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

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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 ISC17 (Tsukahara et al 2017). The total catch of tunas (excluding skipjack) caught by Japanese fisheries in the north Pacific Ocean was 93,151 metric ton (t) in 2016 and 96,903 t in 2017. The total catch of tunas (including skipjack) caught by Japanese fisheries in the north Pacific Ocean was 246,894 t in 2016 and 228,229 t in 2017. The total catch of swordfish and striped marlin was 7,661 t in 2016 and 6,202 t in 2017. In addition to fisheries description, brief descriptions were given on Japanese research activities on tuna and tuna-like species in the Pacific Ocean in 2017.

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 2006-2017. The number of active vessels 2006-2017 was estimated based on logbook data. The coastal longline vessels less than 20 Gross Register Tonnage (GRT), 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 2016 and 2017 were provisional in Table 1B.

The total number of longline vessels showed continuous declining trend since the early 1990s (Table 1A). The number of longline vessels of the largest size class (> 200 GRT) was near 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 this fishery following the management measures adopted in 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 2017 which was 31% of that in 2006, and the number of vessels of 50-99 GRT was 15 in 2017 which was 34% 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 229 in 2017 (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 2017, at a peek in 2012, 2013 and 2017. The number of vessels of 50-200 GRT was 37 in 2017 which is the largest since 2006. The purse seine vessel which is allowed to operate in the tropical waters is larger vessel (currently, > 348 GRT). The 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 2006-2017, 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 47 in 2017 which is 57% of that in 2006. The number of vessels for over 200 GRT showed a declining trend until 2015, and then, increased from 24 to 28 during the 2015-2017 period.

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 2016 and 2017 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 13,046 t in 2017 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 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 have 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 2003-2017.

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 (> 349 GRT) 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. 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. Southern most 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 Pacific side of Japan, and harvest relatively small amount of yellowfin 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 7,599 days in 2017 (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 dominant species for this fishery, but the proportion of skipjack tends to decrease, from 80-78% in the 1980-1986 to 60-75% in the 2010-2017.

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 2017 was 9,040 t, which corresponds to 8% increase of the catch in 2016 (8,346 t). This was even 23 points higher than the average level of past five years (2012-2016: 7,360 t). Because catch of small PBF is affected by the recruitment strength of each year, Japanese catch has tended to fluctuate largely (Table 2-A). However, because of strict catch upper limit especially for small PBF implemented since January 2015 in accordance with the WCPFC conservation and Management Measure, the contrast in the catch for some fisheries, which mainly target small PBF, might become smaller than the previous years. For example, a certain strong recruitment was estimated in 2010 fishing year by recent stock assessments, while small pelagic purse seine (small PS) targeting age 0-1 fish showed the highest catch (6,113 t) among the recent eight years in 2011 calendar year. In contrast, their catch in 2017 remained low (1,199 t), although the most recent stock assessment estimated relatively high recruitment for the 2016 year class, reflecting the restriction by the management. Longline fishery tends to target the larger fish compared to the other fisheries, and their length frequency showed bimodal distribution at around 190 cm, which shifted a little toward larger size from 2016 to 2017, and 210 cm in fork length (FL) (Fig. 7).

3.2. Albacore (Table 2-B)

Preliminary total catch of albacore in 2017 was 34,753 t, which was almost the same as the catch in 2016 (34,990 t) and was smaller than the average of past five years (2012-2016: 49,671 t). Albacore caught by the pole-and-line fluctuated largely, but caught by longline was comparatively stable. Fishing effort mainly targeted on albacore by middle class (20-199 GRT) and large class (> 200 GRT) pole-and-line vessels fluctuated in recent years. Catch by longline in 2017 (16,312 t) was smaller than the catch in 2016 (16,549 t). The length frequency for longline distributed from 57 cm to 126 cm FL, whereas much smaller fish were caught by pole-and-line, which distributed from 45 to 101 cm (Fig. 8).

3.3. Swordfish (Table 2-C)

Preliminary total catch of swordfish in 2017 was 4,954 t which corresponds to 80% of the catch in 2016 (6,228 t) and was smaller than the average of past five years (2012-2016: 5,358 t).

Swordfish has been caught mainly by offshore and distant-water longline, which catch in 2017 was 2,648 t. The coastal longline in the Tohoku area operates night-shallow sets targeting swordfish. The length frequency for longline mainly distributed from 90-210 cm eye-fork length in 2016 and 2017 (Fig. 9).

3.4. Striped marlin (Table 2-D)

Preliminary total catch of striped marlin in 2017 was 1,248 t which corresponds to 87% of the catch in 2016 (1,433 t) and was smaller than the average of past five years (2012-2016: 1,709 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 180 t in 2017). 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 2017 was about 160 cm (Fig. 10).

3.5. Blue shark (Table 2-E)

A total catch of blue shark by Japanese fisheries was estimated 9,574 t in 2016. Those had reached at 20,099 t in 2011, and then had decreased since 2011 due to suffering of coastal and offshore longliners, who seasonally target blue shark, by the Great East Japan Earthquake. In addition to the update of the catch in 2016, most of the previous catch during 2011-2015 were updated due to the revision of the latest available species-specific data and statistics.

3.6. Shortfin mako (Table 2-F)

ISC SHARK WG had conducted a full stock assessment of shortfin mako for the first time and the recent catch was reported. A total catch of shortfin mako by Japanese fisheries was estimated 886 t in 2016. Those had reached at 1,054 t in 2013, and then had decreased since 2013 due to the decrease of the fishing effort of coastal and offshore longliners, who seasonally target blue shark and swordfish.

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

Preliminary total catch of bigeye in 2017 was 14,783 t which corresponds to 5% increase of the catch in 2016 (14,109 t) and was lower than the average of past five years (2012-2016: 18,808 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 2017 was 131,326 t which corresponds to 15% decrease of the catch in 2016 (153,743 t) and was lower than the average of past five years (2012-2016: 182,628 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.

Preliminary total catch of yellowfin in 2017 was 38,327 t which corresponds to 7% increase of the catch in 2016 (35,706 t) and was higher than the average of past five years (2012-2016: 31,392 t). The yellowfin catch by purse seine has been the highest proportion among gears in the North Pacific. Relatively higher total catches during the 2015-2017 period were mainly due to higher purse sein catch in tropical waters in the North Pacific.

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 popup 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 2017, research cruises were designed to focus on ecological studies of larval/juvenile PBF by R/Vs Shunyo-Maru, Yoko-Maru, Hokko-Maru, fisheries training vessel Mizunagi 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 May to July and also in the Sea of Japan, which is another spawning ground of PBF, from July to August. In the latter area, more than 1,300 of PBF larvae were captured in the west of the Noto Peninsula, which could help to understand biological and environmental factors on larval survival of PBF.

Juvenile surveys were conducted in nursery areas both the Pacific Ocean 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 for reporting preliminary recruitment abundances from two spawning grounds in a timely manner. In the 2017 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 2017 were available for evaluation of recruitment. However, the number of available data in 2017 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 7,714 fish were released and 1,263 fish were recaptured (16.4%). In addition, to investigate the habitat utilization of age-0 PBF, 442 individual PBF have been released with the implemented small archival tags (LAT2910, Lotek Ltd.) since 2016. 115 archival-tagged fish were recaptured in total (recovery rate 26.0%). With the data obtained from this survey, a part of the local and trans-Pacific migrations of this species were investigated (Furukawa et al. 2017, Fujioka et al. 2018a, 2018b). 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 63 fish about 30-60 kg in weight were attached various electronic data storage tags (archival tags, acceleration data-loggers and pop-up tags). Seven fish attached archival tags were recaptured in the Sea of Japan 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 2014 and around 3,000 individuals were sampled in 2017. Large mature adults of PBF (about 120-300 kg in body weight: 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. The quality and quantity of single-nucleotide-polymorphic markers (SNPs) developed and screened via Nest-Generation-Sequencing are exactly evaluated to detect parent-offspring-pairs (POPs) and half-sibling-pairs (HSPs) among wild PBF samples. 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 2017, size and sex data of blue shark and shortfin mako shark were collected from port sampling in Kesennuma fishing port and the onboard research project throughout the year. For blue shark, size data from 79,704 individuals was collected from port sampling and 73% of individuals measured were males. In addition, 78% of males and 65% 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 292,524 blue shark were recorded by size category and “large (processed weight: ≥ 15 kg)” consisted 35% of all catch with 27% of “middle (11 kg ≦ processed weight < 15 kg)”, 31% of “small (5 kg ≦ processed weight < 11 kg)” and 8% of “extra small (processed weight: < 5 kg)”.

For shortfin mako, size and sex data from 13,402 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 working group. Total

of 10,029 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 34% of "middle (150 cm < precaudal length ≦ 200 cm)", 56% 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 145 shortfin mako, two longfin mako, 32 bigeye thresher shark, and 734 blue shark.

In the research cruise by Shunyo-Maru conducted between 12th May and 1st June in 2017, popup satellite archival tag (PSAT) was deployed for 26 blue shark. In addition to the tagging, pregnancy was checked using echo observation and biochemical analysis for female blue shark released with PSAT.

4.2.3. Biological sample collection

For the estimation of life history parameters, vertebrae and/or reproductive organ were collected from 136 blue sharks and 34 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 pattern 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 8 and 10˚N in December 2017. A total of 202 skipjack tuna including 22 fishes with archival tag (Lotek LAT2910) were released in 2017. In addition, skipjack tagging has been being conducted in cooperation with Ajinomoto Co., Inc. in the coastal area of southwestern Japan since 2009. In 2017, 100 skipjack tuna including 22 fishes with archival tag were released at the east of Taiwan in December 2017 and March 2018.

Besides above studies, three research/training pole-and-line vessels conducted skipjack tagging in 2017 around Japanese water. A total of 797 skipjack tuna including 98 archival tags were deployed in the south off Japan and around Izu Islands, around Hachijo Island (33˚N, 139˚E) and Wakayama (33.15˚N, 135.75˚E).

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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 2016 and 2017 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[*2]	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	248	18	21	90	377	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	88	354	32	33	4	69	1	50	25	76
2017	229	15	16	110	370	37	34	4	75	1	47	28	76

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
2012	1,043	1,419	6	8	667	570	113	1,932	343	6,101
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	11	4	607	413	8	1,242	432	6,361
2016	3,267	1,828	14	4	674	778	44	1,227	508	8,346
2017[*3]	3,341	1,199	21	6	865	603	86	2,255	665	9,040

*1 Catch amounts of purse seine fisheries are based on logbook data since 2002.

*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
2012	5,160	17,668	22,710	10,940	92	26	4,193	610	48	129	61,576
2013	4,729	15,110	21,197	12,310	61	14	1,988	302	36	211	55,958
2014	4,269	15,701	17,462	11,890	81	11	2,009	197	24	197	51,841
2015	4,091	16,967	11,498	9,710	86	138	1,072	239	17	170	43,988
2016	3,439	13,110	8,655	5,754	33	19	3,679	148	25	128	34,990
2017	(3,950)	(12,362)	(8,655)	(5,754)	(33)	(19)	(3,679)	(148)	(25)	(128)	(34,753)

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

*6 Others include Troll catch for 1952-1994

( ) Different data souce or carry over from previous year

C. Swordfish

	Longline								
Year	Distant Water + Offshore	Coastal	Others	Drift-net	Bait fishing	Net fishing	Trap-net	Others	Total
2012	2,946	1,085	4	371	288	-	8	59	4,760
2013	3,319	924	5	290	291	-	13	163	5,005
2014	3,279	1,081	2	269	291	-	7	-	4,929
2015	3,867	1,234	1	277	281	-	3	204	5,867
2016[*7]	3,535	1,961	2	303	256	-	2	169	6,228
2017[*7]	2,648	1,573	2	303	256	-	2	169	4,954

*7 Catch between 2016 and 2017 are preliminary

Table 2. Continued.

D. Striped Marlin

	Longline								
Year	Distant Water + Offshore	Coastal	Others	Drift-net	Bait fishing	Net fishing	Trap-net	Others	Total
2012	326	981	29	597	34	-	52	33	2,052
2013	358	1,104	33	336	34	-	39	19	1,924
2014	265	842	35	173	22	-	35	-	1,372
2015	292	1,039	43	287	27	-	37	37	1,762
2016[*8]	257	737	33	308	32	-	25	41	1,433
2017[*8]	180	630	33	308	32	-	25	41	1,248

*8 Catch between 2016 and 2017 are preliminary

E. Blue shark

	Longline								
Year	Distant Water	Offshore	Coastal	Others	Large mesh drift-net	Bait fishing	Trap-net	Others	Total
2011	14,234	4,135	64	859	795	3	8	1	20,099
2012	6,309	5,356	829	760	1,120	3	2	3	14,380
2013	6,585	4,676	1,124	622	1,103	2	6	4	14,124
2014	6,540	5,614	538	598	1,060	2	4	0	14,354
2015	6,700	4,889	551	386	697	2	21	0	13,247
2016	4,182	2,930	375	225	1,832	2	26	1	9,574

F. Shortfin Mako

	Longline					
Year	Distant Water + Offshore (Shallow-set)	Distant Water + Offshore (Deep-set)	Coastal and other	Large mesh drift-net	Trap-net and others	Total
2011	469	131	48	163	11	823
2012	522	185	9	229	2	948
2013	554	99	47	345	9	1,054
2014	578	199	7	263	3	1,051
2015	466	85	2	334	11	898
2016	314	66	33	448	26	886

Table 2. Continued.

G. Bigeye

Year	Longline	Pole-and-line	Purse seine	Gill-net	Set-net	Troll	Other	Total
2012	15,813	2,097	2,552	2	0	118	146	20,728
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	11,592	1,012	1,308	0	1	87	109	14,109
2017	11,580	804	2,202	0	1	87	109	14,783

H. Skipjack

Year	Longline	Pole-and-line	Purse seine	Gill-net	Set-net	Troll	Other	Total
2012	166	66,243	140,900	95	404	3,487	188	211,483
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	28	36,234	92,994	111	264	1,642	53	131,326

I. Yellowfin

Year	Longline	Pole-and-line	Purse seine	Gill-net	Set-net	Troll	Other	Total
2012	7,072	3,651	19,317	6	113	2,279	369	32,807
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	7,996	3,218	21,300	16	120	2,250	806	35,706
2017	8,204	2,790	24,141	16	120	2,250	806	38,327

Longline fishery

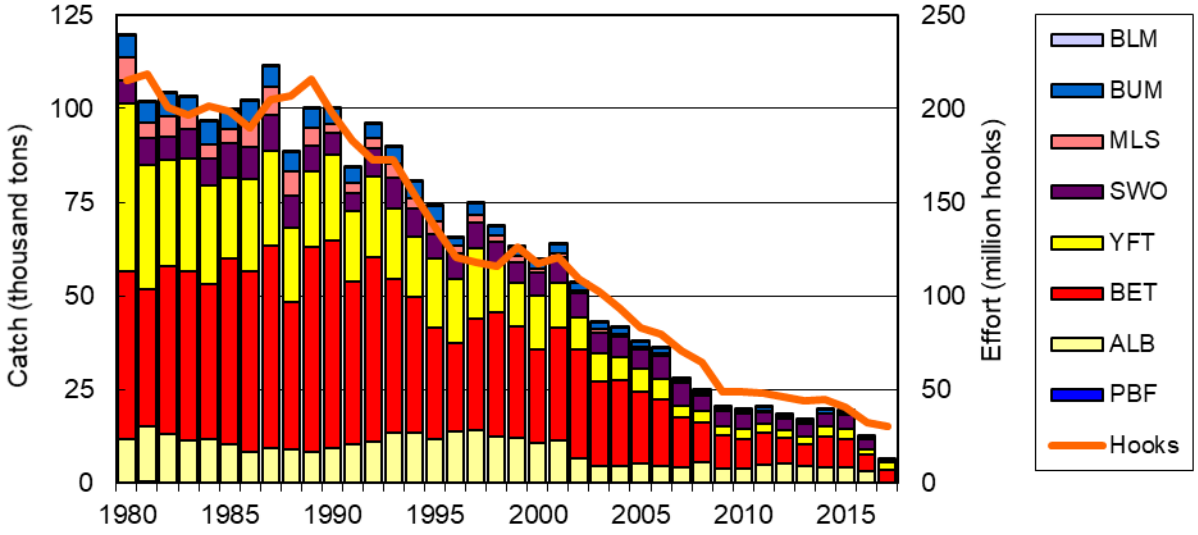

Fig. 1. Historical catches in weight (t) for major species and fishing effort (Number of hooks in million) of the Japanese distant water and offshore longline fisheries (not including small offshore fishery) in the North Pacific Ocean. PBF: Pacific bluefin tuna, ALB: albacore, BET: bigeye, YFT: yellowfin tuna, SWO: sword fish, MLS: striped marlin, BUM: blue marlin, BLM: black marlin. Values in 2016 and 2017 are provisional.

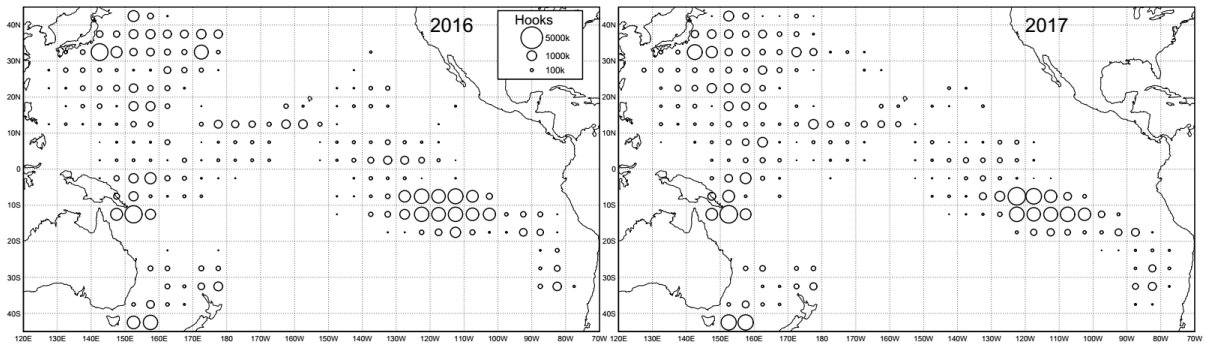

Fig. 2. Distribution of fishing effort (Number of hooks) for the Japanese distant water and offshore longline fisheries in the Pacific, 2016-2017.

Purse seine fishery

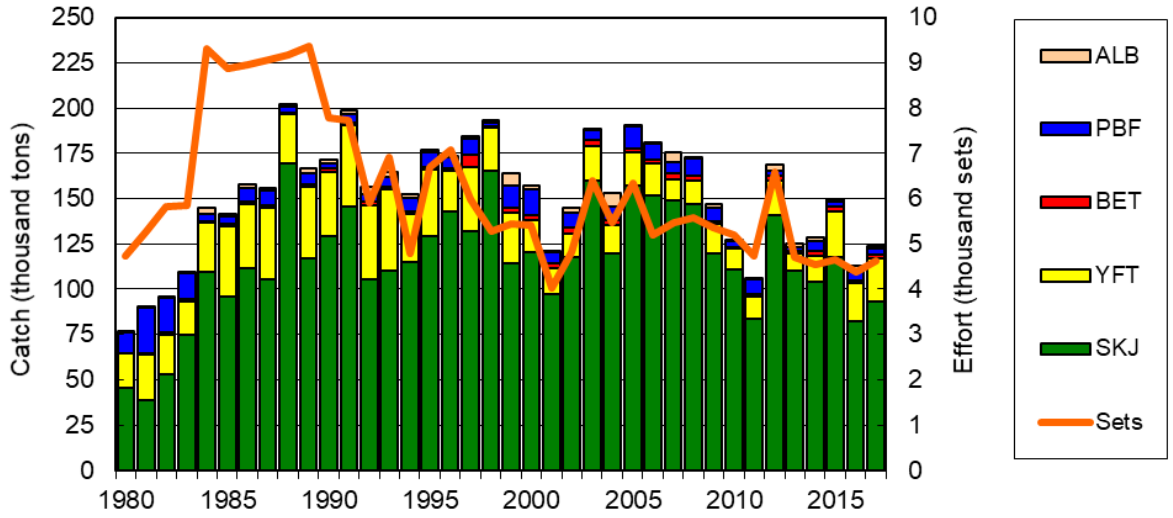

Fig. 3. Historical catches in weight (t) for major species and fishing effort (Number of sets) of the Japanese purse seine fishery in the North Pacific Ocean. SKJ: skipjack, YFT: yellowfin tuna, BET: bigeye, PBF: Pacific bluefin tuna, ALB: albacore. Value in 2017 is provisional.

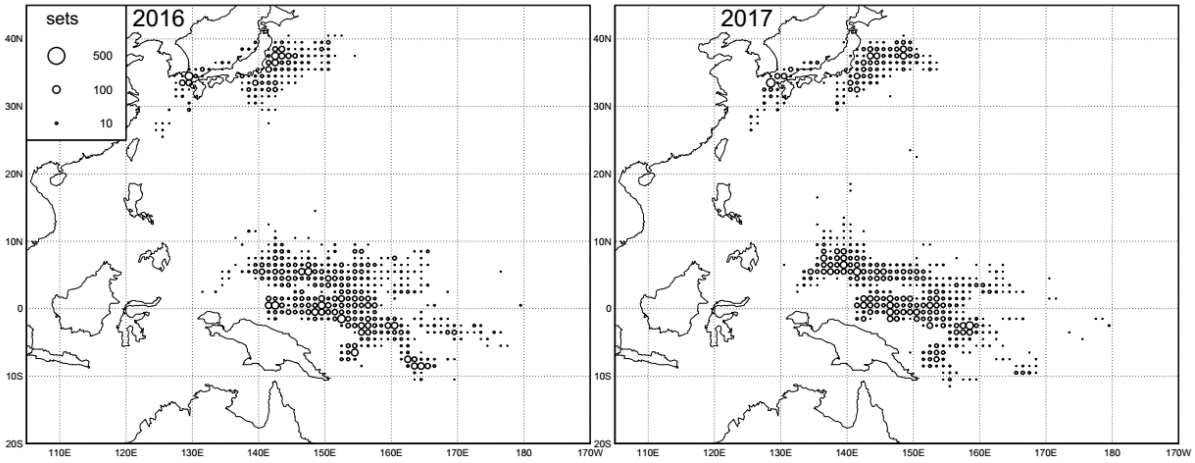

Fig. 4. Distribution of fishing effort (number of sets) for the Japanese purse seine fishery in the Pacific, 2016-2017.

Pole-and-line fishery

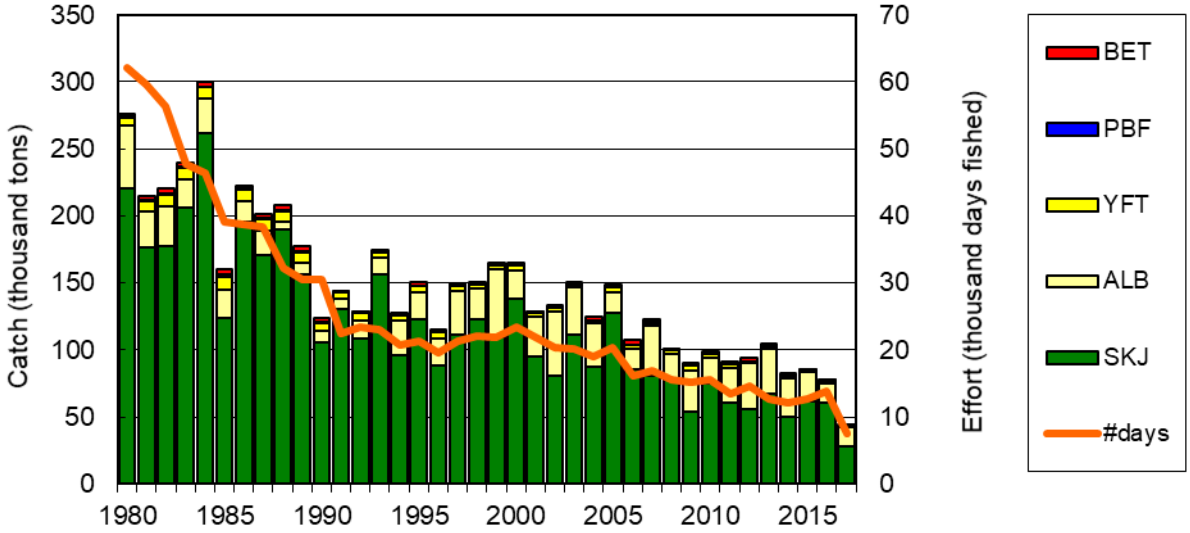

Fig. 5. Historical catches in weight (t) for major species and fishing effort (Number of fishing days) of Japanese distant water and offshore fisheries in the North Pacific. SKJ: skipjack, ALB: albacore, YFT: yellowfin tuna, PBF: Pacific bluefin tuna, BET: bigeye. The catch for PBF includes the catch by coastal pole-and-line (less than 20 GRT vessels) fishery. Value in 2017 is provisional.

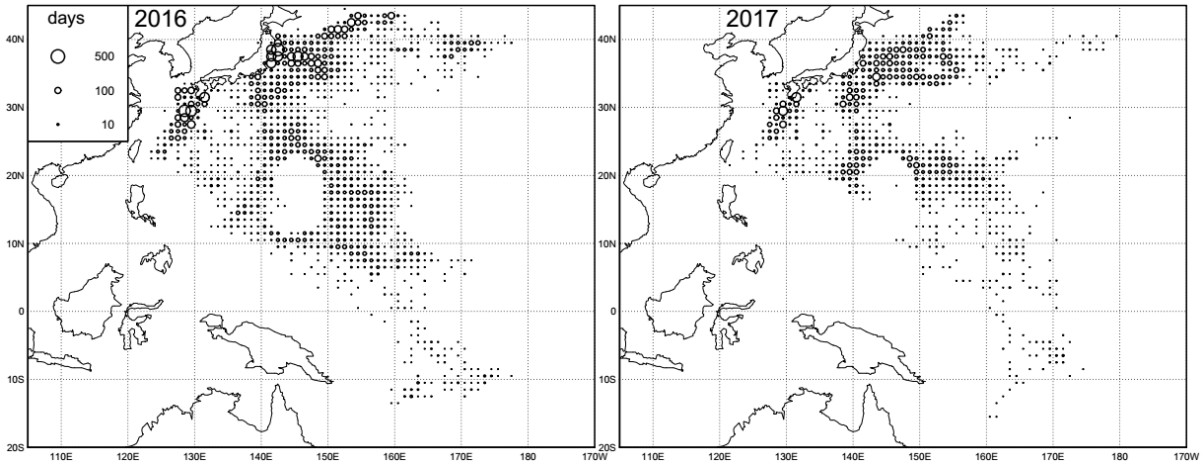

Fig. 6. Distribution of fishing effort (number of days) of the Japanese pole-and-line fishery (larger than 20 GRT vessels) in the Pacific, 2016-2017.

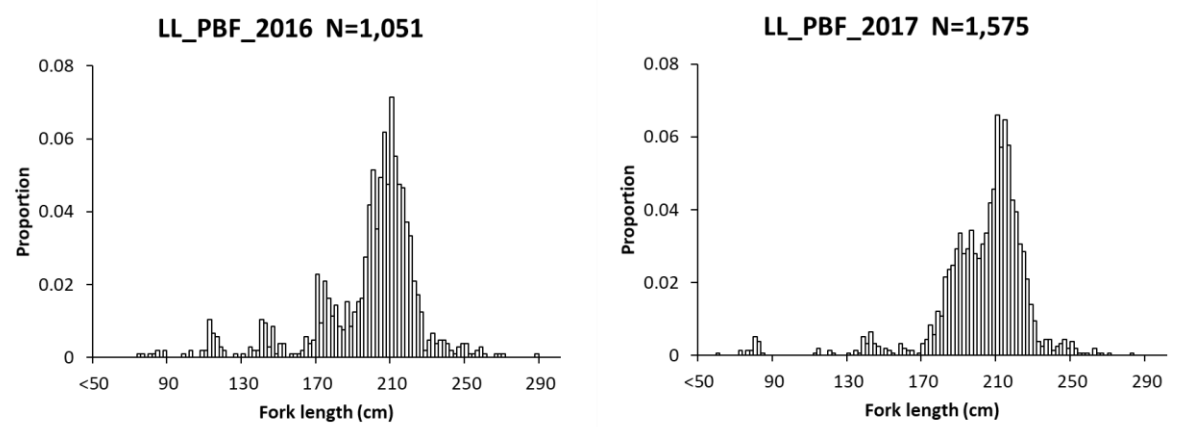

Fig. 7. Annual relative length frequency distribution (simply summing up all measurements) for Pacific bluefin tuna (PBF) caught by longline in 2016 (left) and 2017 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

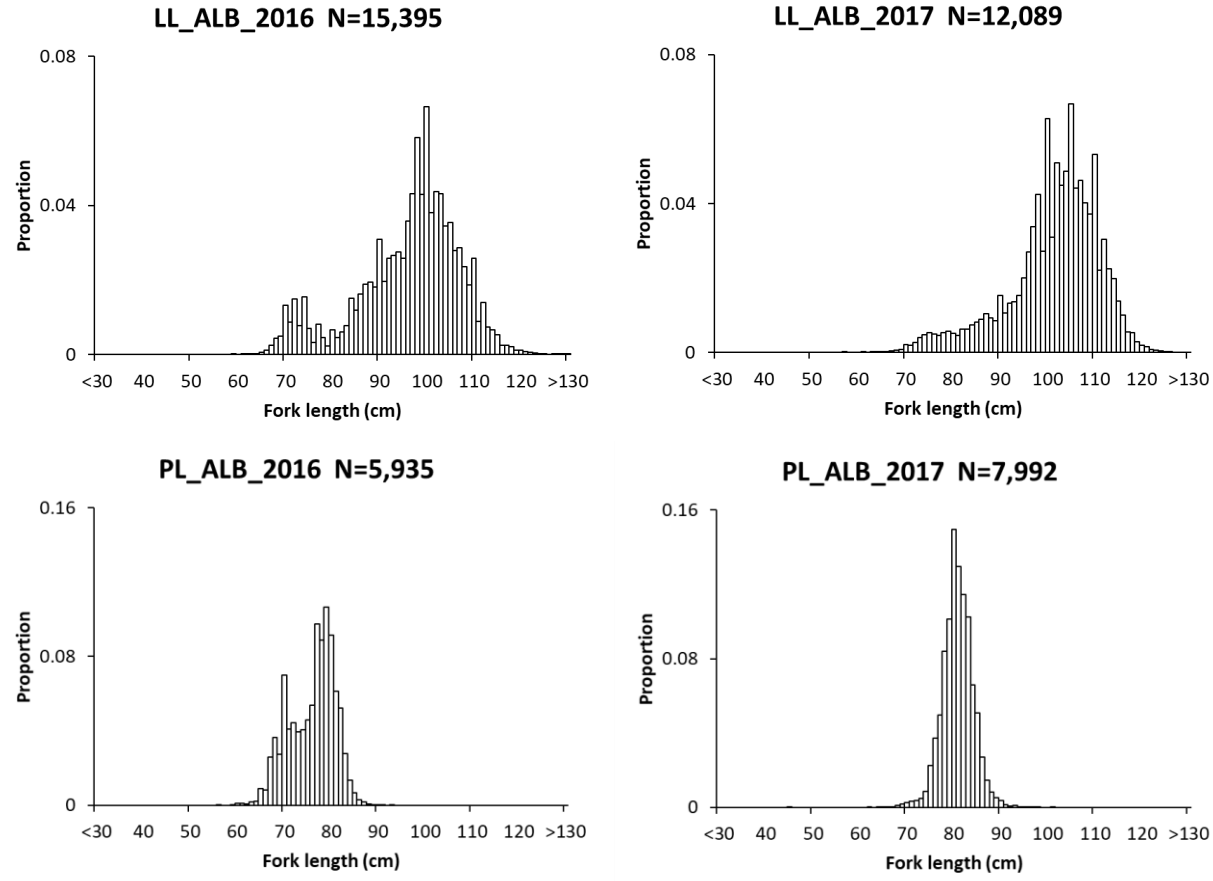

Fig. 8. Annual relative length frequency distribution (simply summing up all measurements) for albacore (ALB) caught by longline (upper two panels) and pole-and-line (lower two

panels) in 2016 (left) and 2017 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

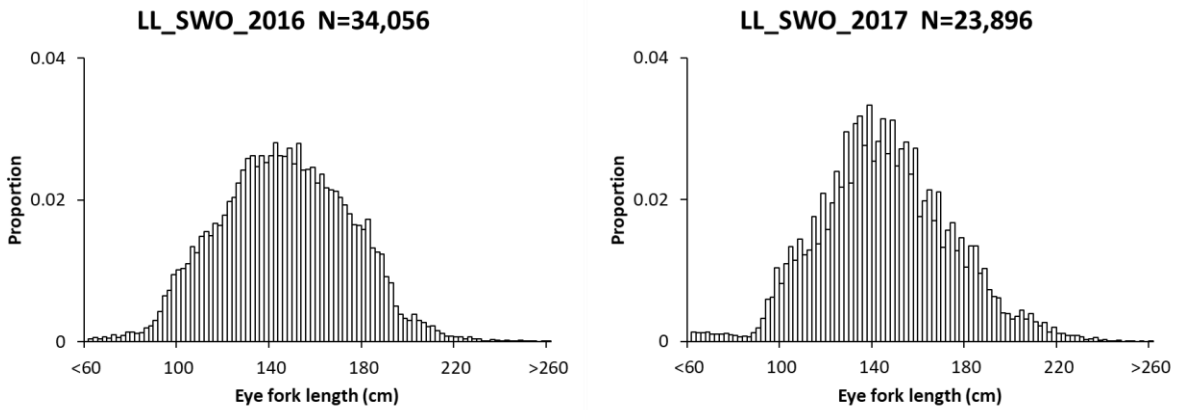

Fig. 9. Annual relative length frequency distribution (simply summing up all measurements) for swordfish (SWO) caught by longline in 2016 (left) and 2017 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

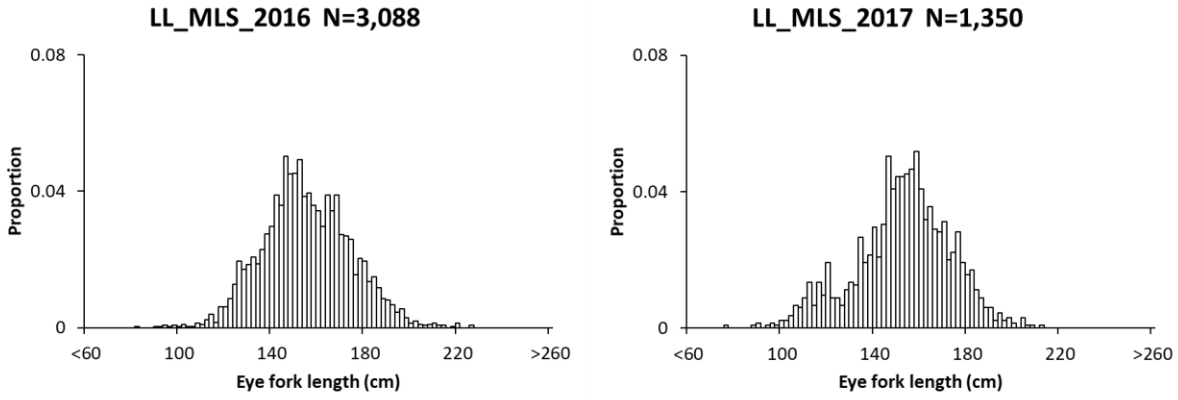

Fig. 10. Annual relative length frequency distribution (simply summing up all measurements) for striped marlin (MLS) caught by longline in 2016 (left) and 2017 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.