14th Meeting of the
International Scientific Committee
for Tuna and Tuna-Like Species in the North Pacific Ocean
Taipei, Chinese Taipei
16-21 July 2014

National Report of Japan[1]

Yuko Hiraoka, Hiroyuki Shimada, Kazuhiro Oshima, Ko Fujioka, Yasuko Semba, Siji Ohshimo, Mikihiko Kai, Kotaro Yokawa, Ai Kimoto, Keisuke Sato, Osamu Abe, Takayuko Matsumoto and Koji Uoksaki

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

July 2014

[1]Prepared for the Fourteenth Meeting of the International Scientific committee on Tuna and Tuna-like Species in the North Pacific Ocean (ISC), 16-21 July 2014, Taipei, Chinese-Taipei. Document should not be cited without permission of the authors.

National report of Japan

Yuko Hiraoka[2], Hiroyuki Shimada[2], Kazuhiro Oshima[2], Ko Fujioka[2], Yasuko Semba[2], Seiji Ohshimo[2], Mikihiko Kai[2], Kotaro Yokawa[2], Ai Kimoto[2], Keisuke Sato[2],Osamu Abe[2], Takayuki Matsumoto[2] and Koji Uosaki[2]

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

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 ISC13 (Hiraoka et al 2013). The total landing of tunas (excluding skipjack) caught by Japanese fisheries in the north Pacific Ocean was 119,631 metric ton (t) in 2012 and 104,635 t in 2013. The total landing of swordfish and striped marlin was 6,752 t in 2012 and 6,640 t in 2013. The landing of skipjack tuna was 211,482 t in 2012 and 186,019 t in 2013. 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 2013. The brief reports of Pacific Bluefin Tuna and Albacore Tuna Aging Workshop were also provided.

1. Trends in fleet size

Table 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 (MAFF 1982-2008) and 2006-2013. The number of active vessels 2006-2013 was estimated based on logbook data. The coastal longline vessels less than 20 Gross Register Tonnage (GRT), the research and training vessels of longline, and pole-and-line are not included in Table 1B. Results in 2012 and 2013 are provisional in those tables.

The total number of longline vessels shows continuous declining trend since the early 1990s

(Table 1A). The number of longline vessels of the largest size class (larger than 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 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 2^{nd} fleet reduction program for this fishery following management measures adopted in tuna RFMO. Recent declining trend for larger than 50 GRT are remarkable, the number of vessels of 100-200 GRT was 25 in 2013 which is 48% of that in 2006, and the number of vessels of 50-99 GRT was 20 in 2013 which is 45% of that in 2006 (Table 1B). This large reduction were mainly derived from high price of fuel especially since 2007 and the fleet reduction program implemented by the Government of Japan in March 2009 following a management measures agreed in WCPFC.

For the under 50 GRT vessel classes, the number of vessels for 20-49 GRT showed sharp decline since the late 1980s whereas the number of vessels of smallest size class (less than 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 246 and 290 during the 2006-2013 (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). The number of the smaller size (smaller than 200 GRT) purse seine vessels has decreased since the late 1980s. However, the number of purse seine vessels shows a trend of slight increase since 2006. The purse seine vessel which is allowed to operate in the tropical waters is larger vessel (currently, larger than 348 GRT). The number of such vessel has been 35 and has not changed since 1995.

Regarding the pole-and-line fishery, the number of vessels larger than 20 GRT declined to 122 in 2006 from 140 in 2005, which was almost one third of the average in the 1980s. The trend in the number of vessels smaller than 20 GRT also showed the general decreasing trend during the 1995-2006, and the number of vessels in 2006 was 44% of that in 1995. The number of pole-and-line vessels of 50-199 GRT was 55 in 2013 which is 66% of that in 2006. The number of pole-and-line vessels for over 200 GRT also shows declining trend with the lesser extent, is 25 in 2013 which is 83% of that in 2006.

2. Catch and effort trends of the major fisheries

2.1 Longline

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

The fishing effort of longline fishery (distant water and offshore) 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 has further decreased until 2009 (Fig. 1). After in 2009, the amount of effort was relatively stable between 46-48 million hooks. Annual distribution of fishing effort for longline fishery in 2012 and 2013 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 distant water and offshore longline vessels in the north Pacific has been decreased since the highest catch of 119,202 t in 1980, and it was 17,475 t in 2013 which is 15% 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 decreased to less than 10,000 t in 2009. Yellowfin catch ranged between 30,000 t and 50,000 t until early 1980s. It has gradually decreased into about 10,000 t in 2001 and into less than 5,000 t in 2007. Albacore catch which have fluctuated around 10,000 t until 2001 decreased to about 4,000-6,000 t and kept stable at a low level during the period 2003-2013.

2.2 Purse seine

There are two types of purse seiners that target tunas in Japan, i.e., single and group purse seine fisheries. Historically, the group seiner consists of one purse seiner (100-200 GRT) and one searching vessel and two carrier vessels, and operates in the temperate northwestern Pacific (Fig. 4). New type of group seiner launched at March 2005, which consists of one large seiner (300 GRT) than typical size of the purse seiner and one carrier instead of two carriers. The group purse seiner operates in the offshore waters off Japan. 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 seasonally operates in the temperate waters (Fig. 4).

The fishing effort of the purse seine in the North Pacific 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 dominant among species in this fishery, followed by yellowfin. The skipjack catch was about 150,000 t until 2008, and then decreased to 90,000 t in 2011, which recovered to 140,000 t in 2012.

2.3 Pole-and-line

The pole-and-line fishery is composed of three different categories, i.e., coastal (smaller than

20 GRT), offshore (10-120 GRT) and distant water (lager than 120 GRT) vessels in terms of the license of this fishery. Note that some of 19 GRT type vessels obtained offshore license since 2007, those are included into offshore category in this document. The pole-and-line fishery 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 trip is 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 tunas from spring through autumn off Pacific side of Japan, and also 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 more or less similar to 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 tuna 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 fisheries 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 11,462 days in 2013 (Fig. 5). Total (species unspecified) catch 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 90,000 t until the latest year (Fig. 5). Most of catch were occupied by skipjack ranged from 59% in 2013 to 91% in 1991.

Fishing grounds of the pole-and-line fishery are widely spreads ranging from 45˚N and 10˚S, from 120˚E to 170˚W. The fishing grounds were separated by around 25 degree north but more continuous than the purse seine fishing grounds (Figs. 4 and 6).

3. Recent trends for major species

3.1. Pacific bluefin (Table 2-A)

Preliminary total catch of pacific Bluefin (PBF) in 2013 was 7,014, which was slightly higher than the catch in 2012 (6,654 t). The length frequency distribution for PBF caught by longline, which was measured at landing port, is shown in Fig. 7. In both years, PBF ranged 150-250 cmFL which correspond to 5-25 years old were mainly caught.

3.2. Albacore (Table 2-B)

Preliminary total catch of albacore in 2013 was 61,630 t, which was slightly smaller than the catch in 2012 (61,576 t) and was larger than the average of past 5 years (53,711 t), though the value in 2013 is provisional. Albacore catch by the pole-and-line fluctuated largely, but catch by longline was comparatively stable. Fishing effort mainly targeted on albacore by middle class (20-199 GRT) and large (> 200 GRT) pole-and-line vessels fluctuated in recent years. Catch by longline in 2013 (22,867 t) was similar to the catch in 2012 (22,828 t). The length frequency for longline distributed from 60 cm to 130 cm FL, whereas much smaller fish were caught by pole and line, which distributed form 50 to 90 cm (Fig. 8).

3.3. Swordfish (Table 2-C)

Preliminary total catch of swordfish by Japanese fisheries was 4,774 t in 2013. Swordfish have been caught mainly by offshore and distant-water longline. The catch by offshore and distant-water longliners showed a continuous decreasing trend since the mid-1980s and the estimated catch in 2013 was 3,412 t. The observed decreasing trend is due to the decrease to the number of offshore surface longline boats based on Kesennuma fishing port in Tohoku area (northeastern area), whose primarily target species are swordfish and blue shark. The catch by coastal longline showed drastic decrease from 2,014 t in 2007 to 633 t in 2013, which is primarily due to the decrease of the number of longline boats especially in the Tohoku area, where part of boats operates night shallow sets targeting swordfish, by the Great East Japan Earthquake in 2011. The size range of swordfish by the longline fisheries were between 120cm and 190cm eye-fork length in 2012 and 2013 (Fig 9).

3.4. Striped marlin (Table 2-D)

Preliminary total catch of striped marlin by Japanese fisheries was 1,866 t in 2013. Striped marlin was caught mainly by offshore and distant-water longline up to beginning of 1970s when high sea’s drift net fishery started to catch striped marlin actively. In the beginning of 1990s, coastal longline fishery catch also increased due to increase of number of boats. Total catch of striped marlin shows continuous decreasing trend since the mid-1980s primarily due to the decrease of catch of offshore and distant-water longliners. Different from swordfish, decreasing trend of catches by longline fisheries and driftnet fishery shows seems to be ceased or slightly reversed. In recent years, Japanese pelagic fisheries catch striped marlin as bycatch except for coastal driftnet fishery and part of other longline fishery which is seasonally targets striped marlin. The size frequency of striped marlin in 2013 showed two-mode and an appearances of large numbers of small-sized fish ranged between 110cm and 130cm eye-fork length (Fig. 10), which were mainly measured off Hawaiian water.

3.5 Blue shark (Table 2-E)

Preliminary total catch of blue shark by Japanese fisheries, which was estimated for the use of its stock assessment conducted by ISC shark WG, was 13,254 t in 2012. This includes the estimates of dead discard. NRIFSF revised the conversion factor of blue shark from processed weight into round weight of blue shark in the North Pacific using newly collected sampling data (Kai et al 2014). The total amounts of the estimated blue shark catch including dead discard increased by 1.3-1.7 times (2008-2012) from the former values. The estimated catch had increased since 2008 and reached at 27,374 t in 2010, and then dropped in 2011 and 2012 due to suffering of offshore longliners, who seasonally target blue shark, by the Great East Japan Earthquake.

3.6. Others (Bigeye, Skipjack and Yellowfin)

Total catch of bigeye by Japanese fisheries in the North Pacific was 15,054 t in 2013 (Table 2F). Most of this species were caught by longline and the amount of bigeye catch by longline was decreasing in recent 5 years.

Total catch of skipjack by Japanese fisheries in the North Pacific showed no clear trend ranging from 156,372 t to 211,482 t during 2009-2013 (Table 2G) and most catch was made by pole-and-line and purse seine. In 2013, the skipjack catch was 186,019 t which was near the 5 years average during 2009-2013.

Total catch of yellowfin by Japanese fisheries in the North Pacific, were relatively stable, ranging from 27,687 t to 32,181 t during 2009-2012 but largely declined to 20,937 t in 2013 due to declining of purse seine catch (Table 2H). The yellowfin catch by purse seine has been the highest proportion among gears.

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 are cooperative works with prefectural fisheries experimental stations and universities. Several cooperative studies are also on going with foreign countries.

4.1. Pacific Bluefin

4.1.1. PBF larvae/juveniles research cruise

Since 2011, larval studies have been conducted to estimate current core spawning area and time of PBF. In 2013 research cruises were conducted for ecological study of larval/juvenile PBF by R/V Syoyo-Maru, Shunyo-Maru, Yoko-Maru, Tenyo-Maru, and six 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 7 May to 19 June and found that PBF larvae was abundant in the south of Yaeyama Islands and in the southwest Miyako Island. Larval surveys were conducted also in the Sea of Japan, which is another spawning ground of PBF, from 24 June to 20 August, and PBF larvae were captured in the west of Noto Peninsula and the east of Oki Islands. Compiling the three years cruise data from 2011 to 2013, spawning grounds of PBF were estimated by simulating backward Lagrangian transportation model. The results suggest that PBF start spawning late April in the west of Yaeyama Islands and east if Okinawa Main Island, expanding it ranges around Yaeyama Islands to Okinawa Main Island until late July toward the end in the Nansei Islands area. While in the Sea of Japan, PBF start spawning late June off Wakasa Bay and continue to spawn in around Noto to Oki throughout July.

4.1.2. Troll survey on age-0 PBF

NRIFSF has enhanced to conduct timely-monitoring of recruitment strength of age-0 PBF for the purpose of management of this species in recent year. Age-0 PBF at two to three months hatched in May and June migrate to coastal areas on the Pacific side of the western Japan and Tsushima and Goto Islands in the East China Sea and are captured alive for farming in these regions. A monitoring survey of fishing boat of troll fishery targeting the age-0 PBF has been started since 2011 in Kochi on the Pacific side and Tsushima and Goto Islands. Main purpose of this survey is to obtain quick estimation on recruitment abundance of age-0 fish from the fishery for farming before the fishing season during the period of winter to spring. Data loggers, which can collect information on location and sea temperature at a certain interval and include species and number of fish caught during operation, are equipped on 14 fishing boats in both of Kochi and Nagasaki. In last year, this survey had been deployed in Oki Islands in Shimane from September through December when age-0 PBF at two to five months old migrates around this region with installation of the data loggers on 10 fishing boats. In addition, in this year, this survey will be extended to Mie, Wakayama and Miyazaki, being able to cover wide area on the Pacific side of the western Japan. Consequently, this survey will monitor the quick estimation of recruitment abundance in both spawning periods such as May-June (Nansei-Island) and July-August (Sea of Japan).

4.1.3. Tagging for PBF

In order to estimate the natural mortality (M) and fishing mortality (F) of age-0 PBF (about 20 cm in fork length), we conducted a conventional tagging from the off Kochi prefecture since 2011. A total of 3,676 fish were released, and 725 fish were recovered (19.7%) for three years.

In addition, the habitat utilization of age-0 PBT in coastal nursery areas was investigated using small archival tags (LAT2910, Lotek Ltd.) implanted in a fish during summer (July-August) in 2012 and 2013 for 137 individuals. Thirteen tags were recovered in total (recovery rate 9.5%) and we downloaded data successfully from eight of them (61.5%). They are expected to provide valuable information on the design of reliable recruitment monitoring survey and the precise estimation of recruitment abundance levels as well as biology of juvenile periods.

We also conducted a tagging survey of adult PBF at Sado Island in the Sea of Japan in spring (May) to clarify the spawning behavior and migration ecology. A total of 14 fish about 30 kg were attached archival tags and some of them was fitted with acceleration data-loggers. Three indivisuals were recovered in the Sea of Japan after one week to nine months.

4.2. Sharks

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

In 2013, size data with gender of blue shark and shortfin mako shark was collected from port sampling project in Kesennuma fishing port and onboard research program for Kesennuma offshore longline fleet between January and December. For blue shark, data from 72,302 and 16,630 individuals were collected from port sampling and onboard research, respectively. Regarding the blue shark measured in the port sampling, 53.2% of males and 41.7% of females were juveniles. For shortfin mako, data from 7,446 and 5,430 individuals were collected from port sampling and onboard research, respectively. Regarding the shortfin mako measured in the port sampling, 67.7% of males and 99.7% of females were juveniles. Compared to blue shark, the ratio of adult female was small in shortfin mako. These data will be combined for the previously collected data to sketch their gender and growth specific seasonal migration patterns.

4.2.2. Research cruise

From research and training vessel cruise, catch data from 3,378 blue shark and 51 shortfin mako were obtained. In another research cruise by Taikei No.2, total of 2,409 blue shark and 49 shortfin mako were recorded. Within the catch, whole body from 45 blue shark and one shortfin mako were retained for the biological studies including detailed measurement of body length and weight. Body size (PCL: cm) and gender data were collected from 230 blue shark and 10 shortfin mako (except retained specimen).

4.2.3. Biological sample collection

For the estimation of life history parameters, vertebrae and/or reproductive organ from total of 188 blue sharks and 62 shortfin mako were collected from Kesennuma offshore longline fleet. For blue shark, these samples have been processed for the revision of past studies on growth and reproduction. For shortfin mako, the vertebrae are going to be used for the refinement of juvenile growth estimate.

4.3. Skipjack

4.3.1. Tagging for skipjcak

We have been conducting skipjack tagging mainly to know migration pattern to the fishing ground off Japan and its mechanism. One offshore pole-and-line vessel was chartered and tagging was conducted in the south off Japan between February and March in 2013. A total of 3,937 skipjack tuna including 118 fish with archival tag (Lotek LAT2910) were released. To date 400 fish including 6 fish with archival tag were recaptured. Archival tagging of skipjack tuna was conducted in the east off central Honshu area during June to July 2013 using offshore pole-and-line vessel. A total of 81 fish were released with archival tag, and so far 15 fish were recaptured. In addition, skipjack tagging has been being conducted in cooperation with Ajinomoto Co., Inc. in the coastal area of southwestern Japan since 2009. In 2013, 786 skipjack tuna including 43 fish with archival tag were released at around Yonaguni Island (24˚N, 123˚E) in April, and so far 4 fish were recaptured.

Besides above research, three research/training pole-and-line vessels conducted skipjack tagging in the area 13-36˚N, 134-145˚E in 2013. Total of 573 skipjack were released with the conventional tag, and 20 were recovered. By one of these vessels, collaborative study of archival tagging with NRIFSF has been being conducted since 2010. In 2013, a total of 78 archival tags were deployed in the south off Japan, and to date 2 fish were recaptured.

5. Pacific Bulefin Tuna and Albacore Tuna Ageing Workshop

Estimates of population abundance, recruitment, and biomass are highly sensitive to growth curve parameters used in the assessment models. Although growth curves for PBF and North Pacific Albacore (NPALB) have been improving year by year, uncertainty related to age determination is an ongoing challenge for assessing these species.

From 13 to 16 November 2013, the ISC convened the Pacific Bluefin Tuna and North Pacific Albacore Tuna Age Determination Workshop sponsored by the Fisheries Research Agency of Japan. The goals of the workshop were to share information on age determination techniques for NPALB and PBF and to develop standardized protocols for aging to improve the reliability of growth curves used in stock assessments for both species. The meeting was held at the NRIFSF in Shimizu, Japan and discussed on the following issues.

- Identifying age determination issues for PBF and NPALB,
- Discussing and sharing practical aging techniques among specialists to address age determination issues;

- Developing standardized protocols for tuna aging where appropriate,
- Documenting techniques and protocols in age determination manuals for PBF and NPALB; and
- Discussing the establishment of an Age Structure Exchange procedure between agencies to promote for QA/QC and inter-laboratory calibration of age results.

References

Hiraoka, Y, Nakano, H, Semba, Y, Oshima, K, Sato, K, Fujioka, K, Uosaki, K, Yokawa, K, Abe, O, Matsumoto, T and Takeuchi, Y (2013): National report of Japan. ISC/13/Plenary/06. 18pp.

Kai, M, Shiozaki, K, Ohshimo, S., Yokawa, K, Takahashi, N and Kanaiwa, M (2014): Update of Japanese abundance indices and catch for blue shark *Prionace glauca* in the North Pacific. ISC/14/SHARKWG-1/01. 31pp.

MAFF (1982-2012): Gyogyou yousyokugyou seisan toukei nenpou (Yearbook of fisheries and aquaculture production statistics of Japan for 1980-2012, Statistics Department, Minister's Secretariat, Ministry of Agriculture, Forestry and Fishery.

Table 1A. Number of Japanese tuna fishing vessels operated in the Pacific Ocean by type of fisheries and vessel size based on MAFF (1982-2008).

	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. Value in 2013 is 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	274	24	25	99	422	33	36	4	73	0	63	28	91
2012	265	21	21	92	399	34	37	4	75	0	60	27	87
2013	246	20	25	84	375	34	37	4	75	0	55	25	80

Table 2. Catch in weight (t) by species by fisheries in the North Pacific. Values in 2013 are provisional.

A. Pacific bluefin

Year	Longline*1		Purse Seine*2		Troll*3	Pole and Line	Set Net	Others*4	Total
	Distant Water + Offshore	Coastal	Tuna PS	Small PS					
2009	8	1,304	2,127	5,950	2,003	50	2,236	913	14,591
2010	5	903	1,122	2,620	1,583	83	1,603	918	8,836
2011	9	933	2,227	6,113	1,820	63	1,651	654	13,469
2012	6	792	1,043	1,419	570	113	1,932	779	6,654
2013*5	-	740	2,008	763	904*6	8	1,579	1,012	7,014

*1 Catches of the distant-water and offshore longline are yielded by vessels larger than 20 GRT.
*2 Catches of the purse seine fisheries since 2002 were recalculated using the logbook data.
*3 The troll catch since 1998 includes catch for farming.
*4 Others fisheries include drift net, handline, trawl, other longline and unclassified fisheries.
*5 Catch of the coastal longline in 2013 is provisional value and include catch of the distant water and offshore longline.
*6 Catch of the troll in 2013 has possibility to include a measure of catch from the pole-and-line operated in corresponding waters to those of the troll.

B. Albacore

Year	Longline		Plole-and-Line			Driftnet	Purse seine	Troll	Setnet	Others*8	Total
	Distant Water + Offshore (>20GRT)*7	Coastal (<20GRT)	Distant Waters	Offshore	Coastal						
2009	3,820	18,175	17,779	13,302	91	149	2,076	410	33	43	55,878
2010	3,943	17,224	15,737	3,689	135	24	330	588	42	37	41,749
2011	4,858	16,098	16,803	8,844	57	12	480	443	50	78	47,723
2012	5,160	17,668	22,710	10,940	92	26	4,193	610	48	129	61,576
2013	(4,946)	(17,921)	(22,725)	(10,940)	(92)	(26)	(4,193)	(610)	(48)	(129)	(61,630)

*7 category distant warter + offshore LL includes training/research vessel
*8 Others include Troll catch for 1952-1994
( ) different data source or carry over from previous year

C. Swordfish

Year	Longline			Drift net	Bait fishing	Net fishing	Trap net	Others*9	Total
	Distant-water + offshore	Coastal	Others						
2009	4400	1606	1	682	249	0	3	239	7180
2010	4240	1157	2	483	230	0	8	110	6230
2011*10	3046	965	2	189	233	0	2	10	4447
2012*11	2946	1057	4	370	288	0	8	59	4732
2013*11	3412	633	4	370	288	0	8	59	4774

*9 Other fisheries include trolling and harpoon but majority of catch obtianed by harpoon
*10 Some data in Tohoku area were not available due to the earthquake in 2011
*11 Catch between 2012 and 2013 are preliminary

Table 2. Continued.

D. Striped Marlin

Year	Longline: Distant-water + offshore	Longline: Coastal	Longline: Others	Drift net	Bait fishing	Net fishing	Trap net	Others*9	Total
2009	166	622	21	821	39	-	17	34	1721
2010	187	832	42	899	36	-	20	26	2042
2011*10	319	920	55	333	26	-	30	32	1715
2012*11	326	964	29	582	34	-	52	33	2020
2013*11	375	761	29	582	34	-	52	33	1866

*9 Other fisheries include trolling and harpoon but majority of catch obtianed by harpoon

*10 Some data in Tohoku area were not available due to the earthquake in 2011

*11 Catch between 2012 and 2013 are preliminary

E. Blue shark

Year	Longline: Distant Waters	Longline: Offshore	Longline: Coastal	Longline: Others	Large mesh driftnet	Bait fishing	Trapnet	Others	Total
2008	7,492	10,837	1,469	757	1,212	1	9	24	21,801
2009	7,092	12,176	1,270	657	888	1	7	16	22,106
2010	14,797	10,261	964	742	584	1	10	16	27,374
2011	10,413	4,000	65	878	333	3	8	3	15,703
2012	5,127	5,880	928	850	460	2	3	3	13,254

F. Bigeye

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2009	17,819	1,561	1,560	7	5	115	93	21,160
2010	15,532	2,367	988	2	4	157	80	19,130
2011	17,631	2,318	1,609	1	2	141	138	21,840
2012	14,306	2,097	2,552	2	0	118	146	19,221
2013	11,093	2,274	1,421	2	0	118	146	15,054

G. Skipjack

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2009	51	62,425	120,348	324	274	3,819	278	187,519
2010	58	82,253	113,400	315	333	4,729	205	201,293
2011	98	69,998	83,667	111	625	1,780	93	156,372
2012	165	66,243	140,900	95	404	3,487	188	211,482
2013	238	71,358	110,249	95	404	3,487	188	186,019

H. Yellowfin

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2009	7,100	5,016	16,007	12	86	2,534	335	31,090
2010	9,698	4,540	11,374	22	103	3,167	421	29,325
2011	8,075	4,336	12,323	6	111	2,497	339	27,687
2012	6,446	3,651	19,317	6	113	2,279	369	32,181
2013	5,992	2,969	9,209	6	113	2,279	369	20,937

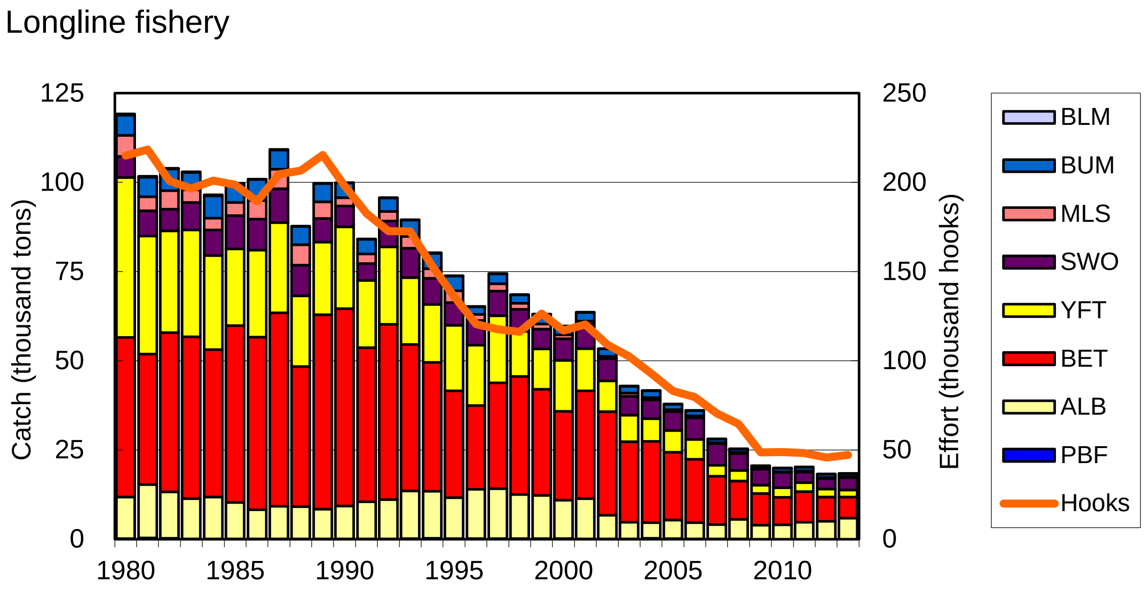

Fig. 1. Historical catches in weight (t) for major species and fishing effort (Number of hooks in million) of the Japanese distant water and offshore longline fishery (not including small offshore) in the North Pacific Ocean. PBF: Pacific bluefin, ALB: albacore, BET: bigeye, YFT: yellowfin, SWO: sword fish, MLS: striped marlin, BUM: blue marlin. Value in 2013 is provisional.

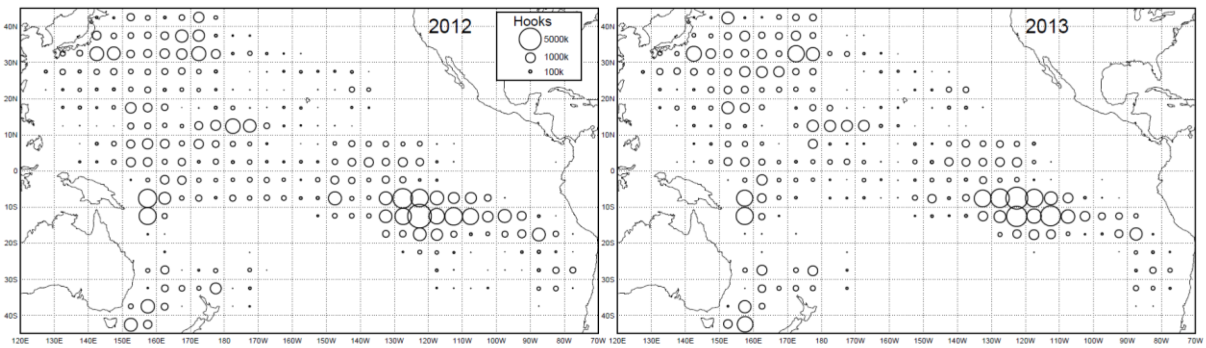

Fig. 2. Distribution of fishing effort (Number of hooks) for the Japanese longline fishery (larger than 20 GRT vessels) in the Pacific, 2012-2013.

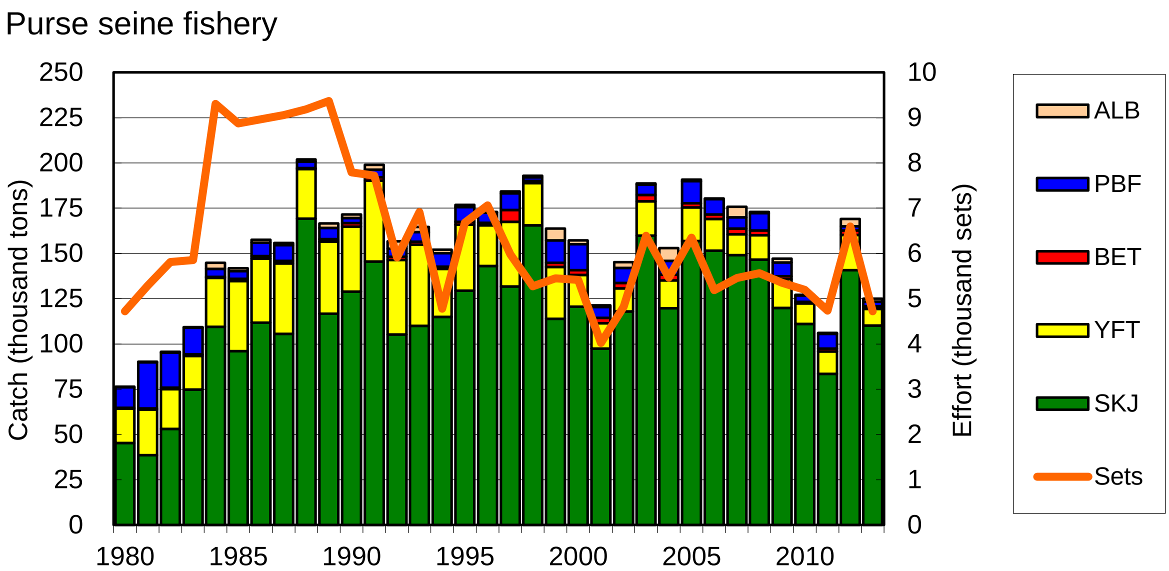

Fig. 3. Historical catches in weight (t) for major species and fishing effort (Number of sets) of the Japanese purse seine fishery in the Pacific Ocean. SKJ: skipjack, YFT: yellowfin, BET: bigeye, PBF: Pacific bluefin, ALB: albacore. Value in 2013 is provisional.

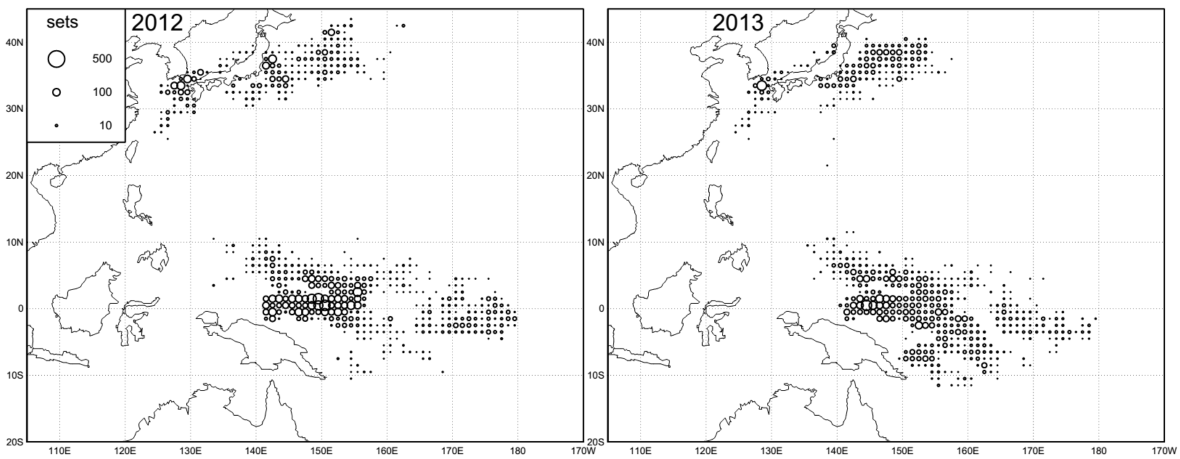

Fig. 4. Distribution of fishing effort (number of sets) for the Japanese purse seine fishery in the Pacific, 2012-2013.

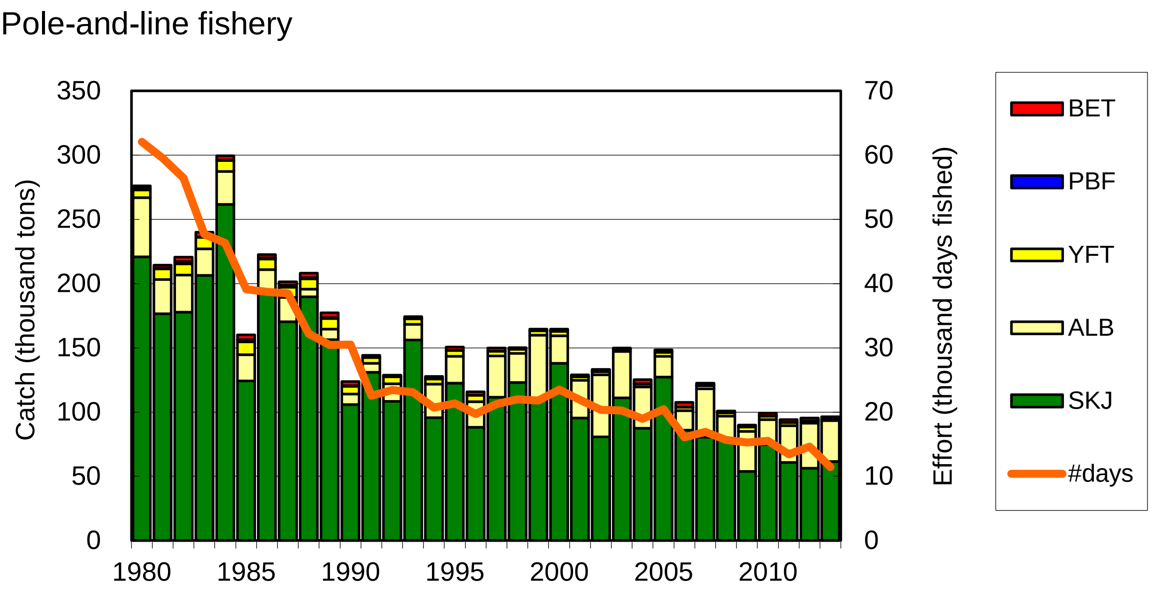

Fig. 5. Historical catch in weight (t) for major species and fishing effort (Number of poles·days) of Japanese distant water and offshore fisheries in the north Pacific. SKJ: skipjack, ALB: albacore, YFT: yellowfin, PBF: Pacific bluefin, BET: bigeye. Value in 2013 is provisional. The catch for PBF includes the catch by coastal pole-and-line (less than 20 GRT vessels) fishery.

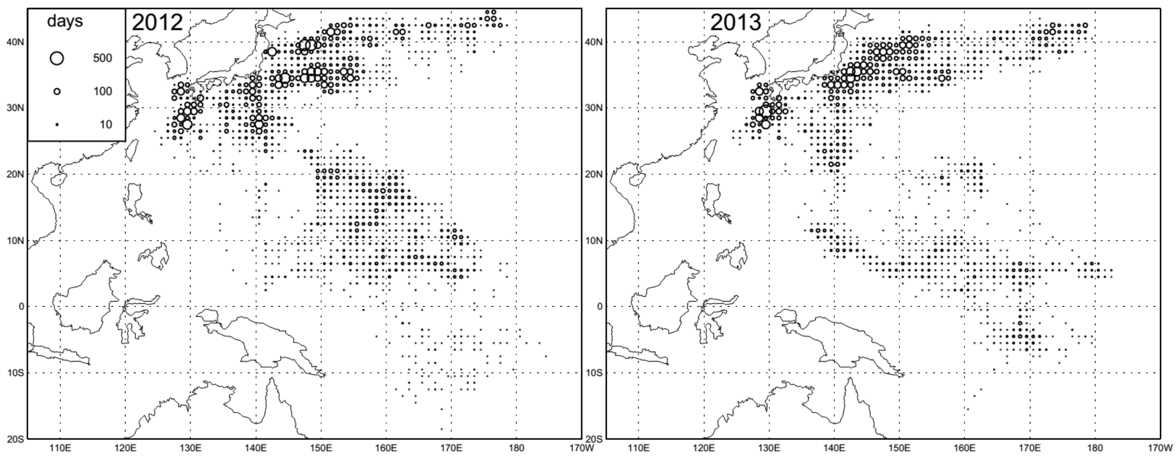

Fig. 6. Distribution of fishing effort (number of days) of the Japanese pole-and-line fishery (larger than 20 GRT vessels) in the Pacific, 2012-2013.

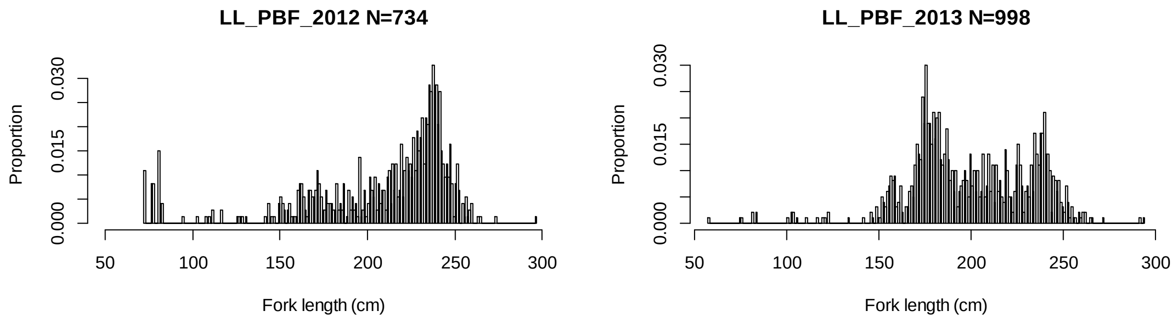

Fig. 7. Annual length frequency distribution (simply summing up all measurements) for pacific bluefin caught by longline in 2012 (left) and 2013 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

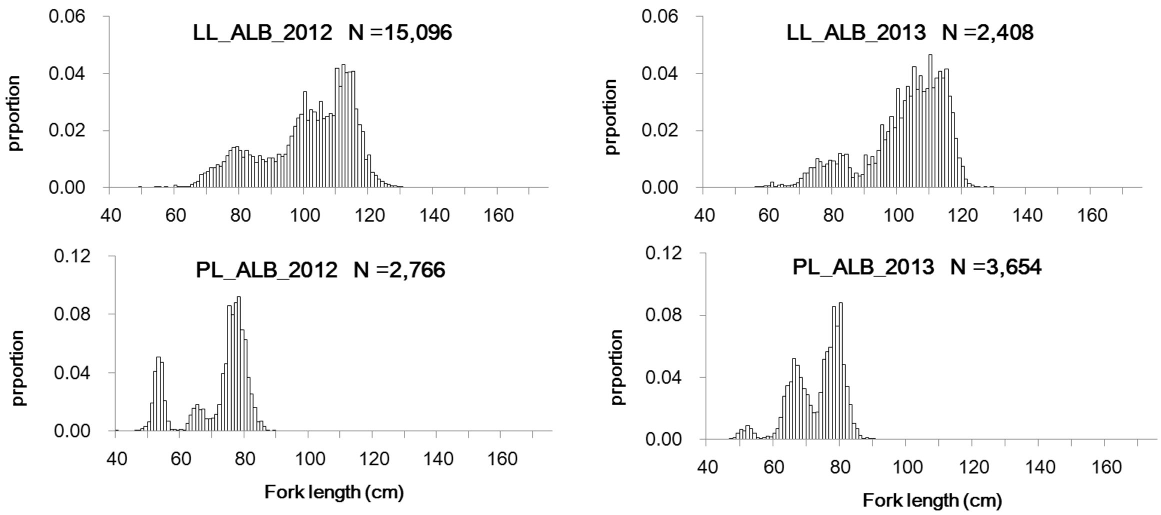

Fig. 8. Annual length frequency distribution (simply summing up all measurements) for albacore caught by longline (upper two panels) and pole and line (lower tow panels) in 2012 (left) and 2013 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

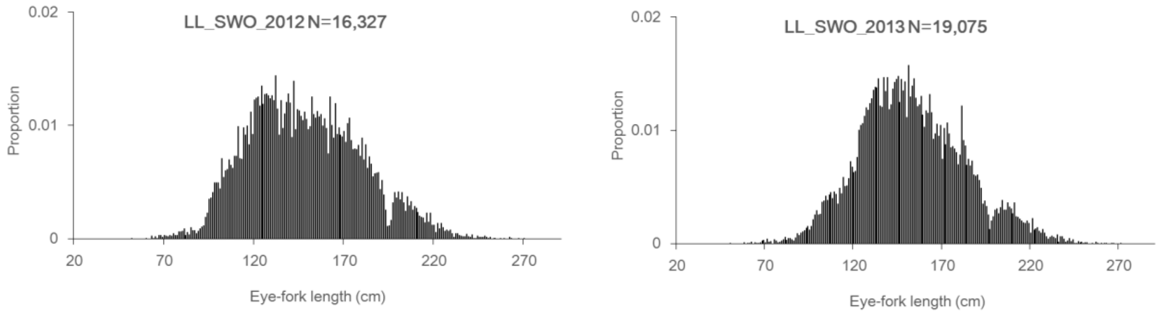

Fig. 9. Annual length frequency distribution (simply summing up all measurements) for swordfish caught by longline in 2012 (left) and 2013 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

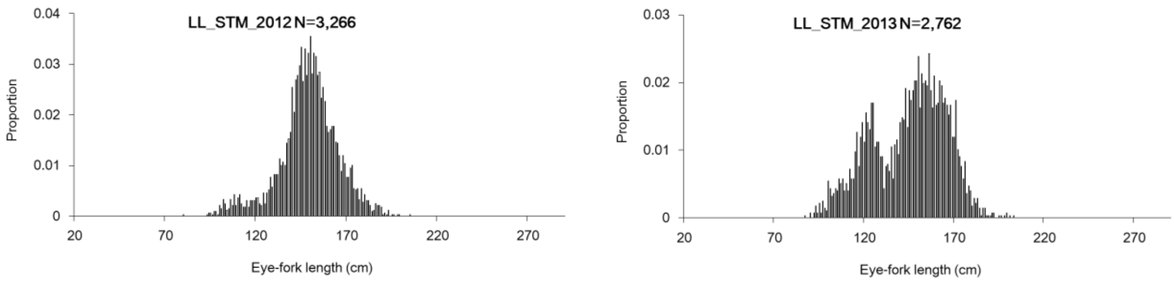

Fig. 10. Annual length frequency distribution (simply summing up all measurements) for striped marlin caught by longline in 2012 (left) and 2013 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.