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NATIONAL REPORT OF JAPAN (JAPANESE TUNA AND TUNA-LIKE FISHERIES IN THE NORTH PACIFIC OCEAN IN 2022)

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SUMMARY

Japanese tuna fisheries consist of the three major fisheries (i.e., longline, purse seine, and pole-and-line) and other miscellaneous fisheries like troll, driftnet, and setnet 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 ISC22 (Kai et al., 2022). The total catch of tunas excluding skipjack caught by Japanese fisheries in the North Pacific Ocean was 83,834 metric ton (t) in 2021 and 71,141 t in 2022. The total catch of tunas including skipjack caught by Japanese fisheries in the North Pacific Ocean was 266,985 t in 2021 and 189,683 t in 2022. The total catch of swordfish and striped marlin was 6,240 t in 2021 and 4,844 t in 2022. In addition to fisheries description, a brief description was given on Japanese research activities in 2022 for tuna and tuna-like species in the Pacific Ocean.

1. TRENDS IN FLEET SIZE

Tables 1-A and B show the number of Japanese tuna fishing vessels 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 2006-2022. The number of active vessels during 2006-2022 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 Exclusive Economic Zone (EEZ), the research and training vessels of both longline and pole-and-line were not included in Table 1-B. The coastal longline vessels less than 20 GRT, which have no license of tuna fishing and are regulated operating only within Japan's EEZ, were not included in Table 1-B. The research and training vessels of both longline and pole-and-line were not included in Table 1-B. The values of number of vessels in 2021 and 2022 were provisional in Table 1-B.

The total number of longline vessels showed a continuous declining trend since the early 1990s (Table 1-A). The number of longline vessels of the largest size class (> 200 GRT) was nearly constant in the period between the beginning of the 1980s and the mid-1990s. In accordance with the agreement of the Food and Agriculture Organization of the United Nations (FAO)'s international action plan on fishing capacity, the 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, the Japanese government implemented the second fleet reduction program for its fishery following the management measures adopted by the Western and Central Pacific Fisheries Commission (WCPFC). The recent declining trend for the fleet size larger than 50 GRT was remarkable. The number of vessels of 50-99 GRT was 6 in 2022 which is 13% of that in 2006, and the number of vessels of 100-199 GRT was 16 in 2022 which is 30% of that in 2006 (Table 1-B). 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 a sharp decline since the late 1980s whereas the number of vessels of smallest size class (< 20 GRT) fluctuated at around 700 during 1980-2006 (Table 1-A). The number of vessels of 10-49 GRT was relatively stable ranging between 273 and 290 during 2006-2011 and then decreased to 227 in 2022 (Table 1-B).

The total number of purse seine vessels was 52 in 2006, and it was nearly 80% of that in the 1980s (Table 1-A). After 2006, the total number of purse seine vessels fluctuated ranging between 68 and 75 until 2022. The purse seine vessels which are allowed to operate in the tropical waters are larger vessels (currently, 349 GRT or larger). The limitation of the number of such vessels has been 35 and has not changed since 1995.

The total number of pole-and-line vessels showed a continuous declining trend since 1980 (Tables 1-A and B). Suppose vessel size categories 20-49 GRT, 50-199 GRT, and over 200 GRT for 1980-2006 to compare with that for 2006-2021, the number of vessels for each category showed declining trend throughout the period (Table 1-A). The number of vessels both for 50-199 GRT and over 200 GRT showed declining trend throughout the period (Table 1-B). The number of vessels for 50-199 GRT was 32 in 2022 which is 38% of that in 2006. The number of vessels for over 200 GRT showed a declining trend with annual fluctuations, was 22 in 2022, which is 73% of that in 2006.

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).

Annual distributions of fishing effort of longline in 2021 and 2022 are shown in Fig. 1. In those years, the fishing grounds were located in the east-west direction off Japan to Hawaii, the equatorial area between 15˚S and 15˚N, off Australia and off Peru. 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. 2). After 2009, the amount of effort showed a trend of gradual decrease at a level of 35-50 million hooks.

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 9,380 t in 2021 which is 8% of that in 1980 (Fig. 2). 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 the late 1980s, showed a declining trend since the 1990s, was less than 10,000 t since 2009, and was less than 5,000 t since 2016. Yellowfin tuna catch ranged between 30,000 t and 50,000 t until the 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 2,000-6,000 t and kept stable at a low level during the period 2003-2021.

2.2. Purse seine

There are two types of Japanese purse seiners targeting tunas, i.e., single and group purse seine. Historically, a typical group seiner consists of one purse seiner, one searching vessel, and two carrier vessels. Still, the group seiner tended to reduce the number of vessels within each group to reduce costs in recent years. Besides those, coastal purse seiner takes a relatively small number of tunas as a by-catch.

Fishing grounds of Japanese purse seine were widely spread, ranging from 40˚N to 10˚S, and from 120˚E to 180˚ (Fig. 3). The group seiner operates mainly in the temperate northwestern Pacific. 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.

The fishing effort was around 9,000 sets in the late 1980s, then decreased to about 6,000 sets in 1998 (Fig 4). The fishing effort generally stayed at about 4,000-6,000 sets in the last decade (Fig. 4). The skipjack catch has been 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 (Fig. 4). After 2011, the skipjack catch showed no clear trend between 80,000 t and 140,000 t (Fig. 4). The statistics in 2022 are provisional, and that skipjack catch is about 60,000 t.

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 licenses since 2007, which are included in 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.

Fishing grounds of the pole-and-line were widely spread 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. (Fig. 5). 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. 5). These vessels primarily fish skipjack and albacore from spring through autumn off the Pacific side of Japan, and harvest relatively small amount of yellowfin and bigeye tuna. 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. 5). 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 1994, increased to around 23,000 days in 2000, and then decreased to 8,966 days (preliminary) in 2022 (Fig. 6). 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 40,000 t until the latest year (Fig. 6). Skipjack is a dominant species for this fishery, but the proportion of skipjack tended to decrease, from 87-78% during 1980-1986 to 87-50% during 2011-2022.

3. RECENT TRENDS FOR MAJOR SPECIES

3.1. Pacific bluefin tuna (Table 2-A)

Preliminary total catch of Pacific bluefin tuna (PBF) in 2022 was 10,112 t (Table 2-A), which was higher than the catch in 2021 (8,585 t). This was the highest level since the strict catch upper limit was implemented in 2015 in accordance with the WCPFC Conservation and Management Measure (CMM). The annual catches of PBF by major fisheries in 2022 is as follows; purse seine: 4,702 t, troll: 1,079 t, setnet: 2,126 t, longline: 1,587 t, and other fisheries: 605 t.

Because of strict catch upper limit for PBF implemented since January 2015, the annual catch since 2015 to 2021 have been lower than those of the years before. There would be two major considerable reasons for increased PBF catch in 2022, the one could be an increase in catch limit for large PBF (fish larger than 30 kg) fishery which has been implemented since 2022 based on the amended WCPFC CMM in 2021. Increased catch by longline and tuna purse seine fishery might indicate that they benefited from the relaxation of the quota under the improved availability at their fishing ground due to the stock recovery. Japanese longline fishery usually catches large adult PBF, which are about 200 cm FL (Fork Length), but the length composition in a recent couple of years showed multimodal distribution which has the several peaks for less than 200 cm FL (Fig. 7). Another reason of increased catch could be better management practices (such as catch limit transfer between management unit) implemented by the local government of Japan, and it resulted in a quota consumption rate closer to the catch limit for those coastal fisheries. It should be noted that the average quota consumption rate for the coastal fisheries was about 90 % in 2022 fishing year, and it was improved from the 2021 fishing year (c.a. 86%).

3.2. Albacore (Table 2-B)

The preliminary total catch of albacore in 2022 was 29,879 t which was smaller than the average of the past five years (2017-2021: 36,524 t). The main Japanese fisheries that catch the albacore are the longline and pole-and-line fisheries. The longline catches in recent years are stable at around 15,000 t. The catches by the distant waters pole-and-line fluctuated largely between 4,700 t and 24,000 t. This fishery targets both albacore and skipjack, and the albacore catches fluctuated depending on the catch of both species.

The longline target the larger size of fish and the pole-and-line target much smaller fish (Fig. 8). The size of the albacore caught by the longline in 2022 was found from 30 cm to 135 cm FL. The Albacore caught by pole-and-line was observed in two modes of their size distribution, their peaks were found 75 cm and 90 cm FL in the 2022 composition.

3.3. Swordfish (Table 2-C)

Total swordfish catch in 2022 was 4,084 t which is 79.7% of the catch in 2021 (5,122 t). These statistics are preliminary and somewhat smaller than the average over the past five years (2018-2022: 5,201 t). Swordfish have been caught mainly by offshore and distant water longline, whose catch in 2022 was 2,217 t. The coastal longline catch in 2022 was 1,034 t. Length composition data was collected from longline fishery. The distribution range was approximately from 90 to 220 cm eye-fork length in 2021 and 2022 (Fig. 9).

3.4. Striped marlin (Table 2-D)

The total striped marlin catch in 2022 was 760 t which is 68.0 % of the catch in 2021 (1,118 t). These statistics are preliminary and smaller than the average over the past five years (2018-2022: 1,212 t). In recent years, Japanese pelagic fisheries catch striped marlin as bycatch except for coastal drift-net and part of other longline fisheries that target striped marlin seasonally. Length-composition data was collected from longline fishery. The distribution range was approximately from 100 to 180 cm eye-fork length in 2021 and 2022 (Fig. 10).

3.5. Blue shark (Table 2-E)

ISC SHARK WG had conducted a benchmark stock assessment of blue shark in 2022. The catch for 2016-2020 was maintained using the annual catch used in the stock assessment (Kai, 2021a; Kai and Yano, 2021a) and annual catch in 2021 was updated using the same estimation method used in the stock assessment in 2021. A total catch of blue shark in 2021 was estimated at 8,130 t. The decreasing trends in total catch since 2016 was mainly due to continuous decline of the fishing effort for longline fisheries.

3.6. Shortfin mako (Table 2-F)

ISC SHARK WG had conducted an indicator-based analysis of shortfin mako shark in 2021. The annual catch for 2015-2021 of shortfin mako was updated using the similar approaches used in the indicator analysis (Kai, 2021b; Kai and Yano, 2021b). A total catch of shortfin mako in 2021 was estimated at 599 t. The decline of the catch in 2021 was due to the decline of catches for longline fisheries and large mesh drift-net fishery.

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

Preliminary total catch of bigeye in 2022 was 8,238 t which corresponds to 70.7% of the catch in 2021 (11,651 t) and was lower than the average of past five years (2018-2022: 12,319 t). Total catch of bigeye by Japanese fisheries showed a slight declining trend in the last six years and longline has been the highest proportion among gears in the North Pacific.

Preliminary total catch of skipjack in 2022 was 118,542 t which corresponds to 64.7% of the catch in 2021 (183,151 t) and was lower than the average of past five years (2018-2022: 154,595 t). Most skipjack were caught by pole-and-line and purse seine in the North Pacific Ocean. Total catch of skipjack by Japanese fisheries showed no clear trend in the last six years in the North Pacific Ocean. The lower total catch in 2020 and 2022 were due to lower catch by both pole-and-line and purse seine fisheries.

Preliminary total catch of yellowfin tuna in 2022 was 22,912 t which corresponds to 67.9% of the catch in 2021 (33,720 t) and was lower than the average of past five years (2018-2022: 36,594 t). The yellowfin tuna caught by purse seine has been the highest proportion among gears in the North Pacific Ocean. The lower total catch in 2022 were due to lower catch by the purse seine fisheries in the tropical waters in the North Pacific Ocean.

4. RESEARCH ACTIVITIES

The Fishery Agency of Japan, in cooperation with the Fisheries Resources Institute (FRI) and local prefectural fisheries experimental stations, has run the nationwide port sampling project for collection of catch, effort and size data of tunas, skipjack, billfishes, and sharks at the major landing ports since the early 1990s. The tagging studies using conventional, archival and popup have 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

Since 2011, larval surveys have been conducted to estimate current main spawning area and period of PBF. In 2022, research cruises were designed to focus on ecological studies of larval/juvenile PBF by R/Vs of FRA, Kaiyo-Maru, Yoko-Maru, Hokko-Maru and four prefectural R/Vs. Surveys for larval/juvenile PBF were conducted in the south of Japan around Nansei Islands area, where 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 addition to these two spawning grounds, the survey was conducted in Joban area in the coastal area of northeastern Japan in July and August. In 2022, PBF larvae were captured by all cruises in the spawning grounds. Small juveniles of PBF around 2-5 cm FL were also captured in Nansei Island area and Joban area by small surface-trawl net. The number of larval and juvenile PBF collected is currently being aggregating.

Collected samples are being examined by a variety of approaches such as genetic identification, aging, growth analysis, stable isotope, microchemistry and stomach contents analyses to elucidate the survival processes of larval and juvenile PBF in relation to biological and environmental factors, which should help to understand the recruitment mechanism to PBF fisheries around Japan.

4.1.1. Troll survey on age-0 Pacific Bluefin tuna

Recruitment abundance index (standardized CPUE from the Japanese troll fishery) for current PBF stock assessment is based on the sales slips issued by the commercial markets. Since 2017, a new fishery management scheme for PBF by the local government, which includes substantial Individual quota and the obligation to make effort for the minimum size limitation, was introduced, and the troll fishery operation had to be affected by this new management. Due to this change, the abundance index from the Japanese troll fishery lost its continuity before and after 2016. The FRI commenced using a real-time monitoring survey data of troll fishery's operations in 2011, which has been targeting age-0 PBF, to make an alternative recruitment index. Furthermore, since 2021 fishing year, IQ-independent charter real-time monitoring surveys were initiated to ensure sufficient operations in each spatial and temporal stratum, in addition to the conventional real-time monitoring. When a troll fisherman on a vessel equipped with a data logger and transmitter inputs the number of age-0 fish caught during fishing operation, that catch information including geographic position and Sea Surface Temperature (SST) data is sent to the FRI in real time via a cellular network.

The FRI reported this new recruitment index based on the data of real-time monitoring troll vessels and the chartered troll survey to the PBFWG meeting of the ISC (Fujioka et al., 2023). Totally 3,587 days operational data from 14 real-time monitoring vessels, which targeted for age-0 PBF (i.e., 30-60 cm fork length) during the winter season (November to following February) in the East China Sea were used to standardize the CPUE by Vector Autoregressive Spatio-Temporal (VAST) model formulated a delta-generalized linear mixed model. Estimated indices for 2011-2022 were quite similar to the traditional sales slip index throughout the overlapping period (2011-2016), and the latest high values confirmed robust whichever using chartered real-time monitoring data or not. In the PBFWG meeting held in March 2023, it was agreed to evaluate the performance of this index, either for use as input data for the next stock assessment in the 2024 and MSE.

4.1.2. Tissue sampling and technical development for close-kin analysis for PBF

Tissue sampling for close-kin analysis started in 2015 and around 2,500 individuals were sampled in 2021. The tissues of large mature adult PBFs (about 120-300 kg in BW; Body Weight) were sampled by coastal longline fishery around Okinawa Islands in late April to early July, while those of young-of-the-year juveniles (about 0.1-0.3 kg in BW) were sampled by troll fishery during summer in the Pacific coastal water off Western Japan, such as Kochi Prefecture. The hatching area of these juveniles can be identified as the water around Nansei archipelago based on the knowledge about the migration pattern of age-0 PBF. For the other spawning ground, the Sea of Japan, young adult PBFs which are either nearly-matured or matured (about 20-60 kg in BW) were sampled in Sakai-minato in June to early July, while those of young-of-the-year juveniles were sampled in Oki islands in late September to early November. Additionally, there are several samples to assure the randomness of sampling from all over Japan, especially in the Tsugaru straits. All of muscle tissues sampled were preserved in specific buffer (TNES-Urea 6M buffer) because of the higher stability of content DNA under the room temperature.

The close-kin project team, which consists of FRI, Fisheries Technologies Institute, and collaborating academic researchers, has been working to develop practical procedures of close-kin analysis in PBF. The team began to conduct genotyping of actual samples in 2018 and have completed it for more than 4,000 samples of matured individuals and young-of-the-year juveniles so far. Alongside, the team has developed a model which can incorporate the kinship pair data into the Stock Synthesis model. This development will promote the understanding of the affinity and consistency of CKMR method with the current PBF assessment. The methods and results were introduced in the PBFWG in March 2023.

4.2. Sharks, billfishes and swordfish

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

In 2022, size and sex data of blue shark and shortfin mako were collected from the port sampling in Kesennuma fishing port, located in the northeastern Honshu (the main island of Japan), and the onboard research project for Kesennuma offshore longline fleet throughout the year.

In the port sampling, size data from 10,750 blue shark were collected, and 76% of individuals measured were males. In addition, 67% of males and 69% of females measured were juveniles. In the onboard research program for Kesennuma-offshore longline fleet, the catch number of blue shark was recorded by four size categories (large, middle, small, and extra small). Total of 268,438 blue sharks were recorded and large (processed weight ≥ 15 kg) consisted 45% of all catch with 27% of middle (11 kg ≤ processed weight < 15 kg), 27% of small (5 kg ≤ processed weight < 11 kg) and 1% of extra small (processed weight < 5 kg).

For shortfin mako, size data from 7,111 individuals was collected in port sampling program, and 52% of individuals measured were males. Among these sharks measured, 78% of males and 100% of females were juveniles. In contrast to blue shark, almost all of sampled female were juvenile in shortfin mako. Total of 9,657 shortfin mako was recorded by size category from the onboard research by Kesennuma-offshore longline fleet. Large (precaudal length > 200 cm) consisted 3% of all catch with 28% of middle (150 cm < precaudal length ≤ 200 cm), 57% of small (100 cm < precaudal length ≤ 150 cm) and 12% of extra small (precaudal length ≤ 100 cm).

4.2.2. Tagging for sharks

In 2022, conventional tags were attached to 21 blue sharks in the area around 19 degrees north and 160 degrees east during the research cruise of Japanese research and training vessel (JRTV). The released blue sharks were subadult and adult and the percentage of male was 57%.

4.2.3. Biological sample collection

Samples of sagitta, reproductive organ, dorsal fin and anal fin were collected from a total of 44 swordfish, 73 striped marlin, and 17 blue marlin for the collaborative study within ISC billfish working group to estimate biological parameters of billfishes and swordfish. For the study of genetic population structure and other ecological study, muscle tissue was collected from 16 swordfish, 60 striped marlin, and 9 blue marlins.

For sharks, samples of whole body were collected for five shortfin mako and one salmon shark for the biological study of life history, genetic population structure, and other ecological study. Reproductive organ, muscle, and vertebrae were collected from one adult female shortfin mako to investigate the reproductive cycle, growth, and distribution pattern. In addition, reproductive organs (i.e., ovary) were collected from two bigeye thresher for the study of reproductive ecology.

All the samples above were collected by the research cruise (including chartered vessel) and commercial/training longline operation, and sport-fishing conducted in the North Pacific Ocean in 2022.

4.3. Skipjack

4.3.1. Tagging for Skipjack

The FRI has been conducting skipjack tagging research mainly to investigate the migration patterns around the fishing ground off Japan. One offshore pole-and-line vessel (20-119 GRT) and one distant water pole-and-line vessel (> 199 GRT) were fully chartered to conduct the research off Japan in October 2022 and in tropical areas (0°-25°N, 135°-180°E) in February and March 2023, respectively. A total of 7,245 skipjack tuna (1,250 off Japan and 5,995 in tropical areas) including 256 individuals (75 off Japan and 181 in tropical areas) 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. A total of 750 skipjack tuna (324 in June 2022 and 426 in March 2023) including 5 individuals (all in June 2022) with archival tags were released.

Besides above studies, three research/training cruises on pole-and-line vessels conducted skipjack tagging in 2022 around Japanese water. A total of 148 skipjack tuna including 10 individuals with archival tags were released in off Hachijo Island (33˚N, 139˚E), Wakayama (33.15˚N, 135.75˚E) and Ibaraki (36.5°N 143.2°E).

4.4. Albacore

The FRI has been conducting tagging research to investigate female and male albacore distribution and migration in the northwestern Pacific Ocean. In February 2023, 20 archival tags were attached to albacore in off Wakayama.

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TABLES

TABLE 1. NUMBER OF JAPANESE TUNA FISHING VESSELS.

A. 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.

B. Number of Japanese tuna fishing vessels operated in the North Pacific Ocean by type of fisheries and vessel size based on logbook. Values in 2021 and 2022 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	38	33	4	75	1	50	25	76
2017	233	15	15	50	313	37	34	4	75	1	48	31	80
2018	230	14	16	52	312	35	30	4	69	1	44	25	70
2019	230	13	17	44	304	35	31	5	71	1	42	24	67
2020	227	11	15	44	297	34	31	6	71	1	37	22	60
2021	201	10	16	36	263	33	29	7	69	1	35	22	58
2022	227	6	16	32	281	34	26	8	68	1	32	22	55

*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		Distant-water + Offshore Longline*5		Coastal		Pole-and-			
Year	Tuna PS	Small PS	Noth Pcific	South Pacific	Long line*5	Troll	line	Set-net	Others*7	Total
2017	3,341	1,199	21	6	892	605	49	2,221	665	9,000
2018	3,225	825	21	0	679	371	9	645	431	6,205
2019	3,213	1,251	25	0	977	720	0	951	372	7,509
2020	3,208	752	75	0	1,341	760	1	1,342	532	8,011
2021	3,150	1,048	80	0	1,472	653	0	1,742	440	8,585
2022 *6	3,483	1,219	80	0	1,506	1,079	13	2,126	605	10,112

*5: Distant-water and Offshore longline vessels are mainly 20 GRT or larger, and most of coastal longline vessels are smaller than 20 GRT.
*6: Most recent year's catch value is provisional.
*7: Others include drift net, handline, trawl, other longline, and unclassified fisheries.

B. Albacore

	Longline		Pole-and-line								
Year	Distant-water + Offshore*8	Coastal	Distant-water	Offshore	Coastal	Drift-net	Purse seine	Troll	Set-net	Others	Total
2017	3,712	13,597	12,108	8,753	30	40	1,251	107	48	119	39,765
2018	3,071	10,121	9,362	8,394	119	35	3,039	78	13	70	34,302
2019	2,841	9,375	4,669	3,662	177	9	1,045	543	27	95	22,443
2020	2,415	10,241	23,806	12,578	254	7	5,961	784	25	159	56,230
2021	4,226	13,663	6,869	4,043	224	3	180	428	11	232	29,879
2022	(4,226)	(13,663)	(6,869)	(4,043)	(224)	(3)	(180)	(428)	(11)	(232)	(29,879)

*8 Category Distant-warter + Offshore LL includes training/research vessels
( ) different data source or carry over from previous year

C. Swordfish

	Longline								
Year	Distant-water + Offshore	Coastal	Others	Drift-net	Bait fishing	Net fishing	Set-net	Others	Total
2017	2,860	1,975	2	291	289	NA	3	274	5,694
2018	3,212	1,801	2	230	267	NA	5	480	5,997
2019	2,601	1,307	2	242	210	0	6	339	4,706
2020	3,842	1,471	4	290	305	0	7	179	6,098
2021*9	3,045	1,243	8	301	251	0	4	270	5,122
2022*9	2,217	1,034	8	301	251	0	4	270	4,084

*9 Catches for 2021 and 2022 are preliminary.

D. Striped Marlin

Year	Longline			Drift-net	Bait fishing	Net fishing	Set-net	Others	Total
	Distant-water + Offshore	Coastal	Others						
2017	160	764	53	241	28	NA	28	23	1,296
2018	147	711	28	278	36	NA	28	52	1,280
2019	222	889	29	241	39	NA	29	61	1,510
2020	196	896	49	155	25	0	37	32	1,390
2021*10	190	708	17	95	17	NA	31	60	1,118
2022*10	144	397	17	95	17	NA	31	60	760

*10 Catches for 2021 and 2022 are preliminary.

E. Blue shark

Year	Longline				Large mesh drift-net	Bait fishing	Set-net	Others	Total
	Distant-water	Offshore	Coastal	Others					
2016	4,541	4,366	375	225	1,832	2	26	1	11,367
2017	4,387	4,853	343	212	1,366	1	4	0	11,166
2018	4,081	4,608	263	159	1,236	1	40	0	10,388
2019	3,726	4,351	209	162	1,149	1	35	0	9,634
2020	3,134	3,540	213	185	1,119	2	59	1	8,252
2021	2,814	3,158	416	232	1,484	1	25	1	8,130

F. Shortfin mako

Year	Longline			Large mesh driftnet	Trapnet and others	Total
	Offshore and Distant-water (Shallow-set)	Offshore and Distant-water (Deep-set)	Coastal and other			
2016	803	184	32	446	16	1,481
2017	578	100	23	271	10	983
2018	654	189	19	223	28	1,114
2019	601	226	15	214	3	1,059
2020	510	150	4	194	16	874
2021	332	94	16	133	23	599

G. Bigeye

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2017	11,425	1,444	2,201	1	0	119	89	15,279
2018	11,631	1,432	3,471	1	0	80	84	16,698
2019	10,693	549	1,444	1	0	110	113	12,910
2020	9,158	1,116	1,622	0	1	69	135	12,101
2021	8,362	1,546	1,543	0	0	100	100	11,651
2022	5,936	1,332	771	0	0	100	100	8,238

H. Skipjack

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2017	30	61,940	93,396	61	401	1,615	81	157,524
2018	21	78,998	125,119	91	494	1,154	133	206,010
2019	38	73,592	84,054	96	246	1,387	110	159,523
2020	24	48,938	55,352	70	335	949	86	105,755
2021	63	84,409	95,679	100	600	2,200	100	183,151
2022	40	55,187	60,316	100	600	2,200	100	118,542

I. Yellowfin tuna

Year	Longline	Pole-and-line	Purse seine	Gillnet	Set-net	Troll	Other	Total
2017	7,966	3,201	24,195	7	135	1,877	690	38,071
2018	7,955	3,519	38,868	6	77	1,738	587	52,750
2019	9,901	2,930	27,039	4	208	2,070	778	42,930
2020	6,382	3,065	18,224	13	125	2,008	846	30,663
2021	7,818	3,728	18,974	0	200	2,200	800	33,720
2022	5,309	3,265	11,138	0	200	2,200	800	22,912

FIGURES

Longline fishery

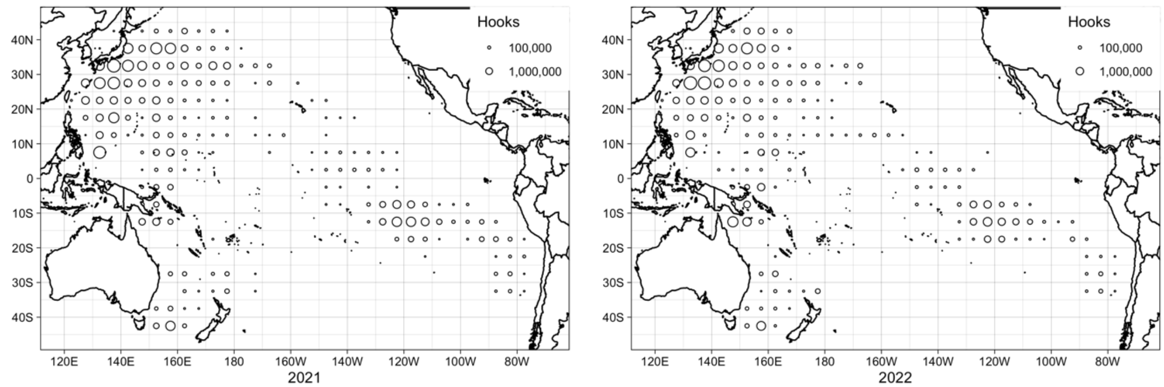

Fig 1. Distribution of fishing effort (Number of hooks) for the Japanese distant water and offshore longline fisheries in the Pacific, 2021-2022.

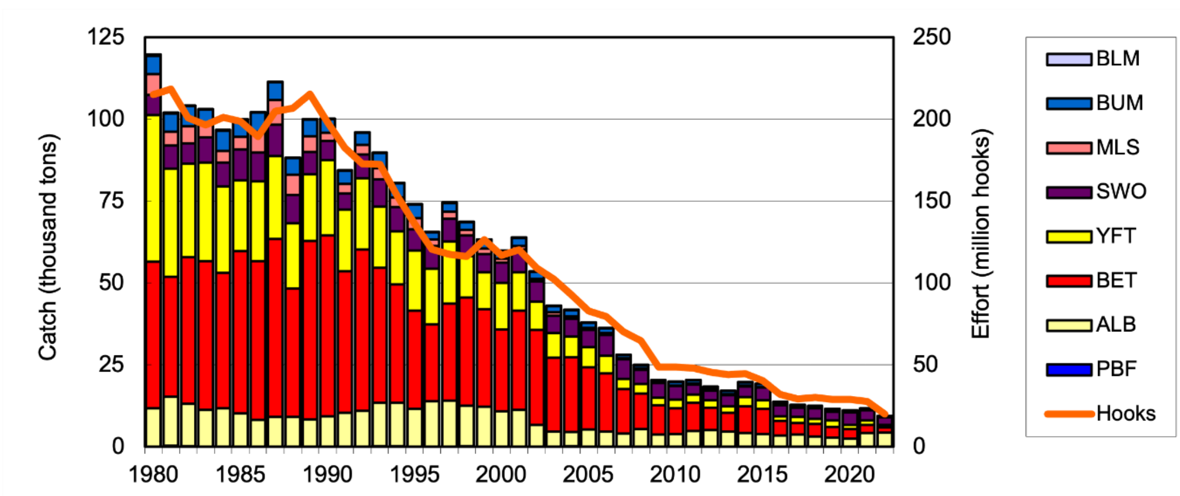

Fig 2. Historical catches in weight (t) for major species and fishing effort (Number of hooks in million) of the Japanese distant water and offshore longline fisheries (not including small offshore fishery) in the North Pacific. PBF: Pacific bluefin tuna, ALB: albacore, BET: bigeye, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin, BUM: blue marlin, BLM: black marlin. Values in 2021 and 2022 are provisional.

Purse seine fishery

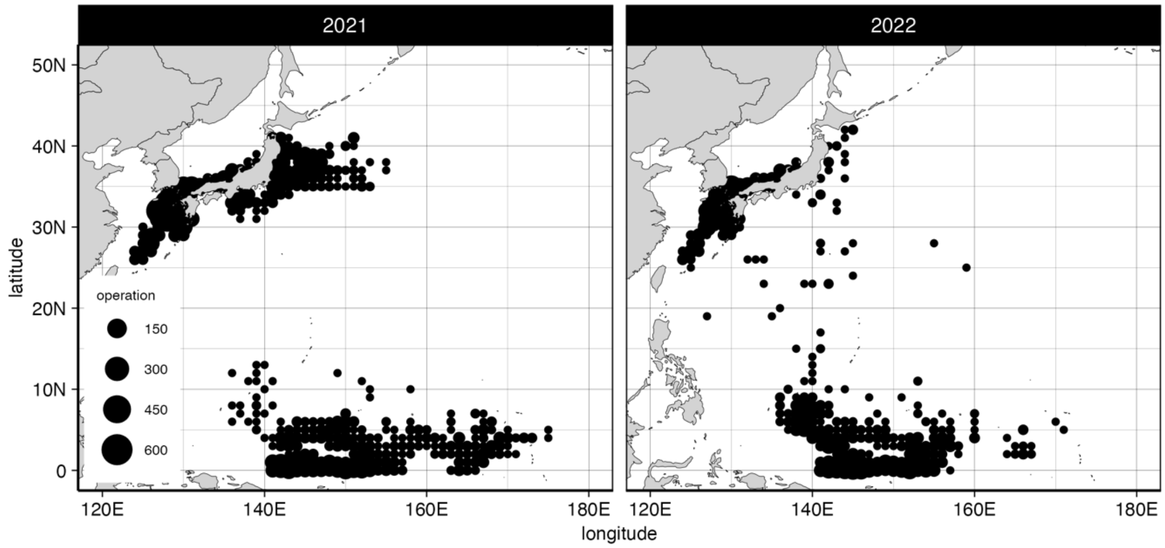

Fig 3. Distribution of fishing effort (number of sets) for the Japanese purse seine fishery in the Pacific, 2021-2022.

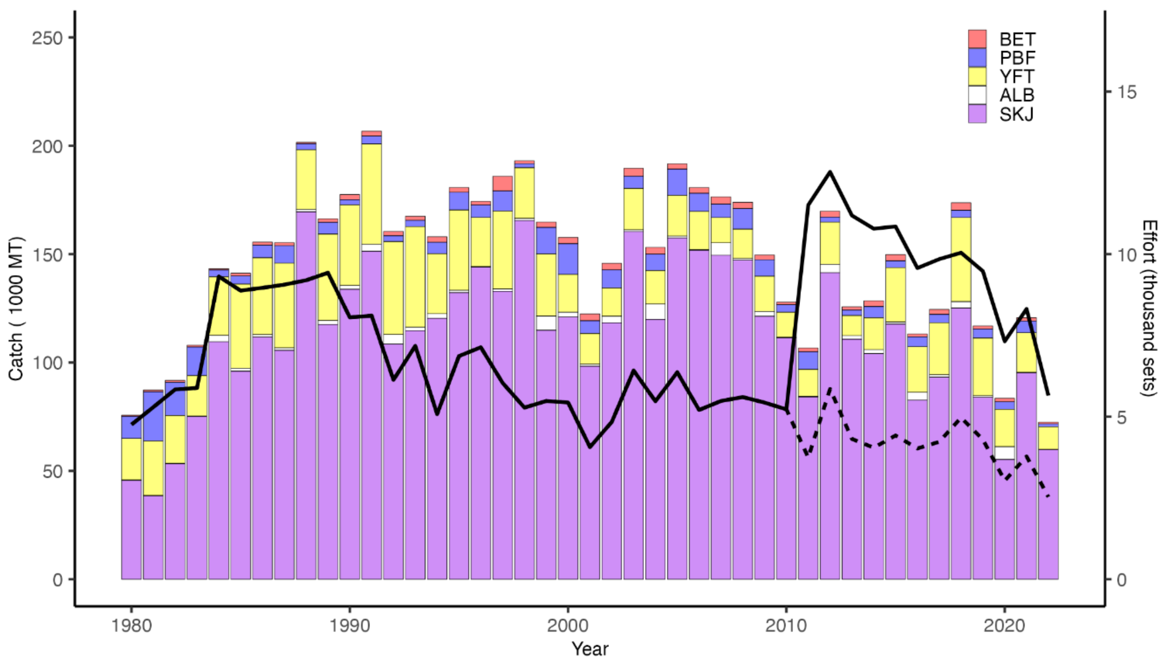

Fig 4. Historical catches in weight (t) for major species and fishing efforts (Number of sets) of the Japanese purse seine fishery in the North Pacific. SKJ: skipjack, YFT: yellowfin tuna, BET: bigeye, PBF: Pacific bluefin tuna, ALB: albacore. Since 2011, Japanese logbook data has included records of purse seine operations that do not specifically target tunas. The solid line represents the overall number of sets by target and non-target tunas. The dashed line denotes the total number of sets by targeting vessels since 2011. The statistics for 2022 are still provisional.

POLE-AND -LINE FISHERY

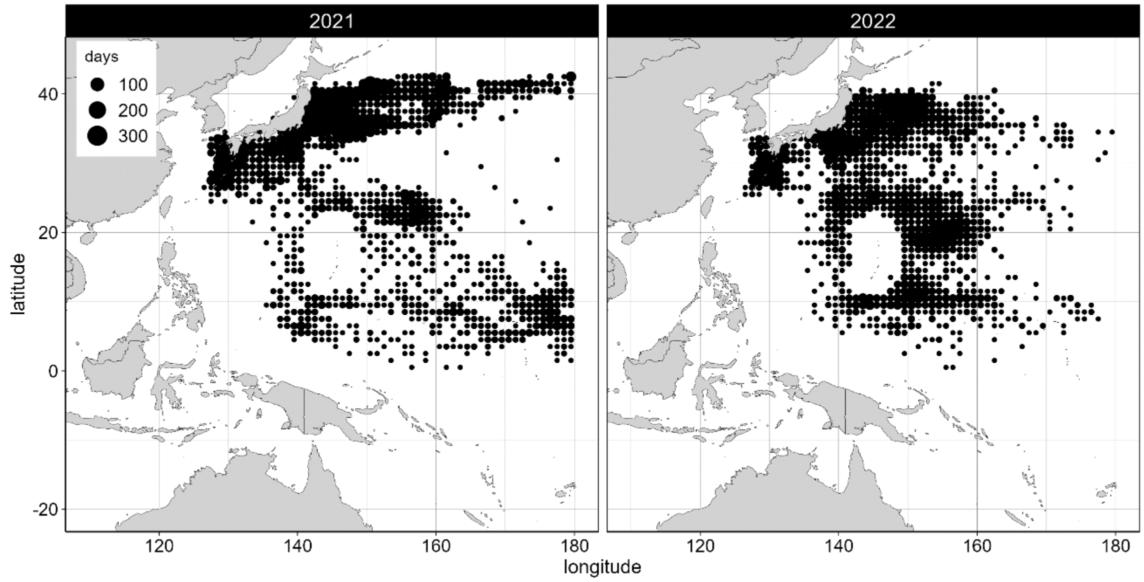

Fig 5. Distribution of fishing effort (number of days) of the Japanese pole-and-line fishery (larger than 20 GRT vessels) in the Pacific, 2021-2022. Distribution of fishing effort in 2022 is provisional (right panel).

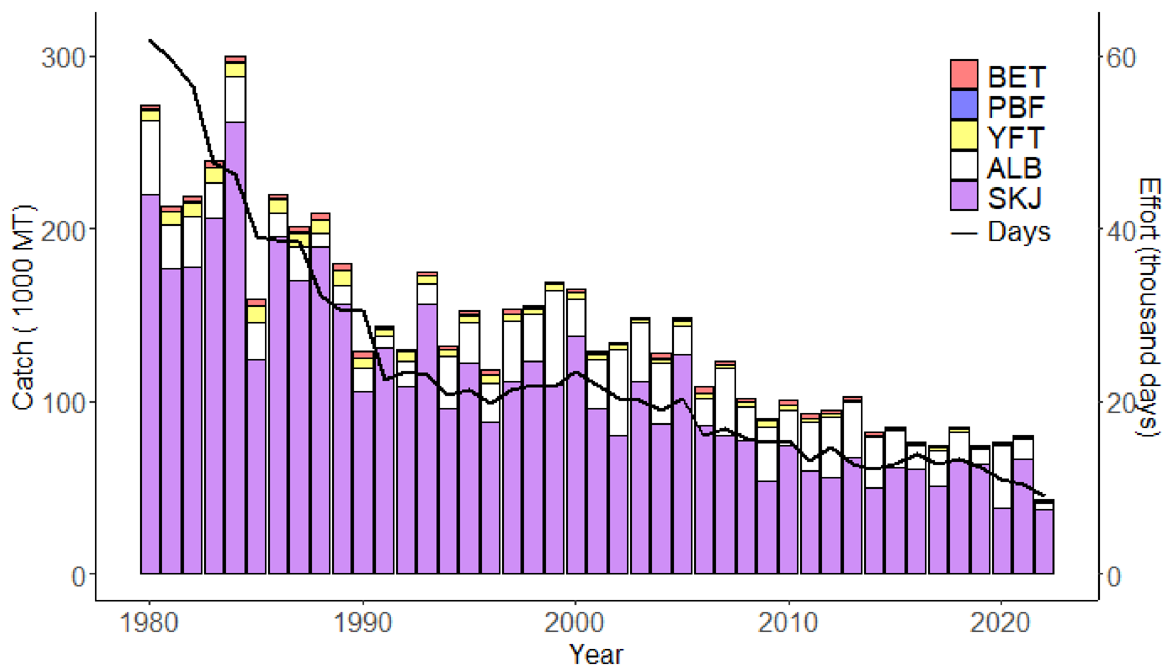

Fig.6. Historical catches in weight (t) for major species and fishing effort (Number of fishing days) of Japanese distant water and offshore fisheries in the North Pacific. SKJ: skipjack, ALB: albacore, YFT: yellowfin tuna, PBF: Pacific bluefin tuna, BET: bigeye. The catch for PBF includes the catch by coastal pole-and-line (less than 20 GRT vessels) fishery. Value in 2022 is provisional.

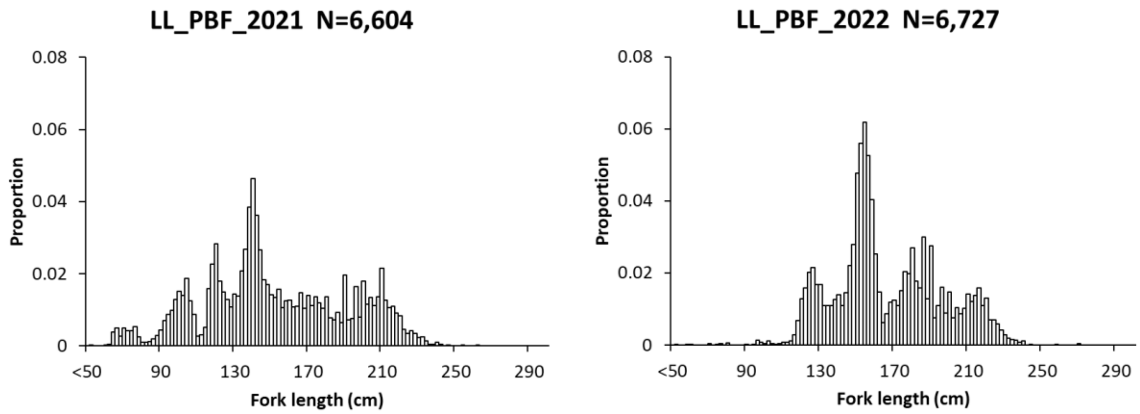

Fig.7. Annual relative length frequency distribution (simply summing up all measurements) for Pacific bluefin tuna (PBF) caught by longline in 2021 (left) and 2022 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

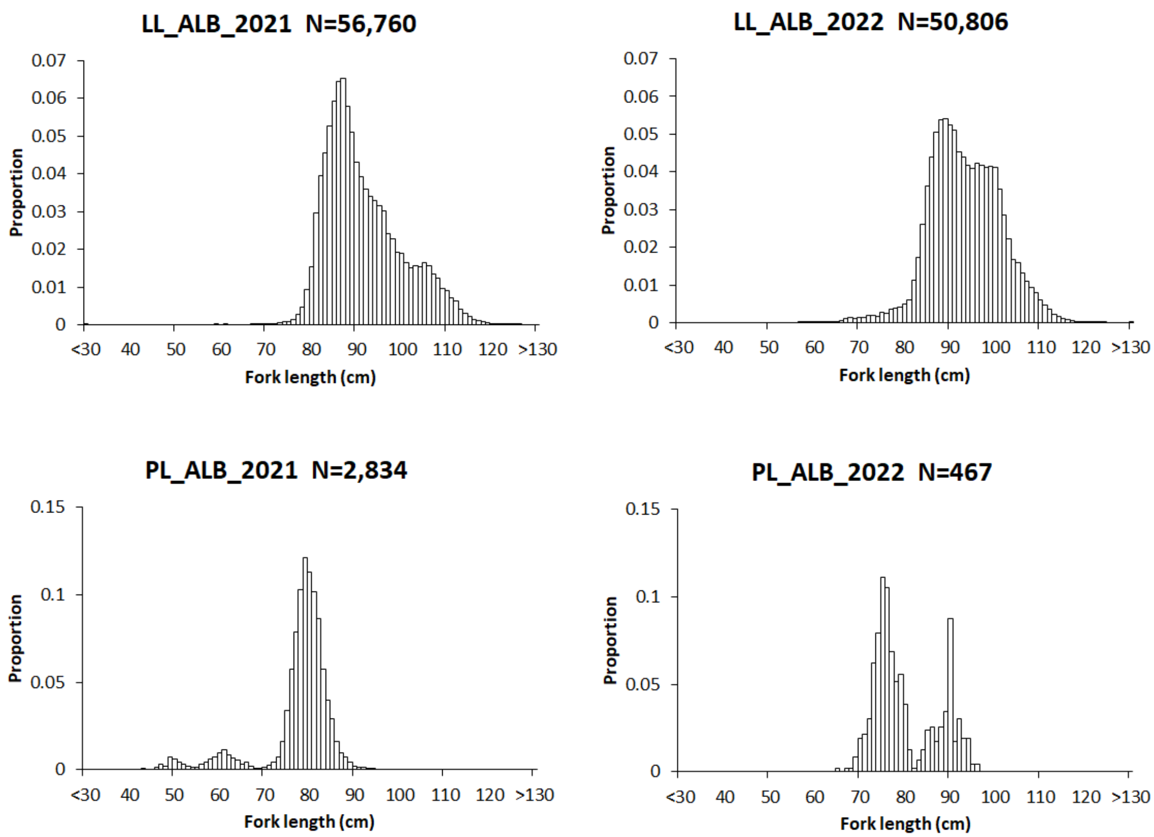

Fig.8. Annual relative length frequency distribution (simply summing up all measurements) for albacore (ALB) caught by longline (upper two panels) and pole-and-line (lower two panels) in 2021 (left) and 2022 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

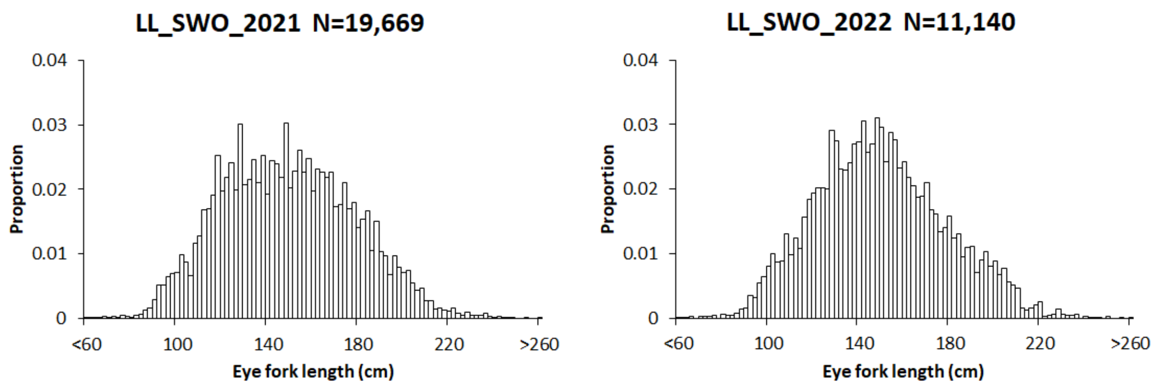

Fig.9. Annual relative length frequency distribution (simply summing up all measurements) for swordfish (SWO) caught by longline in 2021 (left) and 2022 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

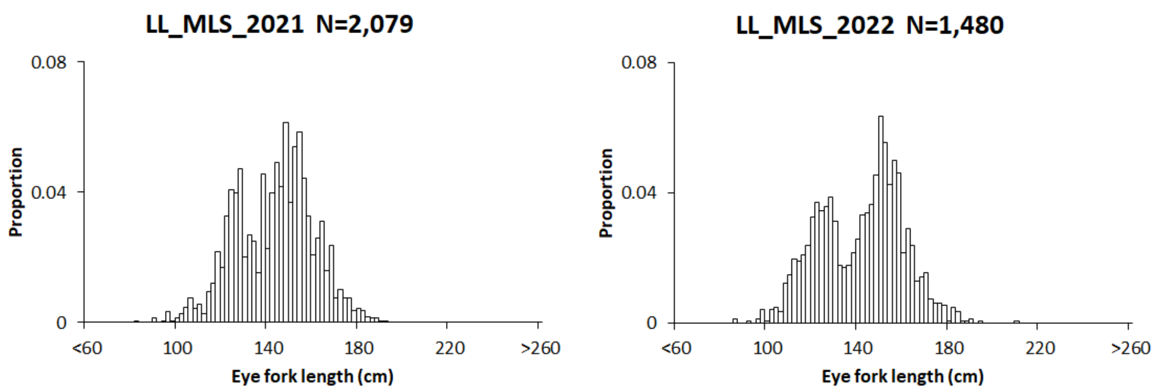

Fig.10. Annual relative length frequency distribution (simply summing up all measurements) for striped marlin (MLS) caught by longline in 2021 (left) and 2022 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.