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ANNUAL REPORT TO THE COMMISION
PART1: INFORMATION ON FISHERIES, RESEARCH AND STATISTICS

National Tuna Fisheries Report of Japan

Fisheries Agency of Japan

and

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

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Scientific data was provided to the Commission in accordance with the decision relating to the provision of scientific data to the Commission by 30 April, 2010	YES Annual catch data, April 30. Catch and effort data, April 30. Size data for skipjack assessment, July 2.
If no, please indicate the reason(s) and intended actions:	

SUMMARY

This paper describes recent trends in the Japanese tuna and billfish fishing activities by longline, pole-and-line, purse seine and the other fisheries mostly in the WCPFC Convention Area (WCP-CA), including fleet size, catch and fishing effort statistics. Total number of commercial longline vessels (larger than 10 GRT) was 402 in 2009 which was 63 vessels (14%) less than that in 2008. Total number of pole-and-line vessels (larger than 20 GRT) was 97 in 2009 which was 2 vessels (2%) less than that in 2008. For the purse seine vessels, the number of vessels over 200 GRT, which operate in the equatorial waters, was 38 in 2009, which were 3 vessels larger than that in 2008. The number of the distant water purse seine vessels which are allowed to operate in tropical waters was 35 in 2009 and has been stabilized since 1995.

The total WCP-CA catch of tunas (Pacific bluefin, albacore, bigeye, yellowfin and skipjack) by the Japanese fishery was 410,861 mt in 2009 corresponding to 91% of 451,780 mt in 2008, though the figures in the catch statistics in 2009 is preliminary. In 2009, the catch of tunas by the purse seine fishery was 237,599 mt (58% of the total catch of tunas), with 104,282 mt (25%) by the pole-and-line, 53,738 mt (13%) by the longline, and the remaining (3%) by the other gears.

Japan has conducted several research activities in relation to biological and stock assessment studies on tuna, billfish and other bycatch species in the WCP-CA in 2009 and early 2010 such as tagging study for tropical tunas and sharks, several research cruises on Pacific bluefin tuna larval sampling, a research cruise to reduce the catch of juvenile bigeye in the purse seine fishing, and bigeye migration.. In addition, as a bycatch species related research, experimental use of circle hooks in reducing hooking mortality of sea turtles and at sea experiments on longline side setting method, and sea turtle nesting survey were conducted.

1. Introduction

This paper describes recent trends in the Japanese tuna and billfish fisheries, e.g., longline, pole-and-line, purse seine and other miscellaneous coastal fisheries in the WCPFC Convention Area (WCP-CA), including fleet size, catch and fishing effort statistics. With respect to the recent research activities, a brief explanation was given at section 6 of this report.

The catch statistics is given not only in WCP-CA but in the other areas, depending on species, according to the section on "Annual Catch Estimates" contained in the document "Scientific Data to be provided to the Commission". The catch estimates for bigeye, yellowfin, blue marlin, black marlin and skipjack in the portion of the WCP-CA east of the 150˚ meridian of west longitude, where is the duplicate area to IATTC, is shown in Appendix Table 1. This is requested by Attachment N of the report of the SC4. Note that there are some catches in the portion of the WCP-CA east of the 150˚ meridian of west longitude only by the distant-water and offshore longline fisheries. The catch estimates for Pacific bluefin, albacore, swordfish and striped marlin in other broad ocean areas are shown in Appendix Table 2. Swordfish catch in weight at south of 20˚South of WCPFC statistics area is shown in Appendix Table 3 with vessel numbers, which is requested by the CMM 2009-03. As for the transshipment information requested by CMM 2009-6, there has been no information reported so far.

2. Data source

The National Research Institute of Far Seas Fisheries (NRIFSF) is responsible for compiling catch and effort statistics for major fisheries (pole-and-line boats larger than 20 GRT, longliner larger than 10 GRT, tuna purse seine). For the other minor fisheries are referred to the publication of the Statistics Department, Minister's Secretariat, Ministry of Agriculture, Forestry and Fisheries for 2005-2006 (MAFFJ 2007-2008), and presented in this paper. Although the MAFFJ did not publish as a book, the 2007 data is available on the Web site (http://www.maff.go.jp/j/tokei/kouhyou/kaimen_gyosei/index.html). Although the MAFFJ did not officially publish 2008 data yet at the time when this manuscript was written, the catch statistics for 2008 was made available to be included in this paper by the special arrangement for reference.

3. Trends in fleet size

Table 1 shows the number of Japanese tuna fishing vessels by fishery and vessel size class, which actually fished in the WCP-CA during 2005-2009. This number of active vessels is estimated based on logbook data except for that for longline less than 10 GRT. Therefore some vessels who actuary operated but did not submit logbook were not included. The research and training vessels of longline and pole-and-line had been included in the number of vessels in previous annual reports, but these are not included this time.

Japanese commercial longline vessels (not including coastal longliners) have decreased from about 500 in 2005 to 400 in 2009 although the data of 2009 is still preliminary. Especially, the declining trend for larger size categories than 100 GRT is more remarkable, and the number of vessels of 100-200 GRT and over 200 GRT in 2008 was 40 and 107 which is 67% and 82% of that in 2005, respectively.

In March, 2009, the Government of Japan implemented the fleet reduction program for logline vessels, which is to meet the reduced catch quota for Japan and to reduce the excess fishing capacity resulted from the strengthened management measures that were agreed in the various tuna RFMOs. The number of vessels reduced by this plan was a total of 87 vessels, 64 distant-water longline vessels and 23 offshore longline vessels. These vessels had stopped their operation and returned to Japan by the end of March, 2009. The large number of vessel reduction for distant water and offshore longliners in recent years has been mainly derived from high price of fuel especially since 2007 and this fleet reduction program in 2009.

Total number of pole-and-line vessels (larger than 20 GRT) has decreased quickly until 2007, but slowed down

thereafter. Reduction rate is faster for the larger boat size (28% over 500 GRT class) than the medium size class (24% for 50-200 GRT class). The number of medium-sized vessel categories, 50-200 GRT, decreased from 89 in 2005 to 68 in 2009, corresponding to 24% decrease. The number of largest size category (over 200 GRT) vessels also sharply decreased from 39 in 2005 to 28 in 2009 (28% decrease).

Purse seine vessels, which operate in the equatorial waters 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 the coastal and offshore waters of Japan north of 20˚N. The number of vessels of 50-200GRT that engaged in tuna fishery has slightly increased from 31 in 2005 to 35 in 2009. Note that the number of distant water purse seiners which are allowed to operate in tropical waters was 35 and has been stabilized since 1995.

4. Trends in catch and effort

The total 2009 WCP-CA catch of tunas (Pacific bluefin, albacore, bigeye, yellowfin and skipjack) by the Japanese fishery was still provisional and estimated to be 406,390 mt, and this is corresponding to 90% of 2008 total tuna catch (451,780 mt), In 2008, the total tuna catch by the purse seine fishery was 263,410 mt (58% of the total), with 115,490 mt (26%) by the pole-and-line fishery, 56,116 mt (12%) by the longline fishery, and the remaining 4% by the other gears. In 2009, the total tuna catch by the purse seine fishery was 237,599 mt (58% of the total), with 104,282 mt (25%) by the pole-and-line fishery, 49,266 mt (12%) by the longline, and the remaining (3%) by the other gears. The following is the description of each fishery more in detail including tables of their catch and effort in the WCP-CA.

4.1. Longline fishery

Japanese longline boats are classified into three categories (coastal, offshore and distant water longline fisheries) according to the operation area and boat size. Coastal longliner is 0-20 GRT, and is allowed to fish only in the Japan's EEZ. Offshore longline boats are further divided into two, small offshore, 10-20 GRT, and offshore, 10-120 GRT, longline both of which are able to go beyond the Japan's EEZ in the Pacific with exceptional area in the eastern Pacific Ocean. Although the vessel size of two offshore categories is duplicated in the range 10-20 GRT, most vessels of latter category are larger than 50 GRT. Distant water longliners are over 120 GRT and basically can fish at all oceans, but need to follow the various domestic regulations that will ensure the management measures in place by the respective tuna RFMO.

Most recent statistics are 2009 provisional data, though the latest data is still preliminary. Catch in weight of all tuna species (Pacific bluefin, albacore, yellowfin, and bigeye), swordfish and billfishes (striped marlin, blue marlin, black marlin, sailfish and shortbill spearfish) caught by the Japanese offshore (not including small offshore) and distant water longline fisheries in the WCP-CA from 2005 to 2009 are shown in Table 2 (top table). Historical changes in fishing effort and catch by species are shown in Fig. 1 and 2, respectively, for the years 1971-2009. Total effort (in number of hooks) of distant water and offshore longline fishery 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 the total fishing effort exerted in the Pacific Ocean to that of all fishing effort was about 40-50% in the latest decade. In the WCP-CA, around 60% of the total Pacific effort has been deployed since the mid 1980s. The fishing effort in the WCP-CA, which was 106 million hooks in 2004, decreased to less than 100million, thereafter. In 2008 and 2009, fishing effort exerted in the WCP-CA was 79 and 63 million hooks, respectively. Although the value of 2009 is still preliminary, this rapid decrease of effort has been derived by the reduction of vessel. Among the species caught, yellowfin catch was around 60,000 mt at a peak during the late 1970s and the early 1980s and has since declined continuously to about 10,000 mt or less in the recent years. Bigeye catch which had been relatively stable until 1993 with fluctuation between 30,000 and 50,000 mt, decreased suddenly to between 20,000 and 30,000 mt, thereafter. After 2003, bigeye catch decreased to about 10,000 mt and that in 2009 was 7699 mt although this is preliminary value.

The average quarterly effort distribution for longline vessels larger than 20 GRT for 2008 and 2009 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.

As for the small offshore longline catch in the WCP-CA from 2005 to 2009 are shown in Table 2 (bottom table). Total number of hooks deployed by small offshore longliner is about 70,000 to 76,000 thousand hooks. In the case of distant water and offshore longliners, catch of bigeye tuna is largest followed by yellowfin and albacore, while albacore catch is largest (10,000-13,000 mt) in the small offshore catch. Bigeye catch of them are about 10,000 mt and yellowfin catch is 3,000 to 4,000 mt, about one third of albacore catch. Geographical distributions of fishing effort and species composition in the catch for the longliners whose vessel size is 10- 20 GRT (coastal longliner larger than 10 GRT and small offshore longliner 10-20 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.

The catch estimates for the longline boats less than 20 GRT for pacific bluefin and albacore are given in Appendix Table 2. The sum of catches in the WCPFC Statistical Area north and south of the Equator is not equal to the sum of small offshore longline (10-20 GRT) in the bottom table in Table 2 and coastal and small offshore longline in Table 5. Because catch estimates for Pacific bluefin and albacore are calculated using different data source.

4.2. 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 2005 to 2009. In addition to this, historical changes in catch by species and effort are shown in Fig. 7 for the period of 1972-2009. The data for 2009 are preliminary. Both the catch and effort which were at a peak around the late 1970s gradually decreased throughout 1980s. After 1991, total catch and effort had been relatively stable until the mid-2000s, though the catch showed some fluctuation. After that the catch decreased though the effort was relatively stable. Total annual catches which ranged from 250,000 to 300,000 mt in 1970s and early 1980s, decreased to around 150,000 mt in 1990s and around 100,000 mt in 2008 and 2009. 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 about 16,000 days.

In 2009, the number of fishing days (including no catch) was 15,727 days, slightly declined (4%) from 2008, and the number of poles was 298,000, also decreased by the same percent (4%) from 2008. Total catch of major species (skipjack, bigeye, yellowfin, albacore and bluefin) in 2009 was 94,466 mt, corresponding to 89% of that in 2008 (Table 3). Catches of skipjack and albacore which are two major species caught by the pole-and-line fishery were 57,100 mt and 32,386 mt, respectively in 2009. While the skipjack catch considerably decreased (31%) from 82,546 mt in 2008, the albacore catch sharply increased (70%) from 19,025 mt

Seasonal distributions of fishing effort (fishing days in 1x1 degree area) of the pole-and-line fishery are shown in Fig 8 as average of 2008-2009. 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 subtropical 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 the 3rd quarter fishing grounds off northern Japan expanded to further east of 175˚E. There were few operations 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 catches 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 northeastward to off northern Japan 35˚N-42˚N, west of 155˚E, so-called Tohoku area. Other than these offshore vessels, some of small sized offshore vessels operate around 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 some region east off northern Japan, in which albacore dominated (Fig. 9). Most of yellowfin catch was made at the waters around Nansei Islands located in south Japan.

4.3. Purse seine fishery

Annual catch of the purse seine fishery has varied from 220,000 to 270,000 mt in recent five years. The majority of the catch has been skipjack which accounted for 80 % of the total catch in recent five years (Table 4 and Fig. 10). Annual total catch by species in 2008 obtained from the logbook in the WCP-CA by this fishery was 185,000 mt, 29,000 mt and 5,100 mt for skipjack, yellowfin and bigeye, respectively. The three species catch stabilized in recent three years (Table 4). Note that catch statistics for purse seine in 2008 is still preliminary but near final. 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 as shown in Fig. 11.

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 shifts. In near shore Japan at Pacific side skipjack fishing season starts in April and continue until 3rd quarter.

This fishery utilizes tuna schools in association with natural log, whale shark 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.

4.4. Other coastal fisheries

Besides the major tuna fisheries described above, there are miscellaneous coastal fisheries, which also catch tunas and tuna like species such as troll, set-net and gillnet fisheries. The catches for such fisheries for the 2005-2009 is shown in Table 5. The figures in 2009 are preliminary.

There used be two kinds of large scale gillnet (driftnet) fisheries. One is large-mesh driftnet fishery, which fished billfishes and tunas, and the other is squid driftnet fishery, which fished flying squid. Those fisheries used to operate in the wide area of high seas in the Pacific Ocean, but stopped the operations on the high seas of the North Pacific in January 1993 due to a moratorium on the use of large-scale driftnets on the high seas. After 1993, the gillnet fishery have operated within the Japanese EEZ targeting tunas and billfishes.

The troll fishery takes various pelagic species including tunas. The size of troll vessels are generally small, mostly less than 10 GRT, and make one-day trip. Skipjack is very important resources for troll fishermen and decline and remaining at a low level of skipjack catch by troll along the Pacific coast in the western Japan is getting big issue in recent years.

The set-net (also called “trap”) fishery also catches pelagic species including tunas.

4.5. 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 6 for 2005-2009. The data in 2009 are preliminary. Total catch of bigeye declined from 35,035 mt at a peak in 2006 to 18,613 mt in 2009 (64%) due to the decline of the

both distant water and offshore and small offshore longline catches. Total catch of yellowfin shows an increase trend from 47,309 mt to 54,136 mt in 2009 (114%). Total catch of skipjack shows substantial declining trend from 362,814 mt in 2006 to 263,662 mt in 2009 (73%) mainly due to large decline of distant water and offshore pole-and-line catches.

5. Status of tuna fishery data collection systems

5.1. Logbook data collection and verification

Longline

The owners of fishing vessels larger than or equal to 10 GRT are required to submit the log sheet on their operations and catch information to the Japanese government. Coastal, small offshore and offshore vessel have to submit it by each cruise in three months after the cruise was finished while distant water longliners are required to submit it every ten days. In the log sheet of longline, set by set data on catch number and weight in each species, and other information data such as fishing date and location, fishing effort (the number of basket and hooks used), water temperature are included. Catch weight information was not included in the logbook till 1993. The number of hooks per basket is important information as it suggests the depth of the gear and target species. As tuna and tuna-like fishes, six tunas (Pacific bluefin, southern bluefin, albacore, bigeye, yellowfin and skipjack), and six billfishes (swordfish, striped marlin, blue marlin, black marlin, sailfish and shortbill spearfish) are separately recorded in the logsheet. Additionally, information on the cruise (date and port of departure and arrival of the cruise), vessel (name, size, license number and call sign), number of crew and the configurations of the fishing gear (material of main line and branch line) are asked to fill on the top part of the sheet by each cruise.

Submitted logsheets are processed into electronic data files. Various error checks, such as date, location, range of weight, CPUE, are conducted before these data are finalized. Vessel characteristics (call sign, name, license number, etc) are verified with a register.

Because the coverage rate of logsheet is not 100% for longline fishery, it is necessary to raise the sample values to represent 100 %. For both of the distant water and offshore longline fisheries (20-120 GRT, excluding 10-20 GRT vessels that operate outside of Japanese EEZ), coverage rate has been about 90 - 95% of total operation (Table 7). In the case of distant water longline fishery, information on the total number of operations aggregated by sub-areas and month provided by the fishermen's association (Federation of Japan Tuna Fisheries Co-operative Association) was used to raise the log sheet data to the total catch. For the offshore longline vessels larger than 20 GRT, total number of operation by prefecture (which the vessel belongs to) by year given by MAFFJ has been used for the raising. Since 2008, VMS (vessel monitoring system) information is utilized raise the log sheet data for both fisheries. As for coastal and small offshore longliners, reliable information of coverage rate is not available. But it is considered to be about 90% or more for small offshore as far as basing on the number of registered vessels.

Catch in weight in logsheet data is in processed weight, so that conversion factors by species are used to convert processed weight to whole weight.

Pole-and-line

The owners of pole-and-line fishing vessels larger than 20GRT are required to submit a logsheet on their operations and catch information to the Japanese government within 30 days after the cruise. The logsheets submitted to the government are forwarded to the NRIFSF, and are then compiled. Although the logsheet submission is mandate, the submission rate for the pole-and-line is not necessarily 100%. The coverage is likely to be around 80% in the beginning of the history of the pole-and-line logsheet system (1970's), but the submission rate was improved after that, to nearly 100% in 1990s. The coverage rate in Table 7 for the pole-and-line was calculated by

(Number of the vessels which submitted logsheet) / (Number of vessels which were registered).

Similar error check processes are also conducted. In case there is significant omission or errors, the NRISFS

staff will contact to owner or other relevant person to get revised information.

Purse seine

The logbooks of 50 – 200 GRT class and greater than 200 GRT vessels were reported when fishermen caught tuna species. The coverage of the latter class was 100 % and the reported catch by species could be verified by comparing with the landing data, which were obtained from market receipts of three major unloading ports (Yaizu, Makurazaki, and Yamagawa).

5.2. Observer program

Two observer trips of Japanese distant water fisheries have been conducted in the WCP-CA, one for purse seine and the other for longline.

The observer program for purse seine boats has been implemented in the tropical Pacific Ocean since 1995. The detail of time and position at each operation, type of association, and the length frequencies samples were taken by scientific observers in each operation. Total number of trips conducted in the past is 40 for the past 15 years before 2009 (Table 8).

Two purse seine cruises were observed from October 2009 to November 2009 in tropical waters in the western Pacific Ocean (Table 9). Days spent for these cruises were 26 and 27 days, respectively, which are shorter than the durations for the Japanese purse seiner operated in the tropical waters. These two cruises targeted on the both associated schools and free schools.

The observer program for longline in the WCP-CA started in 2008. The information of fishing boats, fishing operations and almost all the catches in each operation were identified and measured as much as observer can. Five cruises of offshore longline boats were observed in 2009 (Table 10). The number of operations which was recorded by the observers ranged from 13 to 46. The total number of catches which was recorded by each observer ranged from 467 to 3607 individuals. The largest number of catch was albacore, ranging from 16 to 2676 individuals. Other dominant species were yellowfin and bigeye tunas, number of them ranged 2-688 and 81-206, respectively. Two of the trips were conducted in the waters off south east of Australia, targeting mainly southern bluefin tuna.

5.3. Port sampling

NRIFSF has collected size data (weight and/or length) of tunas and billfishes in major landing port of Japan. The following is a summary of size sampling, focusing on length measurements, carried out mainly in 2008 and 2009. Note that size measurement for tunas and billfishes has been carried out on board of research vessels and training vessels in addition to the port sampling for commercial vessels and that sex-specific size sampling on board of commercial longline vessels for billfishes in the North Pacific was started in 2003.

Size sampling

Length data of tunas and billfishes caught mainly nearshore of Japan have been collected in major landing ports in Japan. Such size measurements have been conducted for longline (excluding the distant-water longline), pole-and-line, troll and offshore purse seine. In 2008, the number of length data collected for albacore, and skipjack were 138,000 and 66,000, respectively.

Length data for tropical tunas (bigeye and yellowfin) have been collected in Kesen-numa (north part of Japan) and Kii-Katsuura (central Japan on Pacific coast) ports since 2005. In 2008, about 17,000 bigeye and 21,000 yellowfin were measured at the Kii-Katsuura port.

Length sampling for distant water purse seiners

In addition to the size samplings mentioned above, port sampling programs have been conducted to collect species composition data and length data for skipjack, yellowfin and bigeye caught by distant water purse seine

fishery in Yaizu, Makurazaki and Yamagawa ports. The first port located at central of Japan and the later two located in southwest of Japan. We performed the port sampling 12 times in 2009 in Yaizu port and 13 times at Makurazaki port and one sampling at Yamagawa port. The annual total measurement number in 2009 was 28,456 fishes 8,014 and 3,192 for skipjack, yellowfin and bigeye, respectively. For all three species, the majority of the catch was small fish less than about 80 cm in fork length in 2008 (Fig. 14) and there were three or four modes.

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

With respect to the research activities for tunas and billfishes, tagging studies for tropical tunas and sharks, research cruises for bluefin tuna larval sampling, the mitigation for juvenile bigeye and bigeye migration were conducted.

In the second half of this year, four research cruises are also scheduled to investigate the mitigation for juvenile bigeye, to investigate behavior of seabird, bluefin tuna larval sampling and feeding environment survey for tunas and billfishes.

6.1. 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, collection of detailed movements around the anchored FADs, information on growth, the degree of exploitation by fishing gear in the area and so on. To date, 2,652 bigeye and 12,224 yellowfin of 21-133cm (mainly 30-60cm) in fork length were released with dart tag, of which 293 bigeye and 939 yellowfin tunas were recaptured (Table 11). After released from the waters around Okinawa and Amami Islands (24-30˚N, 123-132˚E), some fishes 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 tunas caught by pole and line fishing in the eastern offshore of Japan has been attempted since 2006. Practical tagging in this area has been conducted since 2008. The studies have been conducted by prefectural research vessel “Shin Miyagi-Maru” in cooperation with NRIFSF (National Research Institute of Far Seas Fisheries). The fish for tagging were caught by pole-and-line gear aiming at small to medium size (40-80cm) bigeye tuna. A total of 1000 (of these, 892 bigeye: 49 -109 cm FL and 34 yellowfin: 48 -65 cm FL) and 714 (of these, 465 bigeye: 48 -101 cm FL and 92 yellowfin: 46 -68 cm FL) fish were tagged and released in waters of eastern offshore of Japan (off central Honshu, 32-37˚N, 142-150˚E) in summer season in 2008 and 2009, respectively. Detail of 2008 study is reported by Matsumoto and Okamoto (2008). This project is being continued and another research cruise was conducted this year (from 25th June to 19th July). Also, pop-up and archival tagging of adult and subadult bigeye tuna was conducted in the eastern and central north Pacific temperate and subtropical area between October and December 2009. This study was conducted by Japanese government’s research vessel Shoyo-Maru. The fish caught by longline gear were used for tagging. A total of 39 bigeye tuna (92-144 cm FL) were released with pop-up tag and 5 bigeye tuna (98-166 cm FL) were released with archival tag.

Skipjack tagging

Four research/training pole-and-line vessels were involved in the skipjack tagging in 2009. The tagging was conducted in a wide area of Western Pacific ranged from 11˚N to 35˚N, from 127˚E to 145˚E. Total of 780 skipjack were released in 2009 and 31 skipjack were recovered to date. Most recaptures were recorded in the

second or third quarter and within 60 days after release.

In addition, skipjack tagging in the coastal area of southwestern Japan started in 2009. Main objective of this study is to investigate migration to the Pacific coast of Japanese water (mainly western part of Japan) along the Kuroshio Current including migration rate from Nansei Islands area to Pacific coast of Japan. The fish caught by coastal pole-and-line vessels were tagged and released. Both dummy and non-dummy archival tags (Lotek LAT2510 and its dummy) were also deployed on some individuals. In 2009, a total of 1,327 fish including 30 fish with dummy archival tag were released around Amami Island (Nansei Islands, around 28˚N, 130˚E) in April and May. So far 42 fish including 2 fish with dummy archival tag were recaptured. In 2010 tagging was conducted around Amami Island and off Kochi area (around 32˚N, 133˚E) from April to June. A total of about 3,000 individuals (mainly 40-45cm FL) were tagged and released which includes 33 dummy and 44 real archival tags.

Another tagging was conducted in Sagami Bay (central part of Japan, Pacific coastal area, around 35˚N, 139˚E) in September 2009. Main objective of this study is feasibility study of archival tagging of skipjack using dummy tags. A total of 211 fish were released, of which 73 fish were released with dummy archival tags. So far 38 fish were recaptured including 3 fish with dummy archival tag. These results indicate that feasibility study of archival tagging of skipjack was successful.

Also, some skipjack were released during tropical tuna tagging mentioned above. In 2009, 90 and 157 fish were released in the Nansei Islands and off central Honshu, respectively. Two individuals released off central Honshu were recaptured to date.

Shark tagging

Shark tagging program has been conducted since 1996 to examine migration, population structure and life history parameters of pelagic sharks. In 2009, tags were attached to 1164 blue sharks, 12 bigeye threshers, 42 shortfin makos, 37 salmon makos and 6 others in the Pacific Ocean. Fifteen tags attached to blue sharks and one to shortfin mako, one to salmon shark and one to other were recovered and the tag recovery data indicated seasonal latitudinal migration of blue shark.

6.2. Research cruise conducted

Tuna larval sampling by Shunyo-Maru

Sampling cruises for larval Pacific bluefin tuna were conducted by R/V Shunyo-Maru in the subtropical waters around the Nansei Islands, where is known as one of the important spawning ground of Pacific bluefin tuna, during May and June 2009. The research cruises continued every year since 2004. A larval net which has 2 m diameter with 0.335 mm mesh size was used. Patches of bluefin tuna larvae were found and tracked with a drifter which was composed of GPS radio buoy and an 8 m drogue during May. Horizontal distribution during the early life history of bluefin tuna was investigated in the spawning area during June. Oceanographic observations were also carried out by using CTD and ADCP.

Research on mitigation of juvenile bigeye catch

Joint research by two research vessels (Shoyo Maru and Nippon Maru) and one commercial purse seine vessel (No. 83 Fukuichi Maru) was conducted in July 2009 at western tropical Pacific Ocean to investigate the mitigation measures that avoid juvenile bigeye tuna catch in the tuna purse seine operation on floating objects such as FADs. This research consists of two main objectives; 1) investigate and confirm the escapement of juvenile bigeye through the large mesh size, 2) observe the reaction of bigeye, yellowfin and skipjack to the stimulus of blinking flush light. The results of this research were summarized in the working paper for SC6 (Hasegawa et al. 2010).

Research on bigeye migration and a trial to catch adult bigeye using deep trolling gear by Shoyo-Maru

During October to December 2009, 19 longline operations were conducted by Shoyo-Maru at the temperate area of North Pacific Ocean, 25^{O}N-36^{O}N and 163^{O}E-127^{O}W, and 39 bigeye (92-144 cm FL) and 2 albacore

(100-102 cm FL) caught were attached with popup-archival tag and released. Among those, 22 tags on bigeye and 1 tag on albacore were popped before the designated time (1 to 96 days after released, 27 days on average). For the remained individuals, PATs were popped up after more than three months after released. During this research cruise, it was also attempted to catch sub-adult to adult bigeye tuna (larger than about 100cm) by using deep-water trolling gear at Emperor Sea Mountain area. As a result, during 10 trials of three hours trolling, nine bigeye and 1 albacore were caught by this gear, which one bigeye was caught at depth of 193.6m (temperature: 16.3^{o}C).

6.3. Bycatch species related research

Mitigation studies for seabirds

To explore safe and effective designs of tori-line in the north Pacific, comparison of four types of tori-line were conducted, by two at-sea experiments. The designs of tori-line which used in this study were; 1) light streamer, 2) WCPFC long streamer, 3) hybrid streamer and 4) modified light streamer. Effectiveness of the different colored streamers was also tested.

The first experiment was conducted using 20 offshore commercial longliners with 567 sets, and seabird CPUE of the light streamer was compared with that of the WCPFC long streamer, and the red colored light streamer was also compared with the yellow colored light streamer. For the large number of observation collected by commercial boats, there were no significant difference in albatross CPUEs between different tori-line types (GLM; Laysan albatross: $p = 0.81$, black-footed albatross: $p = 0.94$), and color types (GLM; Laysan albatross: $p = 0.23$, black-footed albatross: $p = 0.94$), and average CPUEs were similar with each other.

The second experiment was conducted using a chartered longline boat with 24 longline fishing operations deploying new designs of tori-lines (hybrid streamer and modified light streamer) in addition to the light streamer. Seabird attacking behavior on baited hooks and CPUE of these two tori-lines were compared with those of the light streamer. During the experiment, a total of 88 primary attacks were recorded and 81 % of them were attacked by Laysan albatrosses. In the attacking rate of Laysan albatross, there was no significant difference among tori-line types. CPUEs of Laysan albatross were 0.017, 0.011 and 0.022 in the light streamer, hybrid streamer and modified streamer, respectively, and did not have any statistical difference. Approach of the black-footed albatross and shearwaters to the research boat was too rare to evaluate. These low CPUE of Laysan albatrosses suggested all design of tori-lines would be similarly effective to reduce the albatross take, and thus, the further research on the design of tori-line should be useful to reduce incidental seabird bycatch in the north Pacific.

Mitigation studies for sea turtles takes

Captive experiments were conducted to test the potential of different types of hooks (elliptical hooks and large circle hooks) and accessories attached to the hooks in reducing hooking mortality of sea turtles. Field experiments of large circle hooks (Koshina type 4.5-sun, foreign type 18/0) on catch rates of target species and sea turtles are on the way through scientific fishing surveys in the western North Pacific from June to July 2010, using R/V Taikei-maru No. 2. The use of circle hooks is effective to reduce incidental catch or deep hooking of sea turtles. All sea turtles caught by shallow longlines were retrieved alive in our survey. The result indicates that careful live retrieval and release is effective in improving the post-hooking survival of hooked sea turtles.

Stock assessment of pelagic sharks

Short-term trend in standardized CPUE of shortfin mako was analyzed using the data collected by Japanese research and training vessels in the North Pacific from 1992 to 2007. Although there were some fluctuations in standardized CPUEs of this shark, no constant trend of increase or decrease was observed during this study period. Long-term trend in standardized CPUE of blue shark was analyzed using the logbook data from Japanese tuna long line fisheries in the Pacific Ocean from 1971 to 2008. In North Pacific, increasing trend was observed from

1990 to 2004. In South Pacific, there was a slight decreasing trend from 1998 to 2002, and then recovery was observed.

References

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Hasegawa S., Takao Y., Oshima T., Iga H., Semba Y. and Okamoto H. 2009. Study on the methods to reduce the bycatch of juvenile bigeye tuna by purse seine operation on FADs in the western and central Pacific Ocean. - Report of the joint research by Shoyo Maru, Nippon Maru and No.83 Fukuichi Maru in 2009 – WCPFC-SC6 FT-WP-2.

Matsumoto, T. and H. Okamoto. 2008. Overview of Japanese tagging project on tropical tunas in the temperate area of Japanese water. WCPFC-SC4 BI-WP-5. 8pp.

Table 1. Number of fishing vessels engaged in tuna fisheries in the WCPFC Convention Area by gear and size of vessel. Figures in parentheses indicate provisional data. NA indicates not available. In the number of longline vessel, coastal longliner and training/research vessels are not included. In the number of pole-and-line vessel, research and training vessels are not included.

Longline

	10-50 ton	50-100 ton	100-200 ton	200- ton	Total
2005	260	45	60	130	495
2006	279	44	52	122	497
2007	281	42	48	108	479
2008*	276	42	40	107	465
2009*	237	38	32	95	402

Pole-and-line

	20-50 ton	50-200 ton	200- ton	Total
2005	1	89	39	129
2006	1	83	30	114
2007	1	77	29	107
2008*	1	69	29	99
2009*	1	68	28	97

Purse Seine

	50-200 ton	200-500 ton	500- ton	Total
2005	31	35	0	66
2006	27	35	1	63
2007	34	35	1	70
2008	36	35	1	72
2009*	35	34	3	72

Table 2. Fishing effort (in 1000 hooks) and catch (MT) in the WCPFC Convention Area by species for the Japanese distant and offshore (top table) and small offshore (bottom table) longline fisheries. Figures in the parentheses indicate provisional data.

Offshore (10-120 GRT) and distant water (120- GRT) longlines

	#hooks	PBF	ALB	BET	YFT	SWO	MLS	BLZ	BLM	SFA	SSP	Total
2005	90,975	120	9,076	13,842	9,116	5,395	457	1,723	65	100	67	39,960
2006	87,267	73	7,568	14,311	9,631	6,075	457	1,634	67	109	114	40,038
2007	94,723	91	7,294	15,413	10,014	6,202	399	1,604	78	87	70	41,253
2008	79,150	27	7,386	10,649	8,746	4,324	452	1,346	66	50	82	33,128
2009	(62,615)	(15)	(6,261)	(7,699)	(9,806)	(4,051)	(246)	(1,204)	(64)	(80)	(79)	(29,505)

Small offshore longline (10-20 GRT)

	#hooks	PBF	ALB	BET	YFT	SWO	MLS	BLZ	BLM	SFA	SSP	Total
2005	73,170	844	10,621	8,695	3,977	1,085	536	980	20	11	1	26,768
2006	74,601	509	12,276	11,384	3,831	1,316	432	986	25	18	0	30,776
2007	76,067	730	13,627	10,663	3,711	1,846	717	1,104	17	14	0	32,429
2008	68,172	398	9,490	8,830	3,041	1,656	445	1,124	20	20	0	25,024
2009	(46,170)	(234)	(8,049)	(5,090)	(2,308)	(956)	(291)	(741)	(10)	(14)	(0)	(17,694)

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

	#days	#poles	SKJ	YFT	BET	PBF	ALB	Total
2005	20,643	385,525	128,703	3,140	1,283	177	16,102	149,405
2006	16,770	310,725	93,744	2,690	3,745	61	15,328	115,567
2007	17,086	319,874	81,668	2,312	1,804	2	37,664	123,449
2008	16,304	311,039	82,546	2,612	1,477	1	19,025	105,660
2009	(15,727)	(298,002)	(57,100)	(3,560)	(1,419)	(21)	(32,386)	(94,486)

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.

	#days	SKJ	YFT	BET	PBF	ALB	Total
2005	8,658	218,730	26,286	4,700	4,061	844	263,279
2006	7,879	216,782	28,237	4,618	3,962	336	261,814
2007	8,350	227,982	25,304	5,384	3,058	5,679	275,757
2008	8,542	211,972	35,308	5,626	2,954	824	265,225
2009	(7,651)	(192,437)	(33,053)	(3,433)	(2,071)	(824)	(239,469)

Table 5. Japanese catches (mt) for miscellaneous coastal fisheries by species and gear in the WCPFC Convention Area. Figures in parentheses indicate provisional data. SKJ: skipjack tuna, YFT: yellowfin tuna, BET: bigeye tuna, PBF: Pacific bluefin tuna, ALB: albacore. SWO: swordfish, MLS: striped marlin, BLZ: blue marlin, BLM: black marlin

Coastal and small offshore longline

	SKJ	YFT	BET	PBF	ALB	SWO	MLS	BLZ+BLM	Total
2005	25	1,699	484	1,027	2,250	204	132	130	5,951
2006	11	1,197	699	735	2,422	189	107	105	5,465
2007	7	1,383	947	1,204	3,044	169	143	106	7,003
2008	14	1,418	610	922	2,056	100	161	168	5,449
2009	(14)	(1,418)	(610)	(922)	(2,056)	(100)	(161)	(168)	(5,449)

Coastal pole-and-line

	SKJ	YFT	BET	PBF	ALB	Total
2005	7,363	507	51	372	48	8,341
2006	6,213	1,650	75	47	78	8,063
2007	8,026	1,189	173	233	104	9,725
2008	8,651	954	127	63	35	9,830
2009	(8,651)	(954)	(127)	29	(35)	(9,796)

Coastal purse seine

	SKJ	YFT	BET	PBF	ALB	Total
2005	296	153	10	7,390	6	7,855
2006	564	23	52	3,272	28	3,939
2007	715	18	12	2,841	3	3,589
2008	364	59	4	6,299	1	6,727
2009	(364)	(59)	(4)	5,353	(1)	(5,781)

Gillnet

	SKJ	YFT	BET	PBF	ALB	Total
2005	707	13	6	135	154	1,015
2006	311	13	11	313	221	869
2007	480	16	3	144	226	869
2008	332	23	13	276	1,531	2,175
2009	(332)	(23)	(13)	103	(1,531)	(2,002)

Troll

	SKJ	YFT	BET	PBF	ALB	Total
2005	5,971	2,094	135	3406	665	12,271
2006	3,624	2,262	101	1544	460	7,991
2007	3,249	2,297	124	2385	519	8,574
2008	4,178	2,436	138	2767	549	10,068
2009	(4,178)	(2,436)	(138)	1,897	(549)	(9,198)

Set-net

	SKJ	YFT	BET	PBF	ALB	Total
2005	711	30	4	2,182	97	3,024
2006	330	18	0	1,421	55	1,824
2007	535	53	1	1,503	30	2,122
2008	315	94	3	2358	101	2871
2009	(315)	(94)	(3)	1,985	(101)	(2,498)

Table 6. Japanese catches (mt) for tropical tuna species by gear in the WCPFC Convention Area. Figures in parentheses indicate provisional data. LL: longline, PL: pole-and-line, PS: purse seine.

	2005	2006	2007	2008	2009
Skipjack					
Total	362,841	321,827	322,943	308,688	(263,662)
Distant water and Offshore LL	73	61	45	98	(52)
Distant water and Offshore PL	128,703	93,744	81,668	82,546	(57,100)
Tuna PS	218,730	216,782	227,982	211,972	(192,437)
Small offshore LL	2	2	1	2	(2)
Coastal LL	25	11	7	14	(14)
Coastal PL	7,363	6,213	8,026	8,651	(8,651)
Coastal PS	296	564	715	364	(364)
Gill net	707	311	480	332	(332)
Troll	5,971	3,624	3,249	4,178	(4,178)
Set-net	711	330	535	315	(315)
Unclassified	260	186	235	217	(217)
Yellowfin					
Total	47,309	49,814	46,592	55,115	(54,137)
Distant water and Offshore LL	9,116	9,631	10,014	8,746	(9,806)
Distant water and Offshore PL	3,140	2,690	2,312	2,612	(3,560)
Tuna PS	26,286	28,237	25,304	35,308	33,053
Small offshore LL	3,977	3,831	3,711	3,041	(2,308)
Coastal LL	1,699	1,197	1,383	1,418	(1,418)
Coastal PL	507	1,650	1,189	954	(954)
Coastal PS	153	23	18	59	(59)
Gill net	13	13	16	23	(23)
Troll	2,094	2,262	2,297	2,436	(2,436)
Set-net	30	18	53	94	(94)
Unclassified	295	263	295	425	(425)
Bigeye					
Total	29,306	35,035	34,587	27,553	(18,613)
Distant water and Offshore LL	13,842	14,311	15,413	10,649	(7,699)
Distant water and Offshore PL	1,283	3,745	1,804	1,477	(1,419)
Tuna PS	4,700	4,618	5,384	5,626	3,433
Small offshore LL	8,695	11,384	10,663	8,830	(5,090)
Coastal LL	484	699	947	610	(610)
Coastal PL	51	75	173	127	(127)
Coastal PS	10	52	12	4	(4)
Gill net	6	11	3	13	(13)
Troll	135	101	124	138	(138)
Set-net	4	0	1	3	(3)
Unclassified	96	39	64	77	(77)

Table 7. Coverage rate of logbook for longline, pole-and-line and Purse seine fisheries. The calculation methods among fishery are not the same. NA indicates not available.

Type of fishery	2005	2006	2007	2008	2009
Distant water longline	91%	91%	92%	90%	89%
Offshore longline	92%	95%	96%	91%	91%
Small offshore longline	NA	NA	NA	NA	NA
Coastal longline	NA	NA	NA	NA	NA
Offshore pole-and-line (20-120 GRT)	100%	100%	100%	100%	100%
Distant water pole-and-line (over 120 GRT)	100%	100%	100%	100%	100%
Purse seine (>200GRT)	100%	100%	100%	100%	100%

Table 8. Number of cruises for the purse seine observer program in the tropical waters of western central Pacific.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Number of cruises	2	4	3	4	3	3	3	3	3	1	1	2	3	3	2	40

Table 9. Information of observer programs for Japanese purse seiner operated in the tropical waters.

cruise number	1	2
area of operation	1N - 2S	4N - 2S
	156E -161E	150E-155E
departure - return	Yaizu - Yaizu	Yaizu - Yaizu
date of depature	2009/10/15	2009/10/19
date of return	2009/11/9	2009/11/14
days of cruise	26	27
days of fishing	13	14
number of set	19	13
free school	1	10
associated school	18	3
total catch (metric tonn)	1044	751
skipjack	874	540
yellowfin	192	197
bigeye	29	14

Table 10. Number of operations and catch number for longline observer program in the western central Pacific in 2009.

Cruise number	1	2	3	4	5
Number of operations	14	21	13	36	46
Number of catch					
Albacore	614	146	16	2,676	901
Yellowfin tuna	118	2	54	8	688
Southern bluefin tuna	0	0	0	9	440
Bigeye tuna	91	206	156	177	81
Skipjack tuna	15	24	1	17	21
Unidentified billfish	0	0	0	0	4
Sailfish	0	0	0	0	17
Black marlin	0	0	0	0	4
Blue marlin	5	1	38	0	15
Spearfish	26	1	41	1	2
Striped marlin	14	12	3	8	1
Swordfish	2	3	21	49	21
Unidentified fishes	0	0	0	0	4
Lancetfishes	22	0	29	69	98
Longnose lancetfish	68	90	0	0	1
Opah	33	29	2	86	51
Crestfish	3	0	0	2	0
Southern sennet	0	0	0	0	35
Atlantic pomflet	0	0	0	0	1
Pomfrets	0	0	10	9	25
Bigscale pomfret	15	9	0	0	0
Rough pomfret	0	0	0	0	2
Dolphinfish	34	11	0	3	19
Snake mackerel	11	2	0	0	0
Escoler	19	44	14	249	84
Oilfish	0	0	0	29	10
Black gemfish	0	0	0	3	0
Unidentified mackerels	0	0	0	0	3
Wahoo	2	0	14	0	1
Spanish mackerel	0	0	0	0	48
Ocean sunfish	0	0	0	27	3
Slender mola	1	0	0	0	0
Whitetail shark	0	0	0	0	9
Unidentified thresher shark	5	2	2	11	5
Pelagic thresher	16	0	0	0	0
Thresher shark	1	0	0	0	0
Unidentified mackerek shark	0	0	37	0	0
Great white shark	0	0	0	0	1
Shortfin mako	3	2	0	47	16
Porbeagle	0	0	0	0	7
Unidentified requiem shark	0	0	1	0	2
Oceanic whitetip shark	0	0	0	0	2
Tiger shark	0	1	0	0	0
Blue shark	23	51	16	85	180
School shark	0	0	0	0	1
Unidentified ray	0	0	1	0	0
Sting ray	9	12	9	36	166
Davil ray	0	0	1	0	0
Albatrosses	0	0	0	3	0
Unidentified petrels	0	0	0	3	0
Streaked shearwater	7	0	0	0	0
Wedge-tailed shearwater	2	0	0	0	0
Unidentified sea turtles	0	0	0	0	1

Table 11. 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	Release	Recapture	Percentage of recapture	Release	Recapture	Percentage of recapture	Release	Recapture	Percentage of recapture
2000	442	99	22.4%	1,174	165	14.1%	1,616	264	16.3%
2001	374	38	10.2%	1,435	95	6.6%	1,809	133	7.4%
2002	170	15	8.8%	970	53	5.5%	1,140	68	6.0%
2003	365	42	11.5%	1,580	240	15.2%	1,945	282	14.5%
2004	188	16	8,5%	1,463	88	6.6%	1,651	104	6.3%
2005	265	18	6.8%	1,354	84	6.2%	1,619	102	6.3%
2006	279	8	2.9%	1,179	38	3.2%	1,458	46	3.2%
2007	149	20	13.4%	1,121	59	5.3%	1,270	79	6.3%
2008	163	14	8.6%	1,183	81	6.8%	1,346	95	7.1%
2009	257	23	8.9%	765	36	4.7%	1,022	59	5.8%
Total	2,652	293	11.0%	12,224	939	7.7%	14,876	1,232	8.3%

Archival tag

Species	**Bigeye tuna**			**Yellowfin tuna**			**Total**		
Year	Release	Recapture	Percentage of recapture	Release	Recapture	Percentage of recapture	Release	Recapture	Percentage of recapture
2000	20	6	30.0%	13	1	7.7%	33	7	21.2%
2001	16	1	6.3%	24	2	8.3%	40	3	7.5%
2002	19	6	31.6%	10	1	10.0%	29	7	24.1%
2003	7	2	28.6%	19	1	5.3%	26	3	11.5%
2004	9	0	0.0%	10	1	10.0%	19	1	5.3%
2005	21	8	38.1%	3	0	0.0%	24	8	33.3%
2006	13	1	7.7%	1	0	0.0%	14	1	7.1%
2007	20	2	10.0%	0	0		20	2	10.0%
2008	12	3	25.0%	6	1	16.7%	18	4	22.2%
2009	8	3	37.5%	4	0	0.0%	12	3	25.0%
Total	145	32	22.1%	90	7	7.8%	235	39	16.6%

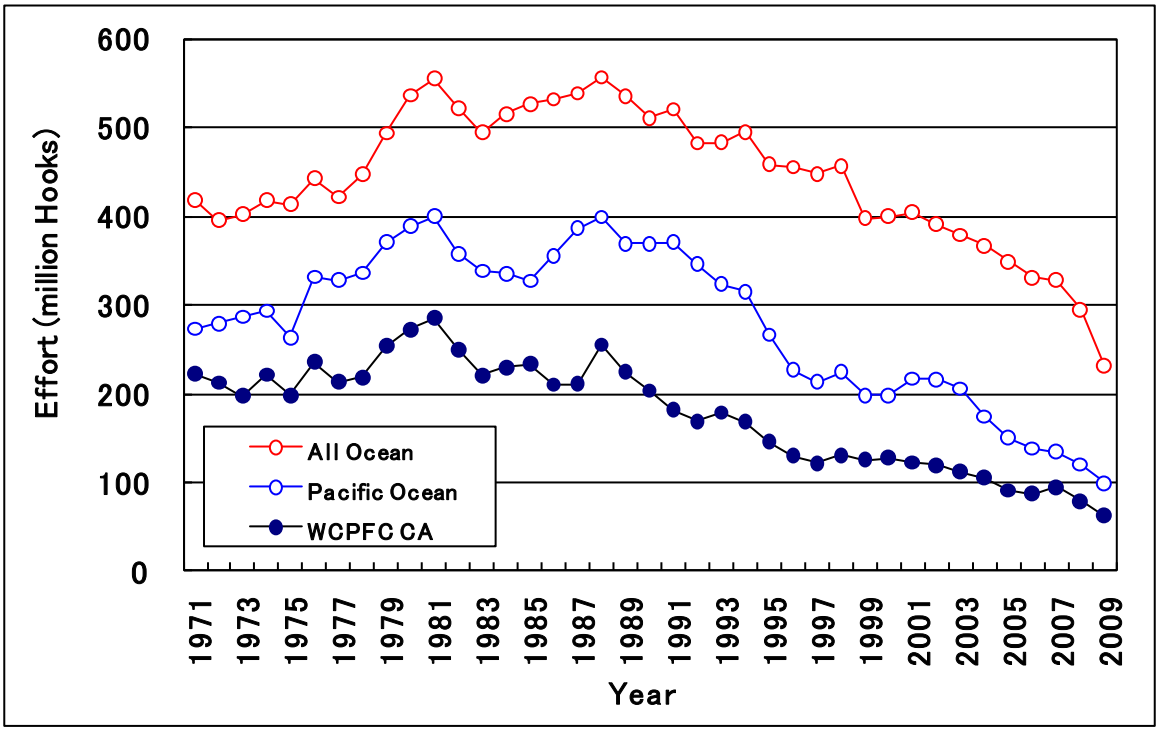

Fig. 1. Historical change in fishing effort of the Japanese distant water and offshore longline fishery (not including small offshore) in the WCPFC Convention Area.

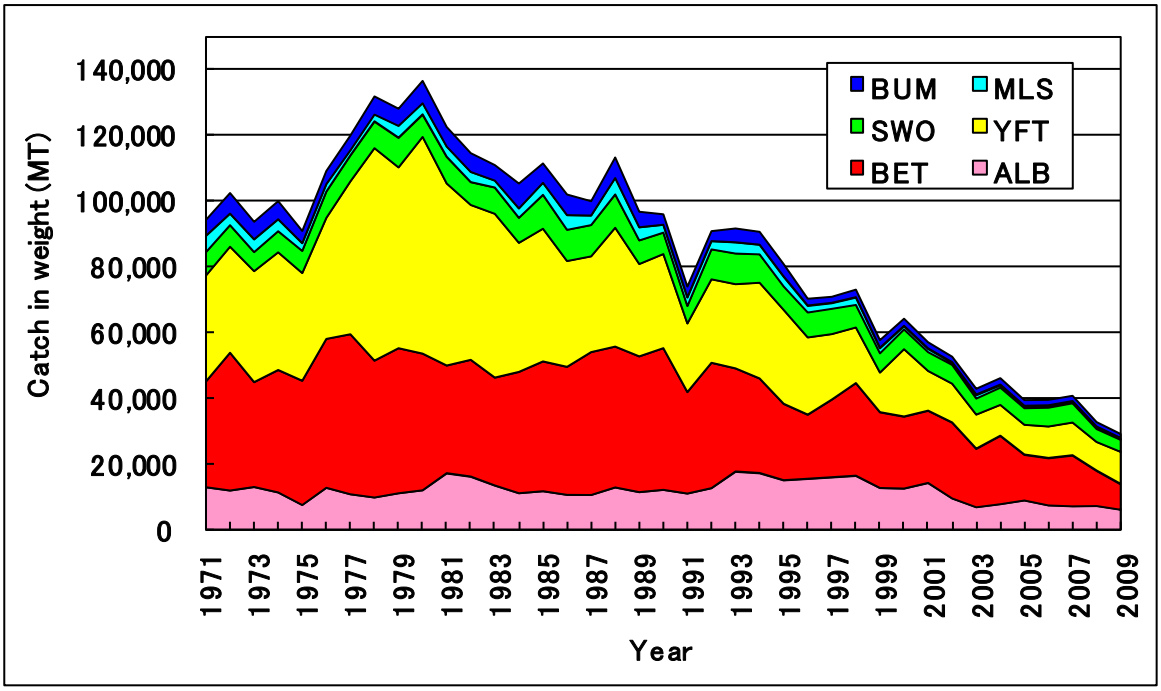

Fig. 2. Historical change of catches for major species for the Japanese distant water and offshore longline fishery (not including small offshore) in the WCPFC Convention Area. ALB: albacore, BET: bigeye, YFT: yellowfin, SWO: sword fish, MLS: striped marlin, BUM: blue marlin.

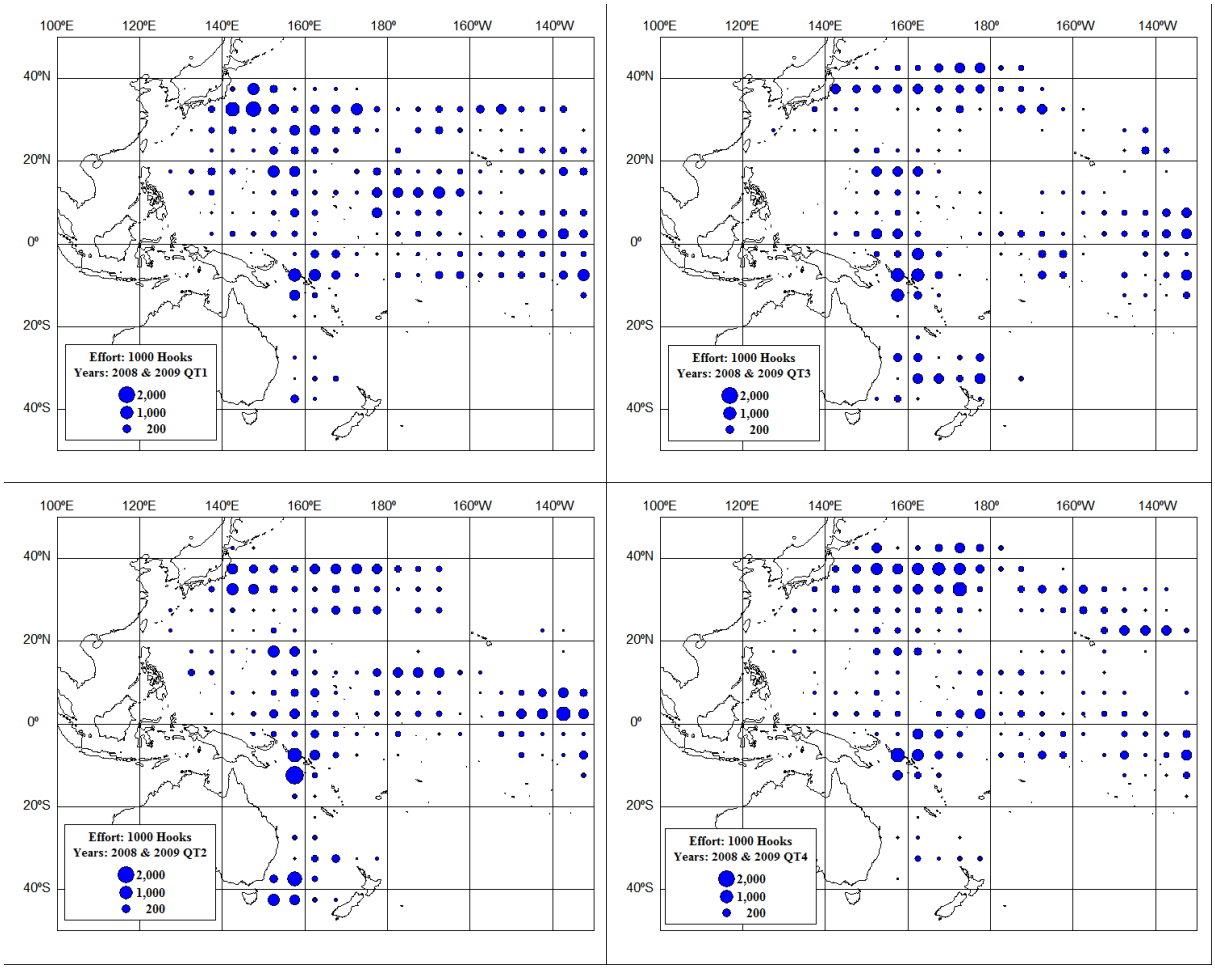

Fig. 3. Quarterly distribution of fishing effort for the Japanese offshore and distant water longline fisheries in the western and central Pacific Ocean in average of 2008-2009.

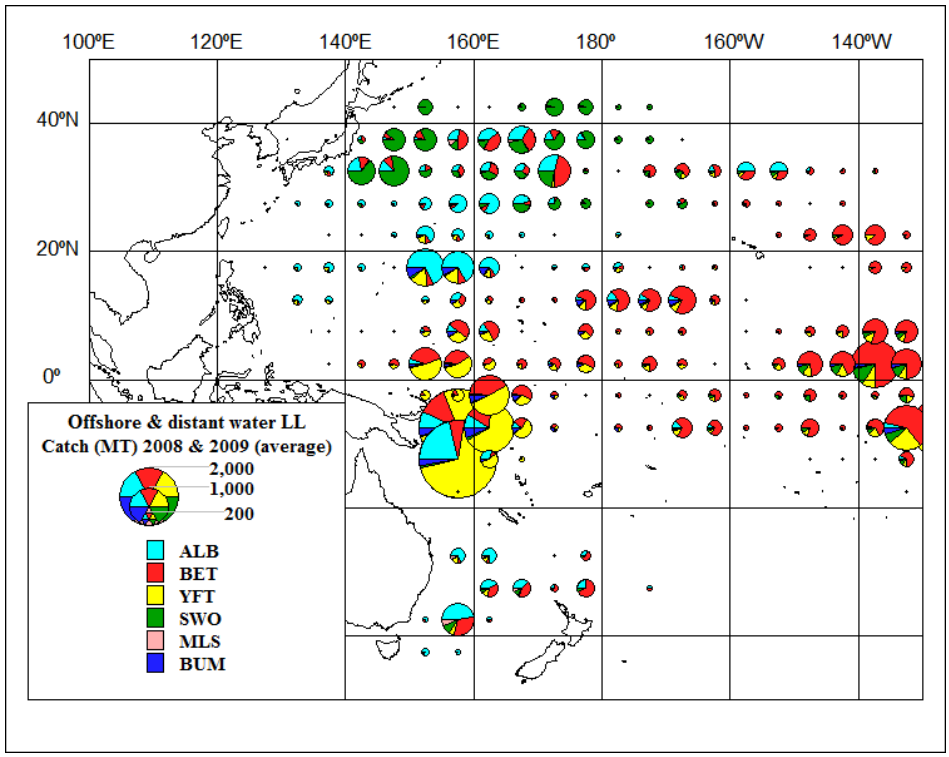

Fig. 4. Distributions of offshore and distant water longline catch (in weight) by species in average of 2008-2009 for six main species (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin and BUM: blue marlin).

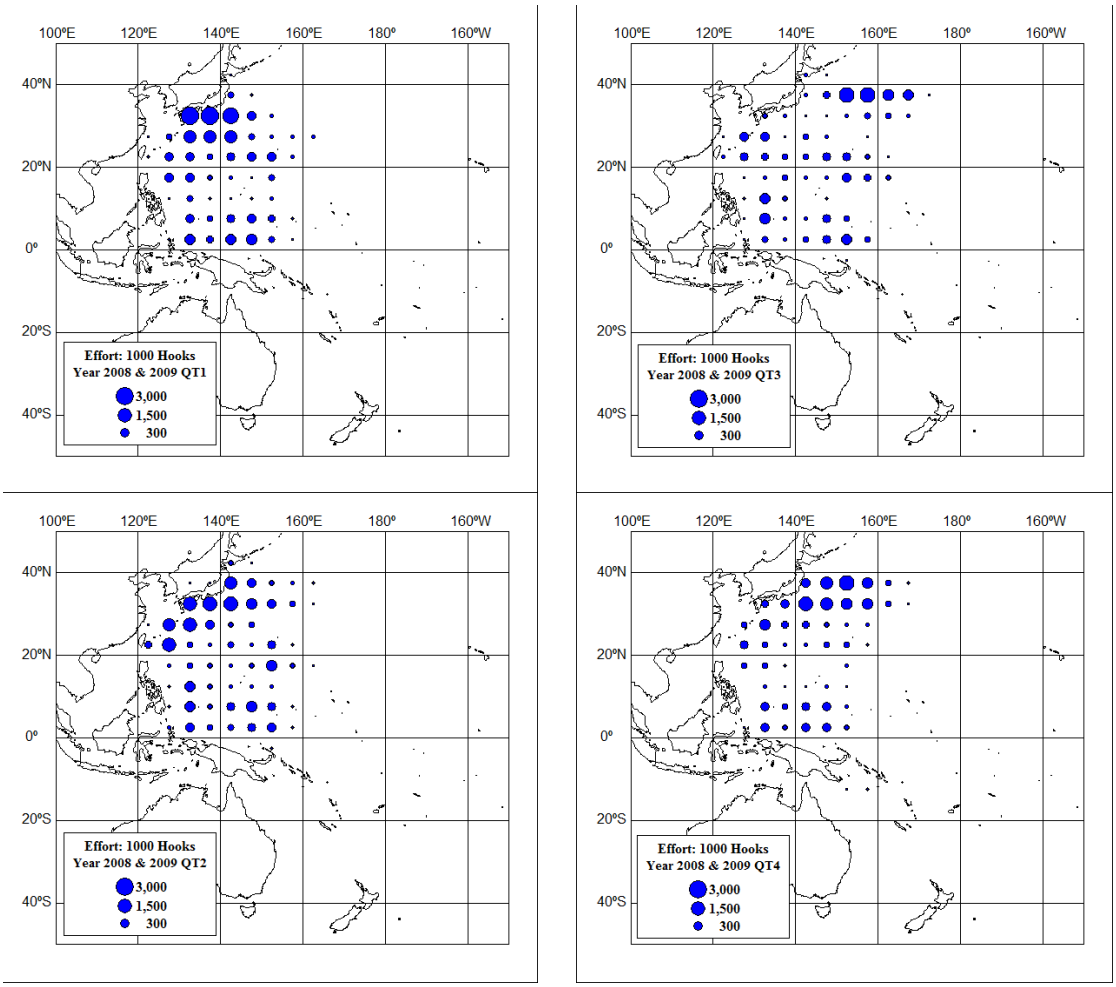

Fig. 5. Quarterly distribution of fishing effort for the Japanese small offshore longline fisheries (less than 20 GRT) in the western and central Pacific Ocean in average of 2008-2009.

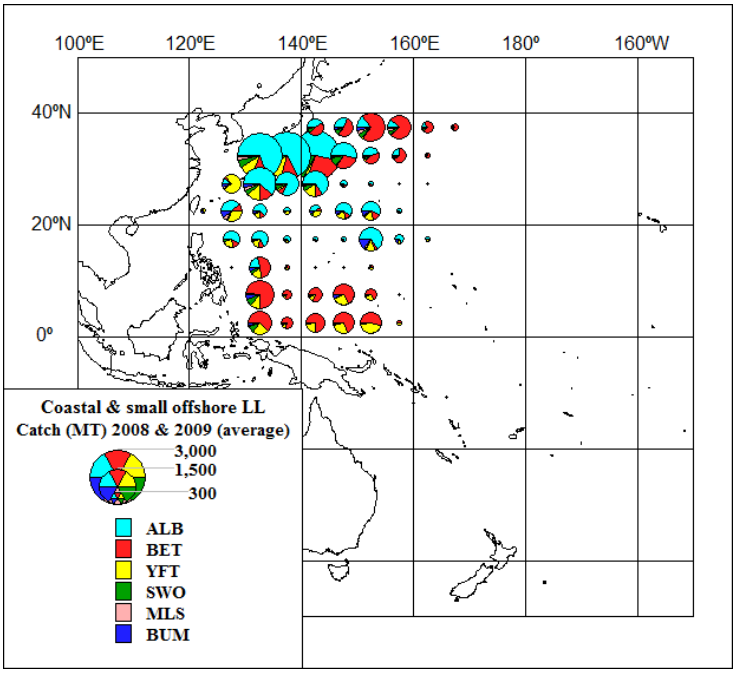

Fig. 6. Distributions of small offshore longline catch (in weight) by species in average of 2008-2009 for six main species (ALB: albacore, BET: bigeye tuna, YFT: yellowfin tuna, SWO: swordfish, MLS: striped marlin and BUM: blue marlin).

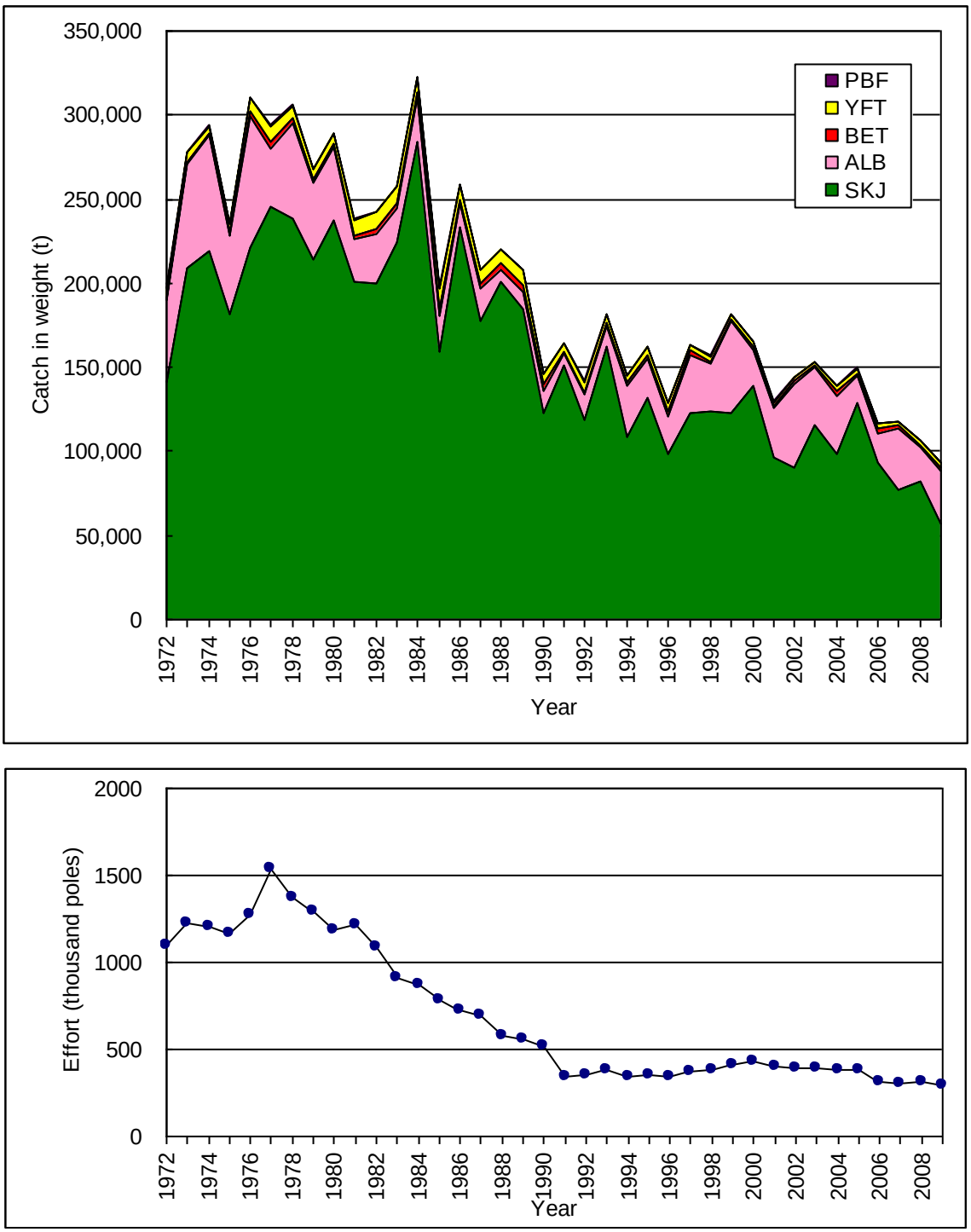

Fig. 7. Historical change of fishing effort and catches by species for the Japanese pole-and-line fishery (>20GRT) in the WCPFC Convention Area. Values in 2009 are provisional.

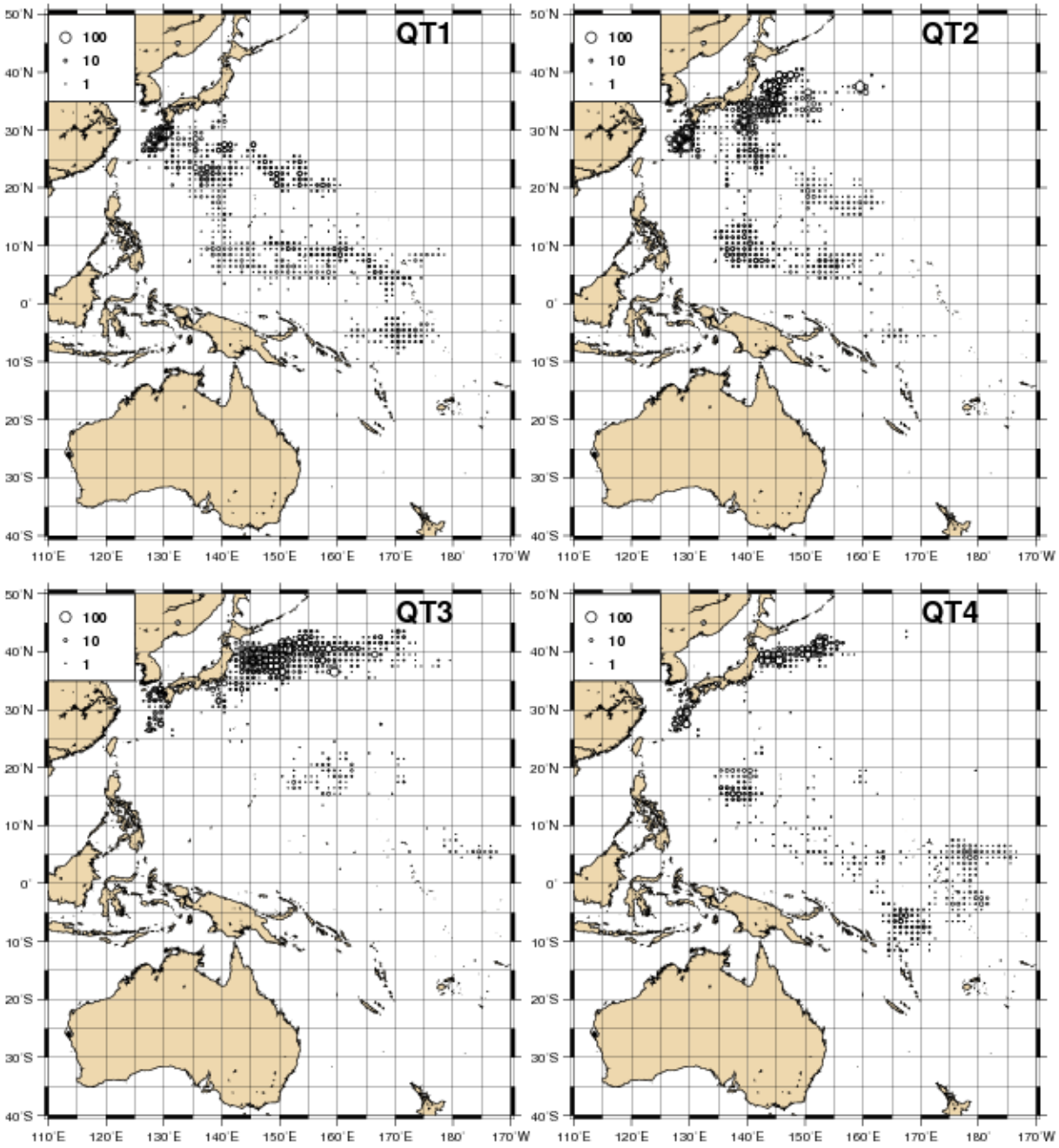

Fig. 8. Quarterly distribution of fishing effort for the Japanese pole-and-line fishery (offshore and distant water licenses) in the Pacific Ocean in average of 2008-2009.

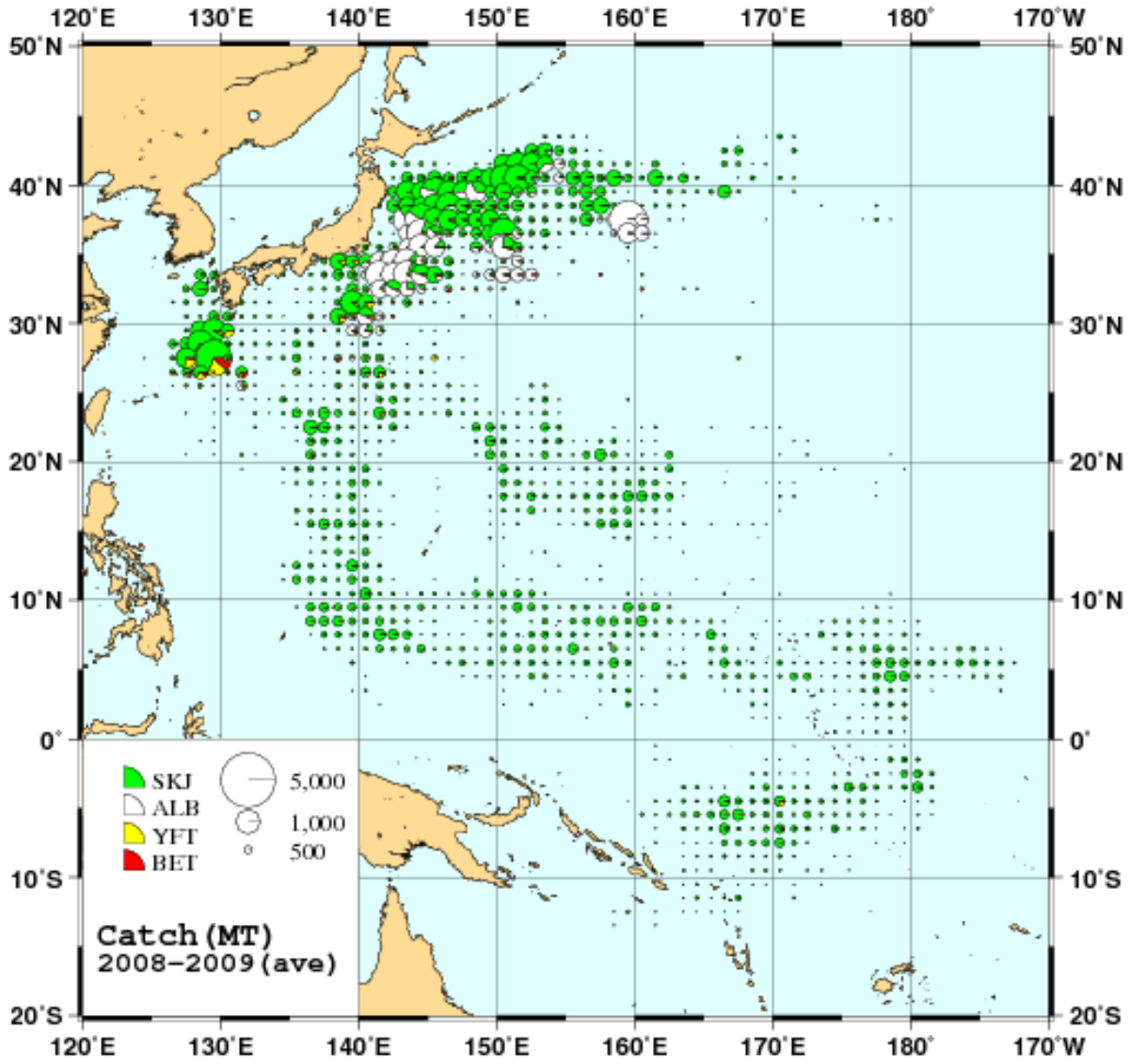

Fig. 9. Distribution of catch and its species composition for the Japanese offshore and distant water pole-and-line fishery in average of 2008-2009.

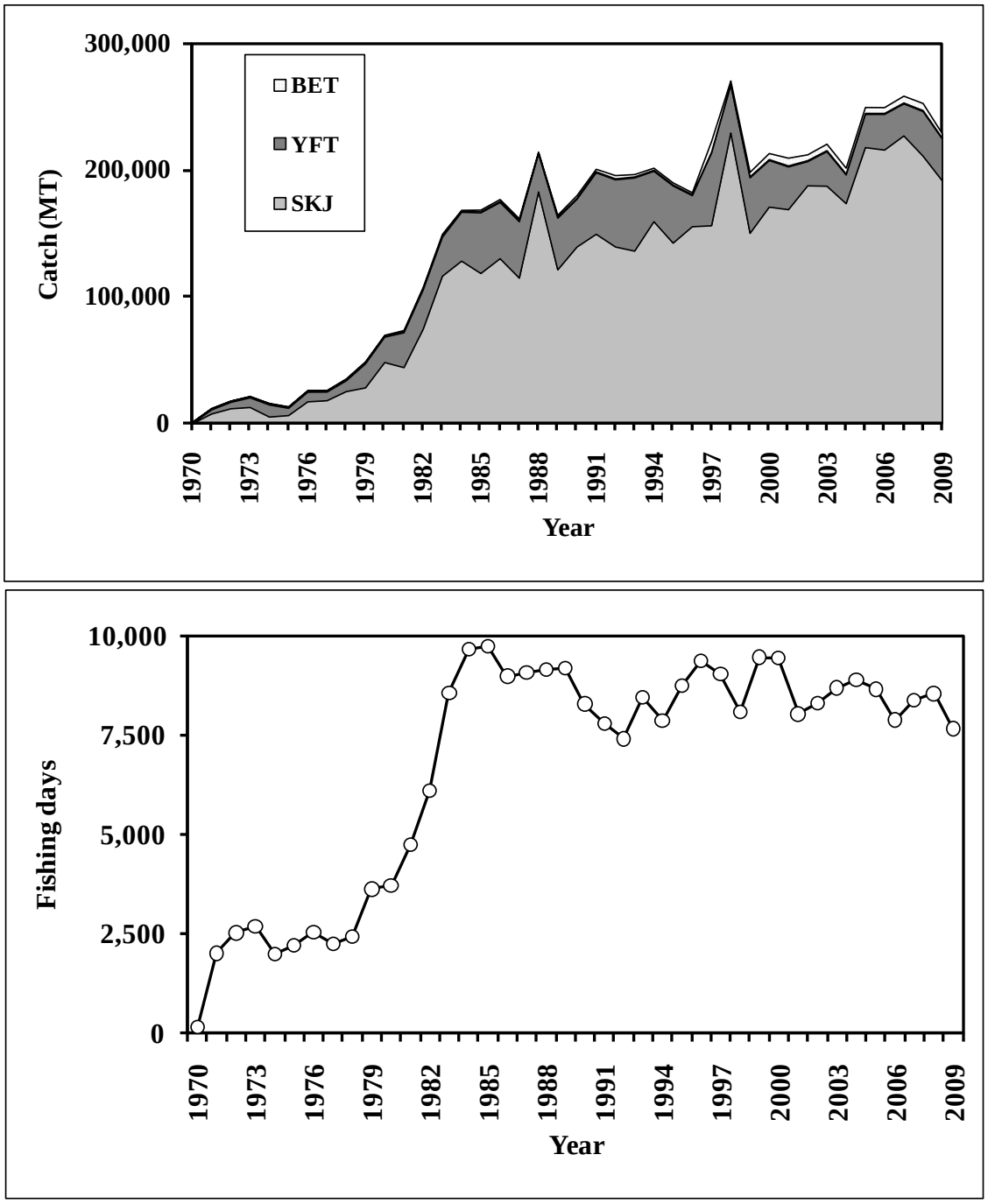

Fig. 10. Trends of fishing effort and catches by species for the Japanese tuna purse seine fishery in the WCPFC Convention Area.

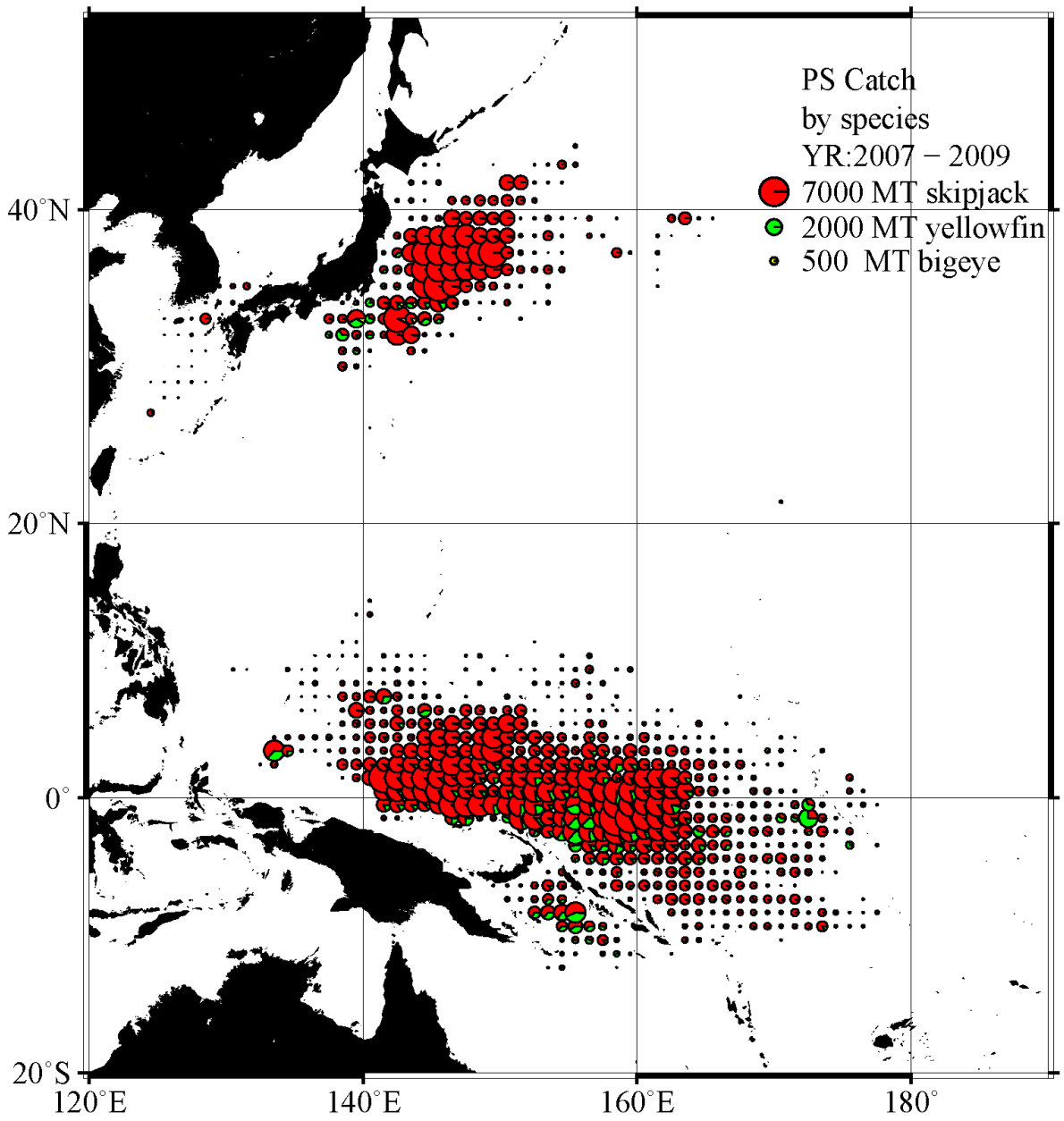

Fig. 11. Distribution of tuna purse seine catch (mt) by species (skipjack, yellowfin and bigeye) combined for 2007-2009.

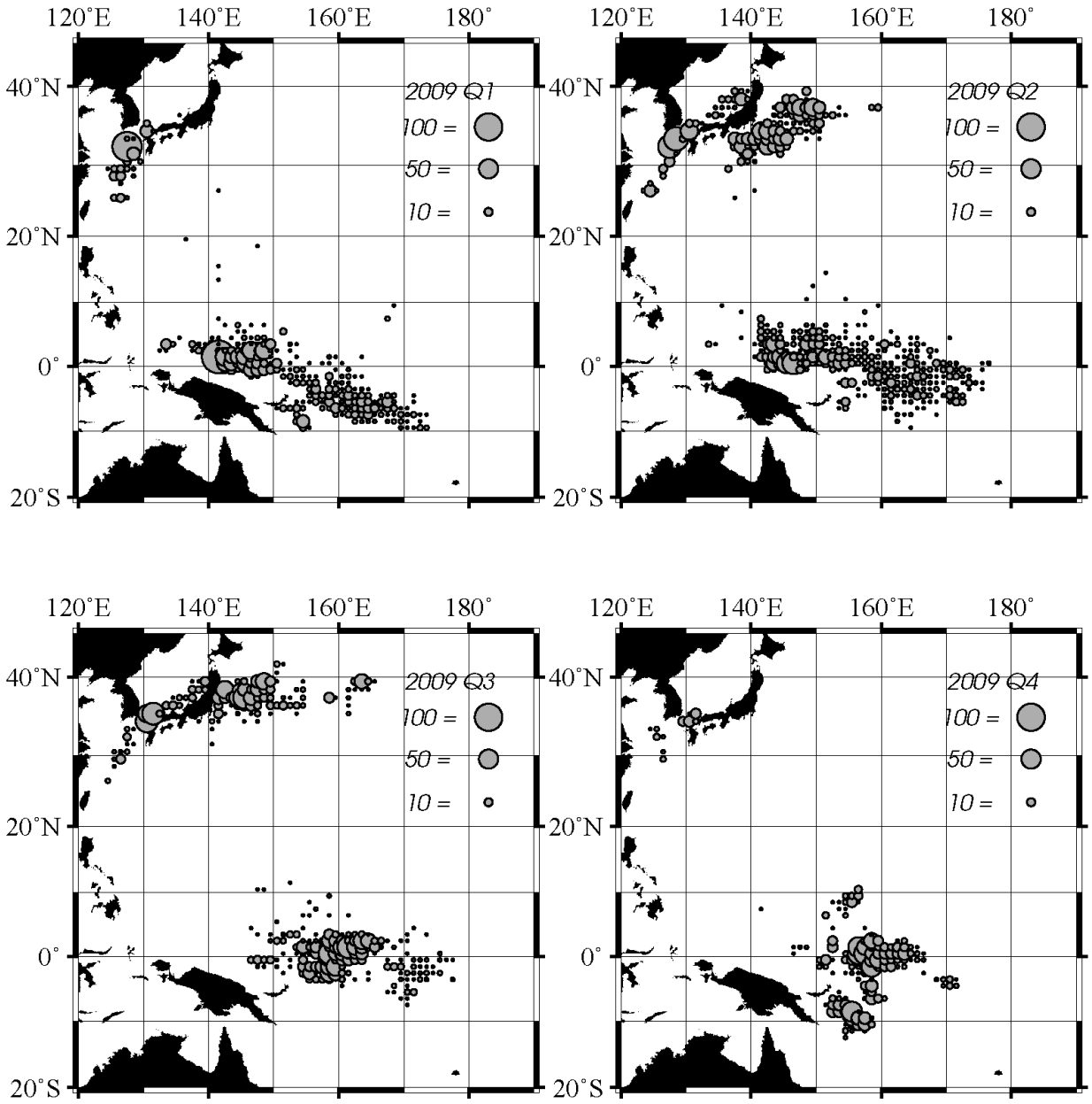

Fig. 12. Quarterly distributions of fishing effort (number of set) for the Japanese tuna purse seine fishery in the Pacific Ocean in 2009.

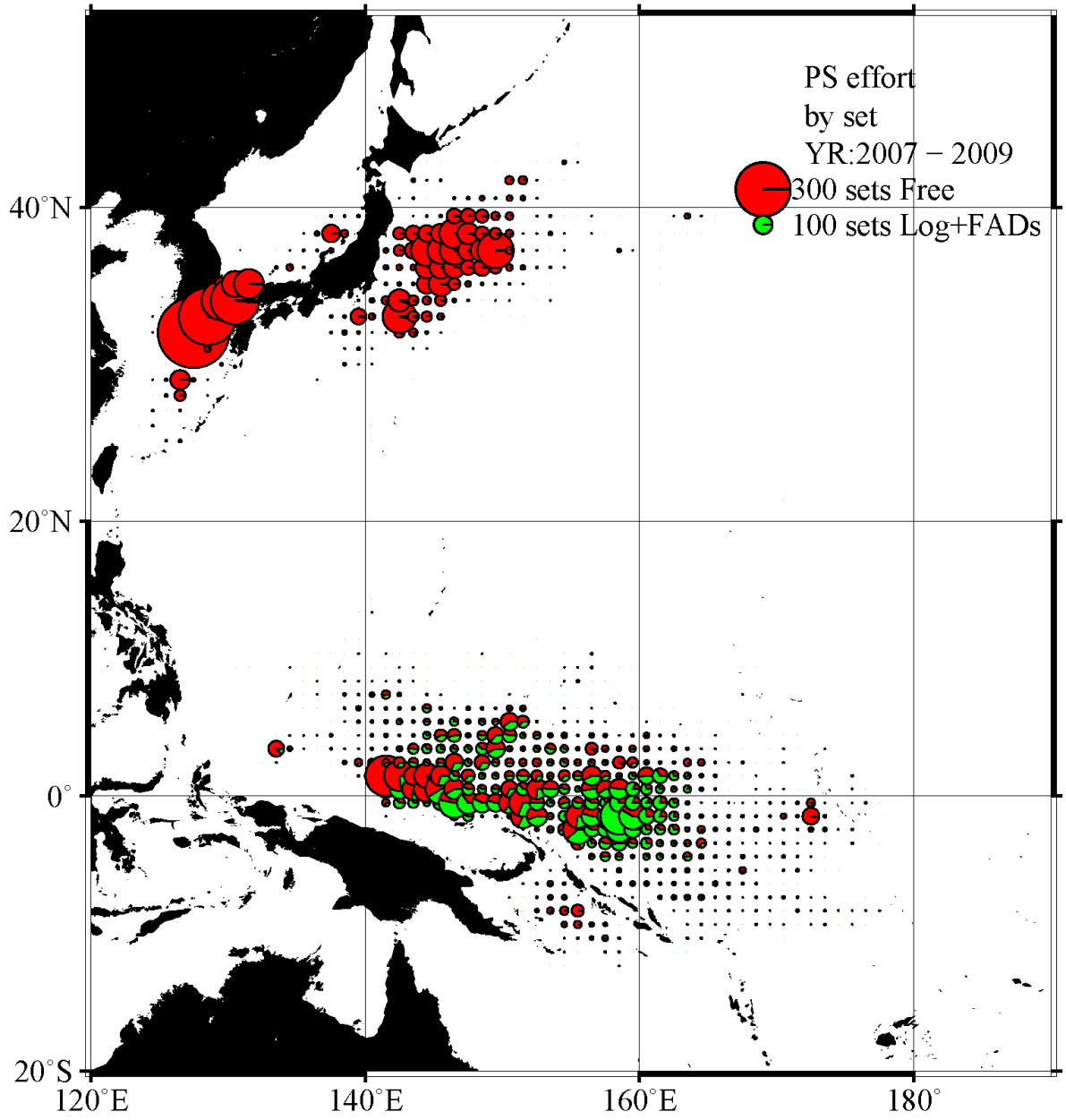

Fig. 13. Distribution of sets by type of school for 2007-2009 deployed by the tuna purse seine fishery by Japan.

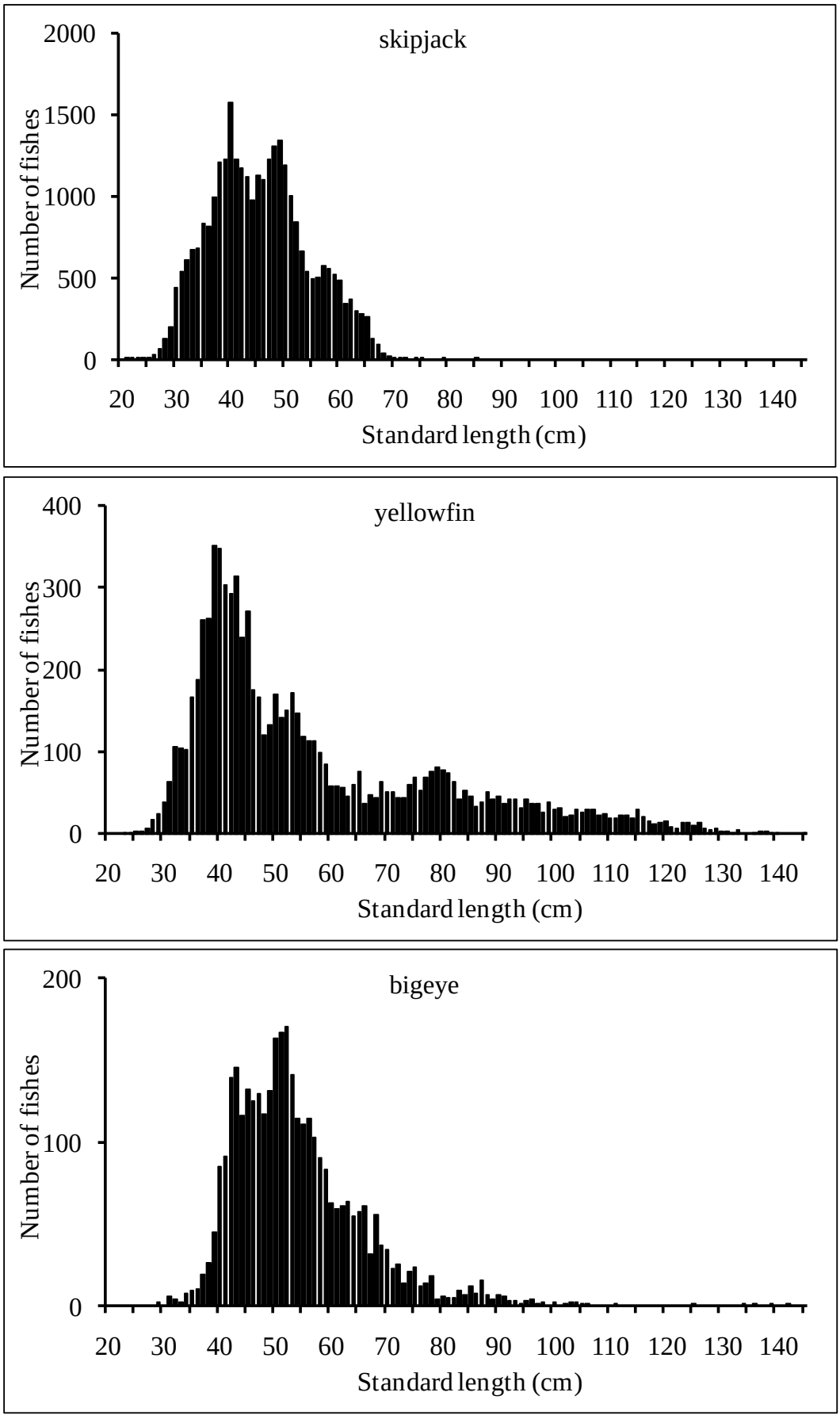

Fig. 14. Annual length frequency distribution of purse seine-caught fish in equatorial waters in 2009.

Appendix Table 1. Catches (mt) for bigeye, yellowfin, blue marlin, black marlin and skipjack in the portion of the WCPFC Convention Area east of the 150˚ meridian of west longitude caught by distant-water and offshore longline fisheries.

Year	BET	YFT	BLZ	BLM	SKJ
2005	1457	344	254	2	3
2006	1616	472	109	3	4
2007	1787	411	166	1	9
2008	1221	279	59	2	2
2009	1194	452	90	1	5

Appendix Table 2. Catches (mt) for Pacific bluefin, albacore, swordfish and striped marlin in the Pacific Ocean north of the Equator, the Pacific Ocean south of the Equator, the WCPFC Convention Area north of the Equator and the WCPFC Convention Area south of the Equator. Parenthesis represents provisional.

Pacific bluefin tuna (1) in the Pacific Ocean north of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	1,818	107	372	177	7,390	4,061	135	3,406	2,182	413
2006	1,058	63	47	61	3,272	3,962	313	1,544	1,421	464
2007	2,225	83	233	2	2,841	3,058	144	2,385	1,503	1,065
2008	1,476	19	63	1	6,299	2,954	276	2,767	2,358	916
2009	(1,476)	(19)	29	21	5,353	2,071	103	1,897	(1,985)	810

*Catch of coastal LL in 2009 includes that of offshore and distant-water LL

Pacific bluefin tuna (2) in the Pacific Ocean south of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	0	14	0	0	0	0	0	0	0	0
2006	0	11	0	0	0	0	0	0	0	0
2007	0	8	0	0	0	0	0	0	0	0
2008	0	8	0	0	0	0	0	0	0	0
2009	0	(8)	0	0	0	0	0	0	0	0

Pacific bluefin tuna (3) in the WCPFC Statistical Area north of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	1,818	107	372	177	7,390	4,061	135	3,406	2,182	413
2006	1,058	63	47	61	3,272	3,962	313	1,544	1,421	464
2007	2,225	83	233	2	2,841	3,058	144	2,385	1,503	1,065
2008	1,476	19	63	1	6,299	2,954	276	2,767	2,358	916
2009	(1,476)	(19)	29	21	5,353	2,071	103	1,897	(1,985)	810

Pacific bluefin tuna (4) in the WCPFC Statistical Area south of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	0	14	0	0	0	0	0	0	0	0
2006	0	10	0	0	0	0	0	0	0	0
2007	0	8	0	0	0	0	0	0	0	0
2008	0	8	0	0	0	0	0	0	0	0
2009	0	(8)	0	0	0	0	0	0	0	0

Pacific bluefin tuna (5) in the portion of the WCPFC Statistical Area east of the 150°meridian of west longitude

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0

Appendix Table 2. (Continued)

Albacore (1) in the Pacific Ocean north of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	15,208	5,212	48	16,085	6	844	154	665	97	234
2006	16,452	4,575	78	15,322	28	336	221	460	55	42
2007	18,319	4,017	104	37,664	3	5,679	226	519	30	44
2008	13,680	5,521	35	19,025	1	824	1,531	549	101	15
2009	(13,680)	(3,838)	(35)	(32,386)	(1)	(824)	(1,531)	(549)	(101)	(15)

Albacore (2) in the Pacific Ocean south of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	45	6,473	0	17	0	0	0	0	0	0
2006	141	5,046	0	6	0	0	0	0	0	0
2007	45	4,985	0	0	0	0	0	0	0	0
2008	1	3,061	0	0	0	0	0	0	0	0
2009	(8)	(4,130)	0	0	0	0	0	0	0	0

Albacore (3) in the WCPFC Statistical Area north of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	15,208	5,189	48	16,085	6	844	154	665	97	234
2006	16,452	4,564	78	15,322	28	336	221	460	55	42
2007	18,319	4,009	104	37,664	3	5,679	226	519	30	44
2008	13,680	5,475	35	19,025	1	824	1,531	549	101	15
2009	(13,680)	(3,835)	(35)	(32,386)	(1)	(824)	(1,531)	(549)	(101)	(15)

Albacore (4) in the WCPFC Statistical Area south of the Equator

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	45	4,033	0	17	0	0	0	0	0	0
2006	141	3,083	0	6	0	0	0	0	0	0
2007	45	3,361	0	0	0	0	0	0	0	0
2008	1	2,050	0	0	0	0	0	0	0	0
2009	(8)	(2,504)	0	0	0	0	0	0	0	0

Albacore (5) in the portion of the WCPFC Statistical Area east of the 150°meridian of west longitude

Year	LL	LL	PL	PL	PS	PS	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water	Coastal	Offshore and distant-water				
2005	0	187	0	0	0	0	0	0	0	0
2006	0	238	0	0	0	0	0	0	0	0
2007	0	338	0	0	0	0	0	0	0	0
2008	0	26	0	0	0	0	0	0	0	0
2009	(8)	(87)	0	0	0	0	0	0	0	0

Appendix Table 2. (Continued)

Swordfish (1) in the Pacific Ocean north of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	1,289	5,334	956	13	3	517
2006	1,505	6,105	796	14	5	576
2007	2,015	5,976	829	14	2	478
2008	1,756	4,335	648	12	4	512
2009	(1,056)	(4,239)	(648)	(12)	(4)	(512)

Swordfish (2) in the Pacific Ocean south of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	0	1,662	0	0	0	0
2006	0	1,436	0	0	0	0
2007	0	1,665	0	0	0	0
2008	0	1,981	0	0	0	0
2009	0	(1,948)	0	0	0	0

Swordfish (3) in the WCPFC Statistical Area north of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	1,289	4,952	956	13	3	517
2006	1,505	5,704	796	14	5	576
2007	2,015	5,772	829	14	2	478
2008	1,756	3,883	648	12	4	512
2009	(1,056)	(3,571)	(648)	(12)	(4)	(512)

Swordfish (4) in the WCPFC Statistical Area south of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	0	444	0	0	0	0
2006	0	371	0	0	0	0
2007	0	431	0	0	0	0
2008	0	441	0	0	0	0
2009	0	(480)	0	0	0	0

Swordfish (5) in the portion of the WCPFC Statistical Area east of the 150°meridian of west longitude

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	0	156	0	0	0	0
2006	0	156	0	0	0	0
2007	0	181	0	0	0	0
2008	0	160	0	0	0	0
2009	0	(152)	0	0	0	0

Striped marlin (1) in the Pacific Ocean north of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	668	503	1,214	20	28	51
2006	539	545	1,190	11	30	54
2007	860	279	970	35	28	28
2008	606	364	1,302	23	33	58
2009	(452)	(149)	(1,302)	(23)	(33)	(58)

Striped marlin (2) in the Pacific Ocean south of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	0	638	0	0	0	0
2006	0	621	0	0	0	0
2007	0	611	0	0	0	0
2008	0	470	0	0	0	0
2009	0	(463)	0	0	0	0

Striped marlin (3) in the WCPFC Statistical Area north of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	668	305	1,214	20	28	51
2006	539	295	1,190	11	30	54
2007	860	249	970	35	28	28
2008	606	319	1,302	23	33	58
2009	(452)	(96)	(1,302)	(23)	(33)	(58)

Striped marlin (4) in the WCPFC Statistical Area south of the Equator

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	0	153	0	0	0	0
2006	0	162	0	0	0	0
2007	0	150	0	0	0	0
2008	0	134	0	0	0	0
2009	0	(150)	0	0	0	0

Striped marlin (5) in the portion of the WCPFC Statistical Area east of the 150°meridian of west longitude

Year	LL	LL	Gillnet	Troll	Set-net	Others
	Coastal	Offshore and distant-water				
2005	0	23	0	0	0	0
2006	0	24	0	0	0	0
2007	0	28	0	0	0	0
2008	0	12	0	0	0	0
2009	0	(8)	0	0	0	0

Appendix Table 3 Catch in weight, of swordfish at south of 20°South of WCPFC statistical area by year with effort and vessel statistics. The vessel in this table means that which caught one or more swordfish in this area in each year.

Year	Japan-flagged vessels south of 20S		Chartered vessels		Other vessels fishing within the Japan's waters south of 20S		
	Catch (t)	Vessel numbers	Catch (t)	Vessel numbers	Flag	Catch (t)	Vessel numbers
2000	588	61	0	0	--	--	--
2001	536	68	0	0	--	--	--
2002	561	75	0	0	--	--	--
2003	337	64	0	0	--	--	--
2004	338	52	0	0	--	--	--
2005	246	40	0	0	--	--	--
2006	154	34	0	0	--	--	--
2007	141	21	0	0	--	--	--
2008	148	19	0	0	--	--	--
2009	168	19	0	0	--	--	--