**Western and
Central Pacific
Fisheries
Commission**

**SCIENTIFIC COMMITTEE
SEVENTH REGULAR SESSION**

9-17 August 2011
Pohnpei, Federated States of Micronesia

**Pilot research on species composition of Korean purse seine catch at cannery sites**

**S. I. Lee, Z. G. Kim, J. T. Yoo, D. W. Lee, D. N. Kim, D. Y. Moon and H. S. Sohn.**

# Pilot research on species composition of Korean purse seine catch at cannery sites

**S. I. Lee, Z. G. Kim, J. T. Yoo, D. W. Lee, D. N. Kim, D. Y. Moon and H. Sohn**

*National Fisheries Research and Development Institute (NFRDI)*
*152-1 Haean-ro, Gijang-eup, Gijang-gun, Busan 619-705, Republic of Korea*

## ABSTRACT

A preliminary study on species composition of a Korean purse seine catch landed at cannery was conducted in April 2011. In the cannery, all tuna catch are sliding through a sorting grid panel that filters and drops fish in the buckets by size class (above 9 kg, 3.4-9 kg, 1.8-3.4 kg, 1.4-1.8 kg and below 1.4 kg). In cannery processing, species sorting was made for skipjack and yellowfin tuna only from catches greater than 3.4kg during filtering but not for bigeye tuna because of difficulties in species identification between bigeye and yellowfin tuna under frozen state. As no species identification was carried out for catch groups less than 3.4kg in the cannery process, this study focused on sorting out skipjack and yellowfin tuna from these groups and then identifying bigeye tuna from all size groups of yellowfin tuna using Itano's Species Identification Manual (2005). Using the mixture rate of species obtained from the samples taken, species composition of the landed catch was estimated. As results, cannery research showed 95% for skipjack, 3% for yellowfin tuna and 2% for bigeye tuna in species composition, while vessel logbook data represented 96%: 3%: 1% for skipjack, yellowfin and bigeye tuna, respectively. The proportion of bigeye tuna identified in the cannery was slightly higher than shown in logbook data by 1%.

## INTRODUCTION

Purse seine is a principal fishery targeting tropical tunas, including small bigeye tuna, skipjack and yellowfin tuna, throughout the world oceans. As the species are caught in mixed composition, an accurate estimates of species and size composition is essential in precise assessment and meaningful management of these resources. There have been efforts for reliable acquiring estimates by conducting grab sampling, spill sampling, paired sampling of both and port-sampling. The 6th annual meeting of the Scientific Committee of the western and Central Pacific

Fisheries Commission recommended that species and size composition data be collected in cooperation with factories and canneries where catch is landed. The results are to serve a comparison with other method in order to improve the precison of them. In this study, a pilot identification of species composition was conducted for a Korean purse seine catch at a cannery in Korea.

## DATA AND METHODS

A Korean purse seine vessel (Juventus) had caught a total of 700mt in the WCPFC convention area during March 10-29, 2011 (Fig. 1). A set of fishing was conducted using FAD at 6°S 167°E in 10 March 2011 and the other sets targeted the unassociated schools in the equatorial area between 145-148°E during March 19-29, 2011 (Fig. 2). The catch was unloaded at the port of Masan, Korea and transported nearby to the cannery of Dongwon Industry in April 2011.

In order to compare the species composition reported by the vessel with what would be obtainable in the cannery, we investigated twice the samples taken from the unloaded catch at the cannery and then estimated the species composition of total catch of the vessel using the species mixture rates of the samples. Collating with vessel logbook, the first investigation was done with the samples from the well No. 1-3 of the vessel which were caught by both FAD and from the unassociated schools, and the second with the samples from the well No. 8 which were caught from the unassociated schools (Table 1).

### 1. Sorting size class and species identification

In the cannery, all tuna catch are sliding through a sorting grid panel that filters and drops fish in the buckets by size class (above 9 kg, 3.4-9 kg, 1.8-3.4 kg, 1.4-1.8 kg and below 1.4 kg). In cannery processing, species sorting was made for skipjack and yellowfin tuna only from catches greater than 3.4kg during filtering but not for bigeye tuna because of difficulties in species identification between bigeye and yellowfin tuna under frozen state. Skipjack was in no doubt discernible from others with respect to external appearance and simply sorted on the grid into 4 categories (above 3.4kg, 1.8-3.4 kg, 1.4-1.8 kg and below 1.4 kg). In case of yellowfin tuna, those of size class above 3.4kg were sorted by picking up manually from the mixture of fishes running on the grid or entering buckets (above 9 kg and 3.4-9 kg), while those less than 3.4 kg, we took samples out of buckets and sorted out 3 categories (1.8-3.4 kg, 1.4-1.8 kg and below 1.4 kg). From the sorted-out yellowfin tuna by size class, we identified bigeye tuna using Itano's Species Identification Manual (2005).

## 2. Estimation of the catch by species

It is a common practice in Korean purse seiners that catches are put into the wells without sorting out by species, fishing type and fishing date but rather taking account of the haul balancing of the vessel. Given the layout of catch in the well of vessel, sorting fishes by size class and species identification, we took the samples from each category and identified the species, we presumed that total landings of species $i$ caught by a Korean purse seine could be formulated as an equation in terms of landings by well as below;

$$S_i = W_{1i} + W_{2i} + W_{3i} + \cdots = \sum_{j=1}^{k} W_{ji} \quad\text{- - - - - - - - - - - - - - - - - - - - - - - - (1)}$$

where $S_i$ is total landings of species $i$ of the vessel, and $W_{ji}$ is the landings of species $i$ from the well $j$.

And $W_{ji}$ can be estimated using the equation below which is the sum of multiplication of the landings of category $l$ sorted from well $j$ by the mixture rate of species $i$ identified in category $l$.

$$W_{ji} = C_{1j} \times s_{1i} + C_{2j} \times s_{2i} + C_{3j} \times s_{3i} + \cdots = \sum_{l=1}^{k} C_{lj} \cdot s_{li} \quad\text{- - - - - - - - - - - (2)}$$

where $C_{lj}$ is landing of category $l$ sorted from well $j$ and $s_{li}$ is the mixture rate of species $i$ identified in category $l$.

## Results and Discussion

### 1. Species identification

Fig. 3 shows the results of species identification which was investigated at the 1st trial. All species for category of yellowfin tuna above 9 kg were identified as yellowfin tuna (Fig. 3(a)), and in category of 3.4-9 kg it was showed that the proportions of yellowfin tuna and bigeye tuna were 61.0% and 39.0%, respectively (Fig. 3(b)). For categories of skipjack above 3.4 kg and 1.8-3.4 kg all of those species were skipjack (Fig. 3(c), (d)). The proportions of skipjack, yellowfin tuna and bigeye tuna in category of 1.4-1.8 kg were 95.5%, 2.8% and 1.7% (Fig. 3(e)), and in category of below 1.4 kg were 64.4%, 6.9% and 28.7% (Fig. 3(f)), respectively.

At the 2nd trial there was no landings corresponding to yellowfin tuna above 9 kg (Fig. 4(a)), and the proportions of yellowfin tuna and bigeye tuna in category of yellowfin tuna 3.4-9 kg were identified as 63.1% and 36.9%, respectively (Fig. 4(b)). For category of skipjack above 3.4 kg all of those species were skipjack (Fig. 4(c)), and the proportions of species in category of

skipjack 1.8-3.4 kg showed that skipjack, yellowfin tuna and bigeye tuna were 61.5%, 24.8% and 13.7%, which were different from those of the 1st trial (Fig. 4(d)). The proportions of skipjack, yellowfin tuna and bigeye tuna in category of skipjack 1.4-1.8 kg were 65.4%, 13.1% and 21.5% (Fig. 4(e)), and in category of skipjack below 1.4 kg were 87.9%, 9.1% and 3.0%, respectively, which were showed higher mixture rates of yellowfin tuna and bigeye tuna than those of the 1st trial (Fig. 4(f)).

In categories sorted into yellowfin tuna there are no skipjack having the distinct external characteristics which is different from yellowfin tuna and bigeye tuna, and the large size category of skipjack above 3.4 kg has also no yellowfin tuna and bigeye tuna. But the category of yellowfin tuna 3.4-9 kg had bigeye tuna with about 37-39%, and the categories of skipjack below 3.4 kg had both yellowfin tuna and bigeye tuna with about 4.5-38.5%.

## 2. Estimation of the catch by species

1) Landings by species from logbook

Total landing from logbook complied by the vessel was 700 mt, and of them the proportions of skipjack, yellowfin tuna and bigeye tuna were 96%, 3% and 1%, respectively (Table 2).

2) Landings by species estimated from the mixture rates through species identification

The proportions of skipjack, yellowfin tuna and bigeye tuna estimated by equations (1) and (2) using the mixture rates (Figs. 4 and 5) through species identification were 95%, 3% and 2%, respectively. In comparison with those results, the proportion of bigeye tuna examined in the cannery was 1% higher than that reported by the vessel (Table 2).

## References

Itano, D. G. 2005. A handbook for the identification of yellowfin and bigeye tunas in Brine Frozen Condition (v5). 1-32.
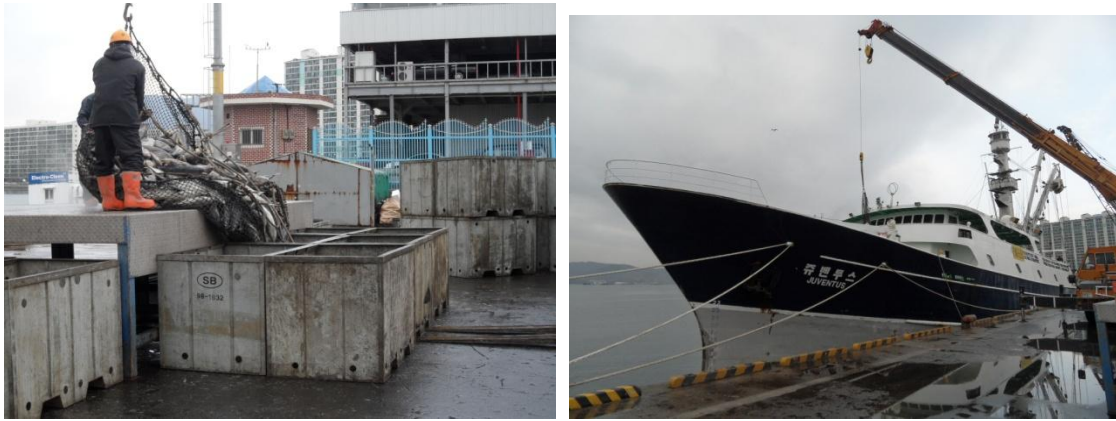
Fig. 1. Photographs of Korean purse seine vessel investigated in this study.
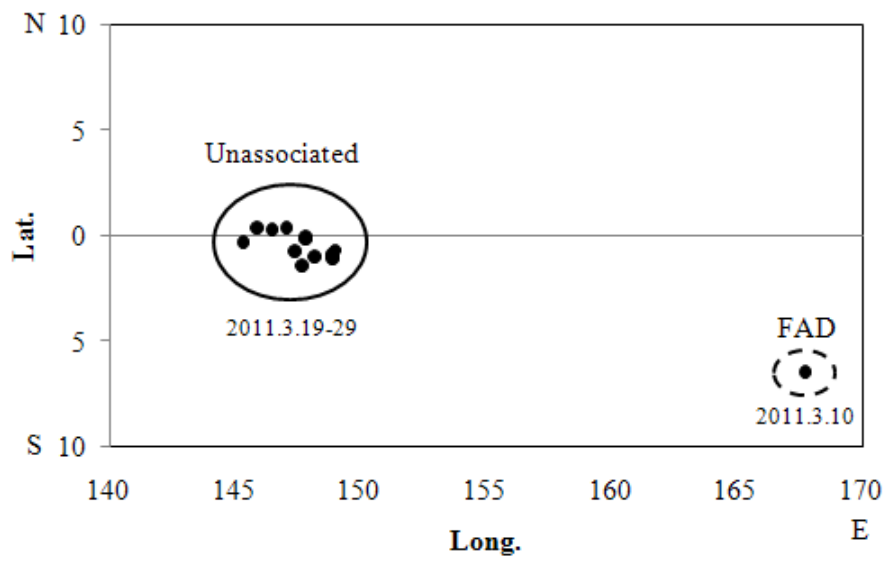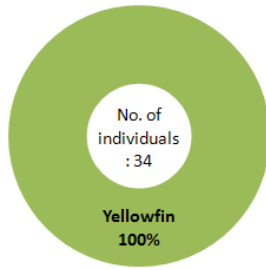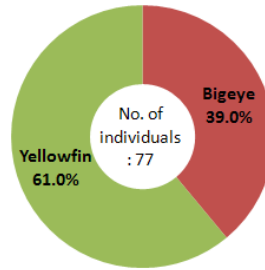


Fig. 2. Map showing the fishing stations of vessel investigated in this study.
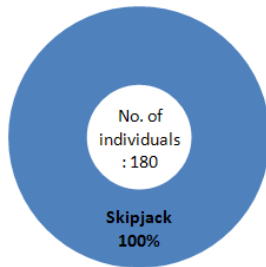
(a) YFT above 9 kg

No. of
individuals
: 34

Yellowfin
100%

(b) YFT 3.4-9 kg

Bigeye
39.0%

No. of
individuals
: 77

Yellowfin
61.0%

(c) SKJ above 3.4 kg

No. of
individuals
: 180

Skipjack
100%

(d) SKJ 1.8-3.4 kg

No. of
individuals
: 280

Skipjack
100%

(e) SKJ 1.4-1.8 kg

Yellowfin
2.8%

Bigeye
1.7%

No. of
individuals
: 278

Skipjack
95.5%

(f) SKJ below 1.4 kg

Yellowfin
6.9%

Bigeye
28.7%

No. of
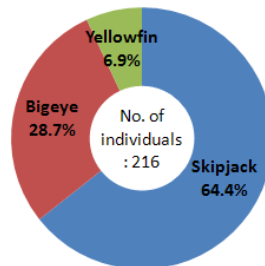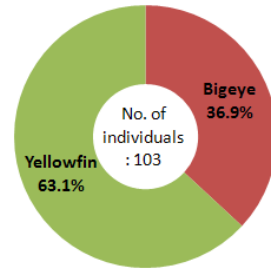individuals
: 216

Skipjack
64.4%
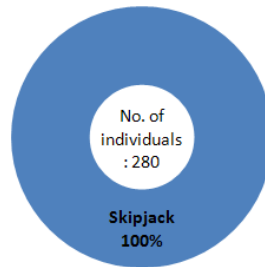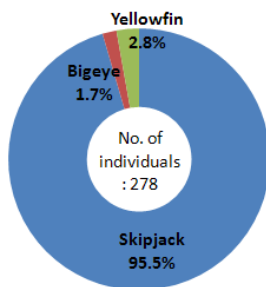
Fig. 3. Results of species identification by categories investigated at the 1st trial.

(a) YFT above 9 kg

NA

(b) YFT 3.4-9 kg

Bigeye
36.9%

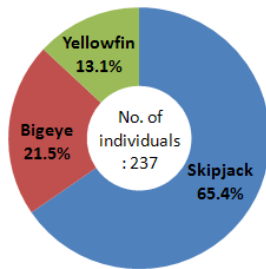No. of
individuals
: 103

Yellowfin
63.1%

(c) SKJ above 3.4 kg

No. of
individuals
: 233

Skipjack
100%

(e) SKJ 1.8-3.4 kg

Yellowfin
24.8%

No. of
individuals
: 278

Skipjack
61.5%

Bigeye
13.7%

(e) SKJ 1.4-1.8 kg

Yellowfin
13.1%

Bigeye
21.5%

No. of
individuals
: 237

Skipjack
65.4%

(f) SKJ below 1.4 kg

Yellowfin 9.1%

Bigeye
3.0%

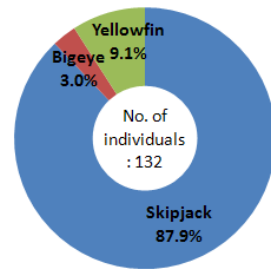No. of
individuals
: 132

Skipjack
87.9%
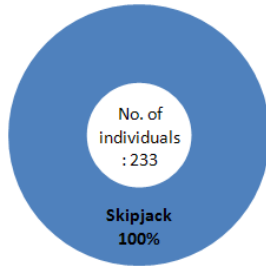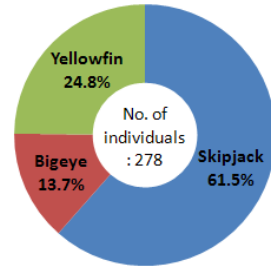
Fig. 4. Results of species identification by categories investigated at the 2st trial.

Table 1. Landings by species retained in each well

| Well | Landings by species (mt) | | | |
| --- | --- | --- | --- | --- |
| | Subtotal | SKJ | YFT | BET |
| NO. 1[*] | 70 | 70 (3.19) | | |
| NO. 2[*] | 65 | 45 (3.10), 20 (3.29) | | |
| NO. 3[*] | 80 | 10 (3.19), 70 (3.20) | | |
| NO. 4 | - | | | |
| NO. 5 | 90 | 10 (3.20), 80 (3.21) | | |
| NO. 6 | 80 | 35 (3.22), 35 (3.23), 5 (3.24) | 5 (3.24) | |
| NO. 7 | 80 | 15 (3.24), 60 (3.26) | 5 (3.24) | |
| NO. 8[**] | 85 | 20 (3.26), 10 (3.27), 45 (3.28) | 5 (3.28) | 5 (3.28) |
| NO. 9 | 80 | 30 (3.28), 45 (3.29) | 5 (3.28) | |
| NO. 10 | 70 | 70 (3.29) | | |
| Total | 700 | 675 | 20 | 5 |

[*] is landings investigated at the 1st trial, and [**] is landings investigated at the 2nd trial. Figures in the parentheses represent fishing date of the vessel.

Table 2. Estimates of landings by species caught by Korean purse seine

| Methods | Catch (mt) and proportion (%) by species | | | Total |
| --- | --- | --- | --- | --- |
| | SKJ | YFT | BET | |
| Landings reported by vessel | 675.0 (96%) | 20.0 (3%) | 5.0 (1%) | 700 |
| Landings estimated through species identification | 664.2 (95%) | 22.4 (3%) | 13.4 (2%) | 700 |