

## かごしま丸による東シナ海トロール操業年次報告 (平成25年度)

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### 2013 Annual Report of Bottom Trawl Conducted by the Training Ship Kagoshima-maru in the East China Sea

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**Key words:** Bottom trawl, East China Sea, Fishing log, Catch composition

#### Abstract

This report represents a summary of bottom trawling conducted by the Training Ship Kagoshima-maru (66.92 m, 1284 t), Faculty of Fisheries, Kagoshima University, in the East China Sea during 2013 academic year (April, 2013 – March, 2014). Bottom trawling is a main content of trainings provided onboard the Training Ship Kagoshima-maru. The students participated in training voyages have an experience of bottom trawl fishing, and they can also perform broad range of practices utilizing the trawl catch as well (ex. freshness assessment, analysis of size distributions). The results of 12 tows presented here include fishing log (position, towing course and speed, water depth, net geometry, weather and sea state) and weight and number of captured organisms.

#### 緒 言

鹿児島大学水産学部附属練習船かごしま丸（全長 66.92 m、国際トン数 1284 トン、平成 24 年 3 月完成）は、多目的漁業システム（表中層及び着底トロール、まぐろ延縄、まき曳き網）や各種の標本採集具、高度の海洋観測機器を装備し、水産学部ならびに水産学研究科の学生に対し年間を通して乗船実習を実施している。また、か

ごしま丸は平成 22 年度に文部科学省より教育関係共同利用拠点に認定され、練習船を保有しない大学の農・理学系学部や研究科に対しても海洋生物採集や海洋観測など洋上実習の機会を提供している。なかでも東シナ海での着底トロール網を用いた実習は、参加学生が大型漁具を用いた操業を体験できるだけでなく、その漁獲物を活用して幅広い内容の実習・演習を船上で実施できるため、

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多くの実習航海に導入されている。例えば、食品・資源利用学分野の乗船実習では漁獲物の鮮度評価や塩干加工を、漁業工学分野や水産生物・海洋学分野では魚種組成や体長組成の分析、主要種の資源密度推定等の実習を実施している。本稿では、かごしま丸が平成 25 年度 (2013 年 4 月～2014 年 3 月) に、洋上実習の一環として東シナ海で実施した着底トロール操業とその結果の概要を報告する。

### 操業概要

#### 実施期間及び水域

平成 25 年度のトロール操業実習は、2013 年 5 月 25 日 (漁獲物船上処理乗船実習、日本大学共同利用)、6 月 27 日 (カセサート大学共同利用)、10 月 10 日及び 11 日 (漁業乗船実習Ⅱ、近畿大学共同利用)、11 月 6 日 (海

洋観測乗船実習Ⅱ、九州大学共同利用)、11 月 22 日 (宮崎大学共同利用) および 2014 年 3 月 8 日 (水産総合乗船実習) の 7 日間に計 12 回に実施した。操業は、農林水産大臣から許可を受けた以西底曳き網漁業 (1 そうびき) の操業区域のうち、東シナ海陸棚上の北緯 30 度 30 分～31 度 30 分、東経 127 度 15 分～35 分の範囲からなる水域で実施した (Fig. 1)。

#### 漁具及び操業方法

操業には、かごしま丸に装備されている着底トロール網 (全長 52.3 m、ヘッドロープ長 40.6 m、グランドロープ長 50.4 m、コッドエンド目合 66 mm (呼称目合) を用いた。オッターボードはニチモウ UVH 型 (2600 mm x 1600 mm、空中重量 1057.4 Kg、水中重量 920.0 Kg) を使用した。トロール網の展開図と漁具構成を Fig. 2 に示した。トロール網には、漁網監視装置 ScanBas (SCANMAR

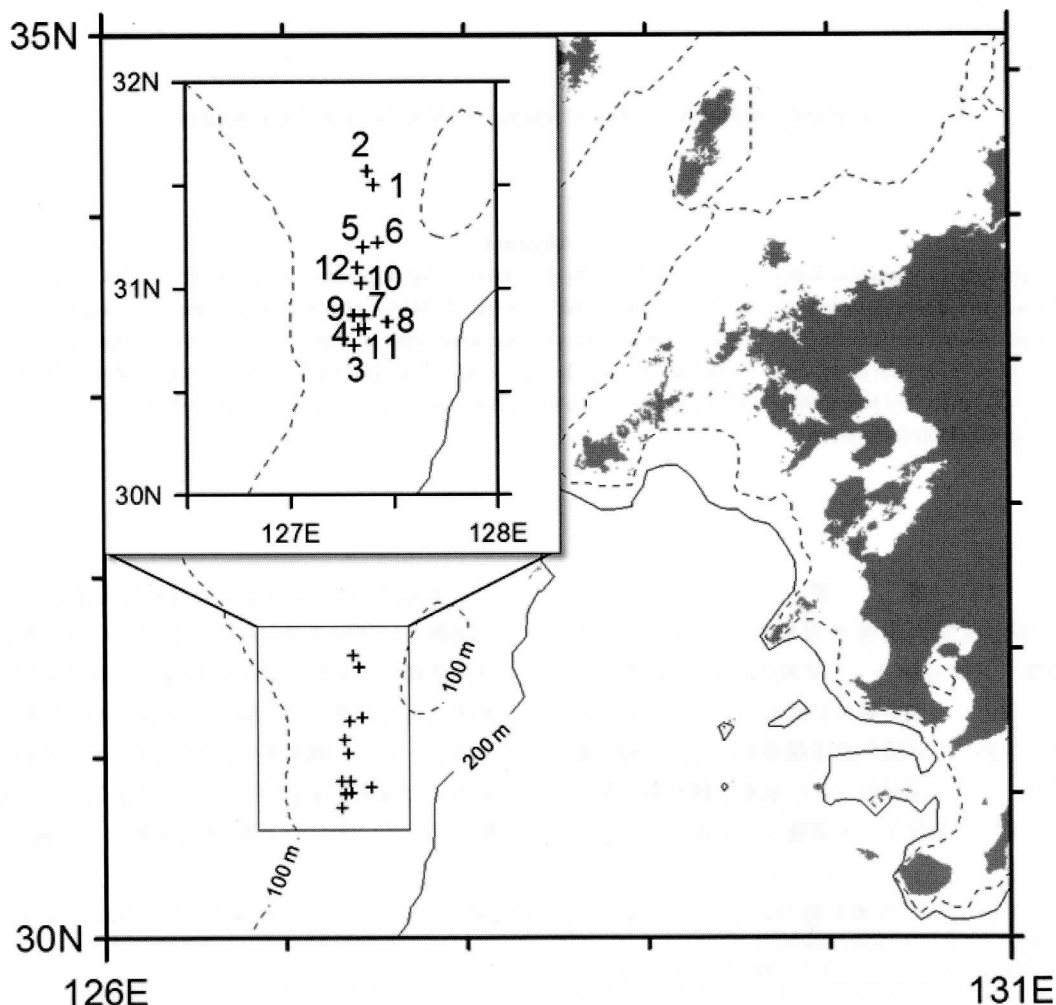


Fig. 1 The distribution of individual hauls made by the Training Ship Kagoshima-maru in the East China Sea during 2013 academic year (April, 2013 – March, 2014).

AS、Norway) の網口高さ・離底距離、深度・水温及び網速度の各センサーをヘッドロープ中央部に、間隔センサーを左右の袖先に装着した。操業時は、船橋のScanBas 表示器により水中の網の挙動をリアルタイムでモニターした。また、ヘッドロープ中央部に装着した網位置測定装置（株式会社ソニック）により、曳網時のトロール網と船との位置関係を船上でモニターした。

全ての操業は昼間に実施した。操業水域は日中漁業協定（漁業に関する日本国と中華人民共和国との間の協定）に基づいて設置された中間水域（両国の共同利用水域）の北東端にあたり、毎操業時、周囲に中国籍と思われる外国漁船が多数見られた。このため、曳網位置や針路は、これらの漁船との競合を避けて決定した。

### 操業記録

学部科目「航海技術乗船実習Ⅰ及びⅡ」で乗船した水産学部4年生の航海当直実習の一環として、全操業について、年月日、時刻、自船の位置及び船速、曳網水深、曳網針路、気象・海象等を着底トロール操業記録（Appendix）に記入した。自船の位置と対地速力はかごしま丸のGPSの表示値を、対水速力は電磁ログの表示値を記入した。曳網中のトロール網の挙動は、漁網監視装置ScanBasの表示値（網速度、袖先間隔、網口高さ、離底距離）を記入した。網の挙動の経時変化を記録するため、曳網開始時（着底時）と終了時（離底時）に加えて、予定曳網時間の1/3及び2/3経過時にも上記表示値を記入した。着底と離底の判断には、漁網監視装置ScanBasの離底距離（グランドロープと海底との距離）の表示値を使用した。離底距離値が0になったときを着底、値が正に増加し始めた時点を離底と定義した。曳網時間と距離は、網が着底して網口高さ及び袖先間隔が静定してからワープ巻き上げを開始して網が離底するまでの時間及び距離とした。

### 漁獲記録

漁獲物は、甲板上で可能な限り種レベルで分類した後、魚種毎の個体数と重量を測定・記録した。ただし、曳網番号1及び2では魚種別重量のみを測定・記録した。多量に漁獲された種（例えばヒラツメガニ）は、プラスチックかご（内寸：長さ52 cm、幅34 cm、深さ27 cm）1個分を標本として抽出し、その重量と個体数を測定した。その後、標本抽出に用いたものと同じ形状のかごを使って残りの漁獲物を計量し、標本重量と個体数を計量に使用した延べかご数で引き伸ばして全体の重量と個体数を求めた。

## 結 果

### 操業概要

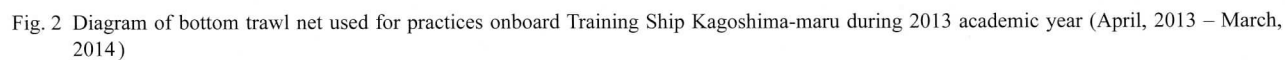
操業時のかごしま丸とトロール網の状況をTable 1に示した。曳網時間と距離は操業毎に異なり、それぞれ49～134分と3.3～6.6マイルの範囲であった。曳網水深は108～131m、ワープ繰り出し長は395～453mで水深の3.3～3.9倍であった。曳網中の平均船速は、対水速力3.1ノット、対地速力3.2ノットであった。漁網監視装置で記録されたトロール網の袖先間隔は21.3～29.0m、網口高さは2.0～3.4m、網速度は1.5～4.1ノットであった。

### 漁獲物組成

12回の操業で漁獲された生物の重量をTable 2に、個体数をTable 3に示した。操業あたり総漁獲重量は28.6kg～381.4Kgであった。操業毎の漁獲種数は、魚類16～35種、甲殻類1～5種、軟体類1～5種であった。水産有用種では、魚類ではキダイ *Dentex hypselosomus*、ホウボウ *Chelidonichthys spinosus*、アカムツ *Doederleinia berycoides*、カイワリ *Kaiwarinus equula*、イボダイ *Psenopsis anolama*、マアジ *Trachurus japonicus*、タチウオ *Trichiurus japonicus*、マトウダイ *Zeus faber*、ヨロイイタチウオ *Hoplobrotula armata*、カゴシマニギス *Argentina kagoshimae*、カナガシラ類 *Lepidotrigla* spp. が漁獲重量、個体数ともに多かった。このうちマトウダイ、カイワリ、キダイは12回全ての操業で、ホウボウ、マアジ、アカムツは11回の操業で漁獲された。

甲殻類では、ヒラツメガニ *Ovalipes punctatus* の漁獲重量と個体数が圧倒的に多かった。ヒラツメガニは、全ての操業で漁獲され、その漁獲重量は全体の半分に当たる6操業で総漁獲量の6割以上を占めた。その他に、ウチワエビ *Ibacus ciliatus*、アカザエビ *Metanephrops japonicus* が少量漁獲された。非有用種では、ヤドカリ類 Paguroidea の漁獲個体数が多かった。

軟体類では、ケンサキイカ *Photololigo edulis*、スルメイカ *Todarodes pacificus*、コウイカ類 *Sepia* spp. の順に漁獲重量が多かった。一方、漁獲個体数では、ケンサキイカ、コウイカ類、スルメイカの順であった。この他にマダコ *Octopus vulgaris* を含むタコ類が少量漁獲された。



| Haul No.                                  | 1                       | 2             | 3             | 4             | 5             | 6             |
|-------------------------------------------|-------------------------|---------------|---------------|---------------|---------------|---------------|
| Date                                      | May 25, 2013            |               | Jun 27, 2013  |               | Oct 10, 2013  |               |
| Moon age                                  | 15.0                    |               | 18.3          |               | 5.0           |               |
| Shot codend                               | Time 08:40              | 12:12         | 08:38         | 11:38         | 9:19          | 13:26         |
|                                           | Latitude 31°-28.55' N   | 31°-33.94' N  | 30°-40.80' N  | 30°-44.40' N  | 31°-12.98' N  | 31°-14.59' N  |
|                                           | Longitude 127°-23.65' E | 127°-21.10' E | 127°-16.22' E | 127°-21.15' E | 127°-20.51' E | 127°-26.74' E |
| Shot trawl doors                          | Time 08:48              | 12:18         | 09:43         | 11:50         | 9:25          | 13:35         |
|                                           | Latitude 31°-29.14' N   | 31°-34.01' N  | 30°-43.07' N  | 30°-47.91' N  | 31°-12.76' N  | 31°-14.23' N  |
|                                           | Longitude 127°-23.91' E | 127°-21.71' E | 127°-18.31' E | 127°-21.43' E | 127°-20.51' E | 127°-26.34' E |
| Net touched down                          | Time 09:01              | 12:30         | 09:56         | 12:01         | 9:42          | 13:52         |
|                                           | Latitude 31°-30.02' N   | 31°-34.11' N  | 30°-43.64' N  | 30°-48.54' N  | 31°-12.01' N  | 31°-13.53' N  |
|                                           | Longitude 127°-24.32' E | 127°-22.61' E | 127°-18.77' E | 127°-21.82' E | 27°-21.18' E  | 127°-25.57' E |
| Net took-off                              | Time 10:15              | 13:42         | 11:08         | 14:15         | 10:31         | 14:58         |
|                                           | Latitude 31°-33.81' N   | 31°-34.32' N  | 30°-46.57' N  | 30°-54.28' N  | 31°-09.95' N  | 31°-10.74' N  |
|                                           | Longitude 127°-26.10' E | 127°-27.73' E | 127°-20.82' E | 127°-25.48' E | 127°-23.12' E | 127°-23.19' E |
| Trawl doors retrieved                     | Time 10:26              | 13:52         | 11:15         | 14:23         | 10:48         | 15:20         |
|                                           | Latitude 31°-34.23' N   | 31°-34.34' N  | 30°-46.82' N  | 30°-54.62' N  | 31°-10.55' N  | 31°-09.92' N  |
|                                           | Longitude 127°-26.39' E | 127°-28.32' E | 127°-20.99' E | 127°-25.61' E | 127°-23.58' E | 127°-23.55' E |
| Hauled up codend                          | Time 10:40              | 14:07         | 11:25         | 14:35         | 10:58         | 15:30         |
|                                           | Latitude 31°-34.74' N   | 31°-34.58' N  | 30°-47.16' N  | 30°-55.16' N  | 31°-11.24' N  | 31°-08.71' N  |
|                                           | Longitude 127°-26.79' E | 127°-29.24' E | 127°-21.20' E | 127°-25.65' E | 127°-24.28' E | 127°-24.09' E |
| Towing duration (min.)                    | 74                      | 72            | 72            | 134           | 49            | 66            |
| Towing direction (°)                      | 30                      | 80            | 40            | 40            | 160           | 220           |
| Towing distance (NM)                      | 3.6                     | 4.4           | 3.4           | 6.6           | 3.7           | 4.0           |
| Warp length (m)                           | 450                     | 450           | 420           | 420           | 395           | 413           |
| Current direction (°)                     | 317                     | 124           | 264           | 291           | 355           | 18            |
| Current speed (kt)                        | 0.7                     | 0.6           | 0.4           | 0.2           | 1.5           | 1.2           |
| Water depth (m)                           | Start of tow 131.0      | 122.0         | 118.0         | 113.8         | 113.1         | 116.0         |
|                                           | 1/3 elapsed 129.0       | 126.0         | 118.0         | 114.2         | 113.0         | 116.0         |
|                                           | 2/3 elapsed 128.0       | 126.0         | 118.0         | 116.8         | 113.7         | 115.0         |
|                                           | End of tow 130.0        | 127.0         | 120.0         | 118.1         | 114.4         | -             |
| Vessel speed (kt)                         |                         |               |               |               |               |               |
| through the water (kt)                    | Start of tow 2.8        | 3.0           | 2.4           | 2.7           | 4.4           | 4.7           |
|                                           | 1/3 elapsed 2.9         | 3.7           | 3.4           | 3.1           | 4.5           | 4.6           |
|                                           | 2/3 elapsed 3.0         | 3.6           | 2.9           | 2.9           | 3.6           | 4.4           |
|                                           | End of tow 1.8          | 3.0           | 2.9           | 2.9           | 2.0           | 4.2           |
| over the ground (kt)                      | Start of tow 3.3        | 3.5           | 2.6           | 3.1           | 3.4           | 3.2           |
|                                           | 1/3 elapsed 3.2         | 3.3           | 3.2           | 2.9           | 3.4           | 3.1           |
|                                           | 2/3 elapsed 3.4         | 3.2           | 3.1           | 2.9           | 3.1           | 3.0           |
|                                           | End of tow 2.3          | 2.3           | 3.1           | 3.0           | 2.5           | 3.2           |
| Net geometry                              |                         |               |               |               |               |               |
| Net speed (kt)                            | Start of tow 2.1        | 1.8           | 2.8           | 3.2           | 1.7           | 1.5           |
|                                           | 1/3 elapsed 1.7         | 2.1           | 3.2           | 3.1           | 1.5           | 1.5           |
|                                           | 2/3 elapsed 1.8         | 2.0           | 3.0           | 3.0           | 1.5           | 1.5           |
|                                           | End of tow 2.5          | 2.8           | 3.5           | 2.8           | 1.5           | 1.5           |
| Wing-tip distance (m)                     | Start of tow 24.0       | 29.0          | -             | -             | 24.0          | 24.0          |
|                                           | 1/3 elapsed 25.0        | 27.0          | -             | 21.3          | 24.0          | 25.0          |
|                                           | 2/3 elapsed 14.0        | 26.0          | -             | 22.1          | 23.0          | 24.0          |
|                                           | End of tow 25.0         | 25.0          | -             | 22.9          | 22.0          | 24.0          |
| Vertical net opening (m)                  | Start of tow 3.1        | 2.8           | -             | -             | 2.8           | 2.8           |
|                                           | 1/3 elapsed 2.6         | 2.6           | -             | 2.9           | 2.0           | 2.7           |
|                                           | 2/3 elapsed 2.4         | 2.6           | -             | 2.7           | 2.9           | 2.8           |
|                                           | End of tow 2.1          | 2.3           | -             | 2.8           | 3.4           | 2.8           |
| Weather                                   | bc                      | bc            | c             | r             | bc            | bc            |
| Wind direction                            | E                       | NW            | NE            | E             | S             | S             |
| Beaufort scale                            | 2                       | 2             | 4             | 4             | 2             | 2             |
| Sea state                                 | 2                       | 1             | 4             | 4             | 3             | 3             |
| Atmospheric pres. (hPa)                   | 1015.2                  | 1015.7        | 1004.4        | 1003.3        | 1015.3        | 1014.2        |
| Air temperature (°C)                      | 21.9                    | 22.9          | 24.6          | 24.1          | 26.8          | 26.9          |
| Water temperature (°C)                    |                         |               |               |               |               |               |
| Sea surface                               | 20.3                    | 20.2          | 25.0          | 24.9          | 26.2          | 26.5          |
| Trawl depth                               | 15.3                    | 15.3          | 15.0          | 15.1          | 17.1          | 17.4          |
| Wing-tip and Vert. opening sensors failed |                         |               |               |               |               |               |

Table 1 Fishing log from bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014)

| Haul No.                 |              | 7             | 8             | 9            | 10           | 11           | 12            |
|--------------------------|--------------|---------------|---------------|--------------|--------------|--------------|---------------|
| Date                     |              | Oct 11, 2013  |               | Nov 6, 2013  |              | Nov 22, 2013 | Mar 8, 2014   |
| Moon age                 |              | 6.0           |               | 2.5          |              | 18.5         | 6.7           |
| Shot codend              | Time         | 8:46          | 13:36         | 08:50        | 13:12        | 09:50        | 10:12         |
|                          | Latitude     | 30°-53.31' N  | 30°-48.50' N  | 30-50.83' N  | 30-59.99' N  | 30-49.13' N  | 31°-07.33' N  |
|                          | Longitud     | 127°-20.46' E | 127°-27.69' E | 127-18.80' E | 127-20.88' E | 127-19.66' E | 127°-19.38' E |
| Shot trawl doors         | Time         | 8:55          | 13:45         | 8:57         | 13:20        | 9:59         | 10:21         |
|                          | Latitude     | 30°-52.94' N  | 30°-49.29' N  | 30-51.42' N  | 31-00.64' N  | 30-48.73' N  | 31°-06.91' N  |
|                          | Longitud     | 127°-20.88' E | 127°-27.91' E | 127-18.77' E | 127-20.89' E | 127-19.73' E | 127°-19.50' E |
| Net touched down         | Time         | 9:08          | 14:03         | 9:09         | 13:35        | 10:10        | 10:37         |
|                          | Latitude     | 30°-52.32' N  | 30°-50.35' N  | 30-52.32' N  | 31-01.80' N  | 30-48.13' N  | 31°-06.06' N  |
|                          | Longitud     | 127°-21.53' E | 127°-28.16' E | 127-18.63' E | 127-20.92' E | 127-19.96' E | 127°-19.77' E |
| Net took-off             | Time         | 10:13         | 15:01         | 10:20        | 14:48        | 12:07        | 12:37         |
|                          | Latitude     | 30°-50.52' N  | 30°-52.24' N  | 30-56.94' N  | 31-06.24' N  | 30-43.54' N  | 31°-01.62' N  |
|                          | Longitud     | 127°-25.71' E | 127°-31.84' E | 127-16.58' E | 127-21.20' E | 127-21.31' E | 127°-21.33' E |
| Trawl doors retrieved    | Time         | 10:28         | 15:16         | 10:31        | 14:57        | 12:18        | 12:46         |
|                          | Latitude     | 30°-50.47' N  | 30°-52.04' N  | 30-57.45' N  | 31-06.66' N  | 30-43.27' N  | 31°-01.36' N  |
|                          | Longitud     | 127°-25.16' E | 127°-32.42' E | 127-16.28' E | 127-21.29' E | 127-21.42' E | 127°-21.43' E |
| Hauled up codend         | Time         | 10:36         | 15:32         | 10:42        | 15:12        | 12:30        | 12:58         |
|                          | Latitude     | 30°-50.52' N  | 30°-51.79' N  | 30-58.07' N  | 31-07.41' N  | 30-42.92' N  | 31°-01.02' N  |
|                          | Longitud     | 127°-25.71' E | 127°-33.71' E | 127-15.86' E | 127-21.34' E | 127-21.65' E | 127°-21.56' E |
| Towing duration (min.)   |              | 65            | 58            | 71           | 73           | 117          | 120           |
| Towing direction (°)     |              | 135           | 0 - 80        | 350          | 0            | 160          | 160           |
| Towing distance (NM)     |              | 3.3           | 4.1           | 4.9          | 4.1          | 4.6          | 5.4           |
| Warp length (m)          |              | 410           | 420           | 400          | 420          | 410          | 453           |
| Current direction (°)    |              | 348           | 306           | 315          | 359.0        | 325          | 333           |
| Current speed (kt)       |              | 1.6           | 1.1           | 0.9          | 2.3          | 0.8          | 0.7           |
| Water depth (m)          | Start of tow | 116.5         | 122.0         | 108.0        | 120.0        | 116.3        | 112.3         |
|                          | 1/3 elapsed  | 117.5         | 123.0         | 110.0        | 117.5        | 117.6        | 114.8         |
|                          | 2/3 elapsed  | 118.6         | 124.0         | 110.0        | 114.5        | 118.5        | 118.4         |
|                          | End of tow   | 119.3         | 121.0         | 108.0        | 117.4        | 117.7        | 119.0         |
| Vessel speed (kt)        |              |               |               |              |              |              |               |
| through the water (kt)   | Start of tow | -             | 2.7           | 3.0          | 2.7          | 3.1          | 2.7           |
|                          | 1/3 elapsed  | -             | 2.1           | 3.1          | 2.7          | 3.6          | 2.8           |
|                          | 2/3 elapsed  | 3.6           | 2.2           | 3.0          | 2.9          | 3.7          | 3.1           |
|                          | End of tow   | 3.1           | 1.8           | 3.0          | 2.8          | 3.1          | 2.8           |
| over the ground (kt)     | Start of tow | 3.0           | 4.0           | 4.2          | 4.1          | 2.3          | 2.3           |
|                          | 1/3 elapsed  | 3.0           | 4.1           | 4.2          | 3.7          | 2.5          | 2.3           |
|                          | 2/3 elapsed  | 3.0           | 4.1           | 4.2          | 3.8          | 2.7          | 2.1           |
|                          | End of tow   | 3.5           | 3.5           | 4.2          | 3.6          | 2.2          | 1.8           |
| Net geometry             |              |               |               |              |              |              |               |
| Net speed (kt)           | Start of tow | 4.1           | 1.5           | 0.5          | 3.0          | 2.3          | 2.0           |
|                          | 1/3 elapsed  | 3.5           | 1.5           | 0.4          | 2.9          | 2.1          | 1.9           |
|                          | 2/3 elapsed  | 3.7           | 1.5           | 0.5          | 2.9          | 2.0          | 1.7           |
|                          | End of tow   | 3.3           | 1.5           | 0.4          | 2.8          | 2.3          | 1.5           |
| Wing-tip distance (m)    | Start of tow | 23.8          | 23.0          | 26.9         | 26.1         | 25.0         | 21.9          |
|                          | 1/3 elapsed  | 26.1          | 23.0          | 27.4         | 22.0         | 26.0         | 37.1          |
|                          | 2/3 elapsed  | 23.9          | 22.0          | 24.8         | 22.8         | 26.0         | 37.1          |
|                          | End of tow   | 22.6          | 22.0          | 24.2         | 22.6         | 22.0         | 22.6          |
| Vertical net opening (m) | Start of tow | 2.8           | 3.1           | 3.3          | 2.8          | 3.3          | 3.2           |
|                          | 1/3 elapsed  | 2.6           | 2.8           | 2.8          | 3.4          | 2.6          | 2.7           |
|                          | 2/3 elapsed  | 2.9           | 3.2           | 2.8          | 2.8          | 2.7          | 2.8           |
|                          | End of tow   | 3.2           | 3.3           | 2.8          | 2.8          | 2.6          | 2.8           |
| Weather                  |              | bc            | b             | bc           | c            | bc           | o             |
| Wind direction           |              | N             | N             | SE           | S            | N            | NNE           |
| Beaufort scale           |              | 4             | 4             | 3            | 4            | 5            | 4             |
| Sea state                |              | 3             | 3             | 1            | 2            | 3            | 3             |
| Atmospheric pres. (hPa)  |              | 1015.3        | 1014.0        | 1021.8       | 1020.5       | 1026.0       | 1024.0        |
| Air temperature (°C)     |              | 25.3          | 26.0          | 23.0         | 23.5         | 19.0         | 10.4          |
| Water temperature (°C)   |              |               |               |              |              |              |               |
| Sea surface              |              | 26.0          | 26.2          | 24.6         | 23.8         | 22.5         | 18.0          |
| Trawl depth              |              | 16.5          | 16.8          | 17.0         | 17.3         | 16.6         | 16.9          |

Table 1 Fishing log from bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014) (Continued)

|         | Nomenclature                      | English name              | Haul number |     |     |      |     |     |     |      |     |     |      |      | Total |
|---------|-----------------------------------|---------------------------|-------------|-----|-----|------|-----|-----|-----|------|-----|-----|------|------|-------|
|         |                                   |                           | 1           | 2   | 3   | 4    | 5   | 6   | 7   | 8    | 9   | 10  | 11   | 12   |       |
| Finfish | <i>Aluterus monoceros</i>         | Unicorn filefish          |             |     | 1.0 |      |     |     |     |      |     |     |      |      | 1.0   |
|         | <i>Antennarius striatus</i>       | Striated frogfish         |             |     |     |      |     |     | 0.2 |      |     |     |      |      | 0.2   |
|         | <i>Argentina kagoshimae</i>       |                           |             |     | 0.0 | 7.1  |     |     | 0.1 |      |     | 0.1 | 0.1  |      | 7.4   |
|         | <i>Arnoglossus</i> sp.            | Flounder                  |             |     |     | 0.1  |     |     |     |      |     |     |      |      | 0.1   |
|         | Ateleopodidae                     | Jellynose fish            |             | 0.1 |     |      |     |     |     |      |     |     | 0.1  |      | 0.2   |
|         | <i>Aulopus japonicus</i>          | Japanese thread sail fish |             | 0.2 |     |      |     |     |     | 0.0  |     |     | 0.1  |      | 1.4   |
|         | <i>Bembras japonica</i>           | Red flathead              | 0.1         |     |     | 1.0  |     |     |     |      |     |     |      |      | 0.9   |
|         | <i>Branchiostegus japonicus</i>   | Red tilefish              |             |     |     | 0.1  |     | 0.2 | 0.1 |      | 0.2 | 0.3 |      |      | 0.8   |
|         | <i>Branchiostegus</i> spp.        | Tilefish                  | 0.2         | 0.2 |     |      | 0.4 |     |     |      |     |     |      | 0.3  | 0.8   |
|         | <i>Caetorinchus multispinosus</i> | Spearnose grenadier       |             |     |     |      |     |     |     |      |     |     |      |      | 1.4   |
|         | Callionymidae                     | Dragonets                 |             |     |     | 0.4  |     | 0.0 |     | 0.1  |     |     | 1.0  |      | 0.1   |
|         | <i>Chanunax abei</i>              |                           | 0.1         |     | 0.1 |      |     |     |     | 0.1  |     |     | 0.1  |      | 0.3   |
|         | <i>Chelidonichthys spinosus</i>   | Red gurnard               | 2.5         | 1.5 | 1.0 | 3.0  | 3.2 | 3.7 | 4.7 | 11.0 | 4.2 | 7.7 | 16.0 |      | 58.5  |
|         | <i>Chelidoperca hirundinacea</i>  |                           | 0.1         |     |     |      | 0.1 | 0.1 | 0.0 |      |     |     | 0.1  |      | 0.4   |
|         | <i>Citharoides macrolepidotus</i> | Largescale flounder       |             |     | 0.1 | 0.9  |     | 0.2 | 0.3 | 0.1  |     |     | 0.5  |      | 1.9   |
|         | <i>Coelorinchus</i> spp.          | Rattail                   |             |     |     |      | 0.2 | 0.2 |     |      |     |     |      |      | 0.4   |
|         | Congridae                         | Conger                    |             |     |     |      |     |     |     |      |     |     |      | 1.2  | 1.2   |
|         | <i>Cookeolus japonicus</i>        | Longfinned bullseye       |             |     |     |      |     |     |     |      | 0.3 | 0.3 |      |      | 0.6   |
|         | <i>Dentex hypselosomus</i>        | Yellowback seabream       | 3.0         | 3.5 | 1.5 | 3.5  | 0.4 | 0.6 | 0.9 | 0.1  | 0.9 | 3.4 | 1.5  | 0.4  | 19.7  |
|         | <i>Dipturus kwangtungensis</i>    | Kwangtung skate           |             |     |     |      | 2.0 |     |     |      |     | 1.0 |      |      | 3.0   |
|         | <i>Doederleinia berycoides</i>    | Rosy seabass              | 2.5         | 3.5 |     | 2.0  | 4.2 | 9.7 | 2.3 | 0.2  | 1.8 | 5.3 | 2.5  | 2.2  | 36.2  |
|         | <i>Erisphex potii</i>             | Spotted velvet fish       |             |     |     | 0.1  |     |     |     |      |     |     |      |      | 0.1   |
|         | <i>Fistularia Petimba</i>         | Red cornetfish            |             |     |     |      |     |     |     | 1.0  |     |     | 1.6  | 0.7  | 3.3   |
|         | Gempylidae                        | Snake mackerels           |             |     |     |      |     |     | 0.7 |      |     |     |      |      | 0.7   |
|         | <i>Glossanodon semifaciatus</i>   | Deepsea smelt             | 0.5         | 1.4 |     |      |     |     |     |      |     |     |      |      | 1.9   |
|         | <i>Halieutaea stellata</i>        | Starry handfish           | 0.1         | 0.1 | 0.5 | 1.0  |     | 0.1 |     |      |     | 0.1 | 0.4  |      | 2.3   |
|         | <i>Helicolenus hilgendorfi</i>    | Hilgendorf saucor         |             |     |     |      |     |     |     |      | 0.2 | 0.1 |      |      | 0.3   |
|         | <i>Histiopertus typus</i>         | Sailfin armourhead        |             |     |     | 0.1  |     |     |     |      |     |     | 0.1  |      | 0.2   |
|         | <i>Hoplobrotula armata</i>        | Armoured cusk             | 1.5         |     |     | 1.0  | 5.5 | 2.3 | 0.0 | 0.2  | 1.0 | 1.8 | 0.8  |      | 14.1  |
|         | <i>Kaivarinus equula</i>          | Whitefin trevally         | 1.0         | 0.4 | 0.1 | 3.0  | 0.6 | 1.6 | 0.4 | 1.6  | 1.0 | 1.7 | 0.2  | 26.2 | 37.8  |
|         | <i>Kentrocapros aculeatus</i>     | Basketfish                |             |     |     | 0.1  |     |     |     |      |     |     |      |      | 0.1   |
|         | <i>Lagocephalus</i> spp.          | Smooth puffers            |             |     |     |      |     |     |     | 4.5  |     |     |      | 1.2  | 5.7   |
|         | <i>Lepidotrigla abyssalis</i>     | Abyssal searobin          |             |     | 1.1 | 11.0 |     |     |     |      |     |     |      |      | 12.1  |

Table 2 Fishing log from bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014)

| Nomenclature                    | English name              | Haul number |     |     |     |      |      |      |     |     |     |     |     | Total |
|---------------------------------|---------------------------|-------------|-----|-----|-----|------|------|------|-----|-----|-----|-----|-----|-------|
|                                 |                           | 1           | 2   | 3   | 4   | 5    | 6    | 7    | 8   | 9   | 10  | 11  | 12  |       |
| Finfish                         |                           |             |     |     |     |      |      |      |     |     |     |     |     |       |
| <i>Lepidorigla guentheri</i>    | Red banded searobin       |             |     | 0.4 |     |      |      |      |     | 0.4 | 0.5 | 3.0 |     | 4.3   |
| <i>Lepidorigla microptera</i>   | Redwing searobin          |             |     |     |     |      |      |      |     |     | 0.3 | 1.5 |     | 1.8   |
| <i>Lepidorigla</i> spp.         | Searobins                 | 2.5         | 2.6 |     |     | 0.1  | 0.5  | 2.5  | 0.1 |     |     | 0.1 | 2.2 | 10.5  |
| Lophiidae                       | Anglerfish                |             |     |     |     |      |      |      |     | 2.0 |     |     |     | 2.0   |
| <i>Lophiomus setigerus</i>      | Blackmouth angler         |             |     |     | 1.5 |      | 2.8  | 1.0  |     |     |     | 0.4 | 2.3 | 8.0   |
| <i>Lophius litulon</i>          | Yellow goosefish          | 0.5         | 1.0 |     |     |      | 0.2  |      |     |     |     | 1.0 |     | 2.7   |
| <i>Macroramphosus scolopax</i>  | Longspine snipefish       |             |     |     |     |      |      | 0.0  | 0.1 |     |     |     |     | 0.1   |
| Macrouridae                     | Grenadier                 | 0.1         |     |     |     |      |      |      |     |     |     |     |     | 0.1   |
| <i>Minous quincarinatus</i>     | White tail goblin fish    |             |     |     | 0.1 |      |      |      |     |     |     |     |     | 0.1   |
| <i>Monocentris japonica</i>     | Pinecone fish             |             |     |     | 0.1 |      |      |      |     |     |     |     |     | 0.1   |
| <i>Muraenesox cinereus</i>      | Daggettooth pike conger   |             |     |     | 5.0 |      |      |      |     |     |     |     |     | 5.0   |
| <i>Nippon spinosus</i>          | Sawedged perch            |             |     |     |     |      | 0.3  | 0.1  |     |     |     |     |     | 0.3   |
| Pleuronectidae                  | Righteye flounder         |             |     |     |     |      |      |      | 0.1 |     |     |     |     | 0.1   |
| <i>Pleuronichthys cornutus</i>  | Finespotted flounder      | 0.9         | 0.5 |     | 0.1 |      | 0.0  | 0.2  | 0.2 |     |     |     |     | 1.6   |
| <i>Priacanthus macracanthus</i> | Red bigeye                | 0.2         |     |     | 1.5 | 49.8 | 65.6 | 72.3 | 4.1 | 2.8 | 1.0 | 0.1 |     | 197.4 |
| <i>Psenopsis anolama</i>        | Melon seed                |             |     |     |     |      |      |      |     |     |     | 0.1 |     | 0.1   |
| <i>Repomucenus virgis</i>       | Hooded dragonet           |             |     |     |     |      |      |      |     |     | 0.1 |     |     | 0.1   |
| <i>Satyricthys rieffeli</i>     | Spotted armoured-gurnard  |             |     |     |     |      |      |      |     |     | 1.1 | 1.0 |     | 2.1   |
| <i>Saurida elongata</i>         | Slender lizardfish        |             |     |     |     |      |      |      |     |     |     | 0.1 |     | 0.1   |
| <i>Saurida macrolepis</i>       | Brushtooth lizardfish     |             |     |     |     |      |      |      |     |     |     | 1.0 |     | 2.3   |
| <i>Saurida wanieso</i>          | Wanieso lizardfish        |             |     |     | 0.1 | 0.1  | 0.1  | 1.1  | 2.5 |     |     |     |     | 2.5   |
| <i>Scomber australasicus</i>    | Spotted chub mackerel     |             |     |     |     |      |      |      |     | 0.4 | 0.6 |     |     | 1.0   |
| <i>Scomber japonicus</i>        | Mackerel                  |             |     |     |     |      |      |      |     |     |     |     |     | 0.7   |
| <i>Scomber japonicus</i>        | Chub mackerel             |             | 0.3 |     |     | 0.2  | 0.2  |      |     | 0.8 |     |     | 1.2 | 2.0   |
| <i>Scomberomorus niphonius</i>  | Japanese Spanish mackerel |             |     |     |     |      |      |      |     | 1.2 | 0.4 | 1.0 |     | 6.5   |
| <i>Scorpaena anaria</i>         | Izu scorpion fish         | 0.2         |     | 0.3 | 0.8 | 1.0  | 0.9  | 0.7  |     |     |     |     |     | 6.6   |
| <i>Sebastiscus marmoratus</i>   | False kelpfish            |             |     | 0.1 |     |      | 0.3  |      |     |     | 0.2 | 0.4 |     | 15.1  |
| <i>Sphoeroides pachygaster</i>  | Slackskinned puffer       |             |     |     | 0.1 | 2.0  |      |      | 6.0 | 1.8 | 4.8 | 0.4 |     | 16.6  |
| <i>Sphyræna japonica</i>        | Japanese barracuda        |             |     |     |     |      |      |      |     | 0.4 | 0.2 | 1.0 |     | 1.3   |
| <i>Sphyræna pinguis</i>         | Brown barracuda           |             |     |     | 0.6 |      | 0.7  |      |     |     |     |     | 0.8 | 0.8   |
| <i>Sphyræna</i> sp.             | Barracudas                |             |     |     |     |      |      |      |     |     |     |     |     | 0.1   |
| <i>Synagrops japonicus</i>      | Blackmouth                |             |     |     |     |      | 0.1  |      |     |     |     |     |     | 0.1   |
| Synodontidae                    | Lizardfish / Snakefish    |             | 0.6 |     |     |      |      |      |     | 0.4 | 0.3 |     | 5.2 | 6.5   |
| <i>Synodus macrops</i>          | Triplecross lizardfish    |             |     |     | 0.1 |      |      |      |     |     |     |     |     | 0.1   |

Table 2 Fishing log from bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014) (Continued)

| Nomenclature | English name                     | Haul number |      |      |       |      |      |      |       |      |       |       |       | Total  |
|--------------|----------------------------------|-------------|------|------|-------|------|------|------|-------|------|-------|-------|-------|--------|
|              |                                  | 1           | 2    | 3    | 4     | 5    | 6    | 7    | 8     | 9    | 10    | 11    | 12    |        |
| Finfish      | Tetraodontidae                   |             |      |      |       |      | 3.3  |      |       |      |       |       |       | 3.3    |
|              | <i>Thamnaconus hypargyreus</i>   |             |      |      |       |      |      |      |       |      |       |       |       | 2.3    |
|              | <i>Thamnaconus modestus</i>      |             |      |      |       |      |      |      |       |      |       |       |       | 3.9    |
|              | <i>Trachipterus ishikawae</i>    |             |      |      |       |      |      |      |       |      |       |       |       | 1.0    |
|              | <i>Trachurus japonicus</i>       | 10.0        | 18.5 |      |       | 2.0  | 0.4  | 2.2  | 3.5   | 14.1 | 1.7   | 2.2   | 0.2   | 55.6   |
|              | <i>Triacanthodes anomalus</i>    | 0.1         |      | 0.0  | 0.2   |      |      | 0.3  | 0.2   | 0.2  | 0.1   | 0.1   |       | 1.2    |
|              | <i>Trichiurus japonicus</i>      |             | 3.0  |      |       |      |      |      | 27.5  | 1.8  | 0.9   | 1.0   |       | 40.9   |
|              | <i>Upeneus japonicus</i>         |             |      |      |       |      |      |      |       |      |       |       |       | 0.3    |
|              | <i>Uranoscopus japonicus</i>     |             |      |      |       |      |      |      |       |      |       |       |       | 0.6    |
|              | <i>Zenopsis nebulosa</i>         |             | 0.2  |      | 0.5   |      |      | 0.1  | 0.2   |      |       | 0.3   |       | 0.7    |
|              | <i>Zeus faber</i>                | 2.0         | 1.6  | 2.5  | 17.0  | 2.0  | 15.3 | 4.7  | 5.9   | 3.4  | 15.1  | 31.0  | 24.4  | 124.9  |
|              | Other fishes                     |             |      |      |       |      |      |      |       | 2.4  | 2.8   |       |       | 5.2    |
| Crustacea    | <i>Charybdis riversandersoni</i> |             |      | 0.3  |       |      | 0.2  |      |       |      |       |       |       | 0.5    |
|              | <i>Ibacus ciliatus</i>           |             | 0.1  | 0.1  |       | 1.4  | 3.9  | 0.4  | 0.3   | 0.4  |       | 1.0   |       | 7.6    |
|              | Majidae                          |             |      |      | 1.5   |      |      |      |       |      |       |       |       | 1.5    |
|              | <i>Metanephrops japonicus</i>    |             |      |      |       |      |      |      |       |      |       |       |       | 0.1    |
|              | <i>Metanephrops thomsoni</i>     |             |      |      |       | 0.1  |      |      |       |      |       |       |       | 0.1    |
|              | <i>Oratosquilla oratoria</i>     |             |      |      | 0.4   |      |      |      |       |      |       |       |       | 0.4    |
|              | <i>Ovalipes punctatus</i>        | 54.3        | 3.5  | 18.0 | 213.0 | 25.0 | 37.5 | 41.3 | 244.1 | 19.9 | 317.1 | 286.0 | 280.0 | 1539.7 |
|              | Paguroidea                       |             | 5.5  | 0.0  | 5.0   |      |      |      |       |      |       |       |       | 10.5   |
|              | <i>Plesionika</i> sp.            |             |      |      | 0.1   |      |      |      |       |      |       |       |       | 0.1    |
|              | Other Crustacea                  | 0.0         | 0.0  | 0.0  | 0.0   | 0.0  | 0.1  | 0.5  | 0.0   | 2.0  | 2.1   | 0.1   | 0.0   | 4.7    |
|              | Common octopus                   |             |      |      |       |      | 2.6  | 0.0  |       | 0.3  | 2.1   |       |       | 5.0    |
|              | <i>Ocutopus</i>                  |             |      |      | 0.4   | 1.0  | 2.4  |      |       |      |       | 0.1   | 4.2   | 8.0    |
|              | <i>Photoligo edulis</i>          | 1.6         | 1.4  | 0.2  | 8.5   | 4.5  | 7.8  | 11.6 | 8.5   | 4.0  | 6.4   | 4.5   |       | 59.0   |
| Mollusca     | Septidae                         | 0.8         | 1.4  | 0.0  | 1.2   | 0.0  | 0.6  | 0.4  | 0.0   | 1.9  | 0.0   | 3.0   | 2.4   | 11.7   |
|              | <i>Todarodes pacificus</i>       | 16.0        | 12.2 |      | 4.5   |      |      | 0.2  | 0.2   | 1.2  | 0.8   | 0.4   | 8.2   | 43.7   |
|              | <i>Guldfordia triumphans</i>     |             |      | 0.0  | 0.5   |      |      |      |       |      |       |       |       | 0.5    |
|              | <i>Volva volva</i>               |             |      | 0.0  |       |      |      |      |       |      |       |       |       | 0.0    |

Table 2 Fishing log from bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014) (Continued)

| Nomenclature                         | English name              | Haul number |   |    |     |    |    |    |     |    |    |     |     | Total |
|--------------------------------------|---------------------------|-------------|---|----|-----|----|----|----|-----|----|----|-----|-----|-------|
|                                      |                           | 1           | 2 | 3  | 4   | 5  | 6  | 7  | 8   | 9  | 10 | 11  | 12  |       |
| Finfish                              |                           |             |   |    |     |    |    |    |     |    |    |     |     |       |
| <i>Aluterus monoceros</i>            | Unicorn filefish          | -           | - | 1  |     |    |    |    |     |    |    |     |     | 1     |
| <i>Antennarius striatus</i>          | Striated frogfish         | -           | - |    |     |    |    | 1  |     |    |    |     |     | 1     |
| <i>Argentina kagoshimae</i>          |                           | -           | - | 1  | 233 |    |    | 16 |     |    | 3  | 5   |     | 258   |
| <i>Arnoglossus</i> sp.               | Flounder                  | -           | - |    | 6   |    |    |    |     |    |    |     |     | 6     |
| <i>Ateleopodidae</i>                 | Jellynose fish            | -           | - |    |     |    |    |    |     |    |    | 1   |     | 1     |
| <i>Aulopus japonicus</i>             | Japanese thread sail fish | -           | - |    | 10  |    |    |    | 2   |    |    | 1   |     | 13    |
| <i>Bembras japonica</i>              | Red flathead              | -           | - |    | 1   |    |    |    |     | 1  | 4  |     |     | 11    |
| <i>Branchiostegus japonicus</i>      | Red tilefish              | -           | - |    |     | 2  |    | 2  |     |    |    |     |     | 2     |
| <i>Branchiostegus</i> spp.           | Tilefish                  | -           | - |    |     |    | 4  |    |     |    |    |     | 2   | 6     |
| <i>Caelorhynchus multispinulosus</i> | Spearnose grenadier       | -           | - |    | 3   |    |    |    |     |    |    | 24  |     | 27    |
| <i>Callionymidae</i>                 | Dragonets                 | -           | - |    |     |    | 2  |    | 1   |    |    |     |     | 3     |
| <i>Chanunax abei</i>                 |                           | -           | - |    |     |    |    |    | 3   |    |    | 1   |     | 5     |
| <i>Chelidonichthys spinosus</i>      | Red gurnard               | -           | - | 1  |     |    |    | 44 | 109 | 21 | 79 | 124 |     | 435   |
| <i>Chelidoperca hirundinacea</i>     |                           | -           | - | 4  | 13  | 13 | 28 | 1  |     |    |    |     |     | 5     |
| <i>Citharoides macrolepidotus</i>    | Largescale flounder       | -           | - |    |     | 2  | 1  | 1  | 3   |    |    | 1   |     | 30    |
| <i>Coelorhynchus</i> spp.            | Rattail                   | -           | - | 1  | 14  | 4  | 11 | 6  |     |    |    | 6   |     | 15    |
| <i>Congridae</i>                     | Conger                    | -           | - |    |     |    |    |    |     |    |    |     | 1   | 1     |
| <i>Cookeolus japonicus</i>           | Longfinned bullseye       | -           | - |    |     |    |    |    |     | 1  | 3  |     |     | 4     |
| <i>Dentex hypselosomus</i>           | Yellowback seabream       | -           | - |    |     |    |    | 22 | 1   | 6  | 88 | 29  | 6   | 228   |
| <i>Dipturus kwangtungensis</i>       | Kwangtung skate           | -           | - | 12 | 34  | 5  | 25 |    |     |    | 1  |     |     | 3     |
| <i>Doederleinia berycoides</i>       | Rosy seabass              | -           | - |    | 12  | 21 | 74 | 15 | 2   | 20 | 67 | 20  | 27  | 258   |
| <i>Erisphex potii</i>                | Spotted velvet fish       | -           | - |    | 1   |    |    |    |     |    |    |     |     | 1     |
| <i>Fistularia Petimba</i>            | Red cornetfish            | -           | - |    |     |    |    | 1  |     |    |    | 2   | 2   | 5     |
| <i>Gempylidae</i>                    | Snake mackerels           | -           | - |    |     |    |    |    |     |    |    |     |     | 1     |
| <i>Glossanodon semifaciatus</i>      | Deepsea smelt             | -           | - |    |     |    |    |    |     |    |    |     |     | -     |
| <i>Halieutaea stellata</i>           | Starry handfish           | -           | - | 1  | 1   |    | 1  |    |     |    | 1  | 3   |     | 7     |
| <i>Helicolenus hilgendorfi</i>       | Hilgendorf saucor         | -           | - |    |     |    |    |    |     | 2  | 1  |     |     | 3     |
| <i>Histiogaster typus</i>            | Sailfin armourhead        | -           | - |    | 1   |    |    | 1  |     |    |    | 3   |     | 5     |
| <i>Hoplobrotula armata</i>           | Armoured cusk             | -           | - |    | 1   | 18 | 10 |    |     |    | 8  | 1   |     | 43    |
| <i>Kaiwarinus equula</i>             | Whitefin trevally         | -           | - | 1  | 13  | 9  | 33 | 3  | 26  | 17 | 41 | 10  | 146 | 299   |
| <i>Kentrocapros aculeatus</i>        | Basketfish                | -           | - |    | 1   |    |    |    | 9   |    |    |     |     | 1     |
| <i>Lagocephalus</i> spp.             | Smooth puffers            | -           | - |    |     |    |    |    |     |    |    |     | 2   | 11    |
| <i>Lepidotrigla abyssalis</i>        | Abyssal scarabin          | -           | - | 37 | 368 |    |    |    |     |    |    |     |     | 405   |

Table 3 Catch weight of species caught in bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014)

|         | Nomenclature                    | English name              | Haul number |   |   |   |     |     |     |    |    |    |    |    | Total |
|---------|---------------------------------|---------------------------|-------------|---|---|---|-----|-----|-----|----|----|----|----|----|-------|
|         |                                 |                           | 1           | 2 | 3 | 4 | 5   | 6   | 7   | 8  | 9  | 10 | 11 | 12 |       |
| Finfish | <i>Lepidotrigla guentheri</i>   | Red banded searobin       | -           | - | - | - | -   | -   | -   | -  | 2  | 5  | 43 | -  | 54    |
|         | <i>Lepidotrigla microptera</i>  | Redwing searobin          | -           | - | - | - | -   | -   | -   | -  | -  | 8  | 32 | -  | 40    |
|         | <i>Lepidotrigla</i> spp.        | Searobins                 | -           | - | - | - | 6   | 28  | 68  | 3  | 3  | -  | 1  | 3  | 109   |
|         | Lophiidae                       | Anglerfish                | -           | - | - | - | -   | -   | -   | -  | -  | -  | -  | -  | 3     |
|         | <i>Lophiomus setigerus</i>      | Blackmouth angler         | -           | - | - | 2 | 1   | 4   | 2   | -  | -  | -  | 1  | 7  | 17    |
|         | <i>Lophius litulon</i>          | Yellow goosefish          | -           | - | - | - | -   | 1   | -   | -  | -  | -  | 1  | -  | 2     |
|         | <i>Macrouramphosus scolopax</i> | Longspine snipefish       | -           | - | - | - | -   | -   | 2   | 2  | -  | -  | -  | -  | 4     |
|         | Macrouridae                     | Grenadier                 | -           | - | - | - | -   | -   | -   | -  | -  | -  | -  | -  | -     |
|         | <i>Minous quincarinatus</i>     | White tail goblin fish    | -           | - | - | 1 | -   | -   | -   | -  | -  | -  | -  | -  | 1     |
|         | <i>Monocentris japonica</i>     | Pinecone fish             | -           | - | - | 2 | -   | -   | -   | -  | -  | -  | -  | -  | 2     |
|         | <i>Muraenesox cinereus</i>      | Daggettooth pike conger   | -           | - | - | 4 | -   | -   | -   | -  | -  | -  | -  | -  | 4     |
|         | <i>Nippon spinosus</i>          | Sawedged perch            | -           | - | - | - | -   | 2   | 1   | -  | -  | -  | -  | -  | 3     |
|         | Pleuronectidae                  | Righteye flounder         | -           | - | - | - | -   | -   | -   | 1  | -  | -  | -  | -  | 1     |
|         | <i>Pleuronichthys cornutus</i>  | Finespotted flounder      | -           | - | 2 | 1 | -   | -   | -   | -  | -  | -  | -  | -  | 3     |
|         | <i>Priacanthus macracanthus</i> | Red bigeye                | -           | - | - | - | -   | 1   | 1   | 2  | -  | -  | -  | -  | 4     |
|         | <i>Psenopsis anolama</i>        | Melon seed                | -           | - | - | 6 | 476 | 637 | 681 | 46 | 21 | 9  | 1  | -  | 1877  |
|         | <i>Repomucenus virgatus</i>     | Hooded dragonet           | -           | - | - | - | -   | -   | -   | -  | -  | 1  | 1  | -  | 1     |
|         | <i>Satyrichthys rieffeli</i>    | Spotted armoured-gurnard  | -           | - | - | - | -   | -   | -   | -  | -  | 1  | -  | -  | 1     |
|         | <i>Saurida elongata</i>         | Slender lizardfish        | -           | - | - | - | -   | -   | -   | -  | -  | 3  | 4  | -  | 7     |
|         | <i>Saurida macrolepis</i>       | Brushtooth lizardfish     | -           | - | - | - | -   | -   | -   | -  | -  | -  | 1  | -  | 1     |
|         | <i>Saurida wanieso</i>          | Wanieso lizardfish        | -           | - | - | 2 | 1   | 2   | 4   | -  | -  | -  | 5  | -  | 14    |
|         | <i>Scomber australasicus</i>    | Spotted chub mackerel     | -           | - | - | - | -   | -   | -   | 11 | -  | -  | -  | -  | 11    |
|         | <i>Scomber japonicus</i>        | Mackerel                  | -           | - | - | - | -   | -   | -   | -  | 1  | 3  | -  | -  | 4     |
|         | <i>Scomber japonicus</i>        | Chub mackerel             | -           | - | - | - | 1   | 1   | -   | -  | -  | -  | -  | -  | 2     |
|         | <i>Scomberomorus niphonius</i>  | Japanese Spanish mackerel | -           | - | - | - | -   | -   | -   | -  | 1  | -  | -  | 3  | 4     |
|         | <i>Scorpaena anaria</i>         | Izu scorpion fish         | -           | - | 1 | 1 | 2   | 3   | 3   | -  | 5  | 2  | 3  | -  | 20    |
|         | <i>Sebastiscus marmoratus</i>   | False kelpfish            | -           | - | 1 | - | -   | 2   | -   | -  | -  | 1  | -  | -  | 4     |
|         | <i>Sphoeroides pachygaster</i>  | Slackskinned puffer       | -           | - | - | 3 | 2   | -   | -   | 12 | 2  | 6  | 1  | -  | 26    |
|         | <i>Sphyræna japonica</i>        | Japanese barracuda        | -           | - | - | - | -   | -   | -   | -  | 5  | 1  | 3  | -  | 9     |
|         | <i>Sphyræna pinguis</i>         | Brown barracuda           | -           | - | - | 2 | -   | 6   | -   | -  | -  | -  | -  | -  | 8     |
|         | <i>Sphyræna</i> sp.             | Barracudas                | -           | - | - | - | -   | -   | -   | -  | -  | -  | -  | 7  | 7     |
|         | <i>Synagrops japonicus</i>      | Blackmouth                | -           | - | - | - | -   | 2   | -   | -  | -  | -  | -  | -  | 2     |
|         | Synodontidae                    | Lizardfish / Snakefish    | -           | - | - | - | -   | -   | -   | -  | 1  | 4  | -  | 8  | 13    |
|         | <i>Synodus macrops</i>          | Triplecross lizardfish    | -           | - | - | 5 | -   | -   | -   | -  | -  | -  | -  | -  | 5     |

Table 3 Catch weight of species caught in bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014) (Continued)

| Nomenclature | English name                     | Haul number |   |   |   |   |   |   |   |   |    |    |    | Total |
|--------------|----------------------------------|-------------|---|---|---|---|---|---|---|---|----|----|----|-------|
|              |                                  | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |       |
| Finfish      | Tetraodontidae                   | -           | - | - | - | - | 3 | - | - | - | -  | -  | -  | 3     |
|              | <i>Thamnaconus hypargyreus</i>   | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Thamnaconus modestus</i>      | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Trachipterus ishikawae</i>    | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Trachurus japonicus</i>       | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Triacanthodes anomalus</i>    | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Trichiurus japonicus</i>      | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Upeneus japonicus</i>         | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Uranoscopus japonicus</i>     | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Zenopsis nebulosa</i>         | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Zeus faber</i>                | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Other fishes                     | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Fan lobster                      | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Spider crabs                     | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Japanese lobster                 | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
| Crustacea    | <i>Charybdis riversandersoni</i> | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Ibacus ciliatus</i>           | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Majidae                          | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Metanephrops japonicus</i>    | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Metanephrops thomsoni</i>     | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Oratosquilla oratoria</i>     | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Ovalipes punctatus</i>        | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Paguroidea                       | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Plesionika</i> sp.            | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Other Crustacea                  | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Common octopus                   | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Ocotopus vulgaris</i>         | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
| Mollusca     | <i>Ocotopus</i> spp.             | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Photoligo edulis</i>          | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Septa</i> spp.                | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Todarodes pacificus</i>       | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Volva volva</i>               | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | <i>Gulifordia triumphans</i>     | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Triumphant star turban           | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |
|              | Other Cephalopoda                | -           | - | - | - | - | - | - | - | - | -  | -  | -  | -     |

Table 3 Catch weight of species caught in bottom trawl made by the Training Ship Kagoshima-maru on the continental shelf of the East China Sea during 2013 academic year (April, 2013 – March, 2014) (Continued)

**F-1**

## 着底トロール操業記録 HAUL BY HAUL DATA SHEET (Bottom Trawl)

鹿児島大学水産学部附属練習船かごしま丸

T/S Kagoshima Maru

Kagoshima University, Faculty of Fisheries

|          |     |             |  |               |  |
|----------|-----|-------------|--|---------------|--|
| 年月日 Date | / / | 月齢 Moon age |  | 操業番号 Haul No. |  |
|----------|-----|-------------|--|---------------|--|

| 投 網 Shooting                  |                 |             |              | 揚 網 Hauling                        |                 |             |              |
|-------------------------------|-----------------|-------------|--------------|------------------------------------|-----------------|-------------|--------------|
|                               | 時刻 Time (hh:mm) | 緯度 Latitude | 経度 Longitude |                                    | 時刻 Time (hh:mm) | 緯度 Latitude | 経度 Longitude |
| コッドエンド投入<br>Shot codend       |                 | N<br>S      | E<br>W       | コッドエンド揚収<br>Hauled up codend       |                 | N<br>S      | E<br>W       |
| オッターボード投入<br>Shot trawl doors |                 | N<br>S      | E<br>W       | オッターボード回収<br>Trawl doors retrieved |                 | N<br>S      | E<br>W       |
| 網着底<br>Net touched down       |                 | N<br>S      | E<br>W       | 網離底<br>Net took-off                |                 | N<br>S      | E<br>W       |

|                    |   |                  |   |            |              |          |    |
|--------------------|---|------------------|---|------------|--------------|----------|----|
| 曳網針路 Towing Course | ° | ワープ長 Warp length | m | 潮流 Current | 流向 Direction | 流速 Speed | kt |
|--------------------|---|------------------|---|------------|--------------|----------|----|

| 曳網中の網形状<br>Net geometry | 水深<br>Water depth | 速力 Vessel speed      |                    | 網速度<br>Net speed | 袖先間隔<br>Wing-tip distance | 網口高さ<br>Vertical net opening | 備考<br>Observations |
|-------------------------|-------------------|----------------------|--------------------|------------------|---------------------------|------------------------------|--------------------|
|                         |                   | 対水 Through the water | 対地 Over the ground |                  |                           |                              |                    |
| 曳網開始時 Start of tow      | m                 | kt                   | kt                 | kt               | m                         | m                            |                    |
| 分後 Minutes after        | m                 | kt                   | kt                 | kt               | m                         | m                            |                    |
| 分後 Minutes after        | m                 | kt                   | kt                 | kt               | m                         | m                            |                    |
| 曳網終了時 End of tow        | m                 | kt                   | kt                 | kt               | m                         | m                            |                    |

|                         |     |                   |    |                   |    |                   |    |
|-------------------------|-----|-------------------|----|-------------------|----|-------------------|----|
| 天候 Weather              |     | 風向 Wind direction |    | 風力 Beaufort scale |    | 海況 Sea state      |    |
| 気圧 Atmospheric pressure | hPa | 気温 Air Temp.      | °C | 表面水温 SST          | °C | 海底水温 Bottom Temp. | °C |

|                 |
|-----------------|
| 備考 Observations |
|-----------------|

Appendix Haul by haul data sheet used onboard the Training Ship Kagoshima-maru