4th Meeting of the Scientific Committee

The Hague, Kingdom of the Netherlands
10 - 15 October 2016

SC-04-30

# Korea's Annual Report

*Seok-Gwan CHOI, Eunjung Kim, Jae Bong LEE Jong Hee LEE & Doohae An (NIFS)*

## 1. Description of the fishery

### *Jack mackerel fishery*

Korean commercial trawl fisheries targeting on Chilean jack mackerel have been operating in the SPRFMO convention area since Korean research trawl vessel *Tamgu No.1* commenced in 2003. The number of active Korean fishing vessels is described in Table 1. The number of operating vessels was stable within the range of 1-3, but the size became larger than the beginning of fisheries.

**Table 1. Number and size of vessels for Korean jack mackerel fisheries in the SPRFMO area.**

| Years | Number of vessels | Gross registered Tonnage | | | |
|---|---|---|---|---|---|
| | | 2,000-2,999 | 3,000-3,999 | 4,000-4,999 | 5000< |
| 2004 | 3 | 1 | 1 | 1 | - |
| 2005 | 2 | 1 | 1 | - | - |
| 2006 | 3 | 1 | 1 | 1 | - |
| 2007 | 3 | 1 | 1 | 1 | - |
| 2008 | 3 | 1 | 1 | 1 | - |
| 2009 | 2 | - | 1 | 1 | - |
| 2010 | 2 | - | 1 | - | 1 |
| 2011 | 2 | - | 1 | - | 1 |
| 2012 | 2 | - | 1 | - | 1 |
| 2013 | 1 | - | 1 | - | - |
| 2014 | 1 | - | 1 | - | - |
| 2015 | 2 | - | 1 | - | 1 |
| 2016 | 2 | - | 1 | - | 1 |

## 2. Catch, effort and CPUE summaries

***Catches by species for jack mackerel fishery***

Annual catches of jack mackerel, chub mackerel, and others are summarized in Table 2. The highest catch in the convention area was approximately 15 thousand tons in 2009, and the lowest catch was in 2014. In 2015, catches of jack and chub mackerel by two trawlers were 5,749 ton and 82 ton, respectively. Catches of other species were reported and added in Table 2. Pomfret catch took the largest proportion in by-catch and jumbo flying squid catch followed next.

The largest CPUE (ton/hour) of jack mackerel was shown when the catch was the largest in 2009 (Figure 1). Since 2012, the CPUE has remained relatively stable around 6 ton per hour.

**Table 2. Jack and chub mackerel catch and by-catch species catch from Korean trawlers**

| Years | Number of fishing days | Total Catches (ton) | Catches (ton) | | |
|---|---|---|---|---|---|
| | | | *Trachurus murphyi* | *Scomber japonicus* | Others |
| 2004 | 205 | 8,146 | 7,438 | 708 | - |
| 2005 | 170 | 9,507 | 9,126 | 381 | - |
| 2006 | 232 | 11,934 | 10,474 | 1,460 | - |
| 2007 | 237 | 12,180 | 10,940 | 1,240 | - |
| 2008 | 249 | 13,568 | 12,600 | 968 | - |
| 2009 | 182 | 14,534 | 13,759 | 716 | 59 |
| 2010 | 136 | 8,267 | 8,183 | 84 | - |
| 2011 | 205 | 9,377 | 9,253 | 24 | 100 |
| 2012 | 117 | 5,492 | 5,492 | - | - |
| 2013 | 140 | 5,378 | 5,267 | 111 | - |
| 2014 | 86 | 4,099 | 4,078 | 21 | - |
| 2015 | 104 | 5,834 | 5,749 | 82 | 3 |

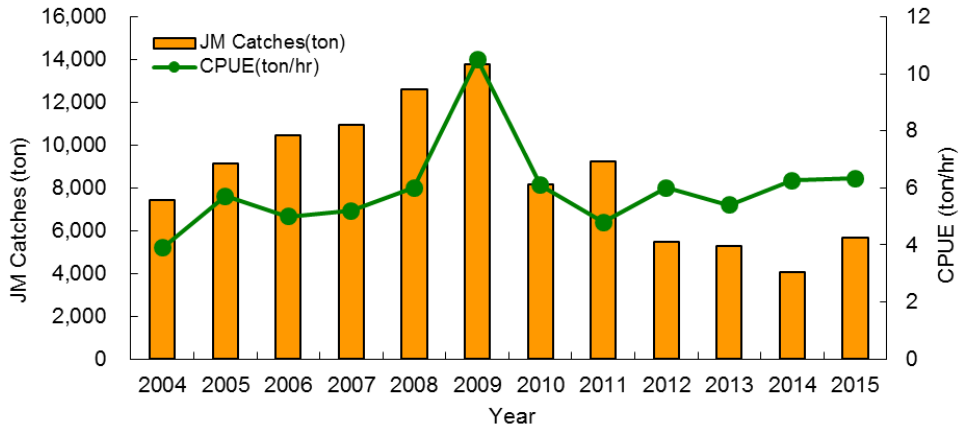


**Figure 1. Catch and CPUE (Catch per unit effort, ton/hr) of jack mackerel from 2004 to 2015.**

***Geographical distribution of the CPUE***

Geographical distributions of the CPUE of jack mackerel from 2009 to 2015 are shown in Figure 2. In 2009, when the catch was the largest, the distribution of CPUE was the widest. In 2010-2012, the distribution of CPUE was revealed in the area of 35°-45°S and 80°-95°W. The CPUE distribution formed closely to the continent in the last 3 years. The fishing ground showed in two latitudinal separated areas; 1) 25°-30°S and 2) 35-45°S.

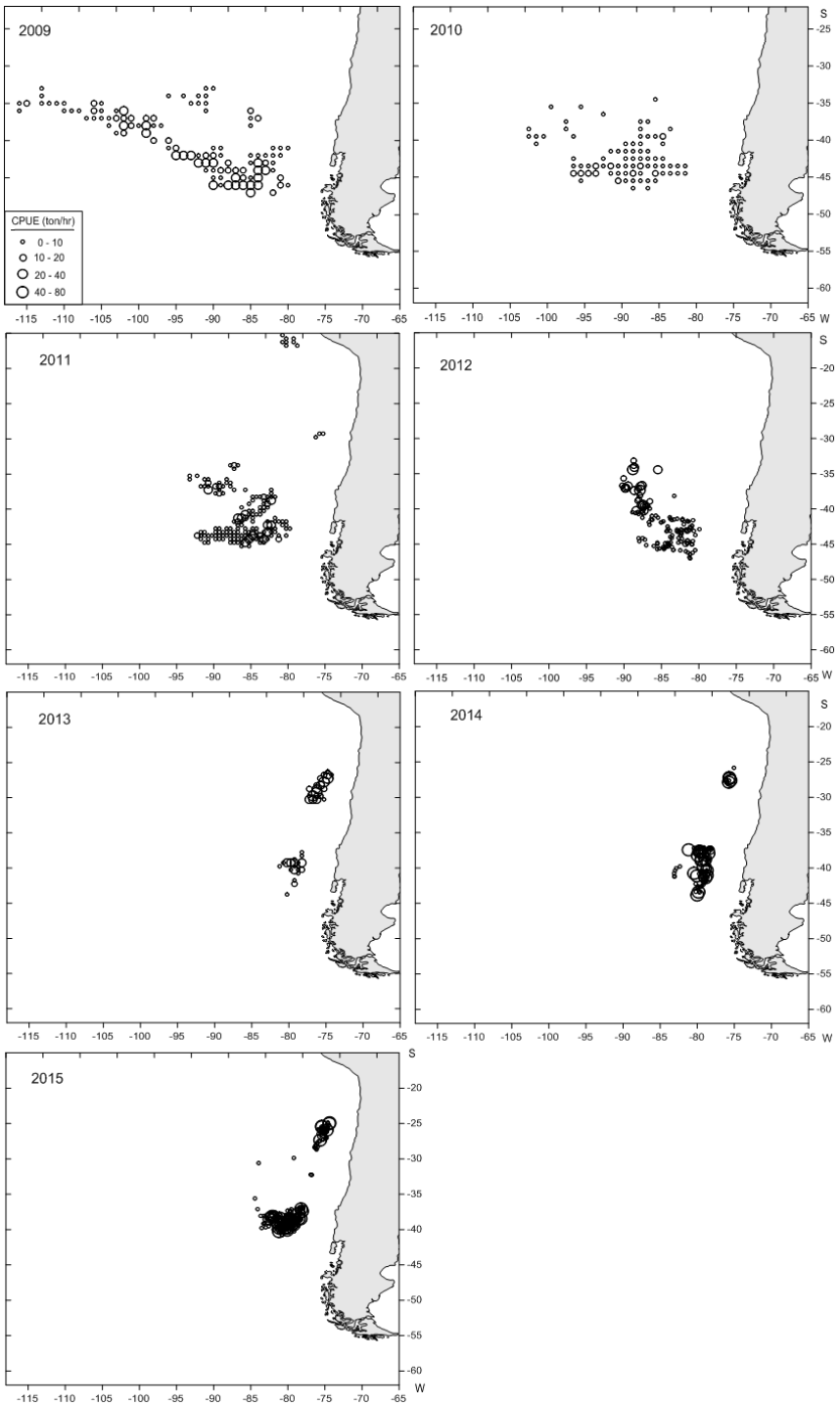


**Figure 2. Distribution of CPUE (ton/hr) of jack mackerel of Korean fishing vessels in the SPRFMO area in 2009-2015.**

### *Catches by species for bottom fishery*

Table 3 represents total annual catches and fishing efforts (number of fishing days) for the Korean bottom trawl fishery during 2001-2007 in the SPRFMO area. The catch including orange roughy increased from 101 tons to 266 tons over 2001-2003, and it decreased to 49 tons over 2004-2007 shown the lowest value in 2007 (Figure 3). Since 2007, bottom fishery was not operated in the convention area.

**Table 3. Annual catches for Korean bottom fisheries in the SPRFMO area**

| Years | Number of fishing days | Catches (ton) | Orange roughy (ton) | Others |
|---|---|---|---|---|
| 2001 | ? | 101.4 | 93.3 | 8.1 |
| 2002 | ? | 225.0 | 207.8 | 17.2 |
| 2003 | ? | 266.5 | 243.3 | 23.2 |
| 2004 | 51 | 143.8 | 137.9 | 5.9 |
| 2005 | - | - | - | - |
| 2006 | 32 | 83.1 | 77.2 | 5.9 |
| 2007 | 29 | 48.8 | 44.2 | 4.4 |

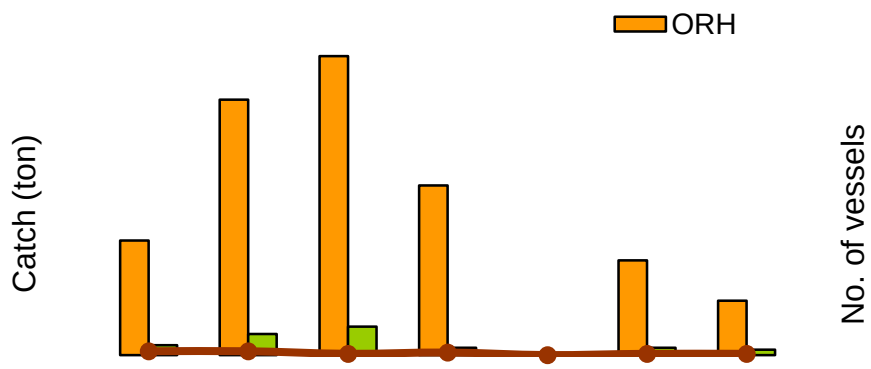


**Figure 3. Trends of annual catch of orange roughy and number of fishing vessels by Korean bottom trawl fisheries in the SPRFMO area in 2001-2007.**

## 3. Fisheries data collection

Official catches by distant-water fishery was obtained by two organizations. Korea Overseas Association (KOFA) collects total catches by gear type from Korean distant-water fishery industries, which are used as Korean official total catch. National Institute of Fisheries Science (NIFS) collects logbook data from fishing vessels. The logbook contains daily catch and effort data on the basis of tow-by-tow. Electronic report system (ERS) was developed on the basis of VMS, and catch data from vessel of distant-water fisheries has been reporting through ERS to Korea Fishery Monitoring Center (KFMC) since September 2015.

***Data collection from the vessel***

Each commercial vessel of distant-water fisheries submits the electronic "Catch Report and Biological Report (e-logbook)" which are recorded on fishing vessels according to the domestic regulation on the tow-by-tow basis. The logbook and catch data have been submitted to the SPRFMO Secretariat in accordance with the data standards of SPRFMO.

***Data collection by observer at the sea***

For the analysis of the biological characteristics for jack mackerel, observers measure fork length, body weight, sex and reproduction indices from the commercial vessels.

In 2008, two Korean vessels operated in the SPRFMO area and one observer was deployed on two vessels for 9 days. The observer coverage rate was 4 %. Korean vessels operated in 2010, but no observer was on these trips. In 2011, one observer embarked on one vessel from August 15 to September 5, and the coverage rate of observation was 6.8 %. In 2012, one observer operated on one vessel from April 22 to July 28, and the coverage rate of observation was 58.1 %. Since 2013, observer coverage rates are 100% in the convention area.

**Table 4. Scientific observers on Korean fishing vessels.**

| Date | Vessel name | observed days | Coverage rate (%, tows) |
|---|---|---|---|
| 2008. 10 | *Insungho* | 3 | 4 |
| | *Kwangjaho* | 6 | |
| 2011. 8-9 | *Kwangjaho* | 14 | 6.8 |
| 2012. 4-7 | *Kwangjaho* | 68 | 58.1 |
| 2013. 6-12 | *Kwangjaho* | 140 | 100 |
| 2014. 5-8 | *Kwangjaho* | 86 | 100 |
| 2015. 6-9 | *Kwangjaho* | 120 | 100 |
| | *Sejongho* | 10 | 100 |

**4. Biological sampling and length composition of Chilean jack mackerel**

In October 2008, a total of 344 jack mackerel was measured. The range of fork length was 32 cm to 49 cm with the average length 37.8 cm. There was only one group with one mode at 38 cm (Fig. 4). The relationship equation between body weight (g) and fork length (cm) was $BW=0.073FL^{2.46}$ ($R^2=0.876$, Fig.5).

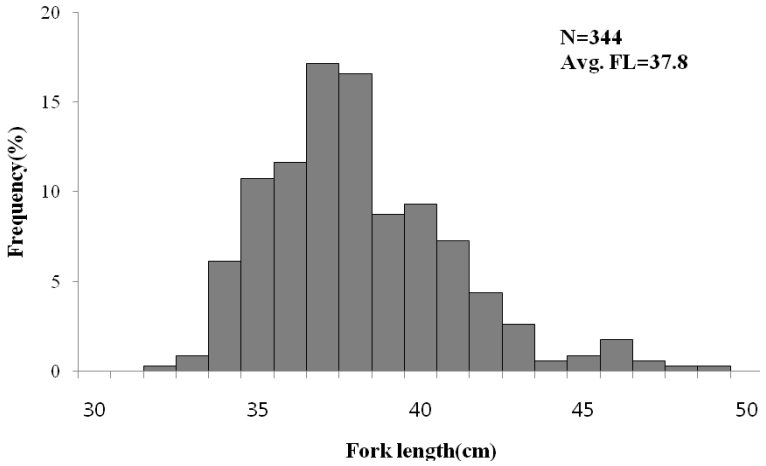


**Figure 4. Fork length frequency of jack mackerel caught by Korean fishing vessels on October 2008.**

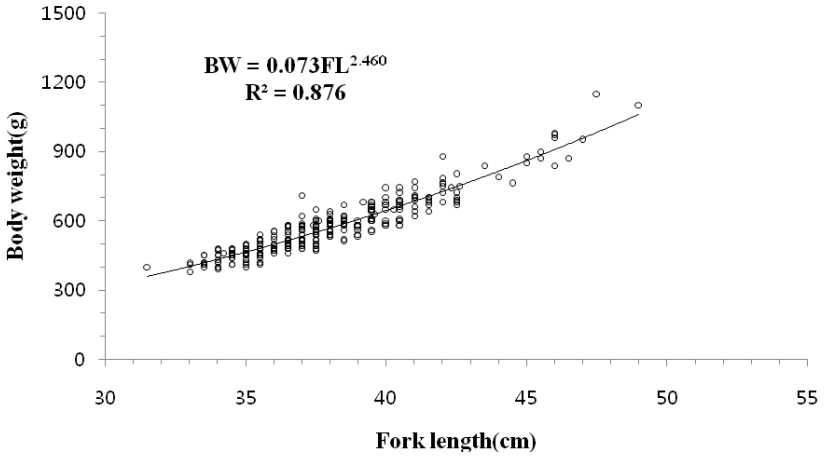


**Figure 5. Relationship between body weight and fork length of jack (2008).**

In August and September 2011, a total of 2,450 jack mackerel was measured. The range of fork length was 28 cm to 69 cm, and the average was 45.6 cm. There were two separate groups with two modes at the 33 cm and 45 cm, respectively. The small group in the smaller length may indicate a new recruitment (Fig. 6). The relationship equation between body weight (g) and fork length (cm) was $BW=0.02FL^{2.76}$ ($R^2=0.949$, Fig. 7).

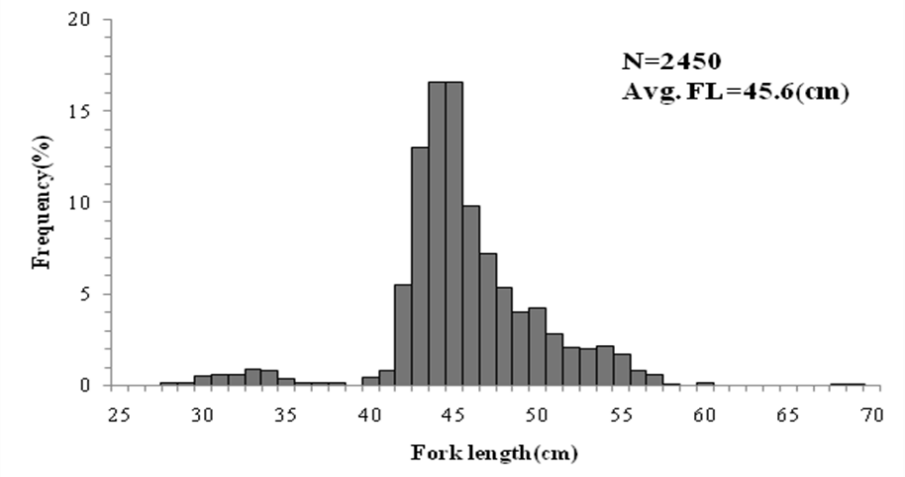


**Figure 6. Fork length frequency of jack mackerel caught by Korean fishing vessels on August-September 2011.**

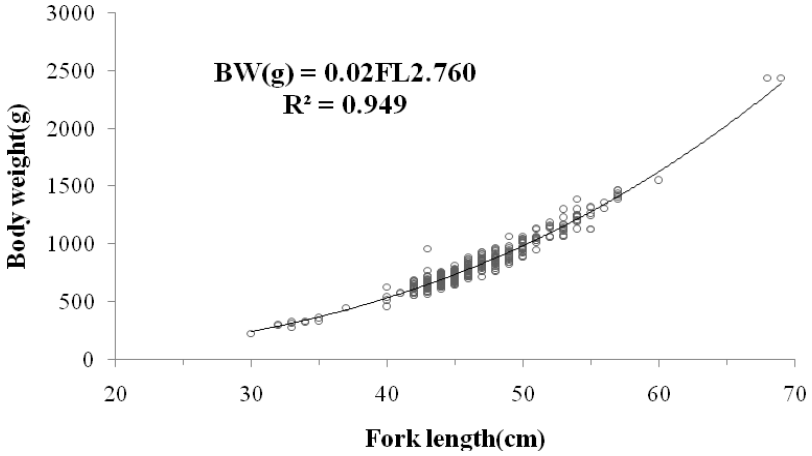


**Figure 7. Relationship between body weight and fork length of jack mackerel (2011).**

In April to July 2012, a total of 9,789 jack mackerel was measured. The range of fork length (FL) was 31 cm to 60 cm, and the average FL was 48.6 cm. There was only one group with one mode at 48 cm (Fig. 8). The relationship equation between body weight (g) and fork length (cm) was $BW=0.016FL^{2.820}$ ($R^2=0.924$, Fig. 9).

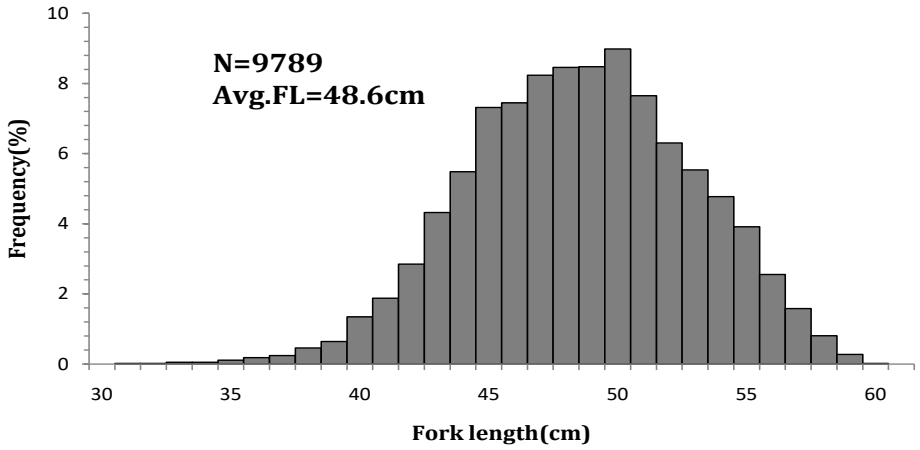


**Figure 8. Fork length frequency of jack mackerel caught by Korean fishing vessels from April to July 2012.**

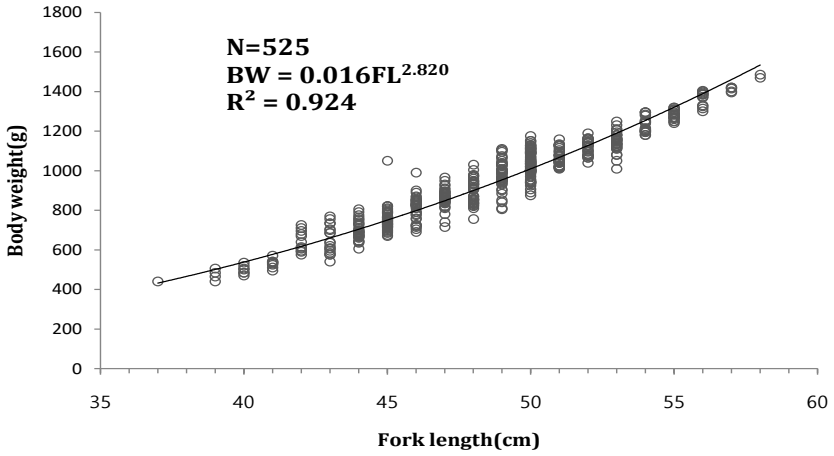


**Figure 9. Relationship between body weight (BW) and fork length (FL) of jack mackerel (2012).**

In June to August 2013, a total of 3,085 jack mackerel was measured. The range of fork length (FL) was from 20 cm to 54 cm, and the average FL was 29.7 cm. Length class with 30 cm was the highest frequency, but modes were not clearly separated (Fig. 10). The relationship equation between body weight (g) and fork length (cm) was $BW=0.035FL^{2.732}$ ($R^2=0.925$, Fig. 11).

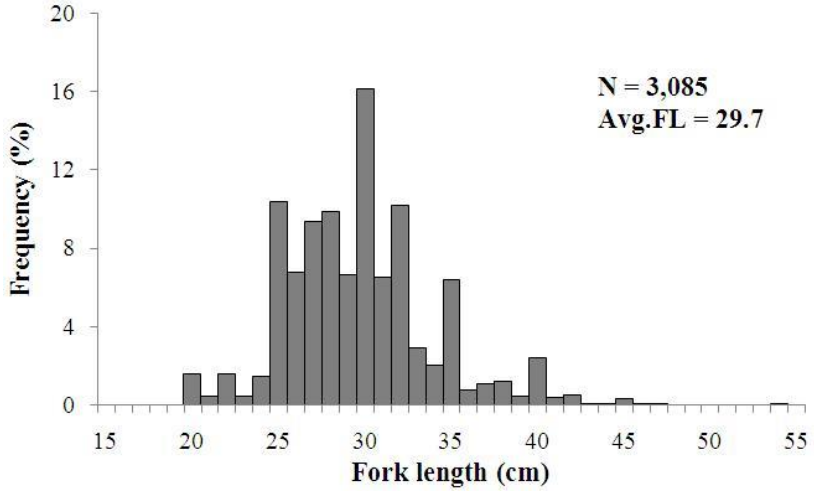


**Figure 10. Fork length frequency of jack mackerel by Korean fishing vessels from June to August 2013.**

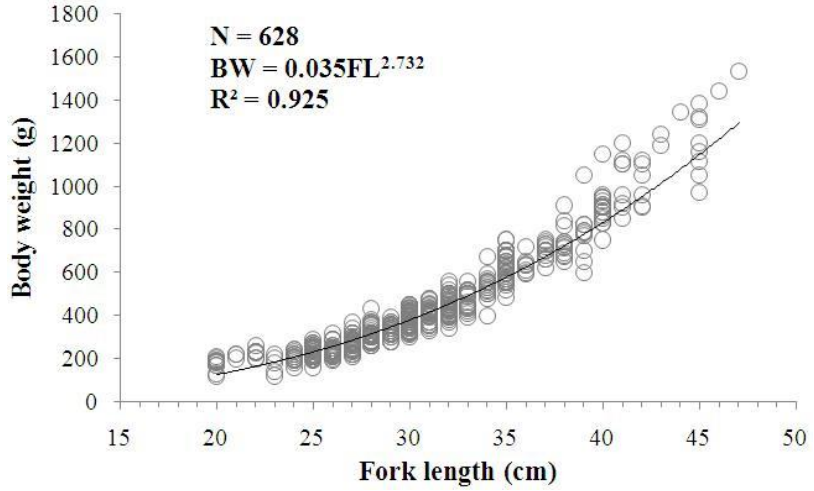


**Figure 11. Relationship between body weight (BW) and fork length (FL) of jack mackerel (2013).**

In June to August 2014, a total of 1,108 jack mackerel was measured. The range of fork length (FL) was from 27 cm to 53 cm, and the average FL was 38.6 cm. Length class with 36 cm was the highest frequency, but modes were not clearly separated (Fig. 12). The relationship equation between body weight (g) and fork length (cm) was $BW=0.00001FL^{3.0082}$ ($R^2=0.974$, Fig. 13).

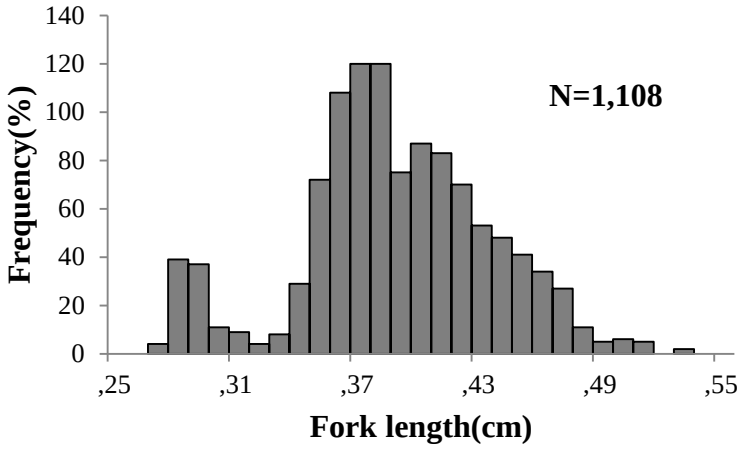


**Figure 12. Fork length frequency of jack mackerel by Korean fishing vessels from June to August 2014.**

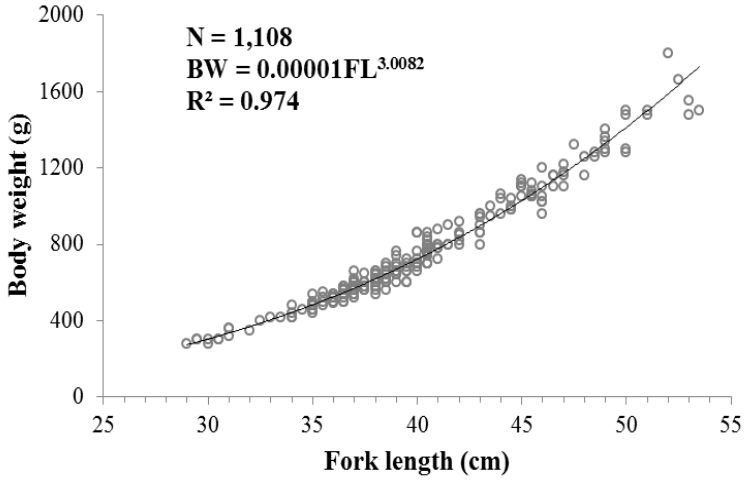


**Figure 13. . Relationship between body weight (BW) and fork length (FL) of jack mackerel (2014).**

In 2015, 2,550 jack mackerels were measured by two observers on two trawlers. The range of fork length (FL) was from 19 cm to 56 cm, and the average FL was 32.8 cm (Fig. 14). More than two modes appeared in the length range, and the highest mode formed between 25-31cm. The highest frequency appeared within 28-29cm. The relationship equation between body weight (BW, g) and fork length (FL, cm) was BW=0.000005FL3.202 (R2=0.977, Fig.15).

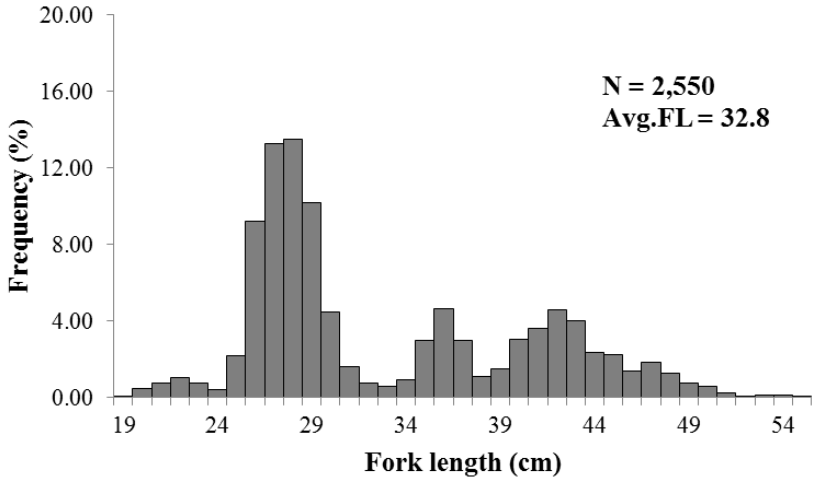


**Figure 14. Fork length frequency of jack mackerel by Korean fishing vessels from June to September 2015.**

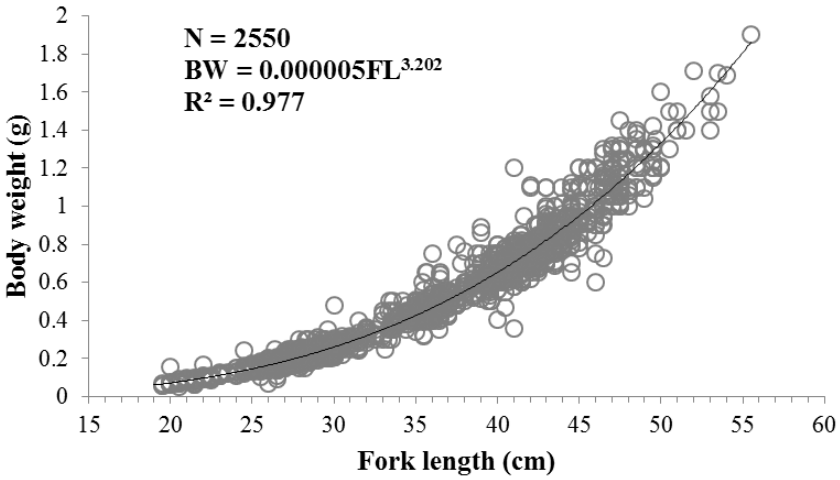


**Figure 15. Relationship between body weight (BW) and fork length (FL) of jack mackerel (2015).**