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OVERVIEW OF TUNA FISHERIES IN THE WESTERN AND CENTRAL PACIFIC OCEAN, INCLUDING ECONOMIC CONDITIONS – 2010

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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 targeted 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 – 2010. The review draws on the latest catch estimates compiled for the WCP–CA, which can be found in Information Paper WCPFC–SC7 ST IP–1 *(Estimates of annual catches in the WCPFC Statistical Area – OFP 2011)*. Where relevant, comparisons with previous years' activities have been included, although it should be noted that data for 2010, 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; a summary of target tuna catches by species, and for the first time, a summary of South Pacific swordfish (*Xiphias gladius*) catches. In each section, the paper makes some observations on recent developments in each fishery, with emphasis on 2010 catches relative to those of recent years, but refers readers to the SC7 National Fisheries Reports, which offer more detail on 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 fishery, the north Pacific swordfish fishery, those fisheries catching north Pacific Bluefin tuna, the Vietnamese tuna fisheries, and several artisanal fisheries. These fisheries may be covered in future reviews, depending on the availability of more complete data.

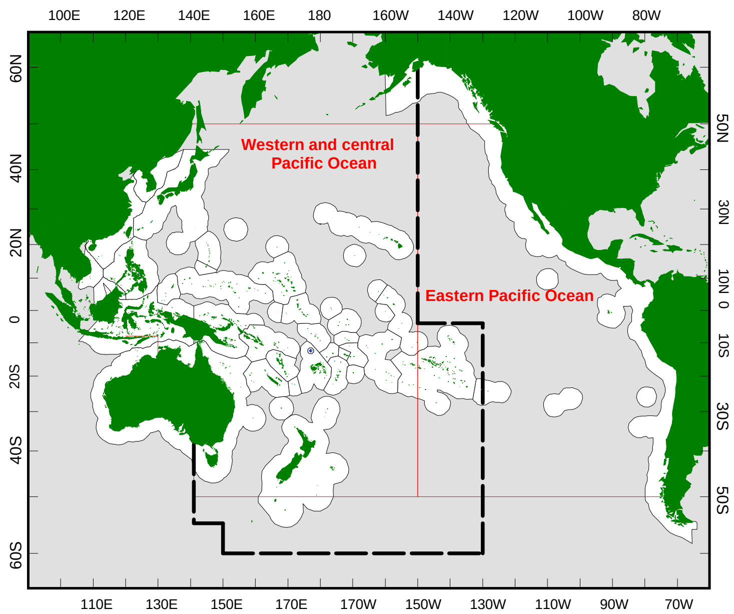


Figure 1. The western and central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Convention Area (WCP–CA in dashed lines)

2. TOTAL TUNA CATCH FOR 2010

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 6 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 2010 was estimated at **2,414,994 mt**, the second highest annual catch recorded and 80,000 mt lower the previous record in 2009 (2,494,112 mt). During 2010, the purse seine fishery accounted for an estimated 1,820,844 mt (75% of the total catch), with pole-and-line taking an estimated 171,604 mt (7%), the longline fishery an estimated 239,853 mt (10%), and the remainder (7%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines. The WCP–CA tuna catch (2,414,994 mt) for 2010 represented 84% of the total Pacific Ocean catch of 2,875,909 mt, and 60% of the global tuna catch (the provisional estimate for 2010 is 4,017,660 mt, which is the lowest for 8 years).

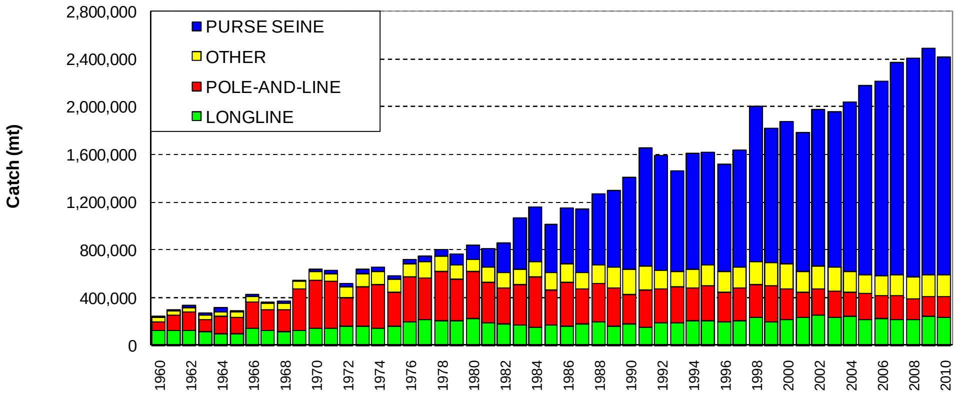


Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

The 2010 WCP–CA catch of skipjack (1,706,166 mt – 71% of the total catch) was the second highest recorded, and 115,000 mt less than the previous record catch of 2009 (1,821,770 mt). The WCP–CA yellowfin catch for 2010 (470,161 mt – 19%) was more than 50,000 mt higher than the 2009 catch level, but still 70,000 mt lower than the record catch taken in 2008 (541,262 mt). The WCP–CA bigeye catch for 2010 (108,997 mt – 5%) was the lowest since 1996, mainly due to a drop in 2010 provisional estimates for the longline fishery. The 2010 WCP–CA albacore[1] catch (129,670 mt - 5%) was the second highest on record, with very good catches from the longline fishery.

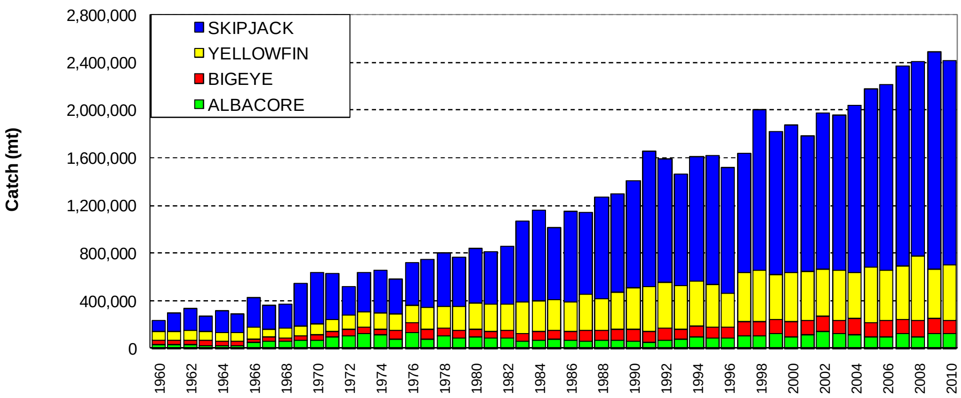


Figure 3. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

[1] includes catches of north and south Pacific albacore in the WCP–CA, which comprised 81% of the total Pacific Ocean albacore catch of 160,221 mt in 2010; the section 7.4 "Summary of Catch by Species - Albacore" is concerned only with catches of south Pacific albacore, which made up approximately 55% of the Pacific albacore catch in 2010.

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 75% of total tuna catch volume (more than 1,800,000 mt – Figure 2). The majority of the historic WCP–CA purse seine catch has come from the four main Distant Water Fishing Nation (DWFN) fleets – Japan, Korea, Chinese-Taipei and USA, which numbered 147 vessels in 1995, declined to a low of 110 vessels in 2006 before increasing again to 137 vessels in 2010[2]. The Pacific Islands fleets have gradually increased in numbers over the past two decades to a level of 78 vessels in 2010 (Figure 4). The remainder of the purse seine fleet includes several fleets which entered the WCPFC tropical fishery in the 2000s (e.g. China, Ecuador, El Salvador, New Zealand and Spain). The total number of purse seine vessels was relatively stable over the period 1990-2006 (in the range of around 180–220 vessels), but over the last four years, the number of vessels has clearly increased, attaining a level of 280 vessels[3] in 2010.

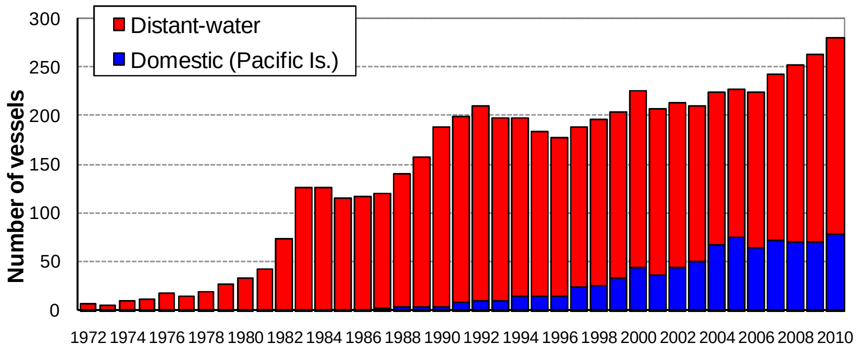


Figure 4. Number of purse seine vessels operating in the WCP–CA
(this does not include the Japanese Coastal purse seine fleet and the Indonesian and Philippines domestic purse-seine/ringnet fleets which account for over 1,000 vessels)

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 two decades include:

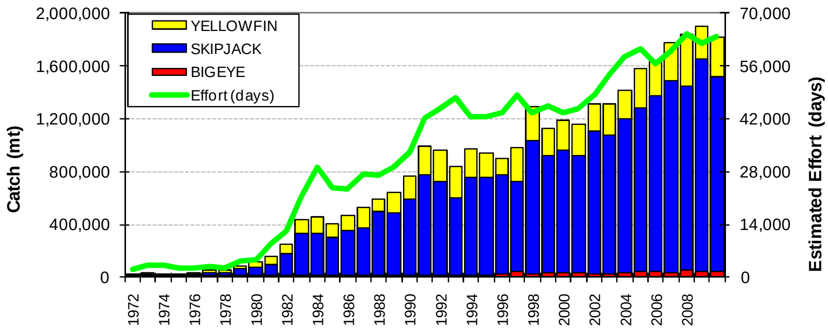


Figure 5. Purse seine catch (mt) of bigeye, skipjack and yellowfin and estimated fishing effort (days fishing and searching) in the WCP–CA

- 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 and now around 1,600,000 mt;
- Annual yellowfin catches fluctuating considerably between 115,000 and 300,000 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. 41,368 mt in 1997 and 39,888 mt in 2000) coinciding with the introduction of drifting FADs (since 1996). In the period 2001–2004, bigeye catches were generally

[2] The number of vessels by fleet in 1995 was Japan (31), Korea (30), Chinese-Taipei (42) and USA (44) and in 2010 the number of vessels by fleet was Japan (37), Korea (29), Chinese Taipei (34) and USA (37). In 2010, there was an additional 35 vessels in the category less than 200 GRT which are a part of the Japanese offshore purse seine fleet but not included here.

[3] There are a large number of ringnet and small purse seine vessels in the Indonesian, Japanese Coastal and Philippines domestic fisheries which are not included in this total.

lower, but the catch estimates in recent years have been the highest on record (50,469 mt for 2008, 46,594 mt for 2009 and 43,389 mt for 2010).

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 intersects the histogram bar (i.e. in 1998 and 2006-2010).

3.2 Provisional catch estimates, fleet size and effort (2010)

The provisional **2010 purse-seine catch of 1,820,844 mt** was the third highest on record for this fishery, at more than 80,000 mt lower than the record attained in 2009. The 2010 purse-seine skipjack catch (1,476,819 mt) was the second highest on record, but significantly lower (130,000 mt) than the record catch in 2009; the proportion of skipjack tuna in the logsheet-reported total catch (81%)[4] was in line with the average for recent years. The 2010 purse-seine catch of yellowfin tuna (300,339 mt – 16%) rebounded (by 54,000 mt) from the relatively low catch of 2009, but was still significantly lower than the record catch taken in 2008 (391,152 mt). The provisional catch estimate for bigeye tuna for 2010 (43,389 mt) was the third highest on record but may be revised once all observer data for 2010 have been received and processed[5].

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-fleet 2010 total catch and effort was the highest ever. The Chinese-Taipei fleet had been the highest producer in the tropical purse seine fishery until 2004, when it was 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. There was a hiatus in the FSM Arrangement fleet development in 2008 (when some vessels reflagged to the US purse-seine fleet) but catch/effort has since picked up again in 2009/2010. 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, the US purse-seine fleet commenced a significant rebuilding phase in late 2007, with vessel numbers more than doubling in comparison to recent years, but still below the fleet size in the early-mid 1990s. The increase in vessel numbers in the US purse seine fleet is reflected in the sharp increase in their catch and effort since 2007, which is now in line with the other major purse seine fleets.

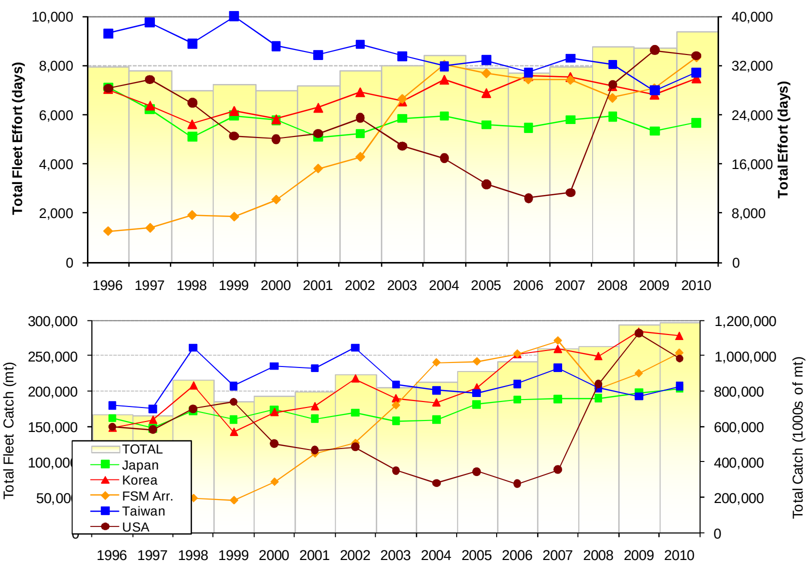


Figure 6. Trends in annual effort (top) and catch (bottom) estimates for the top five purse seine fleets operating in the tropical WCP–CA, 1996–2010.

[4] However, recent studies using observer data (e.g. Lawson, 2007, Lawson, 2010, Hampton and Williams, 2011a) show that the logsheet-reported catch, mainly for associated sets, should contain higher quantities of yellowfin and bigeye tuna that have been misreported as skipjack tuna. The ANNEX to this paper provides figures based on alternative purse-seine species catch estimates which attempt to resolve these problems in the logsheet-reported catch by species (see Lawson, 2010 and OFP, 2011). For example, the proportion of skipjack tuna in the logsheet-reported total catch for 2010 was 81%, but has been estimated to be 75% when accounting for the misreported catch of yellowfin and bigeye tuna. The official WCPFC purse seine catch estimates by species do not yet reflect this adjustment.

[5] 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 2010).

The total number of Pacific-island domestic vessels has gradually increased over the past two decades, attaining its highest level in 2010 (78 vessels). The Pacific-islands purse seine fleets comprise vessels fishing under the FSM Arrangement (36 vessels in 2010), the Vanuatu fleet operating under bilateral arrangements (5 vessels), and domestic vessels operating in PNG (Papua New Guinea; 26 vessels) and Solomon Islands (5 vessels) waters. The FSM Arrangement (FSMA) fleet comprises vessels managed by the Pacific Island "Home Parties" of PNG (19 vessels), the Marshall Islands (10 vessels), FSM (5 vessels) and Kiribati (1 vessel) which fish over a broad area of the tropical WCP–CA. During the past two years, FSM added 2 new non-FSMA vessels to their fleet and Kiribati added 3 new non-FSMA vessels and the first Tuvaluan purse-seine vessel entered the fishery.

The domestic Philippine purse-seine and ring-net fleets operate in Philippine and northern Indonesian waters, and prior to 2010, the high seas pocket between Palau, Indonesia, FSM and PNG, and have taken a combined catch of around 200,000 t in recent years (OFP 2011a). The high seas closure resulted in a decline in the domestic Philippine purse-seine catch for 2010, but with an increase in activities by Philippine-flagged vessels fishing in PNG under bilateral arrangements. The domestic Indonesian purse-seine fleet takes a similar catch level to the Philippines domestic fishery which means that these two domestic fisheries account for about 20-25% of the WCP-CA total purse seine catch.

Figure 7 shows annual trends in the school types set on by the major purse-seine fleets. Sets on free-swimming (unassociated) schools of tuna have predominated during recent years but was particularly high during 2010 (79% of all sets for these fleets), no doubt related in part to the FAD closure (July–September). The number of sets on logs (7%) and drifting FADs (14%) in 2010 showed significant declines on previous years. Hampton and Williams (2011b) provide a more detailed breakdown of catch and effort by set type in 2009 and 2010 using available logsheet and observer data.

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 expanding further to the east during El Niño years and a contracting back to western areas during La Niña periods.

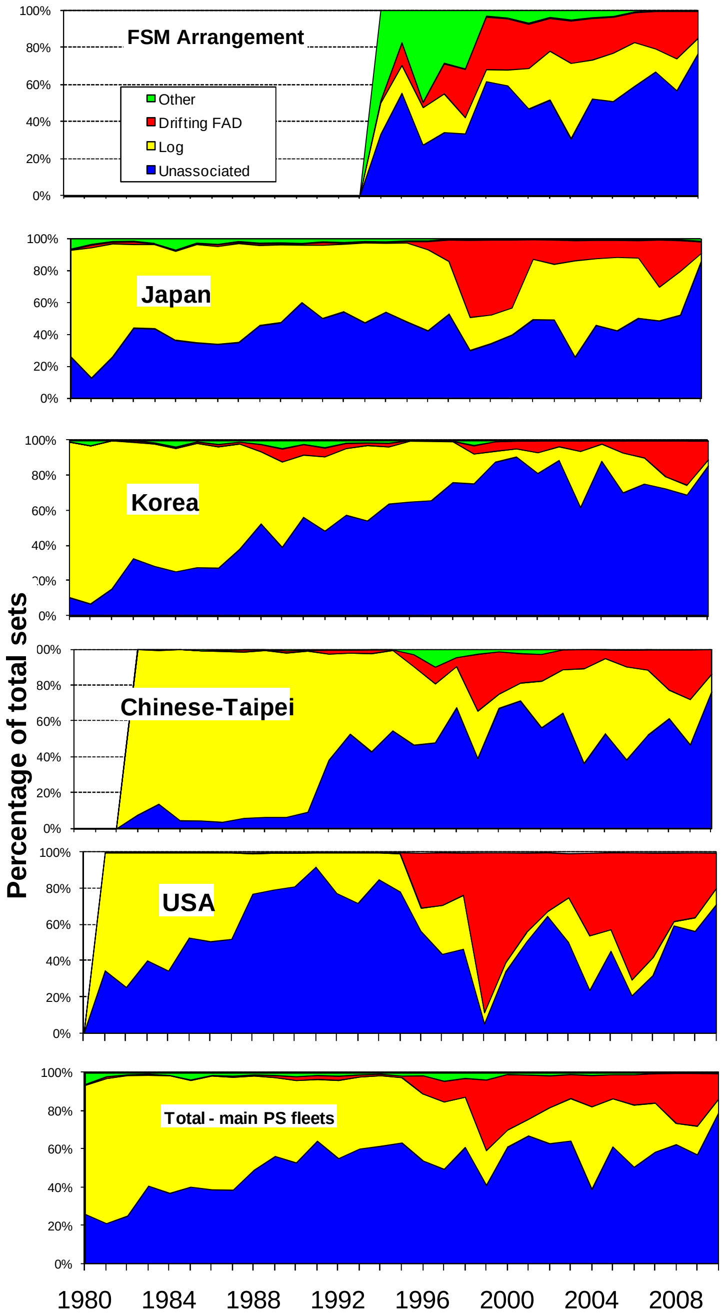


Figure 7. Time series showing the percentage of total sets by school type for the major purse-seine fleets operating in the WCP–CA.

The WCP–CA experienced an El Niño period in 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 Niño 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 Niña-state by the end of 2005. This weak La Niña continued into the first part 2006 but soon dissipated and a weak El Niño event then presided over the remainder of 2006. During first half of 2007, the WCP–CA was in an ENSO-neutral state, but then moved into a prolonged La Niña state, which persisted throughout 2008 and into 2009. There was a transition in the middle of 2009 to an El Niño period which then presided into the first part of 2010. Conditions in the WCP-CA then switched back to a strong La Niña state over the latter months of 2010, and this has persisted into the 1st quarter of 2011. In line with the prevailing ENSO conditions, fishing activity during the first part of 2010 extended further eastwards compared to recent years (2007-2008) when the La Niña conditions generally restricted activities to waters of the PNG, FSM and Solomon Islands, but fishing activities were then restricted to the west in the latter months of 2010 (see Section 3.5 below).

The distribution of effort by set type (Figure 8–right) for the past seven years shows that the establishment of the El Niño event during 2004 coincided with a higher proportion of log-associated sets east of 160°E than in 2008, for example, 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. Note that despite the FAD closure for two months of 2009, there was still a significant amount of drifting FAD sets made in that year overall (Figure 8–right, second from bottom). We would expect to see an increase in unassociated sets in 2010 (Figure 8–right, bottom) due to the FAD closure (July-September), but this set type appears to have dominated in other months as well, perhaps due to operational constraints (e.g. fewer drifting FADs deployed) and/or environmental conditions that were conducive to sets on free-swimming schools.

Figures 9 through 13 show the distribution of purse seine effort for the five major purse seine fleets during 2009 and 2010. The distribution of effort for all fleets in 2010 appears more "compressed" to the western tropical areas than in 2009, with an increase in 2010 effort in the eastern area of PNG, Solomon Islands, FSM and the adjacent high seas pocket. As reported last year, the change in fishing areas for some vessels in the US fleet is evident by the higher proportion of effort in the west for those vessels that don't use Pago Pago as their main unloading port.

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 same period, and Figure 16 shows the distribution of estimated bigeye catch by set type for the past seven years. There are some instances where the composition of the skipjack catch by set type is clearly different to the composition of the yellowfin catch by set type; for example, during the period (2006-2008), unassociated sets clearly accounted for a far greater proportion of the total yellowfin catch in the area to the east of 160°E than they did for the total skipjack catch. Higher proportions of yellowfin in the overall catch (by weight) usually occur during El Niño years as fleets have access to "pure" schools of large yellowfin that are more available in the eastern tropical areas of the WCP–CA. There was some evidence of this in the most recent El Niño period, although yellowfin also comprised a higher proportion of the total catch in 2008 (La Niña) and 2010 (El Niño/La Niña) than in 2009 (La Niña/ El Niño), indicating that this pattern does not hold in all years (Figure 14, Figure 15–right). In contrast, associated sets usually account for a higher proportion of the skipjack catch (than yellowfin), in the respective total catch of each species (Figure 15–left), although as noted earlier, the logsheet-reported catch from associated schools contain a significant amount of yellowfin and bigeye tuna misreported as skipjack tuna.

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). However, there was a relatively large estimated bigeye catch from unassociated sets in the western areas of the tropical WCPO during 2010, perhaps related to prevailing environmental conditions (see Section 3.5).

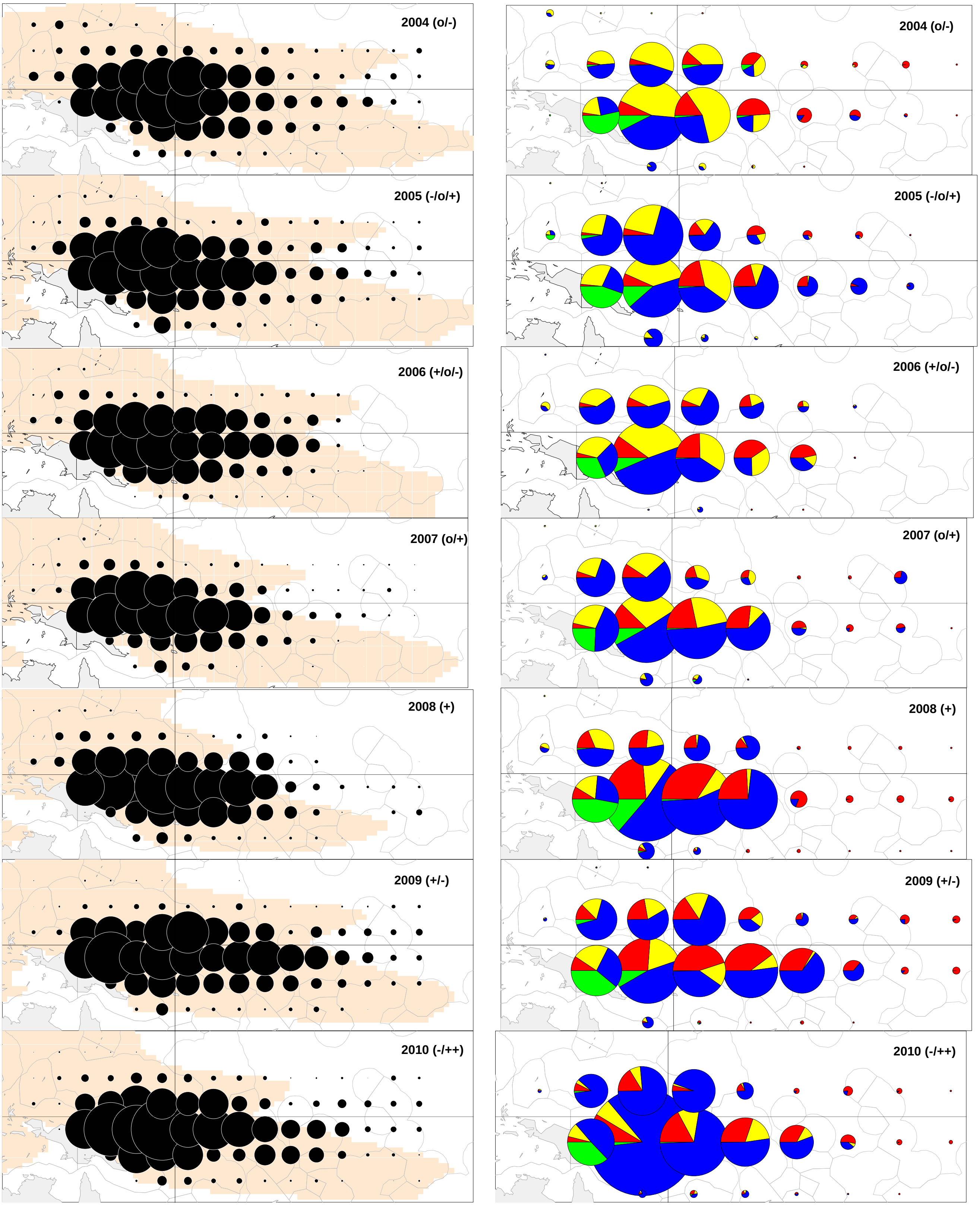


Figure 8. Distribution of purse-seine effort (days fishing – left; sets by set type – right), 2004–2010. (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

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

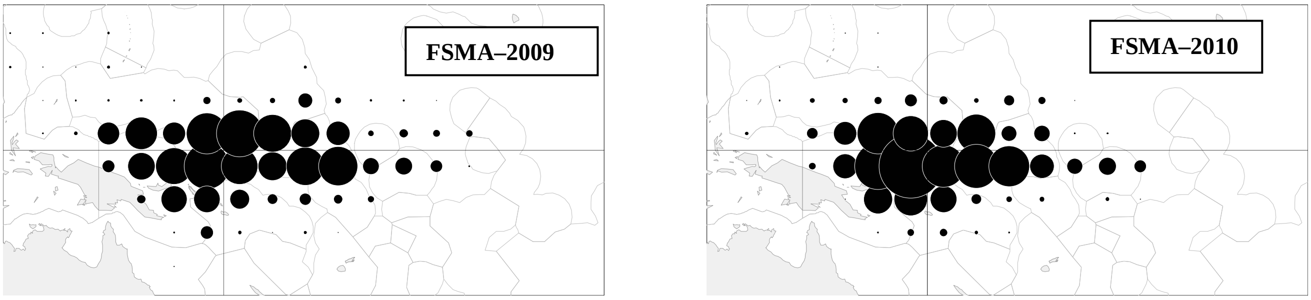


Figure 9. Distribution of effort by fleets operating under the FSM Arrangement during 2008 and 2010
lines for the equator (0° latitude) and 160°E longitude included.

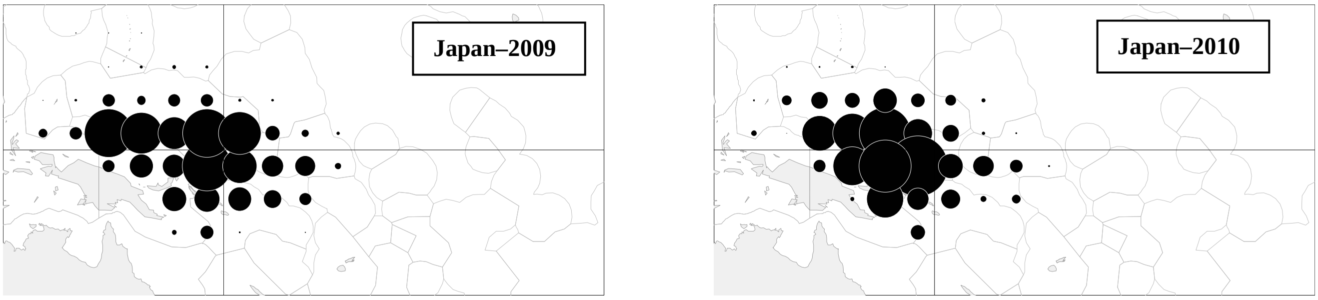


Figure 10. Distribution of effort by the Japanese purse seine fleet during 2008 and 2010
lines for the equator (0° latitude) and 160°E longitude included.

Figure 11. Distribution of effort by the Korean purse seine fleet during 2008 and 2010
lines for the equator (0° latitude) and 160°E longitude included.

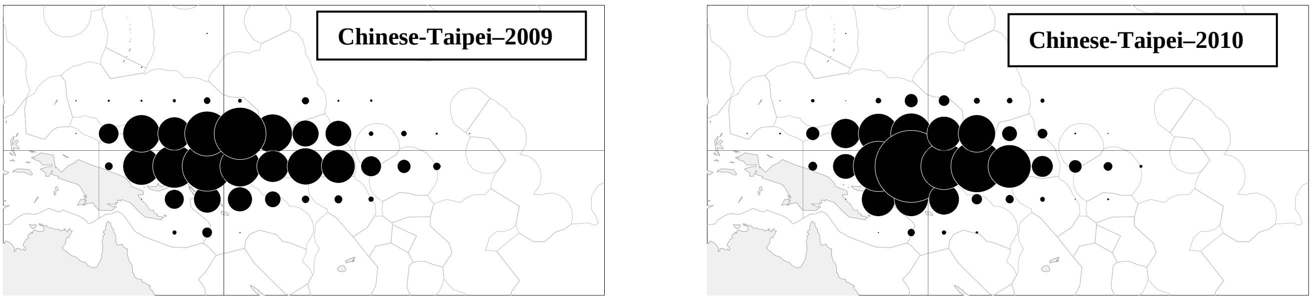


Figure 12. Distribution of effort by the Chinese-Taipei purse seine fleet during 2008 and 2010
lines for the equator (0° latitude) and 160°E longitude included.

Figure 13. Distribution of effort by the US purse seine fleet during 2009 and 2010
lines for the equator (0° latitude) and 160°E longitude included.

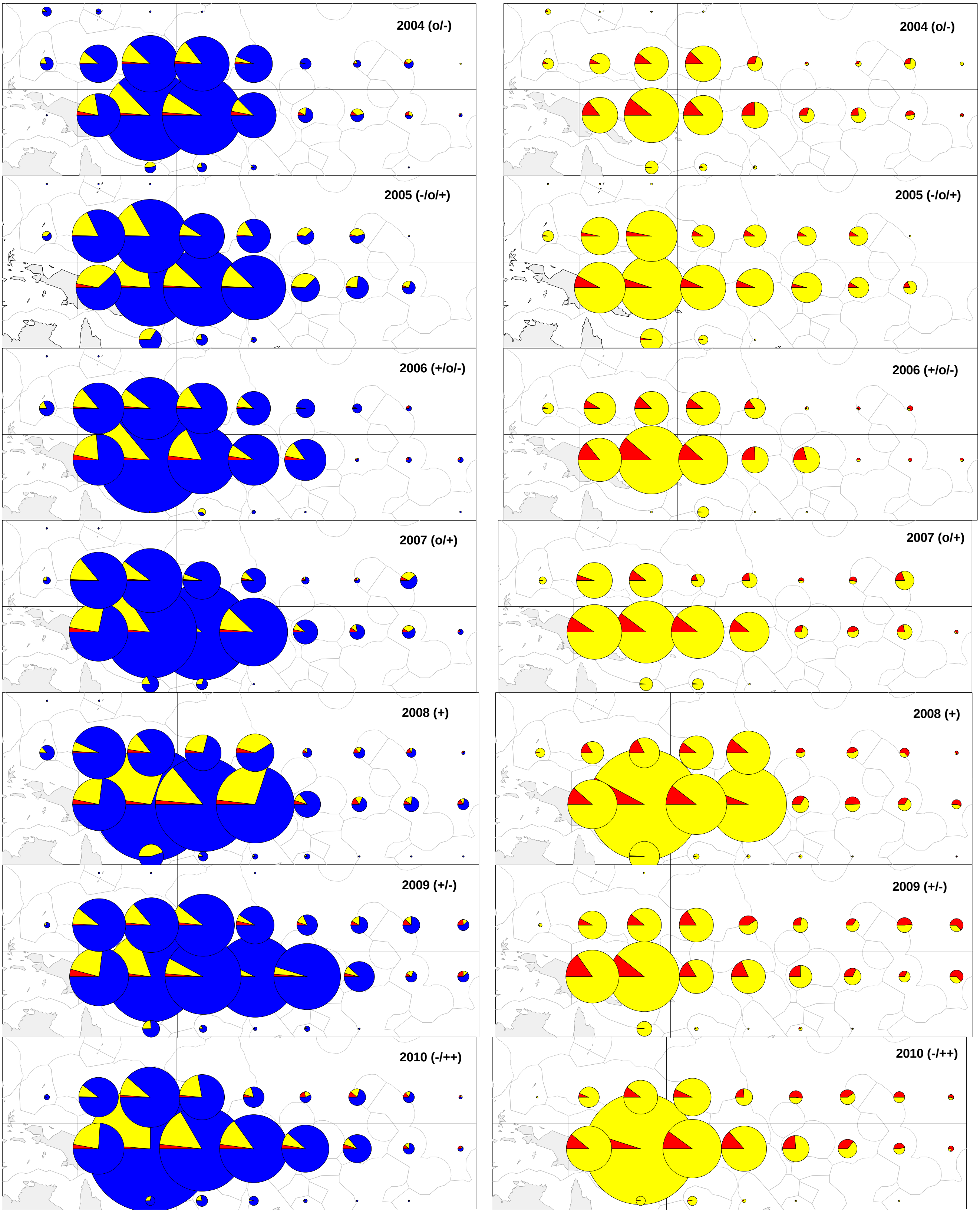


Figure 14. Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch (left) and purse-seine yellowfin/bigeye tuna catch only (right), 2004–2010 (Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).

ENSO periods are denoted by "+": La Niña; "-": El Niño; "o": transitional period.
Estimates of bigeye catch for 2010 are provisional.

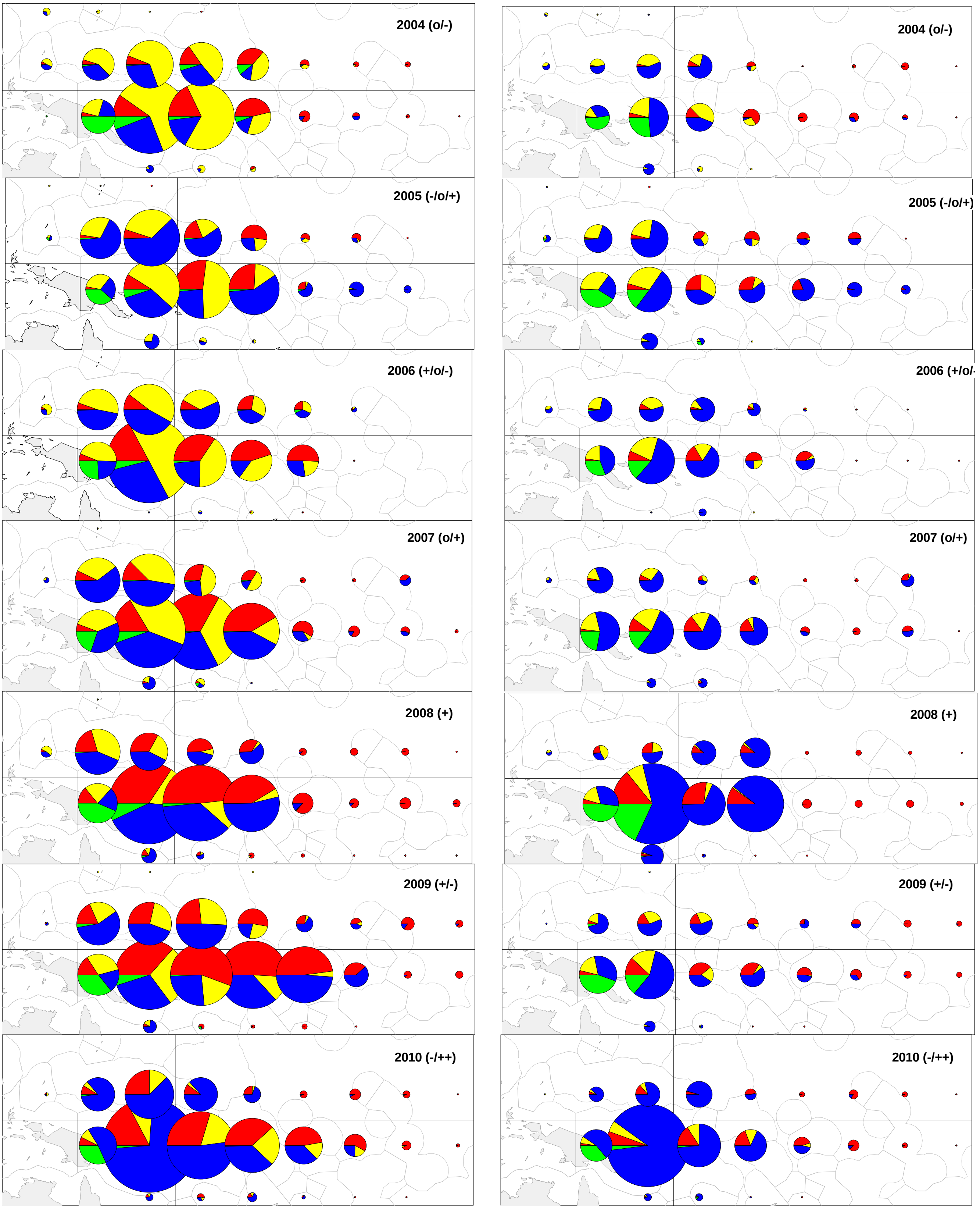


Figure 15. Distribution of skipjack (left) and yellowfin (right) tuna catch by set type, 2004–2010 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

Sizes of circles for all years are relative for that species only.

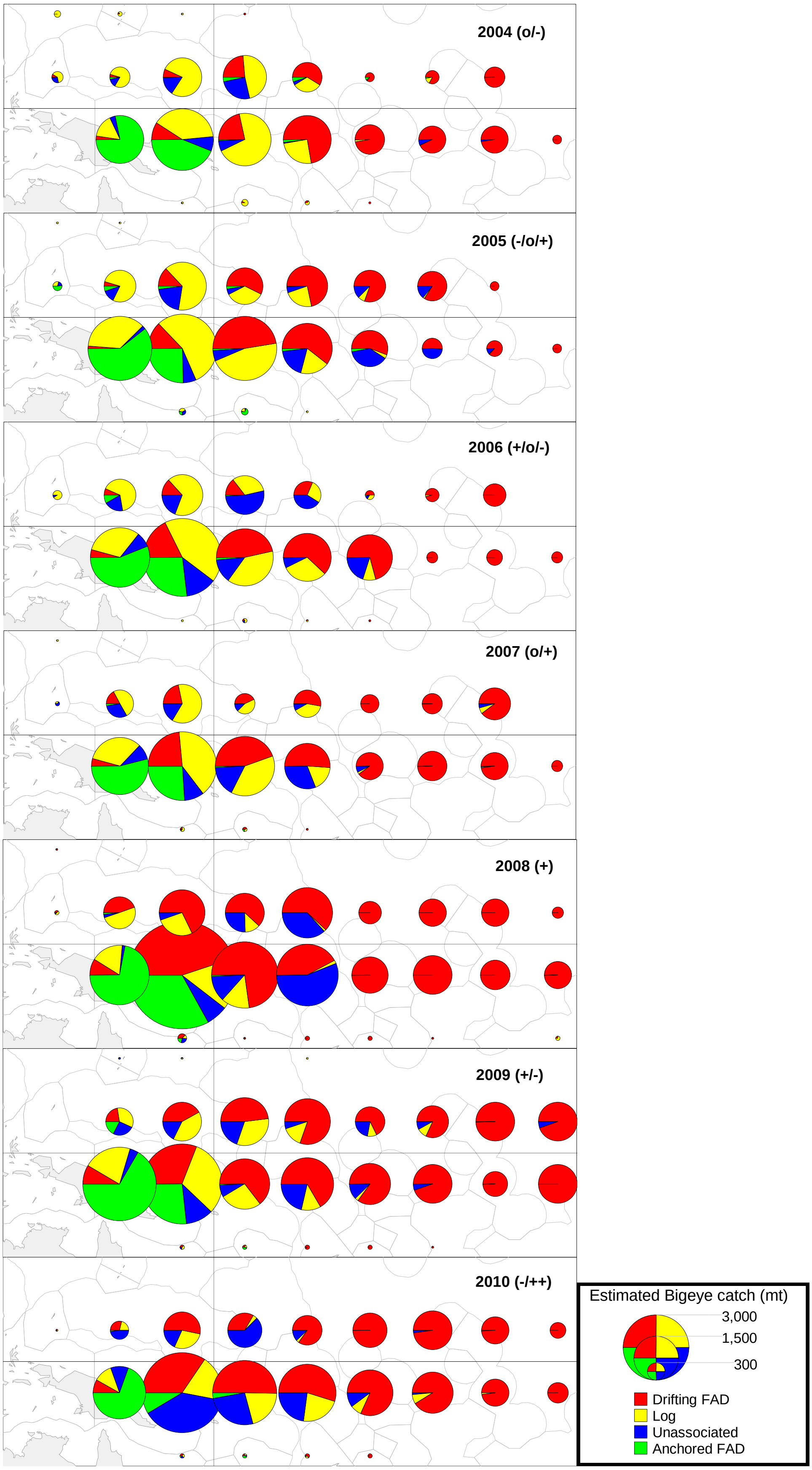


Figure 16. Distribution of estimated bigeye tuna catch by set type, 2004–2010 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).
ENSO periods are denoted by "+": La Niña; "-": El Niño; "o": transitional period.
Estimates of bigeye catch for 2010 are provisional.

3.4 Catch per unit of effort

Figure 17 shows the annual time series of nominal CPUE by set type and vessel nation for skipjack (left) and yellowfin (right). These trends are not standardised for factors that may relate to the efficiency of the fleets, e.g. technological improvements and increased vessel power, so therefore must be interpreted with caution.

Purse seine skipjack CPUE for nearly all set types appears to have decreased during 2010, while the yellowfin CPUE appears to have increased. Over the entire time series, the trend for skipjack CPUE is generally upwards, perhaps stable for the last five years (when overlooking 2009). The pattern is different for yellowfin CPUE with a gradual, but continuous decline in CPUE from associated sets over this time. CPUE from unassociated sets has remained relatively constant. It is unknown whether these trends in associated-set CPUE reflect an increasing ability to target skipjack tuna at the expense of yellowfin or reflect a decrease in yellowfin abundance. However, as noted earlier, the logsheet-reported catch from associated schools contain a significant amount of yellowfin and bigeye tuna misreported as skipjack tuna and this would need to be taken into account in any standardisation exercise.

Yellowfin purse-seine CPUE shows strong inter-annual variability and differences among the fleets. School-set yellowfin CPUE appears influenced by 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.

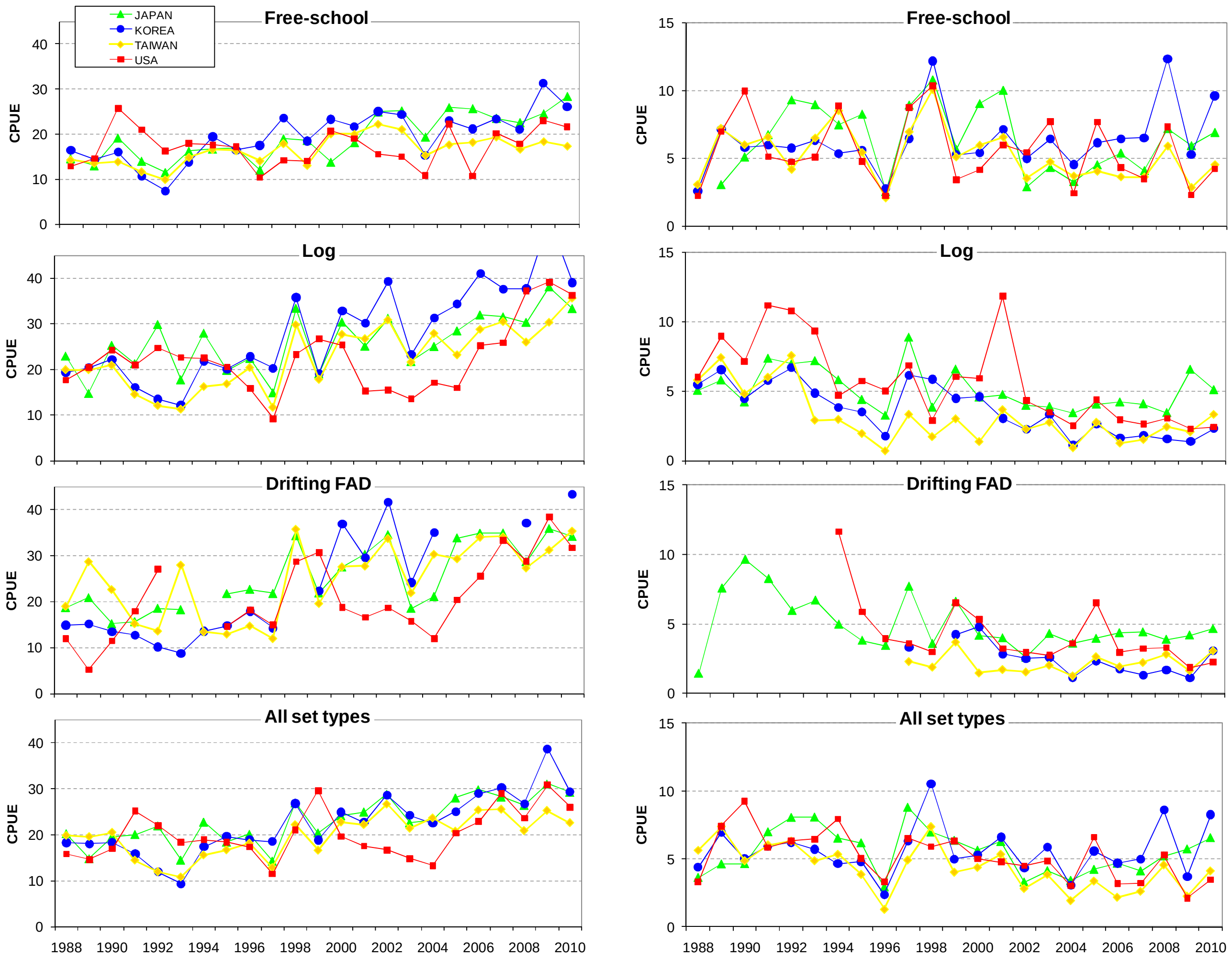


Figure 17. Skipjack tuna CPUE (mt per day–left) and Yellowfin tuna CPUE (mt per day–right) by set-type, and all set types combined, for selected purse-seine fleets fishing in the tropical WCP–CA.
Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each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

Associated (log and drifting FAD) sets generally yield higher catch rates (mt/day) for skipjack than unassociated sets, while unassociated sets generally yield a higher catch rate for yellowfin than associated sets. This is mainly due to the occurrence of unassociated sets in the more eastern areas of the tropical WCP-CA containing "pure" schools of large, adult yellowfin, which account for a larger catch (by weight) than the (mostly) juvenile yellowfin encountered in associated sets. Yellowfin CPUE from unassociated sets appears to have rebounded in 2010 after notable low catch rates experienced in 2009 for some fleets.

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 of this species an order of magnitude higher (Figure 18). The trends in estimated bigeye tuna CPUE since 2000 sometimes varies by fleet and set type with no clear pattern evident.

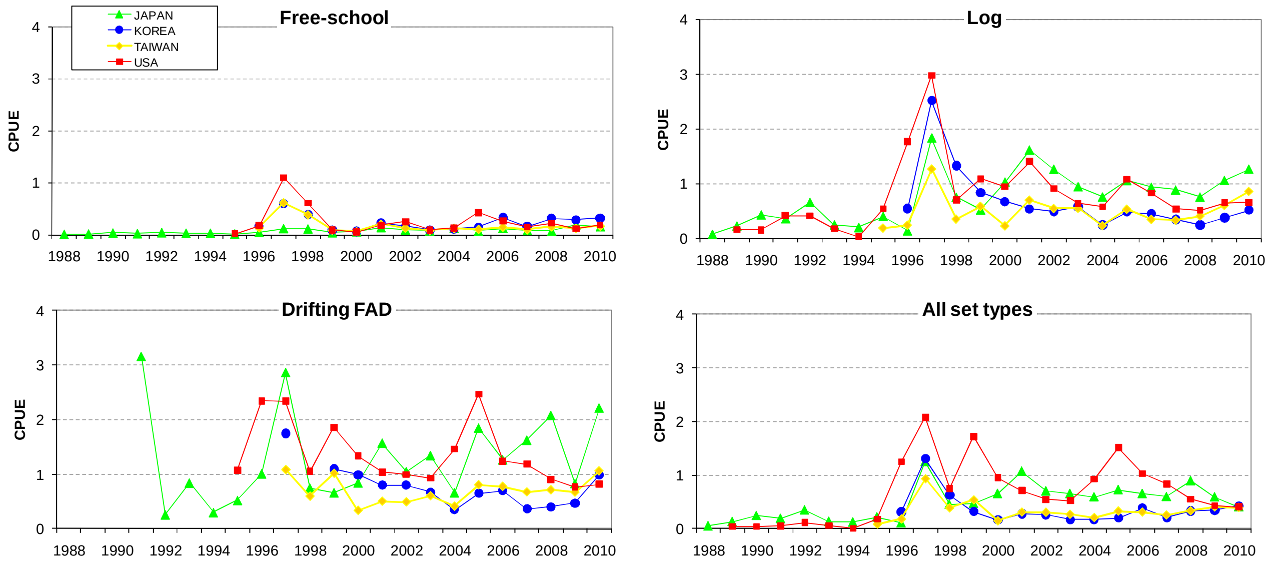


Figure 18. **Estimated Bigeye tuna CPUE (mt per day) by major set-type categories (free-school, log and drifting FAD sets) and all set types combined for Japanese, Korean, Chinese-Taipei and US purse seiners fishing in the tropical WCP–CA.**

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

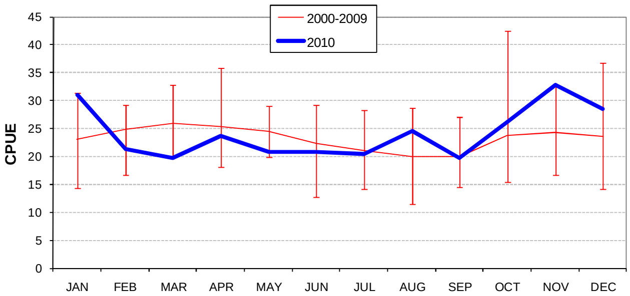
Estimates of bigeye catch for 2010 are provisional.

3.5 Seasonality

Figure 19 shows the seasonal average CPUE for skipjack (left) and yellowfin (right) in the purse seine fishery for the period 2000–2010, and Figure 20 shows the distribution of effort by quarter for the period 2000-2009 in contrast to effort by quarter in 2010. Over the period 2000–2009, 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, 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 the first six months of 2010 was generally lower than average catch rates of skipjack for the past decade (Figure 19–left), whereas yellowfin catch rates were generally higher than the average over 2000-2009 (Figure 19 – right). Yellowfin CPUE in March, April and October 2010 were the highest over this time series (2000-2010). Skipjack and yellowfin CPUE were generally at or above average during the 2010 FAD Closure period (July-September) and both CPUE were above average in the latter months of 2010.

The El Niño state in the 1st quarter of 2010 coincided with the warm pool of surface water (>28.5°C on average) extending more eastwards than the 1st quarter average for years 2000-2009 (Figure 20). In contrast, purse seine effort in the 3rd and 4th quarters of 2010 (Figure 20–bottom, right) was restricted to the western areas of the tropical WCP-CA (PNG, FSM and the Solomons) by what appears to be an unseasonal "tongue" of cooler surface waters (associated with the change to a strong La Niña event) pushing in from the east.



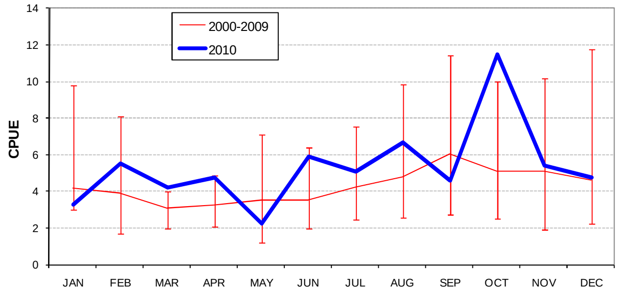
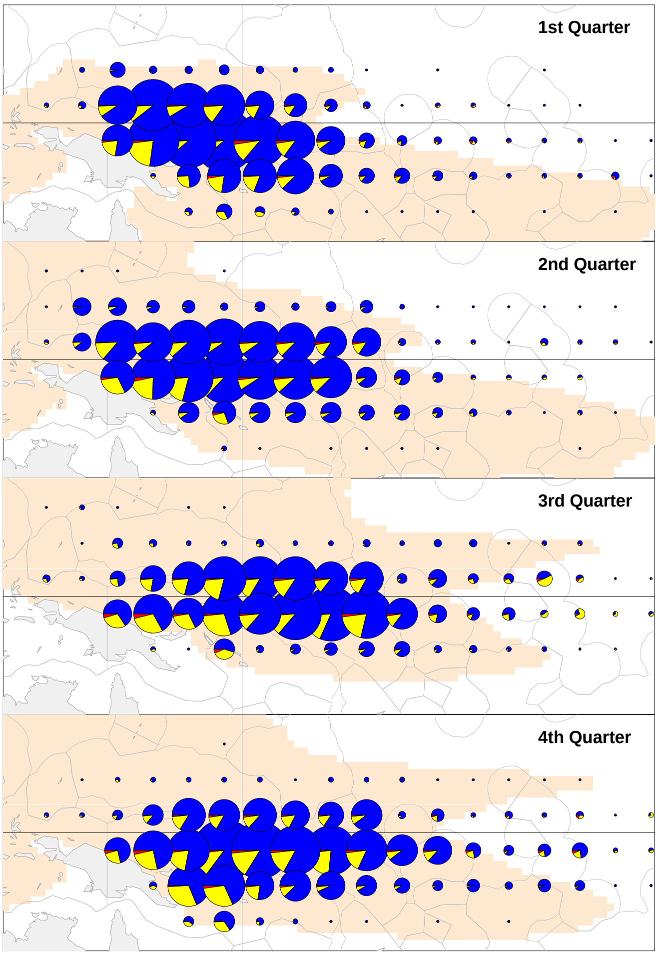


Figure 19. **Average monthly Skipjack (left) and Yellowfin (right) tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2000–2010.**

Red line represents the period 2000–2009 and the blue line represents 2010.

The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2000–2009.



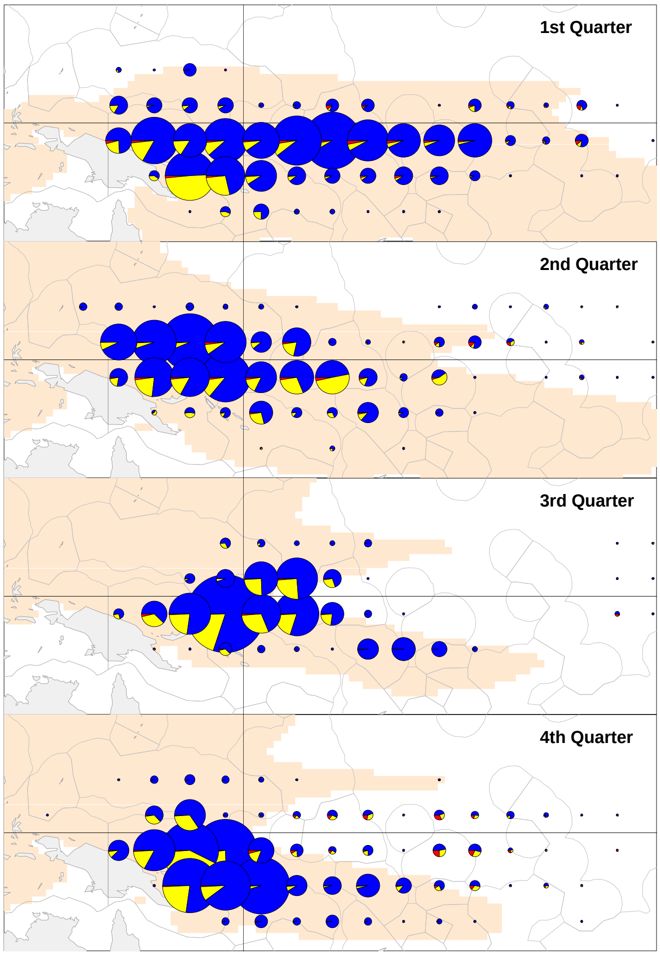


Figure 20. **Quarterly distribution of purse-seine catch by species for 2000–2009 (left) and 2010 (right).**

(Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye)

Pink shading represents the extent of average sea surface temperature > 28.5°C by quarter for the period 2000–2009 (left) and 2010 (right)

3.6 Economic overview of the purse seine fishery

3.6.1 Price trends – Skipjack

Skipjack prices in 2010 averaged around 10% higher than 2009 prices with Bangkok and Yaizu averages at US$1,219 (US$1,099 in 2009) and US$1,401[6] (US$1,325), respectively. The respective averages in 2008 were US$1,543 and US$1,768. From peak levels in mid-2008, prices trended downward sharply well into the first quarter of 2009 (Figure 21, monthly figures). There were moderate improvements towards mid-2009 however prices declined again over the rest of the year. This overall declining trend in skipjack prices was accompanied by reversals in the trends of some of the important factors that previously had driven up fish prices, including trends in global food and oil prices as well as skipjack supplies.

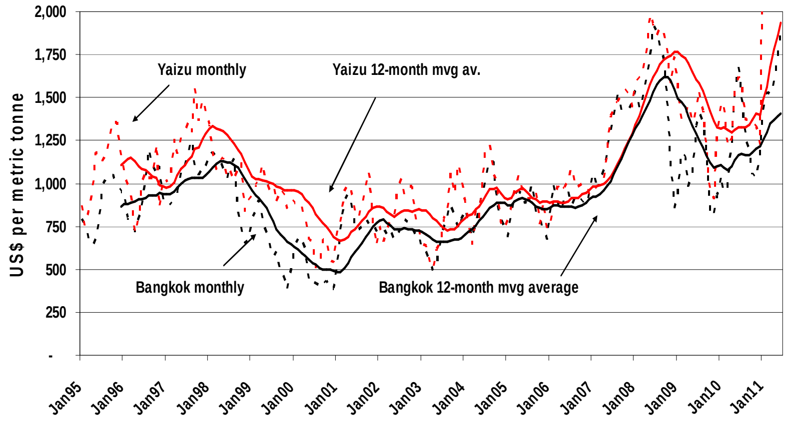


Figure 21. Skipjack prices, Bangkok (4-7.5lbs, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

Over the first half of 2010 monthly skipjack prices rose strongly. Bangkok prices (4-7.5lbs, c&f) have increased to US$1,240/Mt from previous siz months average of US$1,090/Mt and Yaizu (ex-vessel) prices to US$1,429/Mt from US$1,222/Mt. This in part was a consequence of the supply situation increasingly being influenced not only by fishing conditions but also by the closure of two high seas pockets in the WCPO, introduction of the EU-IUU regulations as of the start of the year, as well as uncertainty about the supply situation from the anticipated FAD fishing closures in July and August. Broad recovery from the global financial downturn is also an important factor. Skipjack prices moderated over the second half of the year with Bangkok averaging $1,219/Mt and Yaizu $1,401/Mt. Nonetheless these were about 10 per cent higher than the comparable period in 2009. As it turned out, estimated purse seine skipjack catch in the WCPO in 2010 was 8% lower than in 2009.

By late 2010 with the repeat of the spikes in oil / food prices and the generally poor fishing associated with La Nina conditions, along with anticipated supply shortages from the extended FAD closure to three months (July 1st to September 30th), there was renewed pressure on prices that set the scene for at least the first half of 2011. Skipjack prices over the first six months of 2011 reached new peaks of $1,900/Mt in Bangkok and $2,455 at Yaizu by June.

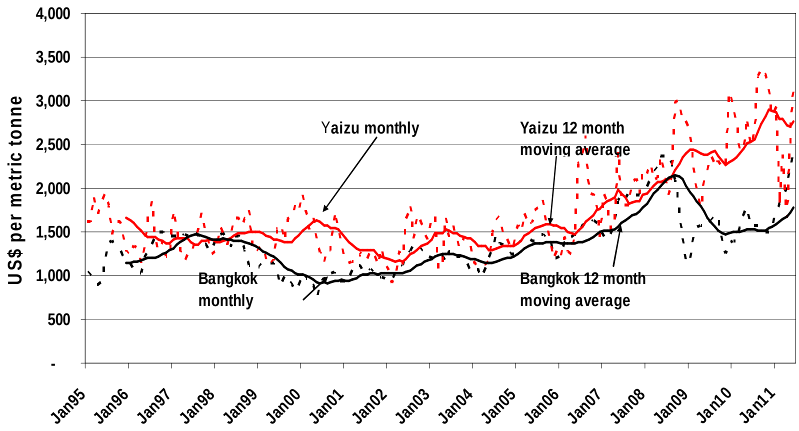


Figure 22. Yellowfin prices, Bangkok (20lbs and up, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

3.6.2 Price trends – Yellowfin

The price trends for purse seine caught yellowfin in 2010, as for skipjack, were also up with Bangkok prices at around US$1,556 or 4% higher than in 2009 (but 23% lower than in 2008) while the Yaizu prices in US-dollar terms at US$2,869 were about 27% higher than in 2009 (and 20% higher than in 2008) [7].

[6] 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

[7] The higher rise in Yaizu prices in US$-terms is explained by the appreciation of the Japanese Yen against the US$. Between 2008 and 2010 the Japanese Yen appreciated by 15% against the US$.

During the course of 2010, Bangkok yellowfin prices (20lbs +, c&f) rose from a low at the end of 2009 at $1,350/Mt to a high of $1,775/Mt in May, averaging US$1,565/Mt in the first five months of the year. Yellowfin prices remained broadly flat during the latter half of the year and averaged $1,556/Mt. During the first half of 2011, Bangkok yellowfin purse seine prices had averaged $2,016, a significant improvement over the previous half and even more so relative to the comparable period in 2010.

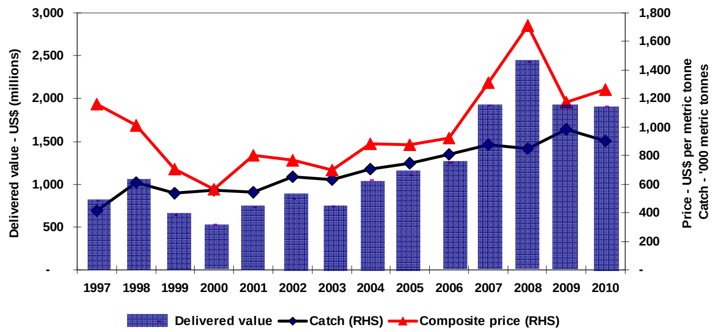


Figure 23. Skipjack in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

At the Yaizu market, purse seine caught yellowfin prices (ex-vessel) noticeably increased more significantly relative to Bangkok prices, both in Japanese Yen terms and even more in US$ terms because of the appreciation of the Japanese Yen currency against the US$. In US$ terms, purse seine yellowfin prices at Yaizu averaged US$2,657/Mt in the first half of 2010 and US$3,086/Mt in the latter half. Yaizu prices during the first half of 2011 had averaged US$2,621/Mt, 8% down on the 2010 average of $2,869.

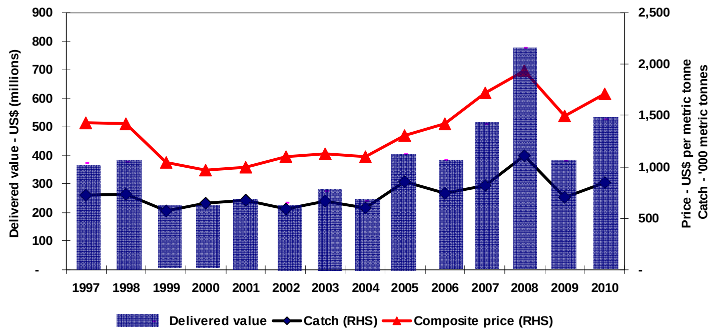


Figure 24. Yellowfin in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

3.6.3 Value of the Purse-seine Catch

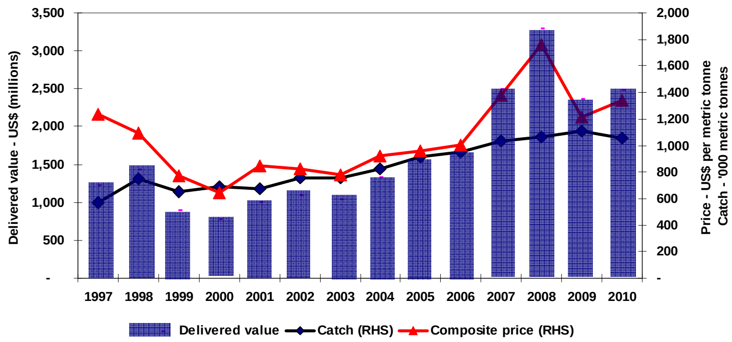


Figure 25. All tuna in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

As a means of examining the effect of the changes in prices and catch levels, estimates of the "delivered" value of the purse seine fishery tuna catch in the WCPFC Area from 1997 to 2010 were 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.[8] The estimated delivered value of the entire purse seine tuna catch in the WCPFC area for 2010 is US$2,480 million that increases from last year's level of US$2,360 million. This represents an increase of US$119 million or 5 per cent on the estimated delivered value of the catch in 2009. This increase was driven by a US$146 million (39 per cent) increase in delivered value of the yellowfin catch, which is estimated to be worth US$524 million in 2010, resulting from a 15 per cent increase in the composite price and a 21 per cent increase in catch. The value of the purse seine skipjack catch declined marginally by one per cent, to around US$1,901 million as a result of the 8 per cent decrease in catch that was less than matched by the increase in the composite price.[9]

[8] 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.

[9] 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 domestic (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) 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 during the 2000s was reduced substantially from the level experienced during the 1990s, and ceased altogether in 2009. Several vessels continue to fish in Hawai'i, and the French Polynesian *bonitier* fleet remains active, but an increasing number of vessels have turned to longline fishing. Provisional statistics also suggest that the Indonesian pole-and-line fleet has also declined over the past decade. However, there is at least one initiative underway to revitalize the domestic pole-and-line fisheries in the Pacific Islands.

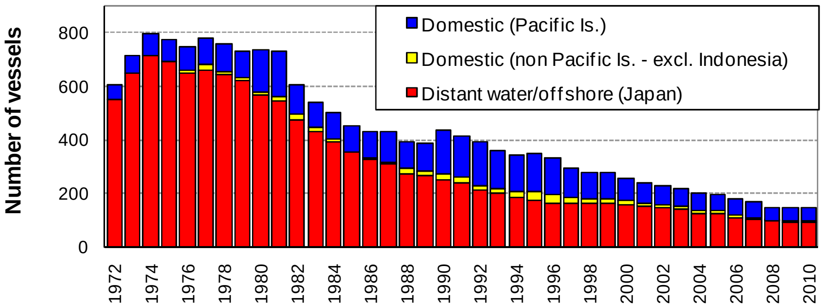


Figure 26. Pole-and-line vessels operating in the WCP–CA
(excludes pole-and-line vessels from the Japanese Coastal and Indonesian domestic fisheries)

4.2 Provisional catch estimates (2010)

The 2010 pole-and-line catch (171,604 mt) was a slight improvement (6,000 mt) on the catch level in 2009, which was the lowest annual catch since the mid-1960s.

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 Japanese distant-water and offshore (110,612 mt in 2010) fleets, and the Indonesian fleets[10] (60,415 mt in 2007), account for most of the

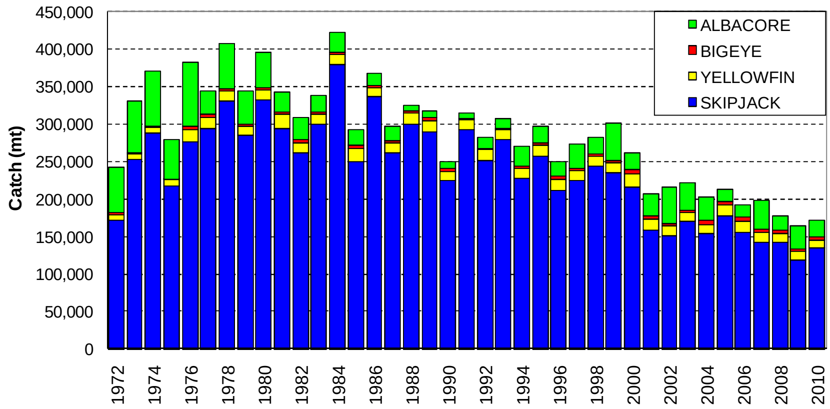


Figure 27. Pole-and-line catch in the WCP–CA

[10] Indonesia has recently revised the proportion of catch taken by gear type for their domestic fisheries. This 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.

WCP–CA pole-and-line catch. The catches by the Japanese distant-water and offshore fleets in recent years have been the lowest for several decades and this is no doubt related to the continued reduction in vessel numbers (in 2009/2010 reduced to only 96 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) to reach a level of 10,448 mt in 2003. This fleet ceased operating in 2009, but there are expectations of it resuming activities in 2011.

Figure 28 shows the average distribution of pole-and-line effort for the period 1995–2010. Effort in tropical areas is usually year-round and includes 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 occurs 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 not shown in this figure because spatial data are not available.

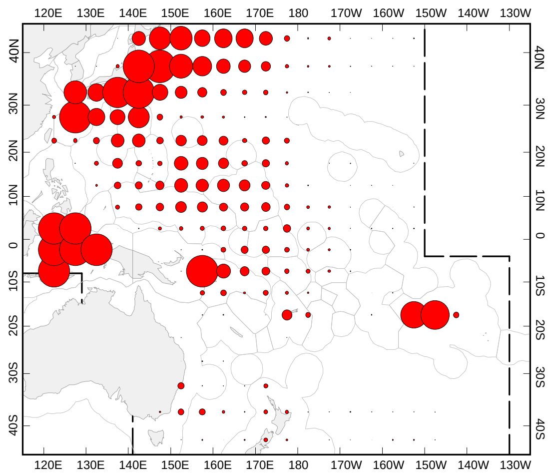


Figure 28. Average distribution of WCP–CA pole-and-line effort (1995–2010).

4.3 Economic overview of the pole-and-line fishery

4.3.1 Market conditions

During 2010 the Yaizu price of pole and line caught skipjack in waters off Japan averaged ¥213/kg (US$2,267/Mt), a decrease of 8% compared to 2009. By contrast, the Yaizu price of pole and line caught skipjack in waters south of Japan decreased averaging ¥187 ($2,129) compared to ¥253/kg (US$2,704/Mt) during 2009, a significant drop of 26% in ¥ terms.

4.3.2 Value of the pole-and-line catch

As a means of examining the effect of the changes in price and catch levels over the period 1997-2010, a rough estimate of the annual delivered value of the tuna catch in the pole and line fishery in the WCP-CA is provided in Figures 29 and 30. The estimated delivered value of the total catch in the WCPFC pole and line fishery for 2010 is US$340 million.[11] This is almost the same level as in 2009 caused by almost equally offsetting movements in catch (up 4%) and overall price (down 4%).

The estimated delivered value of the skipjack catch in the WCPFC pole and line fishery for 2010 is US$251 million. This represents an 8% ($18 million) increase as compared to the estimated value of the catch in 2009 and results from a 14% increase (16,000 Mt) in catch offset by a 5% decrease in price.

The estimated delivered value of the albacore catch is $58 million, a $24 million (30%) decline on the previous year, purely from the decline in pole and line albacore catch. The decline in the albacore catch values is the major offset to increases in skipjack, yellowfin and bigeye estimated delivered values for 2010.

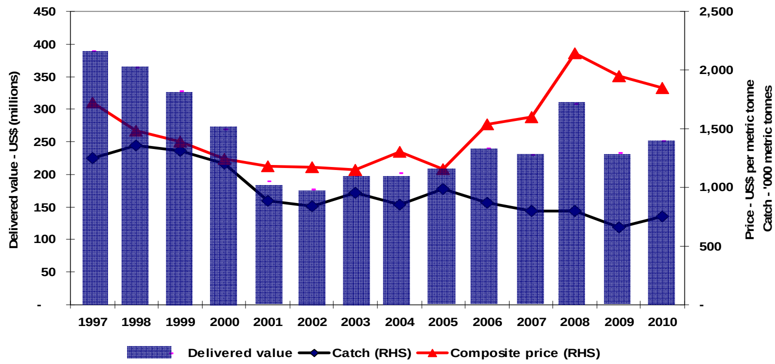


Figure 29. Skipjack in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

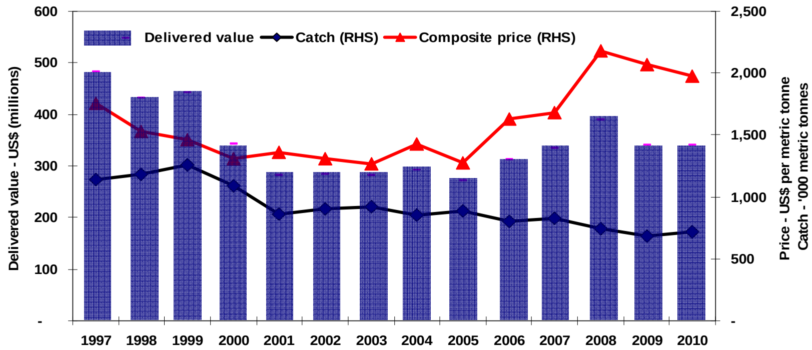


Figure 30. All tuna in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

[11] 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 2011), 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 2011). The total number of vessels involved in the fishery has generally fluctuated between 3,500 and 6,000 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 become 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 at least one fleet has occurred in recent years;
- smaller (typically <100 GRT) **offshore** vessels which are usually **domestically-based**, undertaking trips of less than one month, with ice or chill capacity, and serving fresh or air-freight sashimi markets, or [albacore] canneries. There are several foreign offshore fleets based in Pacific Island countries.

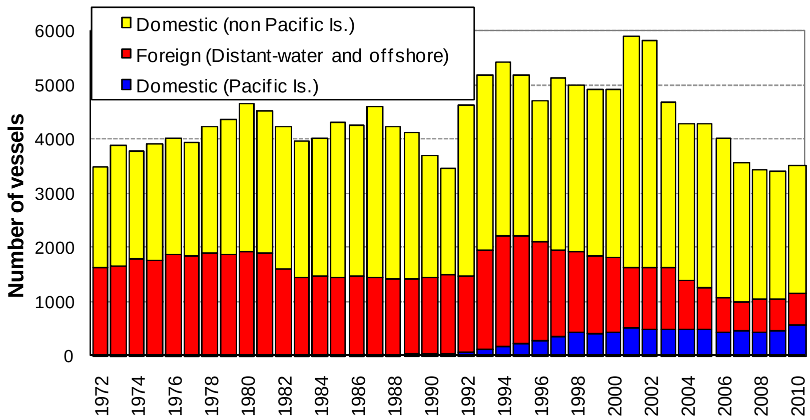


Figure 31. Longline vessels operating in the WCP–CA
(Available data does not make the distinction between foreign "distant-water" and "offshore")

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 PNG use handline and small vertical longline gears, usually fishing around the numerous arrays of anchored FADs in home waters (these types of vessels are not included in Figure 31). The commercial handline fleets target large yellowfin tuna which comprise the majority of the overall catch (> 90%). Information on the domestic Vietnamese longline fleet has only recently been compiled and will be included in future versions of this paper.

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 to 157,072 mt in 1984 (Figure 32). Since then, 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–44%; BET–24%;YFT–32% in 2010) 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).

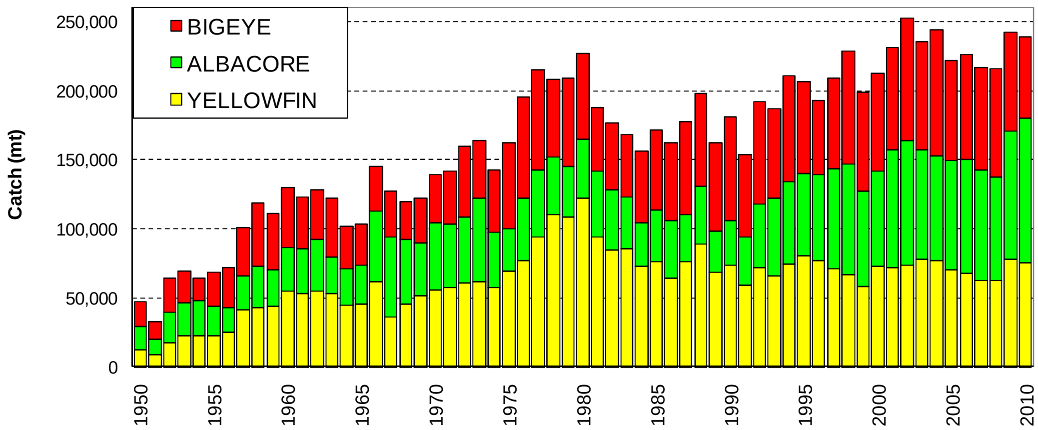


Figure 32. Longline catch (mt) of target tunas in the WCP–CA

5.2 Provisional catch estimates and fleet sizes (2010)

The provisional WCP–CA longline catch (239,853 mt) for 2010 was the fourth highest on record, at around 17,000 mt lower than the highest on record attained in 2002 (256,582 mt). The WCP–CA albacore longline catch (104,482 mt – 44%) for 2010 was the highest on record, 12,000 mt higher than the previous record (92,539 mt in 2009). In contrast, the provisional bigeye catch (58,324 mt – 24%) for 2010 was the lowest since 1996, but may be revised upwards when final estimates are provided. The yellowfin catch for 2010 (76,067 mt – 32%) was slightly higher than the average catch level for this species over the period 2000-2010.

A significant change in the WCP–CA longline fishery over the past 10 years has been the growth of the Pacific Islands domestic albacore fishery, which has risen 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 (including chartered vessels) making up the Pacific Islands domestic albacore fishery have numbered more than 400 (mainly small "offshore") vessels in recent years.

The distant-water fleet dynamics continue to evolve in recent years, with catches down from record levels in the mid-2000s initially due to a reduction in vessel numbers, although vessel numbers for some fleets appear to be on the rise again in 2010. The Japanese distant-water and offshore longline fleets have experienced a substantial decline in both bigeye catches (from 20,725 mt in 2004 to 8,486 mt in 2010) and vessel numbers (366 in 2004 to 171 in 2010). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 8,863 mt (in 2010), mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 75 vessels in 2009, but back up to 90 vessels in 2010). The Korean distant-water longline fleet experienced smaller declines in bigeye and yellowfin catches in recent years, but with a more significant drop in vessel numbers – from 184 vessels active in 2002 reduced to 108 vessels in 2008, but back to 122 vessels in 2010.

With domestic fleet sizes continuing to increase as foreign-offshore and distant-water fleets decrease (Figure 31), this 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 had been balanced to some extent by the switch to targeting bigeye tuna (from albacore) by certain vessels in the distant-water Chinese-Taipei fleet almost a decade ago. More detail on individual fleet activities during recent years is available in WCPFC–SC7 National Fisheries Reports.

5.3 Catch per unit effort

Time series of nominal CPUE provide 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 2010) looks at the standardisation of CPUE for distant-water longline fleets targeting south Pacific albacore and SC6 Working Paper **SA WP–3** (Hoyle 2010) 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 2000–2010.

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 reduction 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 for canning in the more temperate waters.

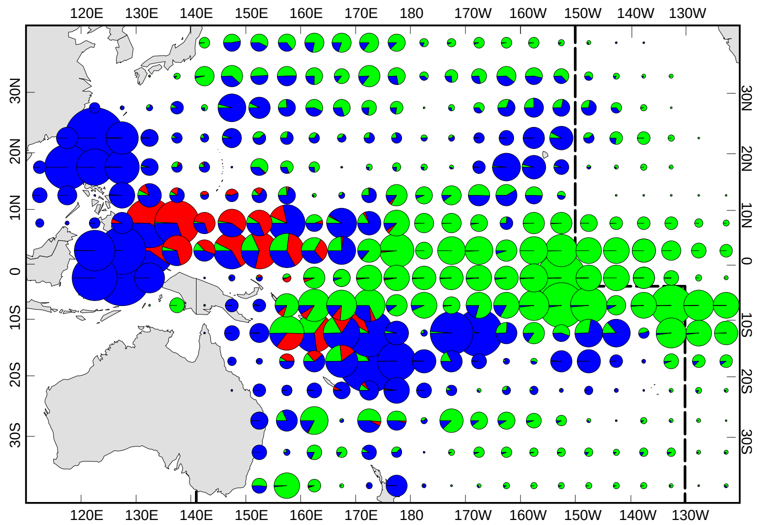


Figure 33. Distribution of longline effort for distant-water fleets (green), foreign-offshore fleets (red) and domestic fleets (blue) for the period 2000–2010.

(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; the Eastern Pacific effort is incomplete)

Activity by the **foreign-offshore fleets** from Japan, mainland China and Chinese-Taipei are restricted to 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 prominent examples are the increases in the Samoan, Fijian and French Polynesian fleets, and more recently the Solomon Islands chartered vessels (Figure 34).

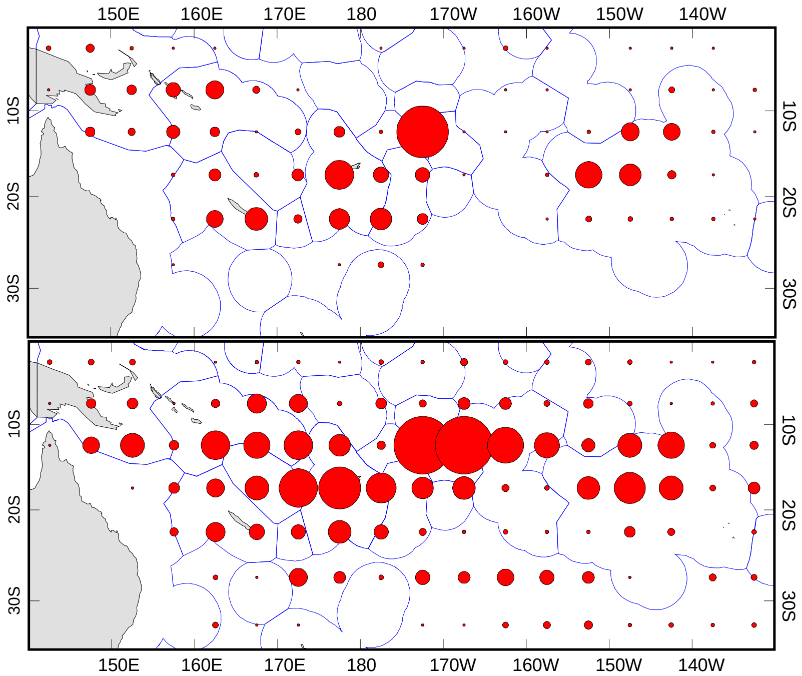


Figure 34. Distribution of south Pacific-islands domestic longline effort for 1999 (top) and 2009 (bottom).

Figure 35 shows quarterly species composition by area for the period 2000–2008 and 2009 (2010 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, albacore are primarily taken in the 1st and 4th quarters. In the South Pacific albacore are taken year round, although they 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. The decline in bigeye catches over recent years is evident when comparing the 2000-2008 quarterly averages (Figure 35–left) with the 2009 catches (Figure 35–right).

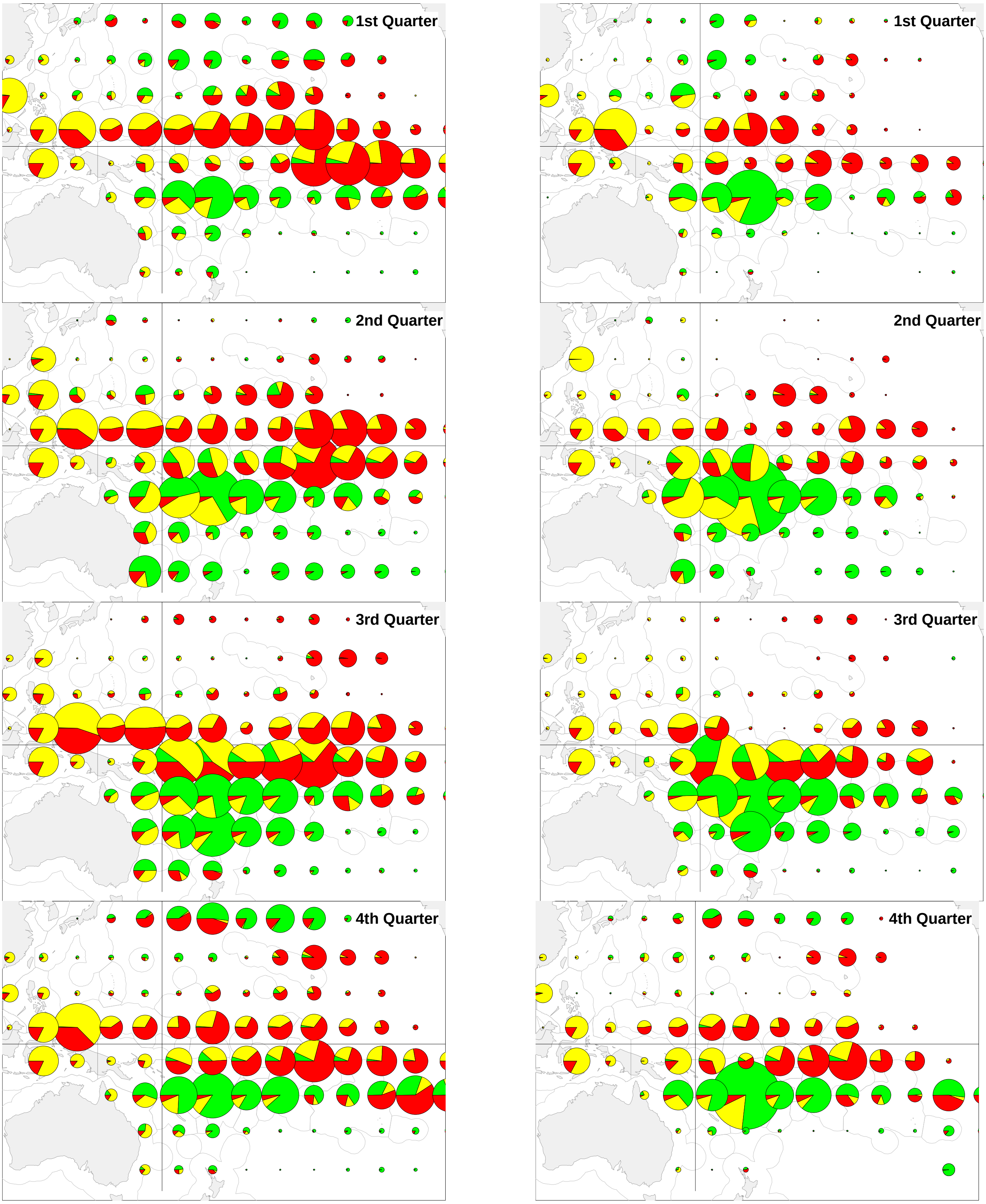


Figure 35. Quarterly distribution of longline tuna catch by species, 2000-2008 (left) and 2009 (right*)*

(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 port improved by 3 per cent (10 per cent in US$ terms) to ¥634/kg ($7.22/Kg). Japan fresh yellowfin import price (c.i.f.) from Oceania improved by 6 per cent (13 per cent in US$ terms) to ¥895/kg ($10.20/Kg) while the price from all sources improved by only 1 per cent (8 per cent).

Japan imports[12] of fresh yellowfin have steadily declined since 2001. Japan imports of fresh yellowfin moderately rose by almost 4 per cent to 16,200Mt in. After a sharp decline of 35% in 2005, Japan imports of fresh yellowfin from Oceania recovered in 2006 by 22% to 5,003Mt but declined again in the next three years and again in 2010 to $2,621Mt. US fresh yellowfin import volumes increased by 12 per cent to 15,985Mt following a 4 per cent increase to 15,904Mt in 2009. US prices (f.a.s.) increased by 2 per cent to $8.05/Kg that reverses the decline of 3 per cent in 2009.

5.5.2 Price trends – Bigeye

Frozen bigeye prices (ex-vessel) at selected major Japanese ports rose 8 per cent in 2010 to ¥968/kg while fresh bigeye prices (ex-vessel) rose 25 per cent to ¥1,237/kg. Japan fresh bigeye import prices (c.i.f.) from all sources rose 5 per cent to ¥882/Kg while frozen bigeye import prices (c.i.f.) rose 11 per cent to ¥759/kg. In US$ terms, Japan fresh bigeye import prices from all sources were up 12 per cent to US$10.04/kg while frozen bigeye import prices rose 19 per cent to US$8.64/kg.

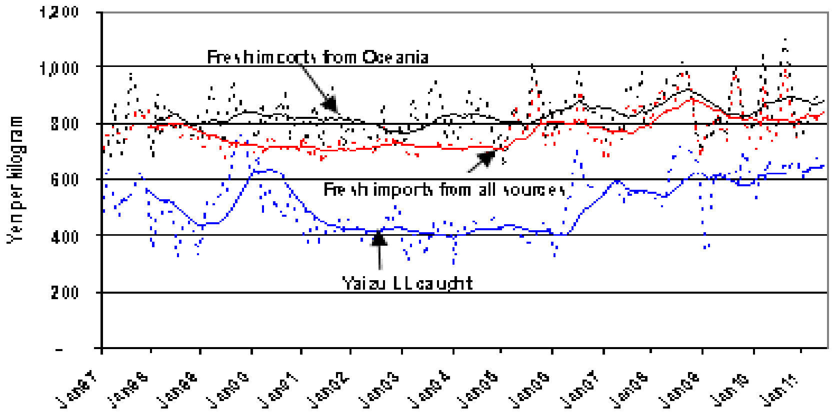


Figure 36. Yellowfin prices on Japanese markets; fresh imports (c.i.f.), fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

(Monthly price given by dashed lines, 12 month moving average price given by solid line)

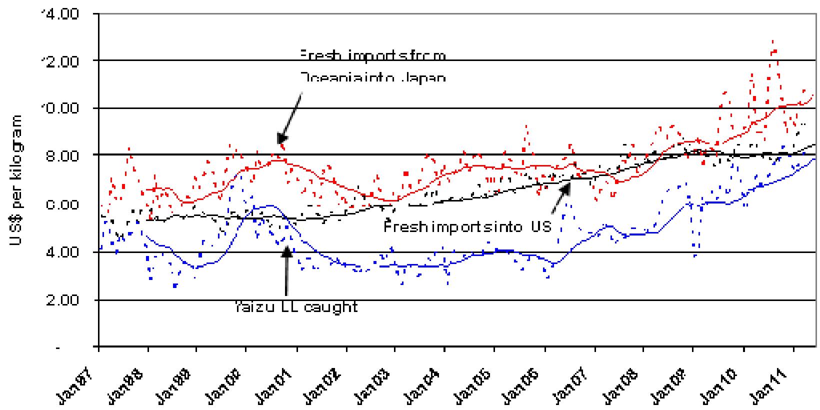


Figure 37. Yellowfin prices in US$: US fresh imports, Japanese fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

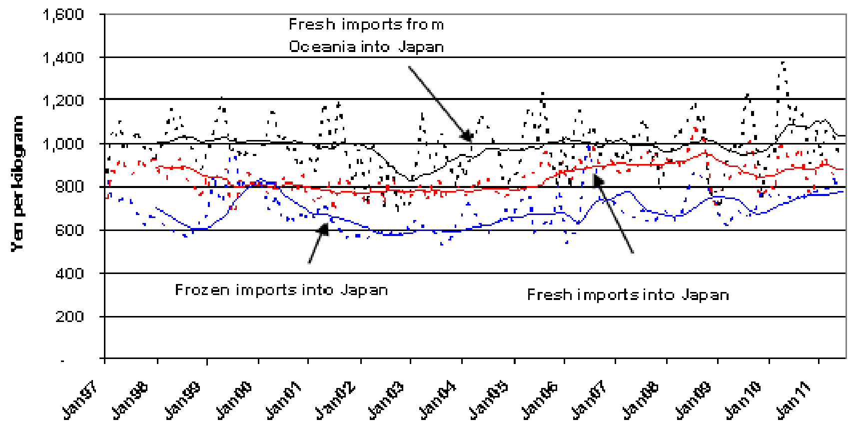


Figure 38. Bigeye prices on Japanese markets; fresh imports (c.i.f.), fresh imports from Oceania (c.i.f.) and frozen imports (ex-vessel)

[12] Imports of tuna into Japan are defined according to Japan's definition of 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 regarded as Japanese products)".

Import volumes of fresh bigeye declined significantly by 24 per cent in 2010 to 11,642Mt of which 1,739Mt was sourced from the Oceania region. Fresh imports from Oceania reduced substantially by 48 per cent from 3,317Mt in 2009. Average prices for fresh bigeye from Oceania rose 15 per cent to ¥1,121/kg (US$12.76/kg). US fresh bigeye import volumes declined 26 per cent to 4,024Mt, the lowest since 1997, while prices (f.a.s.) rose 5% to US$8.05/kg, the highest since 1997.

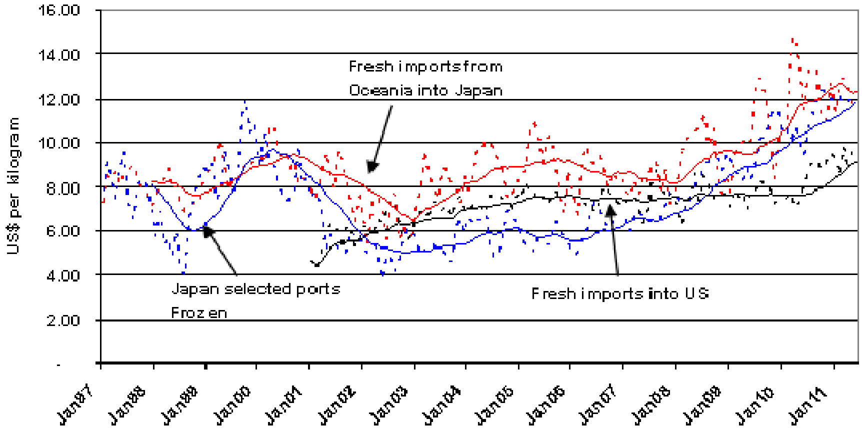


Figure 39. Bigeye prices in US$: US fresh imports, Japanese fresh imports from Oceania (c.i.f.) and Japanese frozen imports from Oceania (c.i.f.)

5.5.4 Price trends – Albacore

The Bangkok albacore market price (10kg and up, c&f) averaged US$2,497/Mt in 2010 up 3 per cent from the 2009 average and up only 1 per cent from the 2008 average, indicating broad stability in the last two years. Prices throughout 2010 rose steadily from $2,350 in January to $2,550 in December, a rise of 9 per cent, according to FFA databases. During the first half of 2011, Bangkok albacore prices have continued the strong uptrend rising to just under $3,000/Mt by end-June.

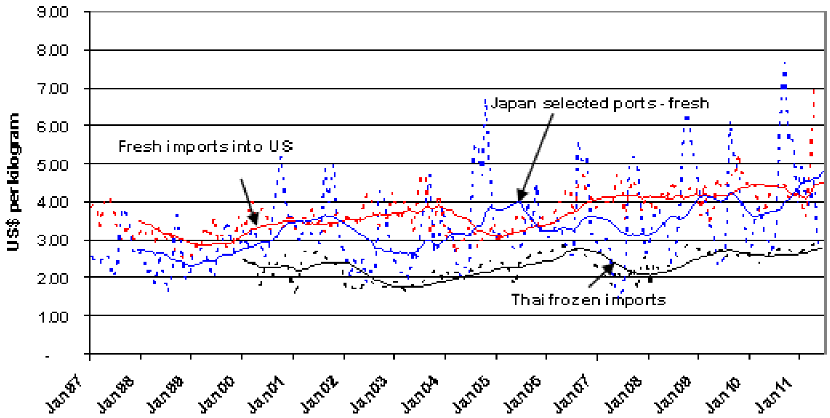


Figure 40. Albacore prices in US$: US fresh imports (f.a.s), fresh landings at selected Japanese ports and Thai frozen imports (c.i.f.)

Thai imports of frozen albacore in 2010 rose 24% to 48,892Mt following a similar strong increase of 21 per cent in 2009. Average prices improved marginally by 1 per cent to US$2,675/Mt (2.68/kg) from US$2,643/Mt (US$2.64/kg).

The US import volume of fresh albacore in 2010 totalled 520Mt, a significant 28 per cent drop compared to 2009. The US price for fresh albacore declined marginally by 2 per cent to US$4.21/kg, reversing the previous year's rise of 2 per cent. Prices for fresh landings at selected Japanese ports rose by 20 per cent to US$3.54/kg that in part reflected the 24 per cent decline in the volume of landings from more than 40,000Mt in 2009 to just more than 30,000Mt in 2010. This trend exactly reverses the previous year's trend when landings rose by 24 per cent.

5.5.5 Price trends – Swordfish

The US swordfish market price (fresh and frozen) averaged US$8.87/Kg in 2010 up 16 per cent from 2009. Between 2006 and 2009 prices had been broadly stable. However, the overall price trend for swordfish in the US market had been on an uptrend since 2000 (Figure 41). In contrast to the uptrend in prices the volume of imports into the US had been on a noticeable decline since 2003 from a peak of 10,404Mt in 2002 to 5,260Mt or a decline of 50 per cent.

For purposes of estimating the annual value of swordfish taken in the WCP-CA, the US market prices (f.a.s. which approximates f.o.b. terms) are used.

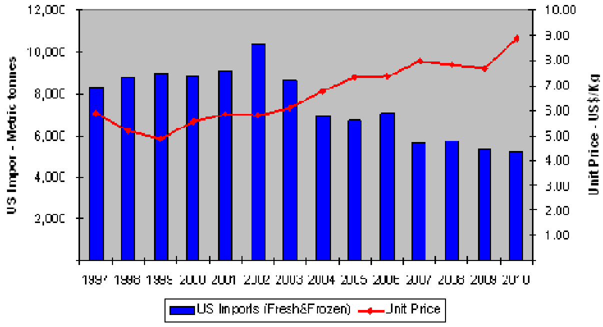


Figure 41. US imports (FOB) of Swordfish and price trends

The estimated fob value of the longline swordfish catch in the WCPFC area for 2010 is US$149,000. This represents a marginal 2% increase on the estimated value of the catch in 2009. The earlier years up to 2007 witnessed an uptrend in catch values that was consistent with the overall upswing in production that peaked at almost 25,000Mt in 2007 and the broad constant rise in prices over the years (Figure 42). Estimated values have been on a downtrend in the last three years, however as catch of swordfish consistently declined.

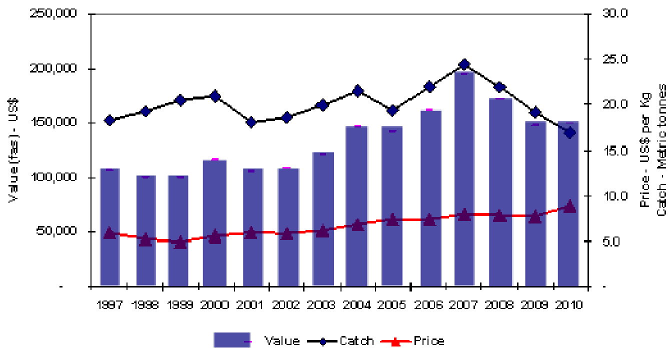


Figure 42. Swordfish in the WCPFC-CA longline fishery – Catch, value and price

5.5.6 Value of the longline catch

As a means of examining the effect of changes in price and catch levels since 1997, an estimate of the "delivered" value of the longline fishery tuna catch in the WCPFC Area from 1997 to 2010 was obtained (Figures 43–46). 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. [13]

The estimated delivered value of the longline tuna catch in the WCPFC area for 2010 is US$1,487 million (Figure 46). This represents an increase of US$27 million on the estimated value of the catch in 2009. The value of the albacore catch increased by US$35 million (14 per cent) while the value of the bigeye catch decreased by US$32 million (5 per cent) and the value of the yellowfin catch increased by $US24 million (4 per cent).

The albacore catch was estimated to be worth US$279 million in 2010 with the 14 per cent increase being driven by a 1 per cent increase in the composite price and a 13 per cent increase in catch. The bigeye catch was estimated to be worth US$614 million in 2010 with the 5 per cent decline accounted for by a 18 per cent drop in catch which more than offset the impact of the 16 per cent increase in the composite price. The estimated delivered value of the yellowfin catch was US$592 million accounted for solely by the 7 per cent increase in the composite price that more than offset the decline of 3 per cent in catch.

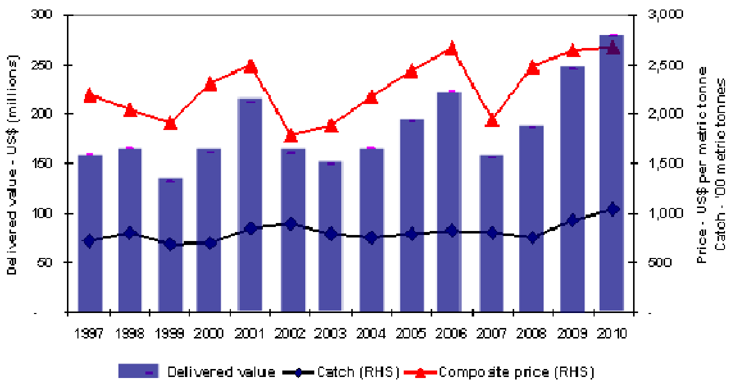


Figure 43. Albacore in the WCPFC longline fishery – Catch, delivered value of catch and composite price

[13] For the yellowfin and bigeye caught by fresh longline vessels it is assumed that 80% of the catch is of export quality and 20% is nonexport 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.

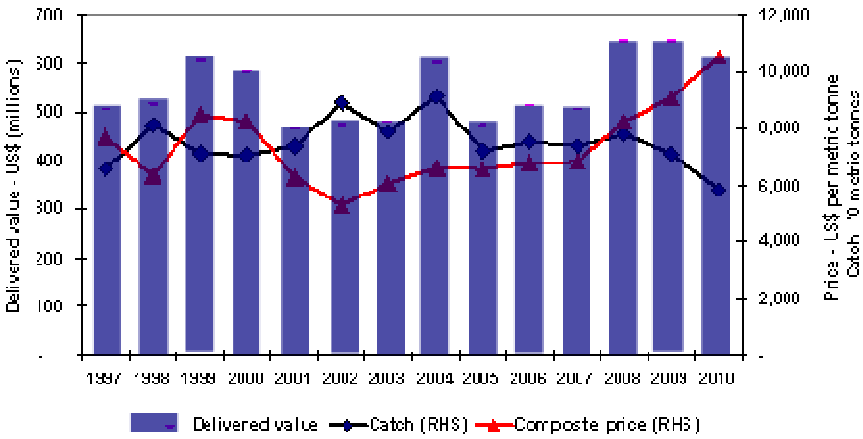


Figure 44. Bigeye in the WCPFC longline fishery – Catch, delivered value of catch and composite price

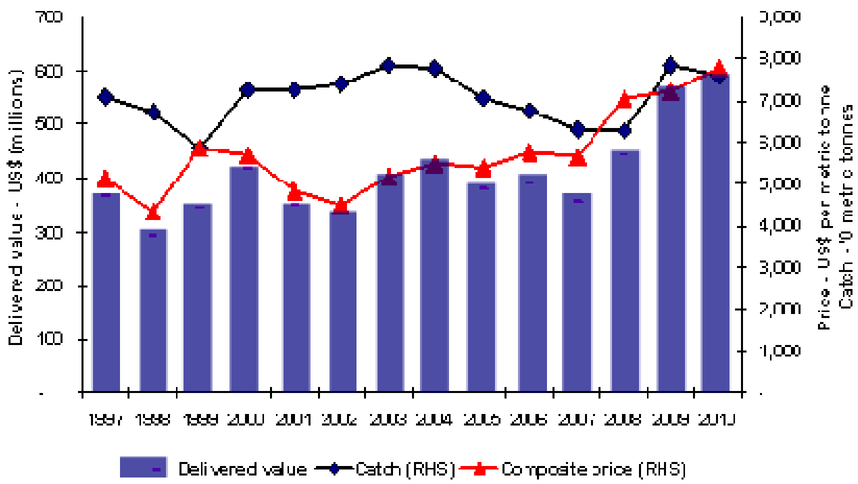


Figure 45. Yellowfin in the WCPFC longline fishery – Catch, delivered value of catch and composite price

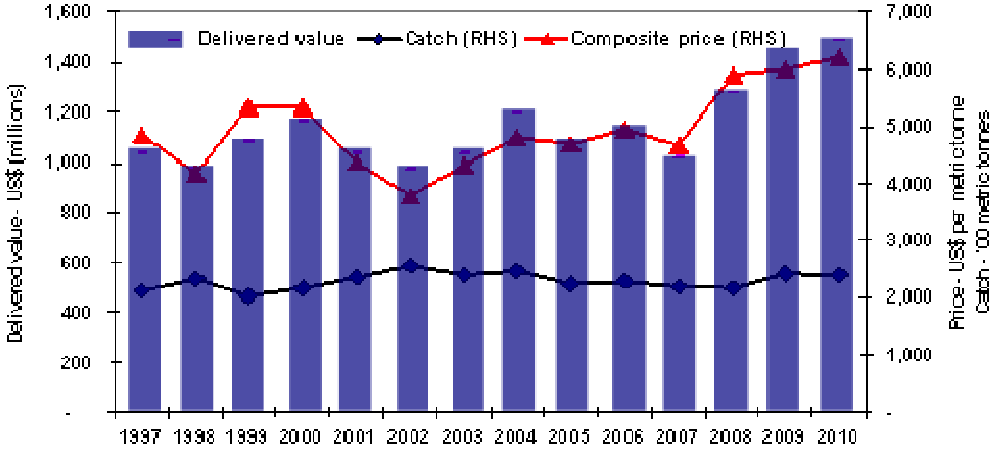


Figure 46. All tuna in the WCPFC longline fishery – Catch, delivered value of catch and composite price

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 New Zealand waters located near 40°S). The fleets of New Zealand and the 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 just above 2,000 mt, low catch levels which have not been experienced since prior to 1988. The level of effort expended by the troll fleets each year can be driven by the price conditions for the product (albacore for canning), and by expectations concerning likely fishing success.

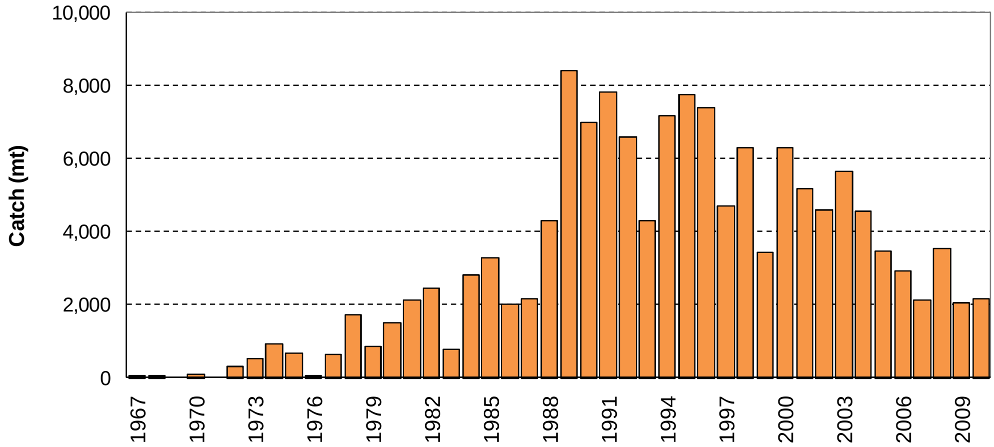


Figure 47. Troll catch (mt) of albacore in the south Pacific Ocean

6.2 Provisional catch estimates (2010)

The 2010 troll albacore catch (2,141 mt) was slightly higher that the catch in 2009 which was the lowest since 1986, and was apparently due to poor catches experienced in the New Zealand domestic fishery. The New Zealand troll fleet (136 vessels catching 1,834 mt in 2010) and the United States troll fleet (6 vessels catching 307 mt in 2010) typically account for most of the albacore troll catch, with minor contributions coming from the Canadian, the Cook Islands and French Polynesian fleets when their fleets are active (which was not the case in 2010).

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 48 reflects the reduction in effort by the US troll fleet in the STCZ in recent years (noting that US troll fleet aggregate data covering complete 2009/2010 activities have yet to be provided).

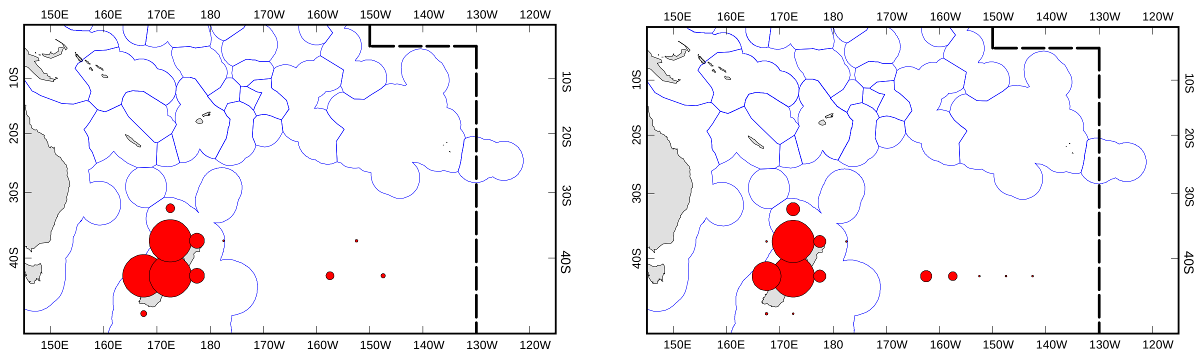


Figure 48. Distribution of South Pacific troll effort during 2008 (left) and 2009 (right)

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 1.6 million mt in the last four years (Figure 49). Pole-and-line fleets, primarily Japanese, initially dominated the fishery, with the catch peaking at 380,000 mt in 1984. The relative importance of the pole-and-line fishery, however, has declined over the years primarily due to economic constraints (the 2009 and 2010 WCP-CA pole-and-line catches were the lowest since 1965). 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 make up 20–25% of the total skipjack catch in WCP–CA).

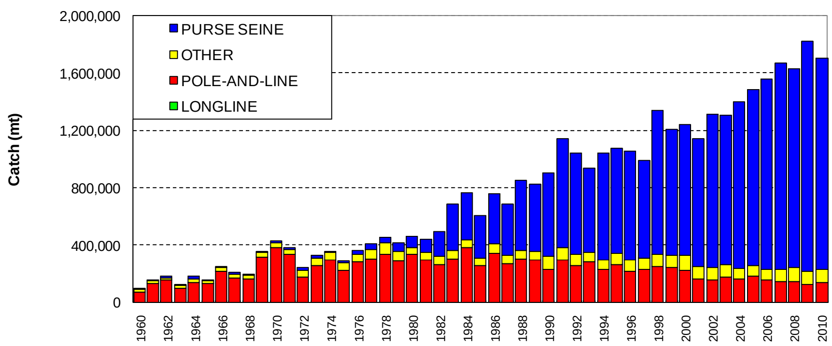


Figure 49. WCP–CA skipjack catch (mt) by gear

The 2010 WCP–CA skipjack catch of 1,706,166 mt was the second highest on record (about 115,000 mt lower than record in 2009). 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 (1,476,819 mt in 2010 – 87%). A declining proportion of the catch was taken by the **pole-and-line** gear (135,510 mt – 8%) and the "**unclassified**" gears in the domestic fisheries of Indonesia, Philippines and Japan (88,629 mt – 5%). 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 domestic (home-water) fishery of Japan (Figure 50). 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. Central tropical waters are dominated by 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.

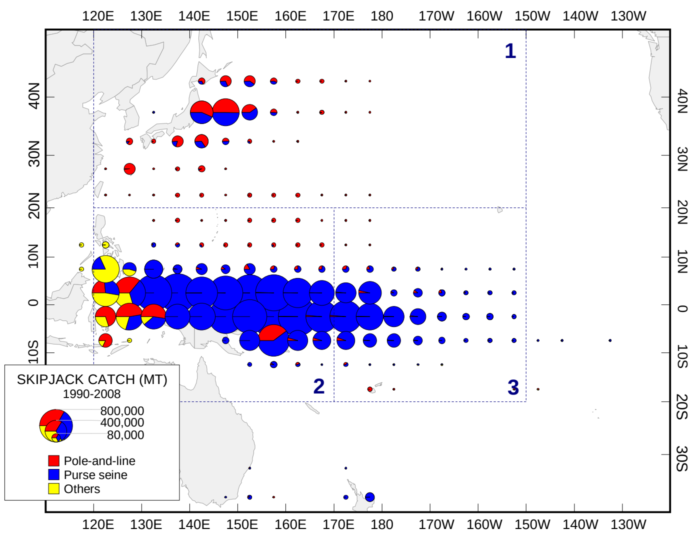


Figure 50. Distribution of skipjack tuna catch, 1990–2010.

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

The Philippines and Indonesian domestic fisheries (archipelagic waters) account for most of the skipjack catch in the 20–40 cm size range (Figure 51). The dominant mode of the WCP–CA skipjack catch (by weight) typically falls in the size range between 40–60 cm, corresponding to 1–2+ year-old fish (Figure 51). There was a greater proportion of medium-large (60–80 cm) skipjack caught in the purse seine fishery during years 2005 and 2010 (unassociated, free swimming school sets account for most of the large skipjack). In contrast, the WCP–CA skipjack purse-seine catch in 2004, 2007 and 2009 comprised more younger fish from associated schools. The overall skipjack size distribution in 2010 is similar to that of 2008 (with relatively larger fish than other years), although more unassociated fish are present in the 2010 catch than in 2008.

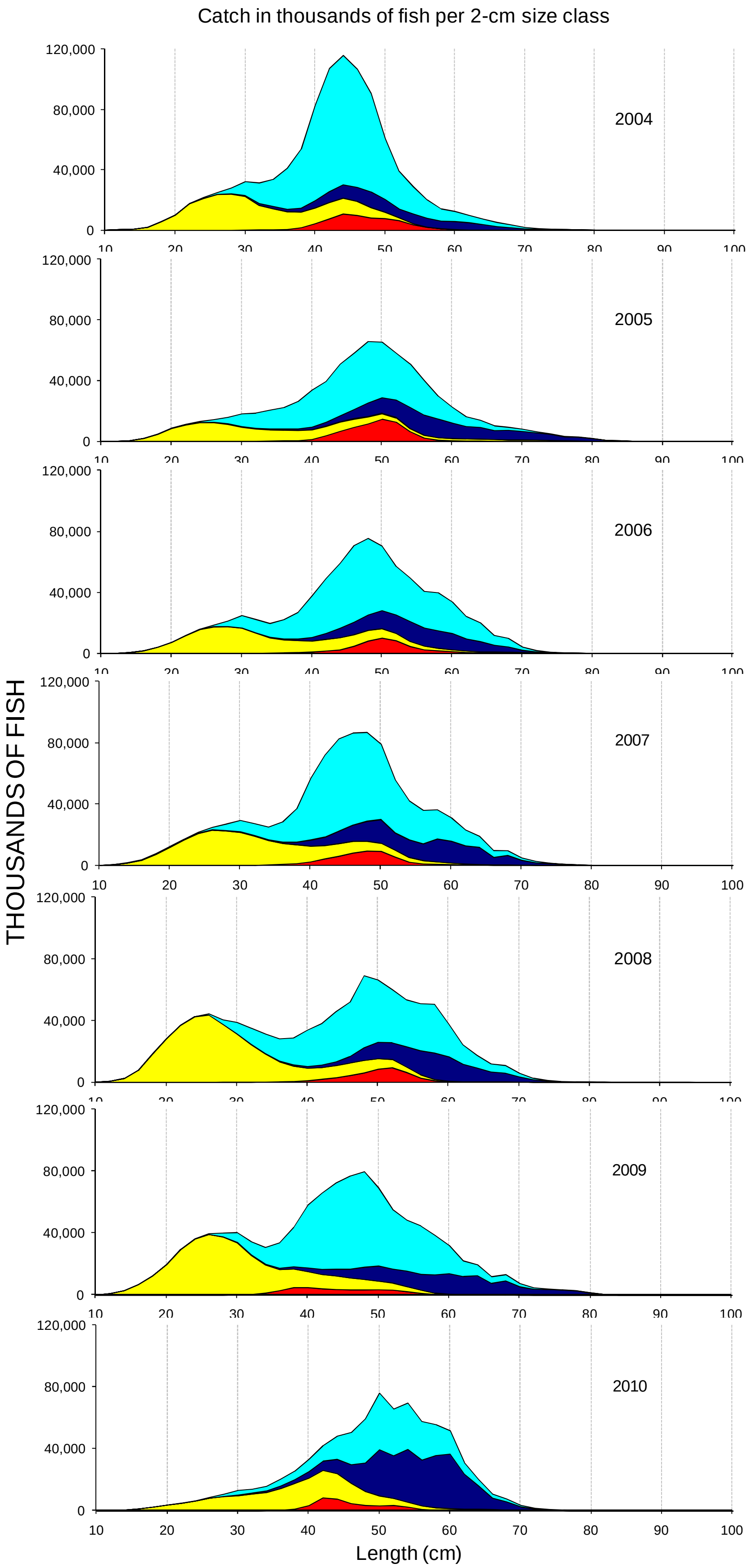


Figure 51. Annual catches (numbers of fish) of skipjack tuna in the WCPO by size and gear type, 2003–2010. **(red–pole-amd-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)**

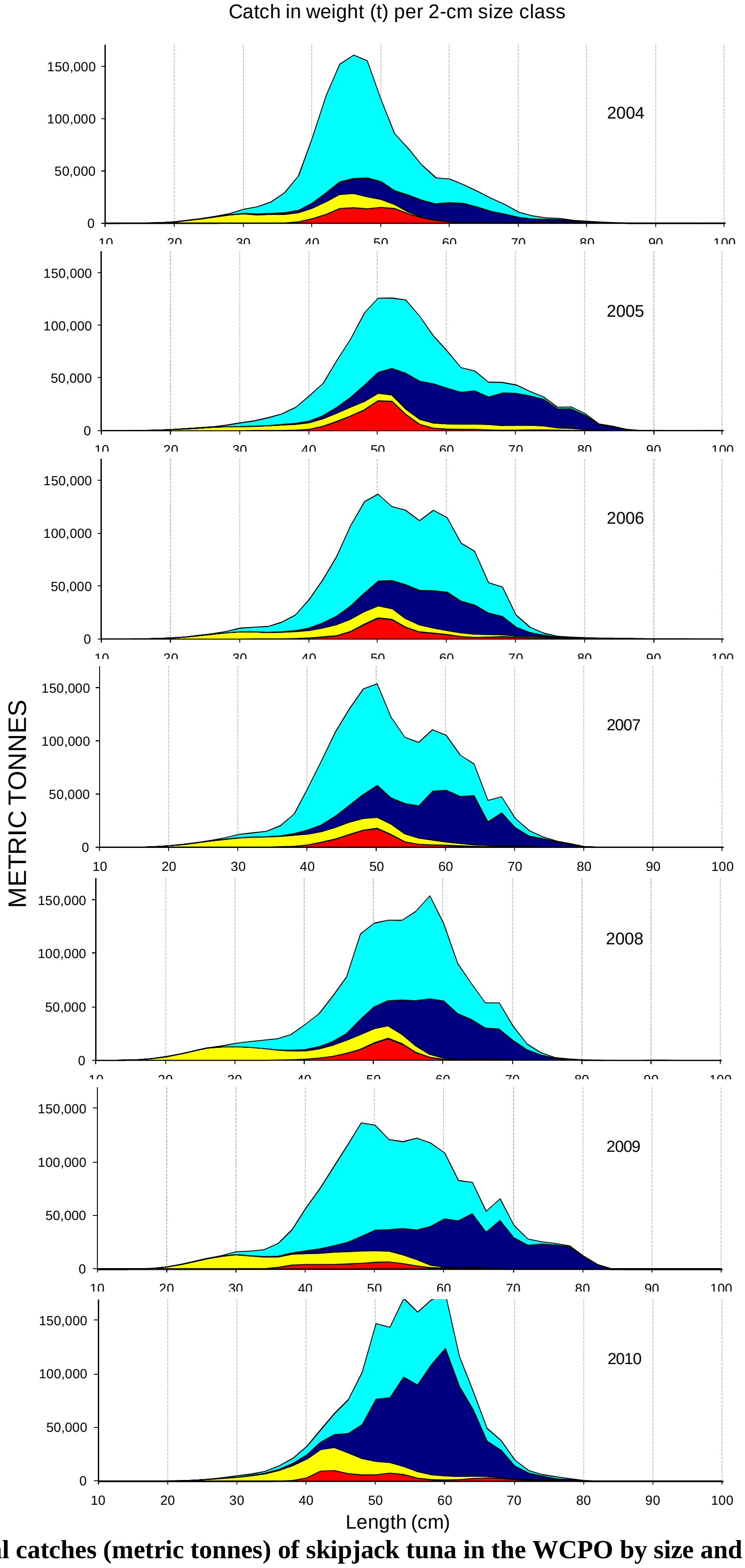


Figure 52. Annual catches (metric tonnes) of skipjack tuna in the WCPO by size and gear type, 2003–2010.

(red–pole-amd-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.2 YELLOWFIN

Since 1997, the total yellowfin catch in the WCP–CA has been generally between 400,000–470,000 mt (Figure 53). The 1998 catch (429,874 mt) was the largest at that time and followed two years after an unusually low catch in 1996; 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).

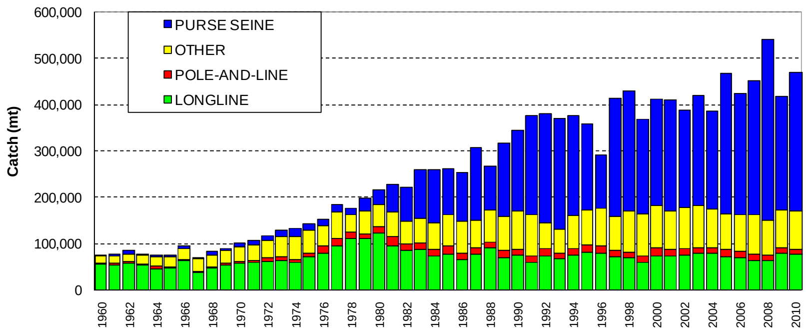


Figure 53. WCP–CA yellowfin catch (mt) by gear

Yellowfin catches in recent years have been the highest on record, primarily due to increased effort and catches in the purse seine fishery. The 2008 yellowfin catch (541,262 mt) was clearly the highest on record and was primarily attributed to the record catch in the **purse-seine** fishery (391,152 mt – 72% of the total yellowfin tuna catch). The WCPC-CA yellowfin catch dropped by 126,000 mt in 2009 (417,839 mt) as result of a decline in the **purse-seine** fishery catches, but rebounded in 2010 to the second highest on record (470,161 mt – but still 70,000 mt less than the 2008 level). The remainder of the yellowfin tuna catch comes from the pole-and-line fishery and the domestic Indonesian and Philippines "other" gears. In recent years, the yellowfin **longline** catch has ranged from 73,000–80,000 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 2010 (76,067 mt in 2010 –16%) was above the average catch level over the period 2000–2010. Since the late 1990s, the **purse-seine** catch of yellowfin tuna has accounted for about 3-4 times the **longline** yellowfin catch. The estimated **purse-seine** catch of yellowfin is probably higher than reported here since the logsheet-reported catch from associated schools contain a significant amount of yellowfin and bigeye tuna misreported as skipjack tuna (see ANNEX for alternative estimates of purse-seine yellowfin catches).

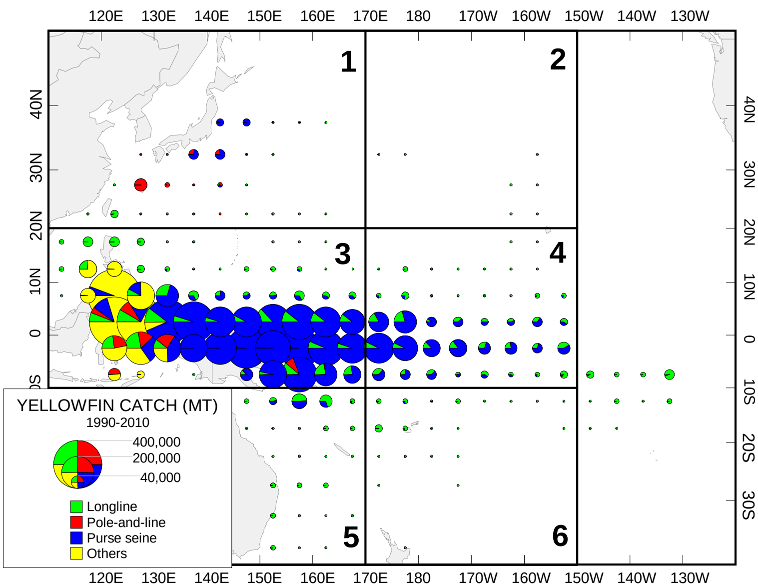


Figure 54. Distribution of yellowfin tuna catch in the WCP–CA, 1990–2010.

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

The **pole-and-line** fisheries took 10,262 mt (2% of the total yellowfin catch and the lowest since 1975) during 2010, and **'other'** category accounted for ~80,000 mt (17%). Catches in the '**other**' category are largely composed of yellowfin taken by various assorted gears (e.g. troll, 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[14]. Figure 54 shows the distribution of yellowfin catch by gear type for the period 1990–2010. As with skipjack, the great majority of the catch is taken in equatorial areas by large purse seine vessels, and a variety of gear types in the Indonesian and Philippine fisheries.

Relatively high catches of yellowfin occurred in the EPO during 2001–2003 (400,000+ mt), but then declined to 178,000 mt in 2006. The EPO yellowfin catch has since recovered to a level of 255,000 mt in 2010, mainly due to higher purse-seine catches as compared to recent years.

The domestic surface fisheries of the Philippines and Indonesia (archipelagic waters) take large numbers of small yellowfin in the range of 20–50 cm (Figure 55), and their deep-water handline fisheries take small quantities of large yellowfin tuna (> 110 cm). 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. This is clearly the case in 2008 and 2010, where exceptional catches of large yellowfin in the size range 120–130 cm were experienced (see Figure 56 – 2008 and 2010). 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 and 2007. The strong mode of large (120–135cm) yellowfin from (purse-seine) unassociated-sets in 2010 corresponds to good catches experienced during the establishment of the strong La Niña event in the 3rd and 4th quarters (Figure 15–right and Figure 20-right). Relatively poor catches of yellowfin occurred during 2004 and 2009, 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 contrasted with the 2008 and 2010 purse-seine catch levels.

[14] 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 2000 compared to what has been reported in previous years.

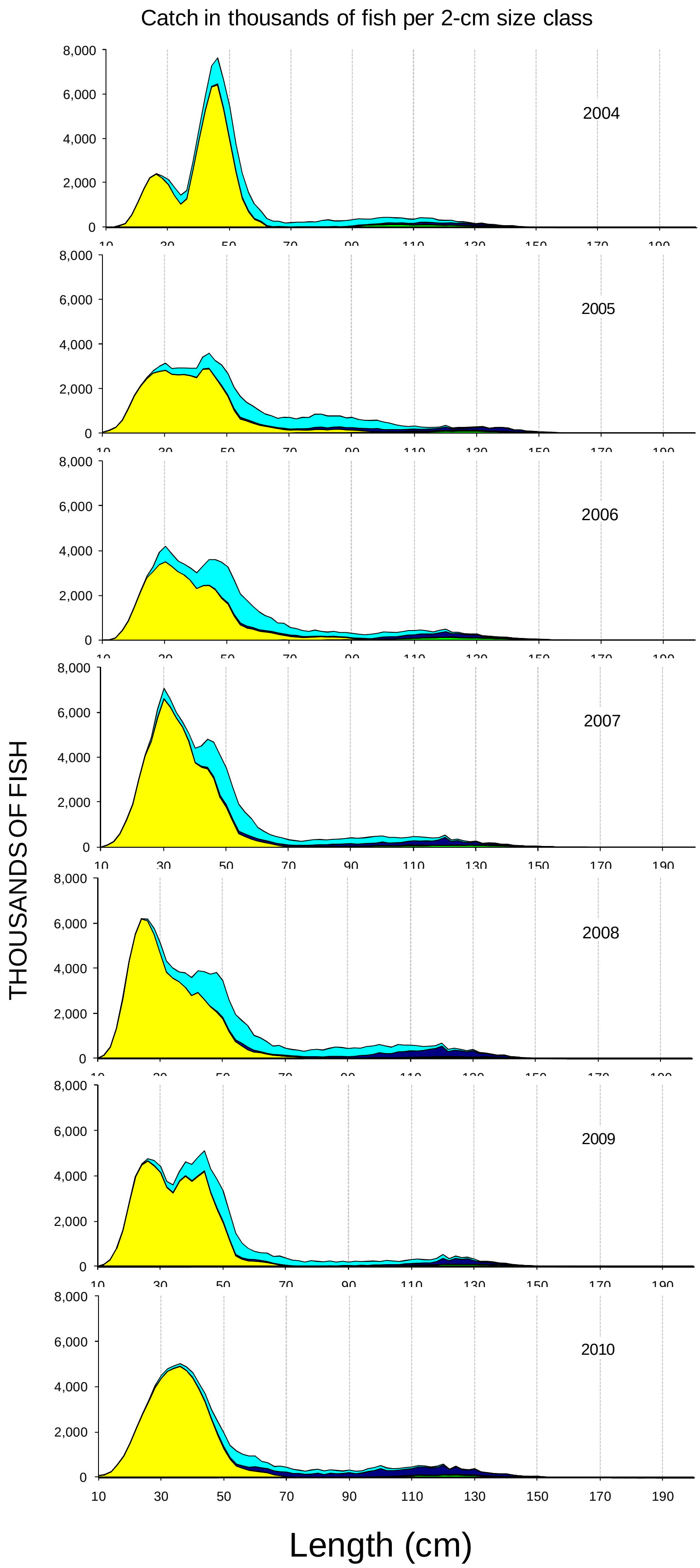


Figure 55. Annual catches (in number of fish) of yellowfin tuna in the WCPO by size and gear type, 2004–2010.

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

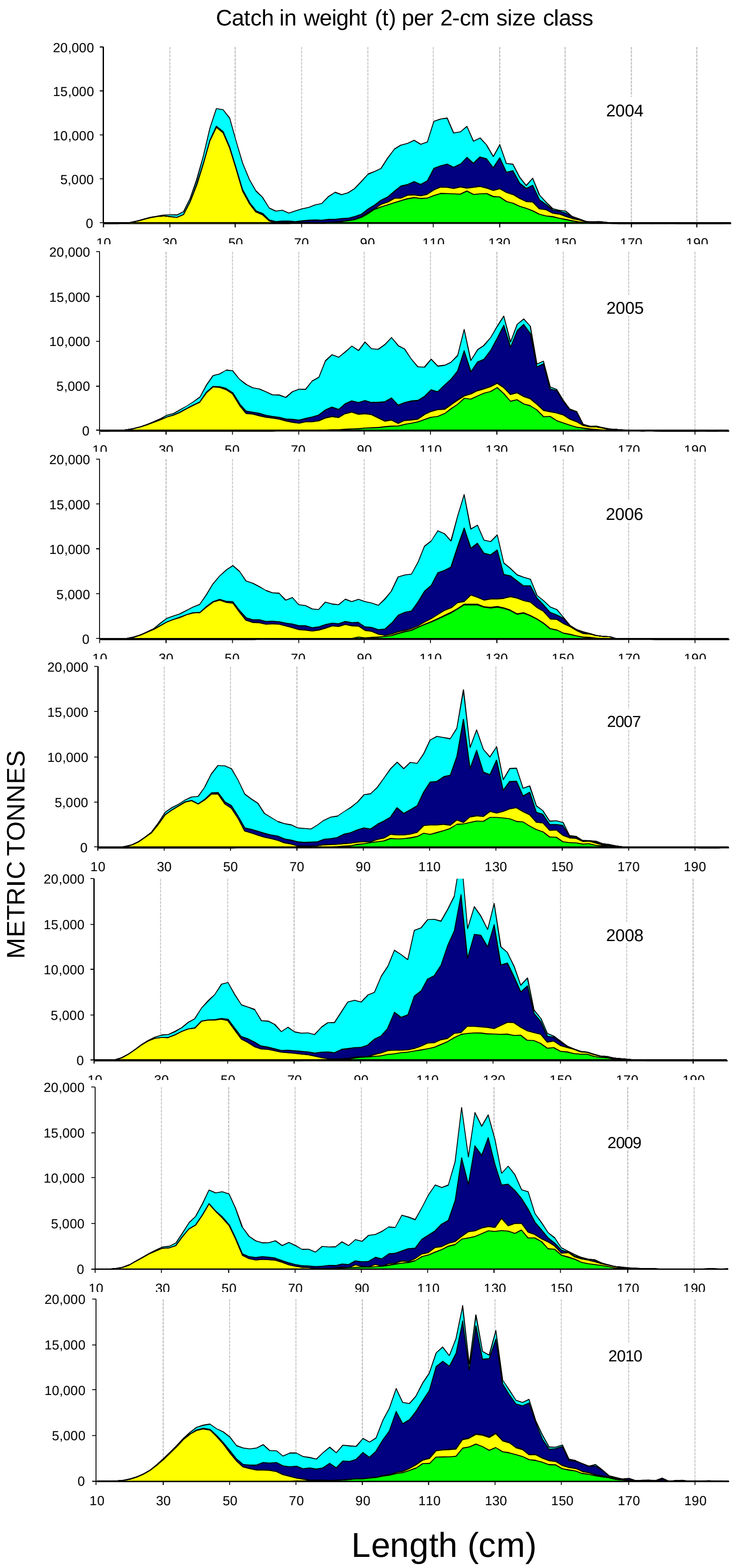


Figure 56. Annual catches (in metric tonnes) of yellowfin tuna in the WCPO by size and gear type, 2004–2010.

(green–longline; yellow–Phil-Indo archipelagic 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 57), with Japanese longline vessels generally contributing over 80% of the catch until the early 1990s. The provisional 2010 bigeye catch for the **Pacific Ocean** (182,477 mt) was the lowest since 1992.

The **purse-seine** catch in the **EPO** (56,753 mt in 2010) continues to account for a significant proportion (72%) of the total EPO bigeye catch despite being the lowest since 1993. The provisional 2010 EPO longline bigeye catch estimate (22,993 mt) is consistent with catches in recent years which are the lowest since 1960, reflecting the reduction in effort by the Asian fleets. However, the EPO catch estimates are acknowledged to be preliminary[15] and may increase when more data become available.

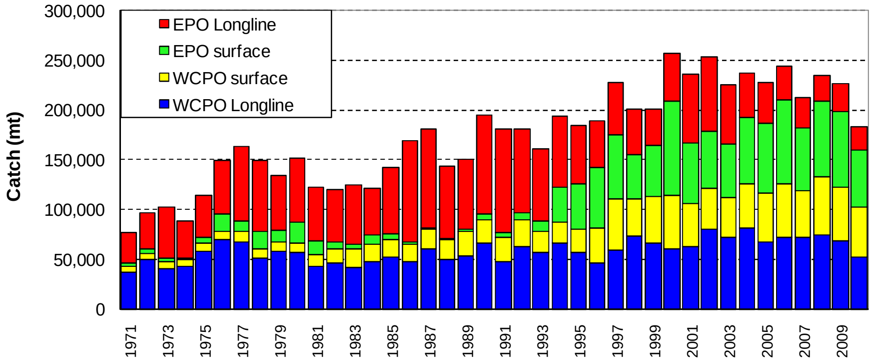


Figure 57. Pacific bigeye catch (mt) by gear
(excludes catches by "other" gears)

The **WCP–CA longline** bigeye catches have fluctuated between 70,000–98,000 mt since 1999, but the 2010 catch (58,324 mt–54% of total WCP-CA bigeye catch) is the lowest since 1996. The provisional **WCP–CA purse seine** bigeye catch for 2010 was estimated to be 43,389 mt (40%) which is clearly lower than the highest on record, taken in 2008 (50,469 mt) (Figure 58). The estimated **purse-seine** catch of bigeye tuna is probably higher than reported here since the logsheet-reported catch from associated schools contain a significant amount of yellowfin and bigeye tuna misreported as skipjack tuna (see ANNEX for alternative estimates of purse-seine bigeye catches).

The **WCP–CA pole-and-line** fishery has generally accounted for between 2,800–6,700 mt (3-5%) of bigeye catch annually over the past decade. The "**other**" category, representing various gears in the Philippine, Indonesian[16] and Japanese domestic fisheries, has accounted for an estimated 4,000–8,000 mt (3–4% of the total WCP–CA bigeye catch) in recent years.

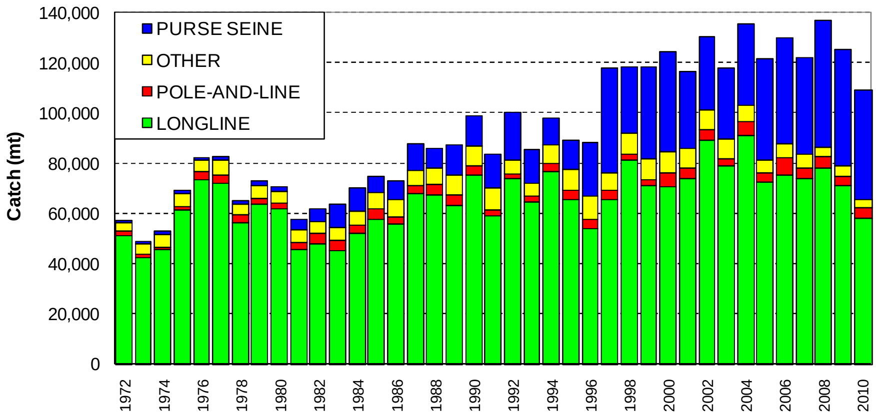


Figure 58. WCP–CA bigeye catch (mt) by gear

Figure 59 shows the spatial distribution of bigeye catch in the Pacific for the period 1990–2010. 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 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.

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[15] Catch estimates for the EPO longline fishery for 2008-2010 and the EPO purse seine fishery for 2009-2010 are preliminary

[16] 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 2000 compared to what has been reported in previous years.

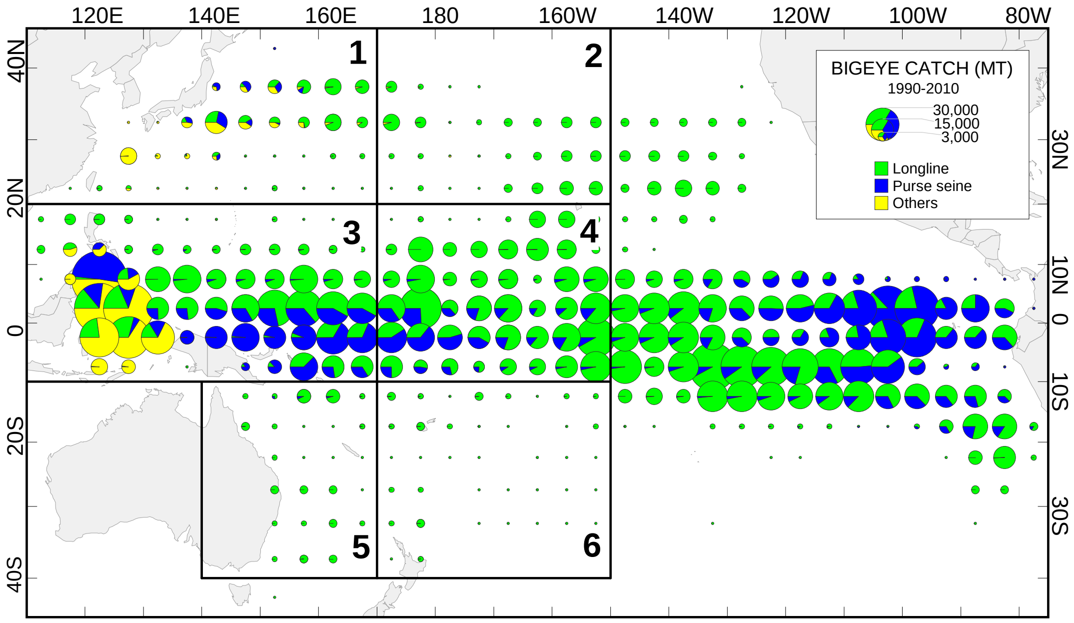

Figure 59. Distribution of bigeye tuna catch, 1990–2010.
The six-region spatial stratification used in stock assessment for the WCP–CA is shown.
Bigeye longline catches in the Eastern Pacific may not be fully covered

As with skipjack and yellowfin tuna, the domestic surface fisheries of the Philippines and Indonesia (archipelagic waters) take large numbers of small bigeye in the range 20–60 cm (Figure 60). The longline fishery clearly accounts for most of the catch (by weight) of large bigeye in the WCP–CA (Figure 60). This is in contrast to large yellowfin tuna, which (in addition to 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 tuna 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 tuna 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, but the main mode of associated-set bigeye tuna generally in the range of 45–55 cm.

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. The clear mode of fish in the size range of 45-50 cm from the purse seine associated and Philippines/Indonesian domestic surface fisheries in 2009 is a strong year-class that appears in the associated-set catch in 2010 as 60-70cm fish.

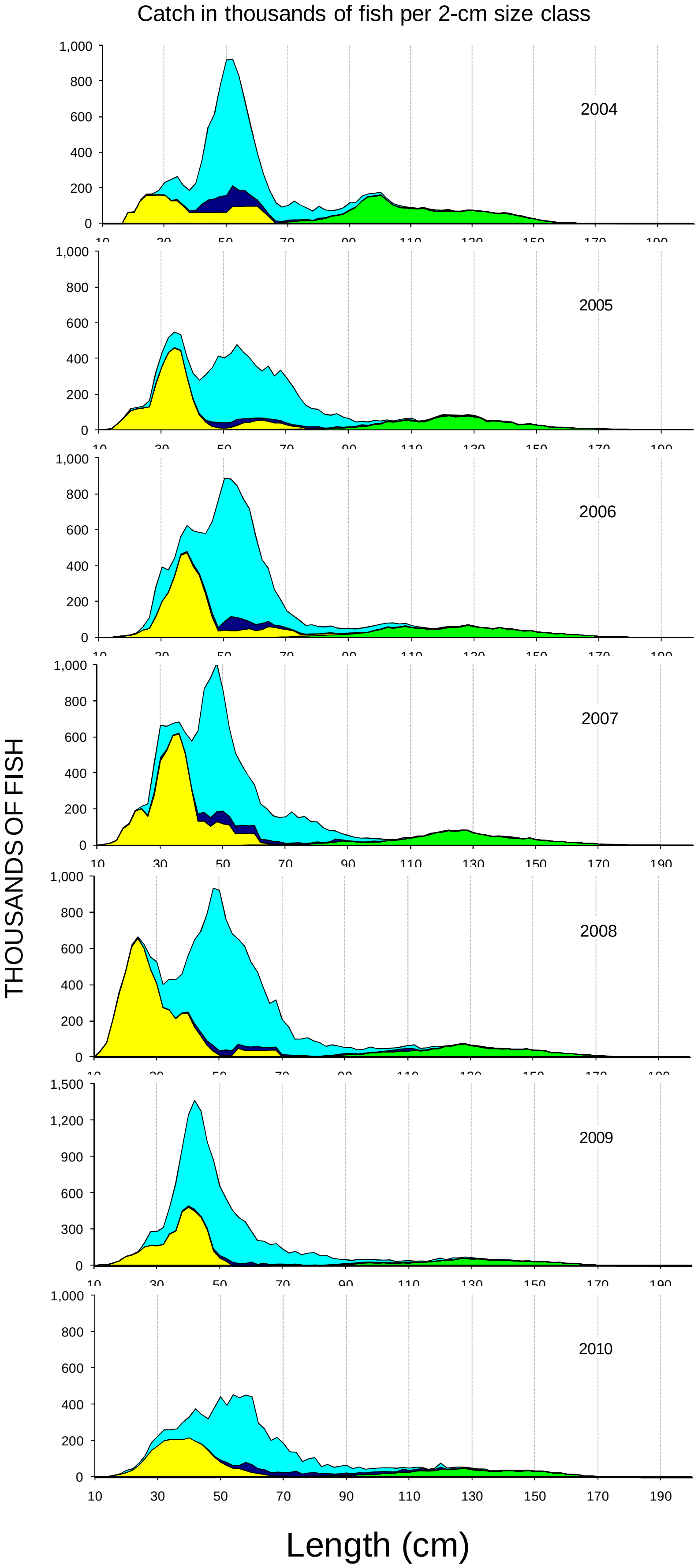

Figure 60. Annual catches (numbers of fish) of bigeye tuna in the WCPO by size and gear type, 2004–2010.

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

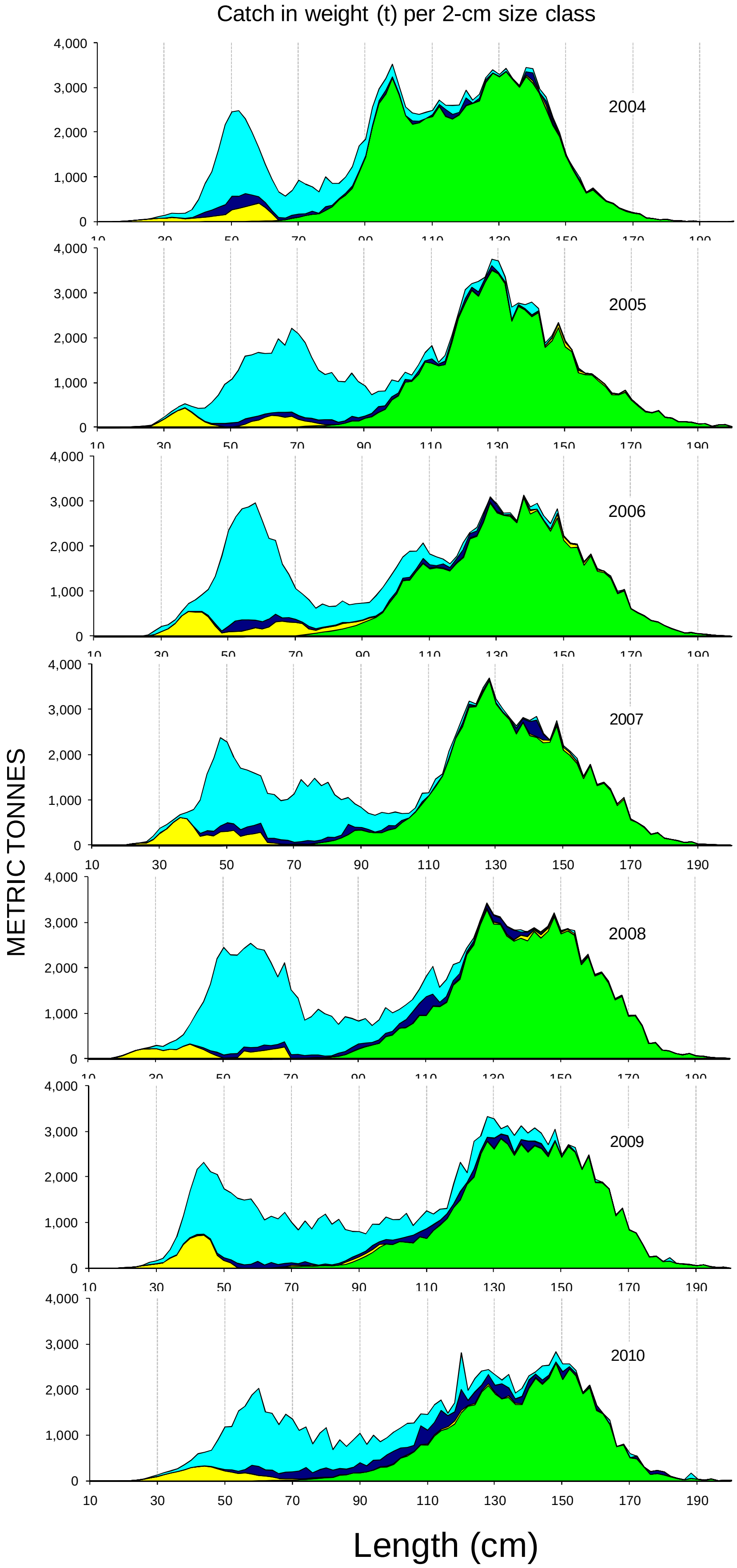

Figure 61. Annual catches (metric tonnes) of bigeye tuna in the WCPO by size and gear type, 2004–2010.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

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 greatly exceeded this range, primarily as a result of the growth in several Pacific Islands domestic longline fisheries. The **south Pacific** albacore catch in 2010 (88,919 mt) was the highest on record (12,000 mt higher than the previous record in 2009 at 76,500 mt).

In the post-driftnet era, **longline** has accounted for most of the South Pacific Albacore catch (> 75% in the 1990s, but > 90% in recent years), while the **troll** catch, for a season spanning November – April has generally been in the range of 3,000–8,000 mt (Figure 62), but has declined to <3,000 mt in recent years. The **WCP–CA** albacore catch includes catches from fisheries in the North Pacific Ocean west of 150°W (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 2010 (129,670 mt) was the second highest on record (after 147,782 mt in 2002), mainly due to large longline fishery catches.

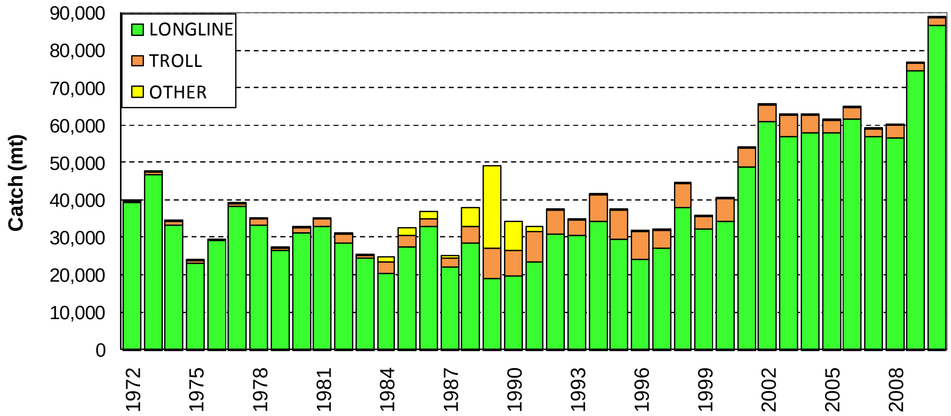

Figure 62. South Pacific albacore catch (mt) by gear ("Other" is primarily catch by the driftnet fishery.)

The longline catch of albacore is distributed over a large area of the south Pacific (Figure 63), but concentrated in the west. The Chinese-Taipei distant-water longline fleet catch is taken in all four 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.

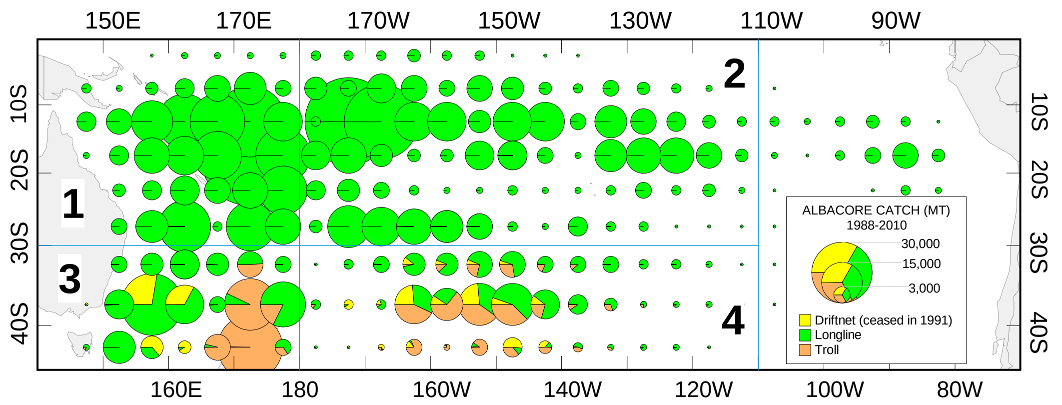

Figure 63. Distribution of South Pacific albacore tuna catch, 1988–2010.
The four-region spatial stratification used in stock assessment is shown.
Albacore longline catches in the Eastern Pacific may not be fully covered by these data

The longline fishery take adult albacore in the narrow size range of 90–105cm and the troll fishery takes juvenile fish in the range of 45–80cm (Figure 64 and Figure 65). 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 2005 and 2009).

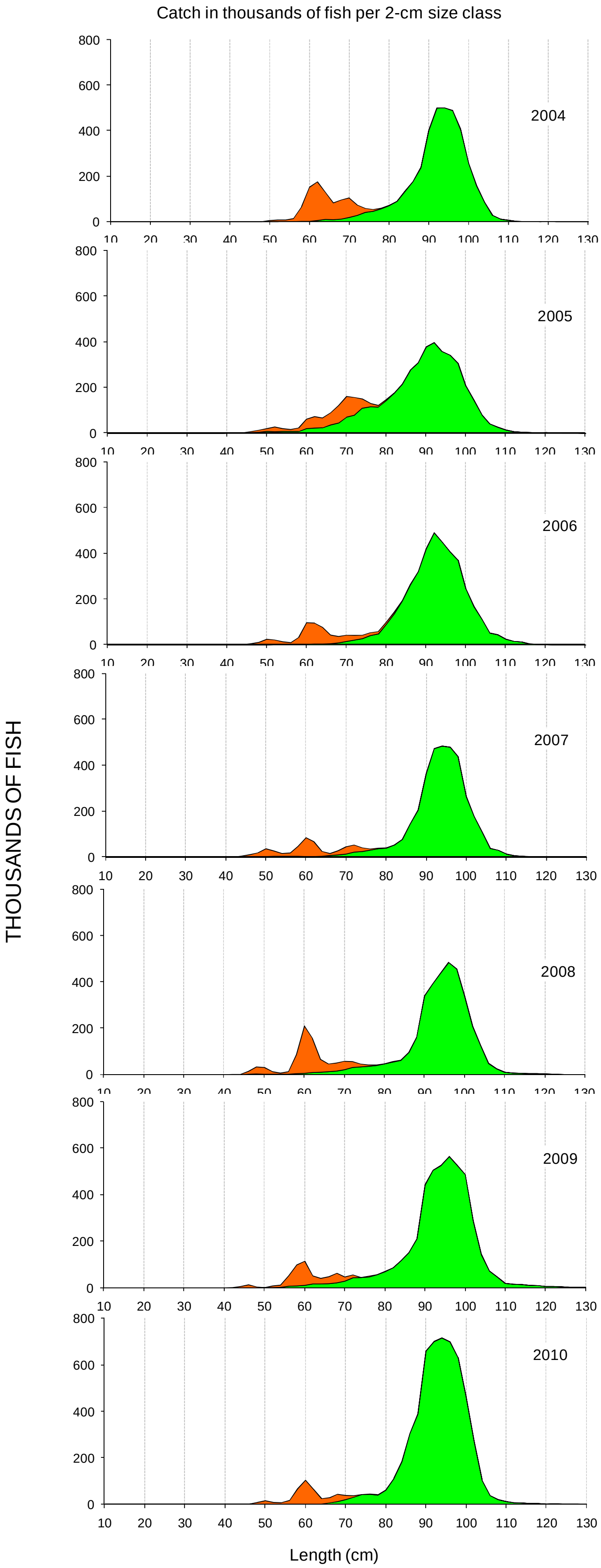

Figure 64. Annual catches (number of fish) of albacore tuna in the South Pacific Ocean by size and gear type, 2004–2010. **(green–longline; orange–troll)**

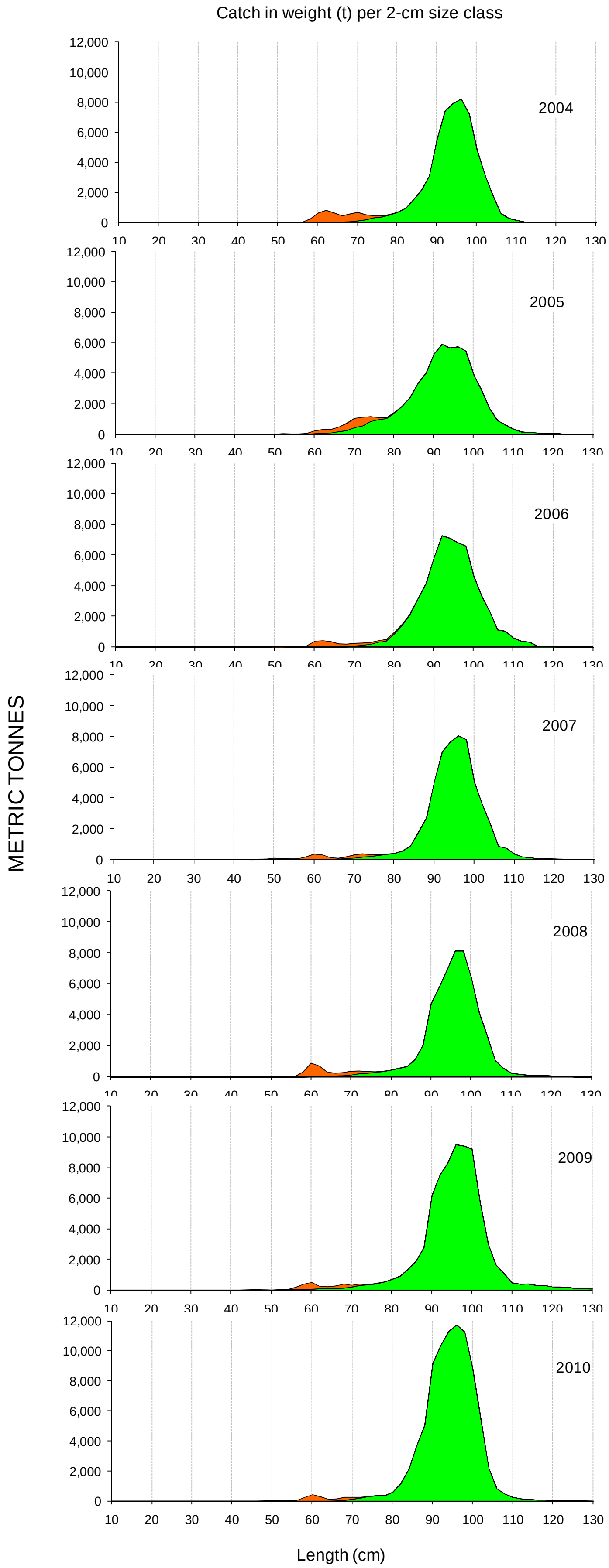

Figure 65. Annual catches (metric tonnes) of albacore tuna in the South Pacific Ocean by size and gear type, 2004–2010. **(green–longline; orange–troll); 2008 troll size data carried over to 2010**

7.5 SOUTH PACIFIC SWORDFISH

The distant-water Asian fleets (Japan, Chinese Taipei and Korea) accounted for most of the south Pacific swordfish catch from 1972 to the mid-1990s (Figure 66), with catches slowly increasing from 2,500 mt to about 5,000 mt. The development of target (domestic) fisheries in Australia and New Zealand accounted for most of the increase in total catch to just below 10,000 mt in 2003, with burgeoning Pacific Island domestic fleets also contributing. The Spanish longline fleet targeting swordfish entered the fishery in 2004 and resulted in catches increasing significantly to a new level of around 15,000 mt which continued to 18,000 mt in the past two years, with contributions from the distant-water Asian fleet catches. These estimates do not include catches from the South American fleets catching swordfish.

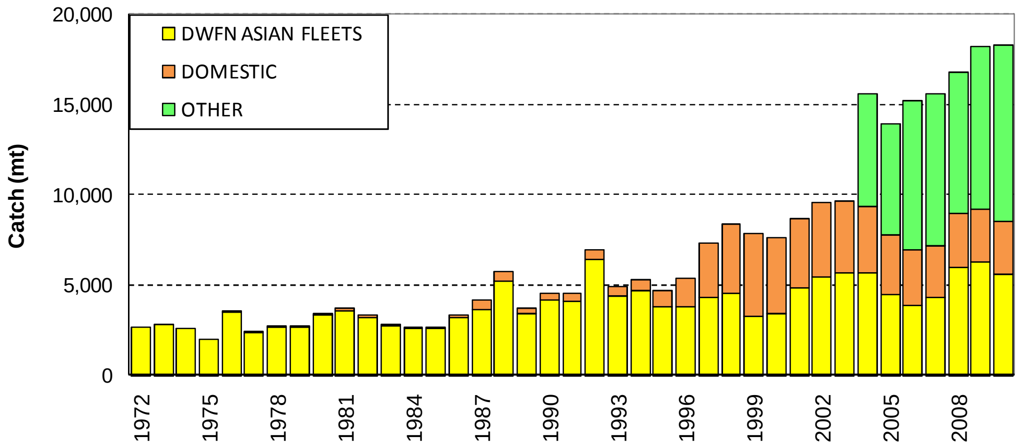

Figure 66. South Pacific longline swordfish catch (mt) by fleet

The longline catch of swordfish is distributed over a large area of the south Pacific (Figure 67). There are four main areas of catches (i) the far eastern Pacific Ocean off Chile and Peru, where most of the Spanish fleet catch comes from but also some of the distant-water Asian catches; (ii) the south central Pacific Ocean region south of the Cook Islands and French Polynesia, predominantly covered by the Spanish fleet; (iii) the coastal waters of New Zealand, Australia and adjacent Pacific Island countries (domestic fleets); and (iii) the equatorial Pacific Ocean between 130–160°W, covered by the distant-water Asian fleets.

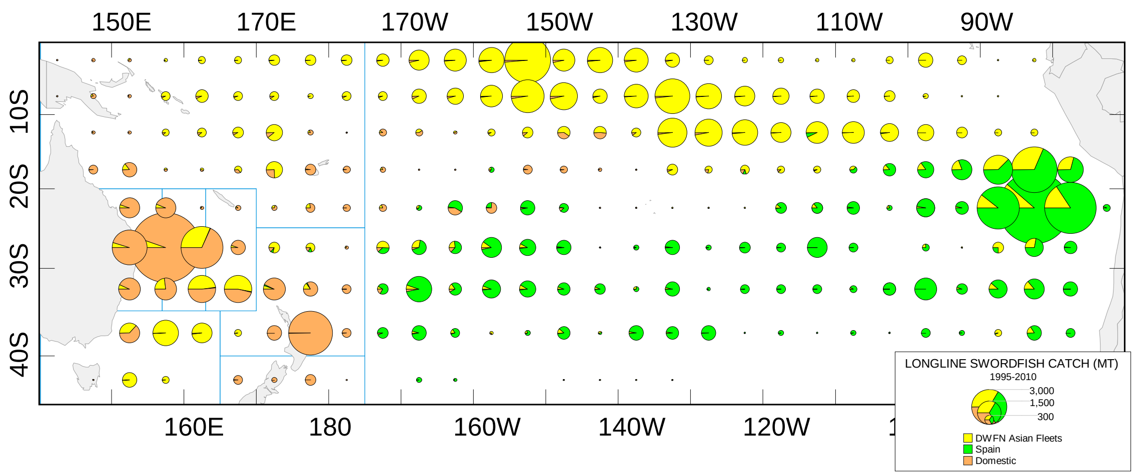

Figure 67. Distribution of South Pacific longline swordfish catch, 1995–2010.

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

Swordfish longline catches in the Eastern Pacific may not be fully covered by these data

The swordfish catch throughout the South Pacific Ocean are generally in the range of 110–170cm (lower jaw-fork length – Figures 68 and 69). There is evidence of inter-annual variation in the size of swordfish taken by fleet and variation in the size of fish by fleet, for example, the distant-water Asian fleets generally catch larger swordfish than the Spanish fleet, which could be related to area fished.

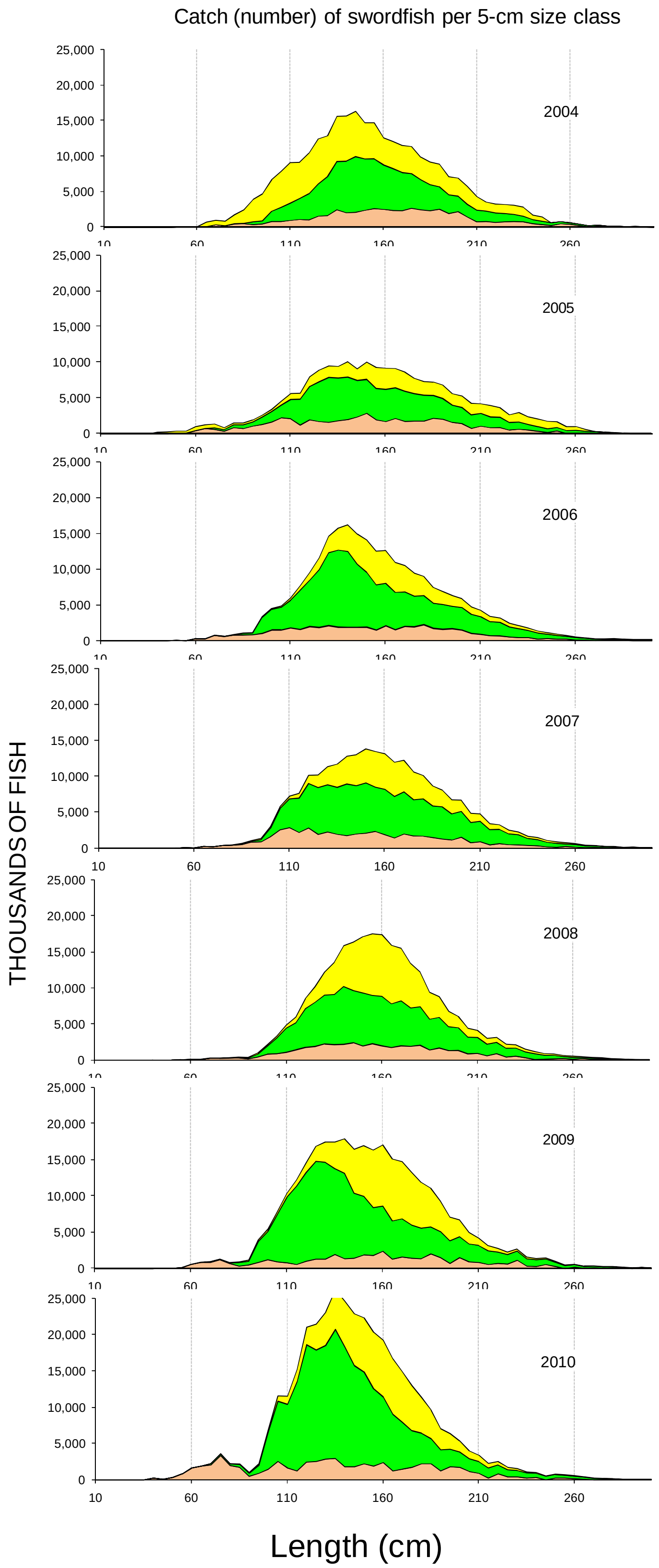

Figure 68. Annual catches (number of fish) of swordfish in the South Pacific Ocean by size and fleet, 2004–2010. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange– Domestic fleets)**

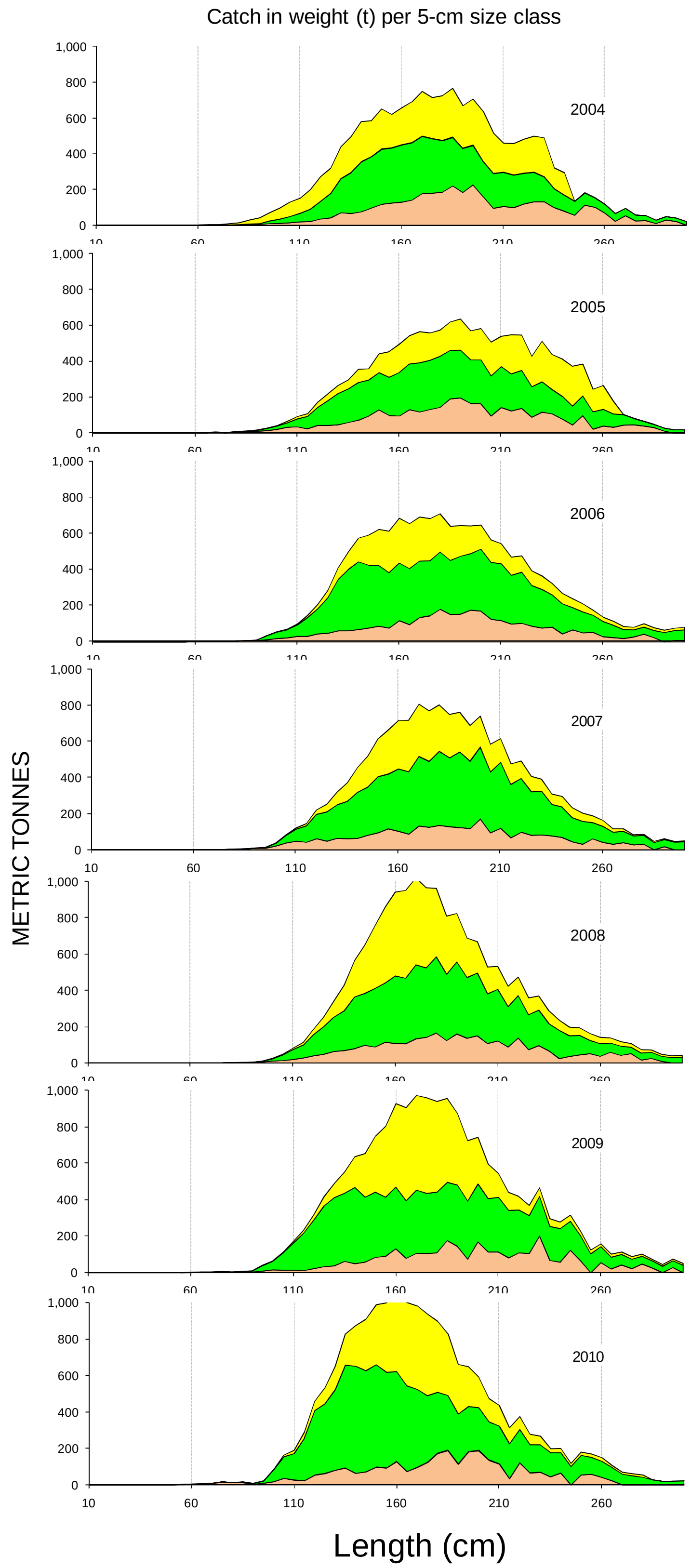

Figure 69. Annual catches (metric tonnes) of swordfish in the South Pacific Ocean by size and fleet, 2004–2010. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange–Domestic fleets)**

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ANNEX

Annual purse seine catch estimates by species – Alternate method for species composition

The following figures contrast catch estimates of relevant tuna species according to logsheet data (left-hand graphs), with catch estimates adjusted with species compositions determined from observer grab samples corrected for size selectivity bias (see Lawson, 2010) to account for the misreporting of small yellowfin and bigeye as skipjack on the logsheets (right-hand graphs). Figures compare catches by species for the WCP-CA (Figure A1) and purse seine catch and effort (Figure A2), the distribution of purse seine catches by species (Figure A3) and the WCP-CA catch of skipjack, yellowfin and bigeye tuna by gear (Figures A4–A6).

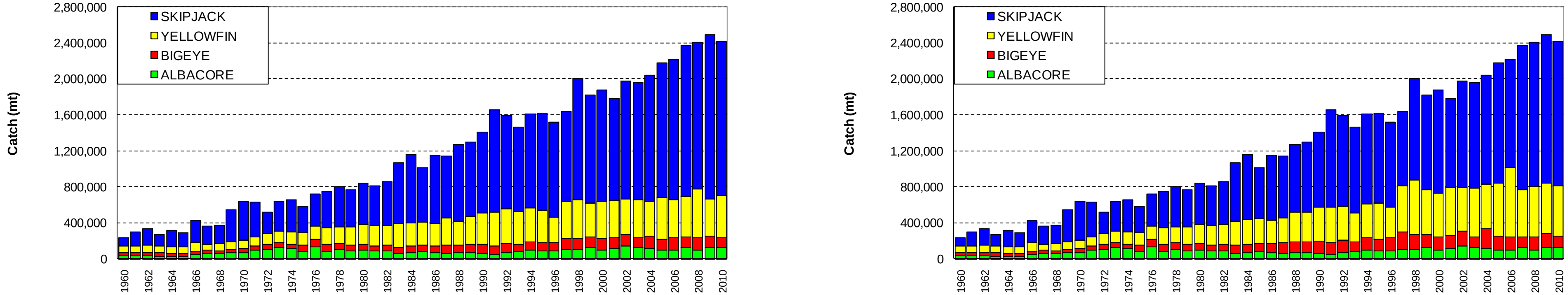


Figure A1. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA
(Right : Purse seine species composition determined from adjusted observer grab sampling data)

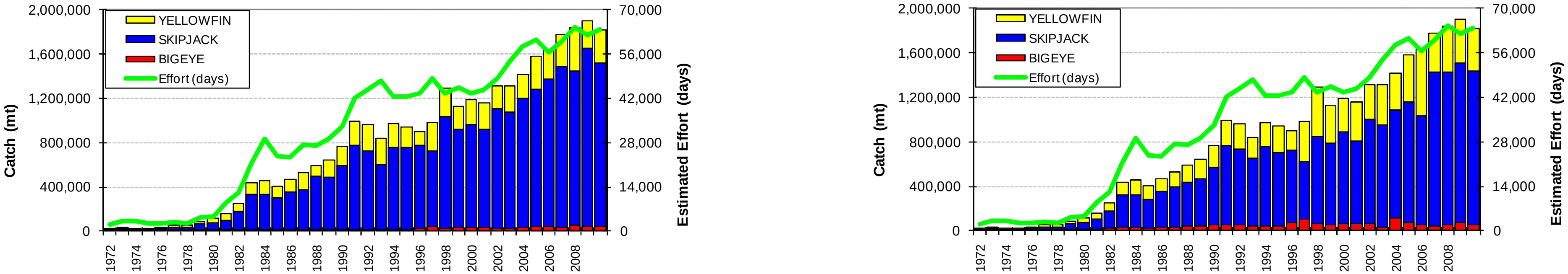


Figure A2. Purse seine catch (mt) of bigeye, skipjack and yellowfin and estimated fishing effort (days fishing and searching) in the WCP–CA

(**Right :** Purse seine species composition determined from adjusted observer grab sampling data)

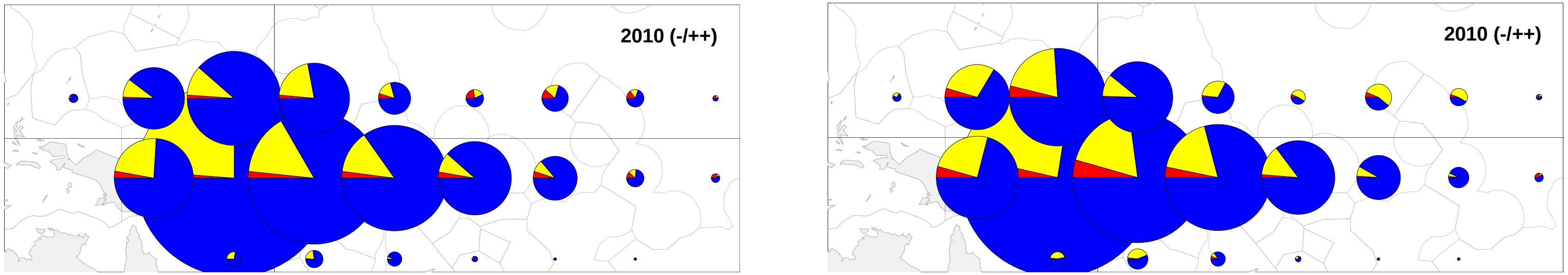


Figure A3. Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch, 2010 (Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).

(Right : Purse seine species composition determined from adjusted observer grab sampling data)

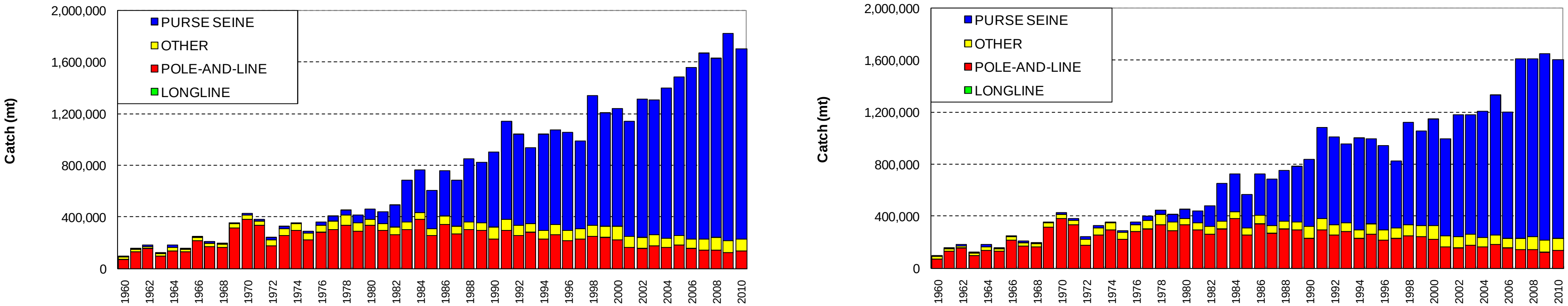
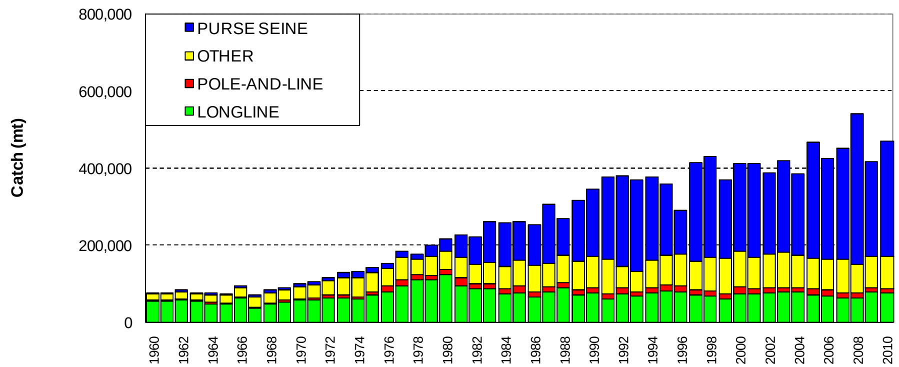


Figure A4. WCP–CA skipjack catch (mt) by gear

(Right : Purse seine species composition determined from adjusted observer grab sampling data)



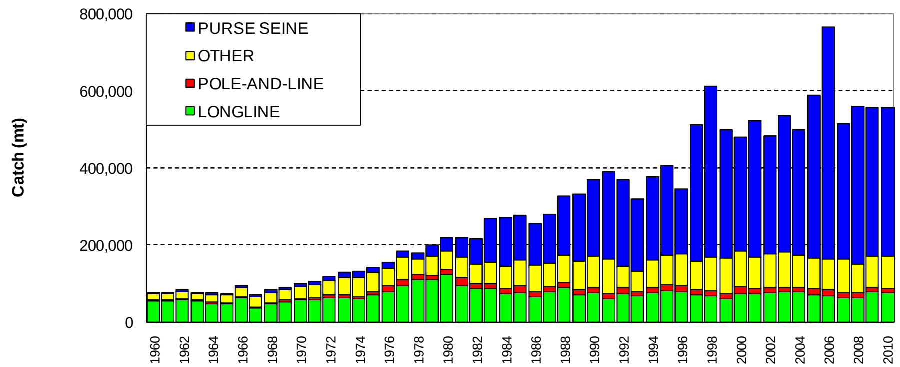
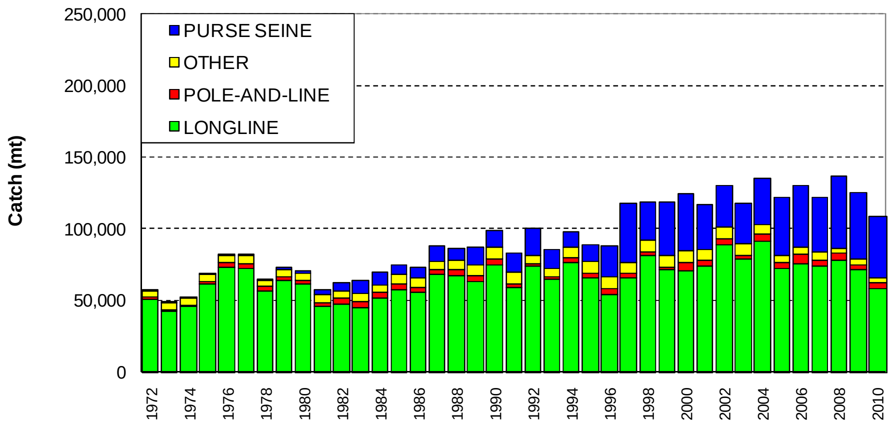


Figure A5. WCP–CA yellowfin catch (mt) by gear

(Right : Purse seine species composition determined from adjusted observer grab sampling data)



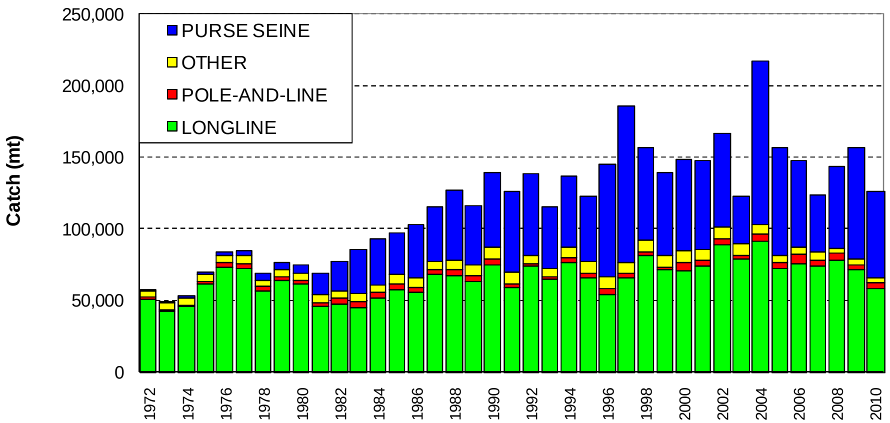


Figure A6. WCP–CA bigeye catch (mt) by gear

(Right : Purse seine species composition determined from adjusted observer grab sampling data)