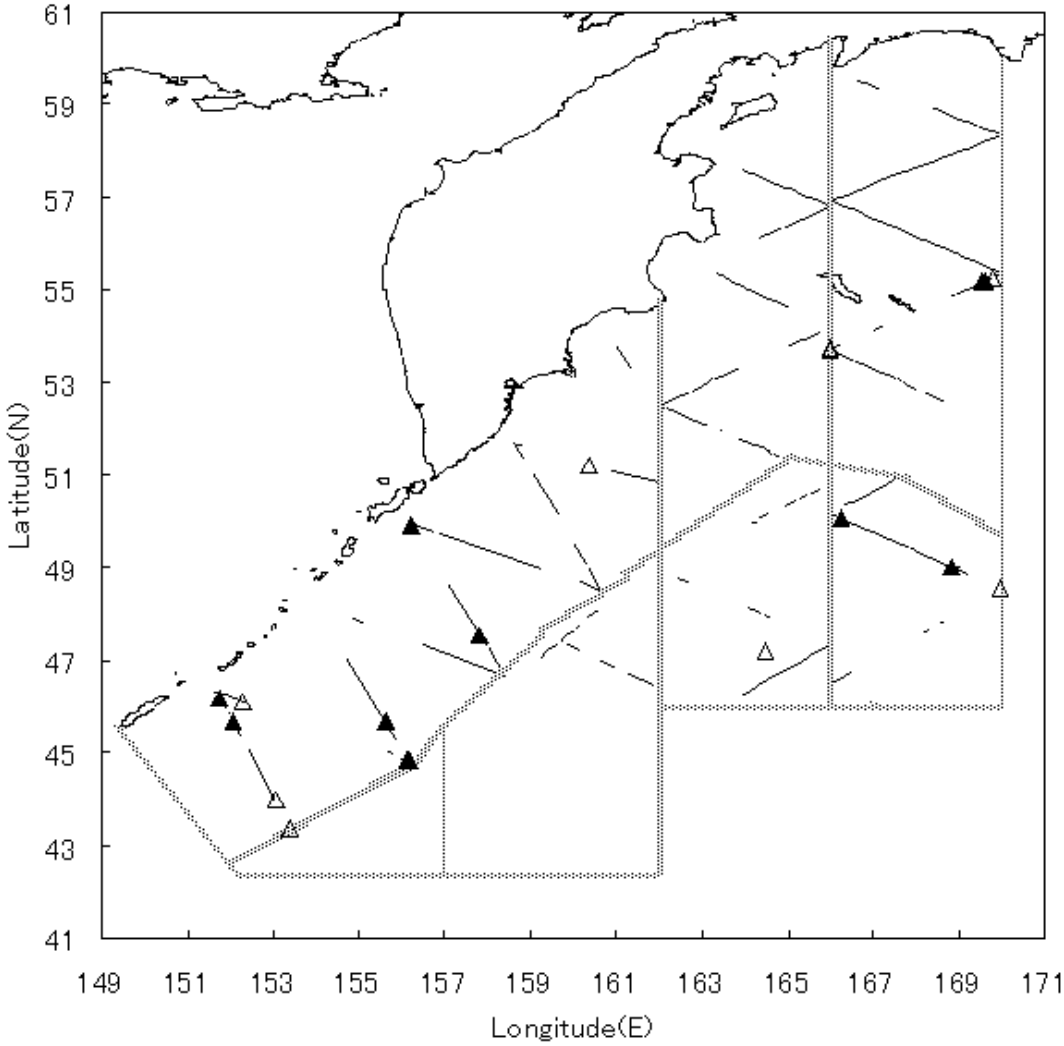
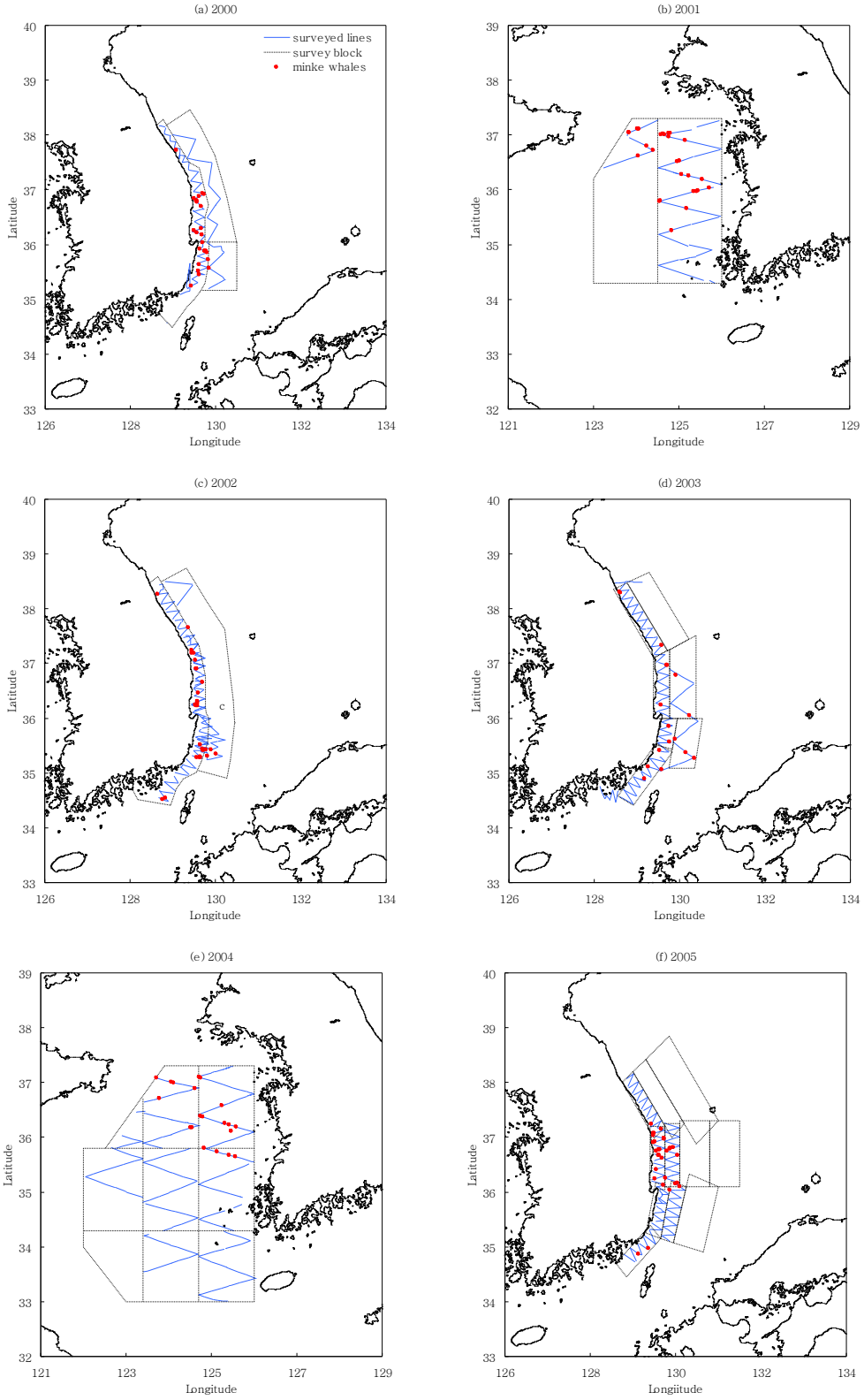



Fig. 8. Sighting positions of common minke whale school during the IO mode sighting survey in the waters east of the Kurile archipelago and the Kamchatka in 2005. Blocks west of 162°E were covered by *Shonan-maru No.2* and those east of 146°E by *Shonan-maru.* Black triangle : primary sightings, white triangle : secondary sightings.


(a) 2000
surveyed lines
survey block
minke whales
Latitude
Longitude
(b) 2001
Latitude
Longitude
(c) 2002
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(d) 2003
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(e) 2004
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(f) 2005
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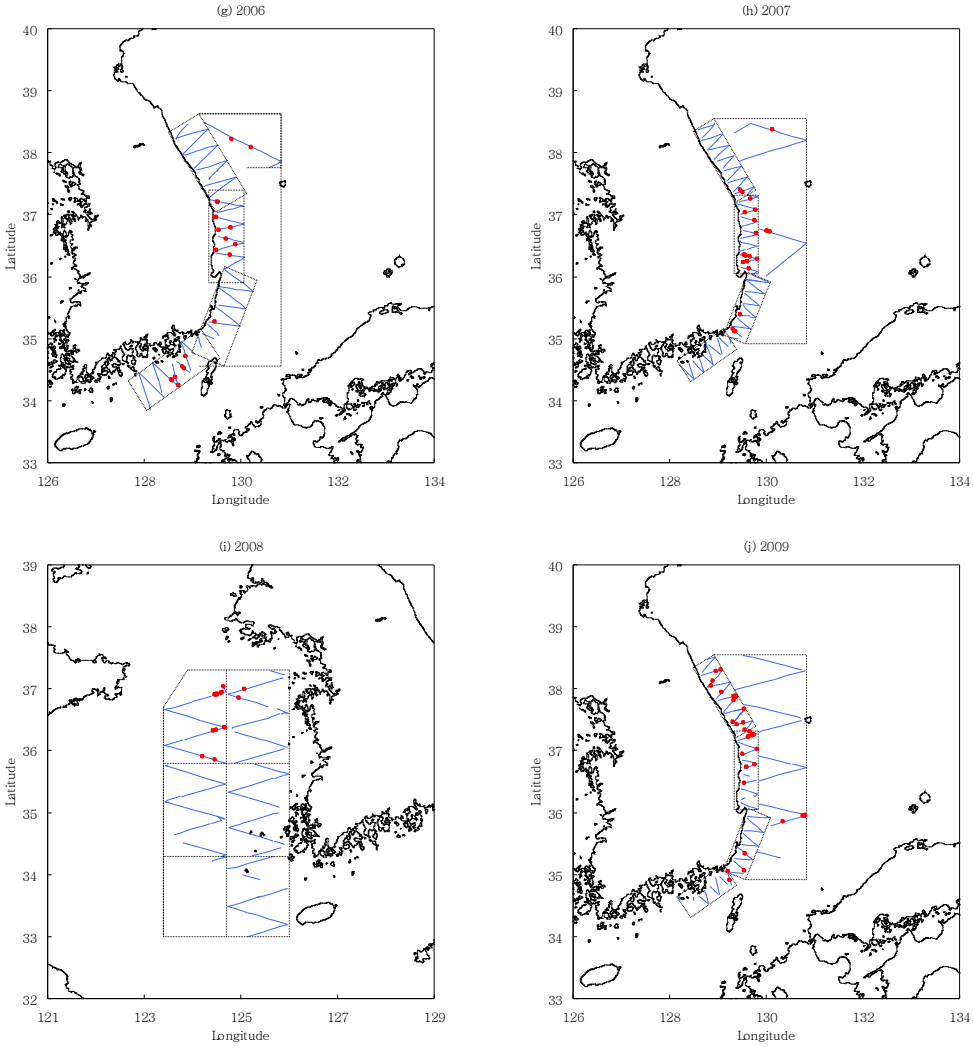


Fig. 9. Track line traversed with sighting effort and sighting positions of common minke whale schools from 2000 to 2009 in sub-areas 5 and 6.

Table 1. Summary of Japanese sighting surveys for common minke whales.

| No. | Year | Period | Vessel[1] | Searching distance (nmi) | Survey mode[2] | No. sighting (sch. – ani.) Pri. | No. sighting (sch. – ani.) Sec. | Area |
|---|---|---|---|---|---|---|---|---|
| 1 | 2002 | 10 April – 9 May | *KSK* | 389.7 | NC | 5–7 | 2–2 | 6ES |
| 2 | | 13 May – 1 July | *SM2* | 2,161.7 | NC | 33–34 | 2–2 | 6EN, 10E |
| 3 | 2003 | 11 April – 10 May | *KSK* | 716.3 | NC | 3–3 | – | 6ES |
| 4 | | 12 May – 30 June | *SM2* | 1,877.8 | NC | 27–31 | 5–5 | 6EN, 10E |
| 5 | 2004 | 11 May – 29 June | *SM2* | 1,898.1 | NC | 14–14 | 11–13 | 6EN, 10E |
| 6 | 2005 | 12 May – 30 June | *SM2* | 841.5 | NC | 11 –12 | 6–6 | 10E |
| 7 | 2006 | 18 May – 28 June | *KKM* | 1,852.2 | IO | 51–55 | 6–6 | 10W, 10E |
| 8 | 2007 | 18 May – 28 June | *SM2* | 1,598.7 | IO | 39–47 | 6–6 | 10E, 11 |
| 9 | 2003 | 22 July – 19 Sep. | *SM1* | 902.7 | IO, DC | 12–12 | 5–6 | 12 |
| 10 | | | *SM2* | 1,598.0 | IO, DC | 60 – 67 | 10–11 | 11, 12 |
| 11 | 2005 | 29 July – 20 Sep. | *SM1* | 996.8 | IO | 4 – 4 | 5 – 5 | 8, 9, 12 |
| 12 | | | *SM2* | 868.2 | IO | 6 – 6 | 7 – 7 | 9 |
| Total | | | | 15701.7 | | 265–292 | 65–69 | |

1: *KSK:Kurosaki, KKM: Kaiko-maru, SM1: Shonan-maru, SM2: Shonan-maru No.2*
2: NC:Normal closing mode, IO:Independent observer passing mode, DC:Delayed closing mode

Table 2. Summary of Korean sighting surveys for common minke whales.

| Year | Period | Survey effort (n. mi.) | No. primary sightings (schools-animals) | Sub-area |
|---|---|---|---|---|
| 2000 | early May to early June | 709 | 25-28 | 6WS |
| 2001 | mid April to late May | 811 | 28-30 | 5ES |
| 2002 | mid May to early June | 1,169 | 30-32 | 6WS |
| 2003 | mid April to late May | 1,082 | 16-18 | 6WS |
| 2004 | mid April to late May | 1,787 | 18-20 | 5ES |
| 2005 | mid April to late May | 1,145 | 28-32 | 6WS |
| 2006 | mid April to late May | 1,070 | 20-25 | 6WS |
| 2007 | mid April to late May | 1,043 | 21-25 | 6WS |
| 2008 | mid April to late May | 1,384 | 18-18 | 5ES |
| 2009 | mid April to late May | 1,144 | 36-40 | 6WS |
| Total | | 11,344 | 240-268 | |