# Review of Korean SBT Fishery of 2007~2009

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## 1. Introduction

Southern bluefin tuna (SBT) fishery is the most recently developed tuna fishery by the Korean distant-water fishing industry. The SBT catch of the Korean longline fleet reached a maximum in 1998, followed by a continuous decrease until recent years. The species composition of the catch shows that SBT accounted for 19.3% in 2007 and 15.7% in 2008 of the total catch. The remaining catch consisted of tunas, billfishes, sharks and other fish species. The Korean longline fleet has voluntarily deployed a tori line and several other on-board measures to reduce the seabird bycatch by longline fishing.

## 2. Review of SBT Fisheries

### *Fleet size and distribution*

The Korean SBT fishery commenced in 1991 with a few longliners shifting from tropical waters where they targeted bigeye and yellowfin tuna. Thus, in the early years of this fishery, SBT did not attract Korean fishing industry, but because of higher market price, the number of longliners rapidly increased to reach a maximum fleet size of 19 longliners in 1998. However, by the voluntary regulation of fleet size among the fishing industries, the annual fleet size for the SBT fishery never exceeded 18 registered vessels. The number of active longline vessel in 2007 and 2008 was 12 and 19 respectively. The annual number of vessels fishing for SBT largely depends on Japanese market price for SBT and fishing condition on the fishing grounds.

### *Distribution of catch and effort*

Typically, the fishing season of the Korean SBT longline fishery usually starts in March and ends by November or December. In the first half of fishing season

from March to July or August, Korean longliners are usually fishing on the high seas of the western Indian Ocean off South Africa, with occasional expanded operation to the southeastern Atlantic, while in the second half they move to the eastern Indian Ocean off the western Australia. This SBT fishing pattern and fishing grounds have rarely changed for the past 16 years of fishing except for 1991, but in 2007 and 2008, some catches were also taken from the western and central fishing grounds from March to December.

In 2007, 12 out of 17 registered longliners fished for SBT and made a catch of 520 mt (reported as round weight). In 2008, 19 out of 20 registered longliners fished for SBT and made a catch of 1134.5 mt. SBT catches in 2008 by Korean longliners were mainly caught from May to November (Table 1) and the fishing was conducted off eastern South Africa (Fig 1). The reason why the Korean fishing ground was formed in this area periodically was that recently, the Korean longliners were mainly targeting the yellowfin and bigeye tunas in the Indian Ocean near the South Africa and Mozambique.

Catch per unit effort of the Korean longline fishery for SBT has shown a decreasing trend from a peak at 8.4 fish/1,000 hooks in 1994. However, CPUE appeared to be more or less stable between 2.4 and 3.9 fish/1,000 hooks in recent years. CPUE in 2007 and 2008 were 2.4 fish/1,000 hooks and 3.6 fish/1,000 hooks, respectively.

## 3. Fisheries monitoring for each fleet

Fisheries statistics are collected and reported for a calendar year. Catch and effort data based on the logbooks are routinely collected through a fisheries data collection system which was lawful in 1977. According to this domestic regulation, distant-water fishing vessels have to submit the reports of their fishing operations within 30 days (home-based) or 60 days (foreign-based) after completion of their operations to the National Fisheries Research and Development Institute (NFRDI).

Korea initiated a fisheries observer program for distant-water fisheries including tuna fisheries in 2002. The purpose of this program is to meet the requirements of relevant regional fishery bodies and therefore the mission of trained observers is similar to those set out in the convention of the fishery bodies.

In 2007, one observer was deployed to monitor tuna longline fishery including by-catch species in the southwestern Indian Ocean, between 27°-39°S and 40°-48°E for three months starting from the end of August to early December. The

observer recorded a total catch of 746 individual of yellowfin and bigeye tunas, and a total catch of 497 individual of SBT during 95 days of observation (Table 3). The percentage of SBT was 13.8% of the total catch in number and sharks were 20.9%, which was more than SBT. In 2009, two observers were deployed to monitor the tuna longline fishery including by-catch species in the southwestern Indian Ocean, between 30S°-43°S and 11E°-43°E for four months starting from the end of March to early June. The observer recorded a total catch of 60 individual of yellowfin and bigeye tunas, and a total catch of 1,068 individual of SBT during 109 days of observation. The percentage of SBT was 18.2% of the total catch in number and sharks were 38.9%.

**4. Seabird**

According to fishermen, some seabird species (unidentified) are usually encountered as they set longlines. However, no documentation on seabird bycatch has been available. During the recent scientific observation trip from March to June in 2009, two observers reported that there was 107 incidental catches of seabirds although fishermen used several on-board voluntary measures to avoid seabird bites such as hook-casting before dawn, tori line installing, using heavy weight and thawed baits, etc.

**5. Other Non-target Fish**

During the scientific observation trip in 2007, incidental catches of sharks caught by 245,641 size-4.0 traditional J hooks in Indian Ocean were 749 individual, comprising 7 species. The dominant species were blue shark (82.0% of the total shark catch in number), mako shark (8.8%), and salmon shark (6.9%) (Table 4). These species were composed of dominant shark species and mostly taken in surface layer. Overall catch rates of sharks were 3.0 sharks/1,000 hooks in the Indian Ocean. The fins comprised, on average, 3.4% in wet weight of the total body weight in Indian Ocean. So, we could estimate the round weight of certain sharks species used for fin production. Twenty other bycatch species were recorded which included escolar (27.8% of total catch of other species in number), oilfish (22.1%) and opah (14.1%) (Table 5).

During the scientific observation of central Indian Ocean in 2009, a total of 97 longline sets (one set per day) with total 311,069 hooks were monitored. Seven

species of sharks were caught, comprising 2,288 individuals. The dominant species were blue shark (80.4% of the total shark catch in number), salmon shark (17.5%), and mako shark (1.8%) (Table 4). Twenty five other bycatch species were recorded , including opah (43.0% of total catch of other species in number), sickle pomfret (15.6%) and brama pomfret (12.8%) (Table 5).

## 6. Marine Mammal and Marine Reptiles

No data is available for marine mammals or reptiles incidentally caught by Korean SBT longline fishery. During the scientific observation trip in 2009, common dolphin was observed for three times. There was no incidental catch of sea turtle.

## 7. Mitigation Measures

Current Measures

*Mandatory Measures for Each Fleet*

Currently there are no mandatory measures taken by the Korean Government to reduce the incidental catch of seabirds by its tuna longline fishery. However, the Ministry of Food, Agriculture, Forestry and Fisheries (MIFAFF) is developing the National Plans of Action for the reduction of seabird and shark bycatch from longline fisheries and the preliminary NPOA-seabird and sharks is under compilation. It completed the NPOA-IUU fishing and reported to FAO in 2005.

*Voluntary Measures for Each Fleet*

While no mandatory measures to reduce seabird bycatch has been taken by the Korean Government, fishermen voluntarily adopted the seabird deterrent device called tori line. Based on fishermen’s interviews, it was around 1990s when Korean longliners voluntarily began to deploy tori line to deter seabirds from baited hooks. Fishermen recognize from their experiences that deterring seabirds from contacting baits during SBT longline sets is beneficial not only to reduce seabird mortality but to their fishery by reducing bait and effort loss.

From 2006, MIFFAF and NFRDI published guidebooks, information booklets and posters to educate fisherman through recent information and identification key for bycatch species in tuna fisheries.

## 8. Public Relations and Education Activities

To avoid or reduce mortality of seabird and sea turtle by tuna longline vessels, guidebooks, information booklets and posters for information, and release manual of these species were distributed to fishing boats including tuna longliners in 2007, 2008 and 2009.

NFRDI conducts a training session for fishing vessel captains as they visit the Korean Tuna Longline Fishing Association before they begin their fishing trip. Last year, 5 training sessions were held for fishing captains. The session largely includes reporting of fishing activity, target species and implementation of international regulations. However, the importance of bycatch reporting is also emphasized and encouraged.

## 9. Other Research Activities

Comparison of circle hooks and J hooks catch rates for target and bycatch species was conducted in the Korean tuna longline fishery in Pacific Ocean in 2005-2007. The results of circle hooks test were reported to the Scientific Committee of WCPFC in 2008.

Table 1. Monthly catch (round weight in mt) of SBT by Korean tuna longliners in 2007-2008.

| Month / Year | Total | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | 520.0 | 0.0 | 0.0 | 18.7 | 87.4 | 41.3 | 39.7 | 35.1 | 56.2 | 62.7 | 103.6 | 32.2 | 43.0 |
| 2008 | 1,134.5 | 9.7 | 11.7 | 15.5 | 62.7 | 113.8 | 144.6 | 232.4 | 156.5 | 100.7 | 98.8 | 112.0 | 76.3 |

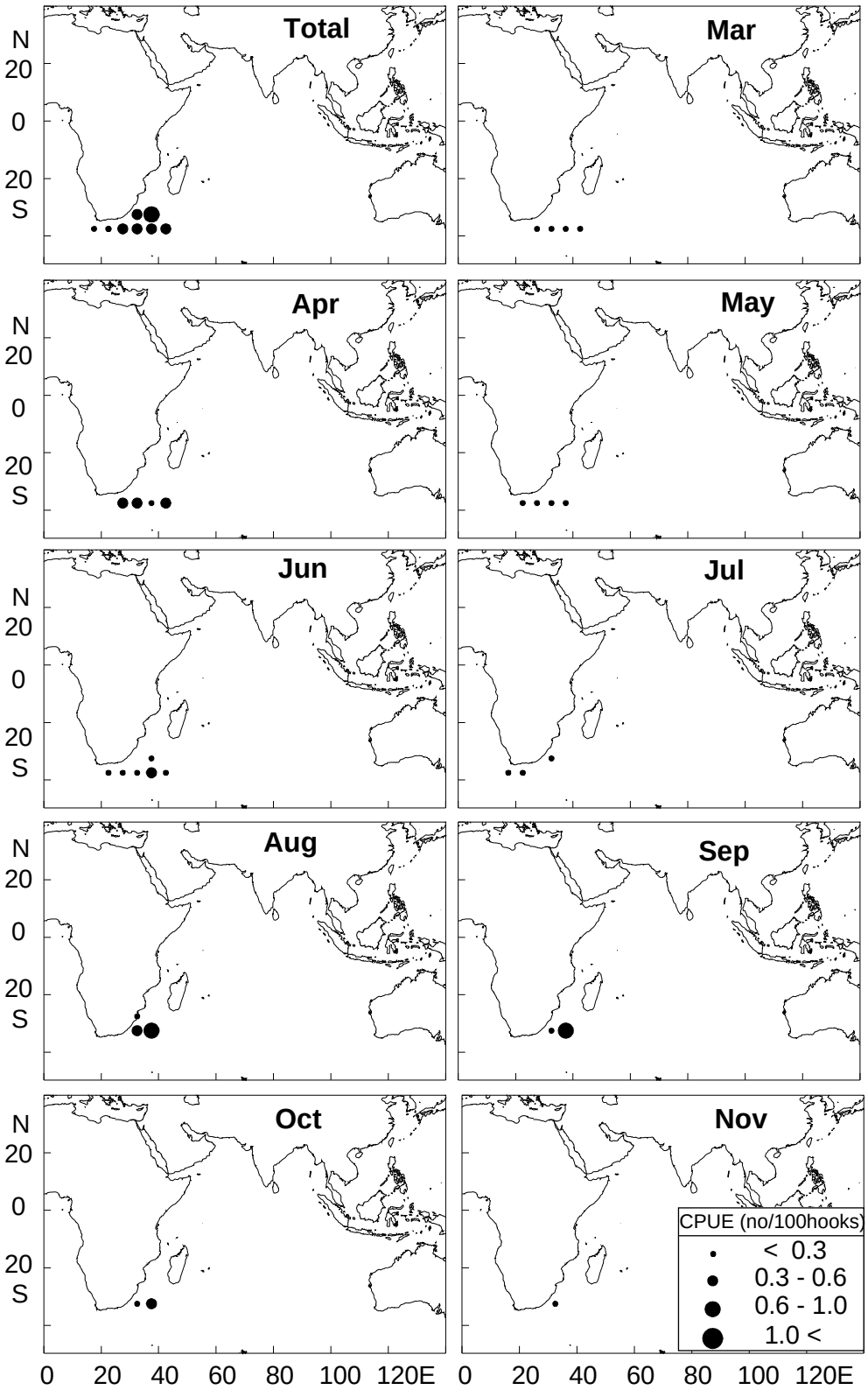


Fig. 1. CPUE (No./100 hooks) distribution of SBT by Korean tuna longliners in 2007.

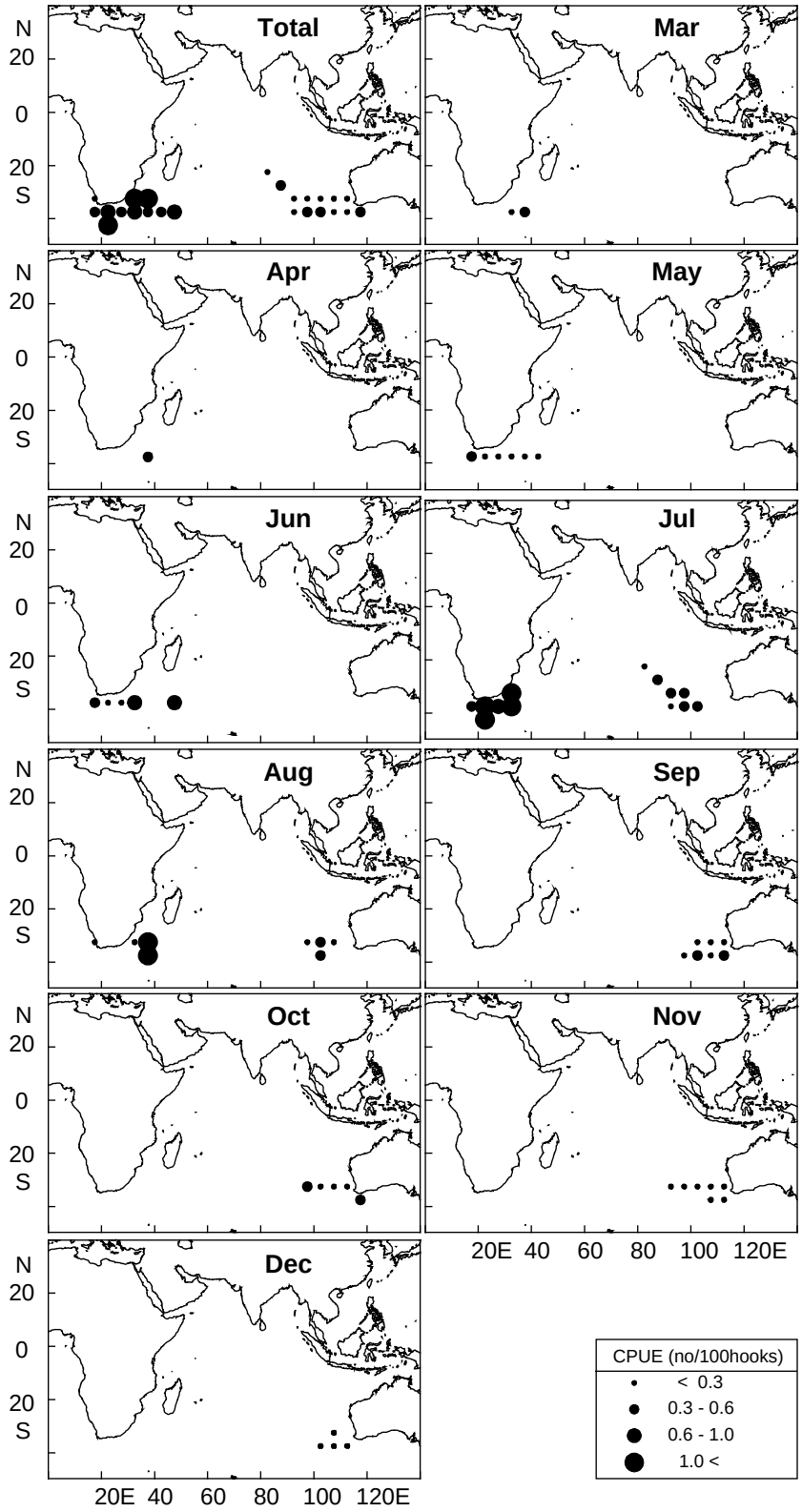


Fig. 2. CPUE (No./100 hooks) distribution of SBT by Korean tuna longliners in 2008.

Table 2. Summary of observed catch and effort coverage by Korea in 2005-2009.

| Year | Sector | Observers Deployed | Sea Days | Sets/Tows Observed | Observed Vessels | Observed Effort (%, units) | Observed Catch (%, units) | Total Cost (Won) |
|---|---|---|---|---|---|---|---|---|
| 2005 | Longline | 1 | 29 | 20 | 9% | 2% (hooks) | - | 6,459,000 |
| 2006 | Longline | 1 | 24 | 21 | 9% | 2% (hooks) | - | 8,400,000 |
| 2007 | Longline | 1 | 95 | 76 | 9% | 2% (hooks) | 27.5% | 16,350,000 |
| 2009 | Longline | 2 | 109 | 97 | 10% | - | - | 37,300,000 |

* In 2008 : No observed data

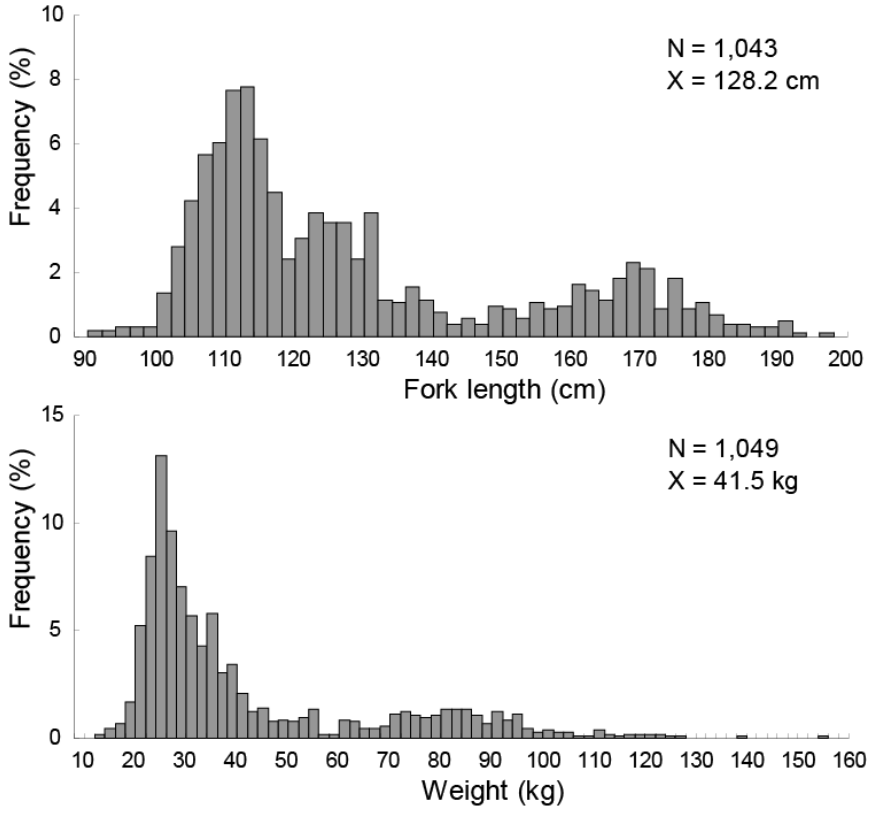


Fig. 3. Size and weight distribution of SBT by Korean tuna longliners in 2009.

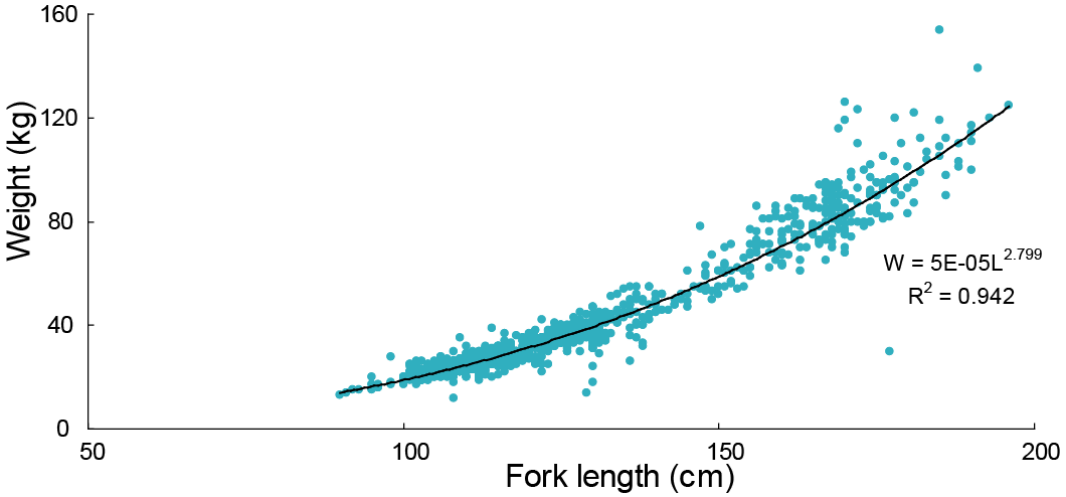


Fig. 4. Relationship between fork length and weight of SBT in 2009.

Table 3. Species composition (%) of the Korean longline fishery targeting SBT in 2007 and 2009

| Year | Unit | SBT | ALB | YFT | BET | STM | SWO | BLM | SHA | OTH | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | Number | 497 | 449 | 523 | 223 | 1 | 31 | 2 | 749 | 1,115 | 3,590 |
| | Ratio % | 13.8 | 12.5 | 14.6 | 6.2 | 0.0 | 0.9 | 0.1 | 20.9 | 31.1 | 100.0 |
| 2009 | Number | 1,068 | 1,152 | 14 | 46 | 0 | 4 | 0 | 2,288 | 1,307 | 5,879 |
| | Ratio % | 18.2 | 19.6 | 0.2 | 0.8 | 0.0 | 0.1 | 0.0 | 38.9 | 22.2 | 100.0 |

SBT : southern bluefin tuna ALB : albacore tuna YFT : yellowfin tuna BET : bigeye tuna

STM : striped marlin SWO : swordfish BLM : black marlin SHA : sharks OTH : other fishes

Table 4. Shark species composition (%) of Korean longline fishery targeting SBT in 2007 and 2009

| Species | 2007 | | 2009 | |
|---|---|---|---|---|
| | Number | Ratio (%) | Number | Ratio (%) |
| Blue shark | 614 | 82.0 | 1,840 | 80.4 |
| Shortfin mako shark | 66 | 8.8 | 41 | 1.8 |
| Salmon shark | 52 | 6.9 | 401 | 17.5 |
| Silky shark | 12 | 1.6 | 0 | 0.0 |
| Crocodile shark | 3 | 0.4 | 0 | 0.0 |
| Velvet dogfish | 1 | 0.1 | 0 | 0.0 |
| Whitetip shark | 1 | 0.1 | 0 | 0.0 |
| Dusky shark | 0 | 0.0 | 2 | 0.1 |
| Mackerel shark | 0 | 0.0 | 2 | 0.1 |
| Pelagic Thresher shark | 0 | 0.0 | 1 | 0.0 |
| Smalltooth and tiger | 0 | 0.0 | 1 | 0.0 |
| Total | 749 | 100.0 | 2,288 | 100.0 |

Table 5. Bycatch species composition (%) of Korean longline fishery targeting SBT in 2007 and 2009

| Species | 2007 | | 2009 | |
|---|---|---|---|---|
| | Number | Ratio (%) | Number | Ratio (%) |
| Escolar | 310 | 27.8 | 31 | 2.4 |
| Oilfish | 246 | 22.1 | 58 | 4.4 |
| Opah | 157 | 14.1 | 562 | 43.0 |
| Wahoo | 114 | 10.2 | 1 | 0.1 |
| Lancetfish | 78 | 7.0 | 0 | 0.0 |
| Shortbill spearfish | 65 | 5.8 | 0 | 0.0 |
| Dolphinfish | 40 | 3.6 | 1 | 0.1 |
| Stingray | 26 | 2.3 | 0 | 0.0 |
| Indo-Pacific sailfish | 16 | 1.4 | 3 | 0.2 |
| Skipjack | 15 | 1.3 | 3 | 0.2 |
| Sickle pomfret | 13 | 1.2 | 204 | 15.6 |
| Snake mackerel | 6 | 0.5 | 3 | 0.2 |
| Shortnose lancetfish | 6 | 0.5 | 2 | 0.2 |
| Ocean sunfish | 5 | 0.4 | 0 | 0.0 |
| Pomfret | 4 | 0.4 | 101 | 7.7 |
| Indo-Pacific marlin | 4 | 0.4 | 2 | 0.2 |
| Crested oarfish | 4 | 0.4 | 1 | 0.1 |
| Great barracuda | 4 | 0.4 | 0 | 0.0 |
| Patagonian toothfish | 1 | 0.1 | 5 | 0.4 |
| Slender suckerfish | 1 | 0.1 | 0 | 0.0 |
| Brama pomfret | 0 | 0.0 | 167 | 12.8 |
| Butterfly kingfish | 0 | 0.0 | 132 | 10.1 |
| Rough pomfret | 0 | 0.0 | 16 | 1.2 |
| Other species | 0 | 0.0 | 4 | 0.3 |
| Sharptail mola | 0 | 0.0 | 3 | 0.2 |
| Pelagic stingray | 0 | 0.0 | 2 | 0.2 |
| Roudi's escolar | 0 | 0.0 | 2 | 0.2 |
| Common dolphinfish | 0 | 0.0 | 1 | 0.1 |
| Common mola | 0 | 0.0 | 1 | 0.1 |
| Slender tuna | 0 | 0.0 | 1 | 0.1 |
| Tapertail ribbonfish | 0 | 0.0 | 1 | 0.1 |
| Total | 1,115 | 100.0 | 1,307 | 100.0 |