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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 2005 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 boat smaller than 20 gross registered tonnages (GRT) for longline and pole-and-line, which is not covered by the current logbook system are not compiled by the NRIFSF but referred to the publication of the Statistical Division of the Ministry of Agriculture, Forestry and Fisheries (MAFFJ 2002-2004), and presented in this paper.

2. Trends in fleet size

Table 1 shows the number of Japanese tuna boats actually engaged in fishing by type of fishery and vessel size class during 2001-2005 (MAFFJ 2002-2004).

For the longline fishery, larger than 100 GRT vessels includes those operating out of the WCP-CA, but almost of 100-199 GRT boats are operating in this area, while most of the boats larger than 200 GRT are operating outside of it. All other smaller size categories operated in the WCP-CA. The number of longline vessels of the largest size class (over 200 GRT), which experienced 20% reduction in 1999, decreased continuously from 490 in 2001 to 448 in 2004. This reduction of vessel in 1999 was implemented in accordance with the agreement at the FAO's International Action Plan on management of fishing capacity. The total number of longline vessel in 2004 was 1,291 which are 99 vessels less than that of 2003.

In the case of pole-and-line boat, the trend of number of largest size category (over 200 GRT) also shows declining. The number of vessels of this category was 43 in 2004 corresponding to 91% of 47 in 2001. 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 in year during this period, ranging from 176 to 215. Total number of pole-and-line vessels in 2004 was 423, which is 14 vessels or 3% less than that in 2003.

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 boats 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 127 in 2003 to 126 in 2004. 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 2004 was 455,751 MT corresponding to 96% of 475,291 MT in 2003. In 2004, the catch of tunas by the purse seine fishery was 216,384 MT (47% of the total catch of tunas), with 149,644 MT (33%) by the pole-and-line, 67,642 MT (15%) by the longline, and the remaining (5%) by the other gears.

3. 1. Longline fishery

Latest complete statistics are 2004 data for longline boats larger than 20 GRT. 2005 statistics is provisional. 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 2001 to 2005 are shown in Table 2. 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 decreased to 495 million in 1983 and increased again to 557 million in 1988 after when it has decreased steadily to around 400 million after 1999. The ratio of effort deployed in the Pacific Ocean to all effort which 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 118 million hooks which is 30 % lower than 10 years ago. Among the species caught, albacore and swordfish did not show remarkable decline while the other species indicated continuous reduction especially after 1981. The yellowfin catch was at a peak during the late 1970s and the early 1980s and started going down soon after. Bigeye catch followed this trend in more recent years beginning in the early 1990s. The billfish catch more or less reflected the decreasing trend in the fishing effort.

The quarterly effort distribution for longline boats larger than 20 GRT of the average of 2003 and 2004 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 patterns of the catch by species for this fleet are shown in Fig. 4, and they are classified into several clear patterns (swordfish targeting near Japan, albacore targeting in the middle latitudes between 15-30˚N 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 2001 to 2005. In addition to this, historical change in catch by species and effort are shown in Fig. 7 for the period 1972-2005. Both the catch and effort gradually decreased throughout 1980s with a peak being around the late 1970s. After 1991 they were nearly stable. Total yearly 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 2004, the number of fishing days (including days of effort but no catch) was 20,331 days, declining slightly (98%) from 2003, and the number of poles was 386 thousand poles, also declining slightly (99%) from 2003. Total catch (sum of skipjack, bigeye, yellowfin, albacore and bluefin) in 2004 was 138,612 MT, corresponding to 91% of that in 2003 (Table 3). Catches of skipjack, yellowfin and bigeye tunas in 2004 were 97,840 MT, 2,267 MT and 3,327 MT, respectively. The skipjack catch decreased to 97,840 MT, 85% of that in 2003. On the other hand, the yellowfin and bigeye catches in 2004 increased from those in 2003, particularly for bigeye tuna, 822 MT in 2003 to 3,327 MT in 2004. Catches of albacore and bluefin in 2004 were 34,847 MT and 331 MT. The catch of bluefin was smaller and much more varied, ranging from 9 MT to 725 MT, than the other tunas in this period.

Seasonal fishing grounds of this fishery are shown as the quarterly distribution of fishing effort (the number of poles in 1x1 degree area) in average of 2003-2004 (Fig. 8). The fishing grounds in the temperate waters (north of around 25˚N) moved from southwest of Japan toward northeast as time progresses. In addition to these fishing grounds 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 20˚N in the 3rd quarter.

Typical seasonal fishing ground by vessel type was 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 others of the smaller size of the offshore vessels operate at 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. Note that considerable amount of albacore was unusually caught from the end of March to April in 2003 in just south of Tokyo.

3. 3. Purse seine fishery

Total catch of the purse seine fishery has stabilized to nearly 200,000 MT in recent years. The majority of the catch has been skipjack which accounted for more than 74% of the total catch in recent years (Table 4 and Fig. 10). Annual total catch in 2005 obtained from the logbook in the WCP-CA by this fishery was 219,000 MT, 26,000 MT and 4,700 MT for skipjack, yellowfin and bigeye, respectively. About 154,000 MT of skipjack, 23,000 MT of yellowfin and 4,200 MT of bigeye were caught in the equatorial waters and the remaining was caught in the vicinity of Japan in 2005. The skipjack catch was about 108% of the recent five years average while bigeye catch was about 83% of five years average (Table 4), and the yellowfin catch was lower than the recent average (86%). 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 8,000 to 9,000 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 was started in April and continued until November.

This fishery utilizes tuna schools in association with FADs mainly east of 155˚E (Fig. 13). The number of operations with FADs was large in 2000 and 2001, but decreased after 2002 with exceptions of 4th quarter of 2003 and 2005. Traditional operations with natural logs increased and were observed in the wide area of the equatorial waters and free swimming schools were found near the Equator 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 2001-2005. The data in 2005 is provisional. The catches in 2004 for bigeye, yellowfin and skipjack were 38,439 MT, 43,929 MT and 297,299 MT, respectively. During 2001-2004, the bigeye catch showed increasing trend from 35,000 MT in 2001 to 38,000 MT in 2004., The skipjack catch showed also increasing trend from 283,000 MT to 300,000 MT. But the yellowfin catch showed declining trend from 58,000 MT in 2001to 44,000 MT in 2004.

4. Research activities related to tuna and billfish in the WCPFC Convention Area

4. 1. Port sampling

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 2004 and 2005. 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 boats and that sex-specific size sampling on board for billfishes of commercial longline vessels in the North Pacific was newly started from 2003.

Length 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. The main fishing method for each species differs depending on the area and season. In 2004, the number of length data collected for bluefin, albacore, and skipjack were 27,000, 133,000 and 90,000, respectively. And for swordfish and striped marline, the numbers were 40,000 and 6,000, 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 started in Kesennuma (North part of Japan) and Kii-Katsuura (South part of Japan) ports from 2005. At the Kii-Katsuura port, Length data of yellowfin caught by vertical longline gear has also been collected.

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 2005 was 25,000 fishes 9,200 and 4,600 for skipjack, yellowfin and bigeye, respectively. For bigeye and yellowfin the majority of the catch was small fish less than about 80cm in fork length in 2005 (Fig. 14). All three species had modes at about 35-39cm, 45-47cm and 53-63 cm. The largest mode of skipjack was 37cm in comparison to 38 cm in 2004.

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 1,803 bigeye and 7,565 yellowfin of 24-83cm in fork length were released with dart tag, of which 172 bigeye and 595 yellowfin were recaptured (Table 6). 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. 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.

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 before May and after November, 2005 were distributed in the area south of 22˚N.

Billfishes tagging

Two conventional tagging studies have conducted on billfishes. One is joint NRIFSF and Japan Game Fish Association (JGFA) which was initiated in 2004. Major purpose of this study is comparing shedding rates between two types of conventional tags, which are the metal dart and the nylon dart. In 2005, these two tags were attached on 23 blue marlins, 1 striped marlin and 1 black marlin in near shore area of Japan. The other is a tag and release

program of JGFA, which was initiated in 1986. This program only uses the nylon dart tag, and tags are attached on 44 blue marlins, 6 striped marlins, and 2 swordfish in 2005. Among striped marlins released in 2005, one was recaptured 16 days after the release.

Shark tagging

Shark tagging program has been conducted since 1996 to examine migration, population structure and life history parameters of pelagic sharks. About 11,000 sharks were tagged from 1996 to 2005, 90 % of which were blue shark. Records of 113 tags recovered provide information on seasonal latitudinal migration of blue shark.

Satellite tagging was conducted to examine timing and route of migration of whale sharks off Japan. Since 2002, ARGOS PTTs or pup-up archival tags were deployed on 13 whale sharks, and their migrations were tracked up to 120 days around Ryukyu Islands and in the East China Sea in summer and autumn.

4. 3. Research cruise conducted

Shoyo-Maru albacore research cruise

A research cruise for migration of adult albacore and oceanographic conditions of tuna habitat was carried out by the R/V Shoyo-Maru during February and March 2006 in the tropical western Pacific (2-27˚N, 137-151˚E). Oceanographic observations were made at 25 points along 13-27˚N, 137˚E and 2-5˚N, 138-151˚E transects, by using CTD, ADCP, EPCS and MOCNESS from 9 to 17 February. Sampling by tuna longline were made at 10 points in the area of 18-21˚N, 135-140˚E from 21 February to 6 March. Twelve archival tags were attached to albacore of 94-103 cm FL and released from 23 to 26 February. Two ultrasonic tags were attached to albacore of 94 and 96 cm FL and tracked for 15 and 24 hours (27-28 February and 3-4 March), respectively. The catch of tuna and billfishes by the longline was composed of 118 albacore (89-115 cm FL), 28 yellowfin (79-135 cm FL), 15 bigeye (52-87 cm FL), 12 skipjack (45-72 cm FL), 5 striped marlin (100-143 cm EFL), 1 swordfish (136 cm EFL) and 18 shortbill spearfish (124-141 cm EFL). Body and gonad weights of male albacore were 15-28 kg and 14-225 g, respectively. Those of female albacore were 14-22 kg and 13-360 g, respectively. Gonad weight of over 100g was found at the length of larger than 95 cm FL of male and female albacore. Information of spatial and temporal changes of underwater shape of longline gear was collected using Global Positioning System, Small-bathythermograph and current meter.

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 2006 in the tropical western Pacific (5˚S-25˚N, 137-165˚E). The net was towed diagonally at 80-120 m and 0-200 m for one hour at 16 sampling points in both day and night. A total of 3,667 skipjack tuna with 147 other tuna (*Thunnus spp*.) was collected. The maximum catch of skipjack tuna (1,365 individuals per one tow) was taken at the point of 5˚S, 165˚E. Approximately 56% of total skipjack specimens were caught at that point. The dominant size of juvenile tunas was 2-5 cm in standard body length. The results of the research cruises since 1992 showed that juvenile skipjack and other tuna are usually more abundant in the north equatorial countercurrent area (0-10˚N) and the south equatorial current area (10˚S-0˚) than that in the north equatorial current area (10-20˚N) during October-December and January-March. High concentrations of juvenile tunas appeared in the thermohaline and salinity frontal areas, 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 techniques for reducing incidental mortality of sea turtles and seabirds in longline fishery. Effects of circle hooks on catch rates of target and non-target species were investigated thorough scientific fishing surveys in the western North Pacific. Gross analysis of resultant data indicated that performance of circle hooks might be dependent on hook morphology: In general, hook size affected hooking rate and hook shape affected hooking position of sea turtles, although the effect was variable among the types of hooks used. Use of circle hooks had little effects on the catch rates of sharks and tuna, but large-sized circle hooks showed negative impacts on billfish catch. Morphology of circle hooks available commercially in Japan were compared to determine appropriate measurement of hook morphology and its relation to hook performance (Yokota et al. 2006). Captive experiments were conducted to explore better shape of circle hooks for the reduction of sea turtle hooking rate and to assess post-hooking survival of turtles. To promote wider use of circle hooks among commercial fishery, the Organization for the Promotion of Responsible Tuna Fisheries (OPRT) is implementing a grant program for distributing circle hooks to Japanese fishers, and collecting feedback from fishermen on the use of circle hooks. To improve post-hooking survival of sea turtles, simple and practical de-hooking devices were developed and distributed to some fishermen for on-site performance tests.

Experiments on side-setting method was conducted in April-May 2006 using a large-sized longline research vessel (R/V Kurosaki, 54m, 450GT). Two sets of line setting equipment were installed at the end and side of the stern deck, and the performance of stern setting and side setting was compared. Preliminary analysis of the results indicated satisfactory performance of side-setting in practical feasibility and in improvement of sink rates of baited hooks.

Sea turtle nesting survey

Nesting beach survey and satellite tracking of leatherback and loggerhead turtles were conducted to evaluate nesting and post-nesting environment in the western Pacific. Nest counts, protection of nests from wild pigs, and assessment of hatching success for leatherbacks were conducted in Jamursba-medi and Wermon, Irian Jaya, Indonesia with the collaboration of the Indonesia Sea Turtle Research Center and a Japanese NPO, Ever-lasting Nature. Satellite tracking of female leatherbacks showed that post-nesting foraging areas of females were different between nesting populations: females nested in Jamursba-medi migrated to the North Pacific and those nested in Wermon migrated to the South Pacific.

The surveys of nesting loggerhead females have been conducted in Omaezaki, Japan since 2002. Results from satellite tracking and stable isotope analysis indicated that loggerhead turtles had two different feeding areas in the western North Pacific off Japan and in the East China Sea.

Stock assessment of pelagic sharks

Short-term trends of the main shark CPUE were analyzed using recent data collected by Japanese research and training vessels in the North Pacific to compare different methods for CPUE standardization. The standardized CPUE of the main shark species such as blue shark, bigeye thresher and silky shark did not show steep decline but were rather stable in recent years.

References

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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*

	2001	2002	2003	2004	2005
0-10 ton	339	342	326	287	(287)
10-50 ton	442	442	441	417	(417)
50-200 ton	186	179	163	132	(132)
200-500 ton	490	484	453	448	(448)
500+ ton	4	5	7	7	(7)

Pole-and-line

	2001	2002	2003	2004	2005
0-10 ton	199	176	215	208	(208)
10-50 ton	87	76	78	77	(77)
50-200 ton	108	103	100	95	(95)
200-500 ton	47	48	44	43	(43)

Purse Seine

	2001	2002	2003	2004	2005
50-200 ton	N/A	101	92	91	(91)
200-500 ton	N/A	34	34	34	(34)
500-1000 ton	N/A	1	1	1	(1)

* Boats 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 (boats larger than 20 GRT). Figures in parentheses indicate provisional data.

	2001	2002	2003	2004	2005
Number of hooks	122	120	112	116	(116)
Pacific bluefin	68	50	97	278	(278)
Albacore	14,427	9,643	6,951	9,032	(9,032)
Bigeye	21,879	22,904	17,686	22,284	(22,284)
Yellowfin	12,152	11,875	10,391	10,232	(10,232)
Swordfish	5,981	5,944	5,170	6,495	(6,495)
Striped marlin	955	620	956	752	(752)
Blue marlin	1,855	1,653	1,726	2,090	(2,090)
Black marlin	38	80	41	60	(60)
Sailfish	39	66	71	43	(43)
Shortbill spearfish	66	51	51	60	(60)
Total	57,461	52,886	43,138	51,325	(51,325)

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.

	2001	2002	2003	2004	2005
Number of fishing day	22,050	20,960	20,664	20,331	(20,331)
Number of pole (thousand)	405	391	392	386	(386)
SKJ	96,144	90,466	115,257	97,840	(97,840)
YFT	2,616	2,501	2,089	2,267	(2,267)
BET	1,321	1,714	822	3,327	(3,327)
ALB	29,225	49,443	34,580	34,847	(34,847)
PBF	725	92	9	331	(331)
Total	130,031	144,216	152,757	138,612	(138,612)

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.

	2001	2002	2003	2004	2005
Nomber of fishing day	8,024	8,314	8,669	8,834	8,555
Pacific bluefin	5,895	7,422	5,321	7,146	10,428
Albacore	979	3,072	837	7,006	901
Bigeye	6,125	4,587	5,099	4,577	4,695
Yellowfin	33,735	19,138	27,195	22,628	26,262
Skipjack	169,328	188,056	187,443	172,619	218,532
Total	216,061	222,275	225,893	213,975	260,818

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.

		2001	2002	2003	2004	2005
Bigeye	Total	35,180	35,949	31,899	38,439	(38,557)
	Distant water and Offshore LL	21,879	22,904	17,686	22,284	(22,284)
	Distant water and Offshore PL	1,321	1,714	822	3,327	(3,327)
	Tuna PS	6,125	4,587	5,099	4,577	4,695
	Coastal LL	5,587	6,538	8,115	8,084	(8,084)
	Coastal PL	56	43	35	52	(52)
	Coastal PS	1	2	1	6	(6)
	Gill net	3	12	11	5	(5)
	Troll	182	126	105	83	(83)
	Set net	7	2	1	2	(2)
	Unclassified	19	21	24	19	(19)
Yellowfin	Total	58,106	41,237	49,752	43,929	(47,563)
	Distant water and Offshore LL	12,152	11,875	10,391	10,232	(10,232)
	Distant water and Offshore PL	2,616	2,501	2,089	2,267	(2,267)
	Tuna PS	33,735	19,138	27,195	22,628	26,262
	Coastal LL	5,944	3,921	6,147	5,445	(5,445)
	Coastal PL	520	874	779	755	(755)
	Coastal PS	2	87	86	8	(8)
	Gill net	20	32	22	10	(10)
	Troll	2,840	2,524	2,683	2,294	(2,294)
	Set net	18	52	31	25	(25)
	Unclassified	259	233	329	265	(265)
Skipjack	Total	282,559	294,278	324,773	297,299	(343,212)
	Distant water and Offshore LL	72	54	67	55	(55)
	Distant water and Offshore PL	96,144	90,466	115,257	97,840	(97,840)
	Tuna PS	169,328	188,056	187,443	172,619	218,532
	Coastal LL	56	19	42	21	(21)
	Coastal PL	7,288	6,901	9,377	9,990	(9,990)
	Coastal PS	852	1,025	1,632	716	(716)
	Gill net	796	488	711	721	(721)
	Troll	6,949	6,376	9,386	14,802	(14,802)
	Set net	685	576	399	224	(224)
	Unclassified	389	317	459	311	(311)

Table 6. 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		2000	2001	2002	2003	2004	2005	Total
Bigeye tuna	Release	453	363	224	352	147	264	1803
	Recapture	78	35	29	22	2	6	172
	% recapture	17.2%	9.6%	12.9%	6.3%	1.4%	2.3%	9.5%
Yellowfin tuna	Release	1042	1417	1409	1309	1280	949	7406
	Recapture	126	83	204	98	31	15	557
	% recapture	12.1%	5.9%	14.5%	7.5%	2.4%	1.6%	7.5%
Total	Release	1495	1780	1633	1661	1427	1213	9209
	Recapture	204	118	233	120	33	21	729
	% recapture	13.6%	6.6%	14.3%	7.2%	2.3%	1.7%	7.9%

Archival tag

Species		2000	2001	2002	2003	2004	2005	Total
Bigeye tuna	Release	23	13	20	14	1	21	92
	Recapture	6	1	4	1	0	5	17
	% recapture	26.1%	7.7%	20.0%	7.1%	0.0%	23.8%	18.5%
Yellowfin tuna	Release	6	25	9	21	8	0	69
	Recapture	0	1	1	1	0	0	3
	% recapture	0.0%	4.0%	11.1%	4.8%	0.0%	0.0%	4.3%
Total	Release	29	38	29	35	9	21	161
	Recapture	6	2	5	2	0	5	20
	% recapture	20.7%	5.3%	17.2%	5.7%	0.0%	23.8%	12.4%

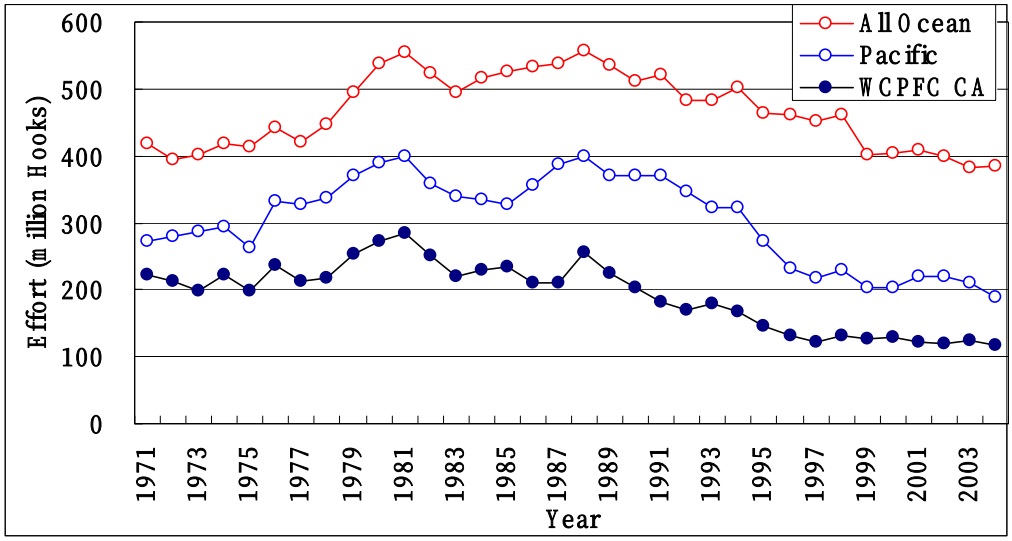

Fig. 1. Historical change in fishing effort of the Japanese longline fishery (>20GRT) in the WCPFC Convention Area.

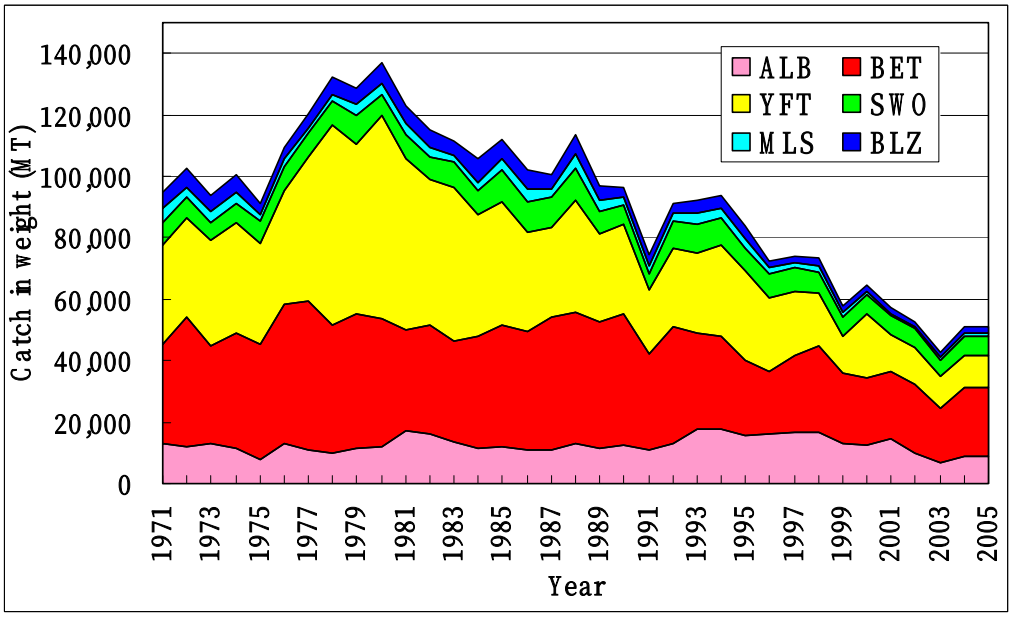

Fig. 2. Historical change of catches of major species for the Japanese longline fishery (>20GRT) in the WCPFC Convention Area.

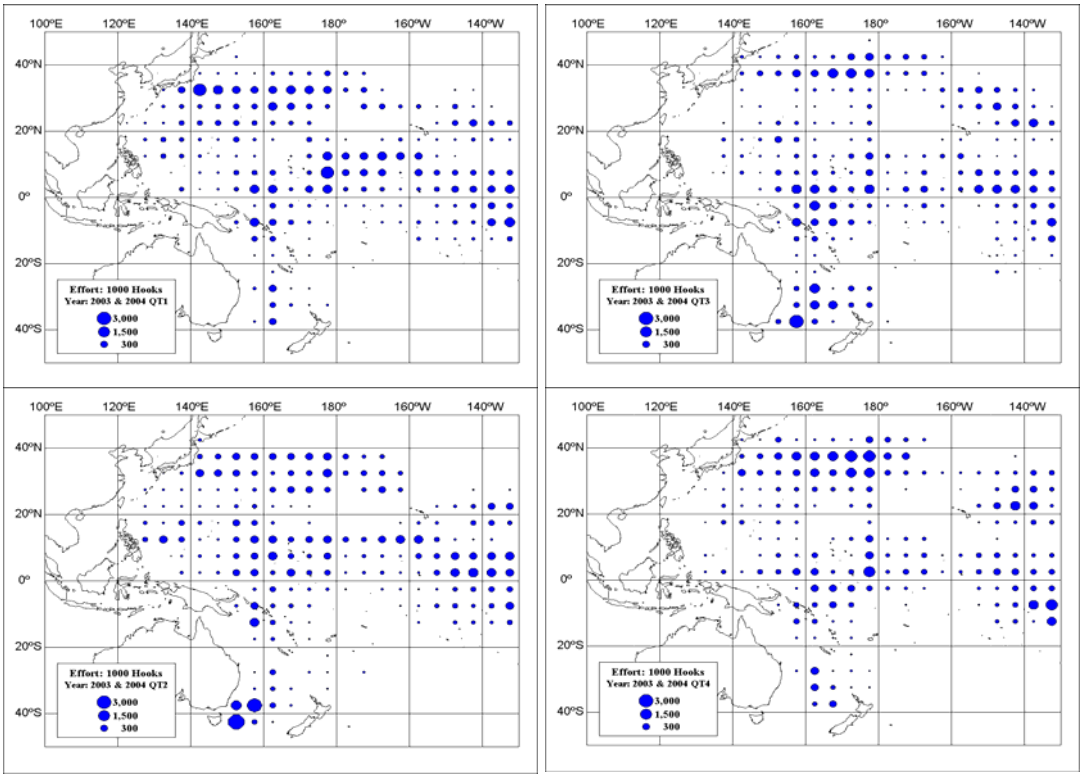

Fig. 3. Quarterly distribution of fishing effort for the Japanese offshore and distant water longline fisheries in the western and central Pacific Ocean in average of 2003-2004.

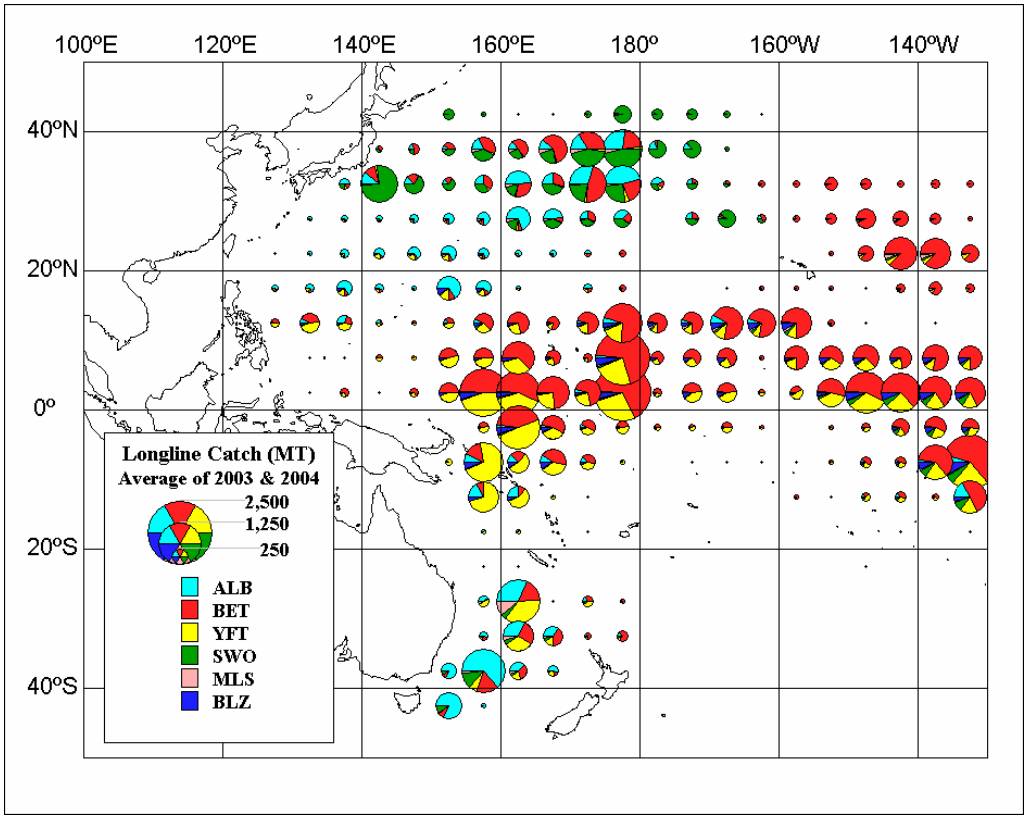

Fig.4. Distributions of offshore and distant water longline catch (weight) by species in average of 2003-2004 for six main species (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin and BLZ: blue marlin).

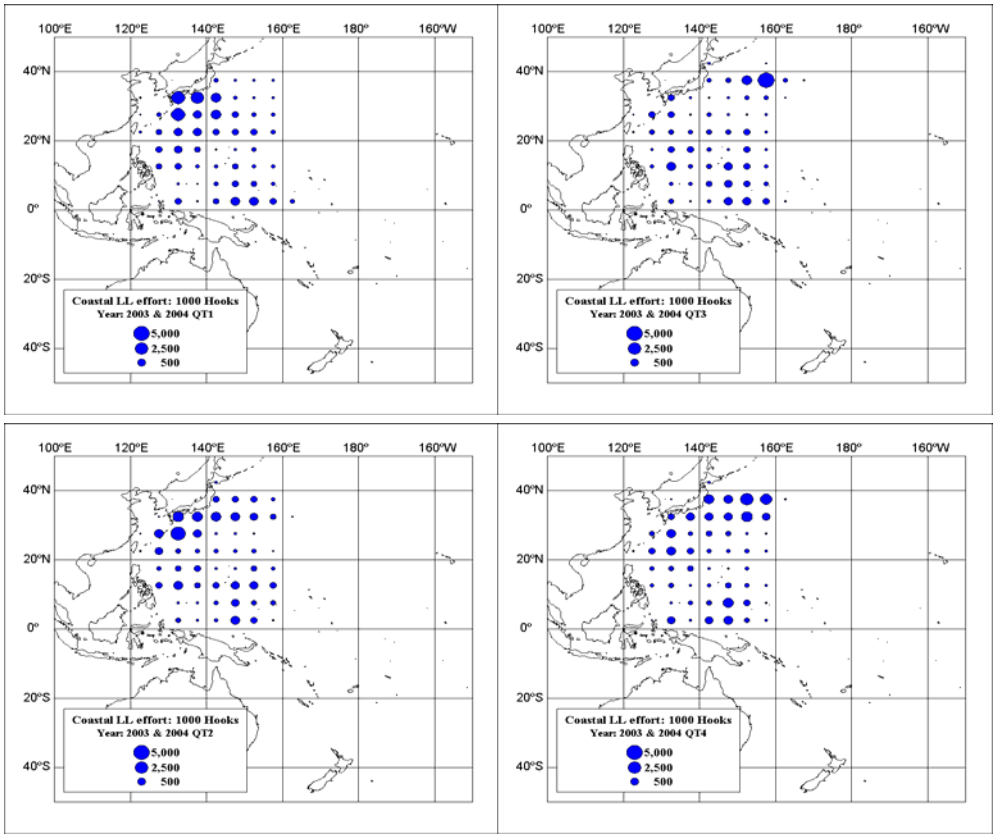

Fig. 5. Quarterly distribution of fishing effort for the Japanese coastal longline fisheries (less than 20 GRT) in the western and central Pacific Ocean in average of 2003-2004.

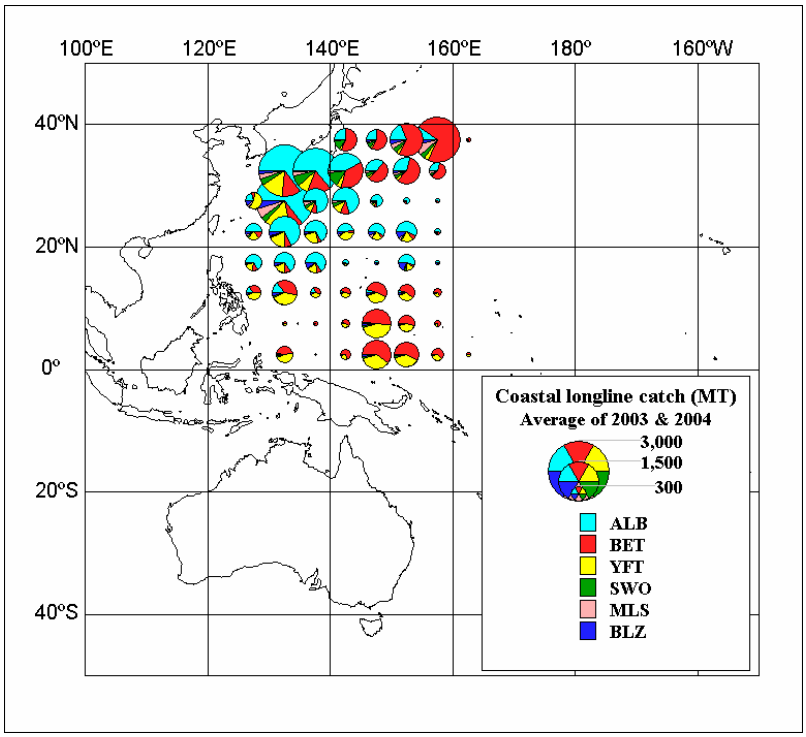

Fig. 6. Distributions of coastal longline catch (weight) by species in average of 2003-2004 for six main species (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin and BLZ: blue marlin).

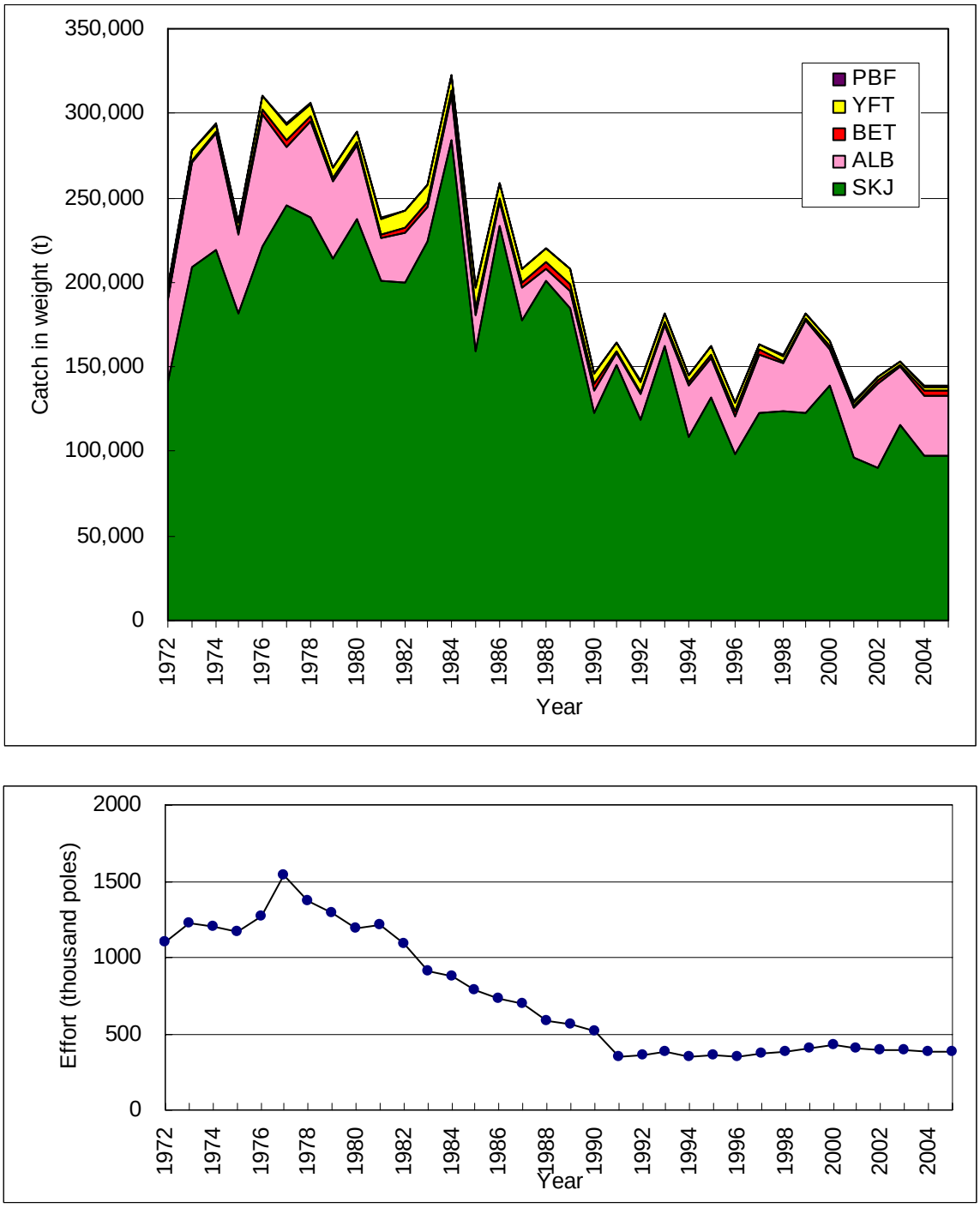

Fig. 7. Historical change of fishing effort and catches by species for the Japanese pole-and-line fishery (>20GRT) in the WCPFC Convention Area.

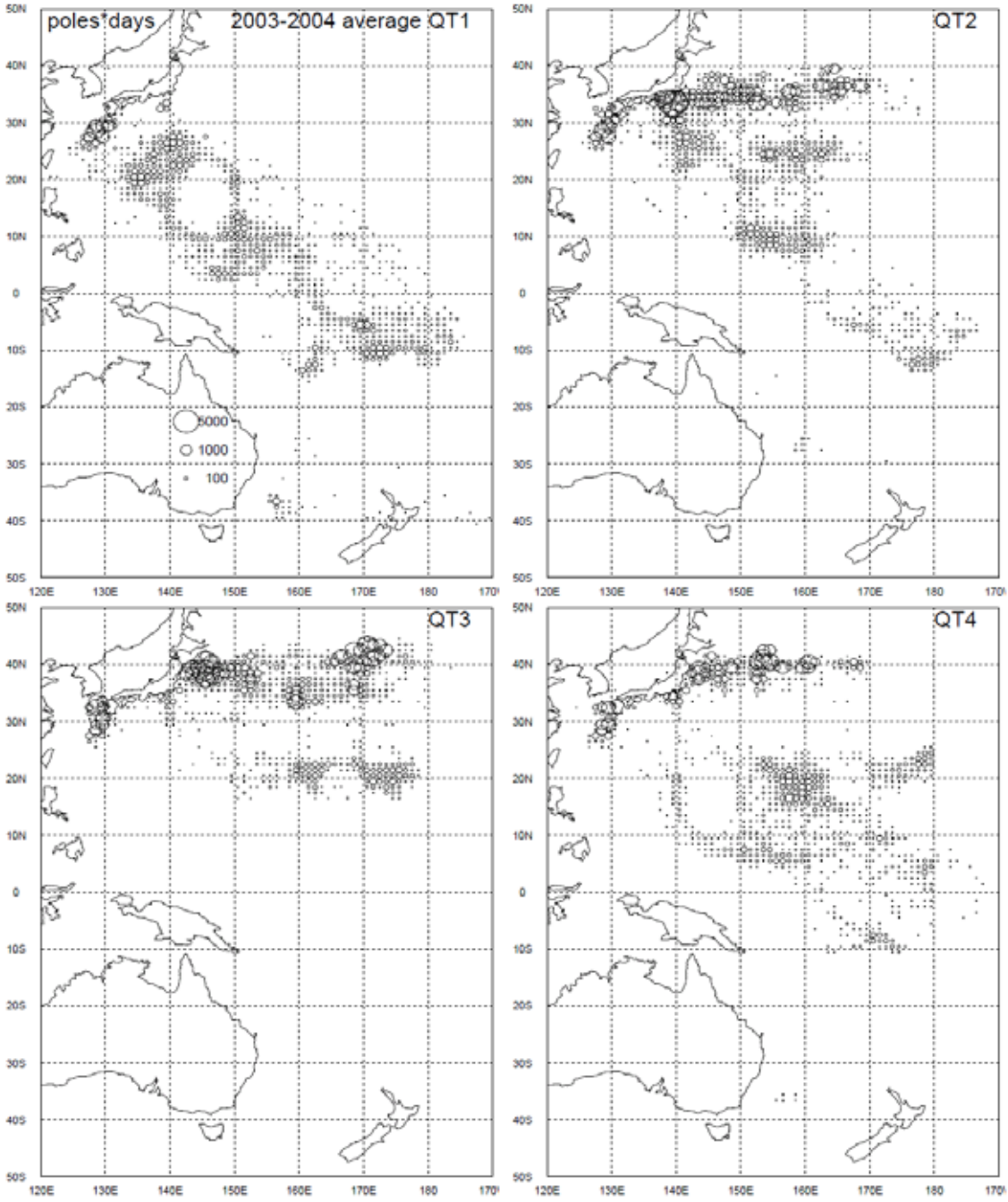

Fig. 8. Quarterly distribution of fishing effort for the Japanese pole-and-line fishery (offshore and distant water licenses) in the Pacific Ocean in average of 2003-2004.

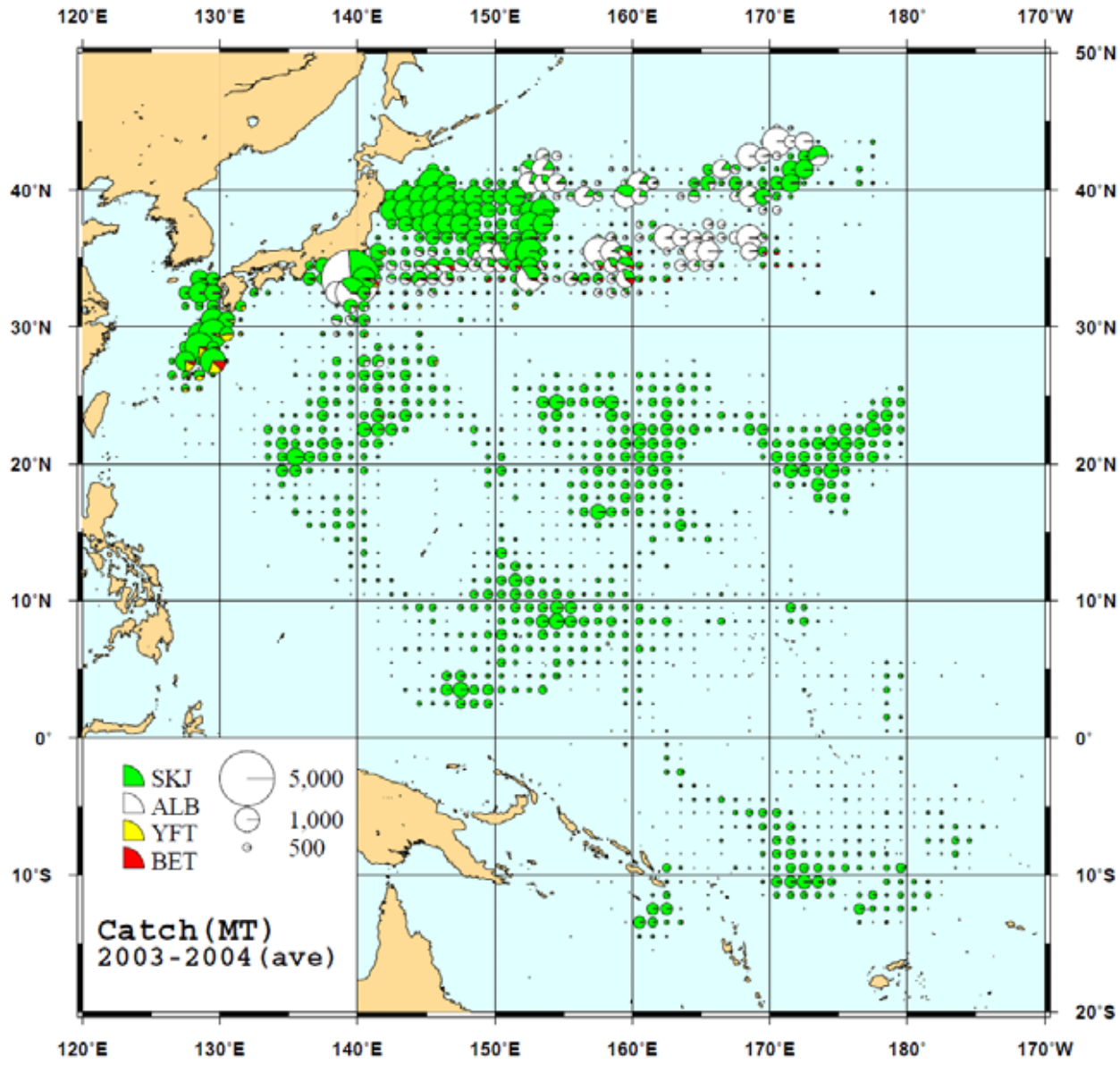

Fig. 9. Distribution of catch and its species composition for the Japanese offshore and distant water pole-and-line fishery in average of 2003-2004.

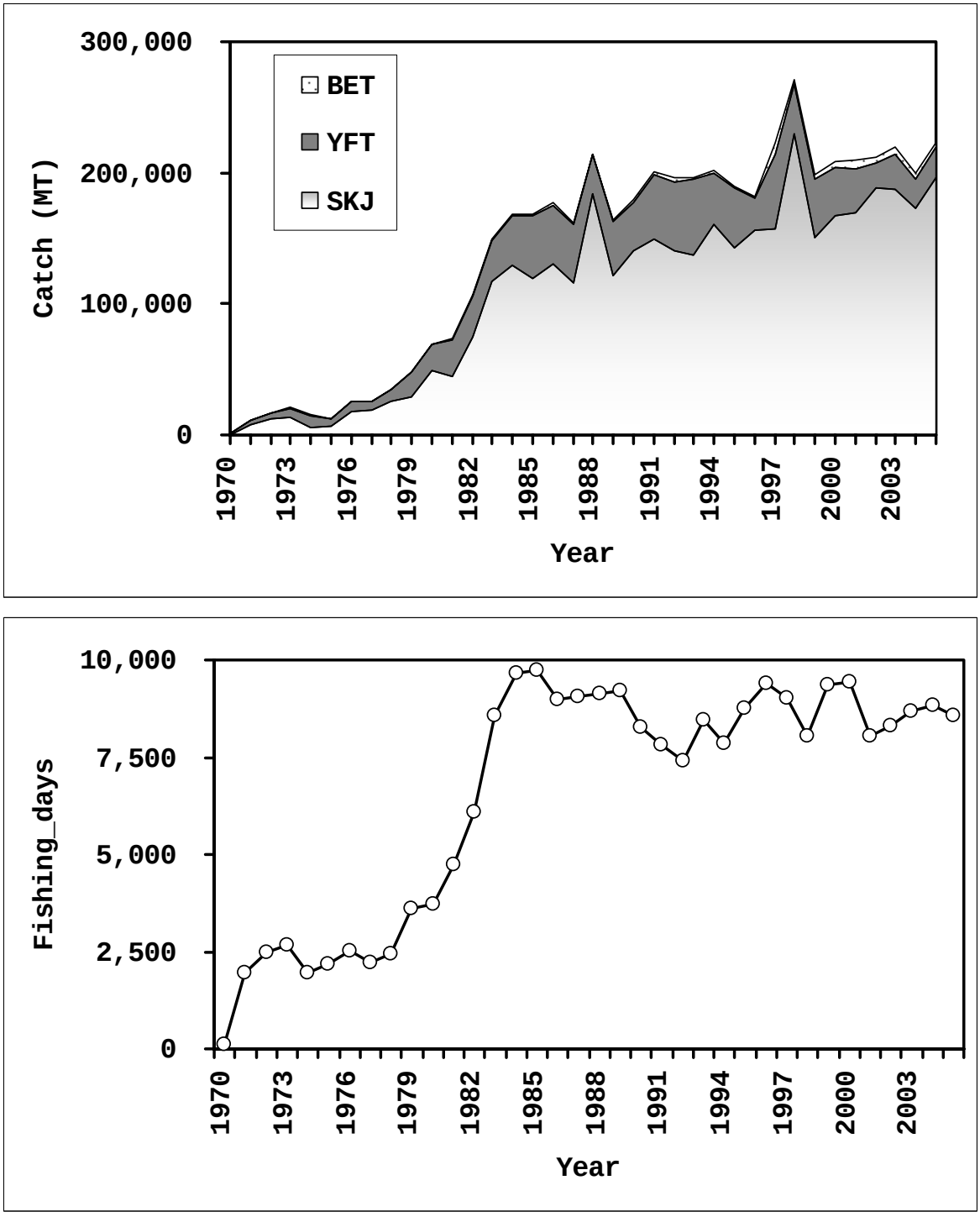

Fig. 10. Trends of fishing effort and catches by species for the Japanese tuna purse seine fishery in the WCPFC Convention Area.

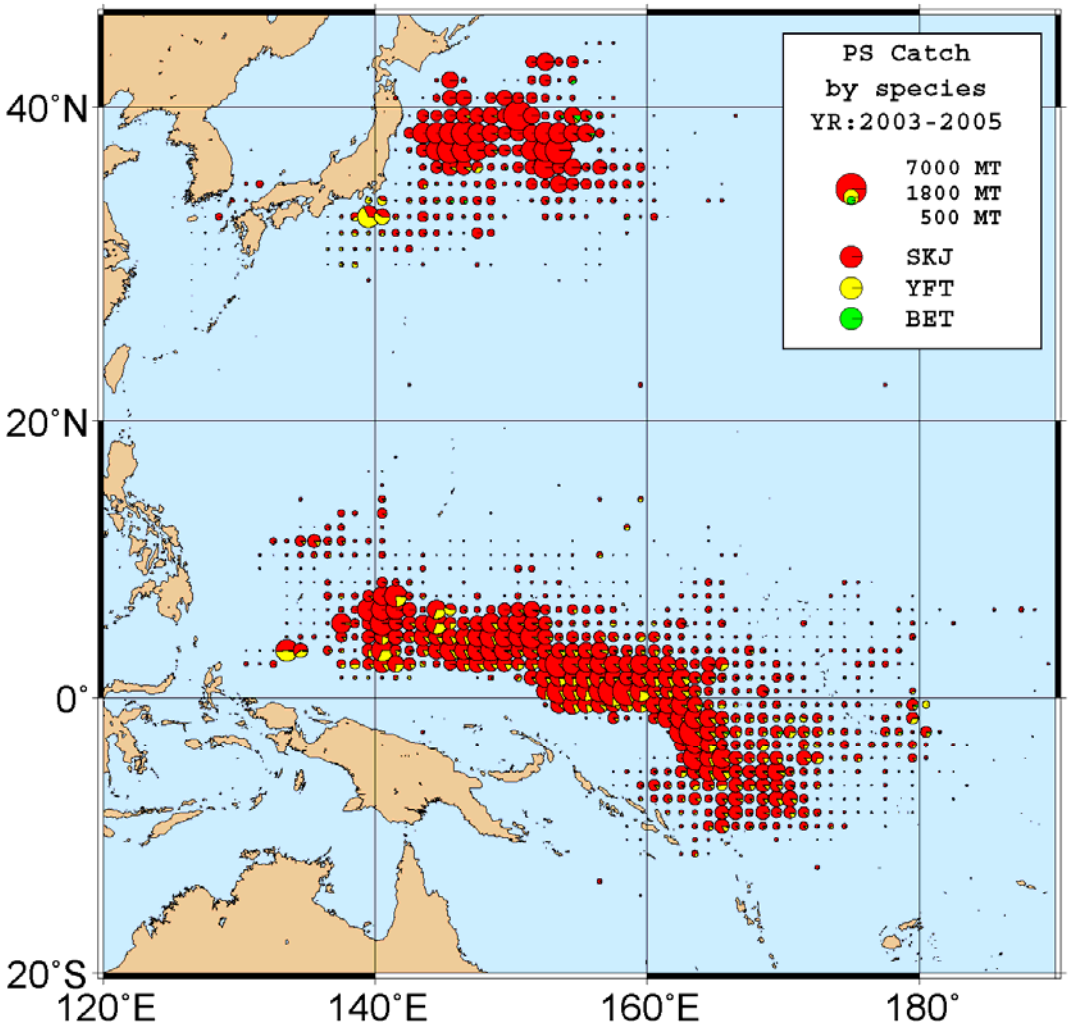

Fig. 11. Distribution of tuna purse seine catch (MT) by species for tropical tuna species (bigeye, yellowfin and skipjack) combined for 2003-2005.

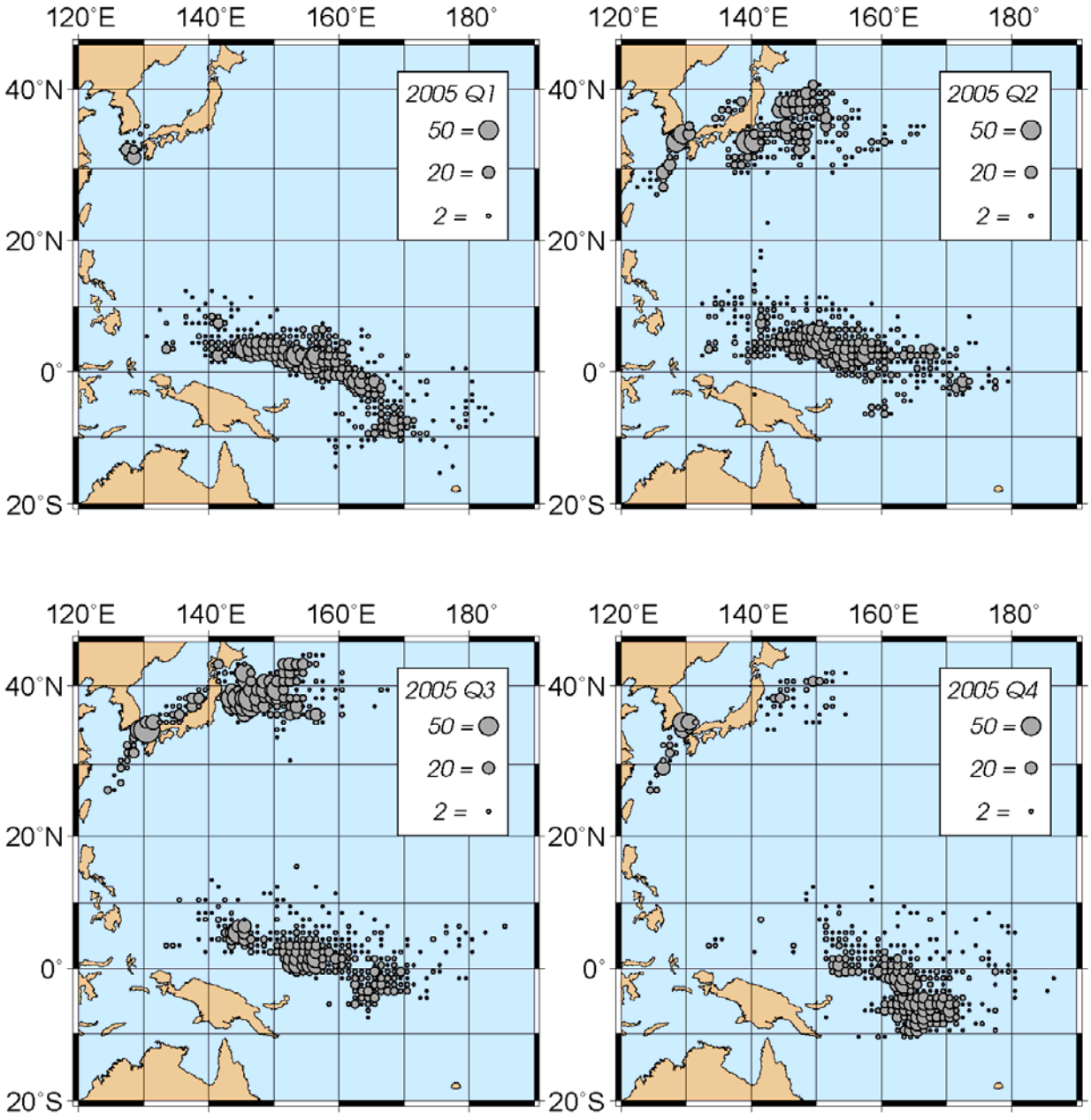

Fig. 12. Quarterly distributions of fishing effort (fishing days including searching days) for the Japanese tuna purse seine fishery in the Pacific Ocean in 2005.

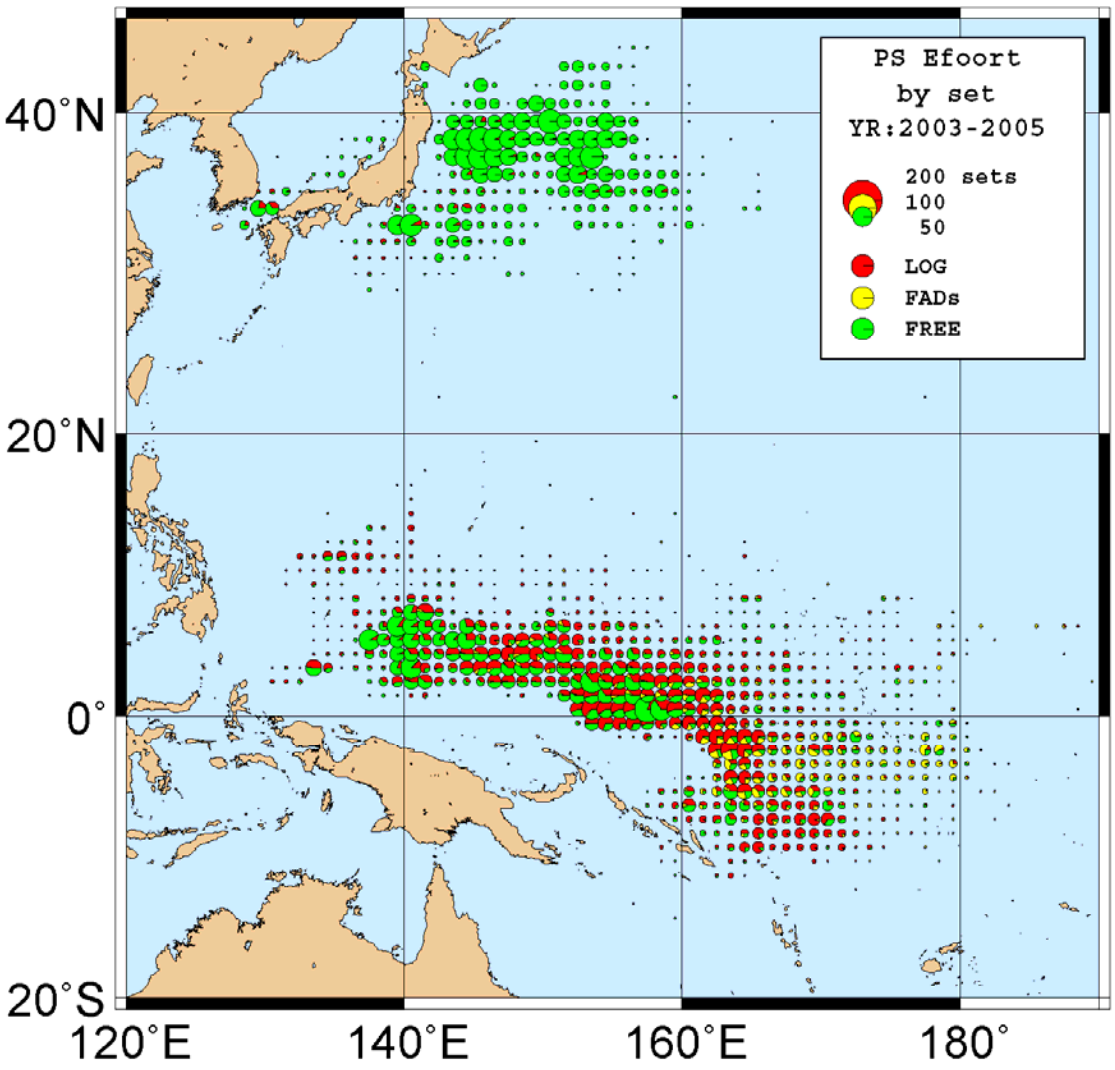

Fig. 13. Trend of quarterly number of sets by type of school since 2000 (upper) and distribution of sets by type of school (lower) for 2003-2005 deployed by the tuna purse seine fishery by Japan.

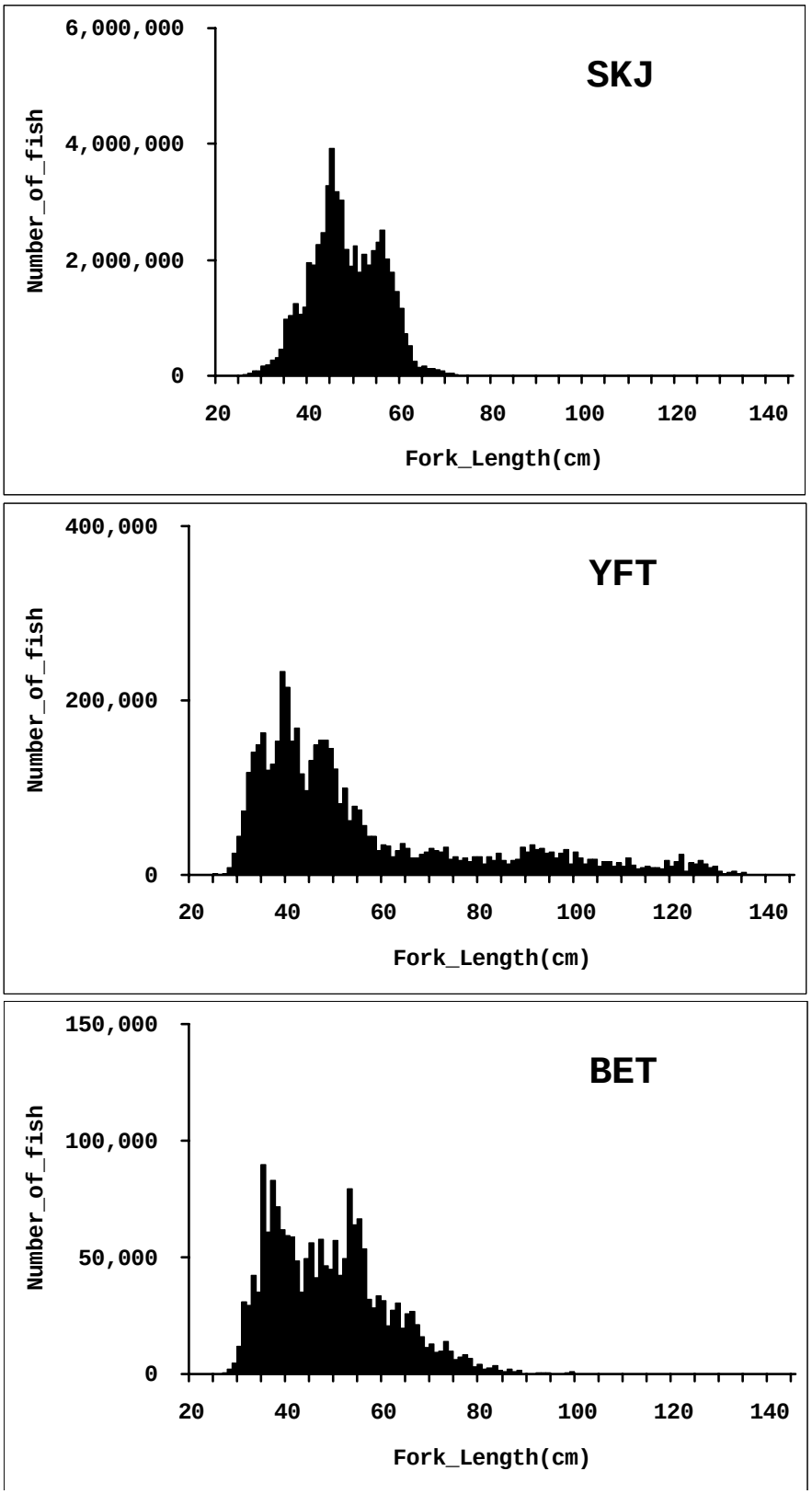

Fig. 14. Annual length frequency distribution of purse seine-caught fish in equatorial waters in 2005.