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OVERVIEW OF TUNA FISHERIES IN THE WESTERN AND CENTRAL PACIFIC OCEAN, INCLUDING ECONOMIC CONDITIONS – 2008

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CONTENTS

1. INTRODUCTION

The tuna fishery in the Western and Central Pacific Ocean is diverse, ranging from small-scale artisanal operations in the coastal waters of Pacific states, to large-scale, industrial purse-seine, pole-and-line and longline operations in both the exclusive economic zones of Pacific states and on the high seas. The main species targetted by these fisheries are skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*) and albacore tuna (*T. alalunga*).

This review provides a broad description of the major fisheries in the WCPFC Statistical Area (**WCP–CA**; see Figure 1), highlighting activities during the most recent calendar year – 2008. The review draws on the latest catch estimates compiled for the WCP–CA, which can be found in Information Paper WCPFC–SC5 ST IP–1 *(Estimates of annual catches in the WCPFC Statistical Area – OFP, 2009a)*. Where relevant, comparisons with previous years' activities have been included, although it should be noted that data for 2008, for some fisheries, are provisional at this stage.

This paper includes sections covering a summary of total target tuna catch in the WCP–CA tuna fisheries, an overview of the WCP–CA tuna fisheries by gear, including economic conditions in each fishery, and a summary of target tuna catches by species. In each section, the paper makes some observations on recent developments in each fishery, with emphasis on 2008 catches relative to those of recent years, but refers readers to the SC4 National Fisheries Reports, which offer more detail of recent activities at the fleet level.

This paper acknowledges, but does not currently include, information on several WCP–CA fisheries, including the north Pacific albacore troll, the north and south Pacific swordfish, the Vietnamese and several artisanal fisheries. These fisheries may be covered in future reviews, depending on the availability of more complete data. This paper does not include a description of non-target species catches at this stage.

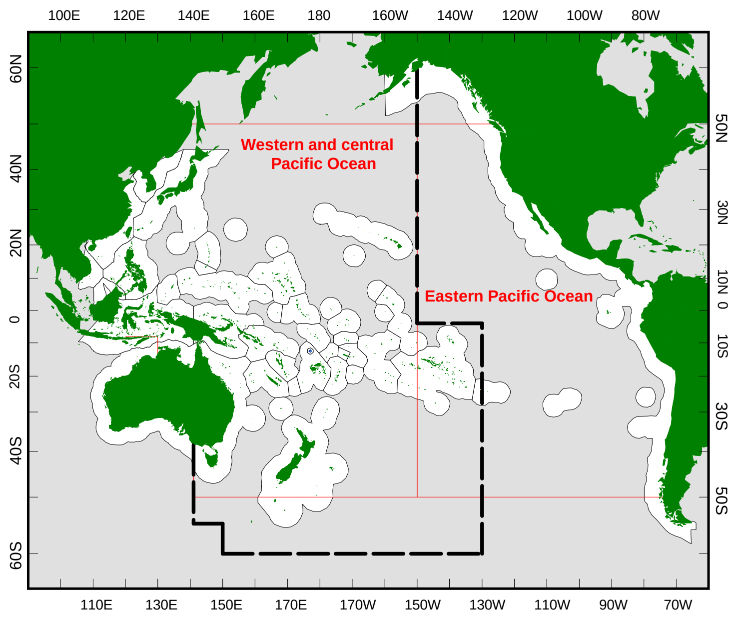

Figure 1. The western and central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Convention Area (WCP–CA in dashed lines)

2. TOTAL TUNA CATCH FOR 2008

Annual total catches of the four main tuna species (skipjack, yellowfin, bigeye and albacore) in the WCP–CA increased steadily during the 1980s as the purse seine fleet expanded and remained relatively stable during most of the 1990s until the sharp increase in catch during 1998. Over the past 7 years, there has been an increasing trend in total tuna catch, primarily due to increases in purse-seine fishery catches (Figure 2 and Figure 3). The provisional total WCP–CA tuna catch for 2008 was estimated at **2,426,195 mt**, the highest annual catch recorded, but only 6,000 mt higher the previous record in 2007 (2,420,082 mt). During 2008, the purse seine fishery accounted for an estimated 1,783,669 mt (74% of the total catch, and a record for this fishery), with pole-and-line taking an estimated 170,805 mt (7%), the longline fishery an estimated 231,003 mt (10%), and the remainder (10%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines. The WCP–CA tuna catch (2,426,195 mt) for 2008 represented 81% of the total Pacific Ocean catch of 3,009,477 mt, and 56% of the global tuna catch (the provisional estimate for 2008 is just over 4.3 million mt).

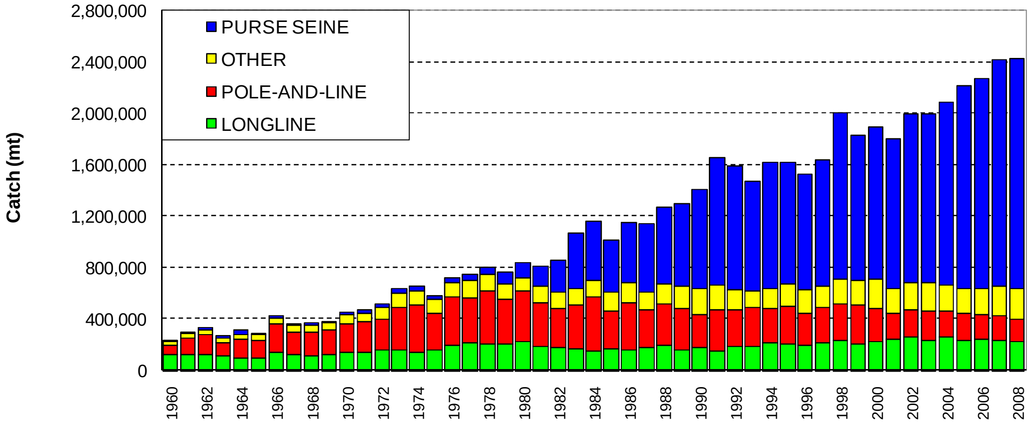

Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

The 2008 WCP–CA catch of skipjack (1,634,617 mt – 67% of the total catch) was the second highest ever, and 74,000 mt less than the record catch of 2007 (1,708,605 mt). The WCP–CA yellowfin catch for 2008 (539,481 mt – 22%) was easily the highest on record and nearly 77,000 mt (17%) higher than the previous record in 1998 (462,786 mt). The WCP–CA bigeye catch for 2008 (157,054 mt – 6%) was the second highest on record (slightly lower that the record catch taken in 2004–157,173 mt), mainly due to a relatively high estimated bigeye catch from the purse seine fishery[1]. The 2008 WCP–CA albacore[1] catch (95,043 mt [4%] was the lowest for over ten years, with reduced catches experienced in both the South and North Pacific fisheries in 2008 compared to recent years.

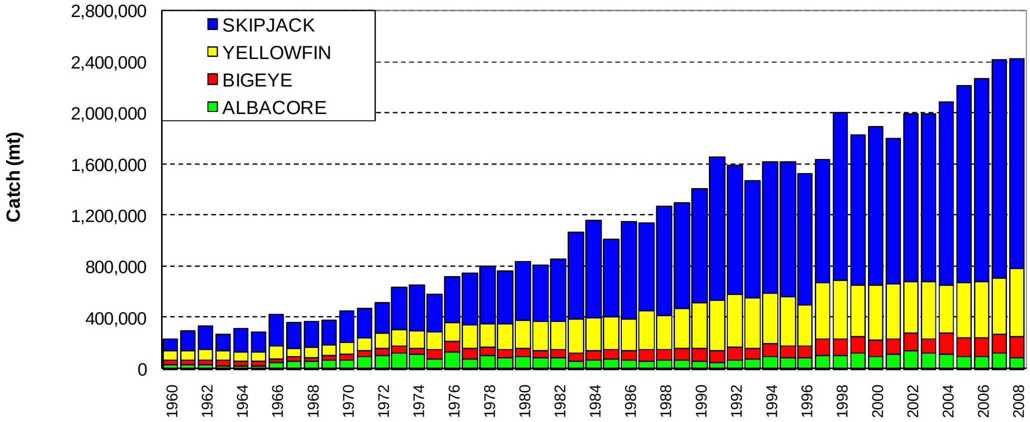

Figure 3. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

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[1] although observer data for 2008, used to estimate the purse-seine bigeye tuna catch, are very preliminary

[1] includes catches of North and South Pacific albacore in the WCP–CA, which comprised 76% of the total Pacific Ocean albacore catch of 125,177 mt in 2008; the section 7.4 “Summary of Catch by Species - Albacore” is concerned only with catches of South Pacific albacore, which make up approximately 40% of the Pacific albacore catch.

3 WCP–CA PURSE SEINE FISHERY

3.1 Historical Overview

During the mid-1980s, the purse seine fishery (400,000-450,000 mt) accounted for only 40% of the total catch, but has grown in significance to a level now contributing around 74% of total tuna catch volume (close to 1,800,000 mt – Figure 2). The majority of the historic WCP–CA purse seine catch has come from the four main DWFN fleets – Japan, Korea, Chinese-Taipei and USA, which numbered 147 vessels in 1995, declined to a low of 111 vessels in 2006 before increasing to 130 vessels in 2008[2]. In contrast, Pacific Islands fleets peaked in 2005 (75 vessels) but have dropped back to 59 vessels in 2008 (Figure 4). The remainder includes a large number of smaller vessels in the Indonesian and Philippines domestic fisheries, and a variety of other domestic and foreign fleets, including several relatively recent distant-water entrants into the tropical fishery (e.g. China, New Zealand and Spain).

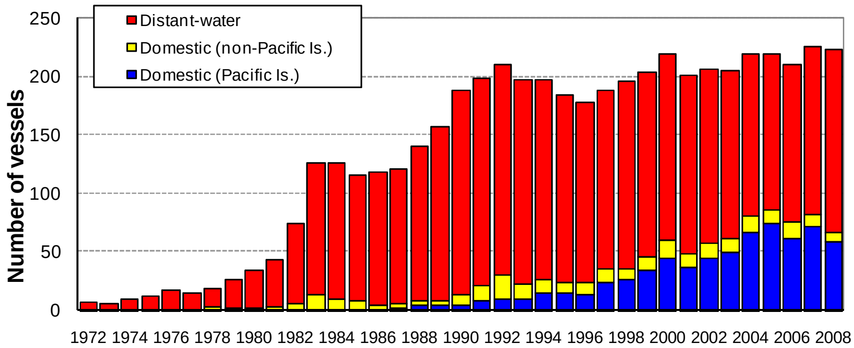

Figure 4. Number of purse seine vessels operating in the WCP–CA
(this does not include the Japanese Coastal purse seine fleet and the Indonesian and Philippines domestic purse-seine/ringnet fleets which account for over 1,000 vessels)

The WCP–CA purse-seine fishery is essentially a skipjack fishery, unlike those of other ocean areas. Skipjack generally account for 70–85% of the purse seine catch, with yellowfin accounting for 15–30% and bigeye accounting for only a small proportion (Figure 5). Small amounts of albacore tuna are also taken in temperate water purse seine fisheries in the North Pacific.

Features of the purse seine catch by species during the past decade include:

- Annual skipjack catches fluctuating between 600,000 and 800,000 mt prior to 1998, a significant increase in the catch during 1998, with catches now maintained well above 1,000,000 mt;
- Annual yellowfin catches fluctuating considerably between 115,000 and 270,000 mt. The proportion of yellowfin in the catch is generally higher during El Niño years and lower during La Niña years (for example, 1995/96 and to a lesser extent 1999/2000);
- Increased bigeye tuna purse seine catches, (e.g. 41,628 mt in 1997 and 37,775 mt in 2000) coinciding with the introduction of drifting FADs (since 1996). In the period 2001–2006, bigeye catches were generally lower, but the provisional catch estimate for bigeye in 2008 (42,782 mt) was the highest on record.

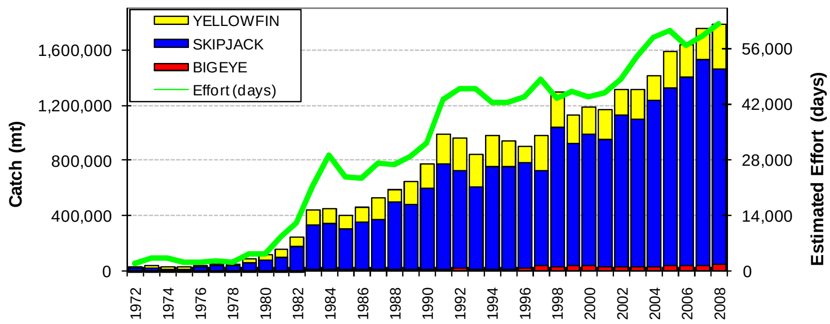

Figure 5. Purse seine catch (mt) of bigeye, skipjack and yellowfin and estimated fishing effort (days fishing and searching) in the WCP–CA

Total estimated effort tends to track the increase in the catch over time (Figure 5), with years of exceptional catches apparent when the effort line overlays the histogram bar (i.e. in 1998 and 2006-2008).

[2] The recent increase is mainly due to newly-flagged US vessels. The number of vessels by fleet in 1995 was Japan (31), Korea (30), Chinese-Taipei (42) and USA (44) and in 2008 the number of vessels by fleet was Japan (36), Korea (28), Chinese Taipei (34) and USA (32).

3.2 Provisional catch estimates, fleet size and effort (2008)

The provisional **2008 purse-seine catch of 1,783,669 mt** was the fifth consecutive record for this fishery but only 23,000 mt higher than the previous record in 2007. The 2008 purse-seine skipjack catch (1,409,921 mt – 79% of the total catch) was clearly lower than the record catch of 2007, although the purse-seine skipjack catch has now increased by more than 500,000 mt (or 59%) since 2001 (919,410 mt), at an average of about 70,000 mt per year. The 2008 purse-seine catch of yellowfin tuna (325,904 mt – 18%) was clearly the highest on record – the 2008 yellowfin catch was more than 95,000 mt (40%) higher than in 2007, and 65,000 mt (25%) higher than the previous record taken in 1998. The provisional catch estimate for bigeye tuna for 2008 (46,811 mt –3%) was also the highest on record but may be revised once all observer data for 2008 have been received and processed[3].

Figure 6 compares annual purse seine effort and catches for the five main purse seine fleets operating in the tropical WCP–CA in recent years. The combined 2008 catch and effort for these fleets was the highest ever. The Chinese-Taipei fleet had been the highest producer in the tropical purse seine fishery until 2004, when surpassed by the combined Pacific Islands purse seine fleets fishing under the FSM Arrangement; from 2006-2007, the Korean and FSM Arrangement fleets were the highest producers, but there has been a notable decline in the FSM Arrangement fleet catch and effort due to a reduction in the number of vessels (some vessels reflagged to the US purse-seine fleet). The fleet sizes and effort by the Japanese and Korean purse seine fleets have been relatively stable for most of this time series. Several Chinese-Taipei vessels re-flagged in 2002, dropping the fleet from 41 to 34 vessels, with fleet numbers stable since. The increase in annual catch by the FSM Arrangement fleet until 2005 corresponded to an increase in vessel numbers, and coincidently, mirrors the decline in US purse seine catch, vessel numbers and effort over this period. However, as noted above, the US purse-seine fleet commenced a significant rebuilding phase in late 2008, with vessels numbers in mid-2008 close to double that of recent years. The increase in vessel numbers in the US purse seine fleet is reflected in the sharp increase in their catch and effort during 2008, which is now in line with the other major purse seine fleets.

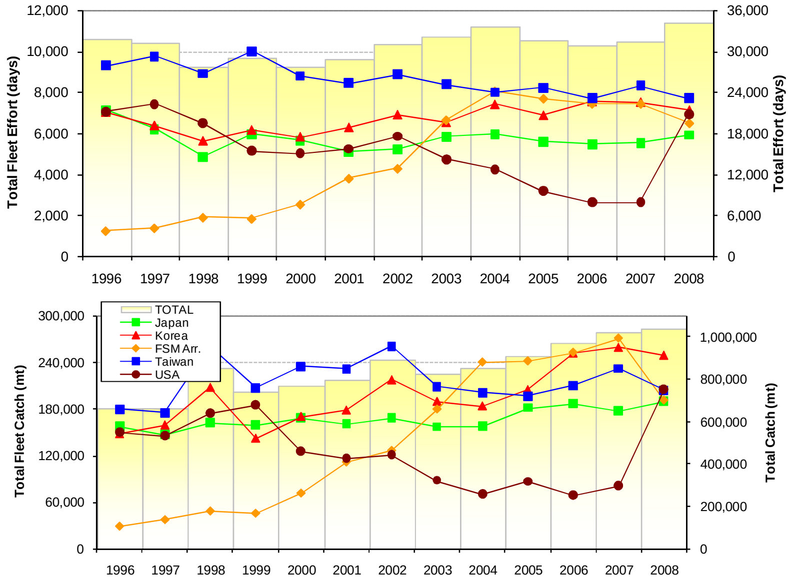

Figure 6. Trends in annual effort (top) and catch (bottom) estimates for the top five purse seine fleets operating in the tropical WCP–CA, 1996–2008.

The total number of Pacific-island domestic vessels has now dropped back to 59 vessels after a period of sustained growth over more than a decade – at its' peak, there were 75 vessels (2005) in this category. The Pacific-islands purse seine fleets comprise vessels fishing under the FSM Arrangement (28 vessels in 2008), the Vanuatu fleet operating under bilateral arrangements (5 vessels) and domestic vessels operating in PNG and Solomon Islands waters. The FSM Arrangement fleet comprises vessels managed by the Pacific Island "Home Parties" of PNG (16 vessels), the Marshall Islands (5 vessels), FSM (3 vessels), Kiribati (1 vessels) and the Solomon Islands (3 vessels) which fish over a broad area of the tropical WCP–CA.

The domestic Philippine purse-seine and ring-net fleets operate in Philippine and northern Indonesian waters, and have taken a combined catch of around 200,000 t. in recent years (OFP, 2009a). The domestic Indonesian

[3] Purse-seine bigeye catches have been adjusted to account for the mis-identification of bigeye as yellowfin in operational catch data and reports of unloadings by a process which uses observer data (see Lawson, 2007 and Lawson, 2008).

purse-seine and ring-net fleets take a similar catch level which means that between 20-25% of the WCP-CA purse seine catch now comes from the waters of these countries.

Figure 7 shows the annual trends in the school types set on by the major purse-seine fleets. The proportion of sets on free-swimming (unassociated) schools of tuna was the predominant set type for all of the main purse-seine fleets during 2008 and, in total, this set type accounted for 63% of all sets for these fleets. There was a notable decline in the number of sets on logs (overall only 11% of sets) with a clear increase in the number of sets on drifting FADs (overall, 25%, the highest since 2000). All purse-seine fleets showed increases in setting with drifting FADs during 2008, except the US fleet, which perhaps reflected a different fishing strategy employed by their new vessels.

Preliminary review of available observer data for the period 2004-2007 shows similar trends in effort by flag and set type when compared to the logsheet data (OFP, 2009b).

3.3 Distribution of fishing effort and catch

The purse seine catch distribution in tropical areas of the WCP–CA is strongly influenced by El Nino–Southern Oscillation Index (ENSO) events.
Figure 8 demonstrates the effect of ENSO events on the spatial distribution of the purse-seine activity, with fishing effort typically distributed further to the east during El Nino years and a contraction westwards during La Nina periods.

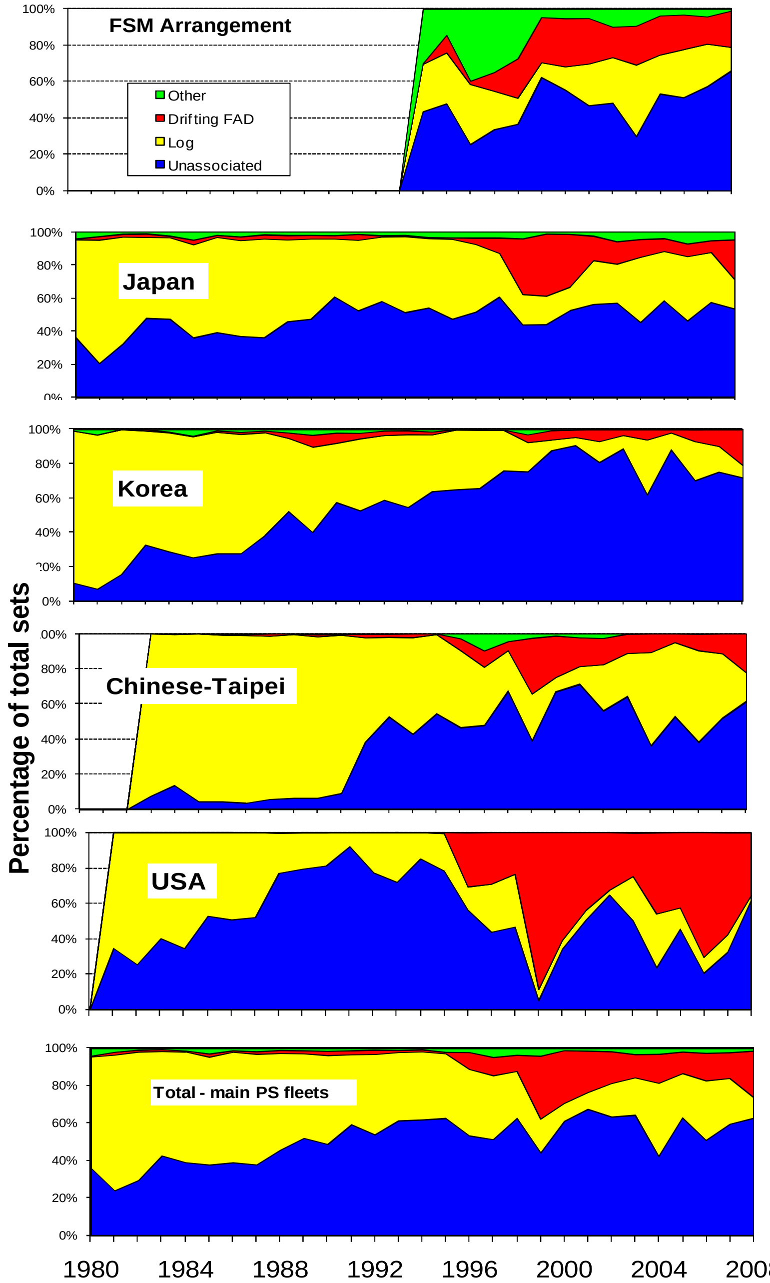

Figure 7. Time series showing the percentage of total sets by school type for the major purse-seine fleets operating in the WCP–CA.

The WCP–CA experienced an ENSO-transitional (or neutral) period during 2001 (Williams and Terawasi, 2008), an El Nino period during 2002 and into the first quarter of 2003, followed by a return to an ENSO-transitional (neutral) period for the remainder of 2003. The ENSO-neutral state continued into the first half of 2004 and then moved to a weak El Nino state in the second half of 2004. During 2005, the WCP–CA was generally in an ENSO-neutral state, moving from a weak El Niño in the early months of 2005 through to a weak La Nina-state by the end of 2005.

The weak La Nina established at the end of 2005 continued into the first part of 2006, but soon dissipated and a weak El Nino event then presided over the remainder of 2006. During the first half of 2007, the WCP–CA was in an ENSO-neutral state, but then moved into a well-established La Nina state, which persisted throughout the rest of 2007 and the most of 2008. As was the case in 2007, fishing activity during 2008 remained concentrated in the PNG, FSM and Solomon Islands area and was restricted from extending east beyond the 175°E longitude (compared to activity in recent years) due to cooler surface water flowing in from the east, in line with the prevailing ENSO conditions. The extension of the warmer pool of water in the eastern areas just north of the equator during 2002-2004 is clearly absent during 2008 (Figure 8 – left).

The distribution of effort by set type Figure 8 (right) for the past seven years shows that the establishment of the El Nino event during 2002 resulted in a higher proportion of log-associated sets east of 160°E than in 2001 when drifting FADs were used to better aggregate schools of tuna in the absence of logs, and/or where unassociated schools were not as available in this area. The reduction in the use of drifting FAD sets during 2004-2006 was probably related to the displacement of effort further west to an area where free-swimming and log-associated tuna schools were more available to purse seine fleets, and therefore less of a need to use drifting FADs. There was a significant increase in the number of log sets made during 2004 suggesting that, for one reason or another, more logs had moved into the main fishing area and had successfully aggregated tuna schools. There was a notable increase in the number of Drifting FAD sets in 2008 which probably resulted from a reduction in the availability of logs and/or a situation where schools were not as available on logs and drifting FAD fishing was more favourable. In general, the proportion of sets by set type to the east of 170°E appears to depend on the availability of free-swimming schools (there were more available during 2005 than in 2004 and 2006, for example), the extension of the warm pool (related to ENSO conditions) and/or whether drifting FAD sets are viable.

Figure 9 through 13 show the distribution of purse seine effort for the five major purse seine fleets during 2007 and 2008. The distribution of effort for all fleets in 2008 was very similar to that of 2007. The increase in effort by the US fleet during 2008 is evident, although the distribution pattern of effort has not changed significantly and continues to extend into the far eastern areas of the WCP-CA (i.e. the area from the Phoenix to Line Islands) (Figure 13 – right). The FSM Arrangement fleet tends to fish in a similar area to the Asian fleets, although there is also activity in the home waters of some vessels (Figure 9).

Figure 14 shows the distribution of catch by species for the past seven years, Figure 15 shows the distribution of skipjack and yellowfin catch by set type for the past seven years, and Figure 16 shows the distribution of estimated bigeye catch by set type for the past seven years. The distribution and proportion of skipjack and yellowfin in the purse-seine catch has been relatively consistent over the past three years (Figure 14–left).

Unassociated sets tend to account for a higher proportion of the total yellowfin catch in the area to the east of 160°E than they do for the total skipjack catch. Higher proportions of yellowfin in the overall catch (by weight) usually occur during El Nino years as fleets have access to "pure" schools of large yellowfin that are more available in the eastern tropical areas of the WCP–CA. However, a significant yellowfin catch was taken in the purse seine fishery during 2008, which was a La Nina year, and it appears that most of the yellowfin catch comprised large fish taken in the area 0°-5°S, 150°E-180° (see Figure 14–right and Section 7.3). The displacement of the cold-water tongue from the eastern Pacific further to the west during 2008 (see Figure 8–left–"2008") may have provided conditions (e.g. a shallower surface-mixed layer) conducive to catching large yellowfin in some of these areas.

In contrast to yellowfin, associated-school sets usually account for a higher proportion of the skipjack and bigeye catch in the respective total catch of each species (Figure 15–left and Figure 16). During 2008, the number of drifting FADs sets was less than half the number of sets on unassociated, free-swimming schools, but the skipjack catch for each of these set types was of a similar magnitude, and the catch of bigeye was higher from drifting-FAD sets. The estimated proportion of bigeye in the "yellowfin plus bigeye" catch tends to be dominated by anchored FADs and logs in the area to the west of 160°E, and drifting FAD sets in the area to the east of 160°E (Figure 16), although there are certain conditions conducive to relatively large unassociated-school catches of bigeye in the east (for example, during 2002 in the Line Group, and during 2008 in the Gilberts – see Figure 16). The distribution of the estimated bigeye catch by set type for 2008 is based on very few observer data and should be treated as provisional at this stage.

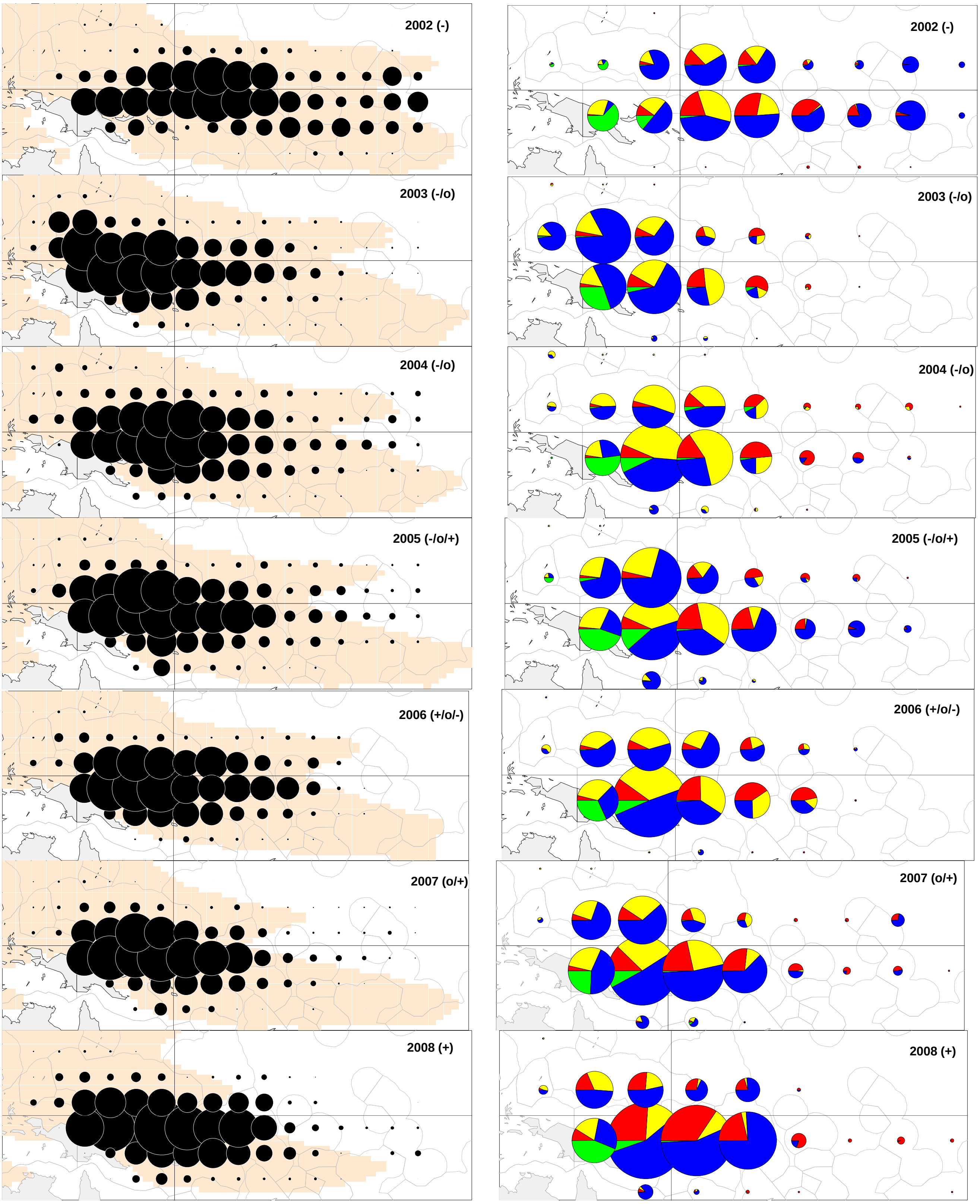

Figure 8. Distribution of purse-seine effort (days fishing – left; sets by set type – right), 2002–2008. (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

Pink shading represents the extent of average sea surface temperature > 28.5°C

ENSO periods are denoted by "+": La Niña; "-": El Niño; "--": strong El Niño; "o": transitional period.

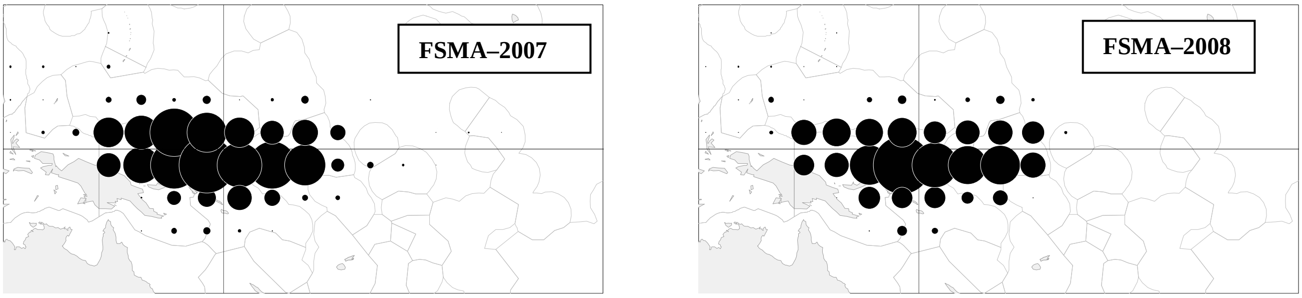

Figure 9. Distribution of effort by fleets operating under the FSM Arrangement during 2006 and 2008
lines for the equator (0° latitude) and 160°E longitude included.

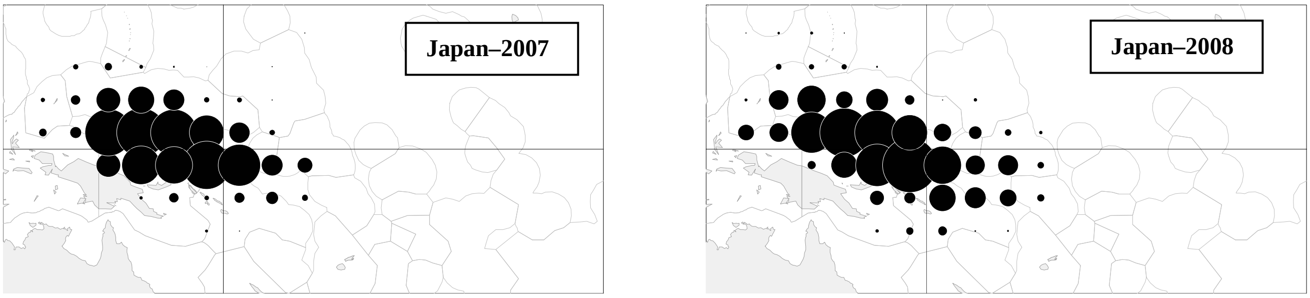

Figure 10. Distribution of effort by the Japanese purse seine fleet during 2006 and 2008
lines for the equator (0° latitude) and 160°E longitude included.

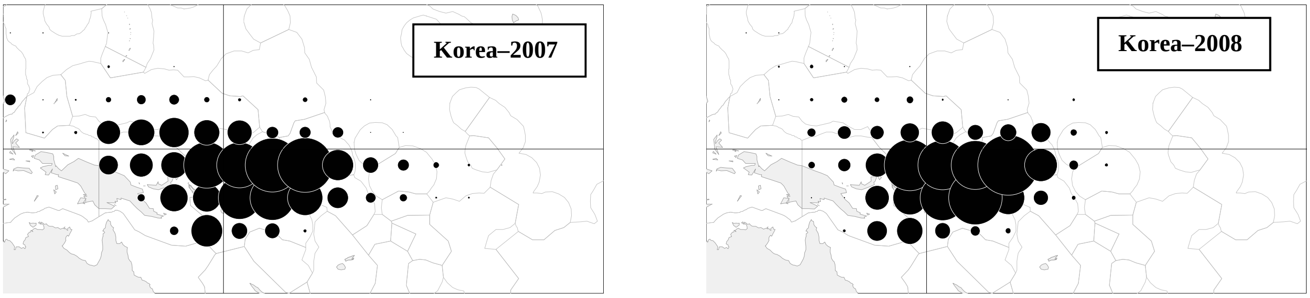

Figure 11. Distribution of effort by the Korean purse seine fleet during 2006 and 2008
lines for the equator (0° latitude) and 160°E longitude included.

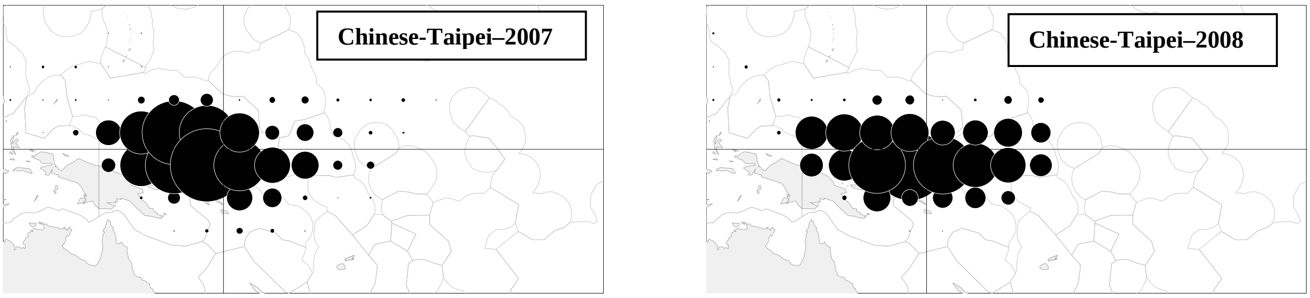

Figure 12. Distribution of effort by the Chinese-Taipei purse seine fleet during 2006 and 2008
lines for the equator (0° latitude) and 160°E longitude included.

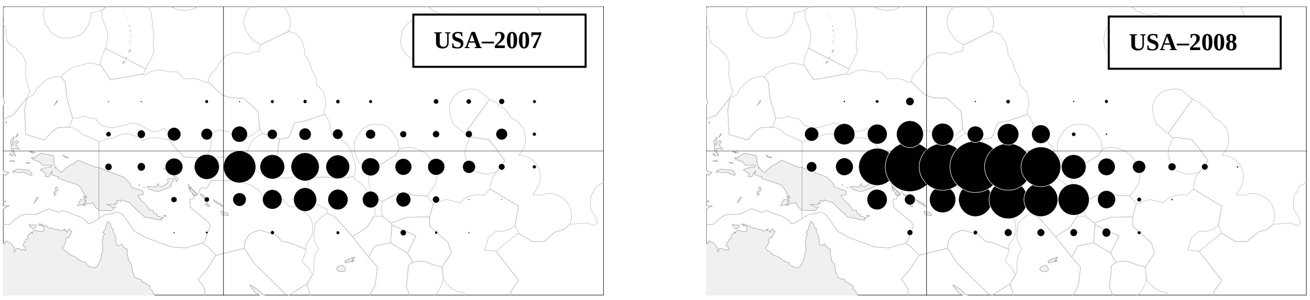

Figure 13. Distribution of effort by the US purse seine fleet during 2007 and 2008
lines for the equator (0° latitude) and 160°E longitude included.

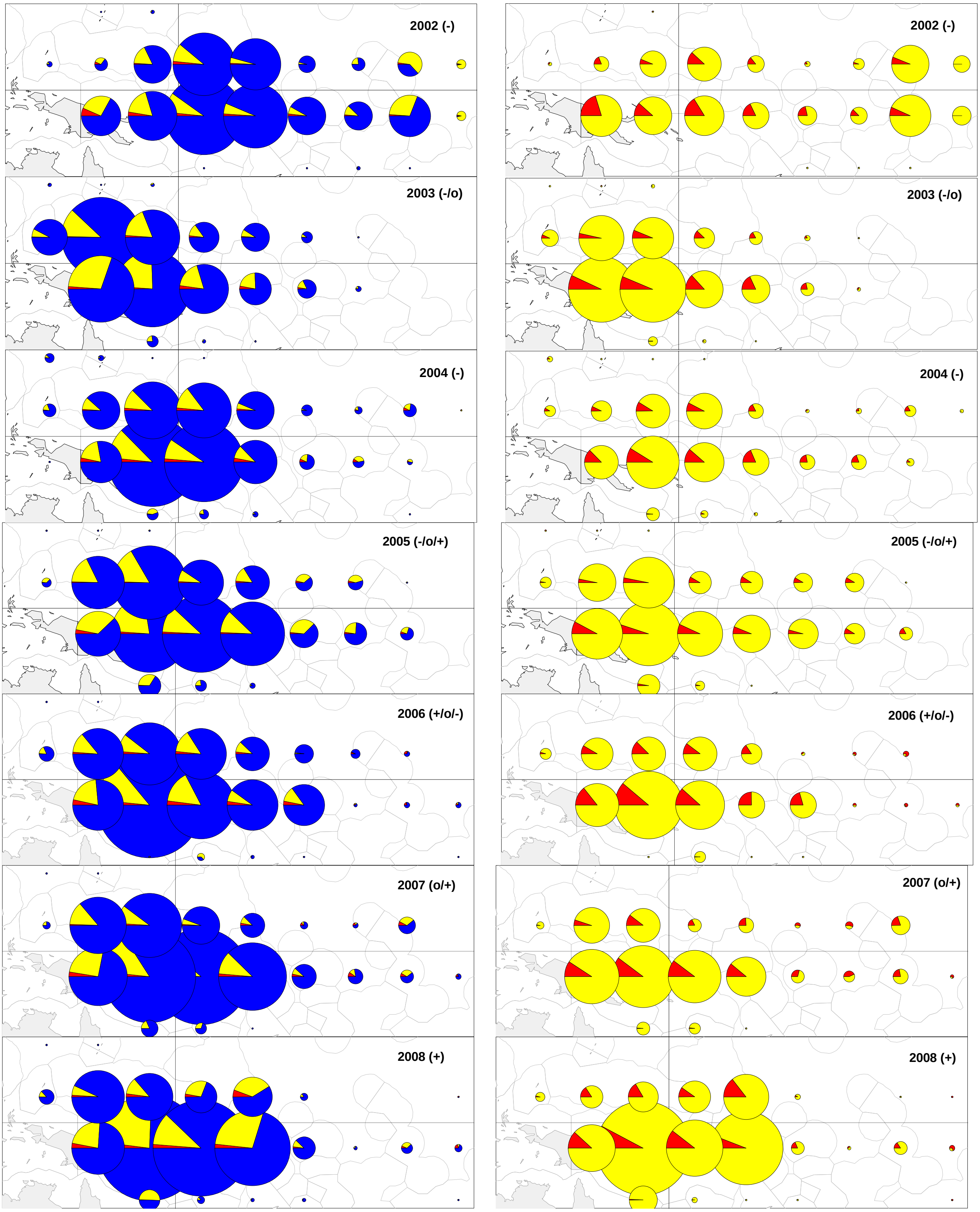

Figure 14. Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch (left) and purse-seine yellowfin/bigeye tuna catch only (right), 2002–2008 (Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).

ENSO periods are denoted by "+": La Niña; "-": El Niño; "--": strong El Niño; "0": transitional period.
Estimates of bigeye catch for 2008 are provisional.

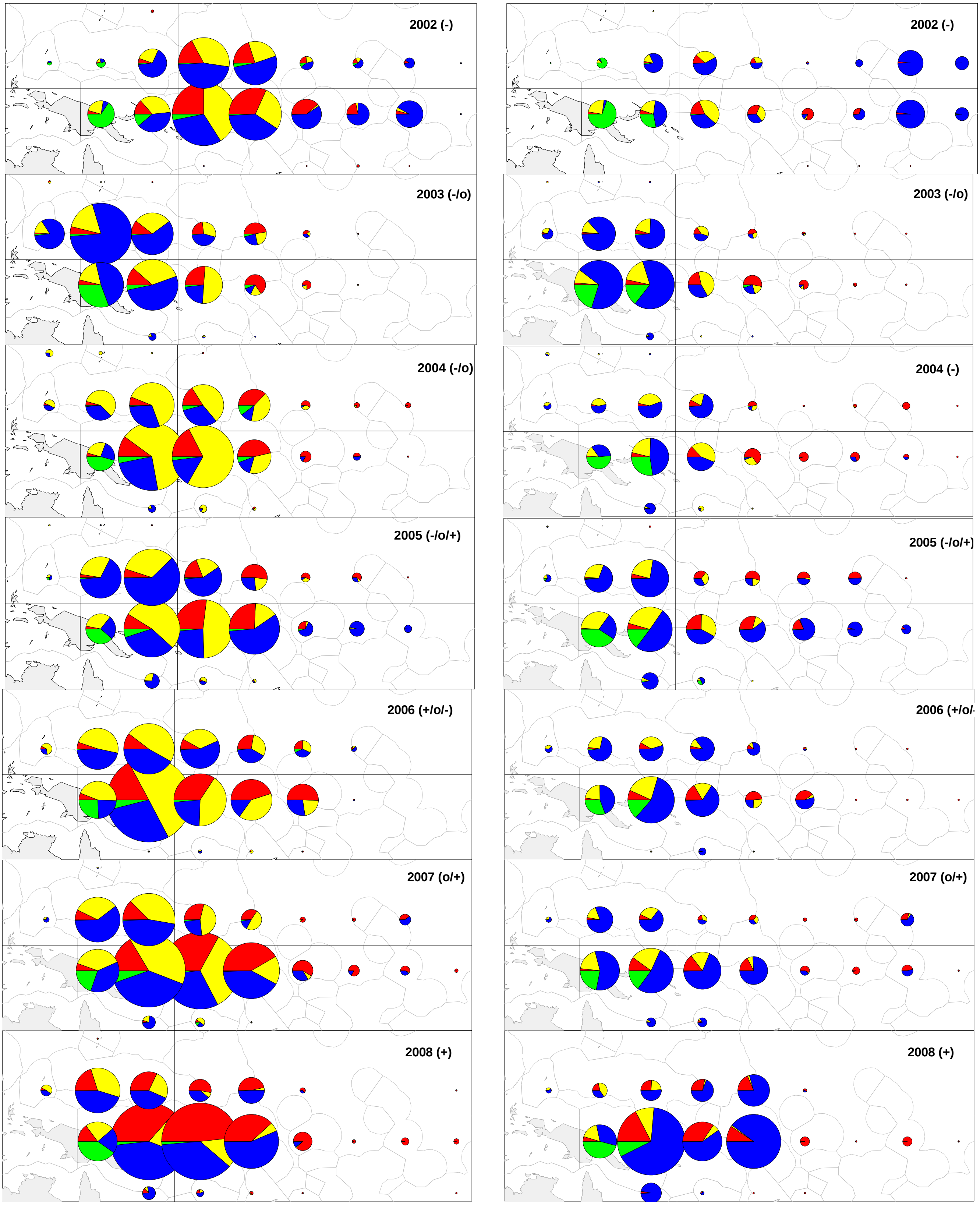

Figure 15. Distribution of skipjack (left) and yellowfin (right) tuna catch by set type, 2002–2008 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

ENSO periods are denoted by "+": La Niña; "-": El Niño; "--": strong El Niño; "o": transitional period.
Sizes of circles for all years are relative for that species only.

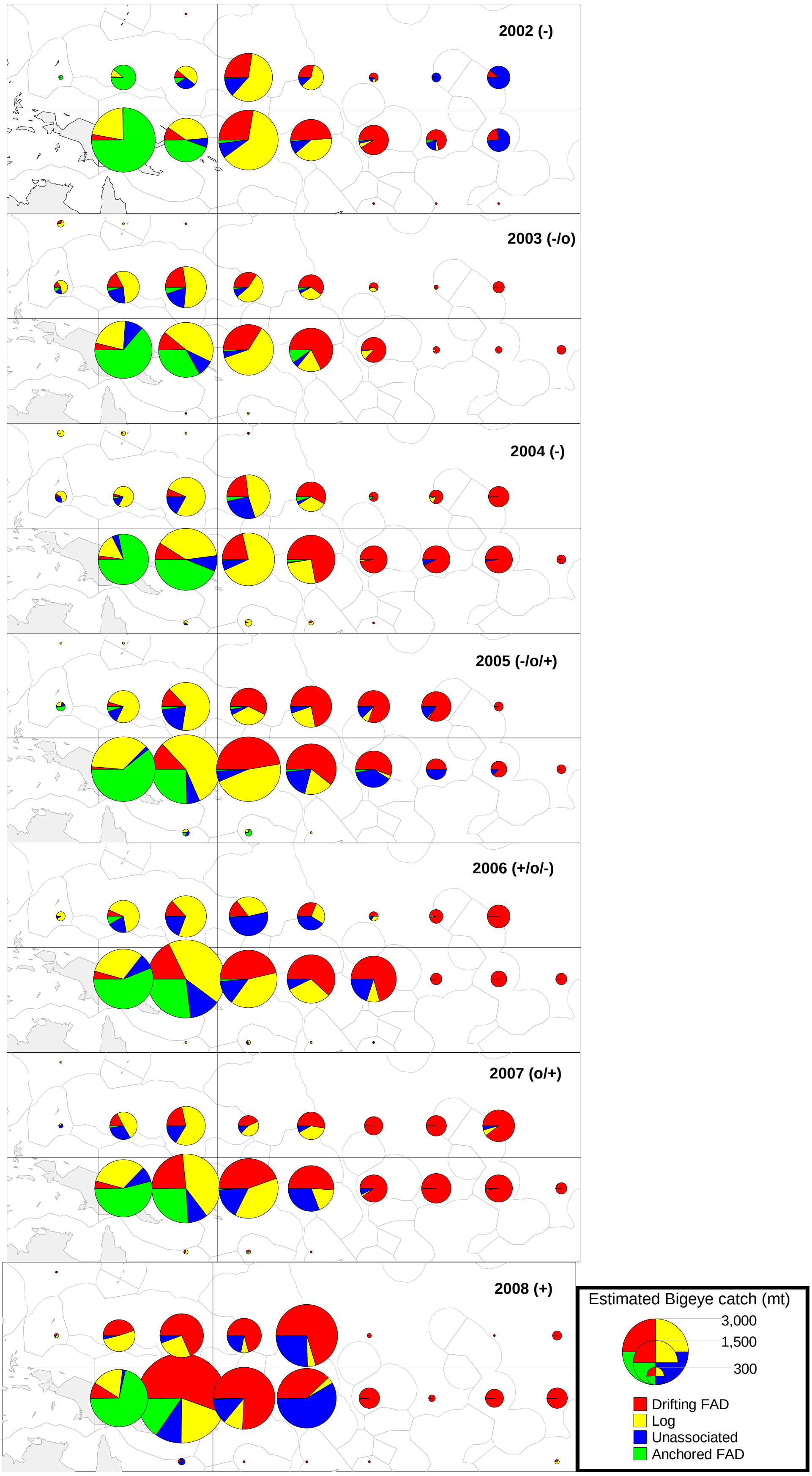

Figure 16. Distribution of estimated bigeye tuna catch by set type, 2002–2008 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

ENSO periods are denoted by "+": La Niña; "-": El Niño; "--": strong El Niño; "0": transitional period.

Estimates of bigeye catch for 2008 are provisional.

3.4 Catch per unit of effort

Figure 17 shows the annual time series of CPUE by set type and vessel nation for skipjack (left) and yellowfin (right). Purse-seine skipjack CPUE for unassociated and drifting FAD sets dropped for all of the major fleets in 2008, with increases for log-associated schools of skipjack for the US and Korean fleets. The overall skipjack CPUE during 2008 was not as high as the record levels of 2007, but with a similar level to that experienced in 2005-2006, and with a higher level of effort (Figure 5), the overall catch remained high. Contrary to the period 2000–2004, the skipjack CPUE for the US fleet has returned to the level of the other major fleets in recent years. As mentioned in the previous section, the overall skipjack catch from drifting FAD sets is at least 50% higher than that taken from unassociated, free-swimming school sets.

Yellowfin purse-seine CPUE is characterised by strong inter-annual variability and differences among the fleets. School-set CPUE is strongly related to ENSO variation in the WCP–CA, with CPUE generally higher during El Niño episodes. This is believed to be related to increased catchability of yellowfin tuna due to a shallower surface-mixed layer during these periods. ENSO variability is also believed to impact the size of yellowfin and other tuna stocks through impacts on recruitment. Associated (log and drifting FAD) sets generally produce higher catch rates (mt/day) for skipjack than unassociated sets, yet unassociated sets produce a higher catch rate for yellowfin than associated sets. This is mainly due to unassociated sets in the eastern areas of the tropical WCP–CA taking large, adult yellowfin, which account for a larger catch (by weight) than the (mostly) juvenile yellowfin encountered in associated sets.

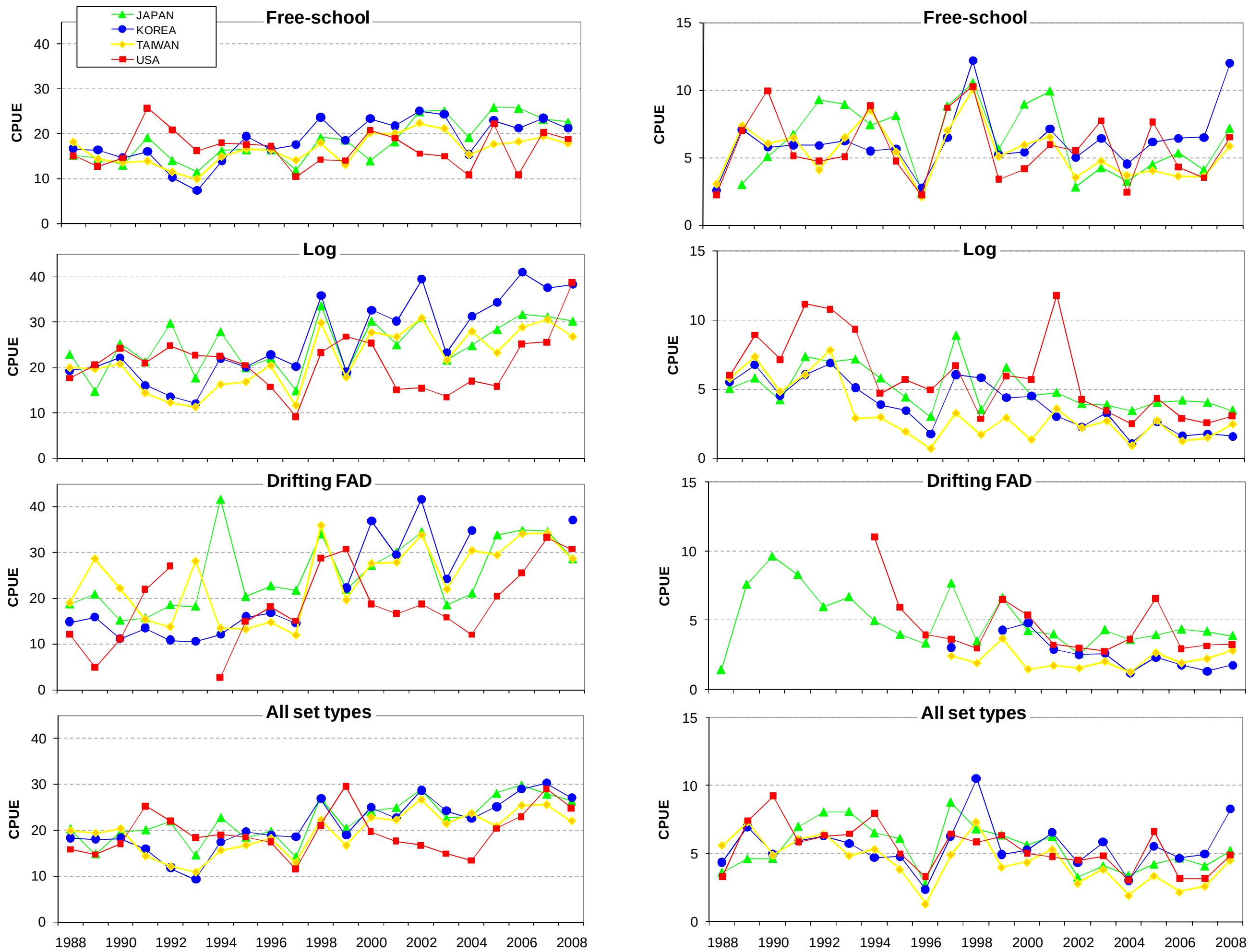

Figure 17. Skipjack tuna CPUE (mt per day–left) and Yellowfin tuna CPUE (mt per day–right) by set-type, and all set types combined, for selected purse-seine fleets fishing in the tropical WCP–CA.
Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.

The Yellowfin CPUE for unassociated school sets in 2008 was clearly higher than in recent years (Figure 17), which would not normally be the case in a La Nina year, but as mentioned in the previous section, certain conditions (e.g. a shallower surface-mixed layer) may have been conducive to catching large yellowfin in some areas.

The trend in total skipjack CPUE over this time series (Figure 17) is clearly upwards and related to increased abundance and improved efficiency in fishing strategy and technological advances in equipment used to better locate schools of tuna. In contrast, the trend in total yellowfin tuna CPUE is clearly downwards over the period 1998–2004; since the very low yellowfin CPUE experienced in 2004, there is some indication of an upward trend for these fleets (Figure 17–right).

The difference in the time of day that sets are undertaken is thought to be one of the main reasons why bigeye tuna are rarely taken in unassociated schools compared to log and drifting FAD schools, which have catch rates an order of magnitude higher (Figure 18). The trends in estimated bigeye tuna CPUE are similar to the trends in yellowfin tuna CPUE to a certain extent, bearing in mind that the 2008 estimates are provisional.

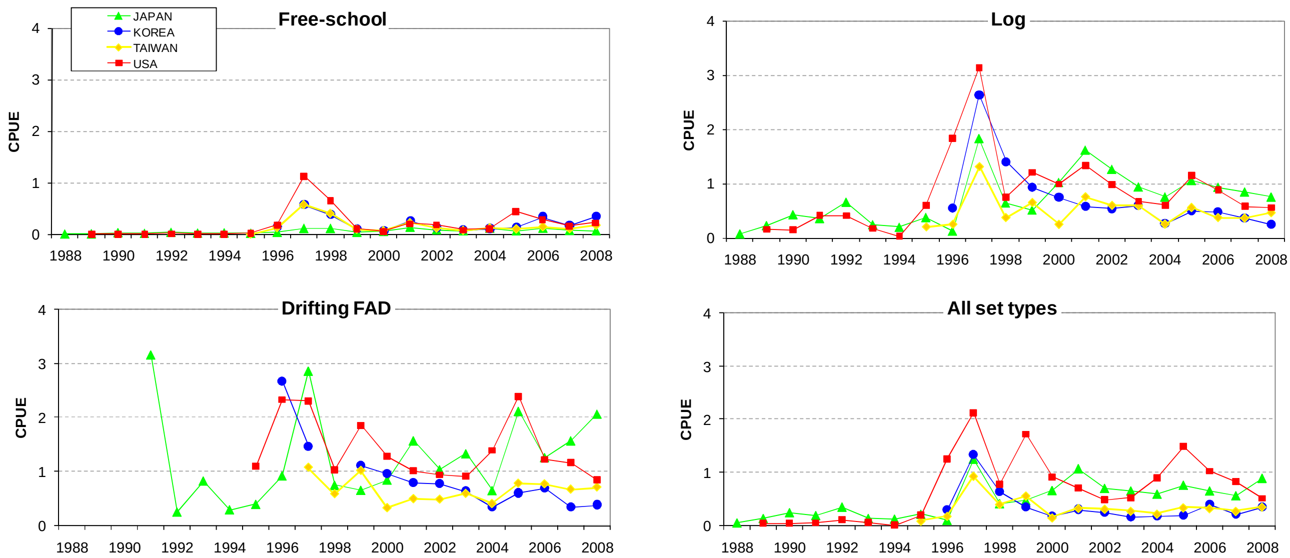

Figure 18. Estimated Bigeye tuna CPUE (mt per day) by major set-type categories (free-school, log and drifting FAD sets) and all set types combined for Japanese, Korean, Chinese-Taipei and US purse seiners fishing in the tropical WCP–CA.

Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.

Estimates of bigeye catch for 2008 are provisional.

3.5 Seasonality

Figure 19 shows the seasonal average CPUE for skipjack (left) and yellowfin (right) in the purse seine fishery for the period 2000–2008, and Figure 20 shows the distribution of catch by species and quarter for the period 2000-2007 contrasting with seasonal catch in 2008. Over the period 2000–2007, the average monthly skipjack CPUE was highest from February–May which is in contrast to the yellowfin CPUE, which was at its lowest during the early part of the year, but gradually increased towards the end of the year. This situation corresponds to the extension east of the fishery in the second half of the year (Figure 20), to an area where schools of large yellowfin are thought to be more available than areas to the west due to, *inter alia*, a shallower surface-mixed layer. The monthly skipjack CPUE for 2008 tended to be above the 2000-2007 average for the first six months, then below average for the remainder of the year. The monthly Yellowfin tuna CPUE for the first six months of 2008 closely tracked the 2000–2007 average, but then moved to very high, record levels for the remaining months of the year. As noted in Section 3.3, fishing activity and catches were generally restricted to the western and central areas of the tropical WCP-CA during 2008 compared to the average 2000-2007 situation and this is evident in Figure 20. High yellowfin catches were clearly evident in some areas for the third and fourth quarters of 2008 (Figure 20 – right) and possibly related to favourable environmental conditions.

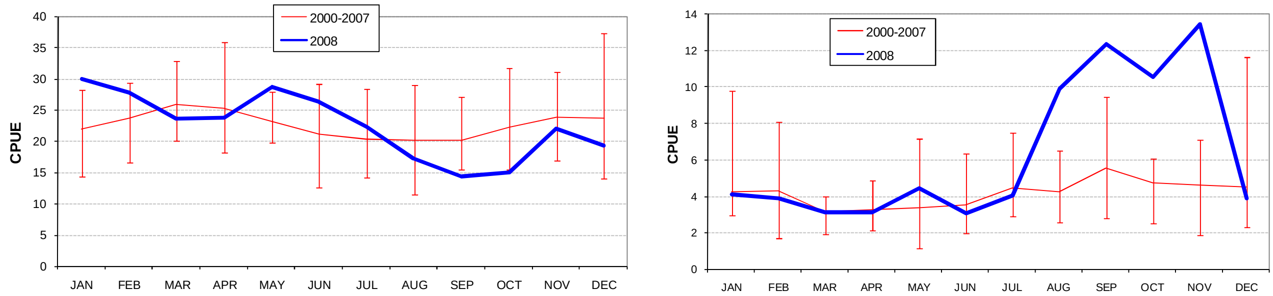

Figure 19. Average Monthly Skipjack (left) and Yellowfin (right) tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2000–2008.
Red line represents the period 2000–2007 and the blue line represents 2008.
The bars represent the extent (i.e. minimum and maximum) of monthly values for the period 2000–2007.

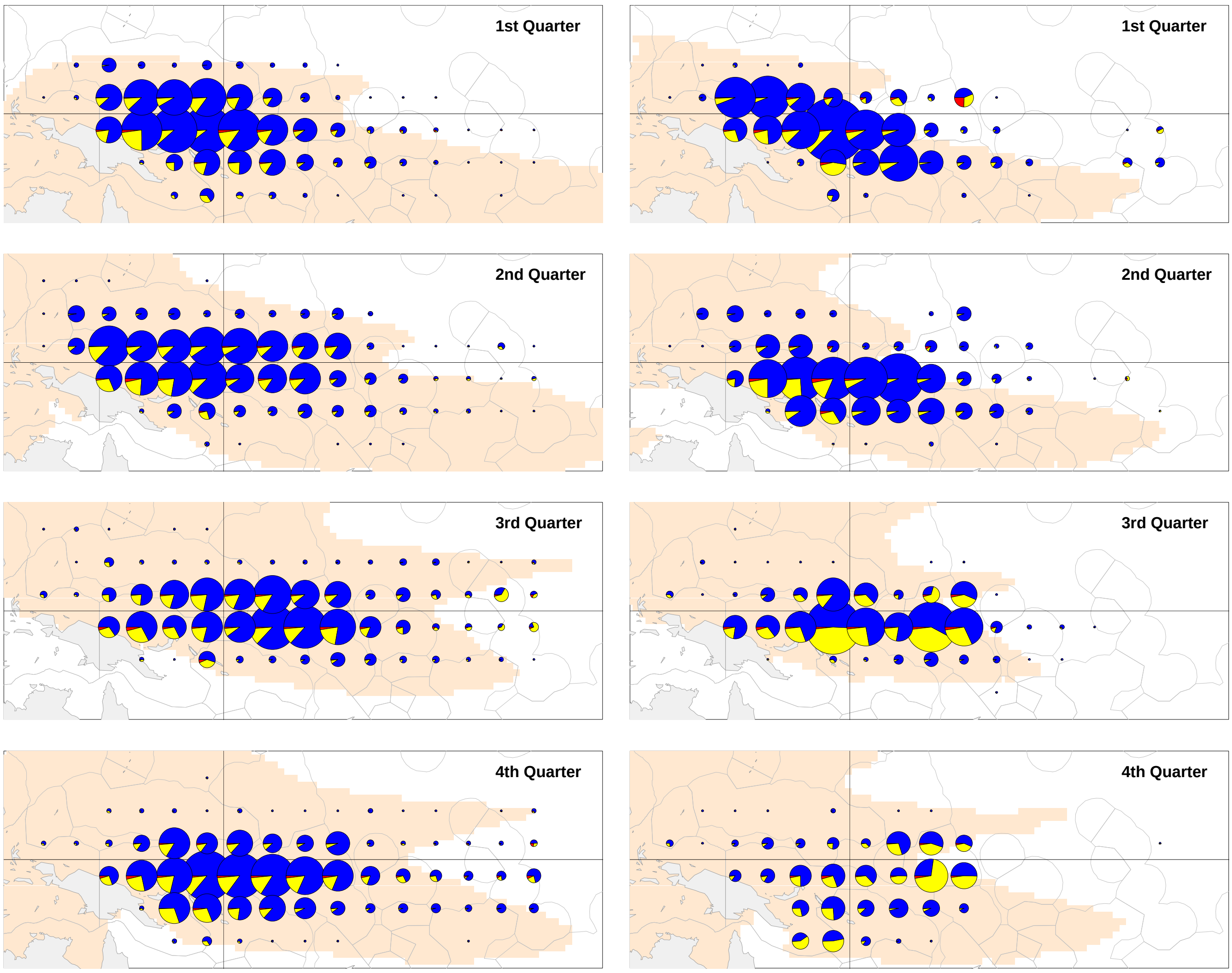

Figure 20. Quarterly distribution of purse-seine catch by species for 2000–2007 (left) and 2008 (right).
(Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye)
Pink shading represents the extent of average sea surface temperature > 28.5°C by quarter for the period 2000–2007 (left) and 2008 (right)

3.6 Economic overview of the purse seine fishery

3.6.1 Price trends – Skipjack

Skipjack prices continued the strong uptrend that began in 2007 and reached record levels around mid-2008 with Bangkok benchmark skipjack prices (4-7.5lbs, c&f) at US$1,920/Mt and Yaizu prices at US$1,929/Mt. The uptrend follows from similar trends in global food and oil prices as well as shortages in skipjack supplies. The uptrend contrasts the preceding years trends when between 1997 and 2001 prices plummeted to their lowest with only modest recoveries between 2001 and 2006.

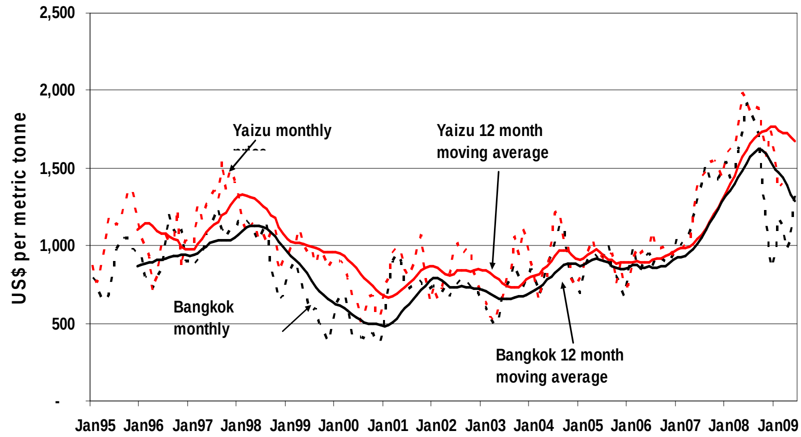

Figure 21. Skipjack prices, Bangkok (4-7.5lbs, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

Note: The Bangkok prices shown in the above figure are indicative figures only. They reflect estimates of the mid-point of prices paid during the respective month based on information received from a range of sources

By the start of the third quarter of 2008, however, skipjack prices trended down sharply again with Bangkok prices reaching a low of US$860/Mt by December and Yaizu prices US$1,573/Mt in November.

Skipjack average prices in 2008 were at record levels with Bangkok prices averaging US$1,543/Mt while Yaizu prices averaged US$1,768/Mt[4]. The respective averages in 2007 were US$1,280/Mt and US$1,287/Mt.

Over the first half of 2009 the monthly skipjack prices have recovered moderately. Bangkok prices (4-7.5lbs, c&f) have increased to US$1,356/Mt in June.

3.6.2 Price trends – Yellowfin

The price trends for purse seine caught yellowfin also displayed noticeable uptrend over the first half of 2008, a continuation of that in 2007, followed by sharp declines in the third quarter although there has been some recovery in the first half of 2009.

Bangkok yellowfin prices (20lbs and up, c&f) in 2008, averaged US$1,969/Mt (US$1,773/Mt in 2007) with averages of US$2,155/Mt and US$1,784/Mt in the first and second halves respectively. During the first half of 2009, yellowfin prices averaged US$1,408/Mt.

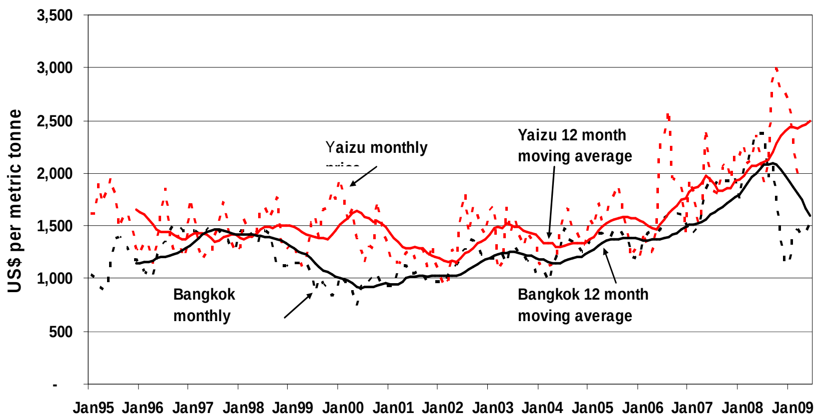

Figure 22. Yellowfin prices, Bangkok (20lbs and up, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

Note: The Bangkok prices shown in the above figure are indicative figures only. They reflect estimates of the mid-point of prices paid during the respective month based on information received from a range of sources

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[4] Where prices are obtained in currencies other than US$ they are converted using inter-bank exchange rates as given by www.oanda.com/convert/fxhistory.

Yaizu purse seine caught yellowfin prices, in US$ terms, averaged US$1,778/Mt in 2008 (US$1,430/Mt in 2007) with the first half of the year average at US$1,788/Mt and the latter half average at US$1,778/Mt. Yaizu average price during the first quarter of 2009 was US$1,295/Mt.

3.6.3 Value of the Purse-seine Catch

As a means of examining the effect of the changes to prices and catch levels, estimate of the "delivered" value of the purse seine fishery tuna catch in the WCPFC Area from 1997 to 2008 are obtained (Figures 23–25). In deriving these estimates certain assumptions were made due to data and other constraints that may or may not be valid and as such caution is urged in the use of these figures.[5]

The estimated delivered value of the purse seine tuna catch in the WCPFC area for 2008 is US$3,124 million that exceeds last year's record level of US$2,393 million. This represents an increase of US$731 million or 41 per cent on the estimated delivered value of the catch in 2007. This increase was driven by a US$496 million (25 per cent) increase in delivered value of the skipjack catch, which is estimated to be worth US$2,491 million in 2008, resulting from a 31 per cent increase in the composite price that more than offset the decline of 4 per cent in the catch. The value of the purse seine yellowfin catch rose even more sharply, by almost 60 per cent, to around US$633 million as a result of a 13 per cent increase in the composite price and a 41 per cent increase in catch.[6]

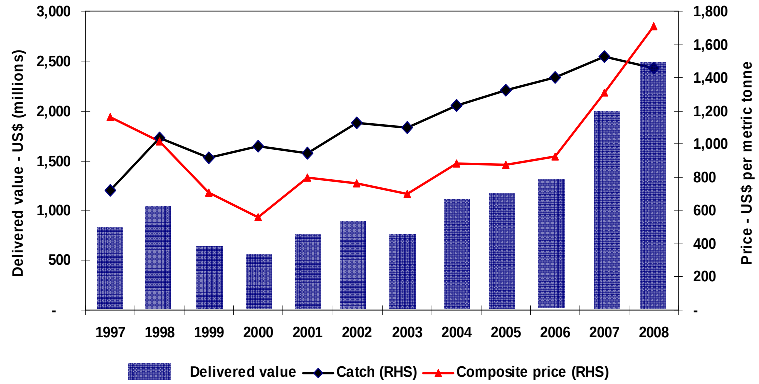

Figure 23. **Skipjack in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price**

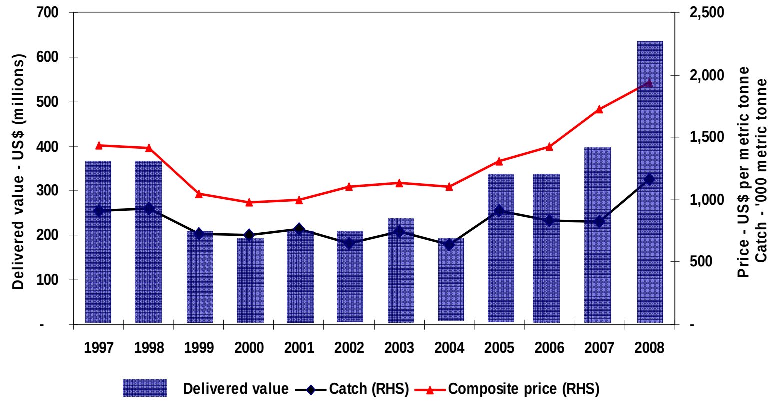

Figure 24. Yellowfin in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

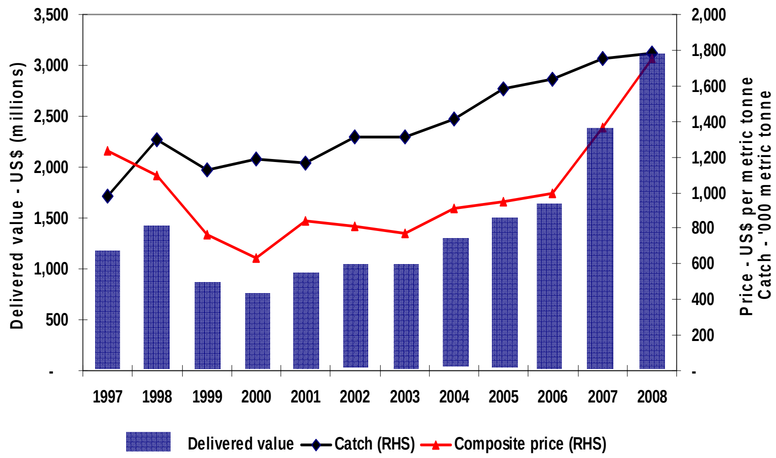

Figure 25. All tuna in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

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[5] The delivered value of each year's catch was estimated as the sum of the product of the annual purse catch of each species, excluding the Japanese purse seine fleet's catch, and the average annual Thai import price for each species (bigeye was assumed to attract the same price as for yellowfin) plus the product of the Japanese purse seine fleet's catch and the average Yaizu price for purse seine caught fish by species. Thai import and Yaizu market prices were used as they best reflect the actual average price across all fish sizes as opposed to prices provided in market reports which are based on benchmark prices, for example, for skipjack the benchmark price is for fish of size 4-7.5lbs.

[6] Further details of the value of tuna catches in WCPFC Convention Area can be obtained from the Forum Fisheries Agency website (www.ffa.int/node/862).

4 WCP–CA POLE-AND-LINE FISHERY

4.1 Historical Overview

The WCP–CA pole-and-line fishery has several components:

- the year-round tropical skipjack fishery, mainly involving the domestic fleets of Indonesia, Solomon Islands and French Polynesia, and the distant water fleet of Japan
- seasonal sub-tropical skipjack fisheries in the home waters of Japan, Australia, Hawaii and Fiji
- a seasonal albacore/skipjack fishery east of Japan (largely an extension of the Japan home-water fishery).

Economic factors and technological advances in the purse seine fishery (primarily targeting the same species, skipjack) have seen a gradual decline in the number of vessels in the pole-and-line fishery (Figure 26[7]) and in the annual pole-and-line catch during the past 15–20 years (Figure 27). The gradual reduction in numbers of vessels has occurred in all pole-and-line fleets over the past decade. Pacific Island domestic fleets have declined in recent years – fisheries formerly operating in Palau, Papua New Guinea and Kiribati are no longer active, only one vessel is now operating (seasonally) in Fiji, and fishing activity in the Solomon Islands fishery has reduced significantly from the level experienced during the 1990s. Several vessels continue to fish in Hawai'i, and the French Polynesian *bonitier* fleet remains active, but more vessels have turned to longline fishing. Provisional statistics also suggest that the Indonesian pole-and-line has also declined over the past decade.

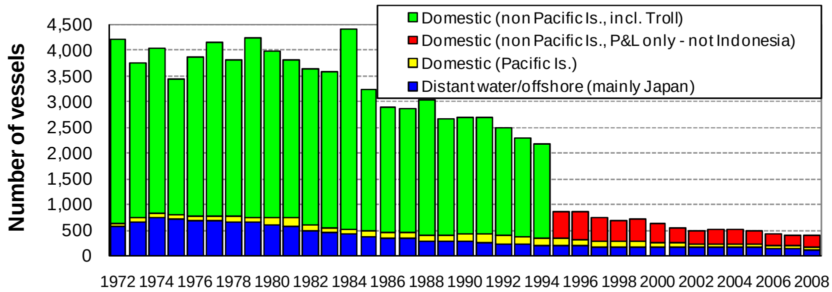

Figure 26. Pole-and-line vessels operating in the WCP–CA
(excludes pole-and-line vessels from the Indonesian domestic fishery)

4.2 Provisional catch estimates (2008)

The 2008 catch estimates for the key pole-and-line fleets operating in the WCP–CA have yet to be provided, although the total catch estimate is expected to show a further decline on levels in recent years. – carrying over the 2007 catch estimates for these key fleets provides a provisional catch for 2008 at 170,805 mt, which is the lowest annual catch for this fishery since the mid-1960s.

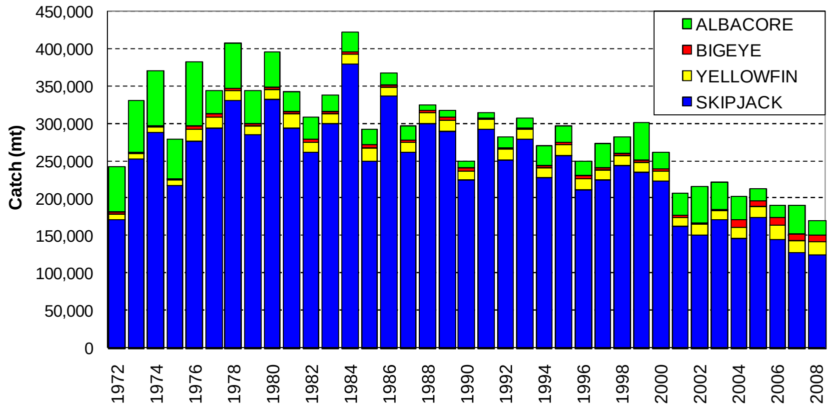

Figure 27. Pole-and-line catch in the WCP–CA

Skipjack tends to account for the majority of the catch (~70-80% in recent years, but typically more than 85% of the total catch in tropical areas) and albacore (8–20% in recent years) is taken by the Japanese coastal and offshore fleets in the temperate waters of the north Pacific; Yellowfin tuna (5–10%) and a small component of bigeye tuna (1–6%) make up the remainder of the catch. The

[7] (note that distinction between troll and pole-and-line gears in the Japanese coastal fleet was not possible for years prior to 1995)

Japanese distant-water and offshore (118,907 mt in 2007) and the Indonesian fleets[8] (60,415 mt in 2007) account for most of the WCP–CA pole-and-line catch. The catches by the Japanese distant-water and offshore fleet in recent years have been the lowest for several decades and is no doubt related to the continued reduction in vessels numbers (which for 2008 was down to only 105 vessels, the lowest on record). The Solomon Islands fleet recovered from low catch levels experienced in the early 2000s (only 2,773 mt in 2000 due to civil unrest), but vessel numbers are now dwindling (only 3 vessels were active in 2008), and the future of this fishery is now in the balance.

Figure 28 shows the average distribution of pole-and-line effort for the period 1995–2007 (2008 data are incomplete). Effort in tropical areas is usually year-round and includes the domestic fisheries in Indonesia and the Solomon Islands, and the Japanese distant-water fishery. The pole-and-line effort in the vicinity of Japan by both offshore and distant-water fleets is seasonal (highest effort and catch in the 2nd and 3rd quarters). There was also some seasonal effort by pole-and-line vessels in Fiji and Australia during this period. The effort in French Polynesian waters is essentially the *bonitier* fleet. Effort by the pole-and-line fleet based in Hawaii is absent from this figure (spatial data are not available).

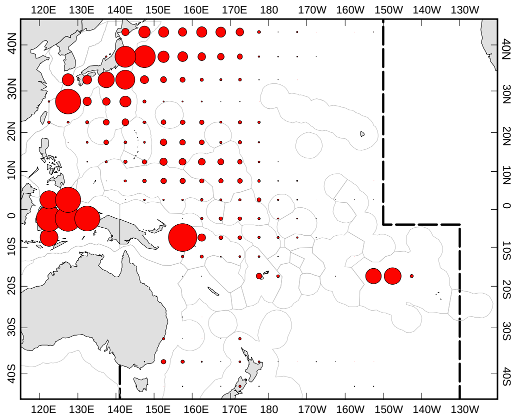

Figure 28. Average distribution of WCP–CA pole-and-line effort (1995–2007).

[8] Indonesia has recently revised the proportion of catch taken by gear type for their domestic fisheries which has resulted in a much larger allocation to their domestic purse seine fishery (at the expense of catches in the pole-and-line and "unclassified" fisheries) since 2004 than has been reported in previous years.

4.3 Economic overview of the pole-and-line fishery

4.3.1 Market conditions

During 2008 the Yaizu price of pole and line caught skipjack in waters off Japan averaged 243JPY/kg (US$2,353/Mt), a decrease of 14 per cent on 2007. By contrast, the Yaizu price of pole and line caught skipjack in waters south of Japan increased averaging 250JPY/kg (US$2,420/Mt) during 2008, a rise of 32 per cent.

4.3.2 Value of the pole-and-line catch

As a means of examining the effect of the changes to prices and catch levels over the period 1997-2008, a rough estimate of the annual delivered value of the tuna catch in the pole and line fishery in the WCPFC Area is provided in Figure 29 and Figure 30. The estimated delivered value of the total catch in the WCPFC pole and line fishery for 2008 is US$372 million.[9] This represents a 15 per cent increase on the estimated value of the catch in 2007 driven by a 28 per cent rise in prices that more than offset the decline in catch of 11 per cent.

The estimated delivered value of the skipjack catch in the WCPFC pole and line fishery for 2008 is US$271 million. This represents a 32 per cent increase on the estimated value of the catch in 2007 resulting from a 34 per cent increase in prices that more than outweighed a 2 per cent decrease in catch.

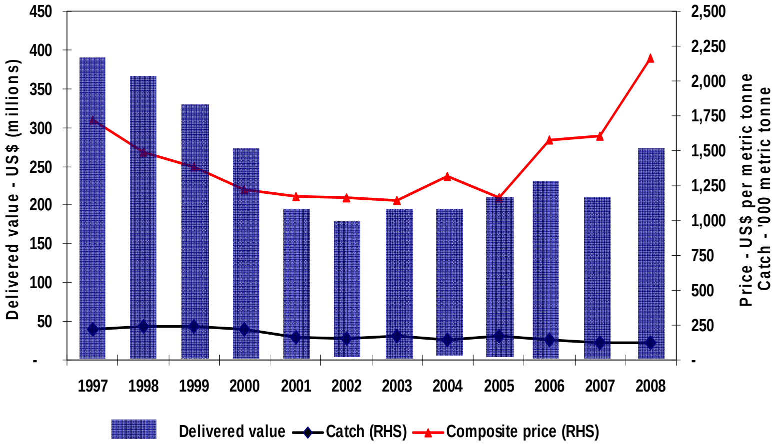

Figure 29. Skipjack in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

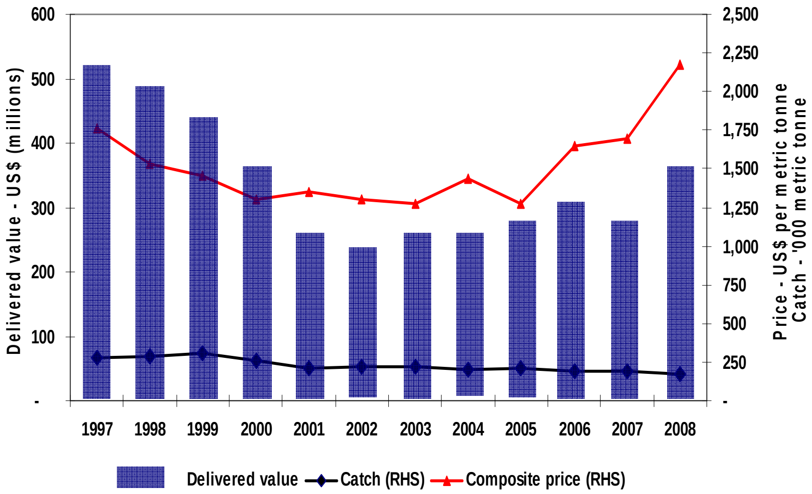

Figure 30. All tuna in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

[9] Delivered skipjack prices for the Japanese pole and line fleet are based on a weighted average of the Yaizu 'south' and 'other' pole and line caught skipjack prices. Delivered yellowfin price for the Japanese pole and line fleet are based on the Yaizu purse seine caught yellowfin price. All other prices are based on Thai import prices.

5 WCP–CA LONGLINE FISHERY

5.1 Overview

The longline fishery continues to account for around 10–13% of the total WCP–CA catch (OFP, 2008a), but rivals the much larger purse seine catch in landed value. It provides the longest time series of catch estimates for the WCP–CA, with estimates available since the early 1950s (OFP, 2008a). The total number of vessels involved in the fishery has generally fluctuated between 3,500 and 5,500 for the last 30 years (Figure 31), although for some distant-water fleets, vessels operating in areas beyond the WCP–CA could not be separated out and more representative vessel numbers for WCP–CA have only been available in recent years.

The fishery involves two main types of operation –

- large (typically >250 GRT) **distant-water** freezer vessels which undertake long voyages (months) and operate over large areas of the region. These vessels may target either tropical (yellowfin, bigeye tuna) or subtropical (albacore tuna) species. Voluntary reduction in vessel numbers by one at least one fleet has occurred in recent years;
- smaller (typically <100 GRT) **offshore** vessels which are usually **domestically-based**, undertaking trips less than one month, with ice or chill capacity, and serving fresh or air-freight sashimi markets, or [albacore] canneries.

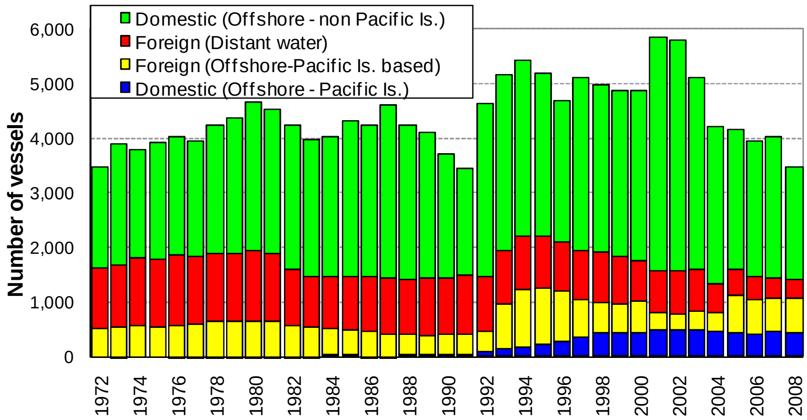

Figure 31. Longline vessels operating in the WCP–CA

The following broad categories of longline fishery, based on type of operation, area fished and target species, are currently active in the WCP–CA :

- **South Pacific offshore albacore fishery** comprises Pacific-Islands domestic "offshore" vessels, such as those from American Samoa, Cook Islands, Fiji, French Polynesia, New Caledonia, Samoa, Solomon Islands, Tonga and Vanuatu; these fleets mainly operate in subtropical waters, with **albacore** the main species taken.
- **Tropical offshore bigeye/yellowfin-target fishery** includes "offshore" sashimi longliners from Chinese-Taipei, based in Micronesia, Guam, Philippines and Chinese-Taipei, mainland Chinese vessels based in Micronesia, and domestic fleets based in Indonesia, Micronesian countries, Philippines, PNG, the Solomon Islands and Vietnam.
- **Tropical distant-water bigeye/yellowfin-target fishery** comprises "distant-water" vessels from Japan, Korea, Chinese-Taipei, mainland China and Vanuatu. These vessels primarily operate in the eastern tropical waters of the WCP–CA (and into the EPO), targeting bigeye and yellowfin tuna for the frozen sashimi market.
- **South Pacific distant-water albacore fishery** comprises "distant-water" vessels from Chinese-Taipei, mainland China and Vanuatu operating in the south Pacific, generally below 20°S, targeting albacore tuna destined for canneries.
- **Domestic fisheries in the sub-tropical and temperate WCP–CA** comprise vessels targeting different species within the same fleet depending on market, season and/or area. These fleets include the domestic fisheries of Australia, Japan, New Zealand and Hawaii. For example, the Hawaiian longline fleet has a component that targets swordfish and another that targets bigeye tuna.
- **South Pacific distant-water swordfish fishery** is a relatively new fishery and comprises "distant-water" vessels from Spain.
- **North Pacific distant-water albacore and swordfish fisheries** mainly comprise "distant-water" vessels from Japan (swordfish and albacore), Chinese-Taipei (albacore only) and Vanuatu (albacore only).

Additionally, small vessels in Indonesia, Philippines and more recently in Papua New Guinea target yellowfin by handlining and small vertical longlines, usually around the numerous arrays of anchored FADs in home waters (although, not included in Figure 31). The commercial handline fleets target large yellowfin tuna which comprise the majority of the overall catch (> 90%).

The WCP–CA longline tuna catch steadily increased from the early years of the fishery (i.e. the early 1950s) to 1980 (227,707 mt), but declined in the five years after this to 157,072 mt in 1984 (Figure 32). Since 1984, catches steadily increased over the next 15 years until the late 1990s, when catch levels were again similar to 1980. Annual catches in the longline fishery since 2000 have been amongst the highest ever, but the composition of the catch in recent years (e.g. ALB–30%; BET–38%;YFT–30%; SKJ–2% in 2008) differs considerably from the period of the late 1970s and early 1980s, when yellowfin tuna were the main target species (e.g. ALB–19%;BET–27%;YFT–54% in 1980).

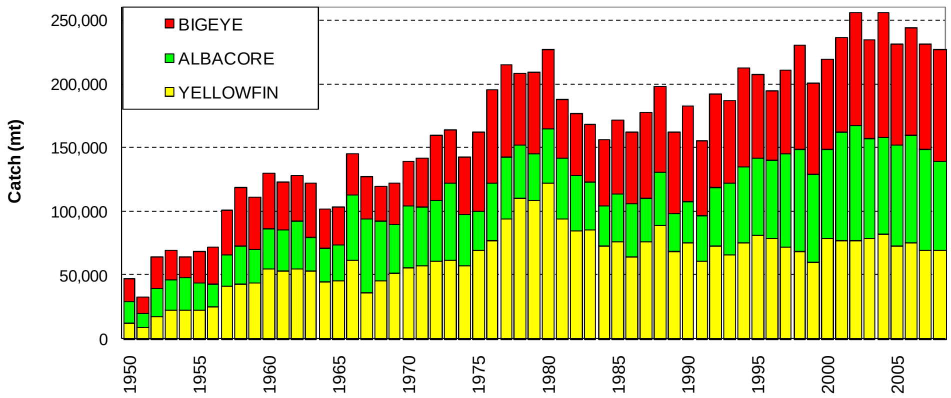

Figure 32. Longline catch (mt) of target tunas in the WCP–CA

5.2 Provisional catch estimates and fleet sizes (2008)

The provisional WCP–CA longline catch (231,003 mt) for 2008 was the lowest since 2000 and around 12% lower than the highest on record which was attained in 2004 (262,584 mt). The WCP–CA albacore longline catch (69,920 mt – 30%) for 2008 was the lowest since 2000. The provisional bigeye catch (87,504 mt – 38%) for 2008 was higher than the average for the period 2000–2008, and the yellowfin catch (69,516 mt – 30%) was similar to the 2007 catch, but the lowest since 1999.

A significant change in the WCP–CA longline fishery over the past 10 years has been the growth of Pacific Islands domestic albacore fishery, which has gone from taking 33% of the total south Pacific albacore longline catch in 1998, to accounting for around 50-60% of the catch in recent years. The combined national fleets making up the Pacific Islands domestic albacore fishery have numbered around 300 (mainly small “offshore”) vessels in recent years.

The clear shift in effort by some vessels in the Chinese-Taipei distant-water longline fleet to targeting bigeye in the eastern equatorial waters of the WCP–CA resulted in a reduced contribution to the albacore catch in recent years (which was compensated by the increase in Pacific-Islands fleet albacore catches), and a significant increase in bigeye catches. During the 1990s, this fleet consistently took less than 2,000 mt of bigeye tuna each year, but in 2002, the bigeye catch went up to 8,741 mt, and by 2004 it was up to 16,888 mt. The bigeye catch by the Chinese-Taipei distant-water longline fleet has since declined to 8,777 mt (in 2008), related to a significant drop in vessel numbers (142 vessels in 2003 down to 84 vessels in 2008). The Korean distant-water longline fleet has also experienced a large decline in bigeye and yellowfin catches in recent years, with a corresponding drop in vessel numbers – from 184 vessels active in 2002 down to 108 vessels in 2008 (41% decline), although their bigeye catch for 2008 was relatively high (17,001 mt) for this number of vessels.

With domestic fleet sizes continuing to increase at the expense of foreign-offshore and distant-water fleets (Figure 31), the evolution in fleet dynamics no doubt has some effect on the species composition of the catch. For example, the increase in effort by the Pacific-Islands domestic fleets has primarily been in albacore fisheries, although this has been balanced to some extent by the switch to targeting bigeye tuna (from albacore) by certain vessels in the distant-water Chinese-Taipei fleet. More detail on individual fleet activities during recent years is available in the WCPFC–SC5 National Fisheries Reports.

5.3 Catch per unit effort

Time series of nominal CPUE provides a broad indication of the abundance and availability of target species to the longline gear, and as longline vessels target larger fish, the CPUE time series should be more indicative of adult tuna abundance. However, more so than purse-seine CPUE, the interpretation of nominal longline CPUE is confounded by various factors, such as the changes in fishing depth that occurred as longliners progressively switched from primarily yellowfin tuna targeting in the 1960s and early 1970s to bigeye tuna targeting from the late 1970s on. Such changes in fishing practices will have changed the effectiveness of longline effort with respect to one species over another, and such changes need to be accounted for if the CPUE time series are to be interpreted as indices of relative abundance.

This paper does not attempt to present or explain trends in longline CPUE or effective effort, as this is dealt with more appropriately in specific studies on the subject. For example, SC5 Working Paper **SA WP–5** (Bigelow & Hoyle, 2009) looks at the standardisation of CPUE for distant-water longline fleets targeting south Pacific albacore and SC5 Working Paper **SA WP–1** (Hoyle, 2009) looks at the standardisation of CPUE for bigeye and yellowfin tuna.

5.4 Geographic distribution

Figure 33 shows the distribution of effort by category of fleet for the period 2000–2007 (representing the most recently available data for all fleets, but reflecting the likely distributions for 2008).

Effort by the **large-vessel, distant-water fleets** of Japan, Korea and Chinese-Taipei account for most of the effort but there has been some reductions in vessel numbers in some fleets over the past decade. Effort is widespread as sectors of these fleets target bigeye and yellowfin for the frozen sashimi market in central and eastern tropical waters, and albacore in the more temperate waters for canning. Activity by the **foreign-offshore fleets** from Japan, mainland China and Chinese-Taipei are restricted to the tropical waters, targeting bigeye and yellowfin for the fresh sashimi market; these fleets have limited overlap with the distant-water fleets. The substantial "**offshore**" effort in the west of the region is primarily by the Indonesian and Chinese-Taipei **domestic fleets** targeting yellowfin and bigeye.

The growth in **domestic fleets** in the South Pacific over the past decade has been noted; the most significant examples are the increases in the Samoan, Fijian and French Polynesian fleets (Figure 34).

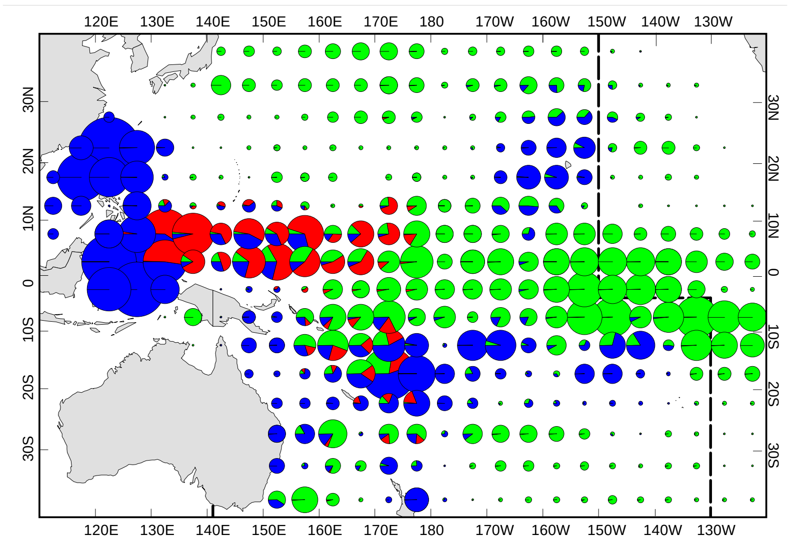

Figure 33. Distribution of longline effort for distant-water fleets (green), foreign-offshore fleets (red) and domestic fleets (blue) for the period 2000–2007.

(Note that the domestic fleet effort excludes the Japanese coastal fishery and the Vietnam fishery; distant-water effort for Chinese-Taipei and other fleets targeting albacore in the North Pacific are poorly covered)

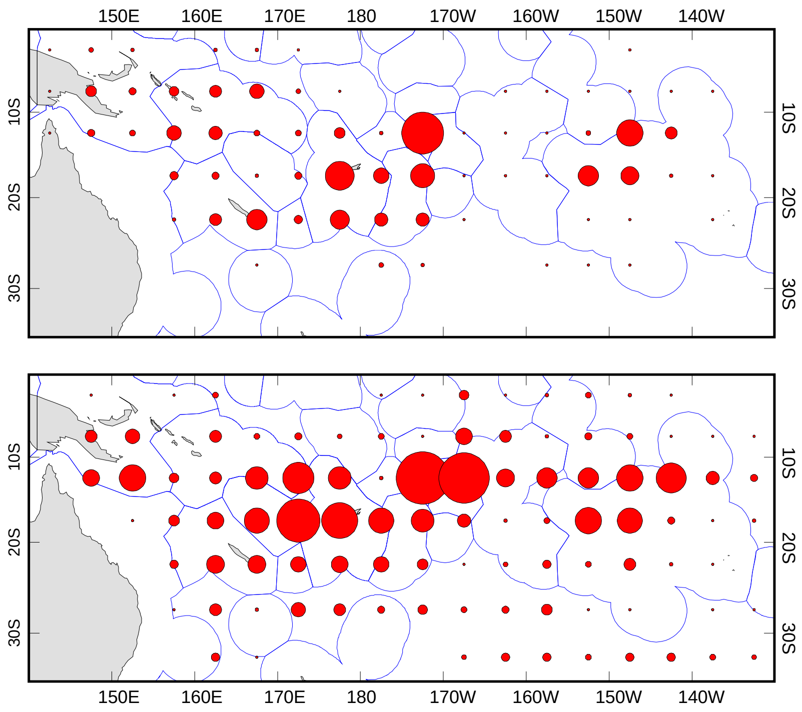

Figure 34. Distribution of south Pacific-islands domestic longline effort for 1998 (top) and 2007 (bottom).

Figure 35 shows quarterly species composition by area for the period 2000–2006 and 2007 (2008 data are incomplete). The majority of the yellowfin catch is taken in tropical areas, especially in the western parts of the region, with smaller amounts in seasonal subtropical fisheries. The majority of the bigeye catch is also taken from tropical areas, but in contrast to yellowfin, mainly in the eastern parts of the WCP–CA, adjacent to the traditional EPO bigeye fishing grounds. The albacore catch is mainly taken in subtropical and temperate waters in both hemispheres. In the North Pacific Ocean, albacore are primarily taken in the 1st and 4th quarters, while south Pacific Albacore are taken year round, although tend to be more prevalent in the catch during the 3rd quarter. Species composition also varies from year to year in line with changes in environmental conditions, particularly in waters where there is some overlap in species targeting, for example, in the latitudinal band from 10°–20°S.

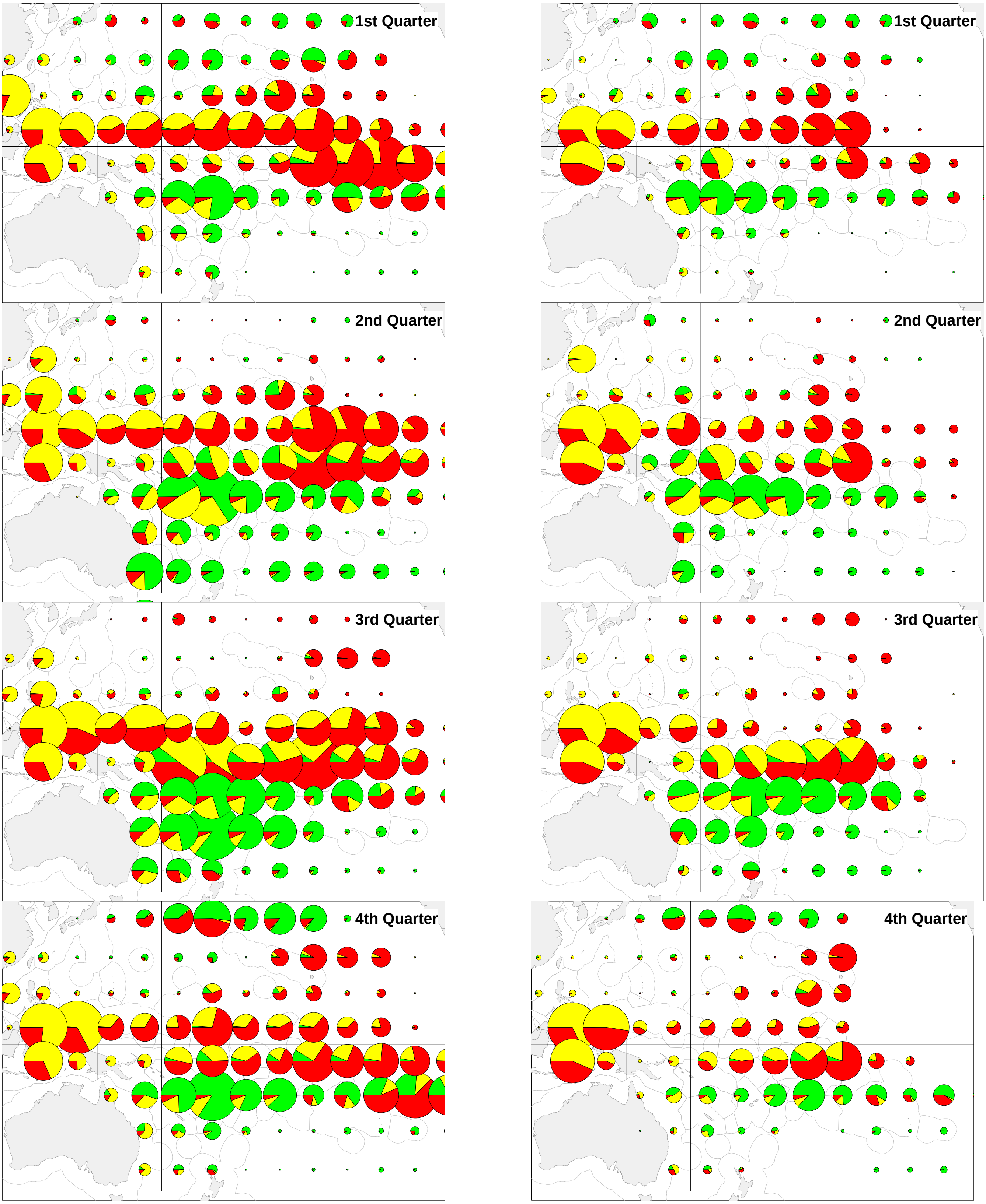

Figure 35. Quarterly distribution of longline tuna catch by species, 2000-2006 (left) and 2007 (right*)*

(Yellow–yellowfin; Red–bigeye; Green–albacore)

(Note that the domestic fleet effort excludes the Japanese coastal fishery and the Vietnam fishery; catches from some distant-water fleets targeting albacore in the North Pacific and Bigeye/Yellowfin in the Eastern Pacific may not be fully covered)

5.5 Economic overview of the longline fishery

5.5.1 Price trends – Yellowfin

Longline caught yellowfin prices (ex-vessel) landed at Yaizu rose by 13 per cent to 635JPY/kg and average fresh yellowfin prices (ex-vessel) at selected Japanese ports dropped 11 per cent to 656 JPY/kg. Fresh yellowfin import prices (c.i.f.) rose 10 per cent to 862 JPY/kg, in US$ terms the rise was greater as a result of the depreciation of the US$ against the JPY with prices rising by 25 per cent to US$8.33/kg. Japanese import prices for fresh yellowfin sourced from Oceania rose 8 per cent to 925 JPY/kg (US$8.94/kg).

Japanese imports[10] of fresh yellowfin have been on a steady downtrend since 2001. Japanese imports of fresh yellowfin were 15,628Mt in 2008 down 7 per cent compared with 2007 and at their lowest level in recent years. After the sharpest decline of 35 per cent in 2005 Japanese imports of fresh yellowfin from Oceania recovered in 2006 by 22 per cent to 5,003Mt but declined again in the next two years. It declined by 19 per cent to 3,562Mt in 2008. US fresh yellowfin import volumes declined by 12 per cent to 15,904Mt in 2008 while prices (f.a.s.) rose 7 per cent to US$8.15/kg.

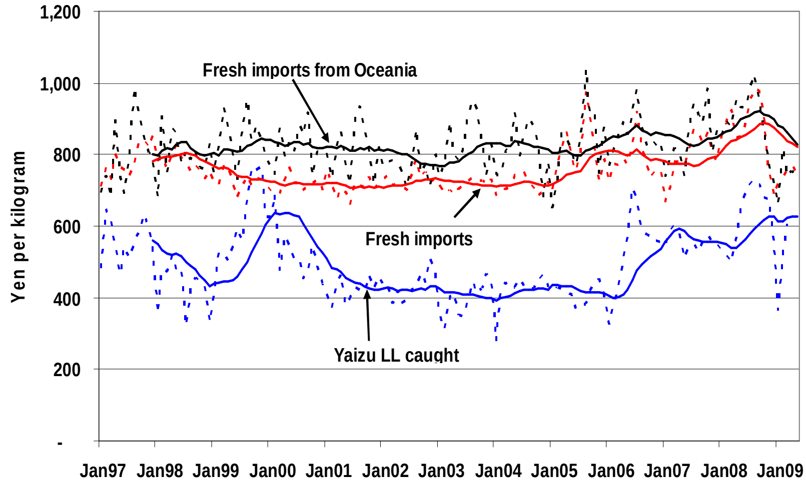

Figure 36. Yellowfin prices on Japanese markets; fresh imports (c.i.f.), fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

(Monthly price given by dashed lines, 12 month moving average price given by solid line)
Sources: Ministry of Finance (www.customs.go.jp), FFA Tuna Industry Advisor, and US National Marine and Fisheries Service (swr.nmfs.noaa.gov)

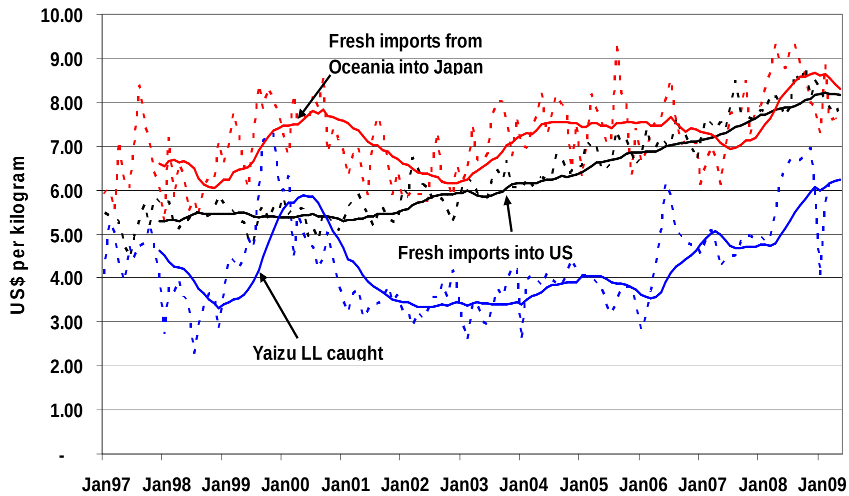

Figure 37. Yellowfin prices in US$: US fresh imports, Japanese fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

(Monthly price given by dashed lines, 12 month moving average price given by solid line)
Sources: Ministry of Finance (www.customs.go.jp), FFA Tuna Industry Advisor, and US National Marine and Fisheries Service (swr.nmfs.noaa.gov)

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[10] Imports of tuna into Japan are defined to be tunas that are carried into Japan as imports. "That is, tuna which is caught by vessels of foreign nationality in the seas outside of territorial waters (including Japan's and other countries' exclusive economic zones) and carried into Japan, or tuna which is caught by vessels of Japanese nationality and first landed in other countries, and then brought into Japan. Those other than the above (i.e., tuna caught by vessels of Japanese nationality on high seas, etc.) are regard as Japanese products)".

5.5.2 Price trends – Bigeye

Frozen bigeye prices (ex-vessel) at selected major Japanese ports rose 7 per cent in 2008 to 857JPY/kg while fresh bigeye prices (ex-vessel) rose 4 per cent to 1,170JPY/kg.

Fresh bigeye import prices (c.i.f.) rose almost 1 per cent to 907JPY while frozen bigeye import prices (c.i.f.) rose 11 per cent to 743JPY/kg. In US$ terms, fresh bigeye import prices were up to US$8.77/kg while frozen bigeye import prices rose 26 per cent to US$7.18/kg.

Import volumes of fresh bigeye declined 9 per cent in 2008 to 13,674Mt of which 4,850Mt was sourced from the Oceania region. Average prices for fresh bigeye from Oceania rose to 1,031JPY/kg (US$8.94/kg).

US fresh bigeye import volumes declined 3 per cent to 5,462 while prices (f.a.s.) rose 1 per cent to US$7.59/kg.

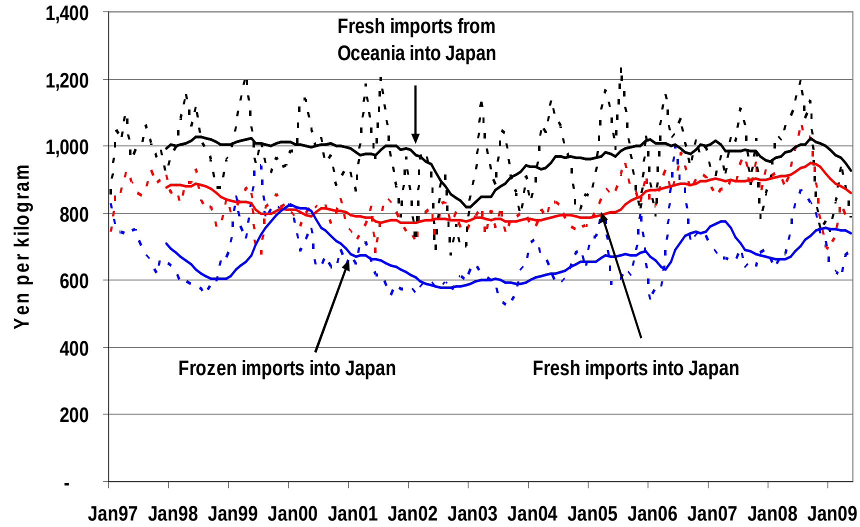

Figure 38. Bigeye prices on Japanese markets; fresh imports (c.i.f.), fresh imports from Oceania (c.i.f.) and frozen imports (ex-vessel)
(Monthly price given by dashed lines, 12 month moving average price given by solid line)
Sources: Ministry of Finance (www.customs.go.jp), FFA Tuna Industry Advisor, and US National Marine and Fisheries Service (swr.nmfs.noaa.gov)

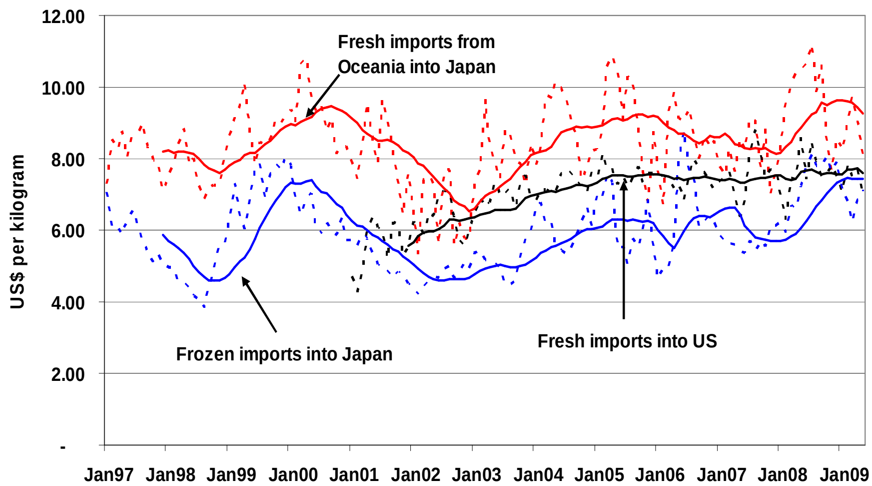

Figure 39. Bigeye prices in US$: US fresh imports, Japanese fresh imports from Oceania (c.i.f.) and Japanese frozen imports from Oceania (c.i.f.)
(Monthly price given by dashed lines, 12 month moving average price given by solid line)
Sources: Ministry of Finance (www.customs.go.jp), FFA Tuna Industry Advisor, and US National Marine and Fisheries Service (swr.nmfs.noaa.gov)

5.5.4 Price trends – Albacore

The Bangkok albacore market price (10kg and up, c&f) averaged US$2,225/Mt in January 2008. According to FFA database[11] the price level steadily rose in the following months to a peak of US$2,650/Mt in September. Prices dropped slightly in the months that follow and steadied at US$2,625/Mt till December. Over the six months to June in the first half of 2009, Bangkok albacore prices have fluctuated but with an overall downtrend to a low of US$2,350 in June.

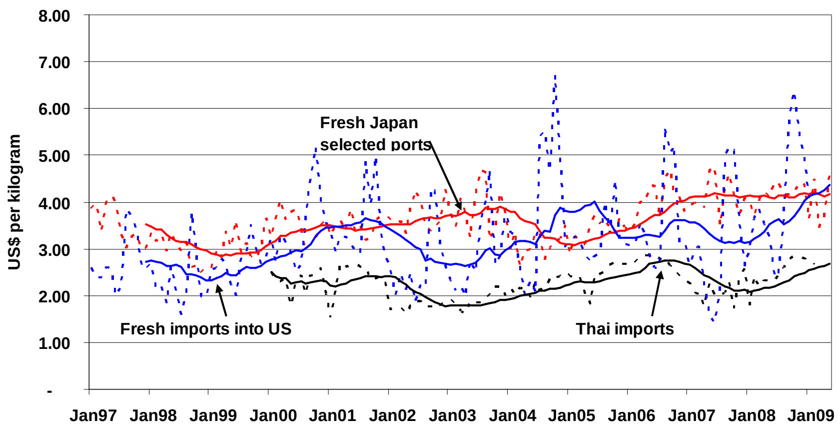

Figure 40. Albacore prices in US$: US fresh imports (f.a.s), fresh landings at selected Japanese ports and Thai frozen imports (c.i.f.)
(Monthly price given by dashed lines, 12 month moving average price given by solid line)
Sources: Thai Customs (www.customs.go.th), FFA Tuna Industry Advisor, and US National Marine and Fisheries Service (swr.nmfs.noaa.gov)

Thai imports of frozen albacore declined 7 per cent in 2008 to 32,792Mt reversing the growth of 6 per cent the previous year. Prices improved by 28 per cent to US$2488 (2.49/kg) from US$1,948/Mt (US$1.95/kg).

The US import price for fresh albacore rose 3 per cent to US$4.20/kg while prices for fresh landings at selected Japanese ports rose substantially by 52 per cent to US$3.13/kg.

5.5.5 Value of the longline catch

As a means of examining the effect of the changes to prices and catch levels since 1997 estimate of the "delivered" value of the longline fishery tuna catch in the WCPFC Area from 1997 to 2008 are obtained (Figures 41–44). In deriving these estimates certain assumptions were made due to data and other constraints that may or may not be valid and as such caution is urged in the use of these figures.[12]

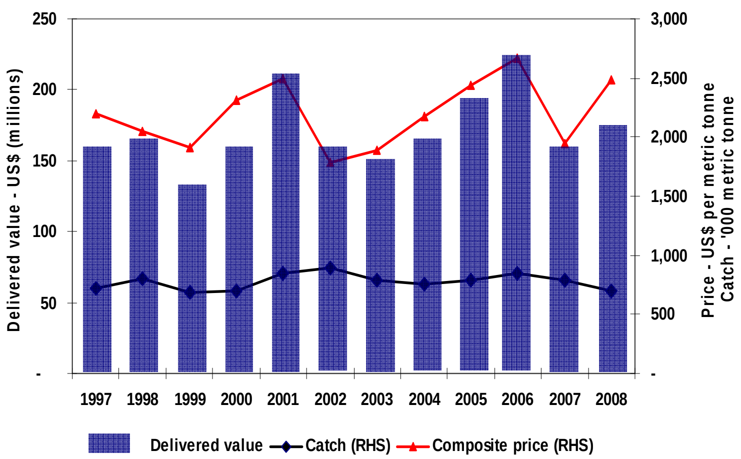

Figure 41. Albacore in the WCPFC longline fishery – Catch, delivered value of catch and composite price

The estimated delivered value of the longline tuna catch in the WCPFC area for 2008 is US$1,384 million. This represents an increase of US$263 million on the estimated value of the catch in 2007. The value of the albacore catch increased by US$20 million (13 per cent) while the value of the bigeye catch increased by US$148 million (26 per cent) and the value of the

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[11] Data for Bangkok albacore market prices (10kg and up, c&f) held at the FFA dates back to 8 June 2001.

[12] For the yellowfin and bigeye caught by fresh longline vessels it is assumed that 80 per cent of the catch is of export quality and 20 per cent is non-export quality. For export quality the annual prices for Japanese fresh yellowfin and bigeye imports from Oceania are used, while it is simply assumed that non-export grade tuna attracted US$1.50/kg throughout the period 1995-2005. For yellowfin caught by frozen longline vessels the delivered price is taken as the Yaizu market price for longline caught yellowfin. For bigeye caught by frozen longline vessels the delivered price is taken as the frozen bigeye price at selected major Japanese ports. For albacore caught by fresh and frozen longline vessel the delivered prices is taken as the Thai import price. The frozen longline catch is taken to be the catch from the longline fleets of Japan and Korea and the distant water longline fleet of Chinese Taipei.

yellowfin catch increased by $US96 million (25 per cent). The albacore catch was estimated to be worth US$174 million in 2008 with the 13 per cent increase being driven by the 28 per cent increase in the composite price that more than offset a 12 per cent decline in catch. The bigeye catch was estimated to be worth US$724 million with the catch rising 6 per cent and the composite price increasing 18 per cent. The estimated delivered value of the yellowfin catch was at US$486 million accounted for solely by the 25 per cent increase in the composite price.

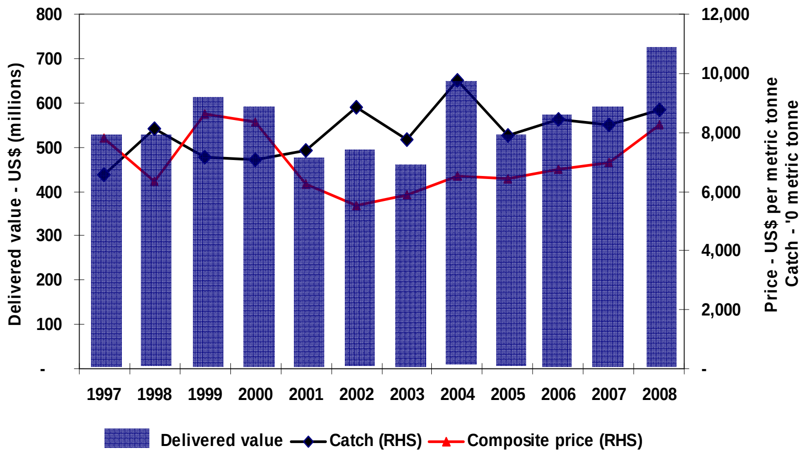

Figure 42. Bigeye in the WCPFC longline fishery – Catch, delivered value of catch and composite price

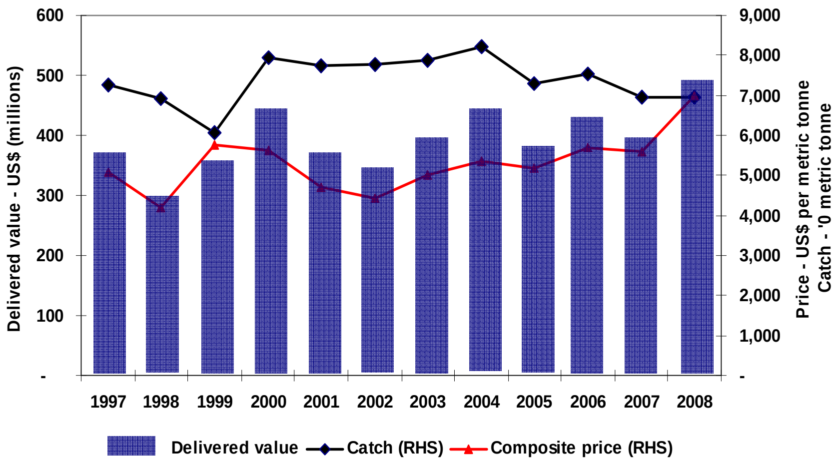

Figure 43. Yellowfin in the WCPFC longline fishery – Catch, delivered value of catch and composite price

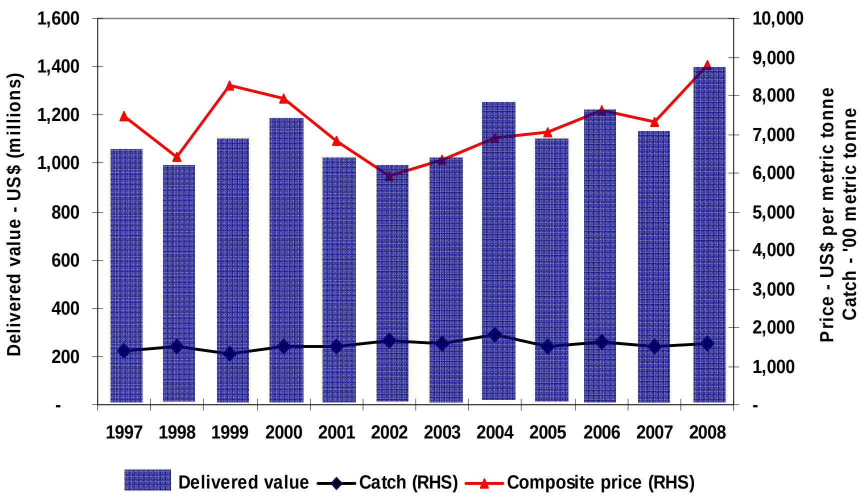

Figure 44. All tuna in the WCPFC longline fishery – Catch, delivered value of catch and composite price

6 SOUTH-PACIFIC TROLL FISHERY

6.1 Overview

The South Pacific troll fishery is based in the coastal waters of New Zealand, and along the Sub-Tropical Convergence Zone (STCZ, east of NZ waters located near 40°S). The fleets of New Zealand and United States have historically accounted for the great majority of the catch that consists almost exclusively of albacore tuna.

The fishery expanded following the development of the STCZ fishery after 1986, with the highest catch attained in 1989 (8,370 mt); in recent years, catches have declined to below 3,000 mt for the first time since 1987. The level of effort expended by the troll fleets each year tends to reflect the price commanded for the product (albacore for canning) to some extent, and by expectations concerning likely fishing success.

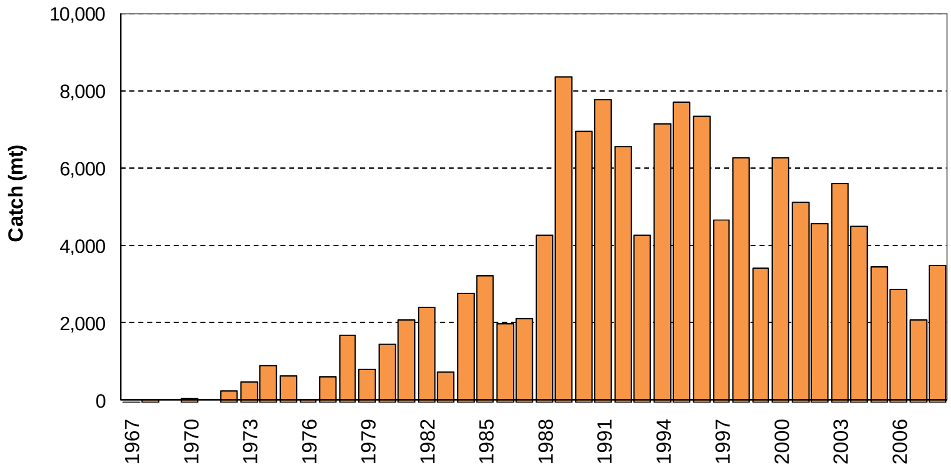

Figure 45. Troll catch (mt) of albacore in the south Pacific Ocean

6.2 Provisional catch estimates (2008)

The 2008 troll albacore catch (3,497 mt) was the highest since 2004, and mainly due to good catches experienced in the New Zealand domestic fishery. The New Zealand troll fleet (168 vessels caught 3,349 mt in 2008) and USA (4 vessels caught 148 mt 2008) typically account for most of the albacore troll catch, with minor contributions coming from the Canadian, the Cook Islands and French Polynesian fleets.

Effort by the South Pacific Albacore troll fleets is concentrated off the coast of New Zealand and across the Sub-tropical convergence zone (STCZ). Figure 46 shows a clear reduction in effort by the US troll fleet in the STCZ from 2006 to 2007 (US troll fleet aggregate data covering 2008 activities have yet to be provided).

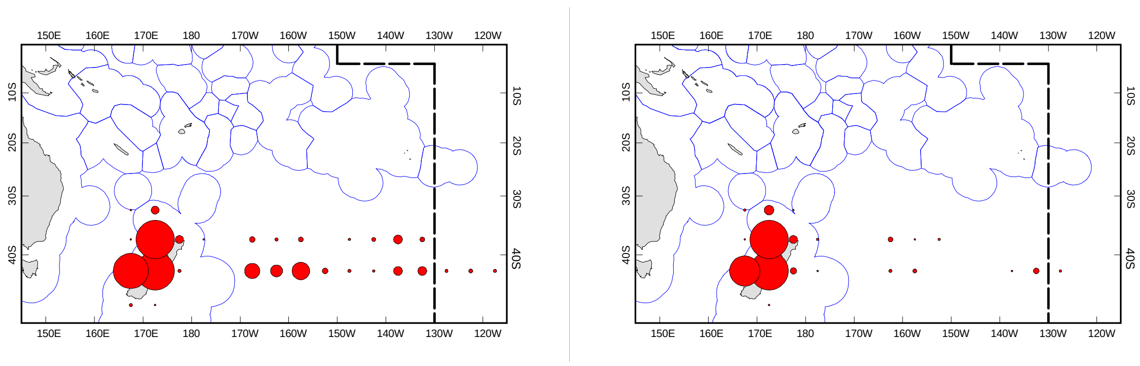

Figure 46. Distribution of South Pacific troll effort during 2006 (left) and 2007 (right)

7. SUMMARY OF CATCH BY SPECIES

7.1 SKIPJACK

Total skipjack catches in the WCP–CA have increased steadily since 1970, more than doubling during the 1980s, and continuing to increase in subsequent years. Annual catches exceeded 1.2 million mt in eight of the last nine years (Figure 47). Pole-and-line fleets, primarily Japanese, initially dominated the fishery, with the catch peaking at 380,000 mt in 1984. The relative importance of this fishery, however, has declined over the years primarily due to economic constraints (the 2008 WCP-CA pole-and-line catch was the lowest since 1963). The skipjack catch increased during the 1980s due to growth in the international purse seine fleet, combined with increased catches by domestic fleets from Philippines and Indonesia (which now make up 20–25% of the total skipjack catch in WCP–CA in recent years).

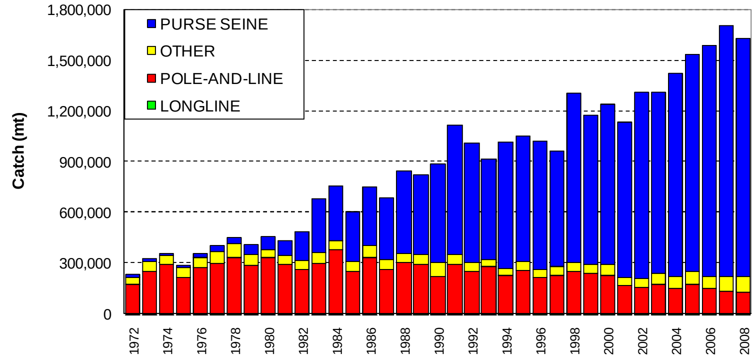

Figure 47. WCP–CA skipjack catch (mt) by gear

The 2008 WCP–CA skipjack catch of 1,634,617mt was the second highest on record (74,000 mt less than the record in 2008). As has been the case in recent years, the main determinant in the overall catch of skipjack is catch taken in the **purse seine** fishery (1,409,921 mt in 2008 – 86%). The balance of the catch was taken by the **pole-and-line** gear (125,367 mt – 8%) and the "**unclassified**" gears in the domestic fisheries of Indonesia, Philippines and Japan (~80,000 mt – 6%), while the **longline** fishery accounted for less than 1% of the total catch.

The majority of the skipjack catch is taken in equatorial areas, and most of the remainder is taken in the seasonal home-water fishery of Japan (Figure 48). The domestic fisheries in Indonesia (purse-seine, pole-and-line and unclassified gears) and the Philippines (e.g. ring-net and purse seine) account for the majority of the skipjack catch in the western equatorial portion of the WCP–CA. The central tropical waters are dominated by the purse-seine catches from several foreign and domestic fleets. As mentioned in Section 3, the spatial distribution of skipjack catch by purse-seine vessels in the central and eastern equatorial areas is influenced by the prevailing ENSO conditions.

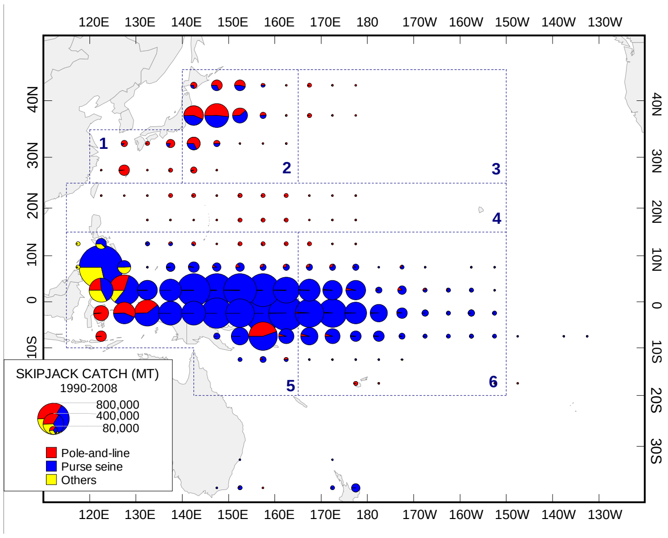

Figure 48. Distribution of skipjack tuna catch, 1990–2008.

The six-region spatial stratification used in stock assessment is shown.

The Philippines and Indonesian domestic fisheries account for most of catch in 20–40 cm size range which represents a significant proportion of the WCP–CA skipjack catch, in numbers of fish (Figure 49). The dominant mode of the WCP–CA skipjack catch (by weight) typically falls in the size range 40–60 cm, corresponding to 1–2+ year-old fish (Figure 50). There was a greater proportion of medium-large (60–80 cm) skipjack caught in the purse seine fishery during 2002 and 2005 (unassociated, free swimming school sets account for most of the large skipjack). In contrast, the WCP–CA skipjack purse-seine catch in 2004 and 2006 comprised younger fish, mainly from associated schools. Skipjack from both associated and unassociated sets during 2008 were mostly in the range 50–65 cm, with very few fish over 70cm evident in the sampled catch.

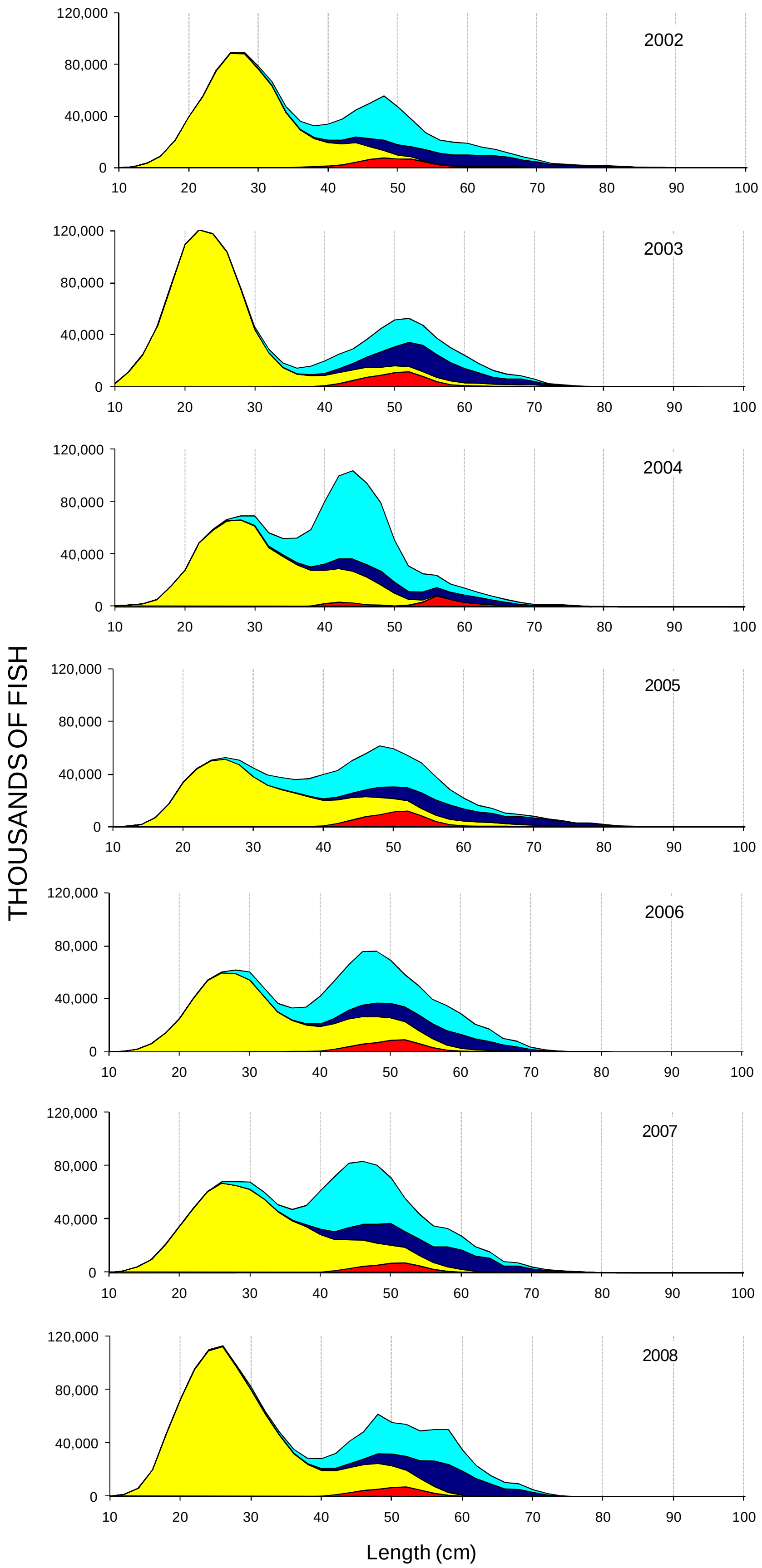

Figure 49. Annual catches (numbers of fish) of skipjack tuna in the WCPO by size and gear type, 2002–2008. **(red–pole-amd-line; yellow–Phil-Indo fisheries; light blue–purse seine associated; dark blue–purse seine unassociated) (Pole-and-line size data for 2005-2008 are not available, and have been substituted with size data from 2004)**

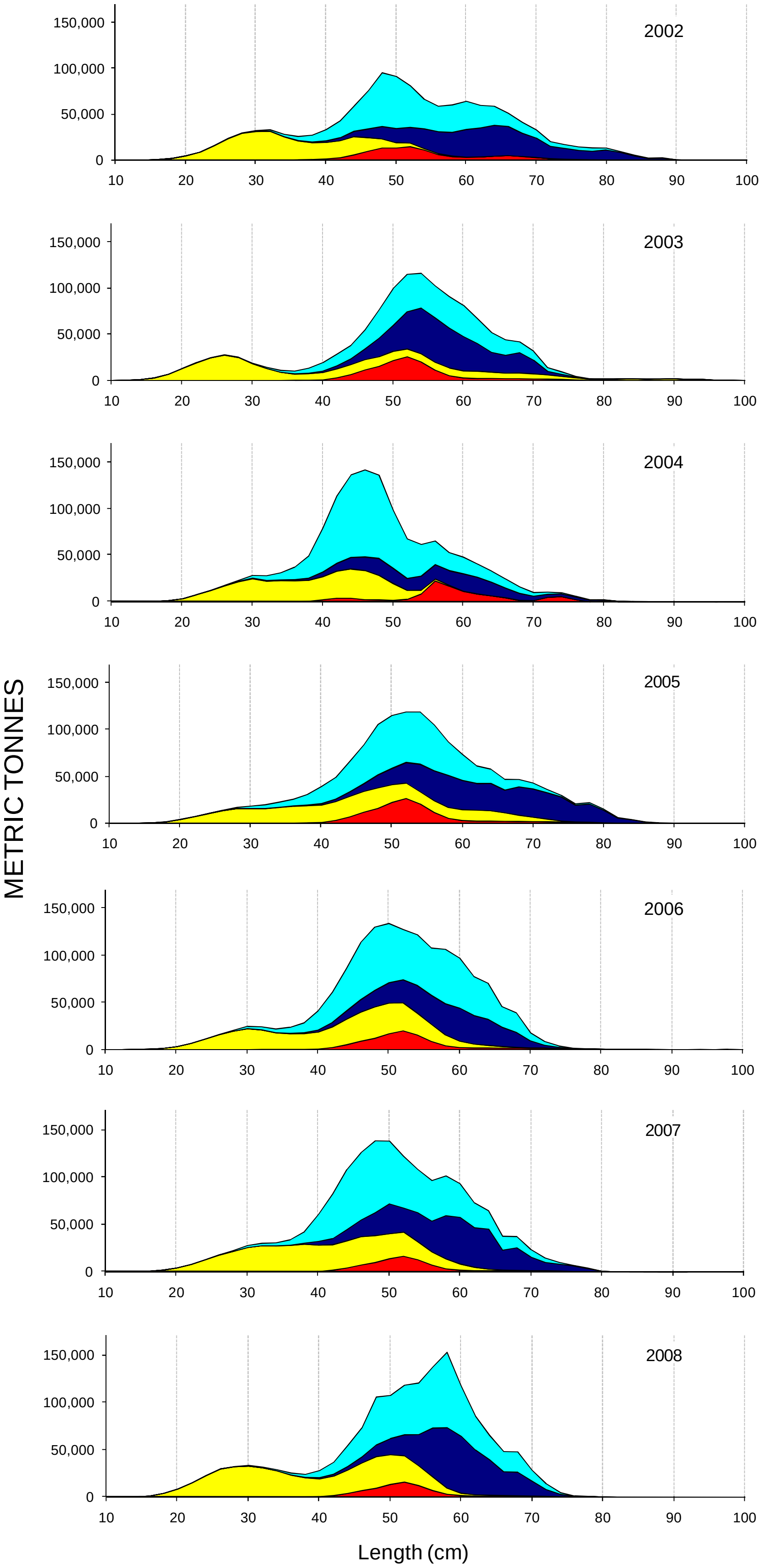

Figure 50. Annual catches (metric tonnes) of skipjack tuna in the WCPO by size and gear type, 2002–2008.

(red–pole-amd-line; yellow–Phil-Indo fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)
(Pole-and-line size data for 2005-2008 are not available, and have been substituted with size data from 2004)

7.2 YELLOWFIN

Since 1997, the total yellowfin catch in the WCP–CA has been generally between 400,000–470,000 mt (Figure 51). Prior to 2008, the 1998 catch was the largest on record (462,786 mt) and followed two years after an unusually low catch in 1996, primarily due to poor catches in the purse seine fishery – the poor yellowfin catch experienced in the purse-seine fishery during 1996 was reflected in the age class that had recruited to the longline fishery by 1999 (which was a relatively poor catch year in that fishery).

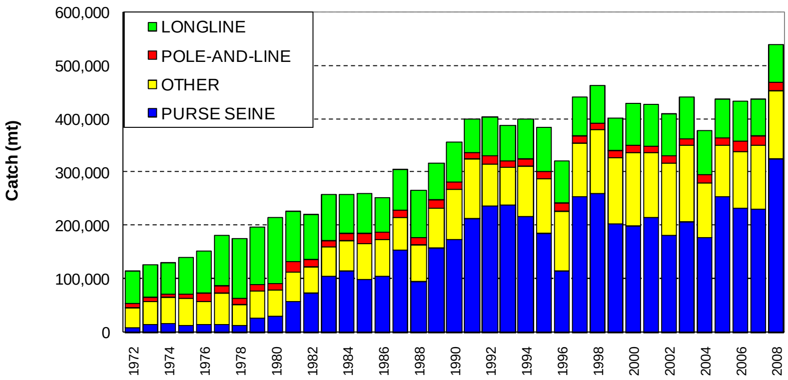

Figure 51. WCP–CA yellowfin catch (mt) by gear

Catches in recent years have been relatively stable (400,000–460,000 mt), although the 2004 catch (378,865 mt) was the lowest since 1996. The 2008 yellowfin catch (539,481 mt) was clearly a record and primarily due to the record catch in the purse seine fishery (325,904 mt – 60% of the total catch). The purse seine catch of yellowfin tuna is now more than four times the longline catch (69,516 mt in 2008 –13%), with the remainder coming from the domestic Indonesian and Philippines "other" gears. The 2008 yellowfin tuna **purse seine** catch was more than 64,000 mt (25%) higher than the previous record. In recent years, the yellowfin **longline** catch has ranged 75,000–82,000 mt, which is well below catches taken in the late 1970s to early 1980s (90,000–120,000 mt), presumably related to changes in targeting practices by some of the large fleets and the gradual reduction in the number of distant-water vessels. The WCP–CA **longline** catch for 2008 was the lowest catch since 1999.

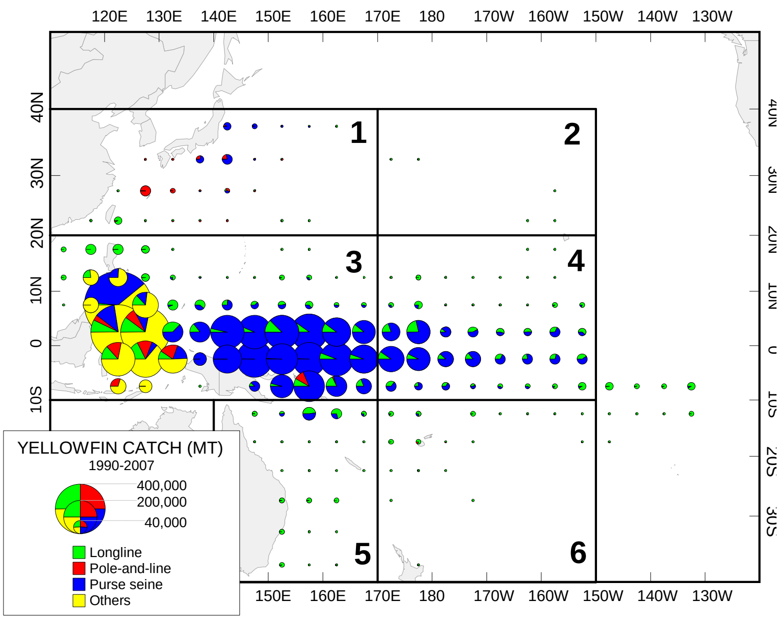

Figure 52. Distribution of yellowfin tuna catch in the WCP–CA, 1990–2007.

The six-region spatial stratification used in stock assessment is shown.

The high catches of yellowfin experienced recently in the EPO (annual catches of over 400,000 mt for 2001–2003) dropped to 280,000-290,000 in 2004 and 2005, and has further declined to 177,000–195,000 mt in recent years, a level not experienced since the mid-1980s. Declines in catches in both the EPO purse-seine and longline fisheries are apparent since 2003.

The **pole-and-line** fisheries took 16,911 mt (3% of the total yellowfin catch) during 2008, and **'other'** category accounted for ~126,000 mt (23%). Catches in the '**other**' category are largely composed of yellowfin taken by various assorted gears (e.g. ring net, bagnet, gillnet, large-fish handline, small-fish hook-and-line and seine net) in the domestic fisheries of the Philippines and eastern Indonesia[13]. Figure 52 shows the distribution of yellowfin catch by gear type for the period 1990–2007 (data for 2008 are incomplete). As with skipjack, the great majority of the catch is

[13] Indonesia has recently revised the proportion of catch by species for their domestic fisheries which has resulted in differences in species composition by gear type since 2004 compared to what has been reported in previous years.

taken in equatorial areas by large purse seine vessels, and a variety of gears in the Indonesian and Philippine fisheries.

As with skipjack tuna, the domestic surface fisheries of the Philippines and Indonesia take large numbers of small yellowfin in the range 20–50 cm (Figure 53). In the purse seine fishery, smaller yellowfin are caught in log and FAD sets than in unassociated sets. A major portion of the purse seine catch is adult (> 100 cm) yellowfin tuna, to the extent that the purse-seine catch (by weight) of adult yellowfin tuna is usually higher than the longline catch, which this is clearly the case in 2008, where exceptional catches of large yellowfin in the size range 120–130 cm were experienced in the purse seine fishery (see Figure 54 – 2008). Inter-annual variability in the size of yellowfin taken exists in all fisheries. For example, the relatively high proportion of yellowfin taken from associated purse-seine sets during 2005 corresponds to a strong recruitment, with the age class of fish taken in this year present as a "peak" of larger fish taken in the purse seine unassociated sets and longline fishery during 2006, 2007 and possibly again in 2008 purse seine catch. Note the strong mode of large (130–150cm) yellowfin from (purse-seine) unassociated-sets in 2002, which corresponds to the good catches experienced in the extreme east of the tropical WCP-CA (Figure 15–right). The purse seine fishery experienced relatively poor catches of yellowfin during 2004 and this appears to be primarily due to lower than normal catches of large fish from unassociated schools (rather than catches of small fish from associated set types), especially when contrasting with the 2008 purse-seine catch levels.

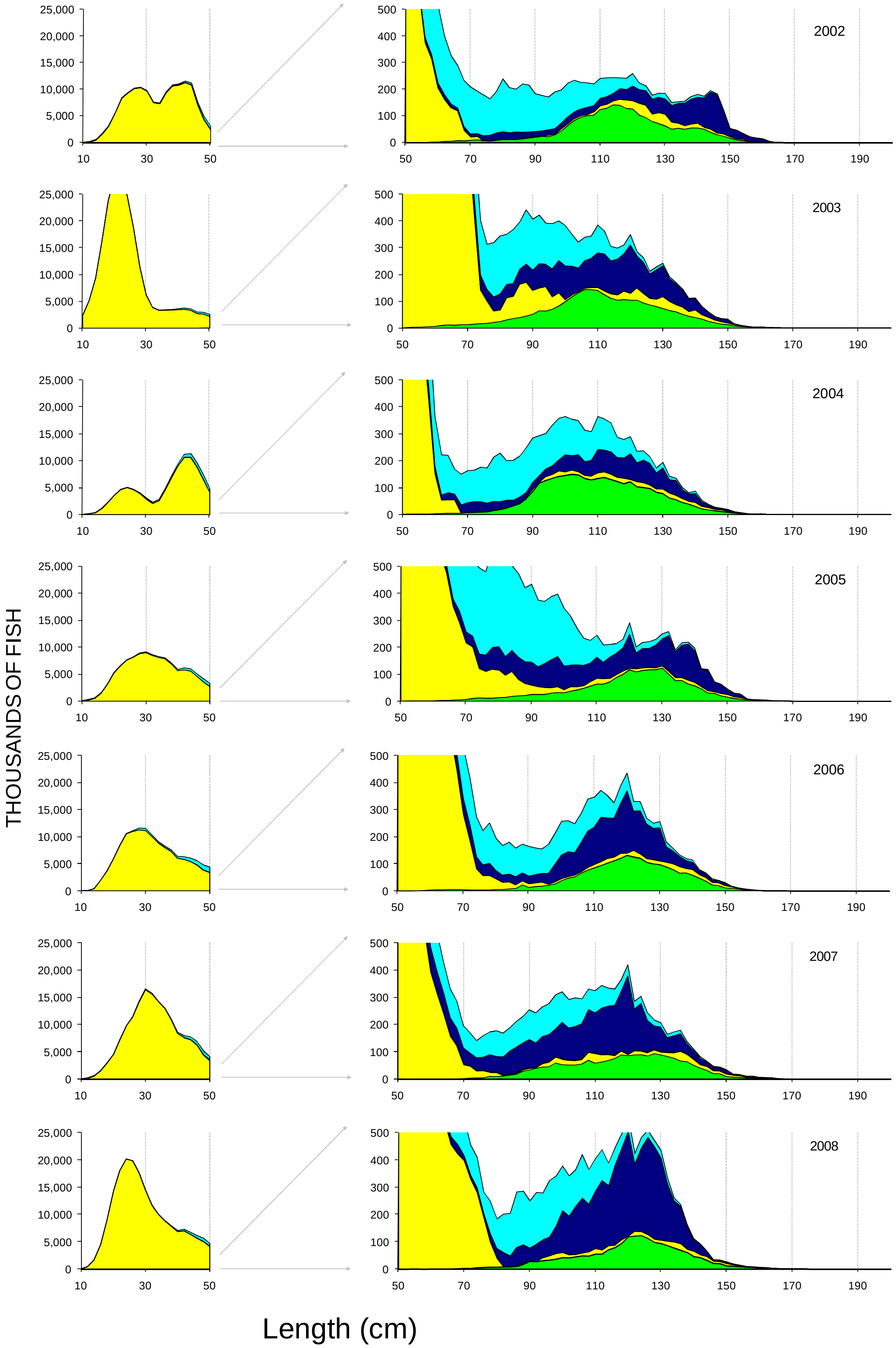

Figure 53. Annual catches (in number of fish) of yellowfin tuna in the WCPO by size and gear type, 2002–2008.

(green–longline; yellow–Phil-Indo fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

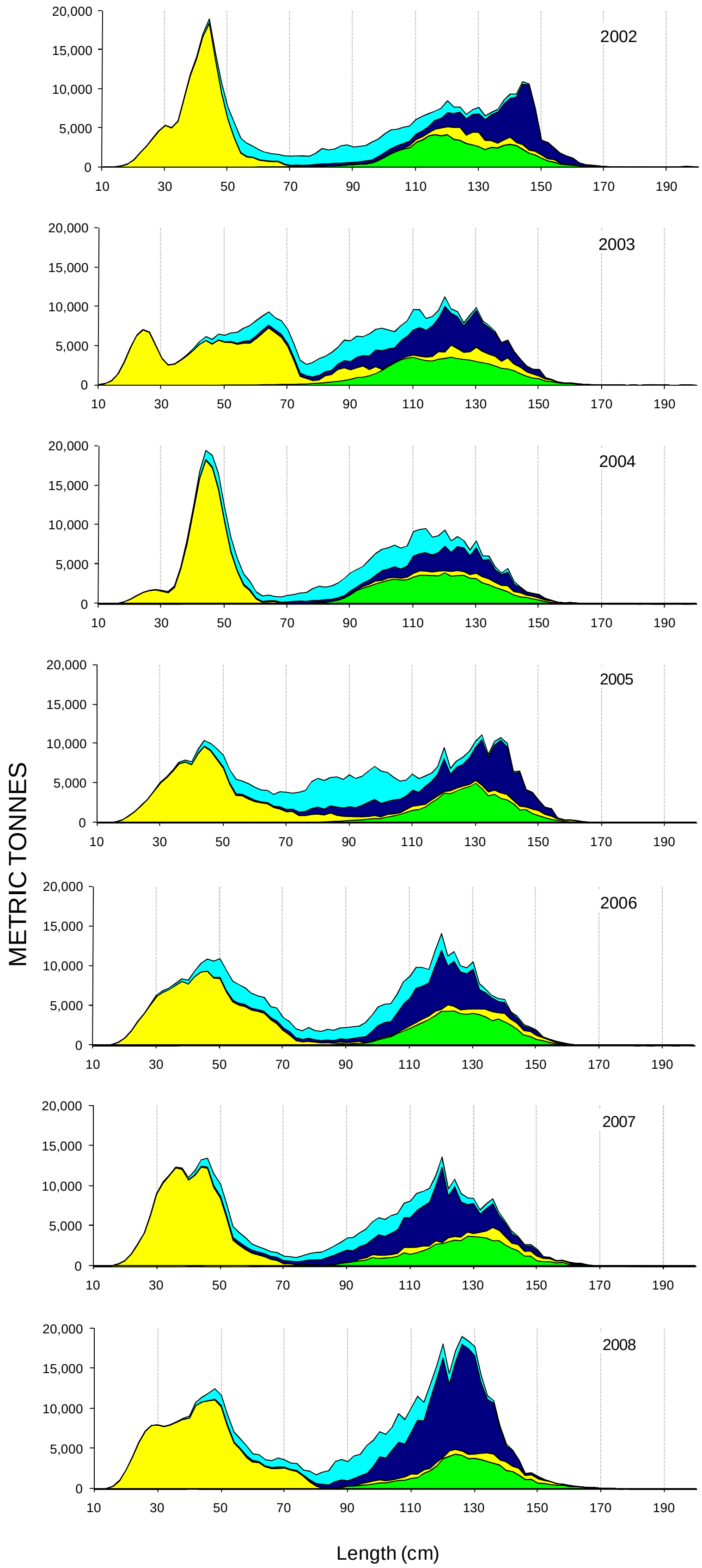

Figure 54. Annual catches (in metric tonnes) of yellowfin tuna in the WCPO by size and gear type, 2002–2008.

(green–longline; yellow–Phil-Indo fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.3 BIGEYE

Since 1980, the Pacific-wide total catch of bigeye (all gears) has varied between 120,000 and 260,000 mt (Figure 55), with Japanese longline vessels generally contributing over 80% of the catch until the early 1990s. The 2008 bigeye catch for the **Pacific Ocean** (239,264 mt) is similar to the average level for the past ten years.

The **purse-seine** catch in the **EPO** (75,653 mt in 2008) continues to account for a significant proportion (80%) of the total EPO bigeye catch. The provisional 2008 EPO longline bigeye catch estimate (19,305 mt) is the lowest since 1960, reflecting, to some extent, the reduction in effort by the Asian fleets. However, the EPO catch estimates are acknowledged to be preliminary[14] and may increase when more data are available. The **WCP–CA longline** bigeye catches have fluctuated between 70,000–98,000 mt since 1999, with the 2008 catch (87,504 mt) being the third highest on record . The provisional **WCP–CA purse seine** bigeye catch for 2008 was estimated to be 46,811 mt which is the highest on record (Figure 56), but this estimate may change since there is a substantial amount of 2008 observer data, which is used to estimate the purse-seine bigeye catch, yet to be received and processed. The **WCP–CA pole-and-line** fishery has generally accounted for between 2,000–4,000 mt of bigeye catch annually over the past decade, although recent revisions to the estimates for the Indonesian fishery have resulted in an increase (to 6,000–11,000 mt) since 2004. The "**other**" category, representing various gears in the Philippine, Indonesian[15] and Japanese domestic fisheries, has accounted for an estimated 11,000–20,000 mt (9–13% of the total WCP–CA bigeye catch) in recent years.

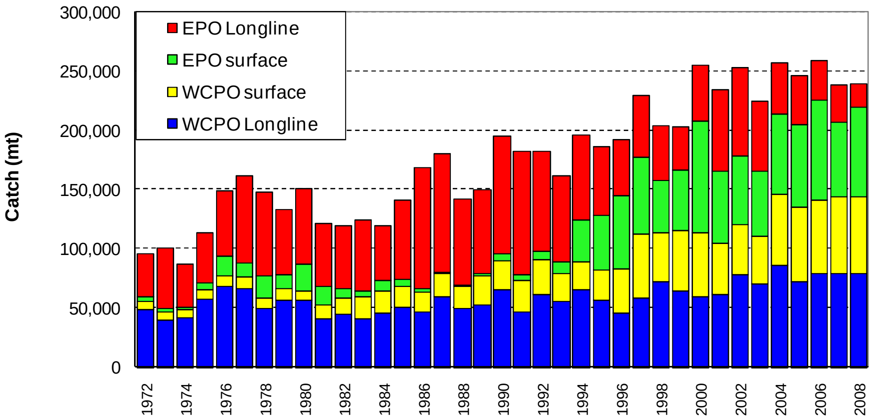

Figure 55. Pacific bigeye catch (mt) by gear
(excludes catches by "other" gears)

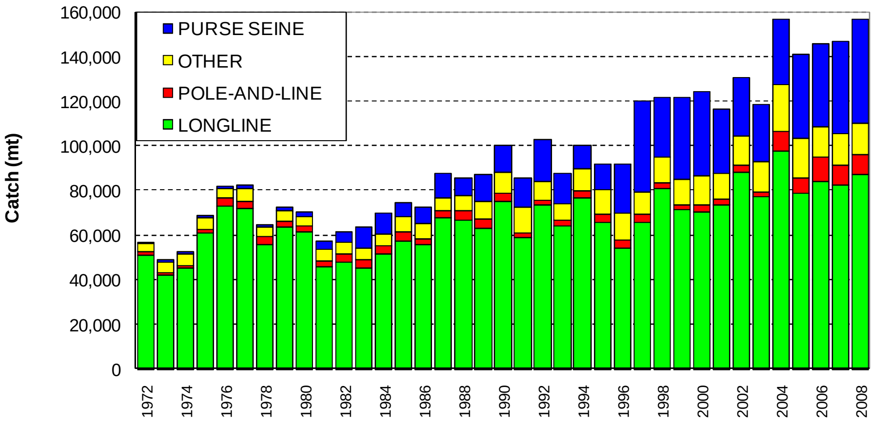

Figure 56. WCP–CA bigeye catch (mt) by gear

Figure 57 shows the spatial distribution of bigeye catch in the Pacific for the period 1990–2007 (2008 data are incomplete). The majority of the WCP–CA catch is taken in equatorial areas, both by purse seine and longline, but with some longline catch in sub-tropical areas (e.g. east of Japan and off the east coast of Australia). In the

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[14] Catch estimates for the EPO longline fishery for 2006-2008 and the EPO purse seine fishery for 2007-2008 are preliminary

[15] Indonesia has recently revised the proportion of catch by species for their domestic fisheries which has resulted in differences in species composition by gear type since 2004 compared to what has been reported in previous years.

equatorial areas, much of the longline catch is taken in the central Pacific, continuous with the important traditional bigeye longline area in the eastern Pacific.

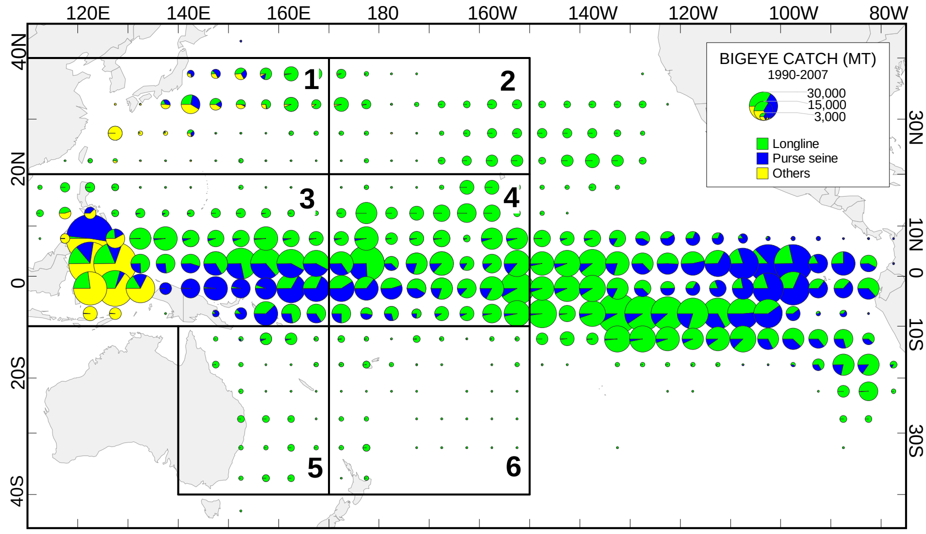

Figure 57. Distribution of bigeye tuna catch, 1990–2007.
The six-region spatial stratification used in stock assessment for the WCP–CA is shown.

As with skipjack and yellowfin tuna, the domestic surface fisheries of the Philippines and Indonesia take large numbers of small bigeye in the range 20–60 cm (Figure 58). The longline fishery clearly accounts for most of the catch (by weight) of large bigeye in the WCP–CA (Figure 58). This is in contrast to large yellowfin tuna, which (in addition to the longline gear) are also taken in significant amounts from unassociated (free-swimming) schools in the purse seine fishery and in the Philippines handline fishery. Large bigeye are very rarely taken in the WCPO purse seine fishery and only a relatively small amount come from the handline fishery in the Philippines. Bigeye sampled in the longline fishery are predominantly adult fish with a mean size of ~130 cm FL (range 80–160 cm FL). Associated sets account for nearly all the bigeye catch in the WCP–CA purse seine fishery with considerable variation in the sizes from year to year. The age class of bigeye taken by associated purse seine sets in the size range 50–55 cm during 2004 and around 70 cm in 2005, are probably represented as the clear mode of fish at size 105–110 cm in the longline fishery in 2006, and modes of larger fish in subsequent years.

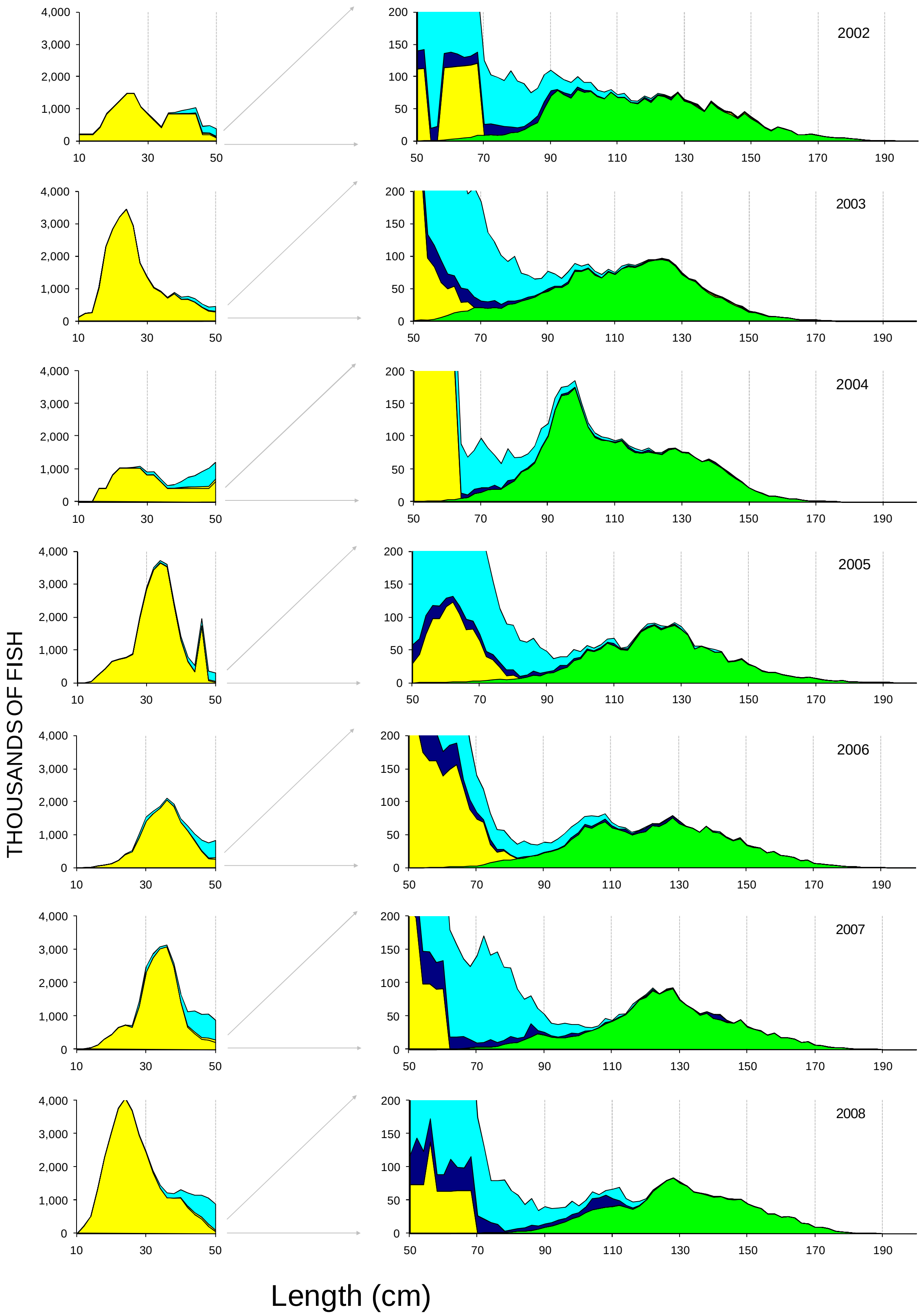

Figure 58. Annual catches (numbers of fish) of bigeye tuna in the WCPO by size and gear type, 2002–2008.

(green–longline; yellow–Phil-Indo fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

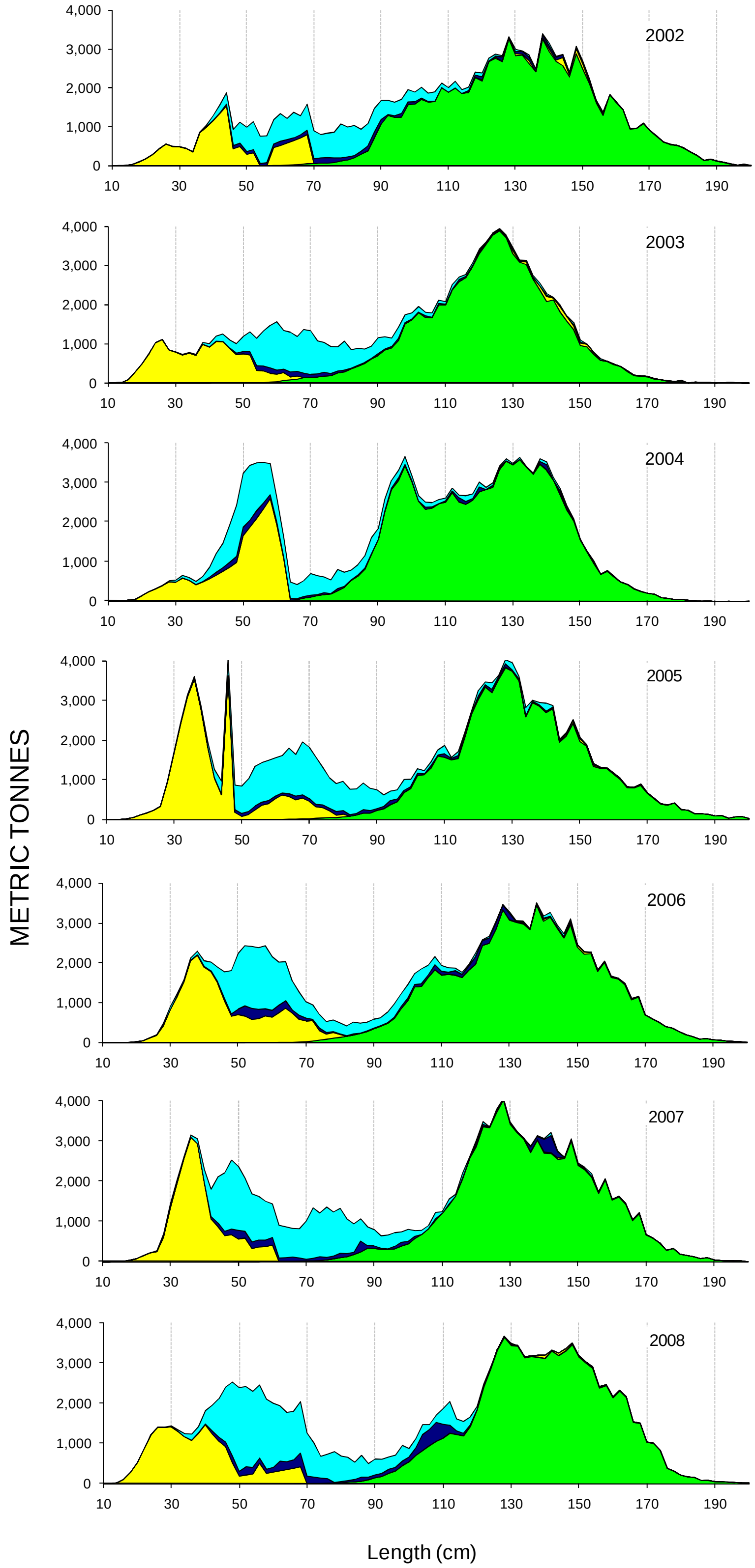

Figure 59. Annual catches (metric tonnes) of bigeye tuna in the WCPO by size and gear type, 2002–2008.
(green–longline; yellow–Phil-Indo fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.4 SOUTH PACIFIC ALBACORE

Prior to 2001, south Pacific albacore catches were generally in the range 25,000–44,000 mt, although a significant peak was attained in 1989 (49,076 mt), when driftnet fishing was in existence. Since 2001, catches have easily exceeded this range, primarily as a result of the growth in several Pacific Islands domestic longline fisheries. The **south Pacific** albacore catch in 2008 (51,672 mt,) was clearly lower that the record catch in 2006 (65,798 mt), but still within the higher range (51,000–66,000 mt) established since 2001.

In the post-driftnet era, **longline** has accounted for most (> 75%) of the South Pacific Albacore catch, while the **troll** catch, for a season spanning November – April has been in the range 3,000–8,000 mt (Figure 60). The **WCP–CA** albacore catch includes north Pacific catches (from the longline, pole-and-line and troll fisheries) and typically contributes around 80–90% of the Pacific catch of albacore. The WCP–CA albacore catch for 2008 (95,043 mt) was the lowest for more than ten years, with declines experienced in all fisheries except the south Pacific troll fishery.

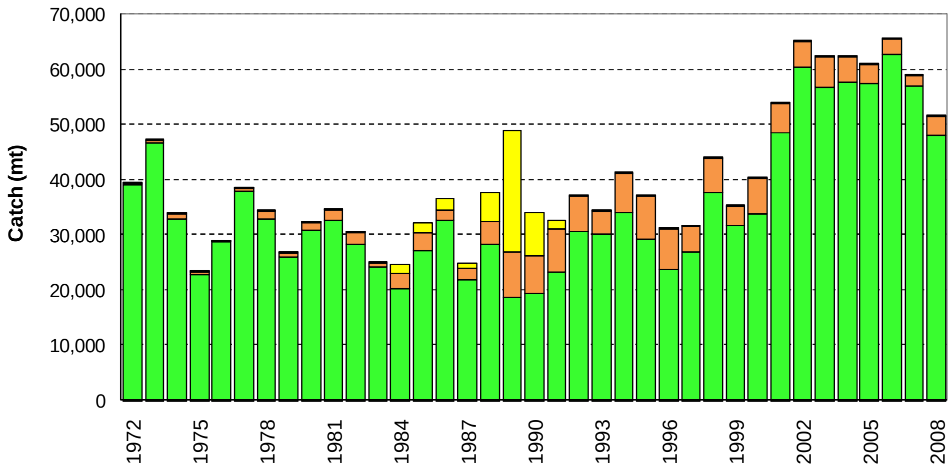

Figure 60. South Pacific albacore catch (mt) by gear ("Other" is primarily catch by the driftnet fishery.)

The longline catch is widely distributed in the south Pacific (Figure 61), but with catches concentrated in the western part of the Pacific. The Chinese-Taipei distant-water longline fleet catch is taken in all three regions, while the Pacific Island domestic longline fleet catch is restricted to the latitudes 10°–25°S. Troll catches are distributed in New Zealand's coastal waters, mainly off the South Island, and along the SCTZ**.** Less than 20% of the overall south Pacific albacore catch is usually taken east of 150°W.

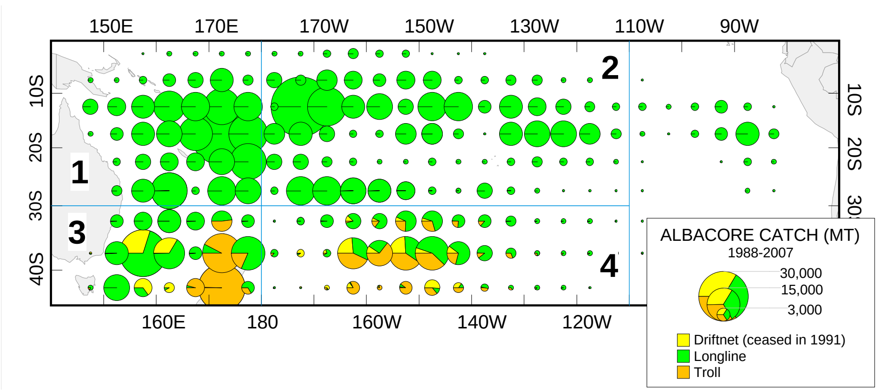

Figure 61. Distribution of South Pacific albacore tuna catch, 1988–2007.
The four-region spatial stratification used in stock assessment is shown.

The longline fishery take adult albacore generally in the narrow size range 90–105cm and the troll fishery take juvenile fish in the range 45–80cm (Figure 62 and Figure 63). Juvenile albacore also appear in the longline catch from time to time (e.g. fish in the range 60–70cm sampled in the longline catch during 2004 and 2006).

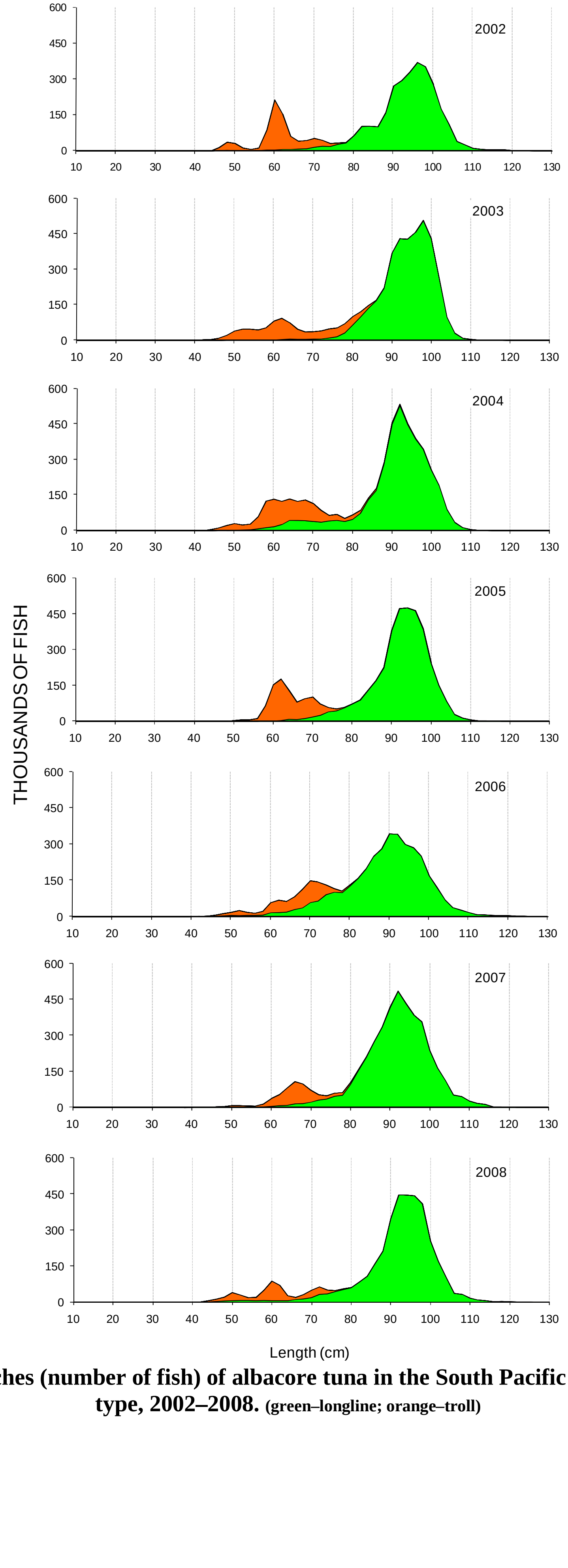

Figure 62. Annual catches (number of fish) of albacore tuna in the South Pacific Ocean by size and gear type, 2002–2008. **(green–longline; orange–troll)**

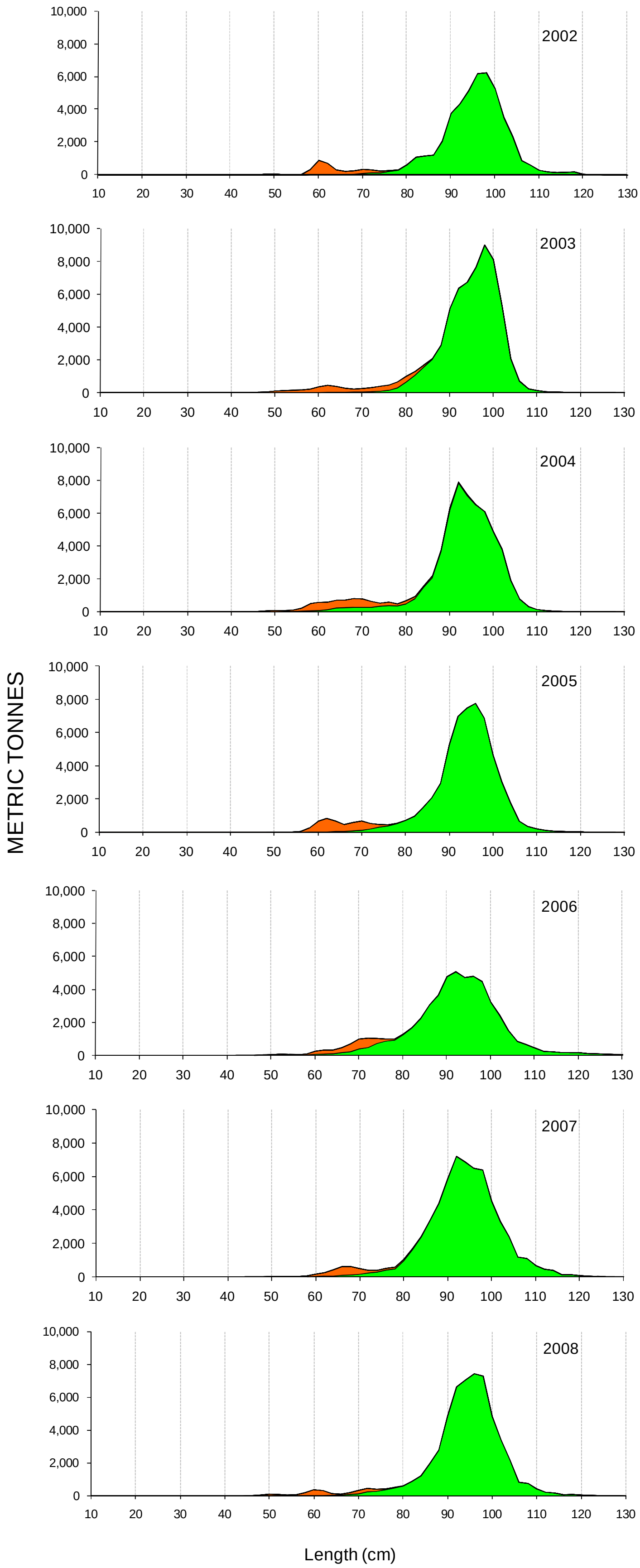

Figure 63. Annual catches (metric tonnes) of albacore tuna in the South Pacific Ocean by size and gear type, 2002–2008. **(green–longline; orange–troll)**

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