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National Tuna Fisheries Report of Japan

Fisheries Agency of Japan

and

Fisheries Research Agency
National Research Institute of Far Seas Fisheries (NRIFSF)

SUMMARY

This paper describes recent trends in the Japanese tuna fishing activities mostly in the WCPFC Convention Area (WCP-CA). An activity of Japanese fisheries that operate in the WCP-CA and catch tuna and billfishes: longline, pole-and-line, purse seine and miscellaneous fisheries were presented. For the longline fishery, the total number of longline vessels was 1,233 in 2005, which are 58 vessels (4%) less than that of 2004. For the pole-and-line vessel, total number of the vessels was 423 in 2005, which are 36 vessels (9%) less than that in 2004. For the purse seine vessels, the number of vessels over 200 GRT, which operate in the equatorial waters, was 35 in 2005, which was equivalent to that in 2004. The number of the purse seine vessels of 50-200 GRT, which operate to catch tunas in north of 20°N, was 87 in 2005 which are 4 vessels less than that in 2004. The total WCP-CA catch of tunas (Pacific bluefin, albacore, bigeye, yellowfin and skipjack) by the Japanese fishery in 2005 was 498,000 mt corresponding to 110% of 454,000 mt in 2004. In 2005, the catch of tunas by the purse seine fishery was 266,000 MT (54% of the total catch of tunas), with 153,000 MT (31%) by the pole-and-line, 64,090 mt (13%) by the longline, and the remaining (3%) by the other gears.

It is reported that Japan made several research activities relation to tuna in the WCP-CA in 2006 and early 2007 such as tagging study for tropical tunas and sharks, cruise survey to know movement and migration pattern for bigeye and blue marlin, mid-water trawling to know distribution of juvenile skipjack, as a bycatch species related research, experiments of circle hook in reducing hooking mortality of sea turtles, experiments on side setting method, and sea turtle nesting survey.

1. Introduction

This paper describes recent trends in the Japanese tuna fishing activities (longline, pole-and-line and purse seine) mostly in the WCPFC Convention Area (WCP-CA). Fleet, fishing effort and catch statistics are included. Purse seine catch statistics are updated to 2006 but it is not possible to provide them for longline and pole-and-line fisheries as the current level of logbook compilation is not yet enough to make the estimation for that year. Catch statistics of vessel smaller than 20 gross registered tonnages (GRT) for longline and pole-and-line are not compiled by the NRIFSF but referred to the publication of the Statistics Division of the Ministry of Agriculture, Forestry and Fisheries for 2002-2004 (MAFFJ 2004-2006), and presented in this paper. The catch statistic for 2005 was derived from the Statistics Department, Ministry of Agriculture and Forestry. Furthermore, it is also shown that Research activities related to tuna and tuna-like species in the WCP-CA.

2. Trends in fleet size

Table 1 shows the number of Japanese tuna fishing vessels actually engaged in fishing by type of fishery and vessel size class during 2002-2006 (MAFFJ 2004-2006).

For the longline fishery, larger than 100 GRT vessels includes those operating out of the WCP-CA, but almost of 100-199 GRT vessels are operating in this area, while most of the vessels larger than 200 GRT are operating outside of it. All other smaller size categories operate in the WCP-CA. The number of longline vessels of the largest size class (over 200 GRT), which experienced 20% reduction in 1999 as reply to the agreement at the FAO's International Action Plan on management of fishing capacity. The number of the large vessels has decreased continuously so far, from 490 in 2001 to 424 in 2005. The total number of longline vessel in 2005 was 1,233 which are 58 vessels less than that of 2004.

In the case of pole-and-line vessel, the trend of number of largest size category (over 200 GRT) also shows decline. The number of vessels of this category was 45 in 2005 corresponding to 94% of 48 in 2002. The trend of numbers of mid-sized vessel categories, 10-50 GRT and 50-200 GRT were similar to that of the largest class. On the contrary, the number of vessel of the 0-10 GRT more or less varies during this period, ranging from 176 to 215. Total number of pole-and-line vessels in 2005 was 387, which is 36 vessels or 9% less than that in 2004.

Purse seine vessels, which operate in the equatorial distant water of the western and central Pacific, are greater than 200 GRT (most of them are 349 GRT), and 50 - 200 GRT class vessels operate in coastal and offshore water of Japan north of 20˚N. The number of vessels of the latter size category engaged in tuna fishery has decreased from 101 in 2002 to 87 in 2006. The number of distant water purse seiner was 35 and showed no change after 1995.

3. Trends in catch and effort

The total WCP-CA catch of tunas (Pacific bluefin, albacore, bigeye, yellowfin and skipjack) by the Japanese fishery in 2005 was 497,518 MT corresponding to 110% of 453,938 MT in 2004. In 2005, the catch of tunas by the purse seine fishery was 265,967 MT (54% of the total catch of tunas), with 152,520 MT (31%) by the pole-and-line, 64,090 MT (13%) by the longline, and the remaining (3%) by the other gears.

3. 1. Longline fishery

Latest complete statistics are 2005 data for longline vessels larger than 20 GRT. Catch in weight of tunas (Pacific bluefin, albacore, yellowfin, and bigeye tunas), swordfish and billfishes (striped marlin, blue marlin, black marlin, sailfish and shortbill spearfish) caught by the Japanese offshore and distant water longline fishery in the WCP-CA from 2002 to 2006 are shown in Table 2 although the value of 2005 was overlaid for 2006 because the data coverage in 2006 is too low to estimate the reliable statistics of this year. Historical change in fishing effort and catch by species are shown in Fig. 1 and 2, respectively, for the years 1971-2005. Total longline fishing effort (in number of hooks) in all oceans which was 556 million hooks in 1981 decreased to 495 million in 1983 and increased again to 557 million in 1988 after when it has decreased steadily to less than 400 million since 1999. The ratio of effort deployed in the Pacific Ocean to all effort was about 70 % until the middle 1990s, has been decreased to about 50% in the latest decade. In the WCP-CA, around 60% of total Pacific effort has been deployed since the middle of 1980s. The fishing effort in the WCP-CA was 104 million hooks in 2005 which is about 30 % lower than 10 years ago. Among the species caught, yellowfin catch was around 60 thousand mt at a peak during the late 1970s and the early 1980s and has declined continuously to about 10 thousand mt in the recent years. Bigeye catch which had been relatively stable until 1992 with fluctuation between 30,000 and 50,000 mt, decreased suddenly to around 20,000 mt, thereafter. The billfish catch more or less reflected the decreasing trend in the fishing effort.

The quarterly effort distribution for longline vessels larger than 20 GRT of the average of 2004 and 2005 is shown in Fig. 3. The fishing grounds are located in east-west direction off Japan to Hawaii, equatorial area between 10˚S and 15˚N and off Australia. Distribution pattern of the effort does not show remarkable seasonal change, but in overall area, the fishing effort appeared to decrease in the second quarter than in the other quarters. Distribution of the catch

by species for this fleet is shown in Fig. 4. They are classified into several clear patterns, swordfish targeting near Japan, albacore targeting in the middle latitudes between 15-30˚N and 25-40˚S, and tropical tuna (mostly bigeye) targeting in the equatorial waters.

Geographical distributions of fishing effort and catch composition for the coastal longliners (less than 20 GRT) were shown in Figs. 5 and 6. At the area between 130˚E and 140˚E and North of 15˚N, albacore is dominant in the catch while bigeye catch is dominant from 140˚E to 160˚E and from 30˚N to 40˚N. At the south of 15˚N, bigeye and yellowfin are major target species.

3. 2. Pole-and-line fishery

The catch and effort statistics in the WCP-CA by the Japanese pole-and-line fishery (larger than 20 GRT in vessel size) are shown in Table 3 from 2002 to 2006. In addition to this, historical change in catch by species and effort are shown in Fig. 7 for the period 1972-2006. Both the catch and effort gradually decreased throughout 1980s with a peak being around the late 1970s. After 1991 they were nearly stable. Total annual catches in 1970s and early 1980s ranged from 250,000 to 300,000 MT, and were around 150,000 MT in 1990s and later. Skipjack occupied the major part of catches being followed by albacore and yellowfin. Number of fishing days exceeded 60,000 days in 1970s but it is now slightly over 20,000 days. Number of poles used also peaked at 1977, and were more than 1,200,000 before 1982 except in 1972. Then, it decreased to 400,000 poles level during the 1990s and thereafter.

In 2005, the number of fishing days (including days of effort but no catch) was 19,709 days, declining slightly (97%) from 2004, and the number of poles was 368 thousand poles, also declining slightly (95%) from 2004. Total catch of major species (skipjack, bigeye, yellowfin, albacore and bluefin) in 2005 was 144,012 MT, corresponding to 104% of that in 2004 (Table 3). Catches of skipjack and albacore which are two major species caught by the pole-and-line fishery were 122,920 MT and 16,177 MT, respectively. While the skipjack catch considerably increased (125%) from 98,138 MT in 2004, the albacore catch decreases (46%) from 34,886 MT

Seasonal fishing ground of this fishery is shown as the quarterly distribution of fishing effort (the number of poles in 1x1 degree area) in average of 2004-2005 (Fig. 8). The fishing ground in the temperate waters (north of around 25˚N) moved from southwest of Japan toward northeast as time progresses. In addition to these fishing ground in temperate waters, north of the North Equatorial Current area was also important fishing ground for this fishery in 1st, 2nd, and 4th quarters of the year. In 2nd and 3rd quarters fishing grounds off northern Japan expanded to further east of 175˚E. There was no operation in the tropical waters south of 15˚N in the 3rd quarter.

Typical seasonal fishing ground by vessel type is as follows. The distant water vessels (larger than 300 GRT) fish skipjack in the tropical waters and the North Equatorial Current area from the late 4th quarter to the early 2nd quarter, and turn to north of around 35˚N, east of 150˚E where they target on albacore during June to October. In the case of the offshore vessels (smaller than 300 GRT), this fleet primarily catch skipjack tuna. Its fishing starts at sub-tropical area east of Northern Mariana Islands in February. This fishing ground gradually moves northward, and then reaches area just nearshore of Japan, south and/or east of Tokyo in May and June. The fishing ground of this fleet moves further northward to off northern Japan 35˚N-42˚N, west of 155˚E, so-called Tohoku area. Other than these offshore vessels, some of smaller size of the offshore vessels operate in the Nansei Islands, southwest of Japan, with anchored FADs almost all year around. The other smaller size vessels of the offshore vessel operate at the Izu Islands area, south of Tokyo, almost all year round.

In most of the fishing ground of pole-and-line fishery, skipjack dominated among species, except for at further northeastern area in which albacore dominated (Fig. 9). Most of yellowfin catch was made at the Nansei Islands area.

3. 3. Purse seine fishery

Total catch of the purse seine fishery has stabilized to nearly 230,000 MT in recent five years. The majority of the catch has been skipjack which accounted for more than 82.3% of the total catch in recent five years (Table 4 and Fig. 10). Annual total catch by species in 2006 obtained from the logbook in the WCP-CA by this fishery was 205,000 MT, 26,000 MT and 4,100 MT for skipjack, yellowfin and bigeye, respectively. About 158,000 MT of skipjack, 25,000 MT of yellowfin and 3,500 MT of bigeye were caught in the equatorial waters and the remaining was caught in the vicinity of Japan in 2006. The skipjack and yellowfin catch slightly increased in recent five years while bigeye catch decreased (Table 4). Geographical distributions of catches for skipjack, yellowfin and bigeye are shown in Fig. 11. In most cases, skipjack was the largest portion of the catch among three species in each 1˚ x 1˚ block.

Fishing effort (fishing days including searching day) fluctuated between 7,500 to 9,500 days after the mid 1980s (Table 4 and Fig. 10).

In the tropical waters purse seine fishing grounds were formed widely between 10˚N, 130˚E and 10˚S, 180˚ (Fig. 12) with some seasonal fishing ground shift. In near shore Japan at Pacific side the fishing season targeted at skipjack started in April and continued until November.

This fishery utilizes tuna schools in association with natural log and FADs mainly in equatorial fishing grounds (Fig. 13). The operations for free swimming schools were found both in equatorial waters and in coastal waters of Japan.

3.4. Total catch for tropical tunas for all gears combined

Total catch for tropical tunas for all gears combined, including coastal fisheries (longline, pole-and-line, troll and other miscellaneous gears), are shown in Table 5 for 2002-2006. The data in 2006 is provisional. The catches in

2005 for bigeye, yellowfin and skipjack were 30,527 MT, 48,362 MT and 356,870 MT, respectively. During 2002-2005, the bigeye catch showed no apparent trend ranging from 31,000 MT to 37,000 MT in 2005. The yellowfin catch showed also no apparent trend ranging from 41,000 MT to 50,000 MT during this period. The skipjack catch showed increasing trend from 294,000 MT in 2002 to 357,000 MT in 2005.

4. Research activities related to tuna and tuna-like species in the WCPFC Convention Area

4. 1. Biological data

NRIFSF has collected size data (weight and/or length) of tunas and billfishes in major landing port of Japan. Following is a summary of size sampling, focusing on length measurements, carried out mainly in 2005 and 2006. Note that size measurement of tunas and billfishes has been carried out on board of research vessels and training vessels other than port sampling for commercial vessels and that sex-specific size sampling on board for billfishes of commercial longline vessels in the North Pacific was newly started from 2003.

Size sampling

Length data of tunas and billfishes caught mainly near offshore of Japan have been collected in major landing ports of Japan. The major fishing gears, whose catches were measured are longline, pole-and-line, trolling and offshore purse seine. In 2005, the number of length data collected for bluefin, albacore, and skipjack were 32,000, 155,000 and 114,000, respectively. Although length data of bigeye and yellowfin caught by coastal and offshore longline fisheries has not been collected so intensely, length data collection for these tropical tunas was intensified in Kesennuma (North part of Japan) and Kii-Katsuura (South part of Japan) ports from 2005. In 2006, 16,537 bigeye and 13,343 yellowfin were measured at the Kii-Katsuura port.

Length sampling for distant water purse seiner

In addition to the size sampling mentioned above, port sampling program have been conducted to collect length data for skipjack, yellowfin and bigeye caught by distant water purse seine fishery in Yaizu and Makurazaki ports located at central and south of Japan, respectively. We performed the port sampling 20 times in a year in Yaizu port and six times at Makurazaki port. Annual total measurement number in 2006 was 30,700 fishes 11,500 and 4,100 for skipjack, yellowfin and bigeye, respectively. All three species the majority of the catch was small fish less than about 80cm in fork length in 2006 (Fig. 14) and there were three or four modes. The largest mode of skipjack was 45cm in comparison to 37 cm in 2005.

Scientific observer program for distant water purse seine

Scientific observer program has been conducted since 1995 according to Japanese purse seine operated in the Pacific Ocean tropical waters. The detail of time course of operations, floating objects and the length frequencies of each operation were investigated. The total number of cruises with observer is 32 until 2006 (Table 6).

4. 2. Tagging

Tropical tuna tagging project in Japan

Tagging project on bigeye and yellowfin was started in 1999 in southern Japan, and is being continued. Major objectives of this project are to investigate movements of fish in this area in relation to the surrounding waters, detailed movements around the anchored FADs, information on growth, the degree of exploitation by fishing gear in the area and so on. To date, nearly 2,077 bigeye and 8,559 yellowfin of 24-83cm in fork length were released with dart tag, of which 174 bigeye and 573 yellowfin tunas were recaptured (Table 7). After released from the waters around Okinawa and Amami Islands (24-30˚N, 123-132˚E), some individuals remained around the released area and the majority of others showed northeastern movement to east of Honshu along the Kuroshio Current. At the same time, archival tagging was also conducted for both species. Although the days at liberty of most recaptures are short, interesting results on the swimming behavior of these species are being gathered. As the information of movement after they reach east of Honshu is very rare, tagging on bigeye and yellowfin tuna caught by pole and line fishing east off Japan was tried in June 2007 using two prefectural research vessels, “Kuroshio” and “Shin Miyagi-Maru” during their albacore research cruise. The latter vessel could release about 70 bigeye tunas in early June, 36 of them were caught by only one purse seine operation about one week after released

Skipjack tagging

One research purse seiner, two research and two training pole-and-line vessels were involved in the skipjack tagging. In addition, one commercial distant water purse seiner conducted voluntary tagging when she operated in the temperate waters. Total of 2,449 skipjack were released in 2005 and 55 skipjack were recovered so far. Of these, 525 skipjack were released from the distant water purse seiner and 17 fish were recovered. The tagging was made mainly in the north western Pacific off Japan and in the equatorial Pacific. Releases in winter, 2005 were distributed in the area south of 22˚N.

Shark tagging

Shark tagging program has been conducted since 1996 to examine migration, population structure and life history parameters of pelagic sharks. In 2006, tags were attached to 1098 blue sharks, 5 bigeye threshers, 3 shortfin makos, one salmon shark and one longfin mako. Eleven tags attached to blue sharks were recovered and the tag recovery data indicated seasonal latitudinal migration of the species.

4. 3. Research cruise conducted

Shoyo-Maru Bigeye and billfishe research cruise in 2006

Shoyo-Maru longline research cruise was conducted in September through December 2006 at the temperate and tropical areas of central and western Pacific Ocean. This cruise consisted of three parts of leg, 1st leg from 18th Sept. to 17th Oct. at tropical region (160˚E-175˚E, 10˚N-12˚N), 2nd leg from 21st Oct. to 21st Nov. at temperate region (150˚E-180˚, 30˚N-35˚N) and 3rd leg from 25th Nov. to 26th Dec. at tropical region (155˚E-165˚E, 2˚N-6˚N). Main purposes of this research were to know diurnal movement and migration pattern of bigeye and blue marlin (only tropical area) and compare these movements between tropical and temperate areas. Through the research cruise, 36 longline operations were conducted and 811 individuals of 32 species including teleosts, elasmobranches, sea bird and sea turtle, were caught. In 102 bigeyes caught, Popup Archival Tag (PAT) were attached to 14 bigeyes and released. In them, 7 PATs were popped up shortly in a week, and remained tags were popped up after 17 – 72 days after released. Besides the tagging study, biological observation and sampling was made on the all individuals caught, and relationship between fishing gear shape under water and Oceanographic conditions was observed.

Ohmi-Maru research cruise

A sampling cruise for distribution of juvenile skipjack and other tunas (mostly composed of yellowfin and bigeye) was carried out by the R/V Ohmi-Maru using “TANSYU-type” mid-water trawl net during February and March 2007 in the tropical western Pacific (2˚N-25˚N, 137-151˚E). The net was towed diagonally at 80-120 m and 0-200 m for one hour at 10 sampling points during both the day and the night. Five points were located in the north equatorial current area (NEC, 10-20˚N) and other 5 points were located in the north equatorial countercurrent area (NECC, 0-10˚N). A total of 670 skipjack tuna with 19 other tuna (*Thunnus* spp.) was collected. Most of skipjack tuna appeared in the NECC (96.6 % of total skipjack specimens) and all of other tuna was collected in the area. The maximum catch of skipjack tuna (147 individuals from 80-120 m tow during the day) was taken at the point of 4˚50’N, 138˚E. Approximately 51% of total skipjack specimens were caught at that point. The dominant size of juvenile tuna was 2-5 cm in standard body length. The results of recent three research cruises during 2005-2007 showed that juvenile skipjack and other tuna are usually more abundant in the southern NECC area and the south equatorial current area (SEC, 0-10˚S) than that in the NEC area during January-March. High concentrations of juvenile tuna appeared in the frontal area observed between the NECC and SEC, indicating the strong relationship between the distribution of juvenile tunas and the oceanographic fronts.

4. 4. Bycatch species related research

Mitigation studies

According to the FAO action plans and guidelines, research and development have been conducted to develop mitigation measures for reducing incidental mortality of sea turtles and seabirds in longline fishery. Scientific fishing operations and captive experiments were conducted to develop effective fishing hooks in reducing hooking mortality of sea turtles. Tests of circle hook (Mutsu improved type 1) hooks on the catch rates and hooking position of loggerhead turtles have been conducted in the western North Pacific using R/V Taikei-maru No.2 (196 GRT). Fishing efficiency of the Mutsu circle were examined by comparing the catch rates of the circle hooks with those of the conventional tuna hook in deep-setting longline fishing operations in the central Pacific, in October-December 2006, using a training vessel (Shonan-maru, 646 GRT). The result showed that the catch rates of bigeye tuna were not substantially different between the tuna hook and the circle hook (tuna hook, mean catch rate ± S.D. = 8.10 ± 4.80, total catch = 120; circle hook, mean catch rate ± S.D. = 8.77 ± 3.80, total catch = 130). Further study will be needed to confirm the effectiveness of the circle hook.

A simple, compact, and practical rescue kit, including de-hooking devices and a line cutter, has been developed to improve post-hooking survival of sea turtles caught in longline fishery. To collect feedback from the fishermen on the use of circle hooks and to promote wider use of de-hooking devices among commercial longline fleets, the Organization for the Promotion of Responsible Tuna Fisheries (OPRT) is implementing a grant program for distributing circle hooks and de-hookers to Japanese fishermen.

Further experiments on side setting method were conducted in the western North Pacific, April-June 2007, using a large-sized longline research vessel (R/V Kurosaki, 54m, 450 GRT). Two sets of line setting equipment were installed; one was at the end of the stern deck (conventional stern setting) and another was at side of the front deck (36.5 m ahead of the stern; side setting), and the performance of stern setting and side setting was compared. The preliminary analysis of the results indicated satisfactory performance of side-setting in reducing incidental catch of seabirds (no Laysan albatross caught in 11 side setting operations, and 11 Laysan albatross caught in 10 stern setting

operations), and in labor-saving of the fishing operation (i.e., eliminating the labor to carry fishing gear and bait from the front to the stern decks). But the safety of fishing operation (e.g., potential risk of the line tangling with the propeller during line setting), the resistance to rough sea condition, and economical cost of deck modification should be evaluated carefully before introducing the side setting method to commercial fishery.

Effective factors of tori line configuration in reducing incidental catch of albatrosses were examined based on the data collected by Japanese scientific observers in the southern bluefin tuna (SBT) longline fishery in the Southern Ocean in 2002-2005. Model analysis of the tori line parameters suggested that, among the tori lines currently used in Japanese SBT longline vessels, length of the line had significant effect on seabird avoidance effect rather than the material and structure of the streamers (Yokota et al., 2007).

Tori line (bird scaring line) configuration has been examined to optimize the practical performance as well as the seabirds avoidance effects of medium-sized commercial longline vessels (R/V Kaisei-maru, 149 GRT, and R/V Taikei-maru No.2, 196 GRT). Results of these experiments suggested that a longer bird line with light-weight main line made of tangle-free material and/or configuration were good in the practical performance for medium-sized longline vessels. The Global Gurdian Trusts (GGT) is implementing a program to distribute free tori lines to medium-sized commercial longline vessels.

Sea turtle nesting survey

Large number of leatherback turtles is known to nest in Jamursba-medi and Wermon, Irian Jaya, Indonesia. Nest counts, assessment of hatching success, and improvement of nesting environment for leatherbacks have been conducted in Indonesia with the collaboration of the Indonesia Sea Turtle Research Center and a Japanese NPO, Everlasting Nature of Asia since 2002. The nesting survey revealed that Indonesian population of leatherback turtles were suffering from poor reproductive success due to beach erosion, egg predation and low hatching rates. The Everlasting Nature constructed electric fences in the highest-density nesting area to prevent pig predation on leatherback eggs. The electric fence drastically reduced the egg predation rates from 63.3% to 7.1% (Suganuma 2004). Satellite tracking of post-nesting female leatherback turtles has been conducted in Jamursba-medi and Welmon since 2003, and showed that post-nesting foraging areas of females differed according to the nesting seasons and/or areas. Most of the females that nested in dry season (mainly in the Jamursba-medi area) moved eastward to the central tropical Pacific, and small number of them moved northward to the western North Pacific off Japan and off Philippine. In contrast, females that nested in rainy season (in the Welmon area) moved southward to the South Pacific.

Stock assessment of pelagic sharks

Short-term trends in standardized CPUE of blue shark, bigeye thresher, and silky shark were analyzed using the data collected by Japanese research and training vessels in the North Pacific from 1992 to 2005. Because sharks are non-target species in tuna longline fishery, catch data of sharks contain many zero values, and may cause biases in conventional CPUE analyses. We therefore compared three statistical models (lognormal model, catch negative binominal model, and delta lognormal model) in shark CPUE analysis. Although there were some fluctuations in standardized CPUEs of the three sharks, no constant trends of increase or decrease were observed during this study period. The three statistical models showed similar trends in standardized CPUEs, but the levels of the CPUEs differed depending on the amount of zero-catch data. The results of 5-fold cross-validation showed that performance of the three models were not significantly different, but delta lognormal model provided better estimation for bigeye thresher which included many zero-catch data.

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Table 1. Number of fishing vessels engaged in tuna fisheries in WCPFC Convention Area by gear and size of vessel. Figures in parentheses indicate provisional data.

Longline*

	2002	2003	2004	2005	2006
0-10 ton	342	326	287	292	(292)
10-50 ton	442	441	417	404	(404)
50-200 ton	179	163	132	105	(105)
200-500 ton	484	453	448	424	(424)
500+ ton	5	7	7	8	(8)

Pole-and-line

	2002	2003	2004	2005	2006
0-10 ton	176	215	208	180	(180)
10-50 ton	76	78	77	68	(68)
50-200 ton	103	100	95	94	(94)
200-500 ton	48	44	43	45	(45)

Purse Seine

	2002	2003	2004	2005	2006
50-200 ton	101	92	91	87	(87)
200-500 ton	34	34	34	34	(34)
500-1000 ton	1	1	1	1	(1)

* Vessels larger than 50 GRT include those operated in the area other than the Pacific.

Table 2. Fishing effort (in million hooks) and catch (MT) in the WCPFC Convention Area by species for the Japanese longline fishery (vessels larger than 20 GRT). Figures in parentheses indicate provisional data.

	2002	2003	2004	2005	2006
Number of hooks	120	112	105	104	(104)
Pacific bluefin	51	95	243	165	(165)
Albacore	9,693	6,947	7,900	10,322	(10,322)
Bigeye	23,009	17,682	20,917	16,087	(16,087)
Yellowfin	11,874	10,385	9,525	10,648	(10,648)
Swordfish	5,988	5,198	5,424	5,765	(5,765)
Striped marlin	626	969	683	534	(534)
Blue marlin	1,657	1,722	1,962	1,992	(1,992)
Black marlin	80	41	54	77	(77)
Sailfish	67	71	42	112	(112)
Shortbill spearfish	51	51	56	82	(82)
Total	53,044	43,064	46,563	45,618	(45,618)

Table 3. Days fished, number of poles used, and catch (MT) by species for the Japanese pole-and-line fishery (larger than 20GRT) in the WCPFC Convention Area. Figures in parentheses indicate provisional data.

	2002	2003	2004	2005	2006
Number of fishing day	20,960	20,772	20,420	19,709	(19,709)
Number of pole	390,937	393,099	386,899	368,206	(368,206)
Skipjack	90,466	115,765	98,138	122,920	(122,920)
Yellowfin	2,501	2,089	2,285	3,093	(3,093)
Bigeye	1,714	822	3,341	1,271	(1,271)
Albacore	49,443	34,580	34,886	16,177	(16,177)
Pacific bluefin	92	9	331	551	(551)
Total	144,216	153,265	138,981	144,012	(144,012)

Table 4. Fishing days including searching days and catch (MT) by species for the Japanese tuna purse seine fishery in the WCPFC Convention Area based on logbook data.

	2002	2003	2004	2005	2006
Number of fishing day	8,311	8,663	8,822	8,603	7,259
Pacific bluefin	7,422	5,321	7,146	10,807	7,073
Albacore	3,072	837	7,006	905	236
Bigeye	4,587	5,099	4,577	4,696	4,025
Yellowfin	19,138	27,195	22,628	26,262	25,795
Skipjack	188,056	187,443	172,619	218,533	196,781
Total	222,275	225,893	213,975	261,203	233,911

Table 5. Japanese catches for tropical tuna species by gear. Figures in parentheses indicate provisional data. LL: longline, PL: pole-and-line, PS: purse seine.

		2002	2003	2004	2005	2006
Bigeye	Total	36,082	32,121	37,433	30,527	(29,855)
	Distant water and Offshore LL	23,009	17,682	20,917	16,087	(16,087)
	Distant water and Offshore PL	1,714	822	3,341	1,271	(1,271)
	Tuna PS	4,587	5,099	4,577	4,696	4,025
	Coastal LL	6,565	8,341	8,431	8,170	(8,170)
	Coastal PL	43	35	52	51	(51)
	Coastal PS	2	1	6	10	(10)
	Gill net	12	11	5	6	(6)
	Troll	126	105	83	135	(135)
	Set net	2	1	2	4	(4)
	Unclassified	21	24	19	96	(96)
Yellowfin	Total	41,251	49,954	43,513	48,362	(47,895)
	Distant water and Offshore LL	11,874	10,385	9,525	10,648	(10,648)
	Distant water and Offshore PL	2,501	2,089	2,285	3,093	(3,093)
	Tuna PS	19,138	27,195	22,628	26,262	25,795
	Coastal LL	3,936	6,356	5,717	5,267	(5,267)
	Coastal PL	874	779	755	507	(507)
	Coastal PS	87	86	8	153	(153)
	Gill net	32	22	10	13	(13)
	Troll	2,524	2,683	2,294	2,094	(2,094)
	Set net	52	31	25	30	(30)
	Unclassified	233	329	265	295	(295)
Skipjack	Total	294,278	325,281	297,594	356,870	(335,118)
	Distant water and Offshore LL	54	67	52	82	(82)
	Distant water and Offshore PL	90,466	115,765	98,138	122,920	(122,920)
	Tuna PS	188,056	187,443	172,619	218,533	196,781
	Coastal LL	19	42	21	27	(27)
	Coastal PL	6,901	9,377	9,990	7,363	(7,363)
	Coastal PS	1,025	1,632	716	296	(296)
	Gill net	488	711	721	707	(707)
	Troll	6,376	9,386	14,802	5,971	(5,971)
	Set net	576	399	224	711	(711)
	Unclassified	317	459	311	260	(260)

Table 6. Number of cruise for scientific observer program in the Pacific tropical water

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Number of cruise	2	4	3	4	3	3	3	3	3	1	1	2	32

Table 7. Number of fish released and recaptured in the tropical tuna tagging project conducted in the Nansei Islands area (Okinawa and Amami Islands).

Dart tag

Species	**Bigeye tuna**			**Yellowfin tuna**			**Total**		
Year	Rel.	Recap.	% recap.	Rel.	Recap.	% recap.	Rel.	Recap.	% recap.
2000	453	78	17.2%	1042	126	12.1%	1495	204	13.6%
2001	363	35	9.6%	1417	83	5.9%	1780	118	6.6%
2002	224	29	12.9%	1409	204	14.5%	1633	233	14.3%
2003	352	22	6.3%	1309	98	7.5%	1661	120	7.2%
2004	147	2	1.4%	1280	31	2.4%	1427	33	2.3%
2005	264	6	2.3%	949	15	1.6%	1213	21	7.9%
2006	274	2	0.7%	1153	16	1.4%	1427	18	1.3%
Total	2077	174	8.4%	8559	573	6.7%	10636	747	7.0%

Archival tag

Species	**Bigeye tuna**			**Yellowfin tuna**			**Total**		
Year	Rel.	Recap.	% recap.	Rel.	Recap.	% recap.	Rel.	Recap.	% recap.
2000	23	6	26.1%	6	0	0.0%	29	6	20.7%
2001	13	1	7.7%	25	1	4.0%	38	2	5.3%
2002	20	4	20.0%	9	1	11.1%	29	5	17.2%
2003	14	1	7.1%	21	1	4.8%	35	2	5.7%
2004	1	0	0.0%	8	0	0.0%	9	0	0.0%
2005	21	5	23.8%	0	0	0.0%	21	5	23.8%
2006	13	1	7.7%	1	0	0.0%	14	1	7.1%
Total	105	18	17.1%	70	3	4.3%	175	21	12.0%

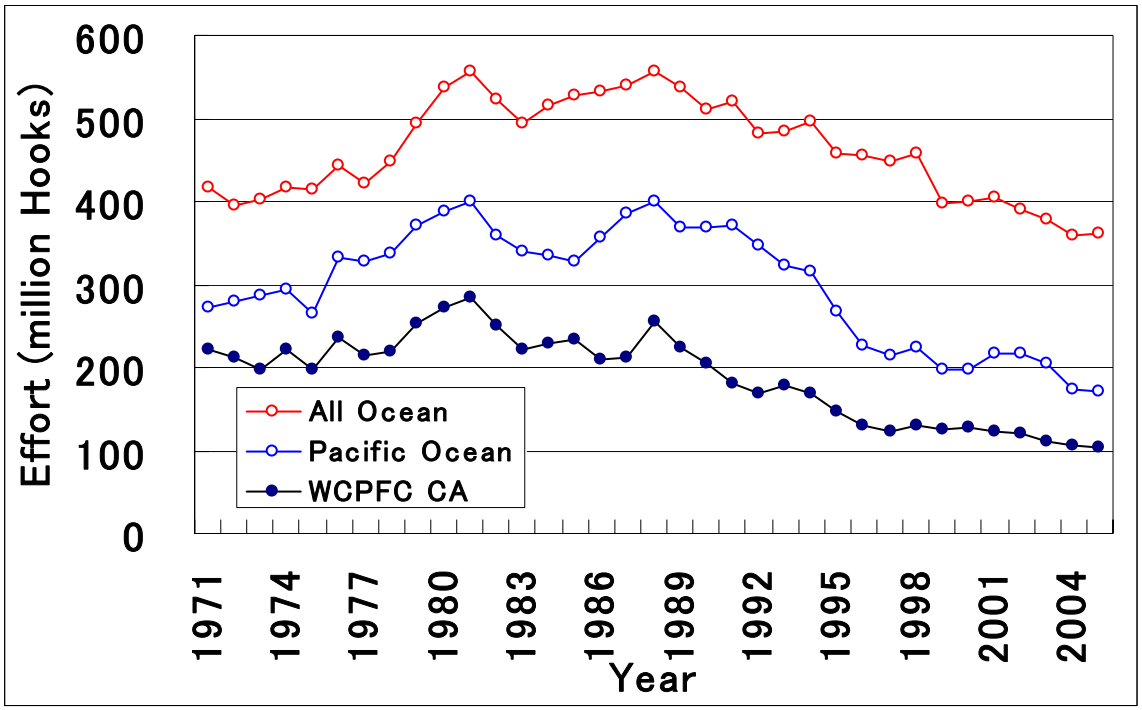

Fig. 1. Historical change in fishing effort of the Japanese longline fishery (>20GRT) in the WCPFC Convention Area.

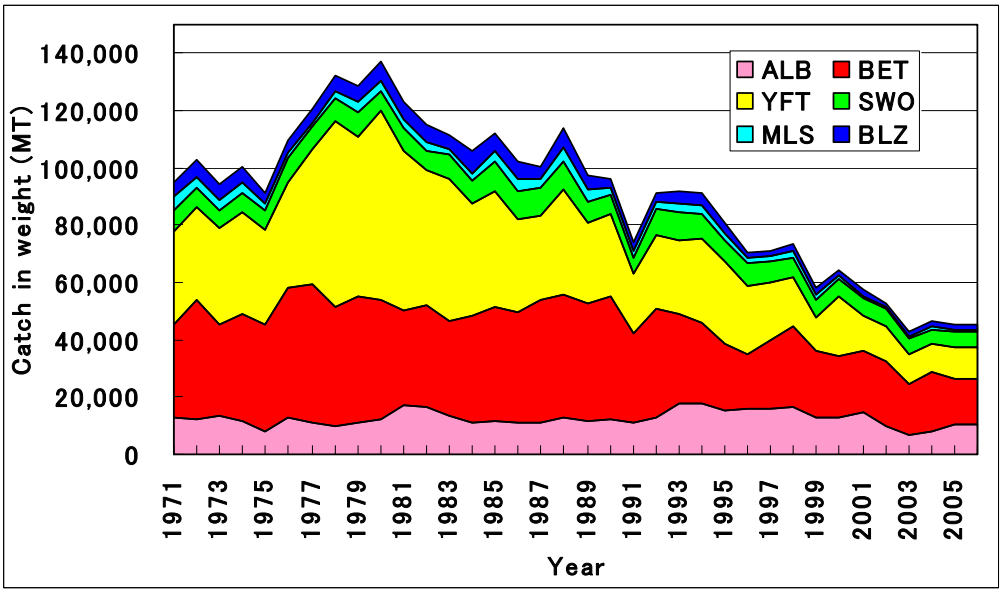

Fig. 2. Historical change of catches of major species for the Japanese longline fishery (>20GRT) in the WCPFC Convention Area.

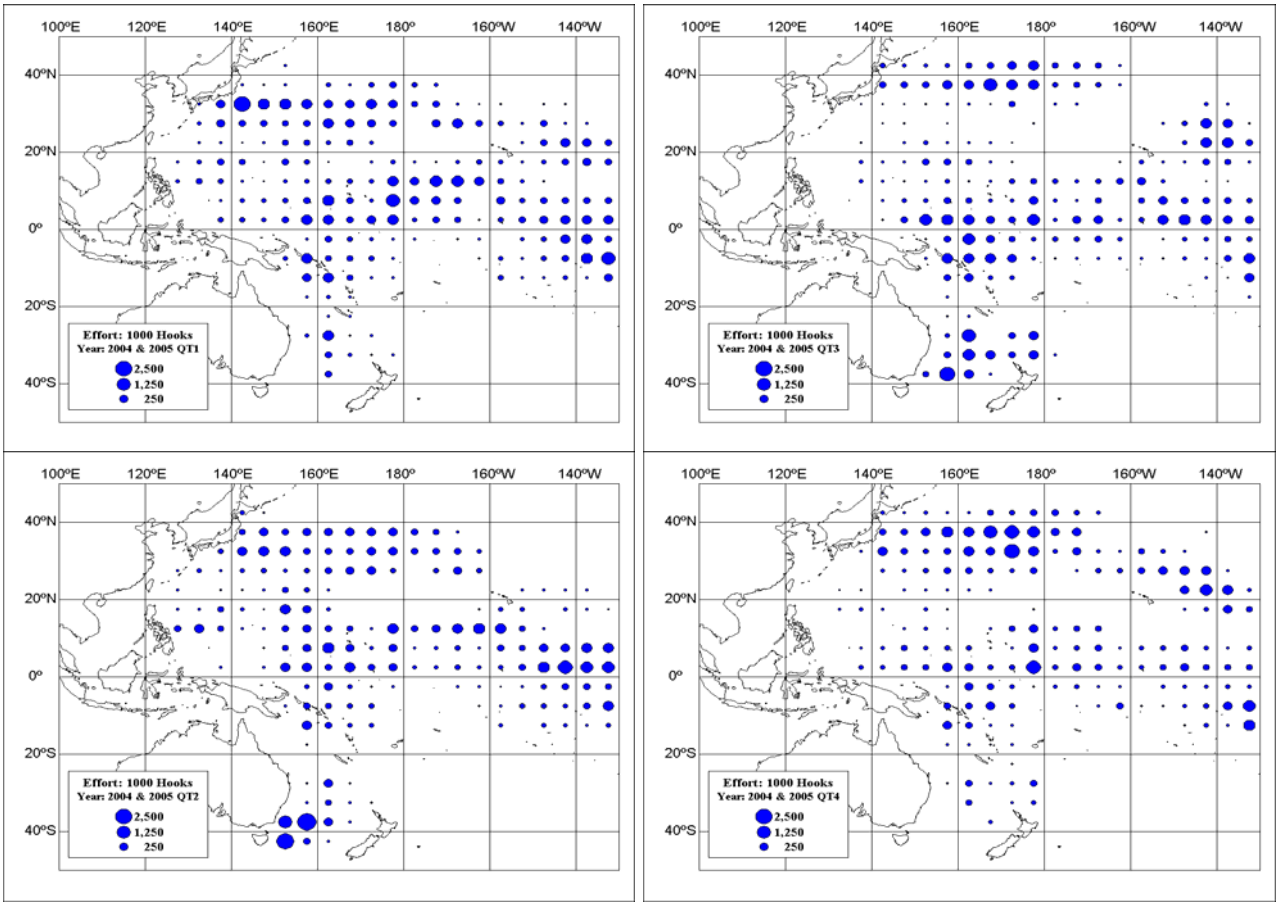

Fig. 3. Quarterly distribution of fishing effort for the Japanese offshore and distant water longline fisheries in the western and central Pacific Ocean in average of 2004-2005.

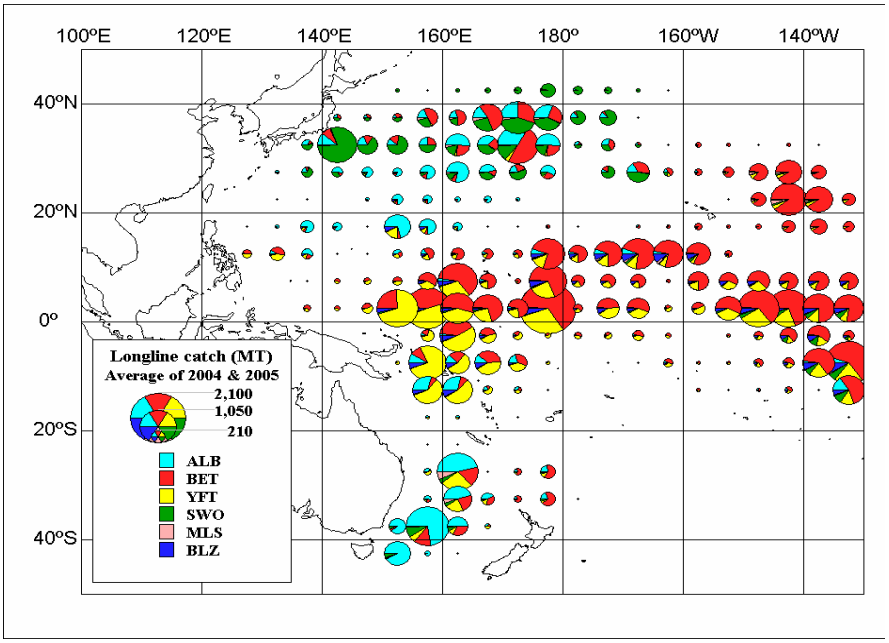

Fig. 4. Distributions of offshore and distant water longline catch (weight) by species in average of 2004-2005 for six main species (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin and BLZ: blue marlin).

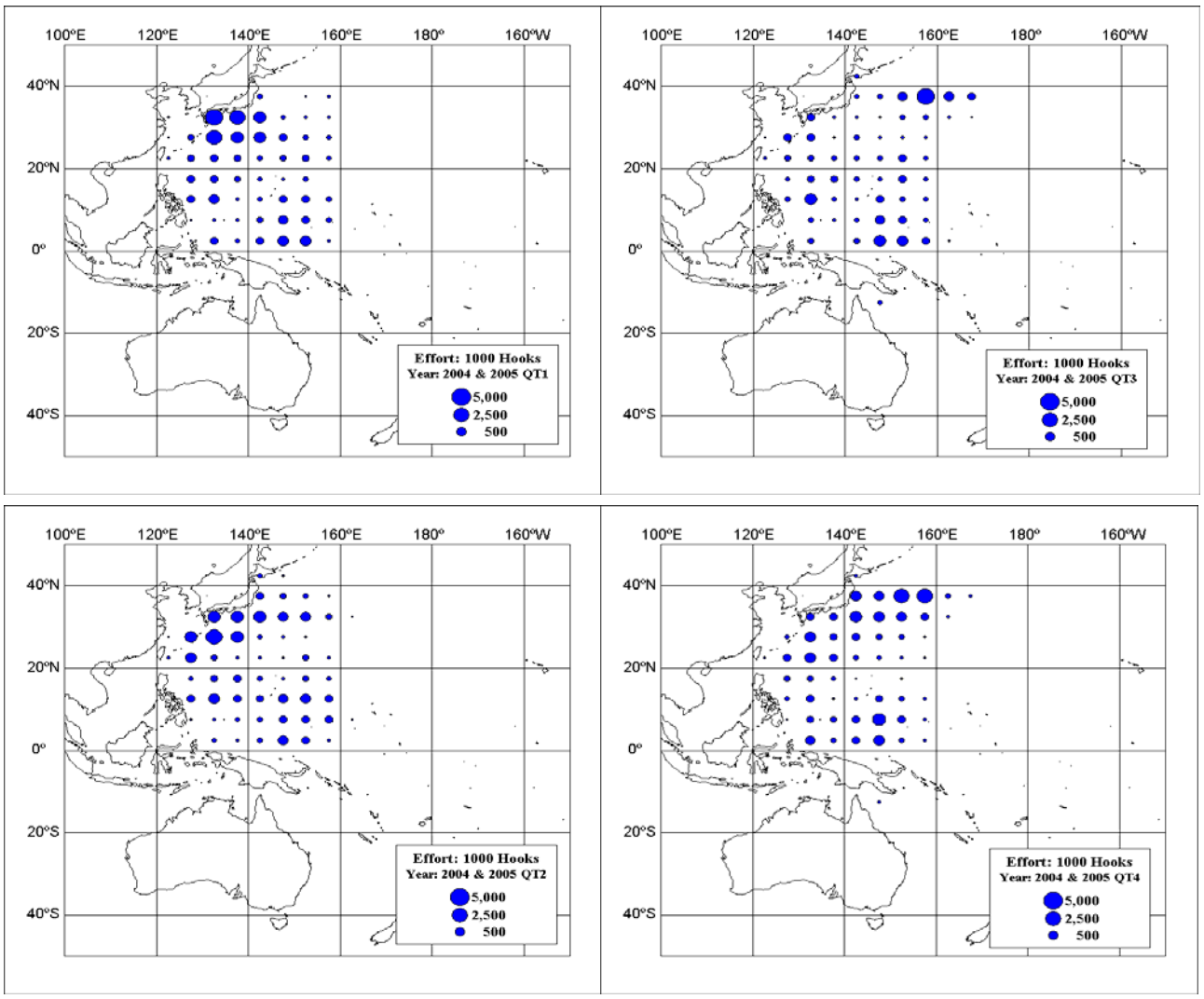

Fig. 5. Quarterly distribution of fishing effort for the Japanese coastal longline fisheries (less than 20 GRT) in the western and central Pacific Ocean in average of 2004-2005.

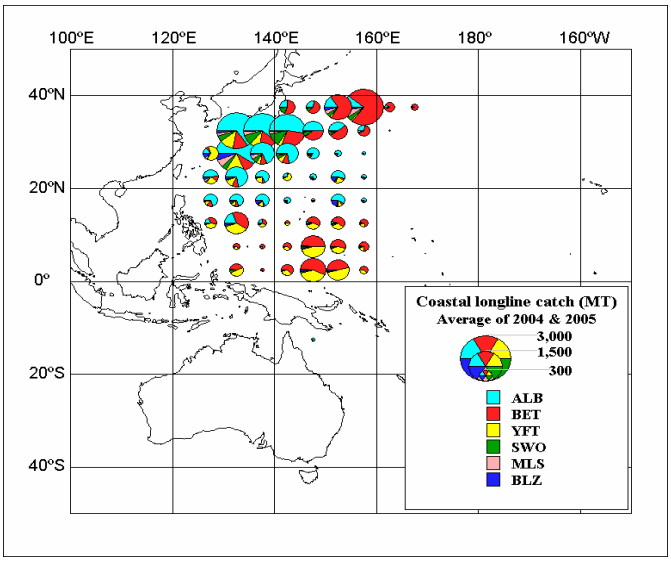

Fig. 6. Distributions of coastal longline catch (weight) by species in average of 2004-2005 for six main species (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin and BLZ: blue marlin).

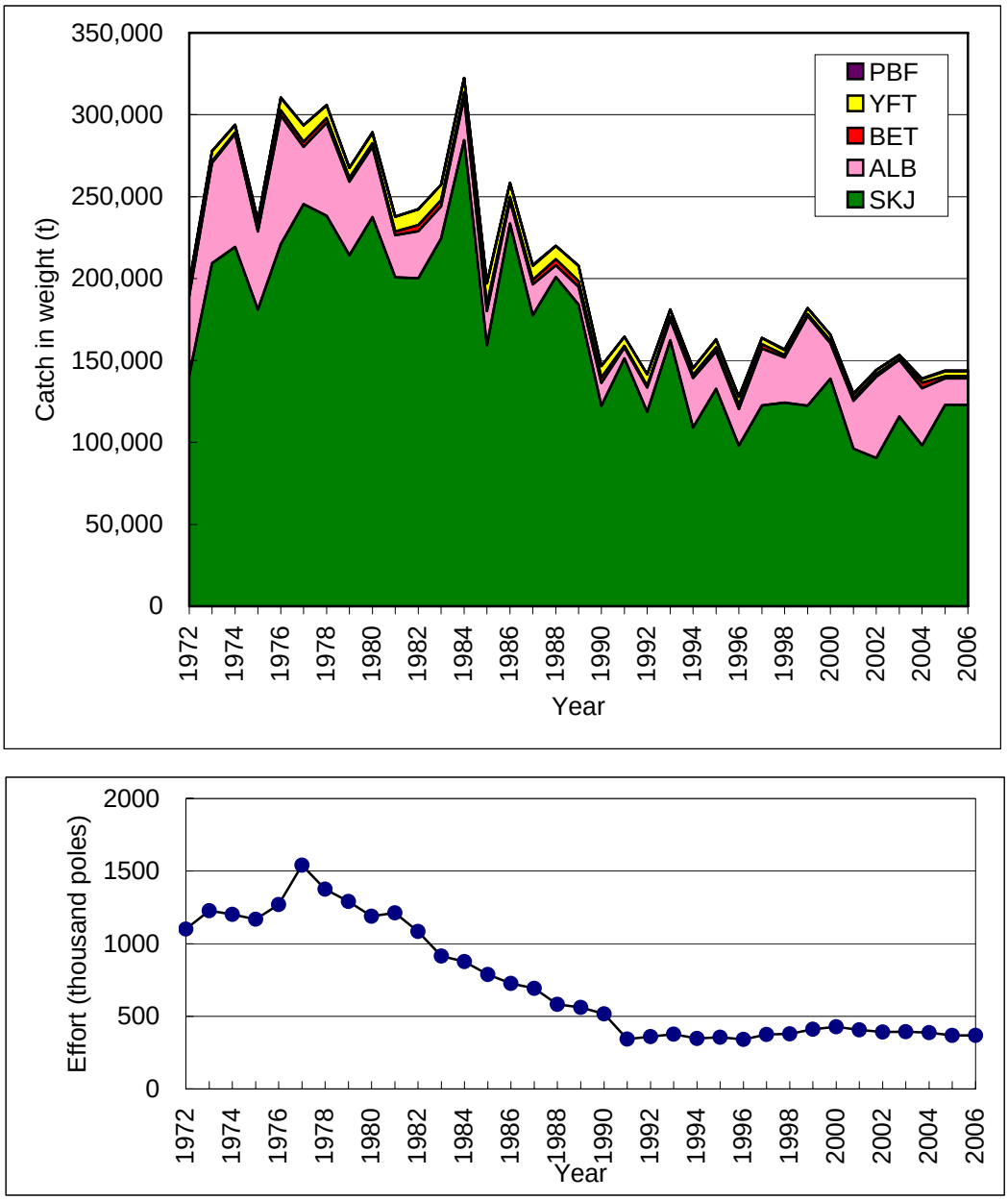

Fig. 7. Historical change of fishing effort and catches by species for the Japanese pole-and-line fishery (>20GRT) in the WCPFC Convention Area.

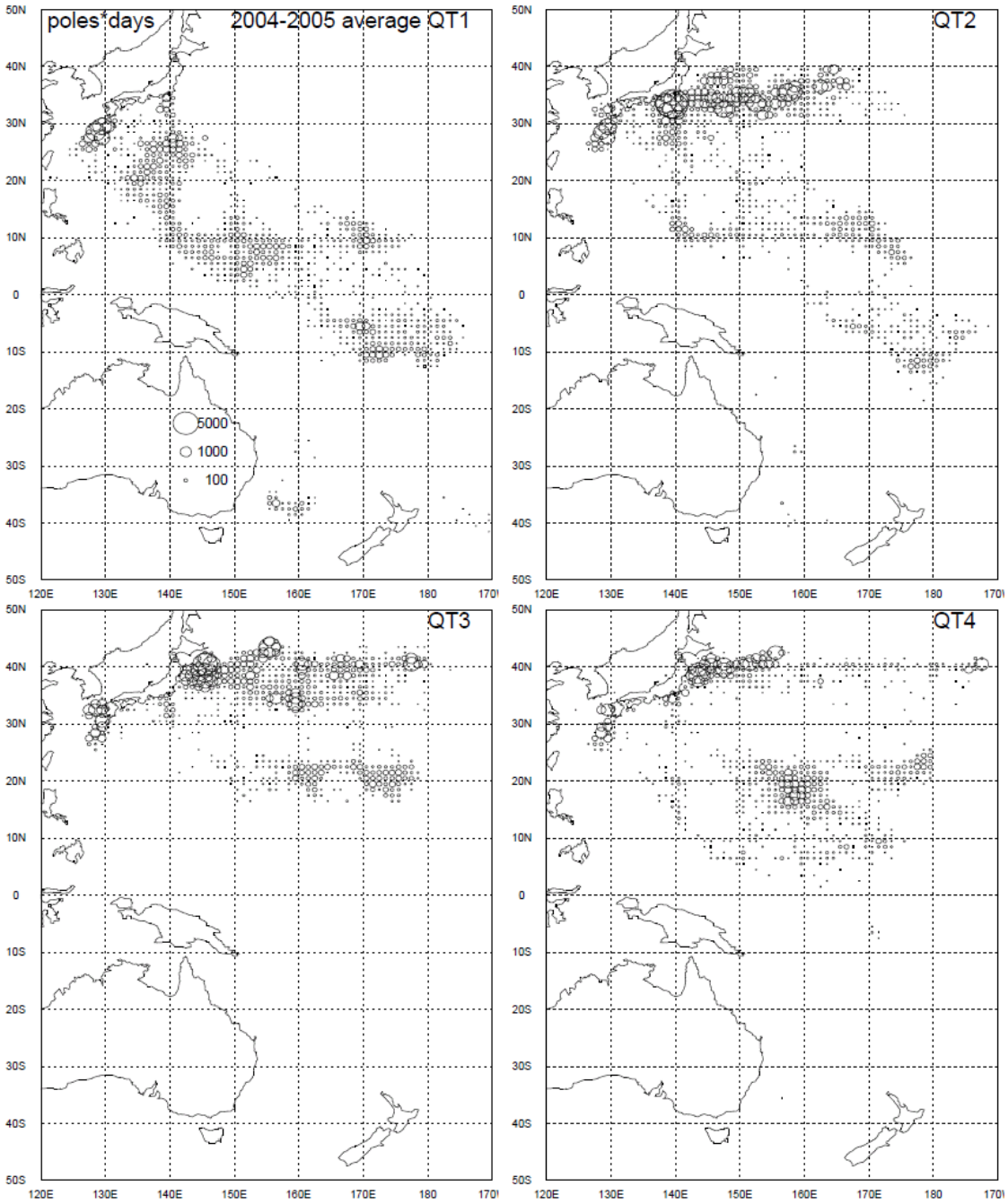

Fig. 8. Quarterly distribution of fishing effort for the Japanese pole-and-line fishery (offshore and distant water licenses) in the Pacific Ocean in average of 2004-2005.

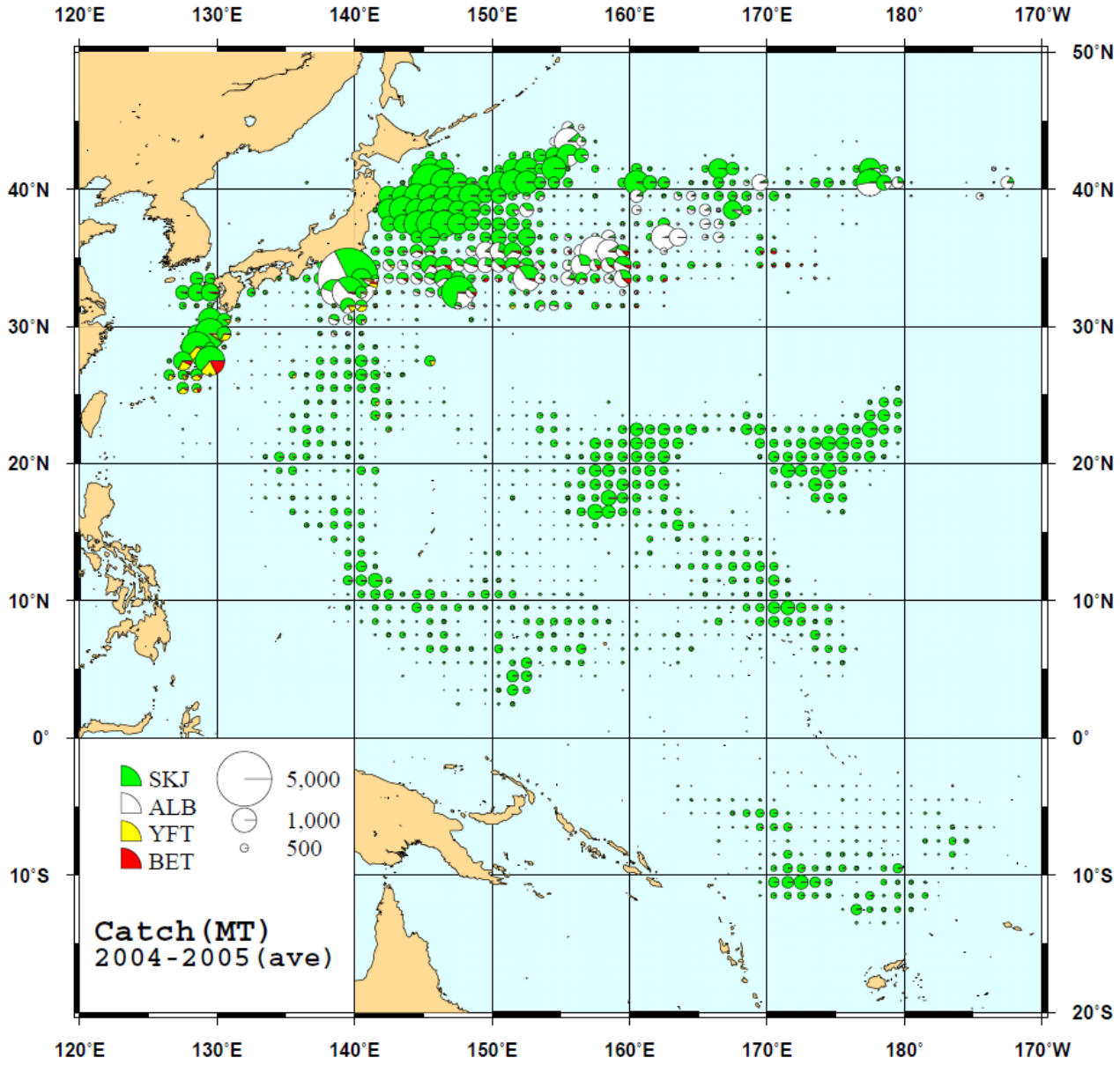

Fig. 9. Distribution of catch and its species composition for the Japanese offshore and distant water pole-and-line fishery in average of 2004-2005.

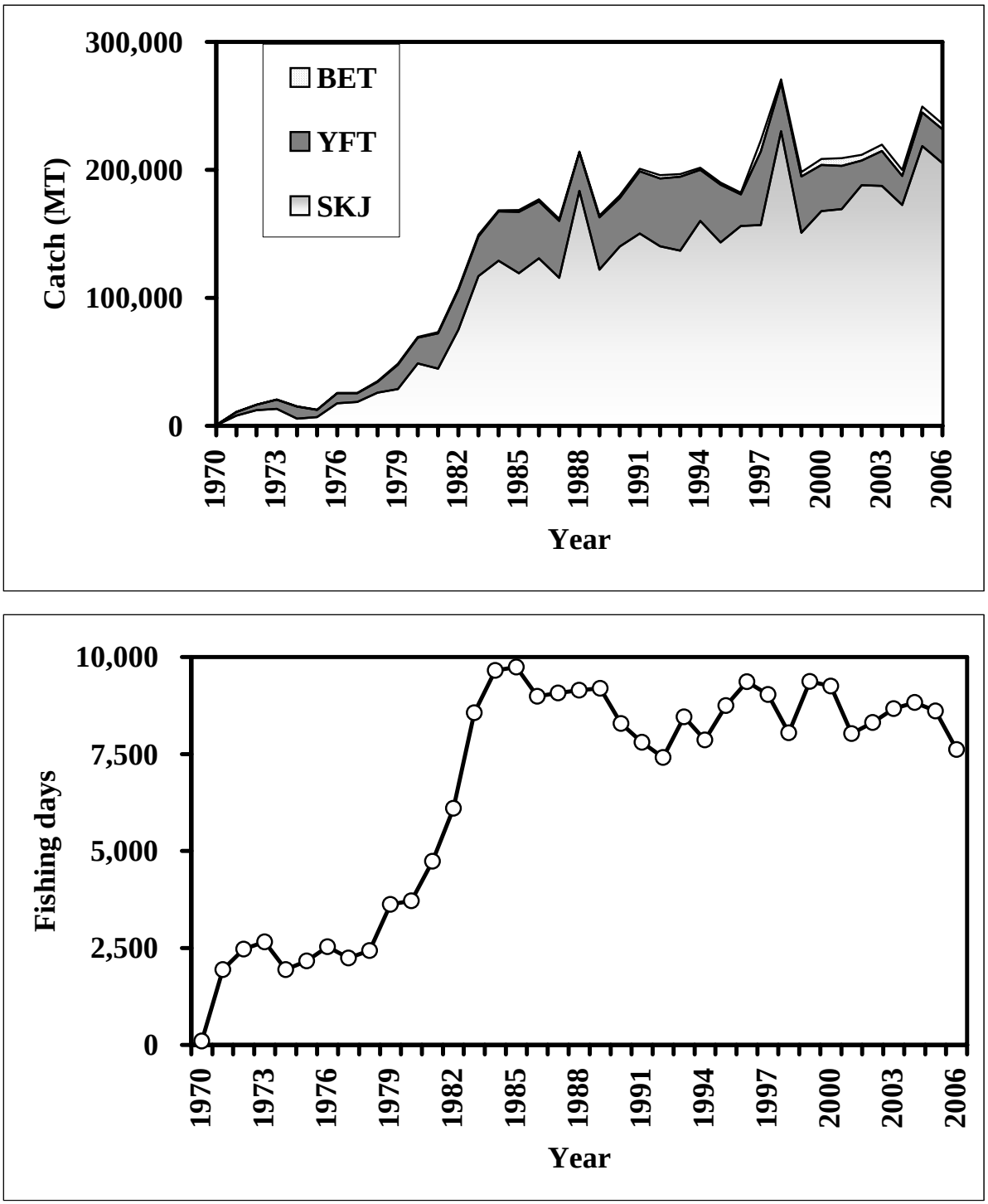

Fig. 10. Trends of fishing effort and catches by species for the Japanese tuna purse seine fishery in the WCPFC Convention Area.

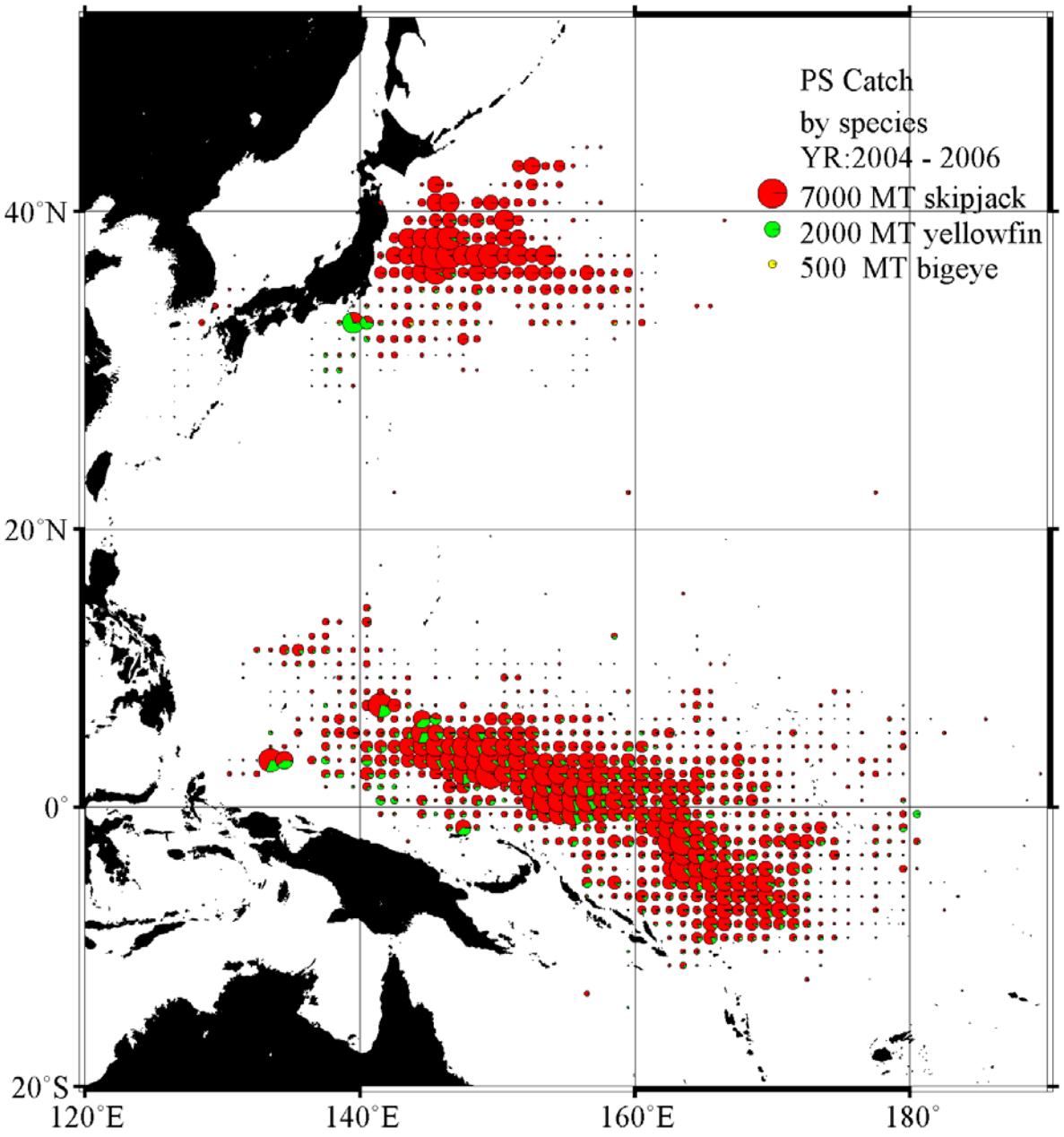

Fig. 11. Distribution of tuna purse seine catch (MT) by species for tropical tuna species (bigeye, yellowfin and skipjack) combined for 2004-2006.

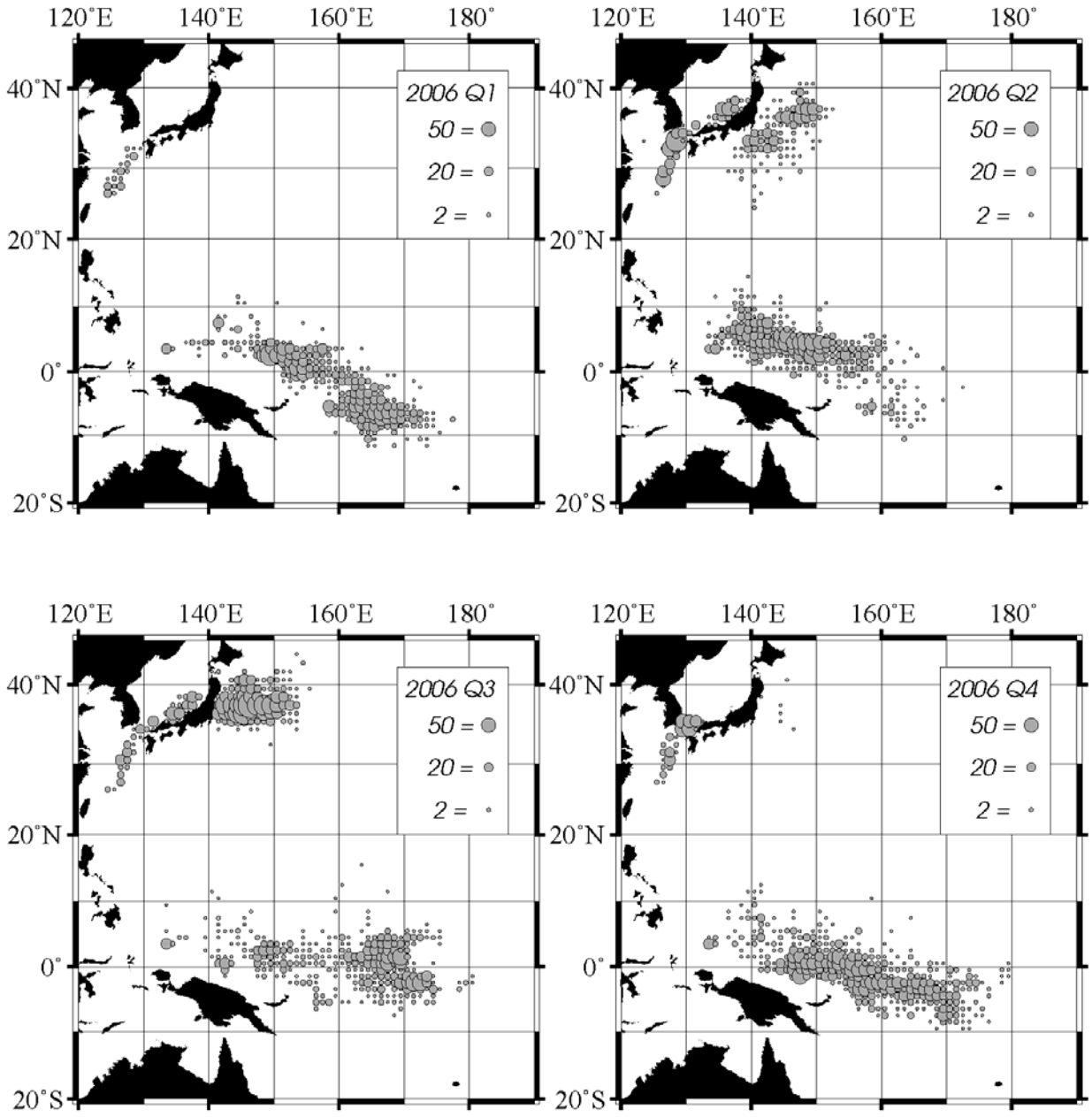

Fig. 12. Quarterly distributions of fishing effort (fishing days including searching days) for the Japanese tuna purse seine fishery in the Pacific Ocean in 2006.

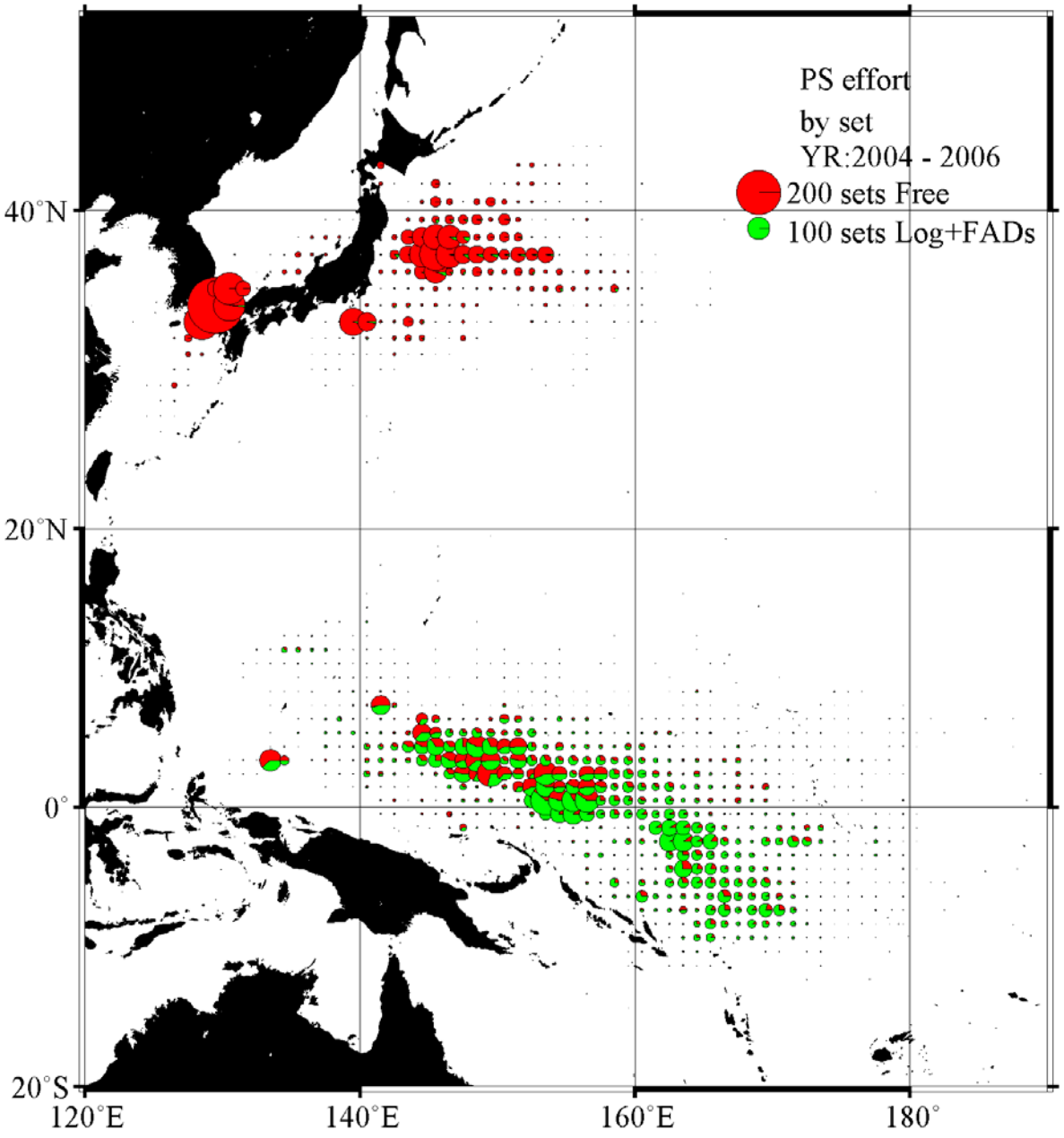

Fig. 13. Distribution of sets by type of school for 2004-2006 deployed by the tuna purse seine fishery by Japan.

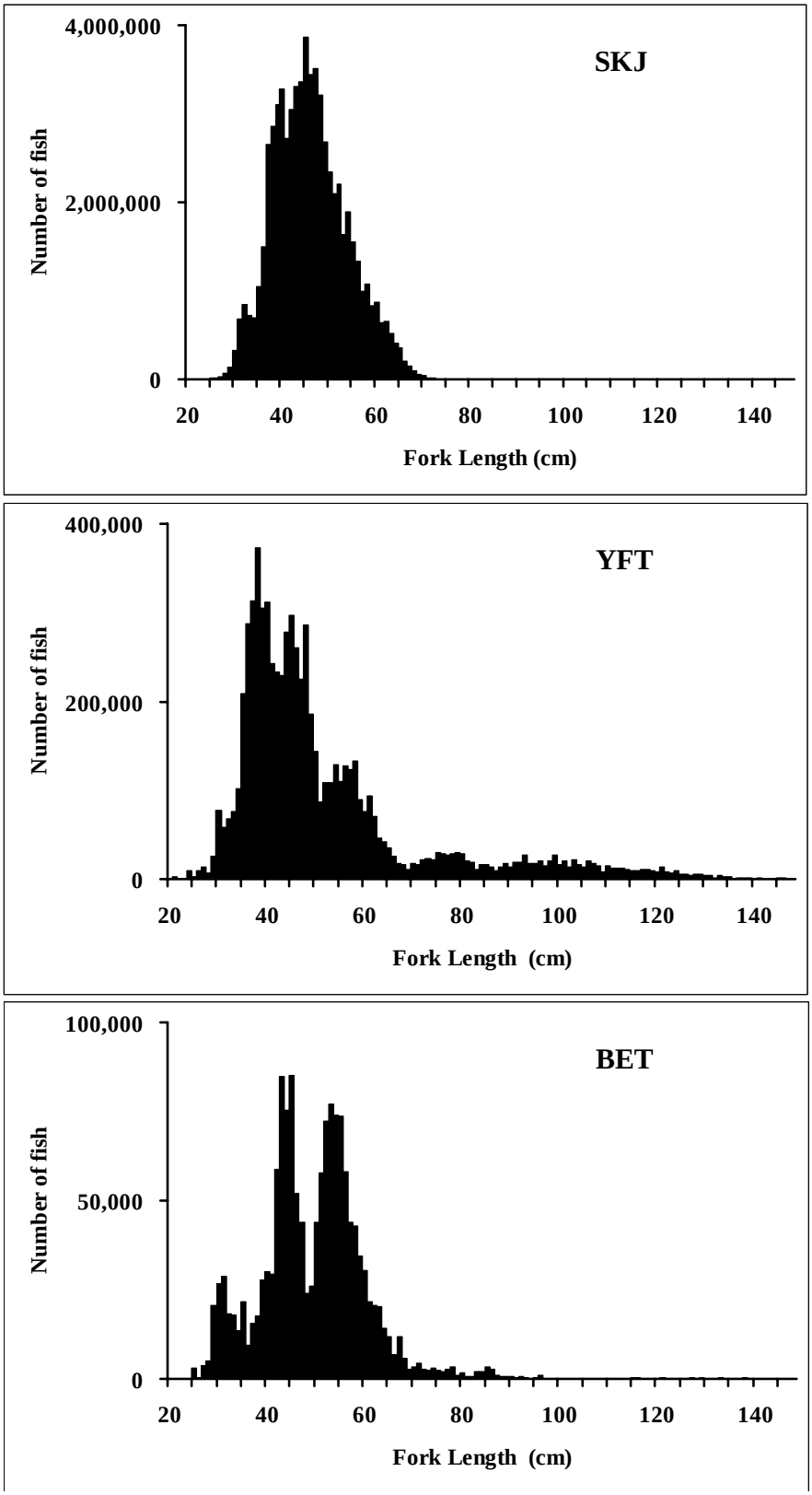

Fig. 14. Annual length frequency distribution of purse seine-caught fish in equatorial waters in 2006.