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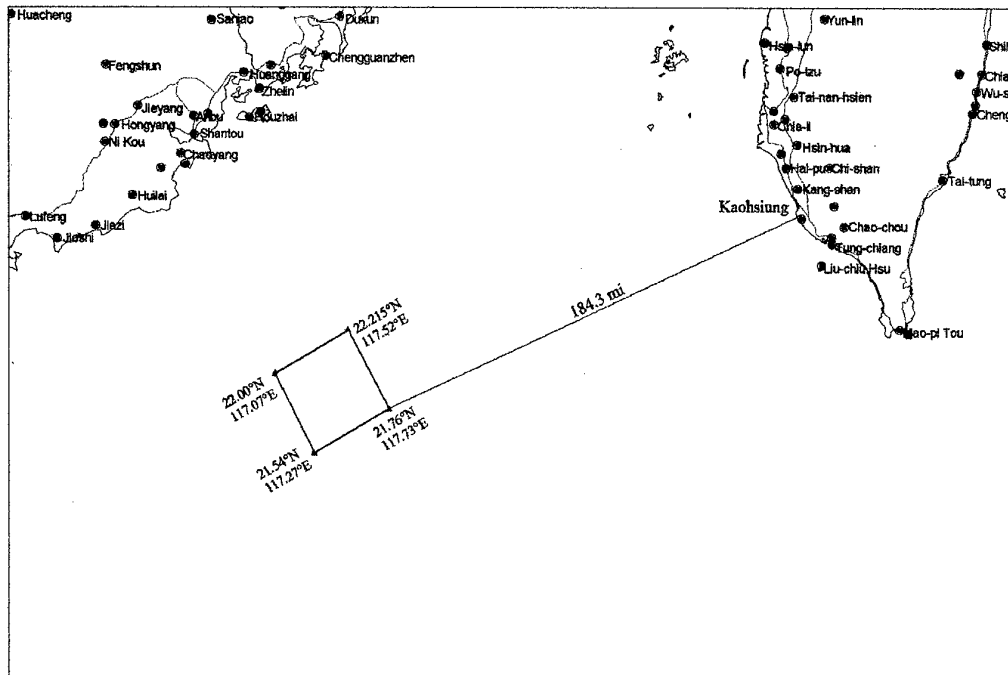
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**Final Report**  
**of**  
**Bathymetric Survey in South China Sea**  
**for ASIAEX**

(Award No: N00014-01-1-0142)



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# Bathymetric Survey in South China Sea for ASIAEX

## Ruey-Chang Wei

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### **I. Introduction**

As the conclusion in the Kona workshop of ASIAEX at June, 2000, the bathymetry in the vicinity of the experiment site in South China Sea (SCS) is more complicated as thought. The need of more accurate bathymetric mapping is agreed among the participants. The survey was assigned to be conducted on board Ocean Research III (OR III) of Taiwan. The cruise date was from September 16 to 20, 2000, and the distance from Kaohsiung harbor to the survey site is about 200 nm each way. Survey site is an area of 50 km x 50 km box, with coordinates of the four corners as NW (22.00N, 117.07E), NE (22.215N, 117.52E), SE (21.76N, 117.73E), SW (21.54N, 117.27E).

### **II. Cruise Chronology of Significant Events**

OR III left Kaohsiung harbor on September 16, 2000, and returned on September 20, 2000. The more significant events of the cruised are described in this section, and the times are local time, referred to Kaohsiung, which is also in the same time zone as South China Sea experimental site.

**9/16/00**

1030 Depart Kaohsiung harbor of Taiwan for SCS bathymetric survey site.

**9/17/00**

0007 Arrive the survey site, and start the survey right away. The cruising speed is 8~12 kt. In addition to EK500, the ADCP is also taking the data throughout the survey.

1855 Complete 6 survey tracks, and stop for CTD measurement. The water depth is 74 m. The GPS data is also downloaded during this short break.

1945 Resume survey on track no. 7.

**9/18/00**

0030 Wind starts to pick up.

1100 Averaged wind speed: 22 kt, gust wind speed 28 kt, seas becomes high and rough. However, the measurements still continue, the ship is cruising at speed of 10 kt.

1438 Complete 13th survey track, and stop for CTD measurement. The water depth is 412 m. The GPS data is also downloaded during this short break.

1534 Resume survey on track no. 14.

**9/19/00**

0750 Rain starts to fall, the wind and seas coming down.

0751 Complete 19th survey track, and stop for CTD measurement. The water depth is 404 m. The GPS data is also downloaded during this short break.

0836 Resume survey on track no. 20.

1200 Wind picks up again in the afternoon, the averaged speed is 5~6, and 7 of gust on Beaufort scale. Sea is full of long and rough swells, which makes it is difficult for ship to remain on the planned survey track. Nevertheless, the survey continues.

2113 Stop in the middle of track no. 24 for final CTD, at the depth of 232 m. The rain has stopped, but seas is still high and rough.

2133 Resume survey on track no. 24.

### **9/20/00**

0314 Complete the planned 26 tracks, in addition begin a cross-reference track for data confirmation.

0706 Complete all the measurements, leave experimental site for Kaohsiung.

## **III. Cruise Scientific Operation and Results**

In addition to bathymetric survey, some other measurements were also preformed for future reference and sound speed correction. Major operations on this cruise are described in this section, the analyzed results are shown.

### **A. Bathymetric Survey**

The bathymetric survey was conducted by using the shipboard Simrad EK500 Scientific Echo Sounder, which operated at 38 kHz. There were 26 tracks in total in the survey box (Figure 1), giving a resolution of 2 km in the bathymetry contour. Even though the weather was poor, with rain and high wind and seas, during the survey, the quality of data is still good, and corrected by CTD measurement.

The resulting bathymetry contour were shown in Figures 2 and 3 (with navigation tracks), the steep slop from 100 m to 400 m is the most prominent feature, which was not shown in the historical data. The flat plane both on the top and bottom of the shelf-break provide the suitable location for future vertical and horizontal arrays deployment.

### **B. CTD Operation**

CTD measurements were conducted by the shipboard SBE (Sea-Bird Electronics) CTD, Figure 4. Four measurement were taken through the survey for sound speed

profile correction, the water depth of measurement points are 74 m, 412 m, 404 m, and 232 m.

#### **D. Shipping Density Observation**

Throughout the survey, the shipping density was monitored and recorded on the hour, with both visual and radar estimations. More fishing activity were observed near the shallow (water depth less than 200 m) side of the survey box, and more than 20 small fishing boats were encountered on several occasions, Table 1. Only a few large containers were sighted, so the cargo shipping should not be the problem, but the major “threat” of the ASIAEX 20001 experiment will still be the fishing activity.

#### **IV. Data FTP**

Thanks to Professor Chi-Fang Chen’s (National Taiwan University) effort, the data FTP site for ASIAEX bathymetric survey in South China Sea is established. The data and related graphs can be downloaded from the following site, and description is also provided.

.....

Information of the FTP site:

Host address: uwlab.na.ntu.edu.tw

User Name: asiaex

Password: asiaex

dir: /pub/SouthChinaSea

Files:

200k.cdr

200k.jpg

all.dat

grid.dat

p1.cdr

p1.jpg

p2.cdr

p2.jpg  
readme-big5.txt  
readme-english.txt  
site.cdr  
site.jpg

Note: The first readme file (Big-5) is written in Traditional Chinese, the second one (English) is translated from the previous file.

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Information of files:

all.dat

The raw data with sound speed correction.

grid.dat

The gridding data.

Note: Since the survey area is a twisted square, the data on the boundary in this file are obtained by extrapolation.

site.cdr, site.jpg

The map of survey area, with CorelDraw 8.0 and jpg format.

p1.cdr, p1.jpg, p2.cdr, p2.jpg

The bathymetry contours in A4 size with CorelDraw 8.0 and jpg format, and p2 includes navigation tracks.

200k.cdr, 200k.jpg

The bathymetry contour with a scale of 1cm to 2km, with CorelDraw 8.0 and jpg format

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## **V. Acknowledgements**

Thanks to ONR for funding this survey. Many thanks are also due to Professor Chi-Fang Chen and Gwo-Shyh Song of National Taiwan University and their assistants, who help out with the survey operations, data analysis, contour plots, and FTP site setup. Finally but not the least, the captain and crew of ORIII are very helpful and supportive during this crew, especially when the weather was rough, they still could make the job done, this is an accomplishment of team work.

Bottom depth, based on EK500 (OR1 c581, 4/14 ~ 4/25, 2000)

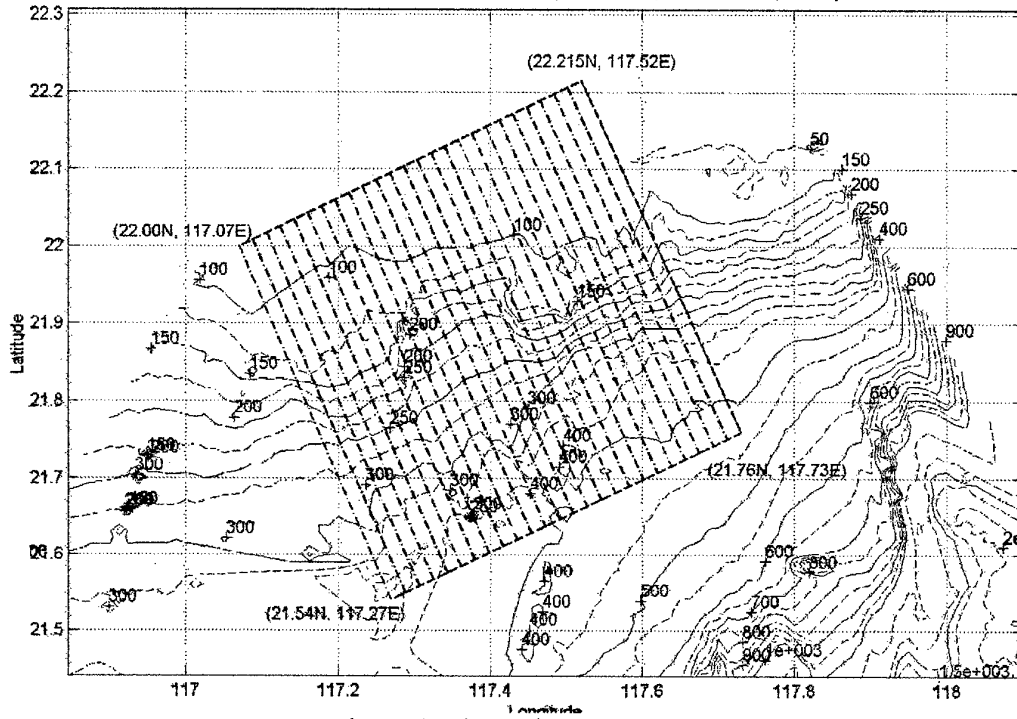


Figure 1. Planned survey tracks.

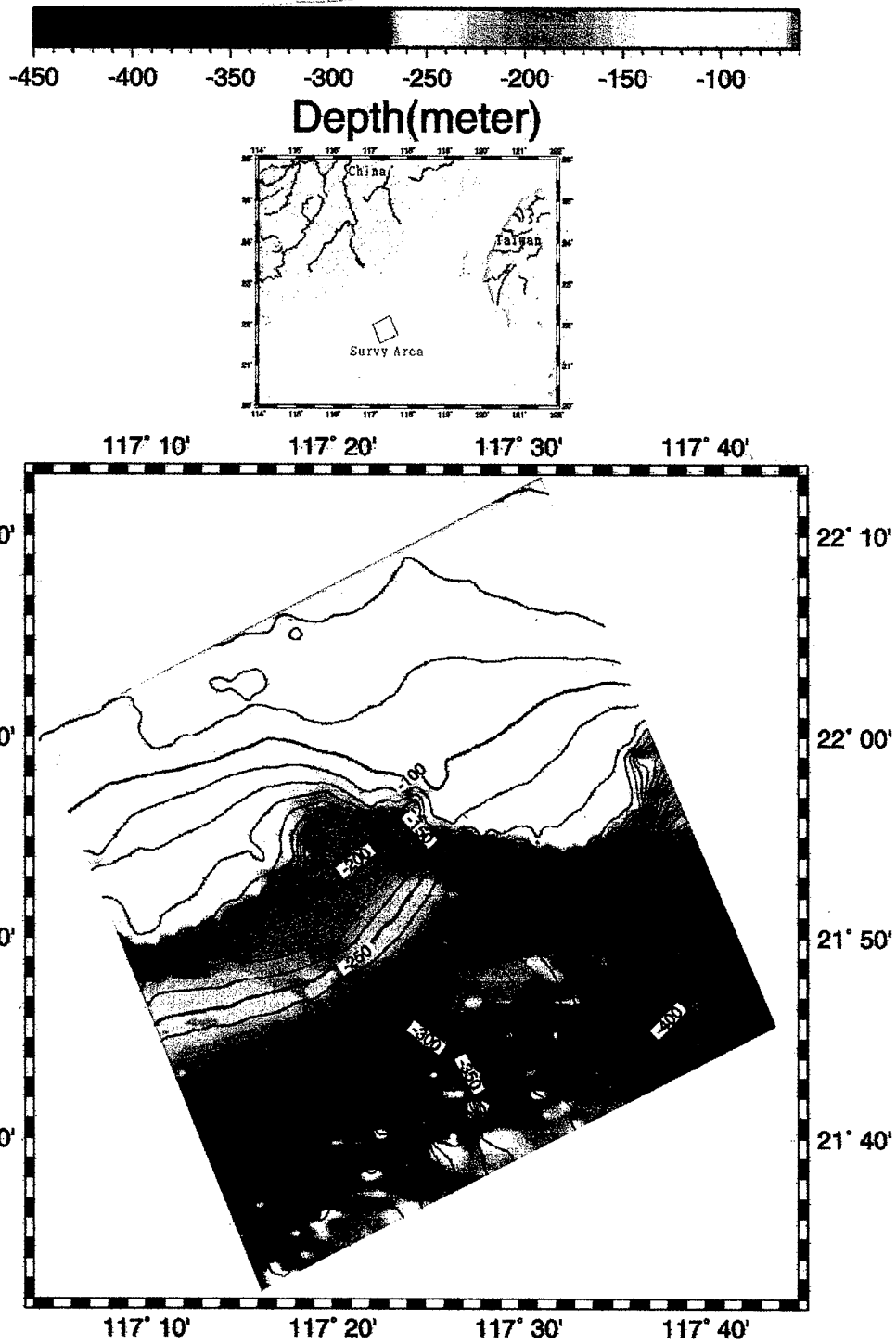


Figure 2. Bathymetry contour of survey site.

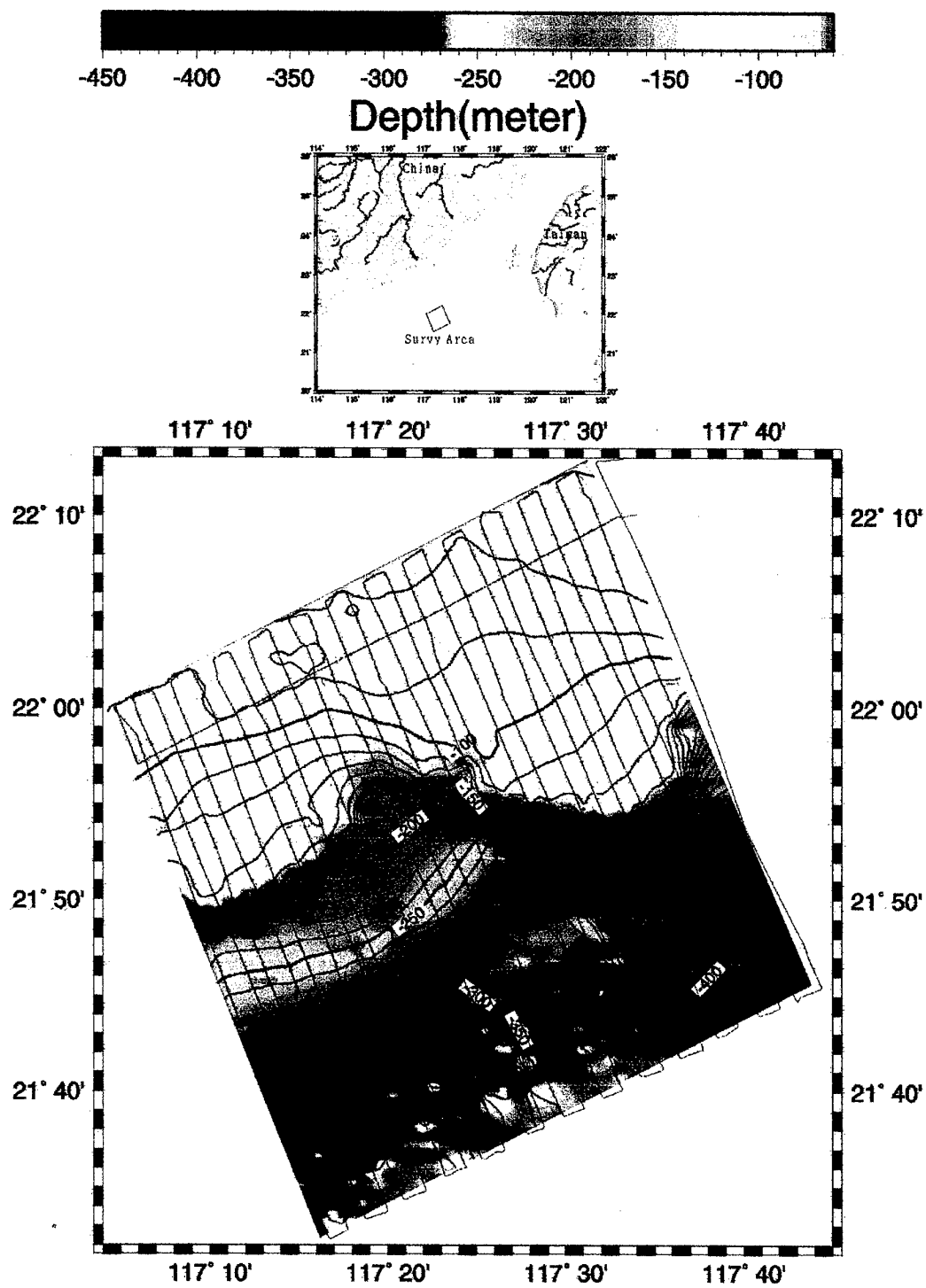


Figure 3. Bathymetry contour of survey site with navigation tracks.

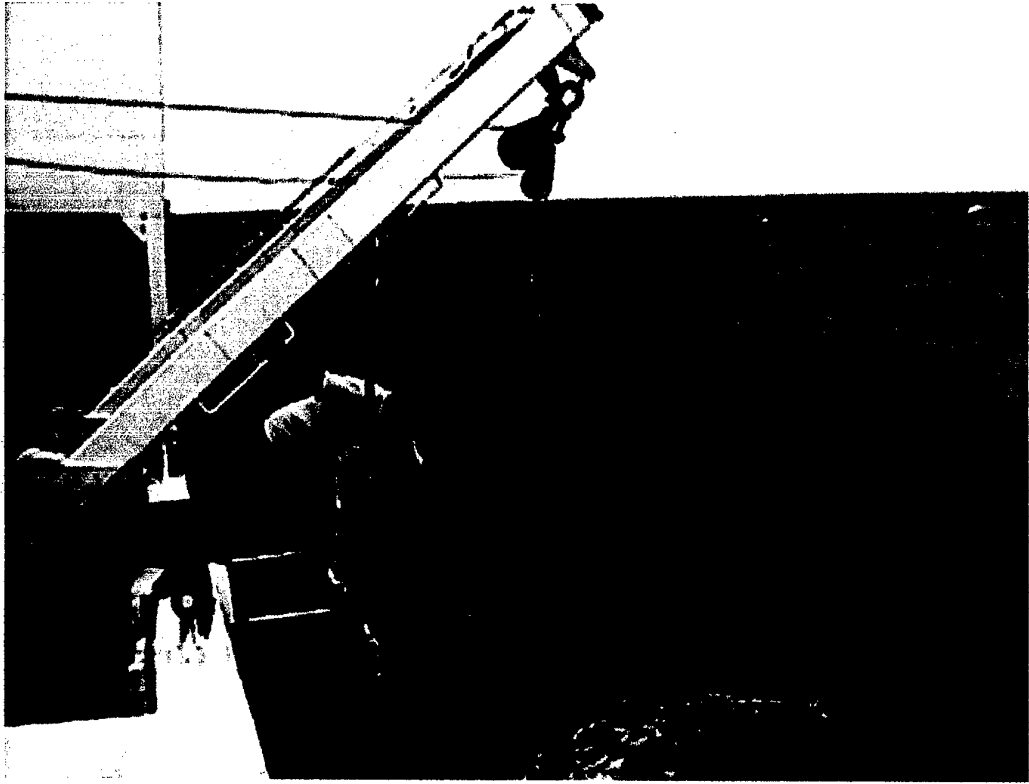


Figure 4. CTD measurement at rough seas.

Table 1. Shipping density observation in SCS of ASIAEX.

| Time        | Type         | Size (tons) | Distance (mi)     | Number |
|-------------|--------------|-------------|-------------------|--------|
| <b>0917</b> |              |             |                   |        |
| 0110        | Fishing boat | -           | 6                 | 1      |
| 0500        | Fishing boat | -           | 4.3               | 1      |
| 0600        | Fishing boat | -           | Scattered (6 mi)  | 14     |
| 0620        | Fishing boat | -           | Scattered (6 mi)  | >30    |
|             | Container    | 60,000      | 6                 | 1      |
|             | Bulk carrier | 50,000      | 6                 | 1      |
| 0700        | Fishing boat | -           | Scattered (6 mi)  | 22     |
| 0800        | Fishing boat | -           | 5.75              | 1      |
| 0900        | Bulk carrier | 10,000      | 10.64             | 1      |
| 1000        | Bulk carrier | 10,000      | 7                 | 1      |
| 1100        | Bulk carrier | 10,000      | 7                 | 1      |
| 1200        | Fishing boat | -           | Scattered (6 mi)  | 10     |
| 1300        | Fishing boat | -           | 5                 | 4      |
| 1400        | Fishing boat | -           | 4                 | 3      |
| 1800        | Fishing boat | -           | 4.5               | 4      |
| 1817        | Fishing boat | -           | Scattered (6 mi)  | 17     |
| 1900        | Fishing boat | -           | Scattered (6 mi)  | 21     |
| 2000        | Fishing boat | -           | Scattered (6 mi)  | 21     |
| 2400        | Fishing boat | -           | Scattered (6 mi)  | 11     |
| <b>0918</b> |              |             |                   |        |
| 0100        | Fishing boat | -           | 11                | 5      |
| 0200        | Fishing boat | -           | Scattered (10 mi) | 14     |
| 0500        | Fishing boat | -           | Scattered (8 mi)  | 14     |
| 0600        | Fishing boat | -           | Scattered (6 mi)  | 8      |
| 0700        | Fishing boat | -           | Scattered (6 mi)  | 22     |
| 1100        | Fishing boat | -           | Scattered (3 mi)  | 25     |
| 1200        | Container    | 30,000-     | 9                 | 2      |
|             | Fishing boat | -           | Scattered (8 mi)  | 6      |
| 1700        | Fishing boat | -           | Scattered (8 mi)  | 8      |
| 1800        | Fishing boat | -           | Scattered (8 mi)  | 17     |
| 1900        | Fishing boat | -           | Scattered (8 mi)  | 24     |
| 2300        | Fishing boat | -           | Scattered (4 mi)  | 12     |
| 2400        | Fishing boat | -           | Scattered (4 mi)  | 5      |
| <b>0919</b> |              |             |                   |        |
| 0500        | Bulk carrier | 30,000      | 2.5               | 1      |
|             | Fishing boat | -           | Scattered (6 mi)  | 5      |
| 1100        | Fishing boat | 150         | 1                 | 1      |
| 1700        | Fishing boat | 20          | Scattered (4 mi)  | 8      |
| 2200        | Container    | 30,000      | 7                 | 1      |
| 2300        | Fishing boat | -           | Scattered (3 mi)  | 6      |
| 2400        | Fishing boat | -           | 1                 | 1      |
| <b>0920</b> |              |             |                   |        |
| 0400        | Fishing boat | -           | Scattered (10 mi) | 12     |
|             | Container    | 30,000      | 5                 | 1      |
| 0500        | Fishing boat | -           | Scattered (6 mi)  | 11     |
| 0600        | Fishing boat | -           | Scattered (6 mi)  | 3      |
|             | Container    | 30,000      | 6                 | 1      |