FINAL

ISC/19/PLENARY/06

PLENARY 6

19th Meeting of the
International Scientific Committee for Tuna
and Tuna-Like Species in the North Pacific Ocean
Taipei, Taiwan
July 11-15, 2019

National Report of Japan
(Japanese Tuna and Tuna-like Fisheries in the North Pacific Ocean in 2018)

National Research Institute of Far Seas Fisheries,
Japan Fisheries Research and Research Agency
5-7-1, Orido, Shimizu-ku, Shizuoka 424-8633, Japan

July 2019

Left Blank for Printing

SUMMARY

Japanese tuna fisheries consist of the three major fisheries (i.e., longline, purse seine, pole-and-line) and other miscellaneous fisheries like troll, drift-net, set-net fisheries. This paper described the recent trend of the Japanese tuna fisheries in the north Pacific Ocean and updated the statistics given in the previous National Report for ISC18 (Tsukahara et al 2018). The total catch of tunas (excluding skipjack) caught by Japanese fisheries in the north Pacific Ocean was 102,124 metric ton (t) in 2017 and 109,505 t in 2018. The total catch of tunas (including skipjack) caught by Japanese fisheries in the north Pacific Ocean was 259,195 t in 2017 and 304,562 t in 2018. The total catch of swordfish and striped marlin was 9,086 t in 2017 and 9,457 t in 2018. In addition to fisheries description, a brief description was given on Japanese research activities on tuna and tuna-like species in the Pacific Ocean in 2018.

1 TRENDS IN FLEET SIZE

Tables 1A and 1B show the number of Japanese tuna fishing vessels actually engaged in fishing by type of fishery and by vessel size class during 1980-2006 (Ministry of Agriculture, Forestry and Fishery, MAFF 1982-2008) and 2006-2018. The number of active vessels 2006-2018 was estimated based on logbook data. The coastal longline vessels less than 20 Gross Register Tonnage (GRT), which are regulated operating only within Japan's EEZ, the research and training vessels of both longline and pole-and-line were not included in Table 1B. The values of number of vessels in 2017 and 2018 were provisional in Table 1B.

The total number of longline vessels have showed continuous declining trend since the early 1990s (Table 1A). The number of longline vessels of the largest size class (> 200 GRT) was nearly constant in the period between the beginning of 1980s and the mid-1990s. In accordance with the agreement of the FAO's international action plan on fishing capacity, Japanese government implemented the fleet reduction program and decreased its large longline vessels by 20% in 1998. The number of longline vessels continued to decline thereafter. In 2009, Japanese government implemented the second fleet reduction program for its fishery following the management measures adopted by WCPFC. Recent declining trend for the fleet size larger than 50 GRT was remarkable. The number of vessels of 100-199 GRT was 16 in 2018 which was 31% of that in 2006, and the number of vessels of 50-99 GRT was 14 in 2018 which was 32% of that in 2006 (Table 1B). This large reduction was mainly derived from high price of fuel especially since 2007 and the fleet reduction programs implemented twice by the Government of Japan. As for the fleet size under 50 GRT, the number of vessels for 20-49 GRT showed sharp decline since the late 1980s whereas the number of vessels of smallest size class (< 20 GRT) fluctuated at around 700 during the 1980-2006 (Table 1A). The number of vessels of 10-49 GRT was relatively stable ranging between 270 and 290 during the 2006-2011 and then decreased to 218 in 2018 (Table 1B).

The total number of purse seine vessel was 52 in 2006, and it was nearly 80% of that in the 1980s (Table 1A). After 2006, the total number of purse seine vessels fluctuated ranging between 67 and 75 until 2018, at a peek in 2012, 2013 and 2017. The purse seine vessels which is allowed to operate in the tropical waters are larger vessels (currently, 349 GRT or larger). The limitation of number of such vessel has been 35 and has not changed since 1995.

The total number of pole-and-line vessels showed continuous declining trend since 1980 (Tables 1A and 1B). Suppose vessel size categories 20-49 GRT, 50-199 GRT, and over 200 GRT for the 1980-2006 to compare with that in the 2006-2018, the number of vessels for each category showed declining trend throughout the period (Table 1A). The number of vessels both for 50-199 GRT and over 200 GRT showed declining trend throughout the period (Table 1B). The number of vessels for 50-199 GRT was 43 in 2018 which is 52% of that in 2006. The number of vessels for over 200 GRT showed a declining trend until 2015, and became stable, except for in 2017. In 2017, relatively many launchings of the pole-and-line vessels which was over 200 GRT occurred in Japan and relatively many transferring of the pole-and-line vessels between fishing companies. When an active fishing vessel transfers from a fishing company to the other fishing company and the vessel was still active within the year, we here count two active vessels in the year in such case. As the result, 6 vessels increase incidentally occurred in 2017. That does not mean real increase of fishing

effort. That is apparent also from the fact that number of the active vessels was 25 in 2018, which was the same as in 2016.

2 CATCH AND EFFORT TRENDS OF THE MAJOR FISHERIES

2.1 Longline

Longline is classified by the type of license issued by the Government of Japan, i.e., coastal (< 20 GRT and can fish only in Japanese EEZ), small offshore (10-20 GRT), offshore (10-120 GRT), and distant water (> 120 GRT).

The fishing effort of the distant water and offshore longline remained stable at around 200 million hooks in the North Pacific in the 1980s, and then it decreased continuously to 100 million hooks in the early 2000s, and it had further decreased until 2009 (Fig. 1). After 2009, the amount of effort showed a trend of gradual decrease at a level of 35-50 million hooks (Fig. 1). Annual distributions of fishing effort of longline in 2017 and 2018 are shown in Fig. 2. In those years, the fishing grounds were located in east-west direction off Japan to Hawaii, equatorial area between 15˚S and 15˚N, off Australia and off Peru.

Total catch of four tuna and four billfish species caught by distant water and offshore longline in the North Pacific has been decreased since the highest catch of 119,752 t in 1980 and was 13,184 t in 2018 which is 11% of that in 1980 (Fig. 1). Bigeye has been the dominant species in this fishery in the North Pacific. The bigeye catch, which was stable in the 1980s and about 50,000 t in late 1980s, showed a declining trend in the 1990s and was less than 10,000 t in 2009. Yellowfin tuna catch ranged between 30,000 t and 50,000 t until early 1980s. It had gradually decreased to less than 5,000 t in 2007. Albacore catch which has fluctuated around 10,000 t until 2001 decreased to about 3,000-6,000 t and kept stable at a low level during the period 2003-2018.

2.2 Purse seine

There are two types of Japanese purse seiners targeting tunas, i.e., single and group purse seine. Other than those, coastal purse seiner takes relatively small amount of tunas as a by-catch. Historically, typical group seiner consists of one purse seiner and one searching vessel and two carrier vessels, but the group seiner tends to reduce number of vessels within each group to reduce a cost in recent years. The group seiner operates mainly in the temperate northwestern Pacific (Fig. 4). The carrier holds fish in chilled water with ice and unloads those catches. Meanwhile, the single purse seiner operates mainly in the tropical waters of the central and western Pacific, but a part of the vessels seasonally operates in the temperate waters (Fig. 4).

The fishing effort and catch for the purse seine, excluding the coastal purse seine, in the North Pacific is shown in Fig. 3. The fishing effort was around 9,000 sets in the late 1980s, and then decreased to about 6,000 sets in 1998 (Fig. 3). The fishing effort generally stayed at the level about 4,000-6,000 sets in the last decade. The skipjack catch was dominant among species in this fishery,

followed by yellowfin tuna. The skipjack catch was about 150,000 t until 2008, and then decreased to 80,000 t in 2011. After 2011, the skipjack catch showed no clear trend between 80,000 t and 140,000 t.

Fishing grounds of the purse seine were widely spreads ranging from 40˚N and 10˚S, from 120˚E to 180˚. The fishing grounds of north and south were separated by the zone from 15˚N and 25˚N (Fig. 4).

2.3 Pole-and-line

The pole-and-line is composed of three distinct categories, i.e., coastal (< 20 GRT), offshore (10-120 GRT) and distant water (> 120 GRT) vessels in terms of the license of this fishery. Note that some of 19 GRT type vessels obtained offshore license since 2007, which are included into offshore category in this document. The pole-and-line can be categorized into large, middle, and small sized vessels which correspond to larger than 300 GRT, 20-300 GRT and less than 20 GRT in vessel size.

The middle-sized vessels generally operate in near shore waters of Japan and their trips are within 10 days. Southernmost fishing area for these vessels, in recent years, is near 15˚N, but the important fishing ground is waters north of 25˚N, around Japan and adjacent areas (Fig. 6). These vessels primarily fish skipjack and albacore from spring through autumn off the Pacific side of Japan, and harvest relatively small amount of yellowfin tuna and bigeye. They hold fish in cooled water and unload it as fresh fish. The activity of the small pole-and-line vessels is like that of the middle vessels but the area of fishing is limited within the Japanese EEZ, and the trip of these vessels is shorter. On the contrary, the large vessels tend to operate farther off waters from Japan and their trips last for two to three months. Usually they primarily target for albacore from summer through autumn season in the waters north of 20˚N, and skipjack in winter and spring in the waters south of 20˚N (Fig. 6). These vessels equip a brine freezer, in which fish caught are immediately stored into a tank filled with cooled brine, and then unloads it as frozen fish.

Generally, fishing effort expressed by fishing days for offshore and distant water pole-and-line rapidly decreased from around 62,000 days in the early 1980s to around 20,000 days in 1991, increased to around 23,000 days in 2000, and then gradually decreased to 12,061 days in 2018 (Fig. 5). Total catch of five tuna species for those fisheries rapidly decreased from around 280,000 t to around 170,000 t during the 1980s, and then gradually decreased from around 130,000 t to 80,000 t until the latest year (Fig. 5). Skipjack is a dominant species for this fishery, but the proportion of skipjack tends to decrease, from 80-78% in the 1980-1986 to 78-60% in the 2010-2018.

Fishing grounds of the pole-and-line were widely spreads ranging from 45˚N and 10˚S, from 120˚E to 180˚. The fishing ground was rather sequential from north to south and was unlike that in the purse seine fishery. (Figs. 4 and 6).

3 RECENT TRENDS FOR MAJOR SPECIES

3.1 Pacific bluefin tuna (Table 2-A)

Preliminary total catch of Pacific bluefin tuna (PBF) in 2018 was 6,205 t (Table 2-A), which corresponds to 31% decrease of the catch in 2017 (9,054 t). This was even 22 points lower than the average level of past five years (2013-2017: 7,945 t). The annual catches of PBF by major fisheries in 2018 calendar year were as follows; purse seine: 4,050 t, troll: 372 t, set-net: 645 t, longline: 700 t, and other fisheries: 431 t. Because of strict catch upper limit for PBF implemented since January 2015 in accordance with the WCPFC conservation and Management Measure, the annual catches from 2015 to 2018 have been relatively lower than those of the previous years.

The national catch limit for PBF was allocated into offshore fisheries and prefectures managing coastal fisheries. In 2018, all of the prefectures managing coastal fisheries, were not allowed to target small PBF (< 30 kg in body weight: BW) during the first half of the year to maintain their allocated catch limit. Some prefectures particularly those which further divide their allocations into several parts corresponding to the detailed area, fishing gear and season, also could not fully utilize their allocations during the second half of the year because of possible mis-match between the fishing activity and seasonal migration of PBF. In addition, the small pelagic purse seine (small PS) targeting age 0-1 fish, also marked historical low level. Thus, the reduction of the PBF catch in 2018 might be partly due to the detailed and strict fisheries management.

On the other hand, some fisheries, for example the purse seine targeting large PBF, longline, and some prefectural fisheries, could fully utilize their allocations and had to stop fishing operation targeting PBF even during fishing season. Longline fishery tends to target large PBF, and their length frequency showed multimodal distribution which has the highest peak at around 200 cm FL (Fig. 7). Note that a peak found at around 80 cm FL in 2018 was not usual for the PBF size composition of the Japanese longline fishery. Those fish were mainly caught in the beginning of the longline fishing season (from February to March) off the coast of the Pacific side of main island.

3.2 Albacore (Table 2-B)

Preliminary total catch of albacore in 2018 was 33,950 t, which was slightly declined from the catch in 2017 (39,764 t) and was smaller than the average of past five years (2013-2017: 45,299 t). Albacore catch by the pole-and-line fluctuated largely but catch by longline did not show such fluctuations. Japanese pole-and-line fisheries target on both skipjack and albacore but particularly, large class pole-and-line vessels (> 200 GRT) primary target on albacore during summer. Recent catch by this fishery fluctuated largely between 8,500 t and 23,000 t. Albacore catch by longline in 2018 (13,248 t) was smaller than the catch in 2017 (17,309 t). Size of albacore caught by the longline fisheries were found from 51 cm to 132 cm FL, whereas much smaller fishes were caught by pole-and-line, which was from 47 to 97 cm (Fig. 8). No significant size differences between 2017 and 2018 were found.

3.3 Swordfish (Table 2-C)

Preliminary total catch of swordfish in 2018 was 7,844 t which corresponds to 105% of the catch in 2017 (7,455 t) and was larger than the average of past five years (2013-2017: 6,255 t). Swordfish has been caught mainly by offshore and distant water longline, which catch in 2018 was 3,793 t. The coastal longline in the Tohoku area operates night-shallow sets targeting swordfish. The length frequency for longline mainly distributed from 90-220 cm eye-fork length in 2017 and 2018 (Fig. 9).

3.4 Striped marlin (Table 2-D)

Preliminary total catch of striped marlin in 2018 was 1,613 t which corresponds to 99% of the catch in 2016 (1,631 t) and was similar to the average of past five years (2013-2017: 1,633 t). Total catch of striped marlin showed the continuous decreasing trend since the mid-1980s primarily due to the decline of the catch of offshore and distant water longline (from 6,378 t in 1980 to 160 t in 2018). In recent years, Japanese pelagic fisheries catch striped marlin as bycatch except for coastal drift-net and part of another longline which is seasonal targets striped marlin. The mode of length frequency in 2018 was about 160 cm (Fig. 10).

3.5 Blue shark (Table 2-E)

The recent catches of blue shark by several fishing gears were updated using available Japanese species-specific data and statistics. A total catch of blue shark by Japanese fisheries was estimated at 15,543 t in 2017. Those are stabilizing around 13,500-15,500 t in recent years due to trends in increase of population biomass and decrease of fishing effort for offshore and distant water fisheries. There is no information about the sharp decrease and increase of large drift-net fishery.

3.6 Shortfin mako (Table 2-F)

ISC SHARK WG had conducted a full stock assessment of shortfin mako for the first time in 2018 and the recent catch was reported. A total catch of shortfin mako by Japanese fisheries was estimated at 862 t in 2017. Those had increased since 2012 and reached at 1,260 t in 2015 due to an increase of catch for offshore and distant water fisheries, and then had decreased since 2015 due to a decrease of catch for offshore and distant water fisheries.

3.7 Others (Bigeye, Skipjack and Yellowfin tuna) (Table 2-G, H and I)

Preliminary total catch of bigeye in 2018 was 16,648 t which corresponds to 9% increase of the catch in 2017 (15,239 t) and was lower than the average of past five years (2013-2017: 17,712 t). Total catch of bigeye by Japanese fisheries showed no clear trend and longline has been the highest proportion among gears in the North Pacific.

Preliminary total catch of skipjack in 2018 was 195,057 t which corresponds to 24% increase of the catch in 2017 (157,071 t) and was higher than the average of past five years (2013-2017: 171,745 t). Most of skipjack was caught by pole-and-line and purse seine in the North Pacific. Total catch of skipjack by Japanese fisheries showed a declining trend in the last five years in the North Pacific. Even though catch of skipjack in the North Pacific has been declining in the long term, relatively higher total catch of skipjack was observed in 2018, mainly due to higher purse sein catch in tropical waters in the North Pacific. The fishing effort of the distant water purse seiner slightly sifted to northern hemisphere in 2018 (see Fig. 4) and then skipjack catch increased in this region in 2018.

Preliminary total catch of yellowfin tuna in 2018 was 52,702 t which corresponds to 38% increase of the catch in 2017 (38,067 t) and was higher than the average of past five years (2013-2017: 32,440 t). The yellowfin tuna catch by purse seine has been the highest proportion among gears in the North Pacific. Relatively higher total catches during the 2015-2018 period were mainly due to higher purse sein catch in tropical waters in the North Pacific. The increase of the yellowfin tuna catch by the purse seine in 2018 was the same reason as that of skipjack.

4 RESEARCH ACTIVITIES

The Fishery Agency of Japan, in cooperation with the National Research Institute of Far Seas Fisheries (NRIFSF) and local prefectural fisheries experimental stations, has run the nationwide port sampling project for collection of catch, effort and size data at the major landing ports since the early 1990s. The tagging studies using conventional, archival and pop-up has been conducted by research and training vessels as well as commercial vessels. In addition, there were cooperative works with prefectural fisheries experimental stations and universities. Several cooperative studies were also conducted with foreign countries.

4.1 Pacific Bluefin tuna

4.1.1 Pacific bluefin tuna larvae/juveniles research cruise

Since 2011, larval surveys have been conducted to estimate current main spawning grounds and periods of PBF. In 2018, research cruises were designed to focus on ecological studies of larval/juvenile PBF by R/Vs Shunyo-Maru, Yoko-Maru, Hokko-Maru and five prefectural R/Vs.

Larval surveys were conducted in the south of Japan around Nansei Islands area, which is a major spawning ground of PBF, from April to June, and also in the Sea of Japan, which is another spawning ground of PBF, from July to August. In addition, larval survey was conducted in off the Pacific coast of Tohoku area, northeastern Japan from August for the first time. PBF larvae were captured ca.1,300 and ca. 2,000 individuals in the Nansei Islands area and the Sea of Japan respectively, which could help to understand biological and environmental factors on larval survival of PBF. Twelve individuals of PBF larvae were also captured in the Tohoku area. This finding implies that Tohoku area is the third spawning area of PBF. The larval ecology and survival of PBF in three spawning grounds contribute to understanding the mechanism of recruitment variability and the stock structure.

Juvenile surveys were conducted in nursery areas both the Pacific side of southern Japan from June to July and the Sea of Japan from July to September, respectively. Samples collected are being examined by a variety of approaches such as genetic identification, aging, stable isotope, microchemistry and stomach contents analyses to understand recruitment process to PBF fisheries around Japan.

4.1.2 Troll survey on age-0 Pacific Bluefin tuna

Recruitment abundance index (CPUE of age-0 PBF) for current stock assessment is based on the sales slips of Japanese troll fishery in coastal waters of western Kyusyu. In addition to this index, the NRIFSF has conducted monitoring survey of troll fishery's operations, which are targeting age-0 PBF for both fresh fish and farming pens, for reporting preliminary recruitment abundances from two spawning grounds in a timely manner. In the 2018 survey, data logger and transmitter were installed on 76 troll fishing boats in six prefectures (Mie, Wakayama, Kochi, Miyazaki, Nagasaki and Shimane). Once the fishermen input their catch number of age-0 fish into the data logger during the fishing operation, the catch information with geographic position data is sent to the NRIFSF via a cellular network on a real time basis. The data from 75 boats in 2018 were available for evaluation of recruitment. However, the number of available data in recent years was lower than that in past because of low demand of farming and/or regulation of catch limit for juveniles. The NRIFSF has reported the preliminary recruitment indices that obtained through this survey on the website of the Fishery Agency since September 2014.

4.1.3 Tagging for Pacific bluefin tuna

The NRIFSF has conducted a conventional tagging of age-0 PBF (about 20 cm FL) from off Kochi Prefecture since 2011. A total of 8,866 fish were released and 1,504 fish were recaptured (17.3%). In addition, to investigate the habitat utilization of age-0 PBF, 603 individual PBF have been released with the implemented small archival tags (LAT2910, Lotek Ltd.) since 2012. 165 archival-tagged fish were recaptured in total (recovery rate 27.4%). With the data obtained from this survey, a part of the trans-Pacific migrations of this species were investigated (Fujioka et al. 2018). The NRIFSF has also conducted a tagging survey of adult PBF at Sado Island in the Sea of Japan, which is one of the known spawning grounds of this species, in just before the spawning season since 2012 to investigate the spawning migration and its behavior. A total of 87 fish about 30-60 kg in BW were attached various electronic data storage tags (archival tags, acceleration data-loggers and pop-up satellite archival tags). Seven fish attached archival tags were recaptured in the Sea of Japan as well as the Pacific Ocean with the time at liberty from one week to 45 months.

4.1.4 Tissue sampling and technical development for close-kin analysis

Tissue sampling for close-kin genetics has started since 2015 and around 3,500 individuals were sampled in 2018. Large mature adults of PBF (about 120-300 kg in BW) were sampled from individuals fished by coastal longline fishery around Okinawa Islands in late April to early July, while young-of-the-year juveniles (about 0.1-0.3 kg in BW) being from marked fish caught by troll fishery and then released into environments off Kochi Prefecture in August. Young adults as well as nearly-matured juveniles (about 20-60 kg in BW) were also sampled from fish landed at Sakai-minato, western part of the Sea of Japan, and Matsumae, southwest of Hokkaido, fish

markets in July and in September to December, respectively. All of muscle tissues sampled were preserved in specific buffer (TNES-Urea 6M buffer) because of higher stability of content DNA.

The close-kin project team which consists of FRA and collaborating academic researches has been working to develop practical procedures of close-kin analysis in PBF and begun to conduct genotyping of actual samples since 2018 using random amplicon sequencing method. Alongside, the project team is addressing development of statistical approaches for estimating stock abundance. Furthermore, a numerical model which can keep the all genealogical information among every individual has been developed with expecting application to operating model of statistical approach and enhancement in the quality of sampling design.

4.2 Sharks

4.2.1 Port sampling and the onboard research program in Kesennuma fishing port

In 2018, size and sex data of blue shark and shortfin mako shark were collected from port sampling in Kesennuma fishing port, located in northeastern Honshu (the main island of Japan), and the onboard research project throughout the year. For blue shark, size data from 73,984 individuals was collected from port sampling and 72% of individuals measured were males. In addition, 64% of males and 64% of females were juveniles. Regarding blue shark, the catch number by four size categories were recorded in the onboard research program for Kesennuma offshore longline fleet. Total of 299,138 blue sharks were recorded by size category and "large (processed weight: ≥ 15 kg)" consisted 38% of all catch with 26% of "middle (11 kg ≦ processed weight < 15 kg)", 29% of "small (5 kg ≦ processed weight < 11 kg)" and 7% of "extra small (processed weight: < 5 kg)".

For shortfin mako, size and sex data from 16,457 individuals were collected from port sampling and 85% of males and 100% of females were juveniles. In contrast to blue shark, almost all of sampled female were juvenile in shortfin mako. Size data from port sampling was used for the stock assessment of North Pacific shortfin mako by ISC SHARK WG. Total of 13,918 sharks were recorded by size category from the onboard research by Kesennuma-offshore longline fleet and "large (precaudal length: > 200 cm)" consisted 3% of all catch with 30% of "middle (150 cm < precaudal length ≦ 200 cm)", 59% of "small (100 cm < precaudal length ≦ 150 cm)" and 7% of "extra small (precaudal length ≦ 100 cm)".

4.2.2 Research cruise

In the research cruise by chartered longline vessel, commercial longline vessel, and research and training vessel (RTV), normal tag was attached to 154 blue sharks, eight shortfin mako, and one bigeye thresher shark.

In the research cruise by Shunyo-Maru conducted between 9th May and 5th June in 2018, pop-up satellite archival tag (PSAT) was deployed for 19 blue sharks. In the research cruise by chartered longline vessel, six blue sharks were released with PSAT.

4.2.3 Biological sample collection

For the estimation of life history parameters, vertebrae and/or reproductive organ were collected from five shortfin mako through commercial longline vessels and longline research vessels operated in the North Pacific.

4.3 Skipjack

4.3.1 Tagging for skipjack

The NRIFSF has been conducting skipjack tagging mainly to investigate migration patterns to the fishing ground off Japan. One distant water pole-and-line vessel (> 199 GRT) was substantially chartered and tagging was conducted in the tropical area between 5˚N and 12˚N in December 2018. A total of 1,073 skipjack tuna including 44 individuals with archival tags (Lotek LAT2910) were released. In addition, skipjack tagging has been conducted in cooperation with Ajinomoto Co., Inc. in the coastal area of southwestern Japan since 2009. In 2018, 138 skipjack tuna including 78 individuals with archival tags were released at the east of Taiwan in March and December.

Besides above studies, three research/training cruises on pole-and-line vessels conducted skipjack tagging in 2018 around Japanese water. A total of 922 skipjack tuna including 99 individuals with archival tags were released in the south off Japan and around Izu Islands, around Hachijo Island (33˚N, 139˚E) and Wakayama (33.15˚N, 135.75˚E).

4.4 Albacore

4.4.1 Tagging for albacore

In the research cruise on a chartered longline vessel, conventional tag was attached to 70 albacore in March 2018 around off Japan.

5 REFERENCES

Fujioka, K., Fukuda, H., Tei, T., Okamoto, S., Kiyofuji, H., Furukawa, S., Takagi, J., Estess, E.E., Farwell, C.J., Fuller, D.W., Suzuki, N., Ohshimo, S., Kitagawa, T. (2018) Spatial and temporal variability in the trans-Pacific migration of Pacific bluefin tuna (*Thunnus orientalis*) revealed by archival tags. Progress in Oceanography 162: 52-65.

MAFF (1982-2008): Gyogyou yousyokugyou seisan toukei nenpou (Yearbook of fisheries and aquaculture production statistics of Japan for 1980-2006), Statistics Department, Minister's Secretariat, Ministry of Agriculture, Forestry and Fishery.

Tsukahara, Y., Okamoto, H., Chiba, K., Ohashi, Y., Kiyofuji, H., Semba, Y., Kai, M., Tawa, A., Fukuda, H., Ijima, H., and Uosaki, K. (2018) National Report of Japan (Japanese Tuna and Tuna-like Fisheries in the North Pacific Ocean). ISC/18/PLENARY/06. 21pp.

6 TABLES

Table 1A. Number of Japanese tuna fishing vessels operated in the Pacific Ocean by type of fisheries and vessel size based on MAFF (1980-2006).

	Longline fishery *1						Purse seine fishery			Pole-and-line fishery					
Year	1-19 GRT	20-49 GRT	50-99 GRT	100-199 GRT	200- GRT	Total	50-199 GRT*2	200- GRT	Total	1-19 GRT*3	20-49 GRT	50-99 GRT	100-199 GRT	200- GRT	Total
1980	821	57	715	103	645	2,341	50	16	66	3,232	14	350	10	198	3,804
1981	774	55	706	100	661	2,296	50	23	73	3,064	10	353	6	179	3,612
1982	722	43	634	90	589	2,078	52	33	85	3,011	11	320	6	138	3,486
1983	561	38	589	93	550	1,831	59	36	95	3,021	12	297	9	116	3,455
1984	523	32	538	108	610	1,811	54	33	87	2,904	8	273	10	105	3,300
1985	620	28	512	131	628	1,919	47	35	82	2,754	8	244	9	95	3,110
1986	536	25	435	168	632	1,796	53	38	91	2,455	6	224	9	91	2,785
1987	661	23	348	197	649	1,878	47	34	81	2,404	6	210	9	89	2,718
1988	586	21	289	233	649	1,778	48	39	87	2,613	5	191	11	70	2,890
1989	650	20	248	238	653	1,809	43	37	80	2,254	3	187	12	67	2,523
1990	685	21	227	241	664	1,838	43	35	78	2,228	4	176	9	66	2,483
1991	768	19	199	222	682	1,890	38	35	73	2,277	3	166	10	63	2,519
1992	793	19	164	206	681	1,863	31	38	69	2,093	3	156	11	46	2,309
1993	790	18	138	201	682	1,829	27	36	63	1,927	3	147	10	43	2,130
1994	819	21	110	198	675	1,823	23	33	56	1,830	3	124	10	48	2,015
1995	738	20	92	187	667	1,704	20	31	51	481	3	104	20	46	654
1996	711	17	91	155	640	1,614	21	32	53	512	3	89	29	43	676
1997	698	11	88	145	631	1,573	20	35	55	436	2	76	39	45	598
1998	712	11	80	129	623	1,555	20	35	55	382	2	73	40	46	543
1999	703	6	78	119	567	1,473	22	36	58	416	1	62	54	46	579
2000	732	3	76	111	496	1,418	23	37	60	357	1	56	57	47	518
2001	777	4	76	110	494	1,461	19	36	55	285	1	49	59	47	441
2002	780	4	69	110	484	1,447	18	36	54	251	1	45	58	48	403
2003	764	3	64	99	460	1,390	17	36	53	292	1	44	56	44	437
2004	702	2	55	77	455	1,291	17	36	53	284	1	38	57	43	423
2005	694	2	46	59	432	1,233	17	36	53	247	1	36	58	45	387
2006	709	1	43	54	401	1,208	16	36	52	213	1	27	58	36	335

*1 Longline vessels larger than 50 GRT include those operated in the area other than the Pacific.
*2 50-199 GRT class vessels only include those operated in the Pacific side of northern Japan.
*3 1–19 GRT class vessels before 1995 include those engaged in trolling.

Table 1B. Number of Japanese tuna fishing vessels operated in the North Pacific Ocean by type of fisheries and vessel size based on logbook. Values in 2017 and 2018 are provisional.

	Longline fishery					Purse seine fishery				Pole-and-line fishery			
Year	10-49 GRT	50-99 GRT	100-199 GRT	200- GRT	Total	50-199 GRT*4	200-499 GRT	500- GRT	Total	20-49 GRT	50-199 GRT	200- GRT	Total
2006	277	44	52	113	486	31	35	1	67	1	83	30	114
2007	279	42	48	89	458	34	36	1	71	1	77	29	107
2008	277	42	40	90	449	35	37	1	73	1	69	29	99
2009	277	38	33	81	429	33	36	3	72	1	68	28	97
2010	290	29	28	98	445	31	35	4	70	1	66	28	95
2011	273	24	25	99	421	33	36	4	73	0	63	28	91
2012	265	21	21	92	399	34	37	4	75	0	60	27	87
2013	260	20	23	87	390	34	37	4	75	0	55	25	80
2014	250	18	21	90	379	33	37	3	73	1	54	25	80
2015	239	18	24	80	361	30	35	5	70	1	51	24	76
2016	234	16	16	64	330	32	33	4	69	1	50	25	76
2017	233	15	15	50	313	37	34	4	75	1	48	31	80
2018	218	14	16	52	300	34	30	4	68	1	43	25	69

*4 50-199 GRT class vessels only include those operated in the Pacific side of northern Japan.

Table 2. Catch in weight (t) by species by fisheries in the North Pacific.

A. Pacific bluefin tuna

	Purse Seine[*1]		Dist. & Off. Longline[*2]							
Year	Tuna PS	Small PS	North Pacific	South Pacific	Coastal Longline[*2]	Troll	Pole-and-line	Set-net	Others[*4]	Total
2013	2,008	763	7	7	777	904	8	1,415	529	6,418
2014	2,250	3,206	11	4	672	1,023	5	1,907	499	9,577
2015	2,759	886	12	4	607	413	8	1,242	432	6,360
2016	3,267	1,828	13	4	644	778	44	1,227	508	8,314
2017	3,341	1,199	21	6	880	603	86	2,255	665	9,054
2018[*3]	3,225	825	19	2	679	372	8	645	431	6,205

*1 Catch amounts of purse seine fisheries are based on logbook data from 2002 to 2017. Those of 2018 are based on JFA monitoring data.

*2 Distant water and offshore longline vessels are mainly 20 GRT or larger, and most of coastal longline vessels are smaller than 20 GRT.

*3 Most recent year's catch value is provisional.

*4 Others include drift-net, handline, trawl, other longline, and unclassified fisheries.

B. Albacore

	Longline		Pole-and-line								
Year	Distant Water + Offshore[*5]	Coastal	Distant Waters	Offshore	Coastal	Drift-net	Purse seine	Troll	Set-net	Others[*6]	Total
2013	4,729	15,110	21,197	12,310	61	14	1,988	302	36	211	55,958
2014	4,270	15,703	17,462	11,890	81	11	2,009	197	24	197	51,844
2015	3,907	17,106	11,498	9,710	86	138	1,072	239	17	170	43,943
2016	3,431	13,118	8,648	5,754	33	19	3,679	148	28	128	34,986
2017	3,720	13,589	12,108	8,753	30	40	1,250	107	48	119	39,764
2018	(3,179)	(10,069)	(9,100)	(8,400)	(100)	(0)	(3,000)	(100)	(0)	(2)	(33,950)

*5 Category distant water + offshore LL includes training/research vessel.

*6 Others include troll catch for 1952-1994.

Numbers in parentheses mean preliminary.

C. Swordfish

	Longline								
Year	Distant Water + Offshore	Coastal	Others	Drift-net	Bait fishing	Net fishing	Trap-net	Others	Total
2013	3,686	924	5	290	291	-	13	163	5,372
2014	3,919	1,101	2	269	291	-	7	0	5,589
2015	4,222	1,235	1	277	281	-	3	204	6,223
2016	3,941	1,961	2	303	256	-	2	169	6,634
2017[*7]	3,404	3,192	2	291	289	-	3	274	7,455
2018[*7]	3,793	3,192	2	291	289	-	3	274	7,844

*7 Catch between 2017 and 2018 are preliminary.

Table 2. Continued.
D. Striped Marlin

Year	Longline								
	Distant Water + Offshore	Coastal	Others	Drift-net	Bait fishing	Net fishing	Trap-net	Others	Total
2013	377	1,104	33	336	34	-	39	19	1,942
2014	269	855	35	173	22	-	35	0	1,389
2015	289	1,039	43	287	27	-	37	37	1,759
2016	265	737	33	308	32	-	25	41	1,441
2017*8	178	1,080	53	241	28	-	28	23	1,631
2018*8	160	1,080	53	241	28	-	28	23	1,613

*8 Catch between 2017 and 2018 are preliminary.

E. Blue shark

Year	Longline								
	Distant Water	Offshore	Coastal	Others	Large mesh drift-net	Bait fishing	Trap-net	Others	Total
2012	6,358	5,325	829	760	1,118	3	2	3	14,396
2013	6,654	4,621	1,124	622	1,103	2	6	4	14,137
2014	6,578	5,593	538	598	1,060	2	4	0	14,372
2015	6,913	4,939	551	386	697	2	21	0	13,510
2016	8,256	4,774	375	225	1,832	2	26	1	15,492
2017	8,108	5,509	342	212	1,366	1	4	0	15,543

F. Shortfin Mako

Year	Longline					
	Offshore and Distant water (Shallow-set)	Offshore and Distant water (Deep-set)	Coastal and other	Large mesh drift-net	Trap-net and others	Total
2012	404	141	9	229	2	786
2013	468	97	47	345	9	966
2014	450	138	7	263	3	861
2015	702	210	2	334	11	1,260
2016	457	157	33	448	26	1,108
2017	473	82	25	271	10	862

Table 2. Continued.

G. Bigeye

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2013	12,804	2,446	1,421	1	5	116	111	16,904
2014	16,694	2,836	2,546	0	0	160	138	22,374
2015	16,030	780	2,855	4	3	140	114	19,926
2016	11,598	1,012	1,310	0	1	87	109	14,117
2017	11,434	1,395	2,201	1	0	119	89	15,239
2018	11,524	1,443	3,472	1	0	119	89	16,648

H. Skipjack

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2013	178	80,833	110,212	112	209	2,514	111	194,169
2014	132	58,621	104,159	119	131	954	93	164,209
2015	77	70,353	117,548	119	153	1,238	46	189,534
2016	34	68,981	82,658	111	264	1,642	53	153,743
2017	30	61,487	93,396	61	401	1,615	81	157,071
2018	21	67,349	125,529	61	401	1,615	81	195,057

I. Yellowfin tuna

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2013	6,900	3,268	9,251	8	103	1,817	491	21,838
2014	6,917	2,810	14,553	8	67	1,523	429	26,307
2015	9,147	2,971	25,503	12	56	2,014	599	40,302
2016	7,978	3,218	21,300	16	120	2,250	806	35,688
2017	7,968	3,195	24,195	7	135	1,877	690	38,067
2018	7,903	2,990	39,100	7	135	1,877	690	52,702

7 FIGURES

Longline fishery

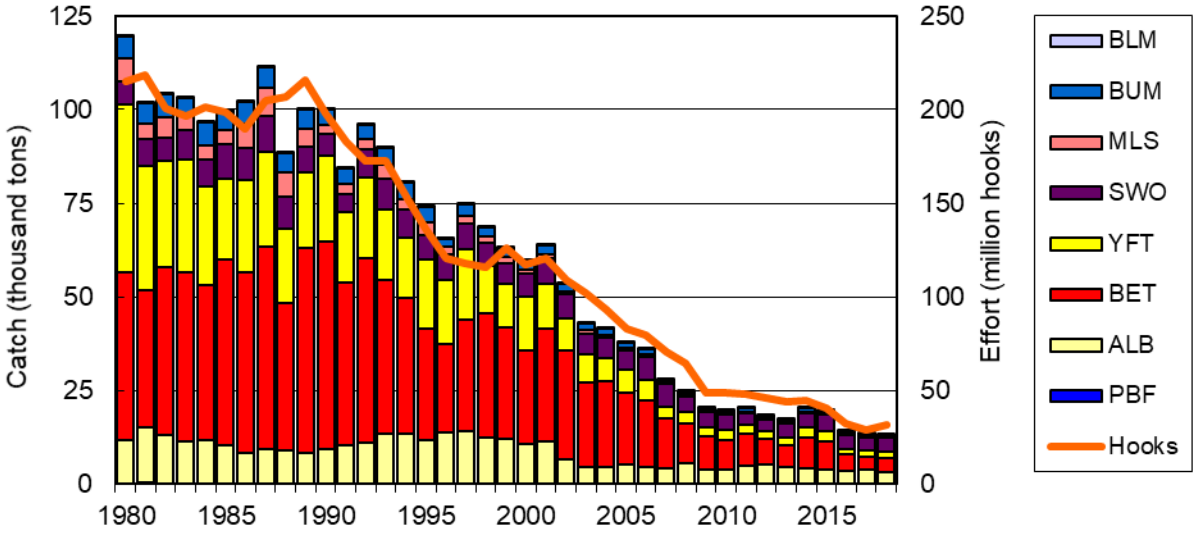

Fig. 1. Historical catches in weight (t) for major species and fishing effort (Number of hooks in million) of the Japanese distant water and offshore longline fisheries (not including small offshore fishery) in the North Pacific Ocean. PBF: Pacific bluefin tuna, ALB: albacore, BET: bigeye, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin, BUM: blue marlin, BLM: black marlin. Values in 2017 and 2018 are provisional.

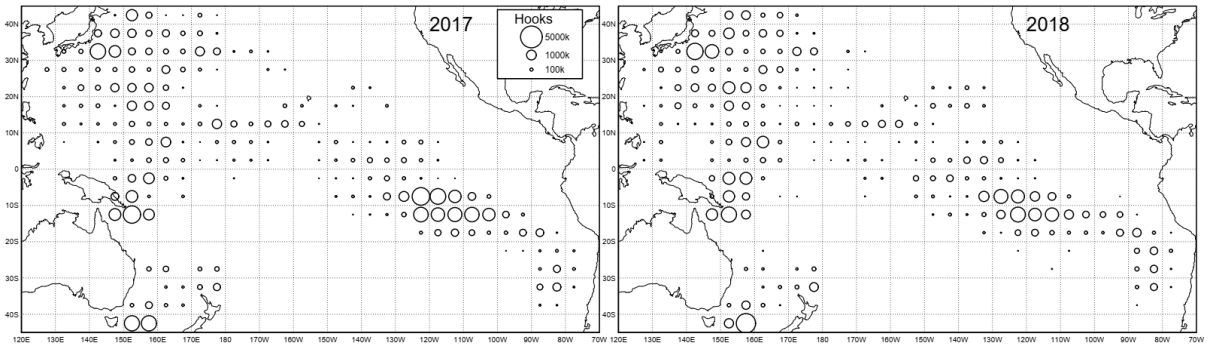

Fig. 2. Distribution of fishing effort (Number of hooks) for the Japanese distant water and offshore longline fisheries in the Pacific, 2017-2018.

Purse seine fishery

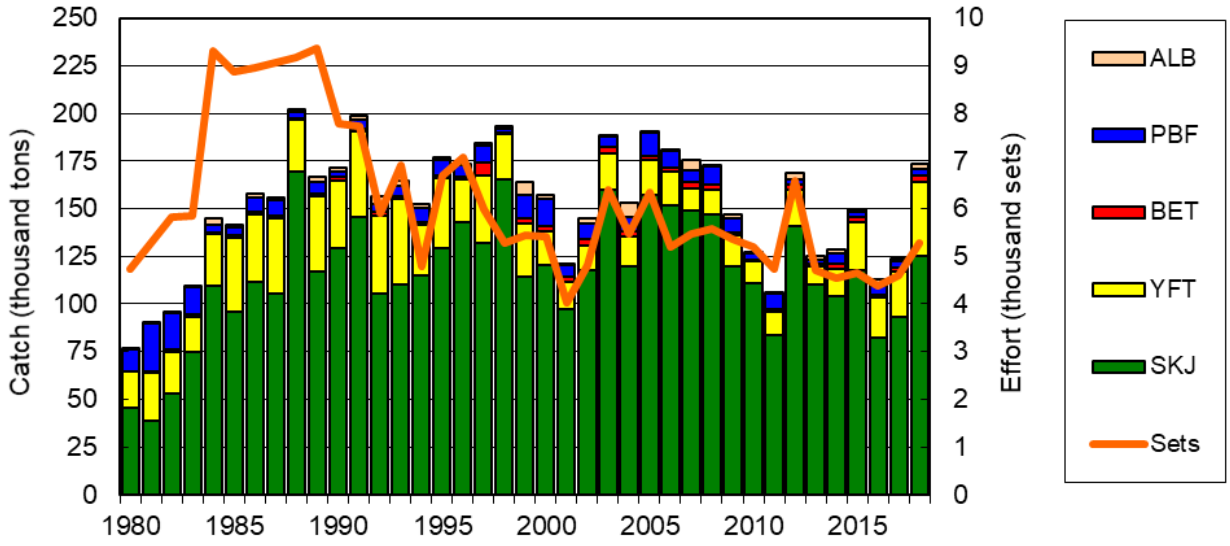

Fig. 3. Historical catches in weight (t) for major species and fishing effort (Number of sets) of the Japanese purse seine fishery in the North Pacific Ocean. SKJ: skipjack, YFT: yellowfin tuna, BET: bigeye, PBF: Pacific bluefin tuna, ALB: albacore. Value in 2018 is provisional.

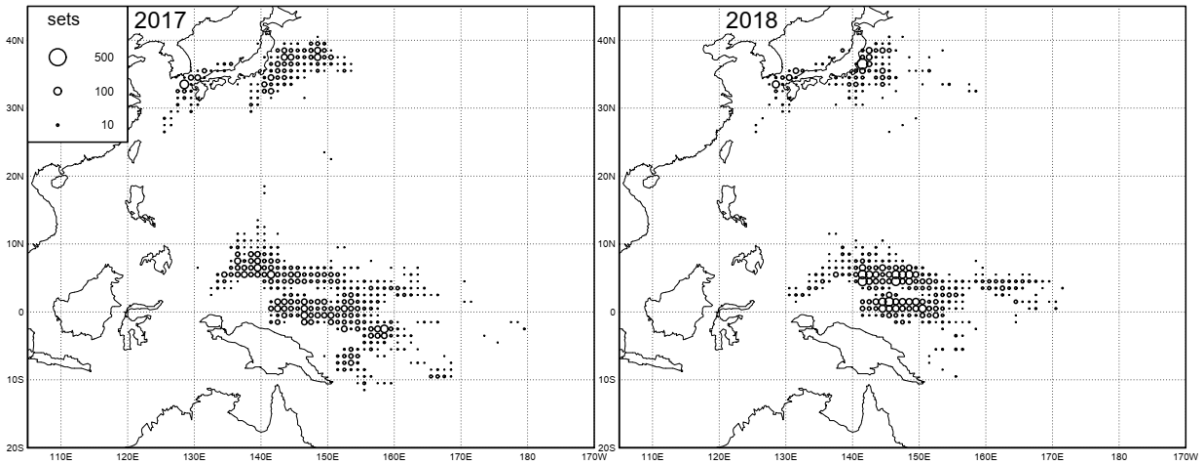

Fig. 4. Distribution of fishing effort (number of sets) for the Japanese purse seine fishery in the Pacific, 2017-2018.

Pole-and-line fishery

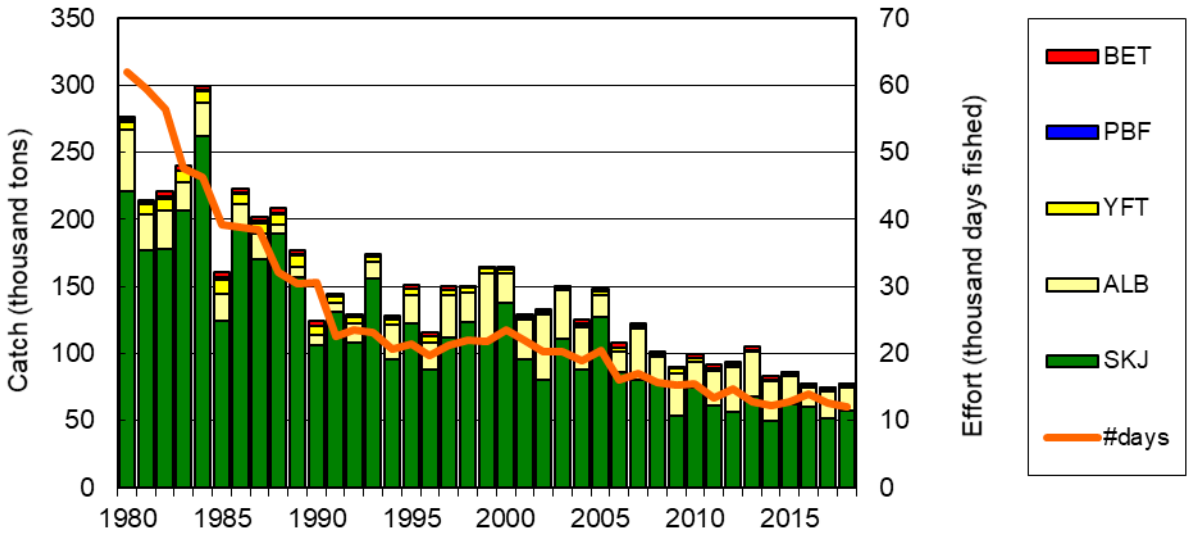

Fig. 5. Historical catches in weight (t) for major species and fishing effort (Number of fishing days) of Japanese distant water and offshore fisheries in the North Pacific. SKJ: skipjack, ALB: albacore, YFT: yellowfin tuna, PBF: Pacific bluefin tuna, BET: bigeye. The catch for PBF includes the catch by coastal pole-and-line (less than 20 GRT vessels) fishery. Value in 2018 is provisional.

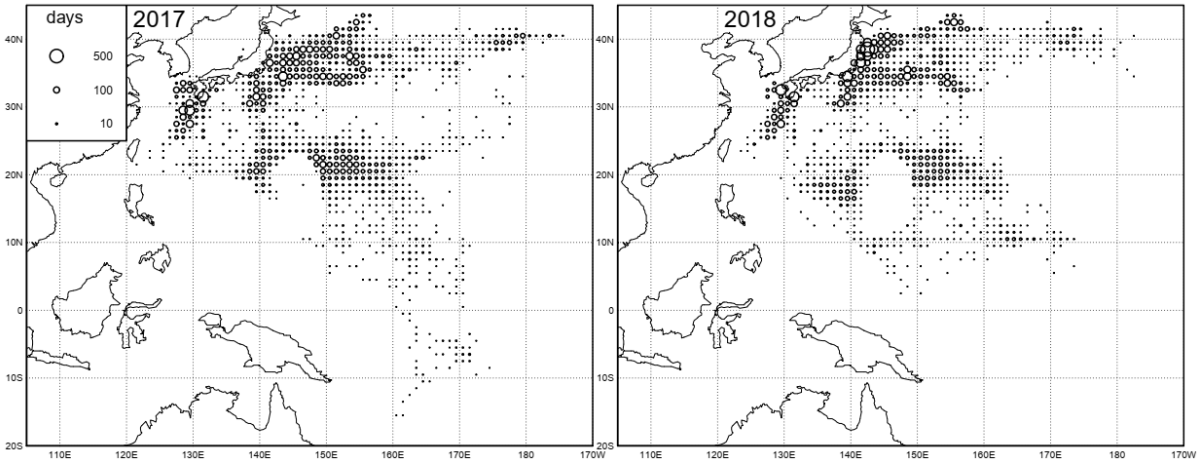

Fig. 6. Distribution of fishing effort (number of days) of the Japanese pole-and-line fishery (larger than 20 GRT vessels) in the Pacific, 2017-2018.

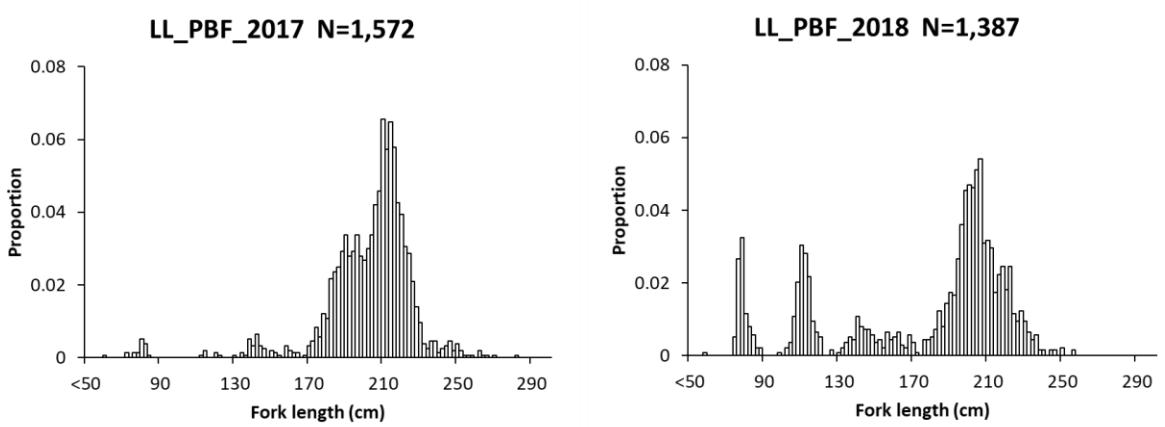

Fig. 7. Annual relative length frequency distribution (simply summing up all measurements) for Pacific bluefin tuna (PBF) caught by longline in 2017 (left) and 2018 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

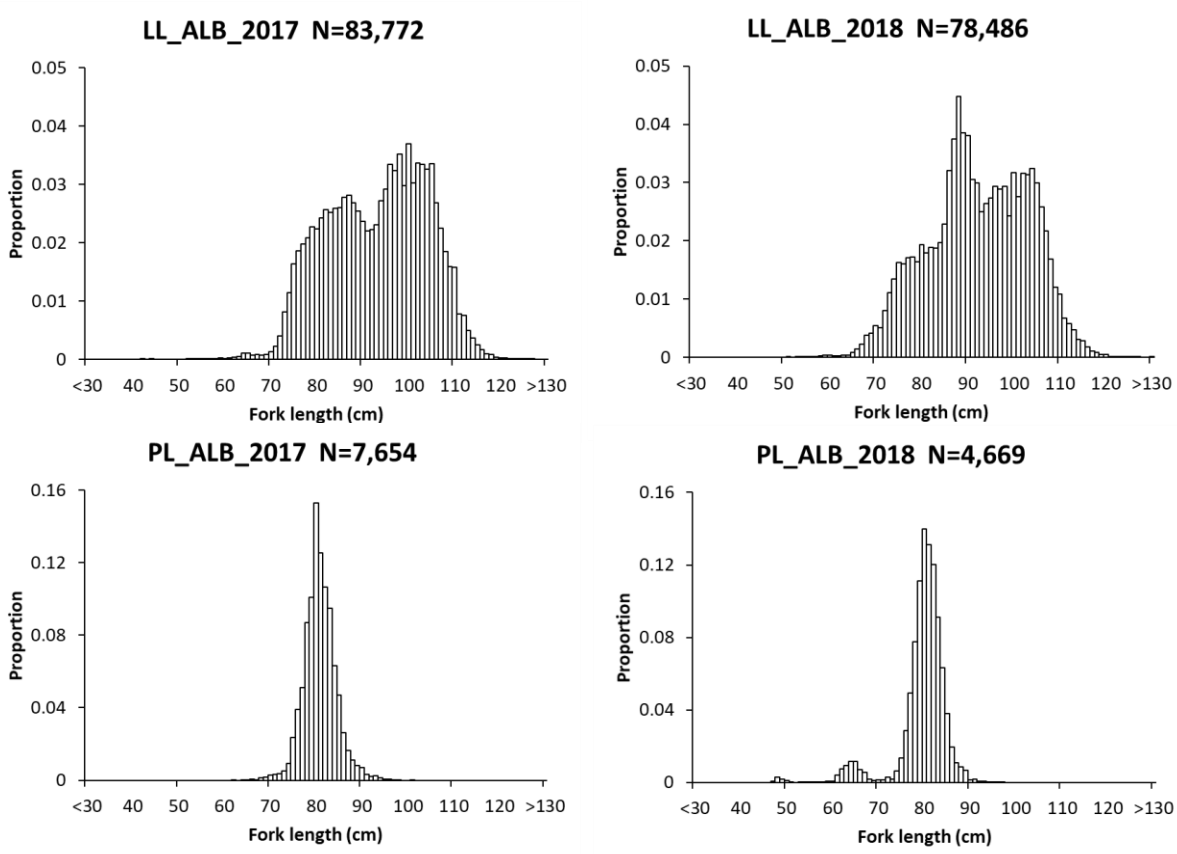

Fig. 8. Annual relative length frequency distribution (simply summing up all measurements) for albacore (ALB) caught by longline (upper two panels) and pole-and-line (lower two panels) in 2017 (left) and 2018 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

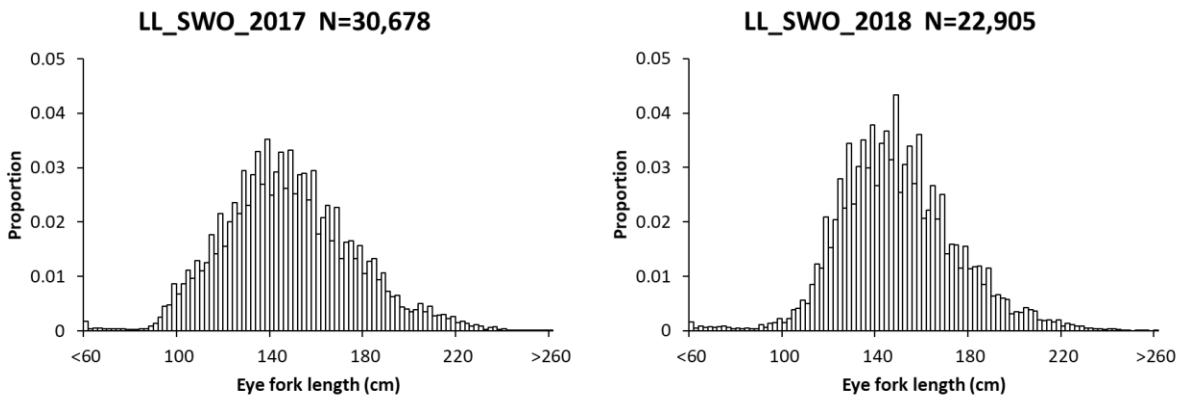

Fig. 9. Annual relative length frequency distribution (simply summing up all measurements) for swordfish (SWO) caught by longline in 2017 (left) and 2018 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

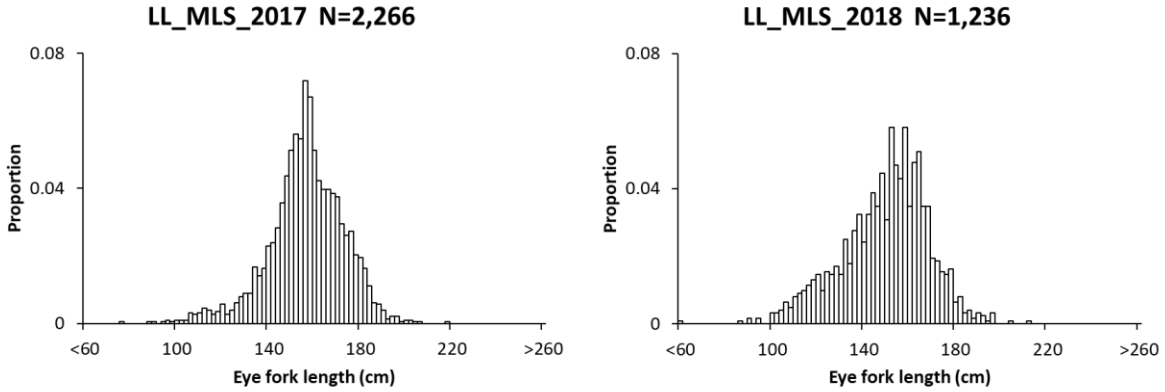

Fig. 10. Annual relative length frequency distribution (simply summing up all measurements) for striped marlin (MLS) caught by longline in 2017 (left) and 2018 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.