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OVERVIEW OF TUNA FISHERIES IN THE WESTERN AND CENTRAL PACIFIC OCEAN, INCLUDING ECONOMIC CONDITIONS – 2011

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Paper prepared by

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ABSTRACT

This paper provides a broad description of the major fisheries in the WCPFC Statistical Area (WCP-CA) highlighting activities during the most recent calendar year (2011) and covering the most recent version of catch estimates by gear and species.

The provisional total WCP–CA tuna catch for 2011 was estimated at **2,244,776 mt**, the lowest since 2005 and 300,000 mt lower than the record in 2009 (2,544,679 mt); this catch represented 79% of the total Pacific Ocean catch of 2,833,020 mt, and 55% of the global tuna catch (the provisional estimate for 2011 is 4,077,814 mt, which is the lowest for 10 years).

The **2011 WCP–CA catch of skipjack** (**1,540,189 mt** – 69% of the total catch) was only the fifth highest recorded and around 215,000 mt less than the record catch of 2009 (1,756,628 mt). The **WCP–CA yellowfin catch** for 2011 (**430,506 mt** – 19%) was the lowest since 1996 and more than 170,000 mt lower than the record catch taken in 2005 (602,892 mt) due to poor catches in the purse seine fishery. The **WCP–CA bigeye catch** for 2011 (**151,533** mt – 7%) was close to the average for the past decade. The **2011 WCP–CA albacore catch** (**122,548 mt** - 5%) was relatively stable and close to the average for the past decade. The 2011 WCP–CA albacore catch includes catches of north and south Pacific albacore in the WCP–CA, which comprised 81% of the total Pacific Ocean albacore catch of 152,195 mt in 2011. The south Pacific albacore catch in 2011 was 75,258 mt.

The provisional **2011 WCP-CA purse-seine catch of 1,688,336 mt** was the lowest catch for five years and more than 220,000 mt lower than the record attained in 2009 (1,919,424 mt). The 2011 purse-seine skipjack catch (1,330,667 mt) was also the lowest for five years and significantly lower (nearly 200,000 mt) than the record catch in 2009. The 2011 purse-seine catch estimate for yellowfin tuna (280,251 mt – 17%) was the lowest since 1996 and significantly lower (150,000+ mt) than the record catch taken in 2008 (434,149 mt). The provisional catch estimate for bigeye tuna for 2011 (77,095 mt) was amongst the highest on record but may be revised once all observer data for 2011 have been received and processed. The high bigeye catch in 2011 coincides with a record number of associated sets and a pulse of bigeye recruitment in the purse seine fishery, and there may have been changes in catchability in some areas of the fishery. While purse seine catch declined in 2011, the number of vessels and effort (both in terms of days fishing and number of sets) were at an all-time high.

The **2011 WCP-CA pole-and-line catch (164,416 mt)** was the lowest annual catch since the mid-1960s and continuing the trend in declining catches for three decades. 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 2011 reduced to only 90 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 resumed fishing in 2011.

The provisional **WCP–CA longline catch (251,298 mt)** for 2011 was the fifth highest on record, at around 15,000 mt lower than the highest on record attained in 2002 (266,963 mt). The WCP–CA albacore longline catch (96,219 mt – 38%) for 2011 was the second highest on record, 6,000 mt lower than the record (102,763 mt in 2010). In contrast, the provisional bigeye catch (67,599 mt – 27%) for 2011 was the lowest since 1997, but may be revised upwards when final estimates are provided. The yellowfin catch for 2011 (86,187 mt – 34%) was stable but slightly higher than the average catch level for this species over the period 2000-2010.

The **2011 South Pacific troll albacore catch (3,119 mt)** was higher than the catch in the past two years, mainly due to higher catches experienced in the New Zealand domestic fishery. The New Zealand troll fleet (162 vessels catching 2,798 mt in 2011) and the United States troll fleet (6 vessels catching 321 mt in 2011) 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 2011).

In regards to the **economic condition of the WCP-CA fishery**, The overriding issue with canned tuna raw materials and sashimi grade products in the year 2011 was on supplies. The increasingly tight management measures with pressure for sustainably produced tuna and tuna products, relatively poor fishing conditions under the prevalence of La Nina conditions, the overhang from previous global financial crisis and in Europe, continuing high fuel/food prices and changing consumer preferences, political disruptions in some of emerging markets and natural disasters such as those in Japan and Thailand, all contributed to defining the supply and demand conditions during the year. Against these backdrops, prices increased to unprecedented levels in the case of canned tuna raw materials while the long-stagnant sashimi tuna product prices also rose.

Prices in the major markets for WCP-CA skipjack catches rose steeply in 2011. The Bangkok benchmark averaged US$1,726/Mt, a substantial 42 per cent rise over the previous year's. The Yaizu average price for skipjack was ¥143 (US$1,785/Mt), up 15 per cent (27 per cent) from 2010. The price trend for purse seine caught yellowfin was up even stronger with Bangkok prices up by 57 per cent to US$2,435 while the Yaizu prices averaged ¥306/Kg (US$3,825/Mt) or 21 per cent (34 per cent in US Dollar terms).

The estimated delivered value of the entire purse seine tuna catch in the WCP-CA area for 2011 is US$3,092 million, 23 per cent higher than 2010 driven by increases in both skipjack and yellowfin values. Yellowfin values increased by 22 per cent and skipjack 25 per cent.
The pole and line price at Yaizu in 2011 averaged ¥189 (US$2,362) as against an average of ¥197 (US$2,239) in 2010, a decline of 4% in Japanese Yen terms (improvement of 6% in US dollar terms). The estimated delivered value of the total catch in the WCP-CA pole and line fishery for 2011 is US$372 million, almost the same level as in 2010 caused by almost equal offsetting movements in catch (down 12%) and overall price (up 13%).

Japan fresh yellowfin import price from Oceania fell by 6 per cent (rose 9 per cent in US$ terms) to ¥889/kg ($11.15/Kg). In the US market prices were also higher at US$9.07/Kg. Japan frozen bigeye import prices rose 7 per cent (18 per cent) to ¥814/kg (US$10.21). Average price for fresh bigeye from Oceania declined by 9 per cent to ¥1,015/kg (US$12.74/kg). US fresh bigeye import prices were higher 10 per cent at US$8.87/Kg. The Bangkok albacore market benchmark price averaged US$2,778/Mt in 2011 up 11 per cent while Thai frozen albacore import prices improved by 14 per cent to US$3,044/Mt. The US fresh albacore import prices increased by 8 per cent to US$4.56/kg.

The US swordfish market price (fresh and frozen) averaged US$8,340/Mt in 2011 up 9 per cent from 2010. The overall price trend in this US market had been on an uptrend since 2000. In contrast to the uptrend in prices the volume of imports into the US had been on a gradual decline. The estimated fob value of the longline swordfish catch in the WCP-CA for 2011 is US$164 million, a moderate 3% increase on 2010 but a 17 per cent decline from the peak of almost US$198 million in 2007.

The estimated delivered value of the longline tuna catch (excluding swordfish) in 2011 is US$1,853 million, an increase of US$145 million on the estimated value of the catch in 2010. The value of albacore catch increased by US$18 million, bigeye by US$37 million and yellowfin by $US90 million.

The total estimated delivered value of the WCP-CA catch in 2011 came to US$5.5 billion, an increase of 15% on 2010. The purse seine value was predominant accounting for 56 per cent of the total value while the longline fishery accounted for 33 per cent. By species, skipjack represented 48 per cent of the total value with yellowfin 29 per cent, bigeye tuna 17 per cent and albacore 7 per cent.

CONTENTS

1. INTRODUCTION

The tuna fishery in the Western and Central Pacific Ocean is diverse, ranging from small-scale artisanal operations in the coastal waters of Pacific states, to large-scale, industrial purse-seine, pole-and-line and longline operations in both the exclusive economic zones of Pacific states and on the high seas. The main species 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 – 2011. The review draws on the latest catch estimates compiled for the WCP–CA, which can be found in Information Paper WCPFC–SC8 ST IP–1 *(Estimates of annual catches in the WCPFC Statistical Area – OFP, 2012)*. Where relevant, comparisons with previous years' activities have been included, although it should be noted that data for 2011, for some fisheries, are provisional at this stage.

This paper includes sections covering a summary of total target tuna and swordfish (*Xiphias gladius*) catch in the WCP–CA tuna fisheries and an overview of the WCP–CA tuna fisheries by gear, including economic conditions in each fishery. In each section, the paper makes some observations on recent developments in each fishery, with emphasis on 2011 catches relative to those of recent years, but refers readers to the SC8 National Fisheries Reports, which offer more detail on recent activities at the fleet level.

This overview acknowledges, but does not currently include detailed 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.

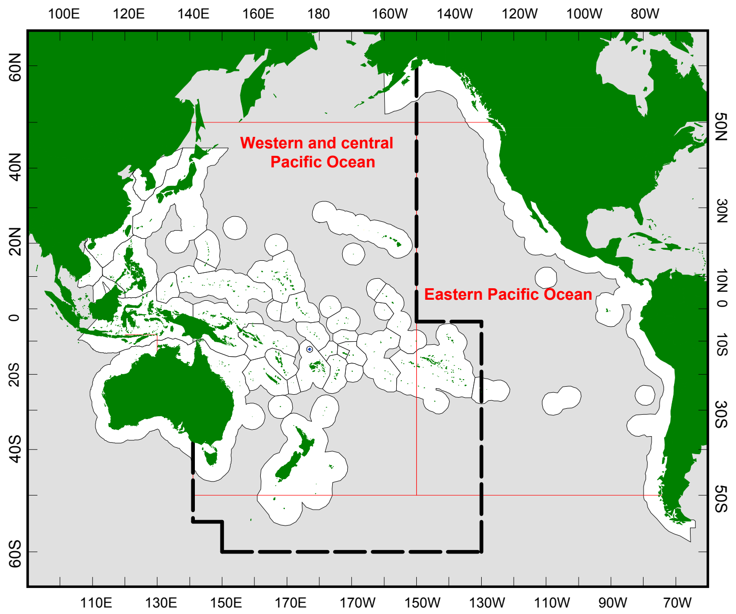

Figure 1. The western and central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Convention Area (WCP–CA in dashed lines)

2. TOTAL TUNA CATCH FOR 2011

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. From 2004 until 2009, there had been a clear 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 2011 was estimated at **2,244,776 mt**, the lowest since 2005 and 300,000 mt lower the record in 2009 (2,544,679 mt). During 2011, the purse seine fishery accounted for an estimated 1,688,336 mt (75% of the total catch), with pole-and-line taking an estimated 164,416 mt (7%), the longline fishery an estimated 251,298 mt (11%), 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 (2,244,776 mt) for 2011 represented 79% of the total Pacific Ocean catch of 2,833,020 mt, and 55% of the global tuna catch (the provisional estimate for 2011 is 4,077,814 mt, which is the lowest for 10 years).

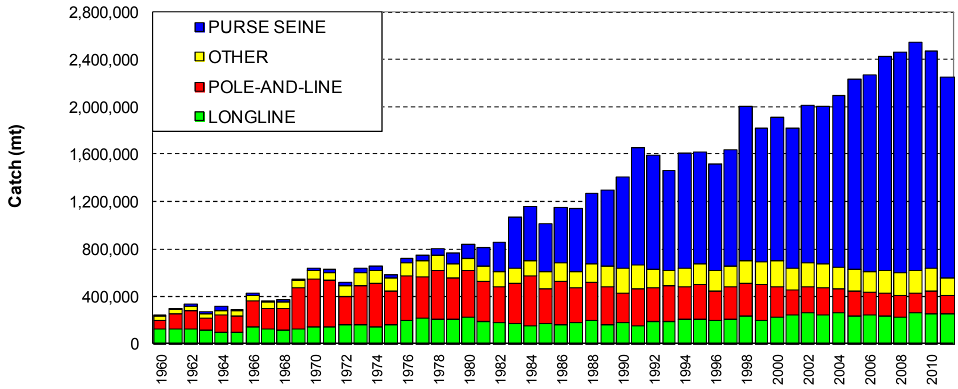

Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

The **2011 WCP–CA catch of skipjack** (**1,540,189 mt** – 69% of the total catch) was the fifth highest recorded and around 215,000 mt less than the record catch of 2009 (1,756,628 mt). The **WCP–CA yellowfin catch** for 2011 (**430,506 mt** – 19%) was the lowest since 1996 and more than 170,000 mt lower than the record catch taken in 2005 (602,892 mt) primarily due to poor catches in the purse seine fishery. The **WCP–CA bigeye catch** for 2011 (**151,533** mt – 7%) was close to the average for the past decade. The **2011 WCP–CA albacore catch** (**122,548 mt** - 5%) was relatively stable and close to the average for the past decade. The 2011 WCP–CA albacore[1] catch (122,548 mt - 5%) was relatively stable and also close to the average for the past decade.

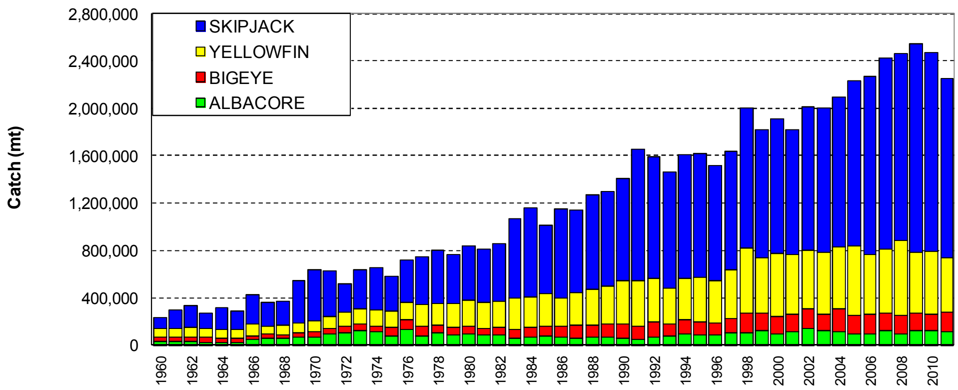

Figure 3. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

[1] includes catches of north and south Pacific albacore in the WCP–CA, which comprised 81% of the total Pacific Ocean albacore catch of 152,195 mt in 2011; the section 7.4 "Summary of Catch by Species - Albacore" is concerned only with catches of south Pacific albacore, which made up approximately 50% of the Pacific albacore catch in 2011.

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 in recent years – 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 136 vessels in 2011[2]. The Pacific Islands fleets have gradually increased in numbers over the past two decades to a level of 87 vessels in 2011 (Figure 4). The remainder of the purse seine fishery 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 five years, the number of vessels has gradually increased, attaining a level of 283 vessels[3] in 2011.

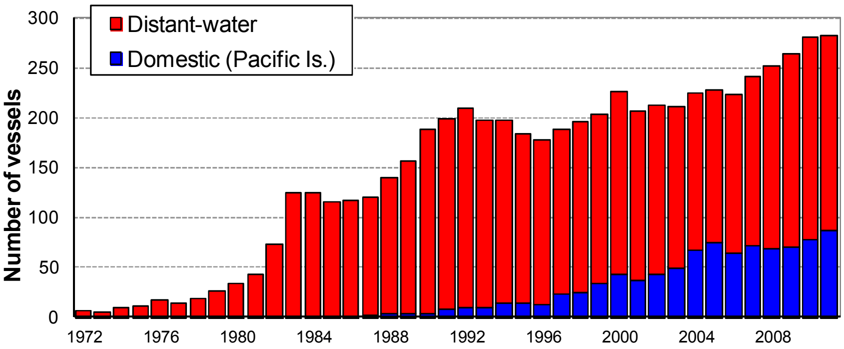

Figure 4. Number of purse seine vessels operating in the WCP–CA
(this does not include the Japanese Coastal purse seine fleet and the Indonesian and Philippines domestic purse-seine/ringnet fleets which account for over 1,000 vessels)

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[4] during the past two decades include:

- Annual skipjack catches fluctuating between 600,000 and 800,000 mt prior to 1998, a significant increase in the catch during 1998, with catches now maintained well above 1,000,000 mt;
- Annual yellowfin catches fluctuating considerably

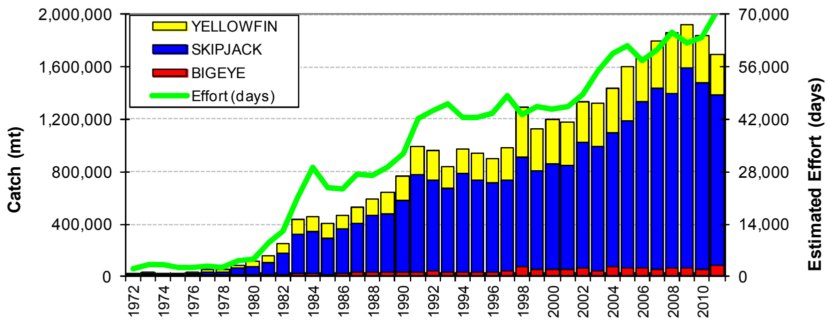

Figure 5. Purse seine catch (mt) of bigeye, skipjack and yellowfin and estimated fishing effort (days fishing and searching) in the WCP–CA

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[2] The number of vessels by fleet in 1995 was Japan (31), Korea (30), Chinese-Taipei (42) and USA (44) and in 2011 the number of vessels by fleet was Japan (37), Korea (28), Chinese Taipei (34) and USA (37). In 2011, there was an additional 39 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.

[4] Recent studies using observer data (e.g. Lawson, 2007, Lawson, 2010, Lawson, 2012, Hampton and Williams, 2011) 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. Observer data have been used to provide more reliable estimates of the purse-seine species catch (Lawson, 2012) which now represent the official catch estimates compiled for the WCP–CA (OFP, 2012) and have been included throughout this paper.

between 300,000 and 400,000 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 catch estimates, coinciding with the introduction of drifting FADs (since 1997). Significant bigeye catch years have been 1997 (76,794 mt), 1998 (76,605 mt) and 2004 (73,843 mt) which correspond to years with a relatively high proportion of associated sets and/or strong bigeye recruitment.

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).
Note that purse seine effort in 2011 was clearly the highest on record.

3.2 Provisional catch estimates, fleet size and effort (2011)

The provisional **2011 purse-seine catch of 1,688,336 mt** was the lowest catch for five years and more than 220,000 mt lower than the record attained in 2009 (1,919,424 mt). The 2011 purse-seine skipjack catch (1,330,667 mt) was also the lowest for five years and significantly lower (nearly 200,000 mt) than the record catch in 2009; the proportion of adjusted skipjack tuna catch (79%) was in line with the average for the past three years, but higher than the average over the past 15 years (72%). The 2011 purse-seine catch estimate for yellowfin tuna (280,251 mt – 17%) was the lowest since 1996 and significantly lower (150,000+ mt) than the record catch taken in 2008 (434,149 mt). The provisional catch estimate for bigeye tuna for 2011 (77,095 mt) was amongst the highest on record but may be revised once all observer data for 2011 have been received and processed[5]. The high bigeye catch in 2011 coincides with a record number of associated sets (WCPFC Database) and a pulse of bigeye recruitment in the purse seine fishery (see Section 7.3).

Figure 6 compares annual purse seine effort and catches for the five main purse seine fleets operating in the tropical WCP–CA in recent years. The combined-fleet 2011 total effort was the highest ever, but there was a clear drop in the total catch in 2011, suggesting lower catch rates. 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 picked up in recent years and it was the highest producer again in 2010 and 2011. 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

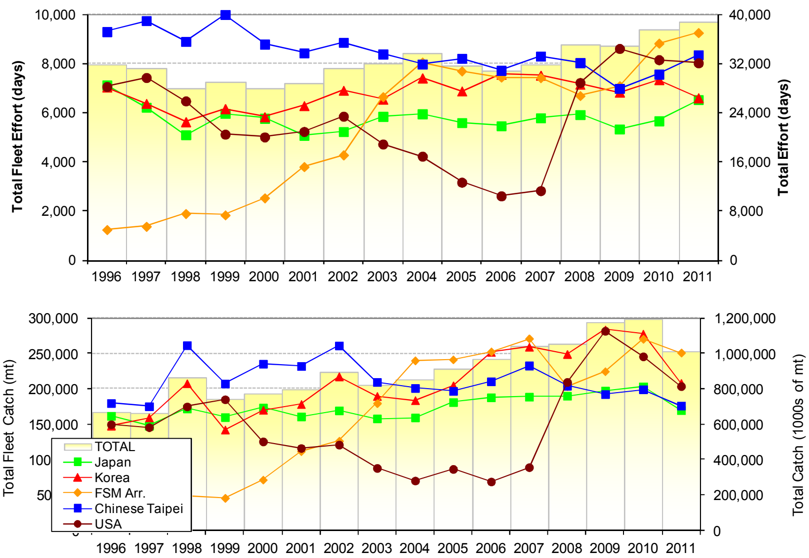

Figure 6. Trends in annual effort (top) and catch (bottom) estimates for the top five purse seine fleets operating in the tropical WCP–CA, 1996–2011.

purse seine fleet is reflected in the sharp increase in their catch and effort since 2007 (they were the highest producer in 2009 with Korea).

The total number of Pacific-island domestic vessels has gradually increased over the past two decades, attaining its highest level in 2011 (87 vessels). The Pacific-islands purse seine fleets comprise vessels fishing under the FSM Arrangement (34 vessels in 2011), the Kiribati (5 vessels) and Vanuatu (6 vessels) fleets operating under bilateral arrangements, the domestic fleets operating in PNG (Papua New Guinea; 34 vessels) and Solomon Islands (7 vessels) waters, and the new Tuvaluan purse seine vessel. The FSM Arrangement (FSMA) fleet comprises vessels managed by the Pacific Island "Home Parties" of PNG (15 vessels), the Marshall Islands (10 vessels), FSM (7 vessels) and Kiribati (2 vessels) which fish over a broad area of the tropical WCP–CA.

The domestic Philippine purse-seine and ring-net fleets operate in Philippine and northern Indonesian waters, and prior to 2010, the high seas pocket between Palau, Indonesia, FSM and PNG; this fleet accounted for between 150,000-200,000 mt annually in the period 2004-2009. The high seas closure (since 2010) has resulted in a considerable decline in the domestic Philippine purse-seine catch, 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 but has not generally fished in high seas areas; these two domestic fisheries accounted for about 20-25% of the WCP-CA total purse seine catch prior to 2010, but since the high seas closure, now take about 17-18% of the WCP-CA total purse seine catch.

Figure 7 shows annual trends in sets by set type (left) and total tuna catch by set type (right) for the major purse-seine fleets. Sets on free-swimming (unassociated) schools of tuna have predominated during recent years but were not as high in 2011 (63% of all sets for these fleets) as in 2010 (79%). The number and proportion (32%) of sets on drifting FADs in 2011 was the highest ever but the number and proportion (5%) of sets on logs was the lowest since 1980; the combined number of "associated" sets in 2011 was the highest ever. Associated set types, particularly drifting FAD sets, generally account for a higher average catch per set than unassociated sets, so the percentage of catch for drifting FADs (for 2011 = 48%: Figure 7–right) will be higher than the percentage of sets for drifting FADs (for 2011 = 32%: Figure 7–left). Hampton et al. (2012) provide a more detailed breakdown of catch and effort by set type in 2009, 2010 and 2011 using available logsheet and observer data.

3.3 Environmental conditions

The purse-seine catch/effort distribution in tropical areas of the WCP–CA is strongly influenced by El Nino–Southern Oscillation Index (ENSO) events (Figure 8). Figure 9 (left) 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 contracting to western areas during La Niña periods.

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 of 2006 but soon dissipated and a weak El Niño event then presided over the remainder of 2006. During the first half of 2007, the WCP–CA was in an ENSO-neutral state, but then moved into a 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 quarter of 2010. Conditions in the WCP-CA then switched back to a strong La Niña state over the latter months of 2010 and into the first quarter of 2011. By the middle of 2011, the WCP-CA was in an ENSO-neutral state and briefly returned to a strong La Niña period in late 2011, before waning again to neutral conditions in early 2012. The forecast for the remainder of 2012 is a shift to El Niño conditions. The strong La Nina in 2011 meant that the main fishing activity was again restricted to the western areas of the WCP-CA (the waters of the PNG, FSM and Solomon Islands) as experienced in other recent La Nina periods (e.g. 2008).

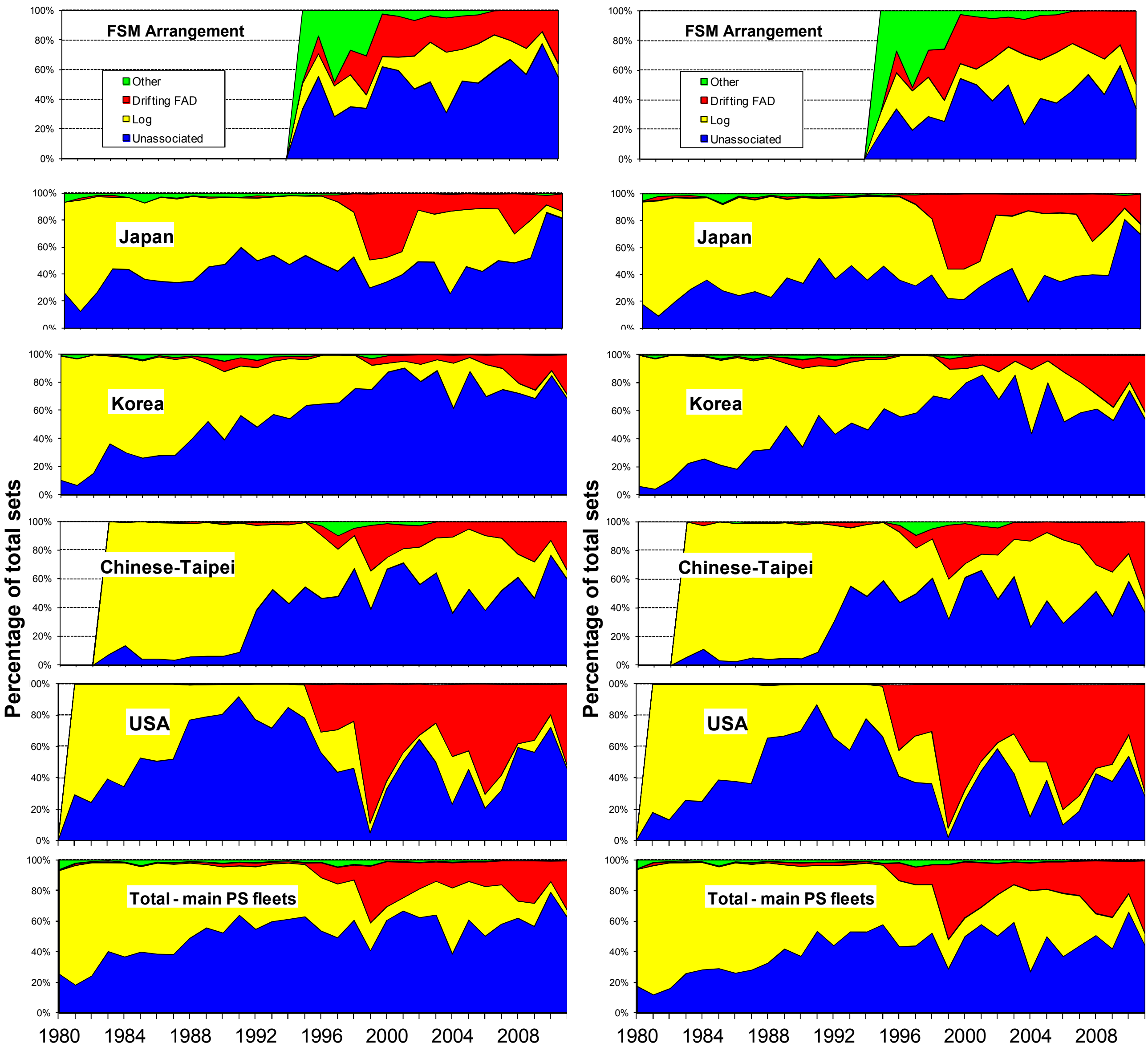

Figure 7. Time series showing the percentage of total sets (left) and total catch (right), by school type for the major purse-seine fleets operating in the WCP–CA.

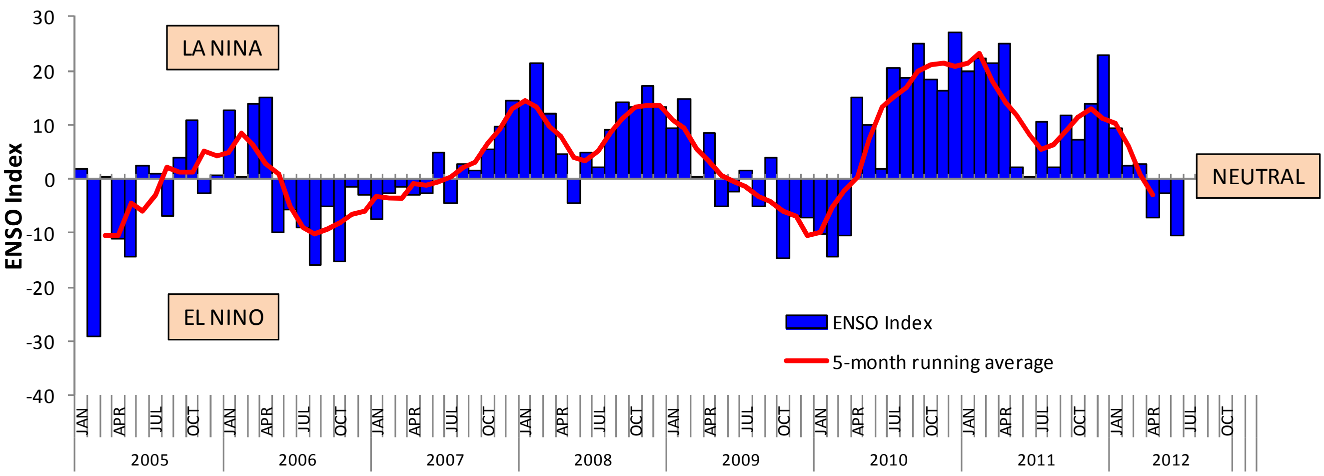

Figure 8. Trends in El Nino Southern Oscillation Index (ENSO), 2005-2012

3.4 Distribution of fishing effort and catch

The distribution of effort by set type (Figure 9–right) for the past seven years shows that El Niño conditions in 2005 and 2006 coincided with a higher proportion of log-associated sets east of 160°E than in 2008, 2010 and 2011 (significant La Nina years), 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. As mentioned previously, despite the FAD closure in both 2009 and 2011, there was still a significant amount of drifting FAD sets made in these years (Figure 9–right), particularly to the east of 160°E. As would be expected, the FAD closure in 2010 and 2011 produced an increase in unassociated sets, but in 2010, this set type appears to have dominated in the non-FAD closure months as well, due to prevailing environmental conditions which were conducive to sets on free-swimming schools.

Figures 10 through 14 show the distribution of purse seine effort for the five major purse seine fleets during 2010 and 2011. The distribution of effort by fleet in 2011 appears very similar to the distribution of effort by fleet in 2010, with all but the US fleet restricted to the western tropical areas (PNG, Solomon Islands, FSM) due to the strong La Nina conditions.

Figure 15 shows the distribution of catch by species for the past seven years, Figure 16 shows the distribution of skipjack and yellowfin catch by set type for the same period, and Figure 17 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 (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. However, yellowfin also comprised a higher proportion of the total catch in 2008 (La Niña), indicating that this pattern does not occur in all years (Figure 15, Figure 16–right and Figure 57). In contrast, associated sets in the area to the west of 160°E usually account for a higher proportion of the skipjack catch (than yellowfin), in the respective total catch of each species (Figure 16–left).

The estimated bigeye catch in the area to the west of 160°E tends to be taken by a mixture of anchored and drifting FADs and logs, and is dominated by drifting FAD sets in the area to the east of 160°E (Figure 17). The only anomaly appears to a significant estimated bigeye catch from unassociated sets in the area 0°–10°S, 150°-160°E during 2010, perhaps related to prevailing environmental conditions. Most of the record catch of bigeye in 2011 appears to have come from drifting FAD sets to the east of 160°E.

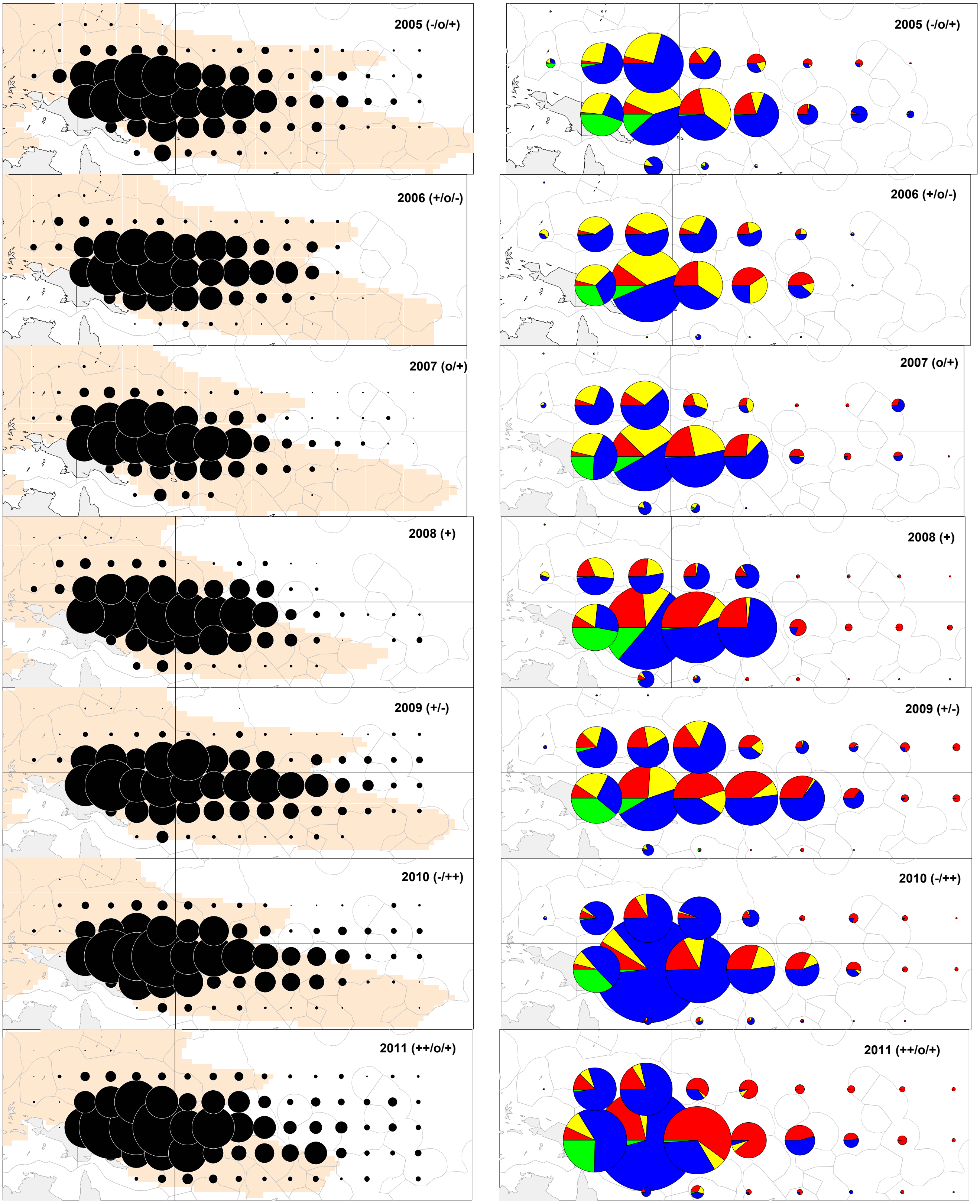

Figure 9. Distribution of purse-seine effort (days fishing – left; sets by set type – right), 2005–2011. (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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.

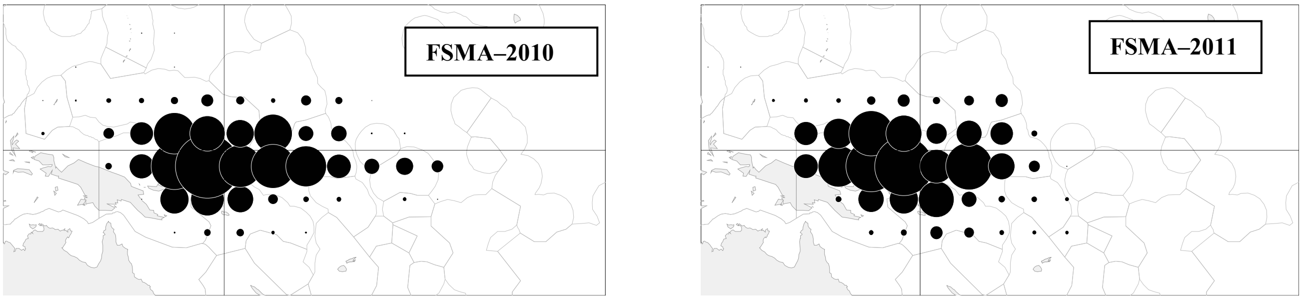

Figure 10. Distribution of effort by fleets operating under the FSM Arrangement during 2010 and 2011
lines for the equator (0° latitude) and 160°E longitude included.

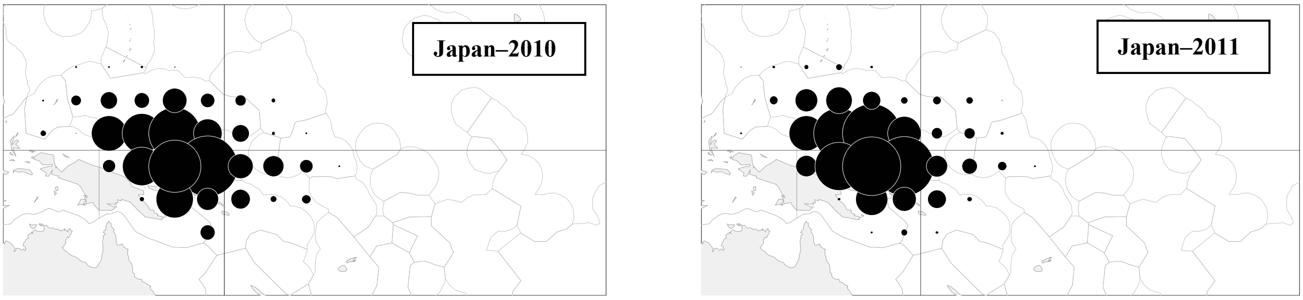

Figure 11. Distribution of effort by the Japanese purse seine fleet during 2010 and 2011
lines for the equator (0° latitude) and 160°E longitude included.

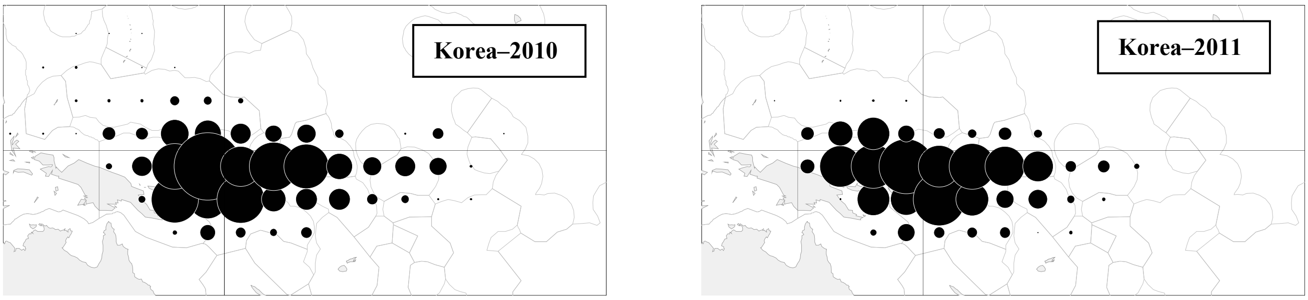

Figure 12. Distribution of effort by the Korean purse seine fleet during 2010 and 2011
lines for the equator (0° latitude) and 160°E longitude included.

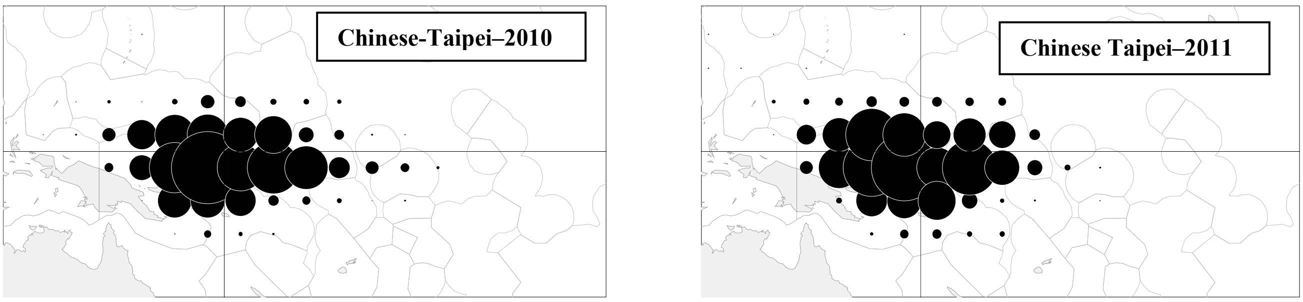

Figure 13. Distribution of effort by the Chinese-Taipei purse seine fleet during 2010 and 2011
lines for the equator (0° latitude) and 160°E longitude included.

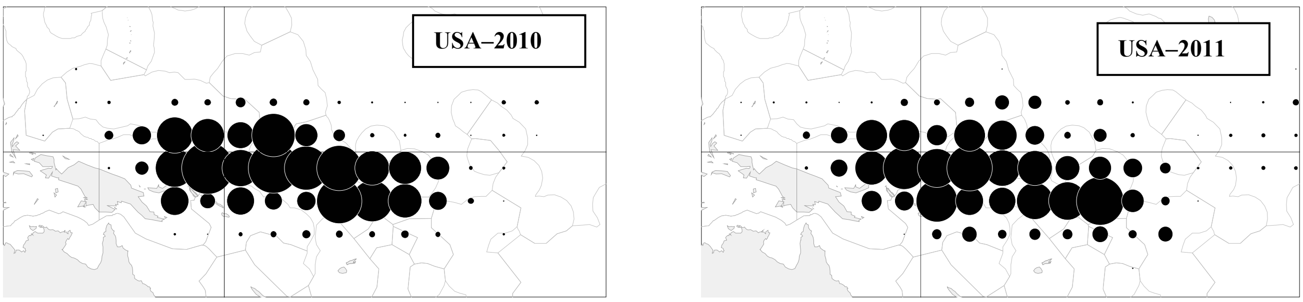

Figure 14. Distribution of effort by the US purse seine fleet during 2010 and 2011
lines for the equator (0° latitude) and 160°E longitude included.

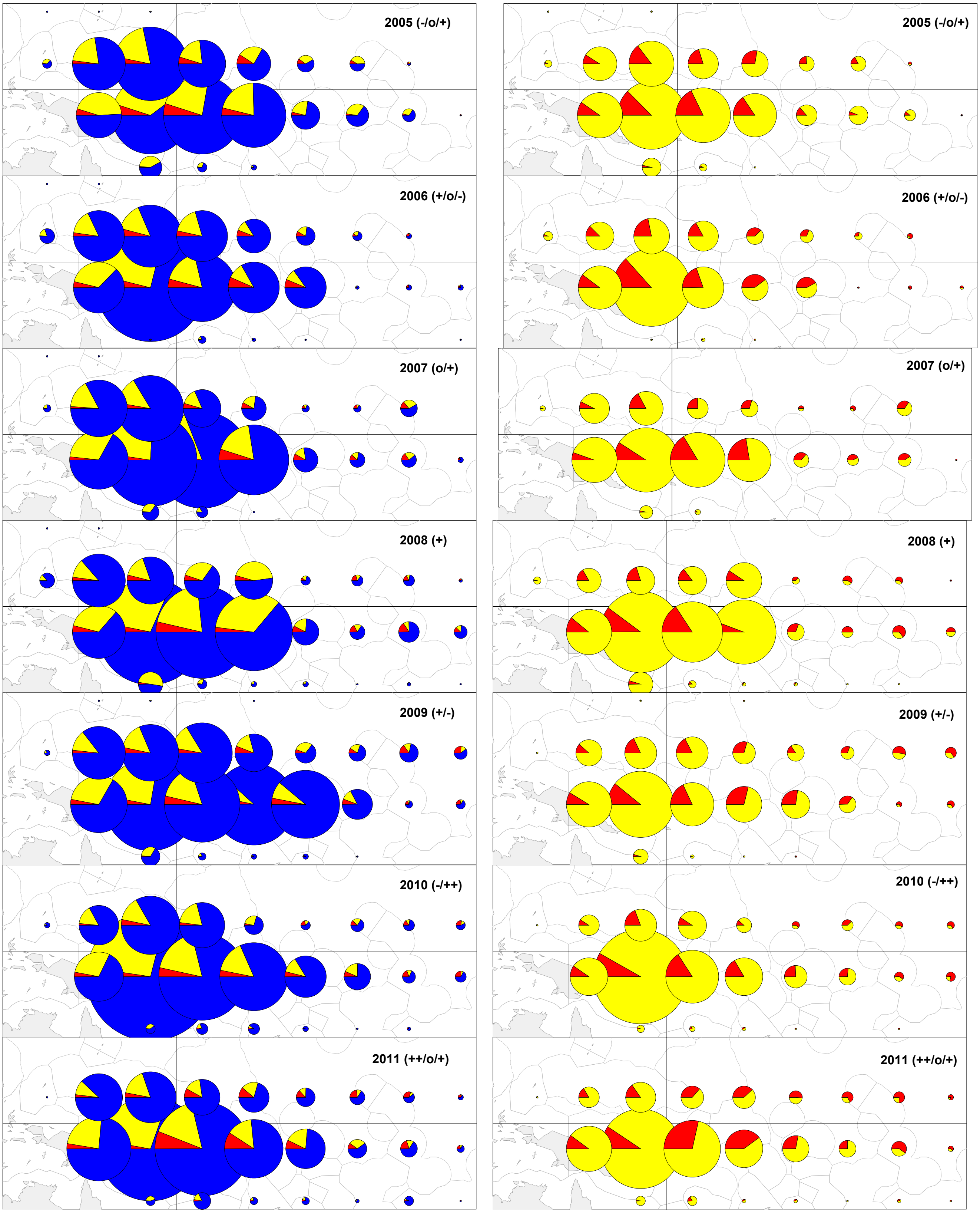

Figure 15. Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch (left) and purse-seine yellowfin/bigeye tuna catch only (right), 2005–2011 (Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).

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

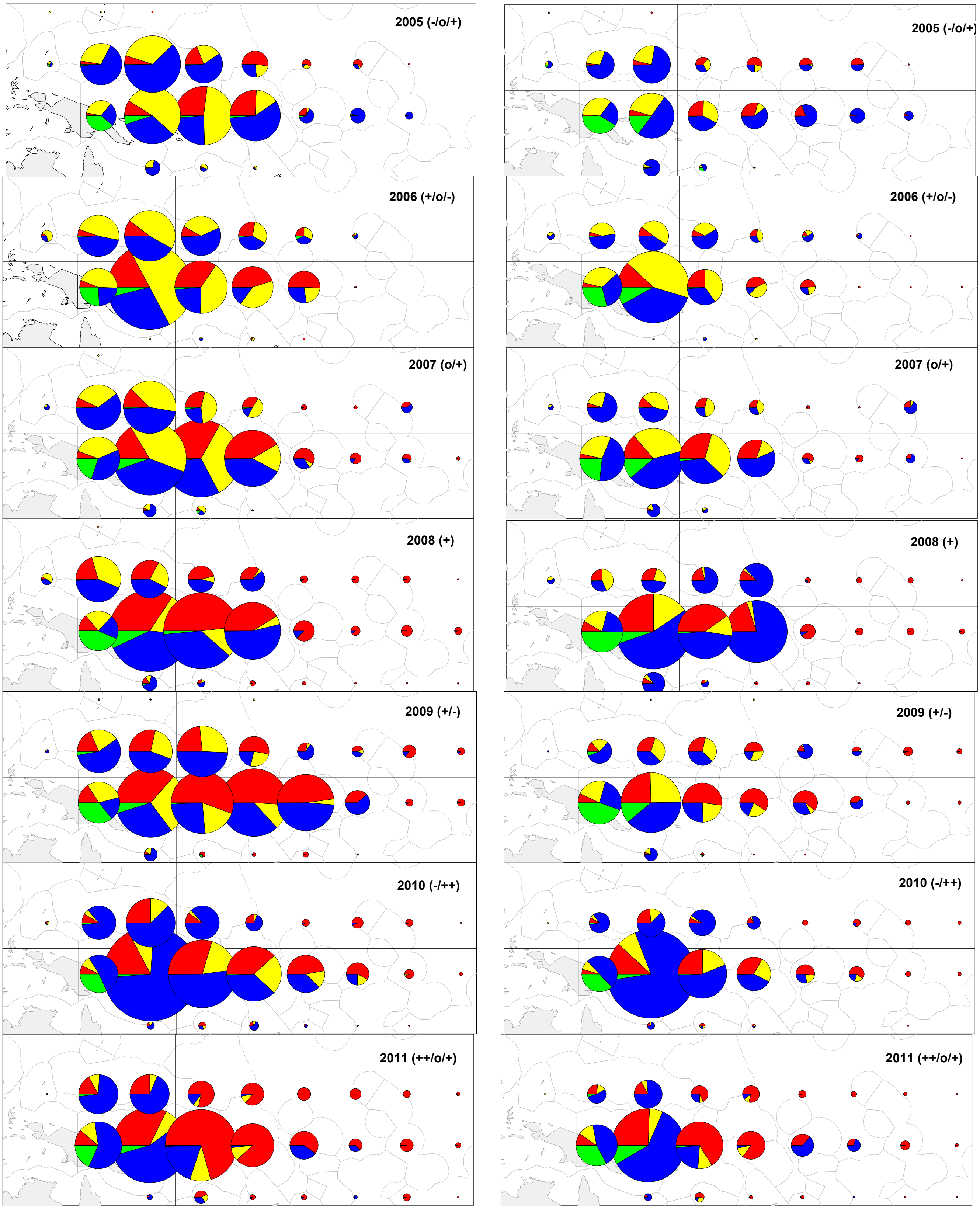

Figure 16. Distribution of skipjack (left) and yellowfin (right) tuna catch by set type, 2005–2011 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

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

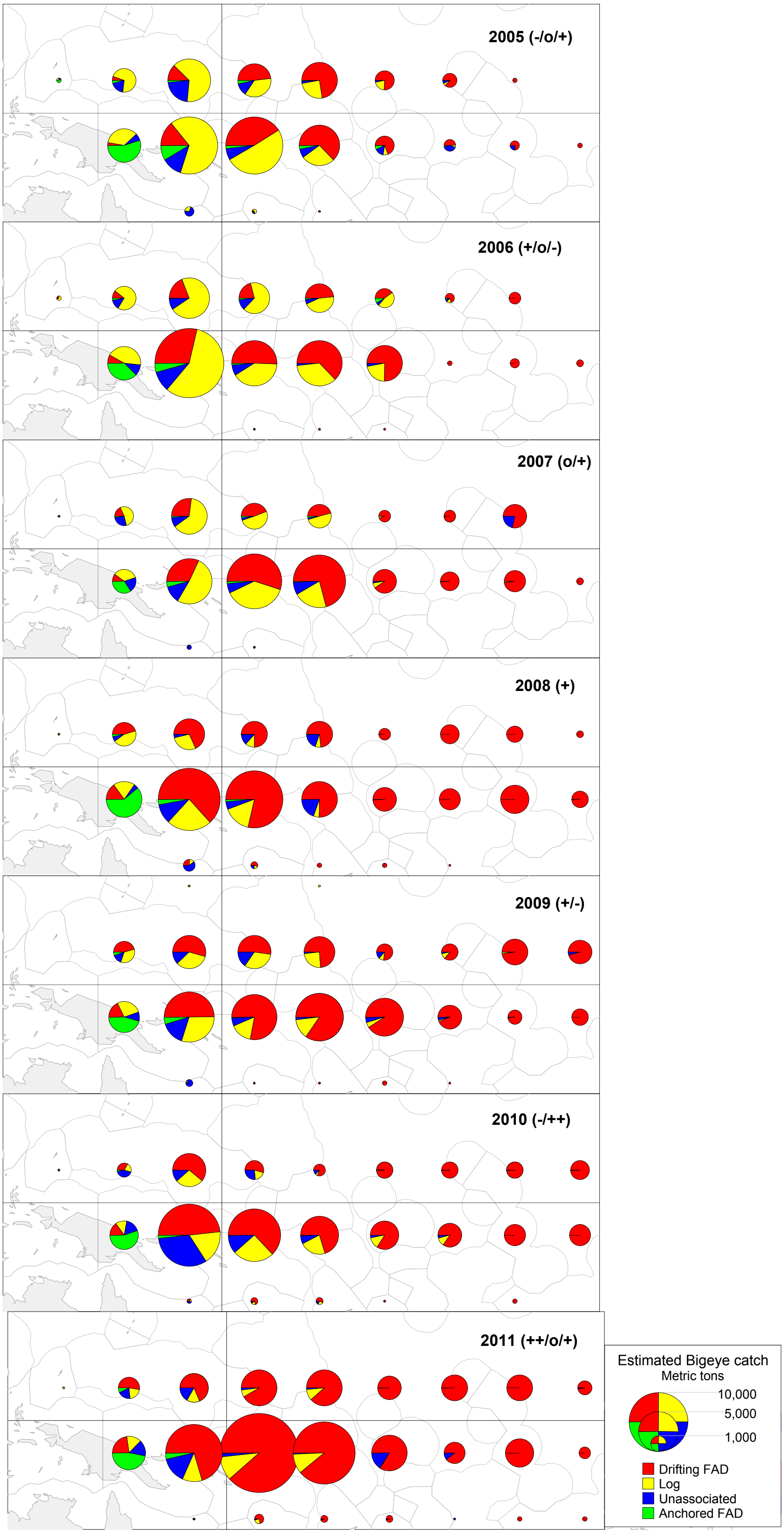

Figure 17. Distribution of estimated bigeye tuna catch by set type, 2005–2011 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).
ENSO periods are denoted by "+": La Niña; "-": El Niño; "o": transitional period.

3.5 Catch per unit of effort

Figure 18 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 and yellowfin CPUE for all set types decreased in 2011, particularly for free-school and drifting FAD sets, with very low CPUE for some fleets (e.g. Chinese Taipei free-school skipjack CPUE). Over the entire time series, the trend for skipjack CPUE has been generally upwards, but we have now seen two years (2010 and 2011) of a clear downward trend, perhaps returning to an equilibrium level after an exceptional year in 2009. The long-term time series is different for yellowfin CPUE with more inter-annual variability and overall, a flatter trend in CPUE than skipjack tuna. It is unknown whether these trends reflect an increasing ability to target skipjack tuna at the expense of yellowfin or reflect a change in yellowfin abundance, given that fishing power has increased.

As noted, yellowfin purse-seine CPUE shows strong inter-annual variability and there are more differences in CPUE 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.

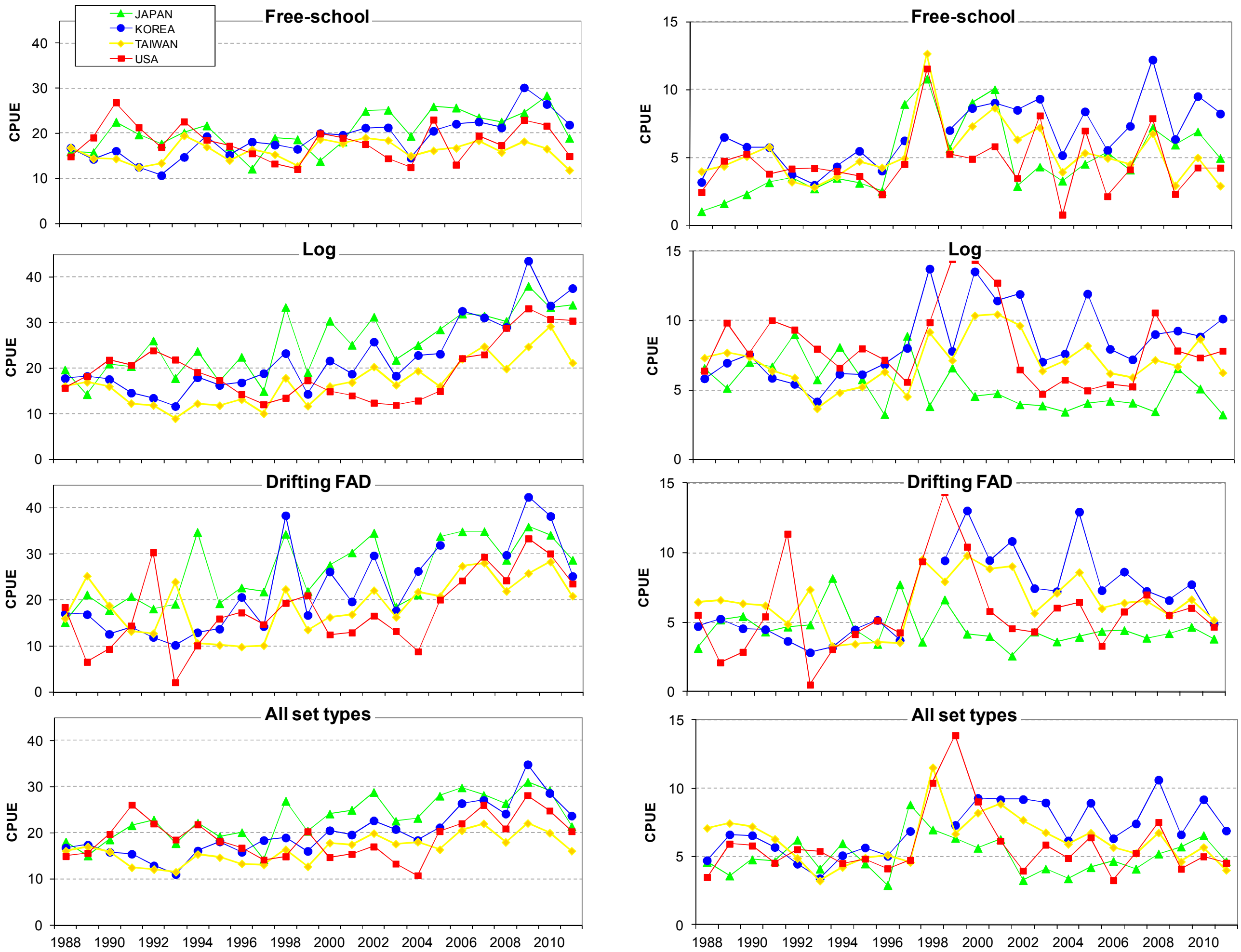

Figure 18. Skipjack tuna CPUE (mt per day–left) and yellowfin tuna CPUE (mt per day–right) by set-type, and all set types combined, for selected purse-seine fleets fishing in the tropical WCP–CA.
Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.

Associated (log and drifting FAD) sets generally yield higher catch rates (mt/day) for skipjack than unassociated sets, while unassociated sets sometimes yield a higher catch rate for yellowfin than associated sets. The higher yellowfin CPUE from free-schools occurs when "pure" schools of large, adult yellowfin are more available to the gear in the more eastern areas of the tropical WCP-CA, and so account for a larger catch (by weight) than the (mostly) juvenile yellowfin encountered in associated sets.

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 19). The trends in estimated bigeye tuna CPUE since 2000 sometimes varies by fleet and set type with no clear pattern evident. The 2011 bigeye CPUE for all set types was higher than in recent years (2008-2010) and similar to the level for years 2004-2007 for most fleets.

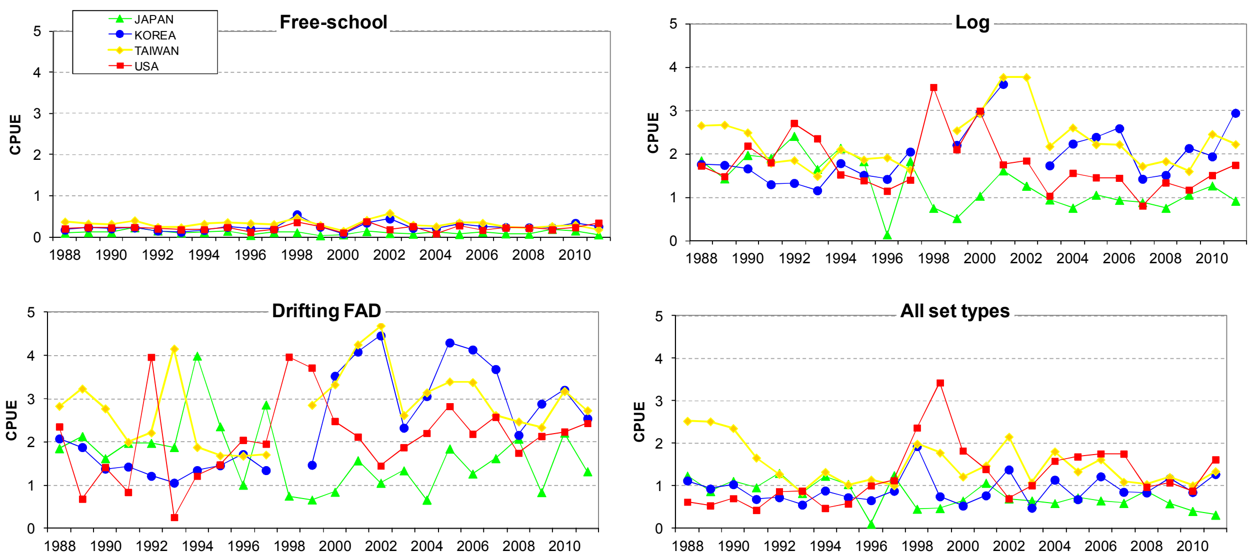

Figure 19. Estimated bigeye tuna CPUE (mt per day) by major set-type categories (free-school, log and drifting FAD sets) and all set types combined for Japanese, Korean, Chinese-Taipei and US purse seiners fishing in the tropical WCP–CA.

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

3.6 Seasonality

Figure 20 shows the seasonal average CPUE for skipjack (left) and yellowfin (right) in the purse seine fishery for the period 2000–2011, and Figure 21 shows the distribution of effort by quarter for the period 2000-2010 in comparison to effort by quarter in 2011. Over the period 2000–2010, the average monthly skipjack CPUE was generally highest in the first half of the year and slightly lower thereafter, which is in contrast to the yellowfin CPUE for 2000-2010, which was at its lowest during the first six months, but higher thereafter. This situation corresponds to the seasonal 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 2011 was slightly higher than average catch rates of skipjack for the past decade (Figure 20–left), but for the remainder of the year dropped significantly to be amongst the lowest monthly CPUE levels over the past decade. In contrast, yellowfin catch rates were very poor for most of 2011, only recovering in the last two months of the year (Figure 20 – right). The skipjack CPUE declined sharply during the 2011 FAD closure period (July) which was also the time that ENSO conditions moved from the strong La Nina to a neutral state (Figure 8); interestingly, the skipjack CPUE was still much lower than the long-term average during remaining (post-closure) months of 2011. Yellowfin CPUE did not appear to be as affected by the FAD closure period in 2011, although the CPUE level had already been poor for the months leading up to that point.

The strong La Nina state in the first half of 2011 is consistent with the restriction of the warm pool from extending eastwards compared to the long-term average (Figure 21), but with good catches experienced at the eastern boundaries of the warm pool during this period. The relatively low catches in the 3rd quarter 2011 coincided with the FAD closure and low yields from unassociated schools (Figure 20); note the lack of bigeye tuna in the catch during the 3rd quarter 2011 compared to the first half of the year which is consistent with the lack of associated sets during the FAD closure period. Based on the distribution of catch, conditions in the fishery appear to have moved towards the long-term average by the 4th quarter 2011 (Figure 21–bottom right).

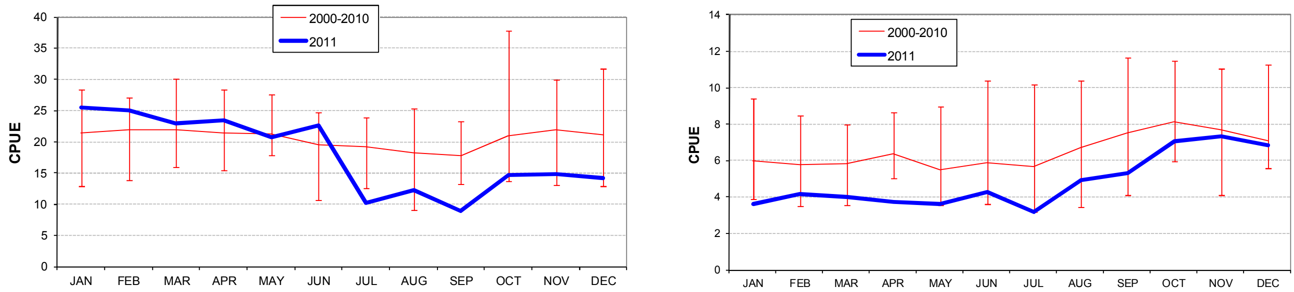

Figure 20. **Average monthly skipjack (left) and yellowfin (right) tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2000–2011.**

Red line represents the period 2000–2010 and the blue line represents 2011.

The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2000–2010.

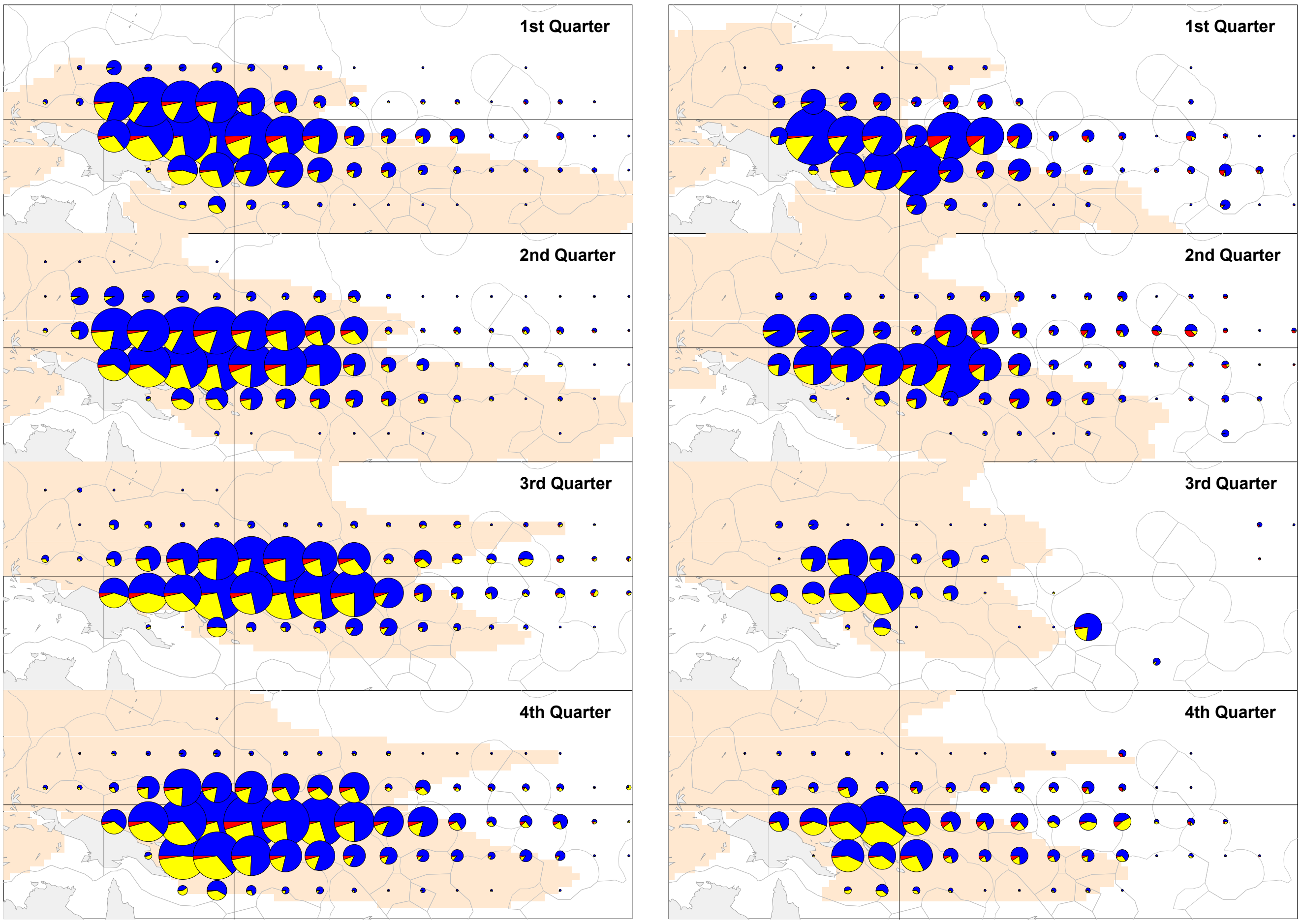

Figure 21. **Quarterly distribution of purse-seine catch by species for 2000–2010 (left) and 2011 (right).**

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

Pink shading represents the extent of average sea surface temperature > 28.5°C by quarter for the period 2000–2010 (left) and 2011 (right)

3.7 Economic overview of the purse seine fishery

3.7.1 Price trends – Skipjack

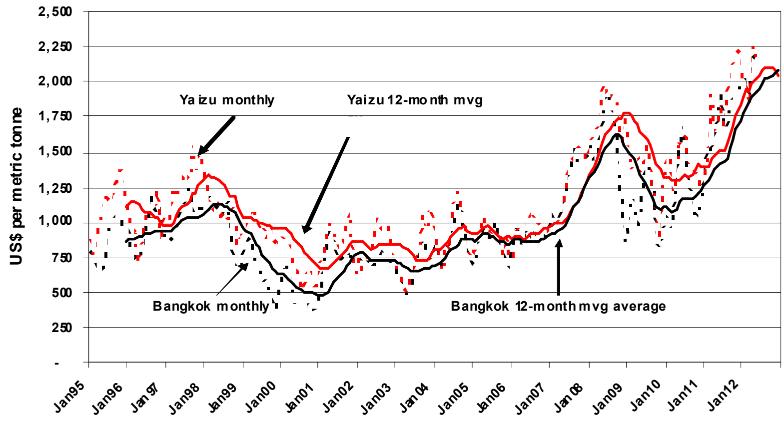

Figure 22. Skipjack prices, Bangkok (4-7.5lbs, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

Prices in the major markets for WCPO skipjack catches, as in other main markets, rose steeply in 2011 with renewed pressure on supply, as of late 2010, by the repeat of the spikes in oil / food prices and the overall poor fishing associated with La Nina conditions, along with uncertainty about raw material supplies from the July/September FAD closure. Bangkok benchmark skipjack prices (4-7.5lbs) over the first six months of 2011 rose to a peak of $1,900/Mt in June, lowered to US$1,667/Mt by August but on an uptrend again to a peak of US$1,975 by year end. Over the year as a whole, the Bangkok benchmark averaged US$1,726/Mt, a substantial 42 per cent over the previous year and also exceeded the previous annual peak of US$1,543 in 2008.

The Yaizu average price trend followed closely the Bangkok benchmark in both the Yen and US Dollar terms but with greater margin of changes in US Dollar terms because of the depreciation against the Japanese Yen. The Yaizu average price for skipjack in 2011 was ¥143 (US$1,785/Mt), up 15 per cent from ¥124/Kg (US$1,407) in 2010.[6] Yaizu prices over the first six months peaked at ¥156/Kg (US$1,907/Mt) in March but retreated over the next few months and not until September did the March peak exceeded again and by December reached ¥173/Kg (US$2,219/Mt) (Figure 22, monthly figures).

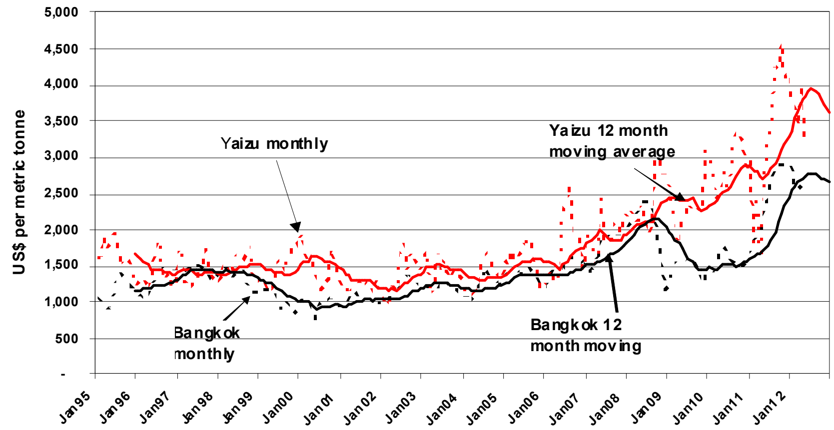

Figure 23. Yellowfin prices, Bangkok (20lbs and up, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

3.7.2 Price trends – Yellowfin

The price trends for purse seine caught yellowfin in 2011, as for skipjack, were up strongly with Bangkok prices at around US$2,435 or 57 per cent higher than in 2010 while the Yaizu prices averaged ¥306/Kg (US$3,825/Mt) or 21 per cent (34 per cent in US Dollar terms). [7] An important aspect of the Yaizu prices for yellowfin is that part of the unloading is destined for lower end sashimi use at supermarkets and hence the relatively large margin between the prices (in US Dollar terms) in this market and those of Bangkok.

During the course of 2011, Bangkok yellowfin prices (20lbs +, c&f) rose from a low at the end of 2010 at $1,550/Mt to a high of $2,900/Mt in the last quarter of 2011, averaging US$2,434/Mt over the year. Yellowfin prices remained broadly flat during the latter half of the year averaging US$2,854/Mt that was 42 per cent higher

[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 2010 and 2011 the Japanese Yen appreciated by around 9% against the US$.

than the first half average of US$2,016/Mt. During the first half of 2012, Bangkok yellowfin purse seine prices had averaged US$2,652/Mt, lower than the latter half of 2011 by 7 per cent but still significantly higher (32%) than the first half of 2011.

3.7.3 Value of the Purse-seine Catch

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 2011 were obtained (Figures 24-26). 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 2011 is US$3,092 million that increases from last year's level of US$2,513 million. This represents an increase of US$579 million or 23 per cent on the estimated delivered value of the catch in 2010. This increase was driven by a US$132 million (22 per cent) increase in delivered value of the yellowfin catch (which is estimated to be worth US$743 million in 2011 resulting from a 39 per cent increase in the composite price that more than offset the decline of 12 per cent increase in catch) and a US$457 million (25 per cent) increase in the value of the purse seine skipjack (with estimated worth of US$2,290 million resulting from a 34 per cent increase in composite price as against a drop in catch of 7 per cent).[9]

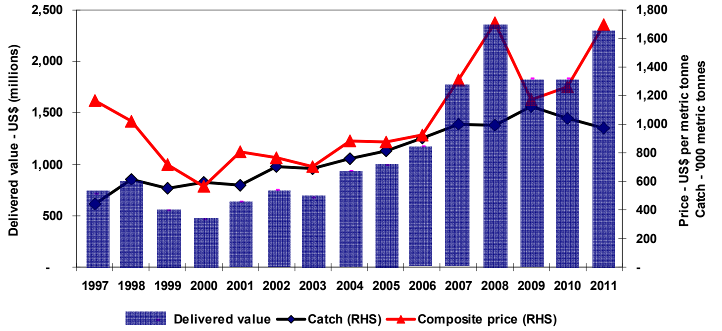

Figure 24. Skipjack in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

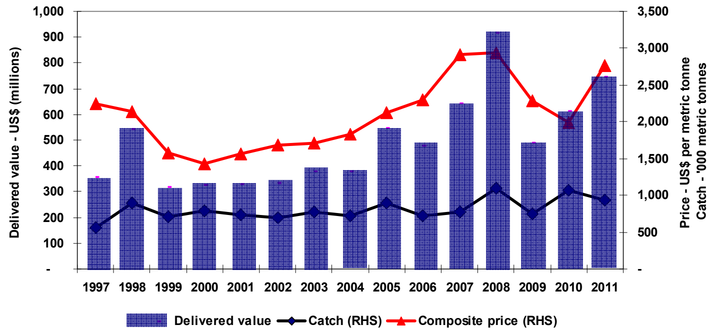

Figure 25. Yellowfin in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

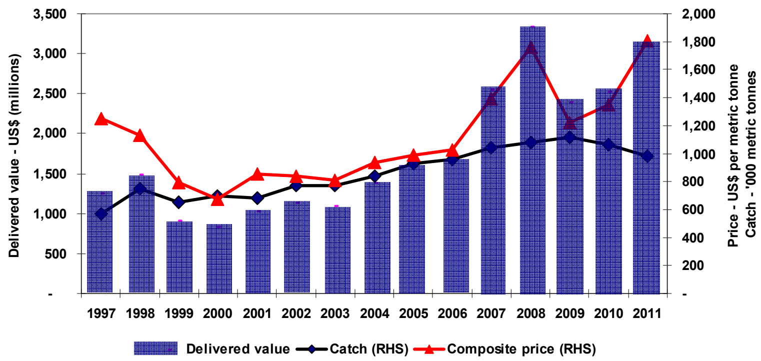

Figure 26. All tuna in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

[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 skipjack) 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 27) and in the annual pole-and-line catch during the past 15–20 years (Figure 28). 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 and increased interest in pole-and-line fish associated with certification/ecolabelling

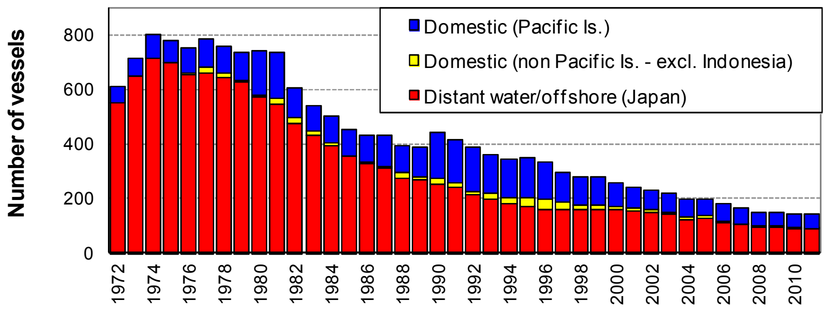

Figure 27. Pole-and-line vessels operating in the WCP–CA
(excludes pole-and-line vessels from the Japanese Coastal and Indonesian domestic fisheries)

4.2 Provisional catch estimates (2011)

The 2011 pole-and-line catch (164,416 mt) was the lowest annual catch since the mid-1960s and continuing the trend in declining catches for three decades.

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 fleets (92,975 mt in 2011), and

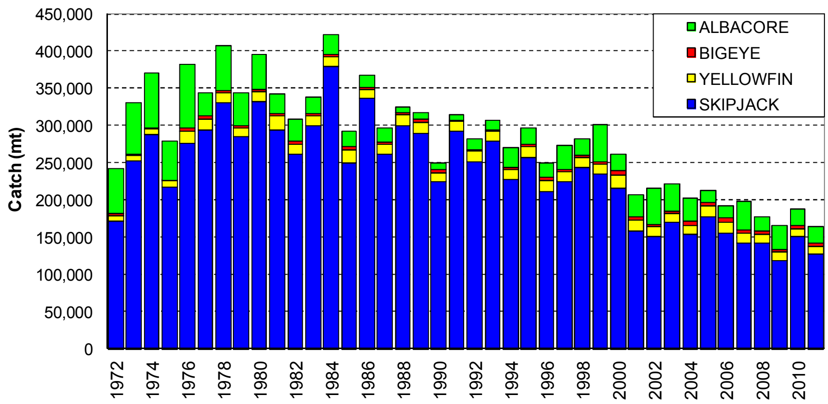

Figure 28. Pole-and-line catch in the WCP–CA

the Indonesian fleets[10] (60,415 mt in 2007), account for most of the WCP–CA pole-and-line catch. The catches by the Japanese distant-water and offshore 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 2011 reduced to only 90 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 resumed fishing in 2011.

Figure 29 shows the average distribution of pole-and-line effort for the period 1995–2011. 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.

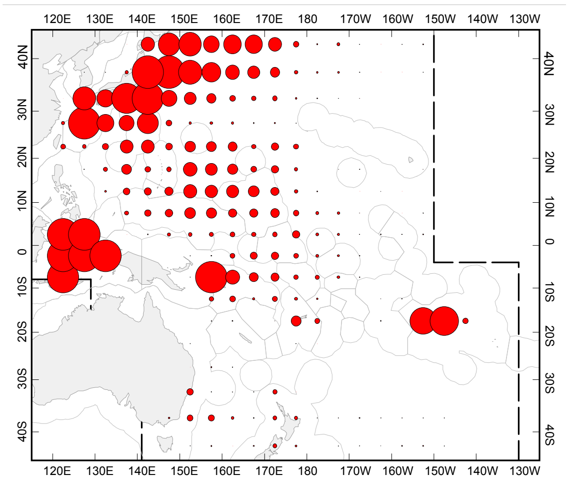

Figure 29. Average distribution of WCP–CA pole-and-line effort (1995–2011).

[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.

4.3 Economic overview of the pole-and-line fishery

4.3.1 Market conditions

During 2011 the Yaizu price of pole and line caught skipjack in waters off Japan averaged ¥195/kg (US$2,446/Mt), a decrease of 8% compared to 2010. The Yaizu price of pole and line caught skipjack in waters south of Japan also decreased but by a lesser margin of just more than 1% to ¥185 ($2,321) from ¥187/kg (US$2,128/Mt) during 2010. Overall, the pole and line price at Yaizu in 2011 averaged ¥189 (US$2,363) as against an average of ¥197 (US$2,239) in 2010, a decline of 4% in Japanese Yen terms (but an improvement of 6% in US dollar terms to reflect the appreciation of around 10% of the Yen against the Dollar between 2011 and 2010).

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 1997-2011, 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 30 and 31. The estimated delivered value of the total catch in the WCPFC pole and line fishery for 2011 is US$372 million.[11] This is almost the same level as in 2010 caused by almost equally offsetting movements in catch (down 12%) and overall price (up 13%).

The estimated delivered value of the skipjack catch in the WCPFC pole and line fishery for 2011 is US$267 million. This represents a 7% ($19 million) decrease as compared to the estimated value of the catch in 2010 and results from a 15% decrease (23,000 Mt) in catch that more than offset the 10% decrease in price.

The estimated delivered value of the albacore catch is $66 million, an $8 million (14%) increase on the previous year, purely from the increase in pole and line albacore price as the estimated catch remained unchanged from the previous year.

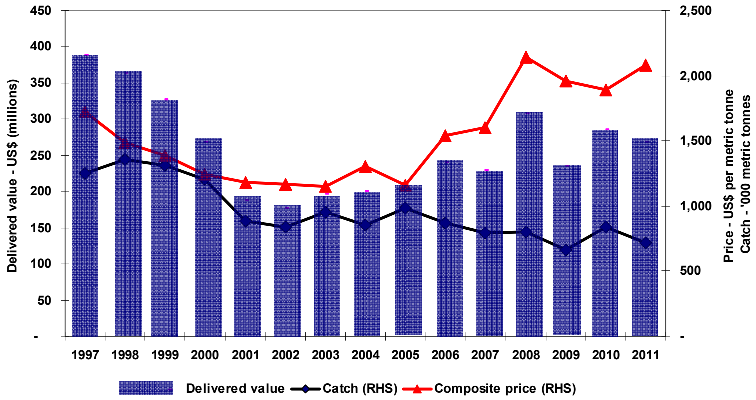

Figure 30. Skipjack in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

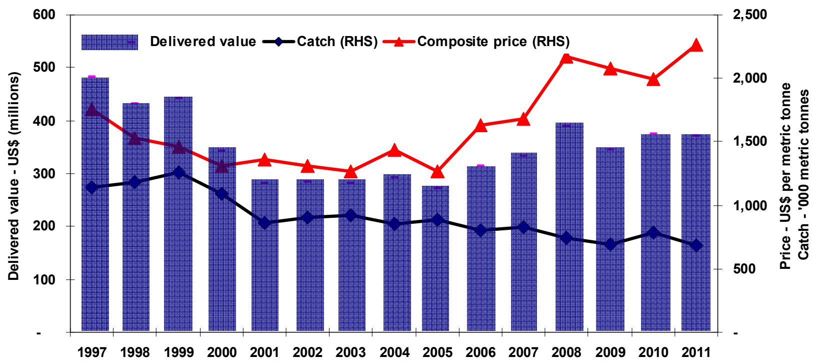

Figure 31. All tuna in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

[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, 2012), 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. The total number of vessels involved in the fishery has generally fluctuated between 3,500 and 6,000 for the last 30 years (Figure 32), 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.

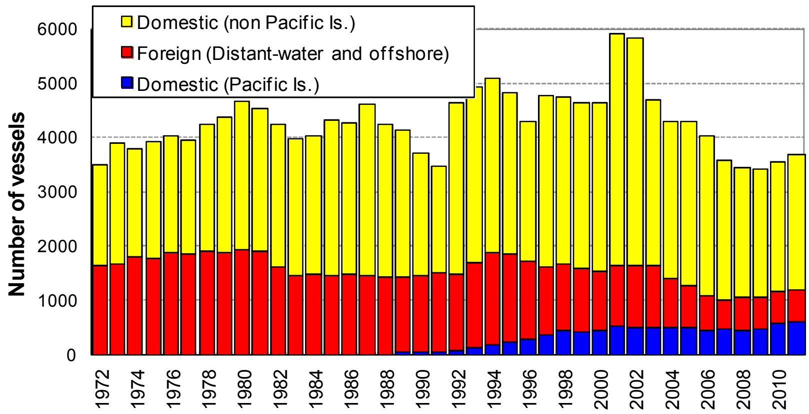

Figure 32. Longline vessels operating in the WCP–CA
(Available data does not make the distinction between foreign "distant-water" and "offshore")

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. Two new entrants, Tuvalu and Wallis& Futuna, joined this category during 2011.
- **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 32). The commercial handline fleets target large yellowfin tuna which comprise the majority of their 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 33). 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–38%; BET–27%;YFT–34% in 2011) differs 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).

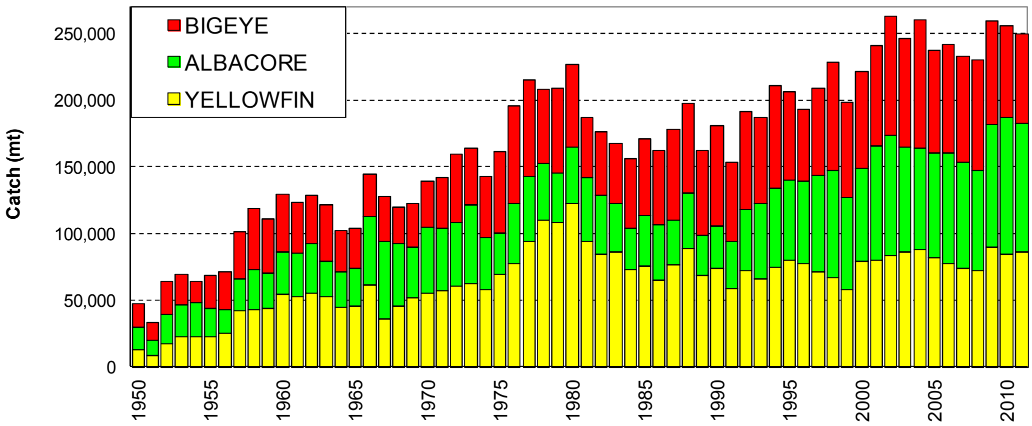

Figure 33. Longline catch (mt) of target tunas in the WCP–CA

5.2 Provisional catch estimates and fleet sizes (2011)

The provisional WCP–CA longline catch (251,298 mt) for 2011 was the fifth highest on record, at around 15,000 mt lower than the highest on record attained in 2002 (266,963 mt). The WCP–CA albacore longline catch (96,219 mt – 38%) for 2011 was the second highest on record, 6,000 mt lower than the record (102,763 mt in 2010). In contrast, the provisional bigeye catch (67,599 mt – 27%) for 2011 was the lowest since 1997, but may be revised upwards when final estimates are provided. The yellowfin catch for 2011 (86,187 mt – 34%) was stable but 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) mainly active in the Pacific Islands domestic albacore fishery have numbered more than 500 (mainly small "offshore") vessels in recent years and are now on par with the number of distant-water longline vessels active in the WCP–CA.

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 recent years. The Japanese distant-water and offshore longline fleets have experienced a substantial decline in both bigeye catches (from 20,725 mt in 2004 to 7,185 mt in 2011) and vessel numbers (366 in 2004 to 152 in 2011). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 6,579 mt (in 2011), mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 75 vessels in 2009, but back up to 95 vessels in 2011). 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 124 vessels in 2011.

With domestic fleet sizes continuing to increase as foreign-offshore and distant-water fleets decrease (Figure 32), 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–SC8 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, SC8 Working Paper **SA IP–3** (Bigelow & Hoyle 2012) looks at the standardisation of CPUE for longline fleets targeting south Pacific albacore.

5.4 Geographic distribution

Figure 34 shows the distribution of effort by category of fleet for the period 2000–2011.

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.

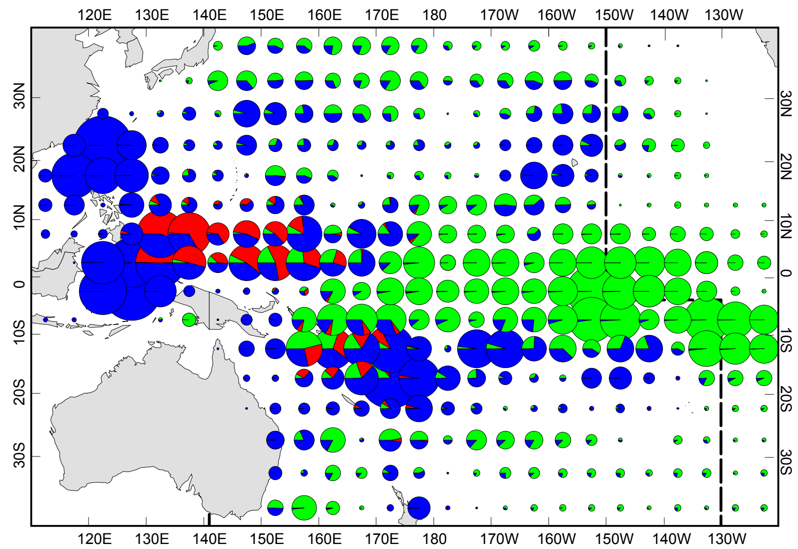

Figure 34. Distribution of longline effort for distant-water fleets (green), foreign-offshore fleets (red) and domestic fleets (blue) for the period 2000–2011.

(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 is poorly covered)

Activity by the **foreign-offshore fleets** from Japan, mainland China and Chinese-Taipei is 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 35).

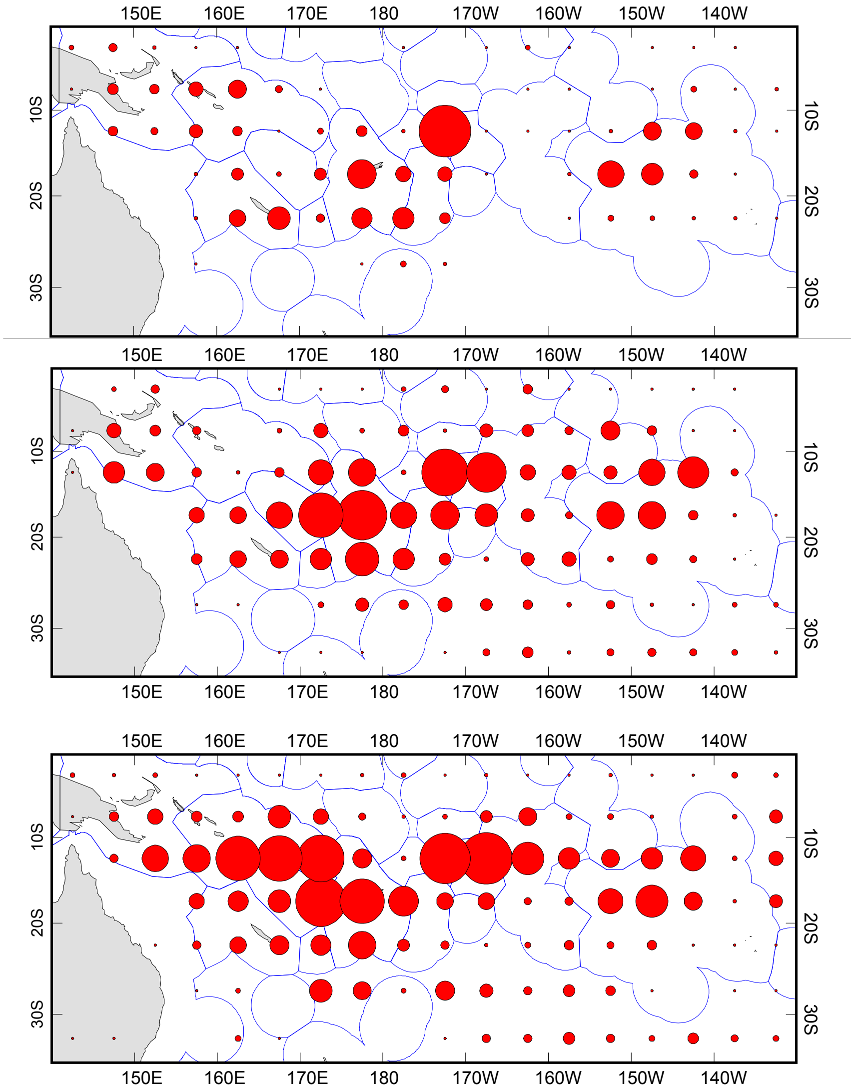

Figure 35. Distribution of south Pacific-island fleet longline effort for 1999 (top), 2003 (middle) and 2011 (bottom).

Figure 36 shows quarterly species composition by area for the period 2000–2009 and 2010 (2011 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 0°–20°S. The decline in bigeye catches over recent years is evident when comparing the 2000-2009 quarterly averages (Figure 36–left) with the 2010 catches (Figure 36–right).

Note the lack of longline catch in the tropical eastern WCP-CA, the latitude band 0°–10°N, during the 3rd and 4th quarters of 2010 (Figure 36–right, bottom two maps), which was a period of strong La Nina conditions where the tongue of cooler surface water from the EPO was more prevalent in this area.

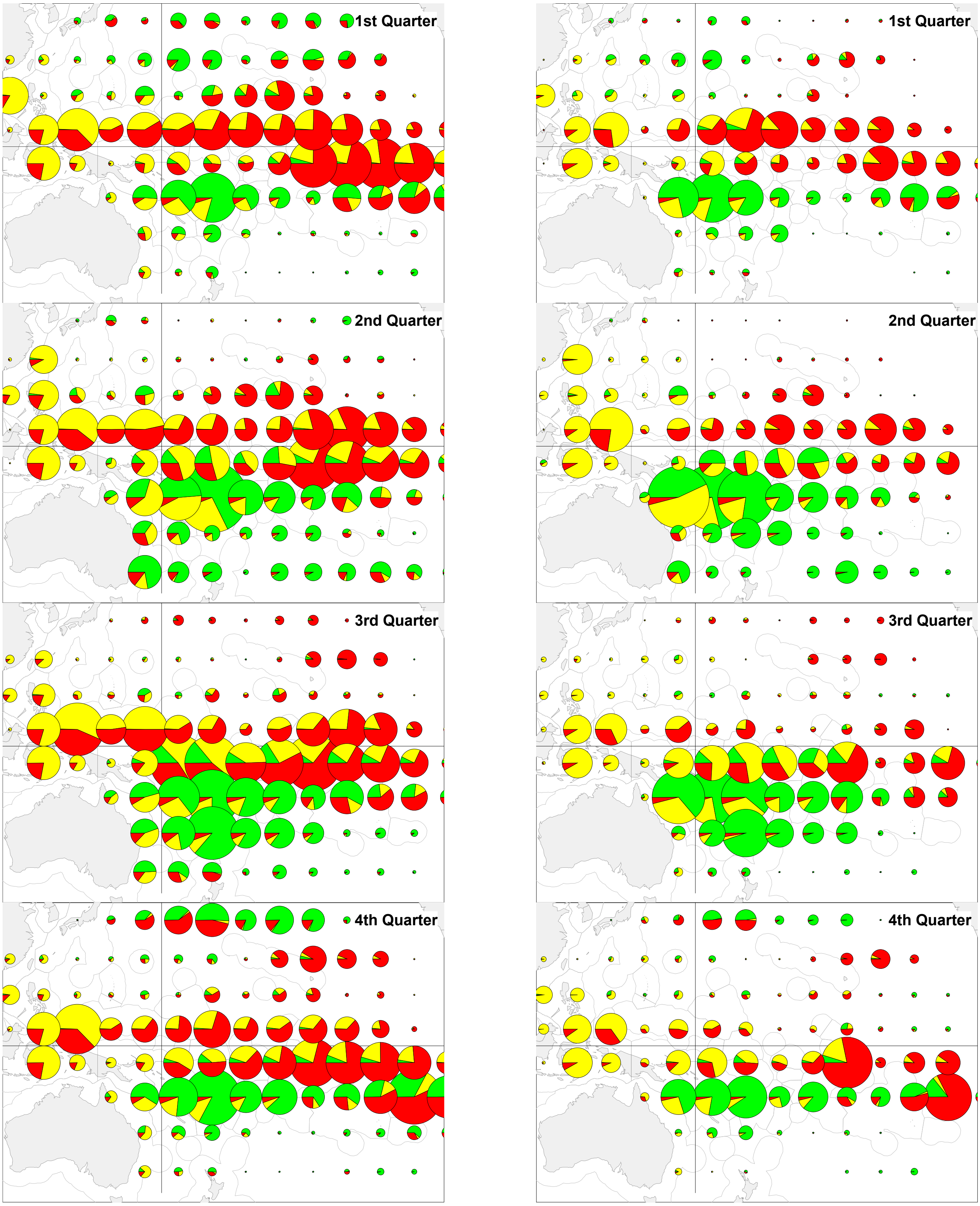

Figure 36. Quarterly distribution of longline tuna catch by species, 2000-2009 (left) and 2010 (right)
(Yellow–yellowfin; Red–bigeye; Green–albacore)
(Note that the domestic fleet effort excludes the Japanese coastal fishery and the Vietnam fishery; catches from some distant-water fleets targeting albacore in the North Pacific may not be fully covered)

5.5 Economic overview of the longline fishery

5.5.1 Price trends – Yellowfin

Japan imports[12] of fresh yellowfin have steadily declined over the years, reflective of the changing consumption pattern with the younger generation and also the tight supply conditions. In 2001 Japan imports of fresh yellowfin totaled almost 37,000Mt however after steady declines over the years, total imports in 2011 only came to 13,700Mt, the lowest on record. It is noted however that imports of other sashimi product forms – loins and fillets - have risen in recent years. Japan fresh yellowfin imports sourced from Oceania increased by 20 per cent to 3,135Mt in 2011 but the overall trend over the years has also been on a steady decline with imports in 2011 being lower by 64 per cent compared to the high of 8,800Mt in 2001.

In 2011 longline caught yellowfin prices (ex-vessel) landed at Yaizu port improved by 6 per cent (17 per cent in US$ terms) to ¥672/kg ($8.43/Kg). Japan fresh yellowfin import price (c.i.f.) from Oceania slightly fell by 6 per cent (rose 9 per cent in US$ terms) to ¥889/kg ($11.15/Kg) while the price from all sources improved by 5 per cent (16 per cent in US Dollar terms).

In the US market, fresh yellowfin import volumes decreased by 2 per cent to 15,635Mt but increased in value terms by 10 per cent to US$140 million. In 2010 sashimi grade fresh yellowfin imports rose by 13 per cent to 15,984Mt however in the preceding two years, against the backdrop of adverse economic conditions, fresh yellowfin imports had successively declined by more than 10 per cent. The decline in the volume of fresh yellowfin imports in 2011 reflected the higher prices for the product that averaged US$9.07/Kg (fas) as against US$8.05 in 2010, a rise of 13 per cent.

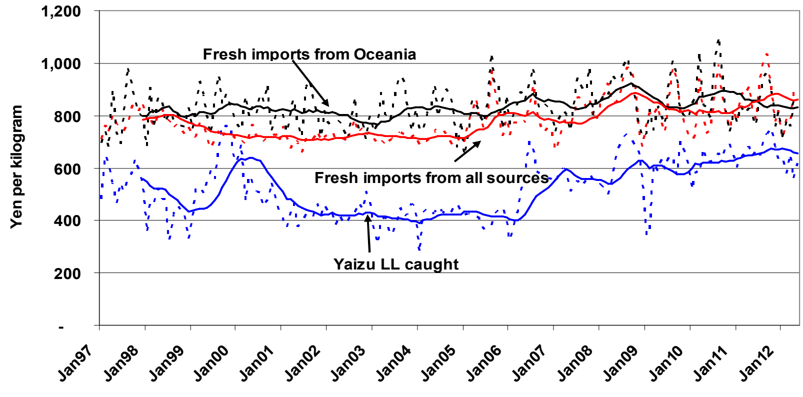

Figure 37. Yellowfin prices on Japanese markets; fresh imports (c.i.f.), fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

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

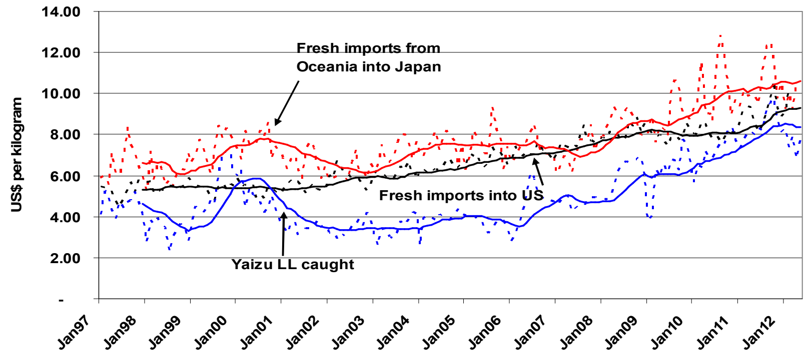

Figure 38. Yellowfin prices in US$: US fresh imports, Japanese fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

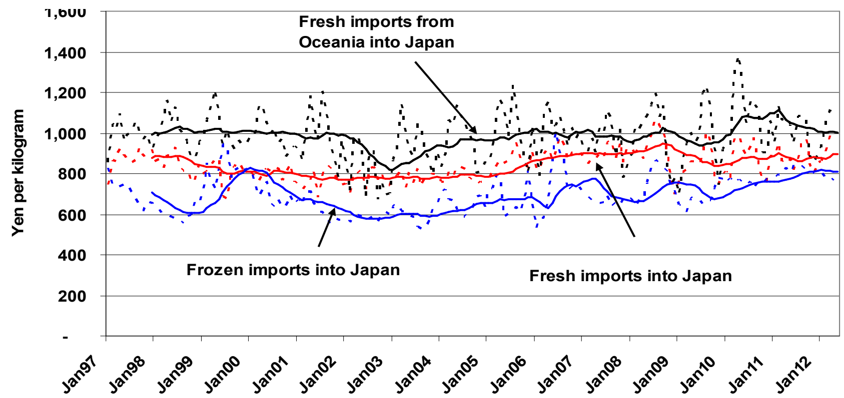

Figure 39. Bigeye prices on Japanese markets; fresh imports (c.i.f.), fresh imports from Oceania (c.i.f.) and frozen imports (ex-vessel)

[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)".

5.5.2 Price trends – Bigeye

Frozen bigeye prices (ex-vessel) at Japan major ports rose 5 per cent in 2011 to ¥1,017/kg while fresh bigeye prices (ex-vessel) remained broadly the same at ¥1,241/kg. Japan fresh bigeye import prices (c.i.f.) from all sources declined marginally by less than 1 per cent to ¥875/Kg while frozen bigeye import prices (c.i.f.) rose 7 per cent to ¥814/kg. In US$ terms, however, Japan fresh bigeye import prices from all sources were up 9 per cent to US$10.98/kg while frozen bigeye import prices rose 18 per cent to US$10.21/kg.

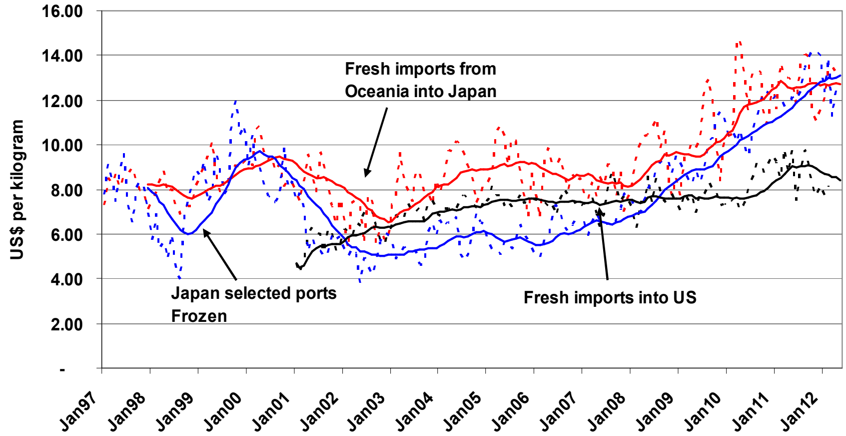

Figure 40. Bigeye prices in US$: US fresh imports, Japanese fresh imports from Oceania (c.i.f.) and Japanese frozen imports from Oceania (c.i.f.)

Import volumes of fresh bigeye rose only moderately by 4 per cent in 2011 to 12,159Mt of which 2,450Mt was sourced from the Oceania region. Fresh imports in total, as in the case for yellowfin, have reduced substantially over the years such that the import total in 2011 has reduced by 45 per cent since 2002 when a total of more than 22,000Mt was recorded. Although fresh imports from Oceania bounced by 41 per cent to 2,450 in the year that reverses the substantial reduction by 48 per cent in the previous year, the long-term trend has seen the 2011 imports from this source reduced by 66 per cent from the 7,188Mt in 2002. Average prices for fresh bigeye from Oceania declined by 9 per cent to ¥1,015/kg (US$12.74/kg), offsetting the gain of 15 per cent in the previous year.

US fresh bigeye import volumes declined by a further 25 per cent in 2011 to 3,010Mt that follows from a similar margin of decline in 2010. As in the case of the sashimi grade fresh yellowfin imports, the demand for fresh bigeye was impacted upon by the higher prices that were 10 per cent higher at US$8.87/Kg (f.a.s.) compared to US$8.05/Kg in 2010. The 2011 average price is the highest to date.

5.5.4 Price trends – Albacore

The Bangkok albacore market benchmark price (10kg and up, c&f) averaged US$2,778/Mt in 2011 up 11 per cent from the 2011 average and up only 14 per cent from the 2009 average, indicating improvement over the broadly stable prices in the previous two years and the generally poor landings in 2011. Prices throughout 2011 rose strongly from $2,575 in January to $3,350 in December, a rise of 30 per cent, according to FFA databases. During the first half of 2012, Bangkok albacore prices have continued the uptrend peaking at $3,625/Mt in April but have moderated since and were at around $3,200/Mt in mid-July.

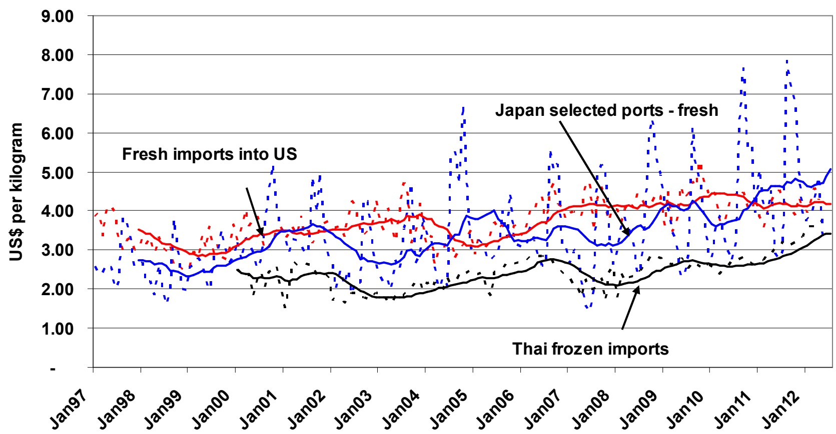

Figure 41. Albacore prices in US$: US fresh imports (f.a.s), fresh landings at selected Japanese ports and Thai frozen imports (c.i.f.)

Thai imports of frozen albacore in 2011 declined 12 per cent to 42,906Mt following a strong respective increases of 24 per cent and 21 per cent in 2010 and 2009. Average prices improved by 14 per cent to US$3,044/Mt (US$3.04/kg) from US$2,675/Mt (US$2.68/kg).

The US import volume of fresh albacore in 2011 totalled 667Mt, a significant 29 per cent increase that reverses a decline in 2010 of the same magnitude. This increase in imports was despite 8 per cent increase in prices of up to US$4.56/kg from US$4.21 in 2010. Prices for fresh landings at Japan major ports declined by 7 per cent to ¥289/Kg (US$3.61/kg) while volumes increased by 13 per cent to 34,178Mt in 2011. In US$ terms, the Japan major port average price of US$3.61/Kg in 2011 was a 2 per cent improvement on the previous year's.

5.5.5 Price trends – Swordfish

The US swordfish market price (fresh and frozen) averaged US$8,340/Mt in 2011 up 9 per cent from 2010. Between 2006 and 2009 prices had been broadly stable. The overall price trend for swordfish in the US market had been on an uptrend since 2000 (Figures 41 and 42). In contrast to the uptrend in prices the volume of imports into the US had been on a gradual decline since 2003 from a peak of 10,404Mt in 2002 to 5,072Mt or a decline of 51 per cent between these years.

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.

The estimated fob value of the longline swordfish catch in the WCP-CA for 2011 is US$164 million. This represents a moderate 3% increase on the estimated value of the catch in 2010 but a 17 per cent decline from the peak of almost US$198 million in 2007. The earlier years between 1999 and 2007 witnessed overall uptrend in catch values driven more by the uptrend in prices as catches appear broadly stable over these years. Estimated values have only been on a slow uptrend in the last three years against mixed performances of catch and prices.

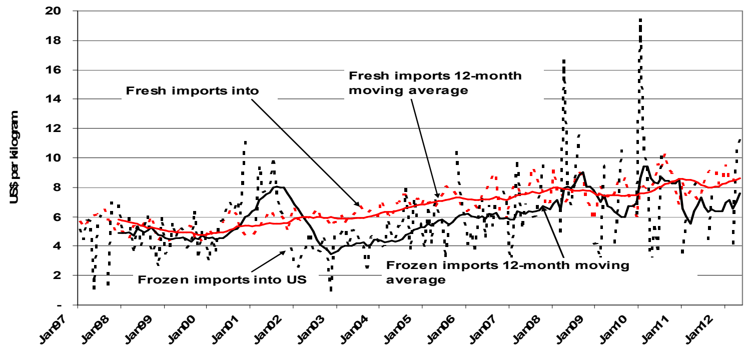

Figure 42. US imports (fas) Swordfish fresh and frozen price trends

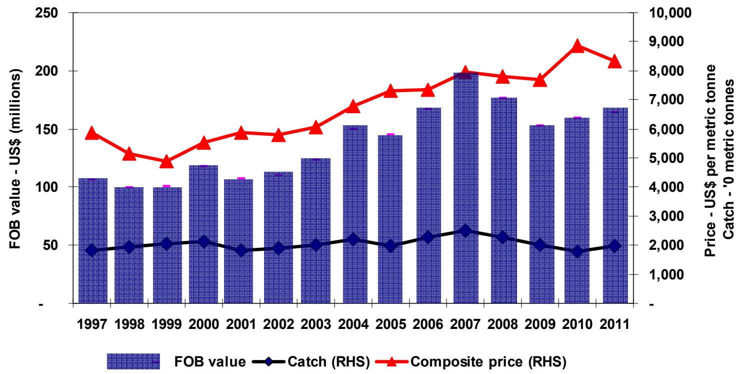

Figure 43. Swordfish in the WCPFC-CA longline fishery – Catch, value and price

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 2011 was obtained (Figures 44–47). 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 2011 is US$1,853 million. This represents an increase of US$145 million on the estimated value of the catch in 2010. The value of the albacore

[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.

catch increased by US$18 million (7 per cent) while the value of the bigeye catch increased by US$37 million (5 per cent) and the value of the yellowfin catch increased by $US90 million (2 per cent).

The albacore catch was estimated to be worth US$293 million in 2011 with the 7 per cent increase resulting from the offsetting 14 per cent increase in the composite price and a 6 per cent decrease in catch. The bigeye catch was estimated to be worth US$775 million in 2011 with the 5 per cent increase accounted for by a 2 per cent drop in catch that was more than offset by the 7 per cent increase in the composite price. The estimated delivered value of the yellowfin catch was US$783 million, an increase of 13 per cent higher than 2010 as a result of increases in both catch and price (2 and 11 per cent respectively).

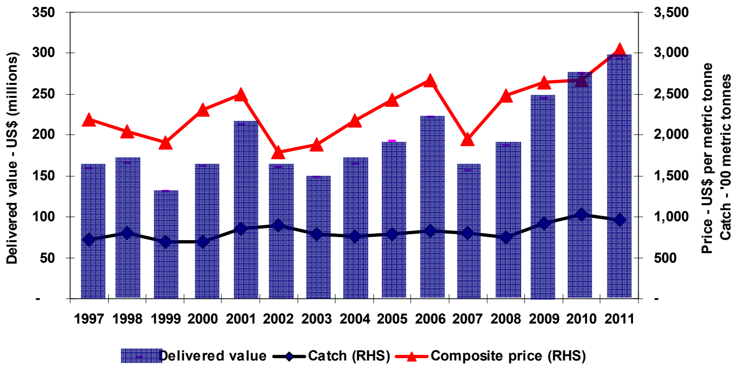

Figure 44. Albacore in the WCPFC longline fishery – Catch, delivered value of catch and composite price

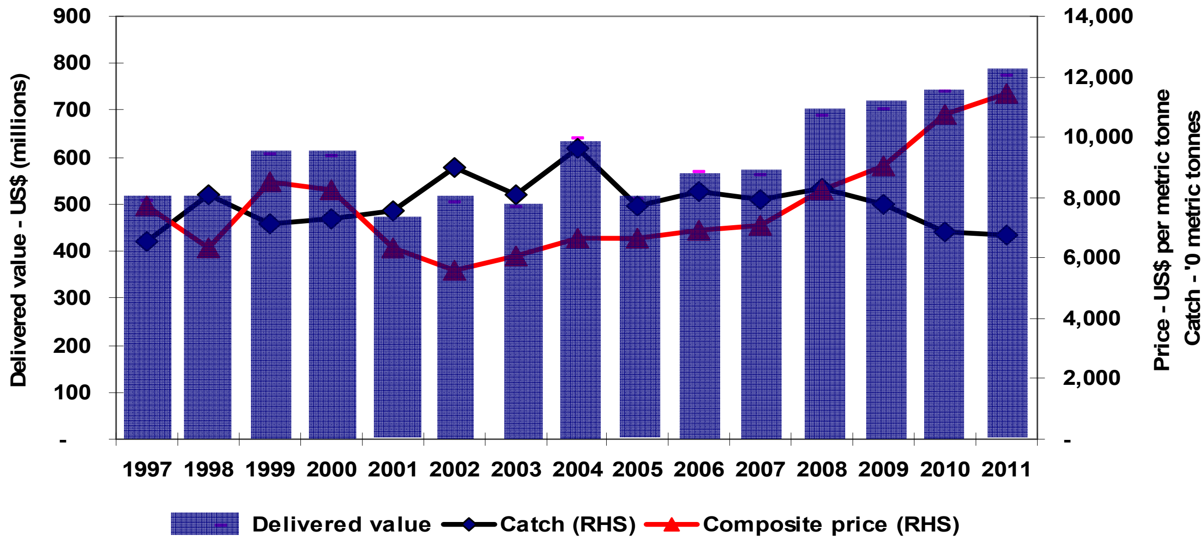

Figure 45. Bigeye in the WCPFC longline fishery – Catch, delivered value of catch and composite price

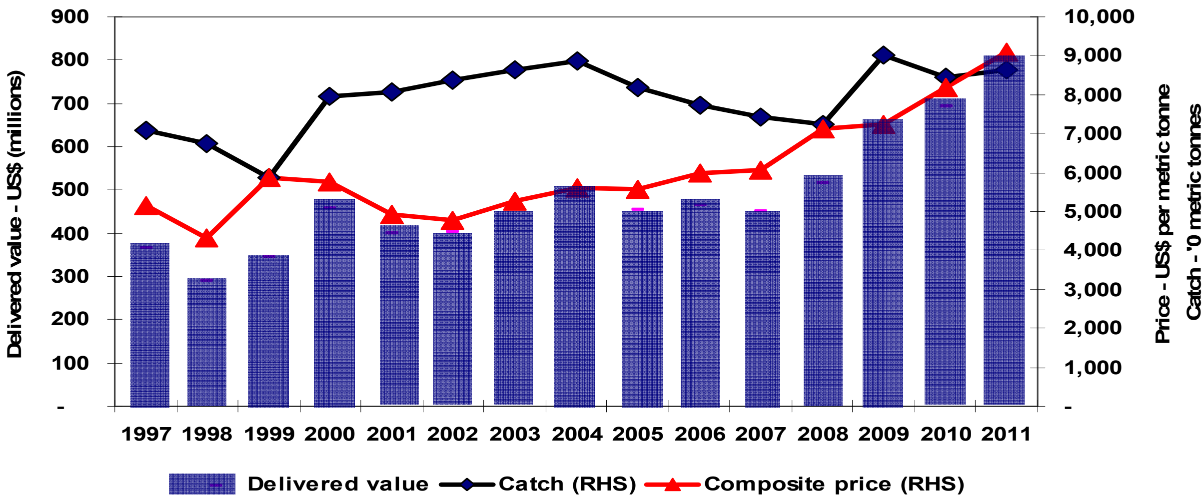

Figure 46. Yellowfin in the WCPFC longline fishery – Catch, delivered value of catch and composite price

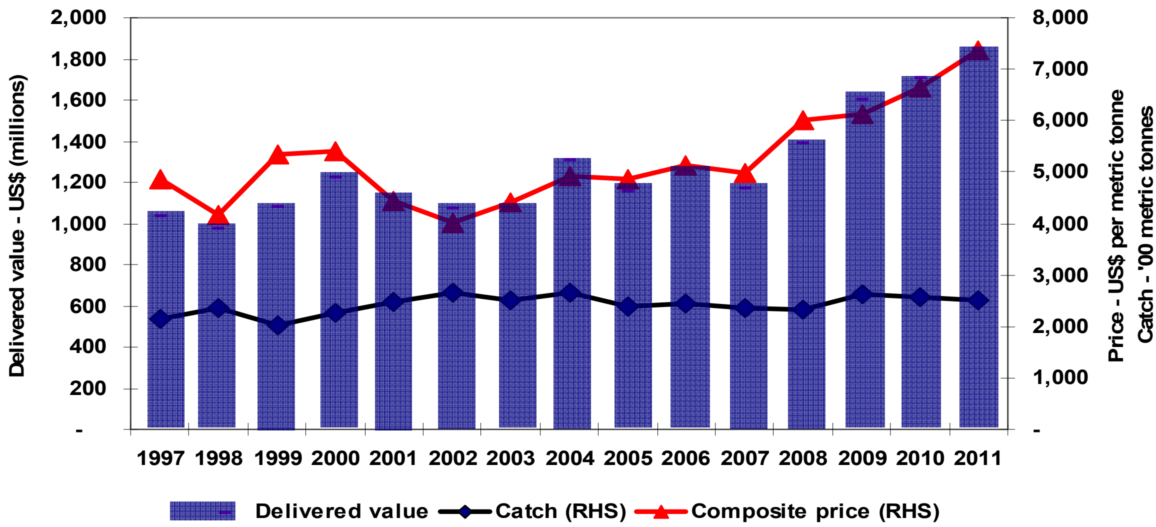

Figure 47. All tuna in the WCPFC longline fishery – Catch, delivered value of catch and composite price

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 range from 2,000–4,000 mt, low catch levels which have not been experienced since prior to 1988 (Figure 48). 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.

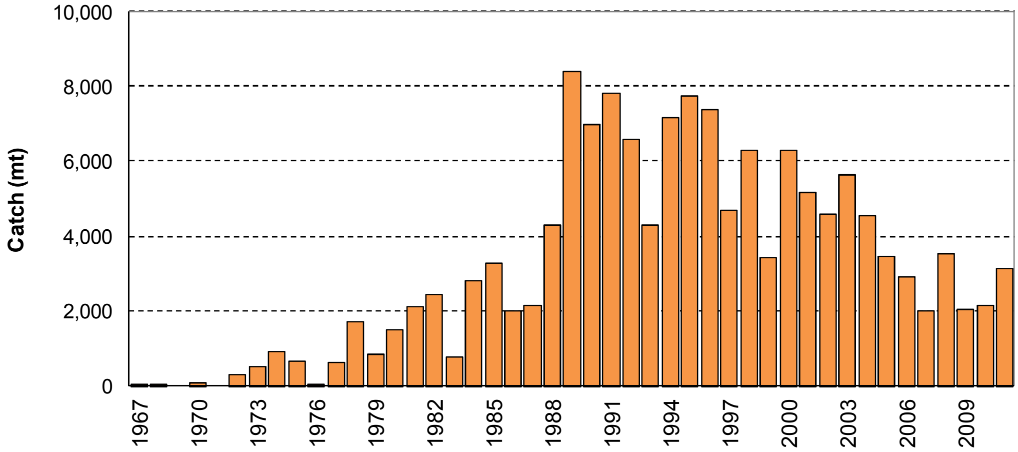

Figure 48. Troll catch (mt) of albacore in the south Pacific Ocean

6.2 Provisional catch estimates (2011)

The 2011 South Pacific troll albacore catch (3,119 mt) was higher that the catch in the past two years, mainly due to better catches experienced in the New Zealand domestic fishery. The New Zealand troll fleet (162 vessels catching 2,798 mt in 2011) and the United States troll fleet (6 vessels catching 321 mt in 2011) 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 2011).

Effort by the South Pacific albacore troll fleets is concentrated off the coast of New Zealand and across the Sub-Tropical Convergence Zone (STCZ) – refer to Figure 49.

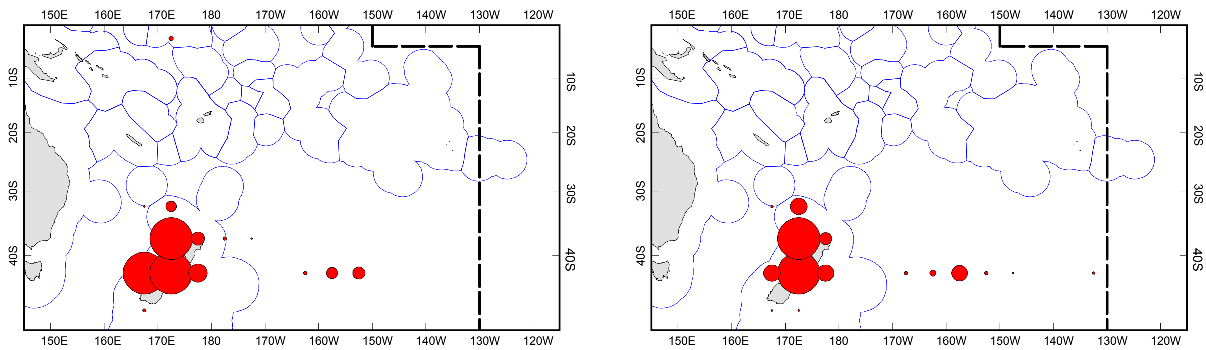

Figure 49. Distribution of South Pacific troll effort during 2010 (left) and 2011 (right)

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 1.5 million mt in the last five years (Figure 50). 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 2011 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).

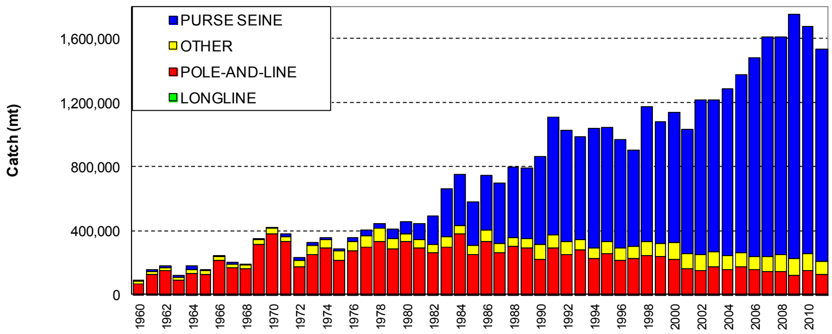

Figure 50. WCP–CA skipjack catch (mt) by gear

The 2011 WCP–CA skipjack catch of 1,540,189 mt was the lowest for five years (nearly 220,000 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 (1,330,667 mt in 2011 – 86%). A declining proportion of the catch was taken by the **pole-and-line** gear (128,290 mt – 8%) and the "**unclassified**" gears in the domestic fisheries of Indonesia, Philippines and Japan (75,188 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 51). 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.

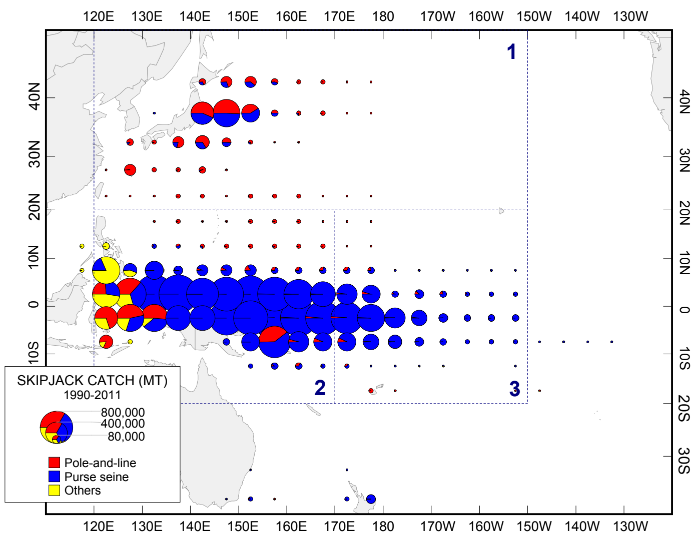

Figure 51. Distribution of skipjack tuna catch, 1990–2011.

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 52). 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 52). There was a greater proportion of medium-large (60–80 cm) skipjack caught in the purse seine fishery in 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 2007 and 2009 comprised more younger fish from associated schools. The overall purse-seine skipjack size distribution in 2011 is similar to that of 2006 (i.e. relatively smaller fish than other years), with catch roughly shared between unassociated and associated schools.

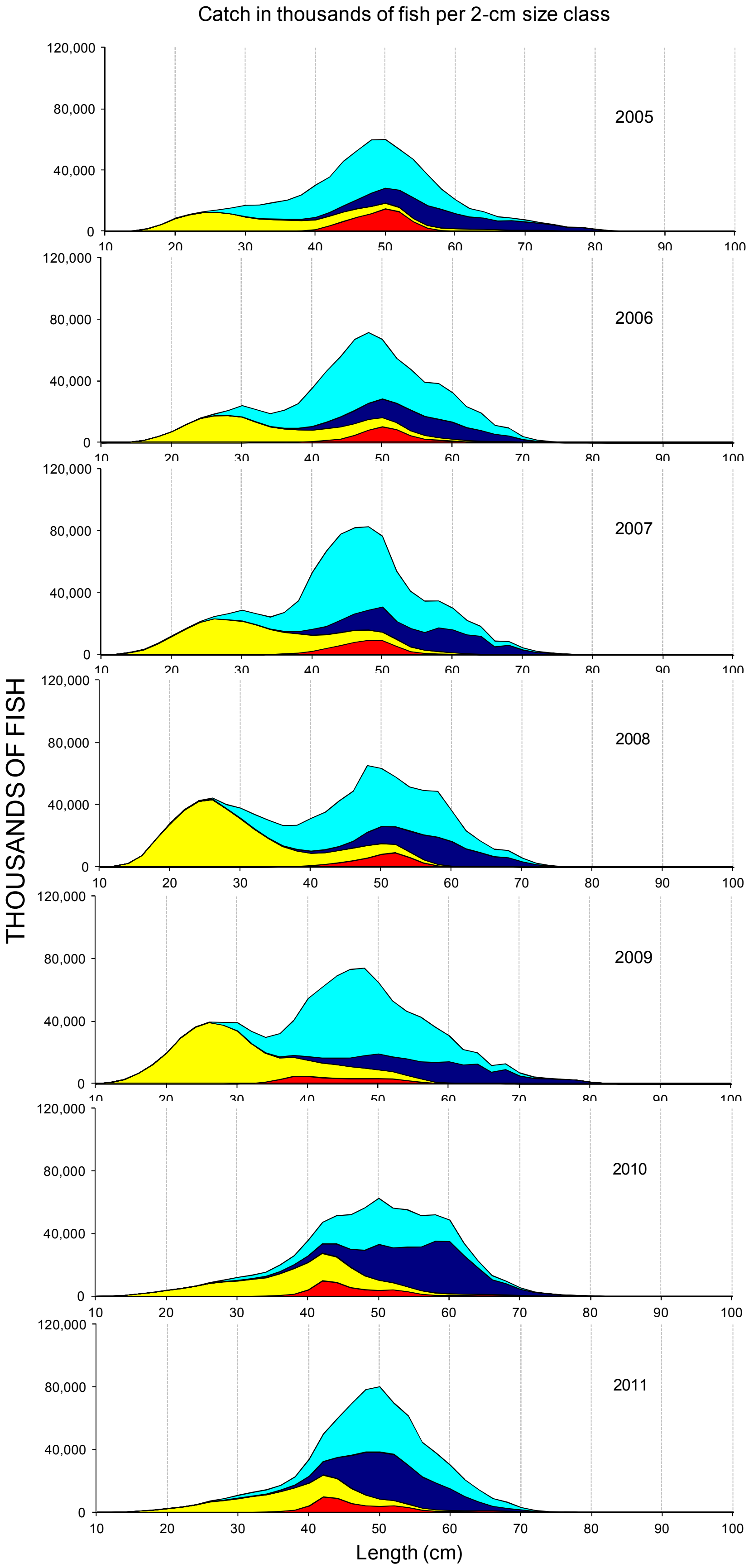

Figure 52. Annual catches (numbers of fish) of skipjack tuna in the WCPO by size and gear type, 2005–2011. **(red–pole-amd-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)**

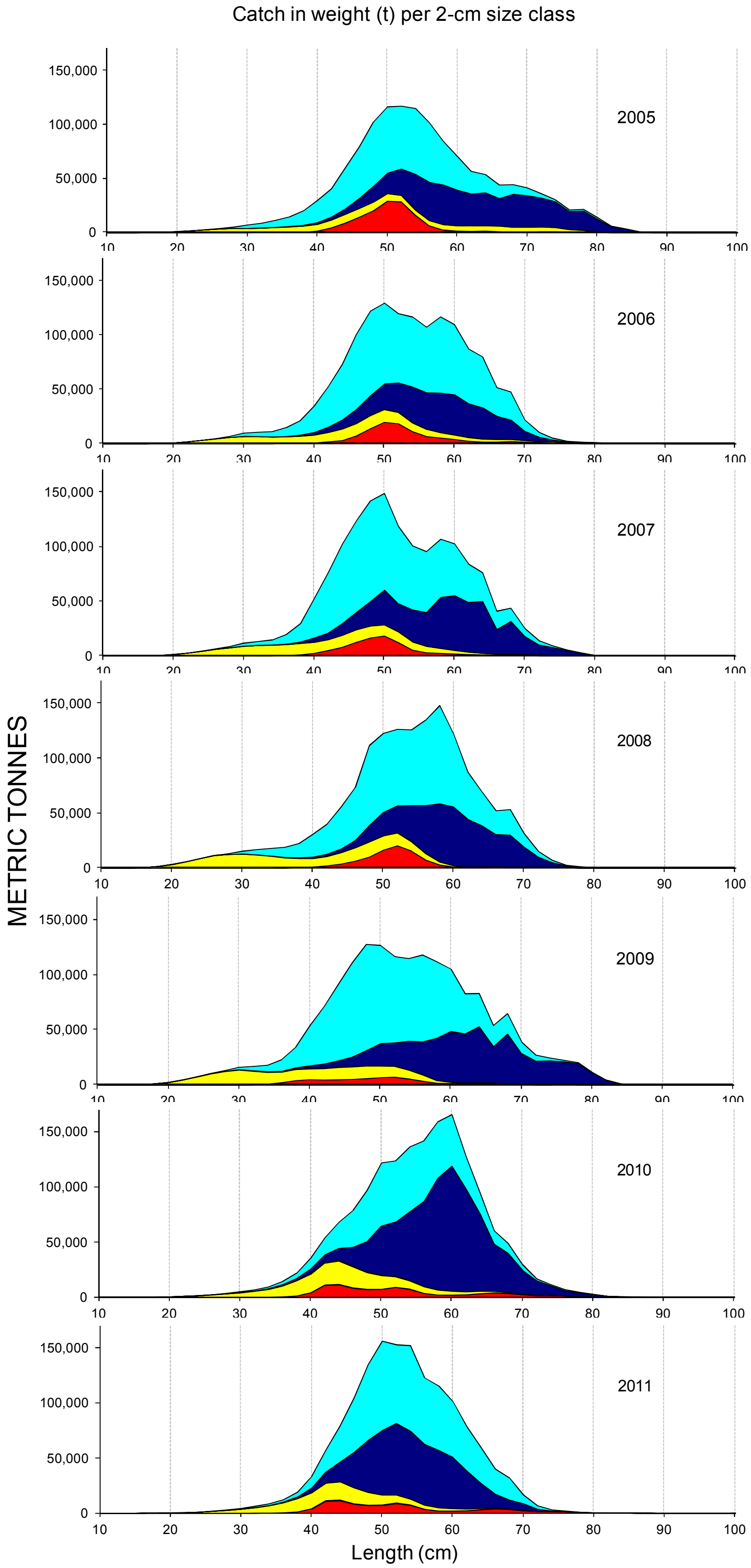

Figure 53. Annual catches (metric tonnes) of skipjack tuna in the WCPO by size and gear type, 2005–2011.

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

7.2 YELLOWFIN

The total yellowfin catch in the WCP–CA hs slowly increased over time but since 1998, jumped to a new level with annual catches regularly exceeding 500,000 mt (Figure 54).

Yellowfin catches in recent years have been the highest on record, primarily due to increased effort and catches in the purse seine fishery. The 2005 yellowfin catch (602,892 mt) was the highest on record and primarily attributed to the record catch in the **purse-seine** fishery (426,631 mt – 71% of the total yellowfin tuna catch). The 2011 WCPC-CA yellowfin catch (430,506 mt; 65%) was the lowest since 1996 due to a sharp decline in the **purse-seine** fishery catches compared to recent years (e.g. a decline of 105,000 mt compared to 2010) and an adjustment to the catch estimates for the Philippines artisanal fisheries (a reduction of ~30,000 mt). In recent years, the yellowfin **longline** catch has ranged from 75,000–90,000 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 2011 (86,187 mt–19%) was slightly 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 3-5 times the **longline** yellowfin catch.

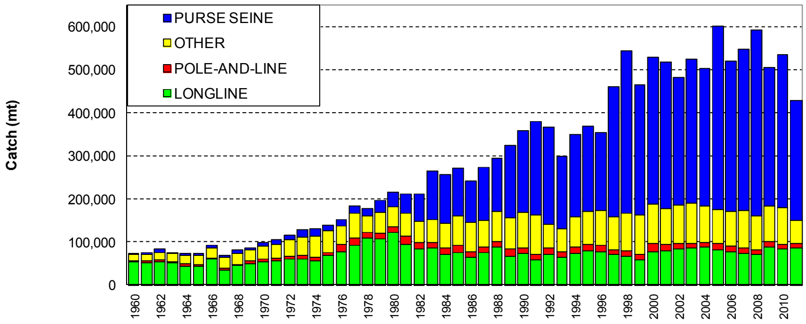

Figure 54. WCP–CA yellowfin catch (mt) by gear

The **pole-and-line** fisheries took 10,430 mt (2% of the total yellowfin catch and the lowest since 1975) during 2011, and **'other'** category accounted for ~50,000 mt (12%). 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[14] and eastern Indonesia[15]. Figure 55 shows the distribution of yellowfin catch by gear type for the period 1990–2011. 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.

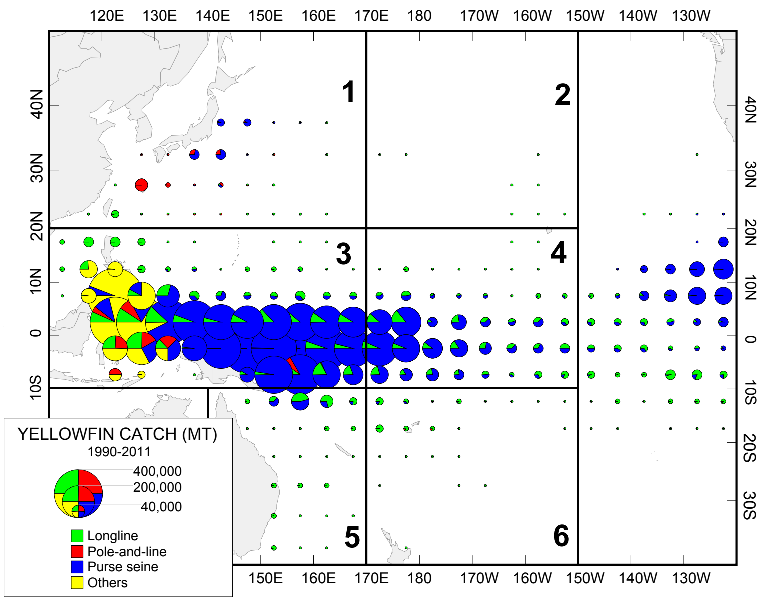

Figure 55. Distribution of yellowfin tuna catch in the WCP–CA, 1990–2011.

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

Relatively high catches of yellowfin occurred in the EPO during 2001–2003

[14] In May 2012, Philippines adjusted their municipal fisheries hook-and-line yellowfin tuna catch estimate, which was set to 43,000 t. in recent years, down to 13,000 t. in 2011.

[15] Indonesia has recently revised the proportion of catch by species for their domestic fisheries which has resulted in differences in species composition by gear type since 2000 compared to what has been reported in previous years.

(400,000+ mt), but then declined to 178,000 mt in 2006. The EPO yellowfin catch has since recovered to a level of around 210,000-250,000 mt over 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 56), and their deep-water handline fisheries take smaller 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 clearly higher than the longline catch. Significant catches of large yellowfin tuna in the purse seine unassociated sets is evident in 2008 and 2010, where exceptional catches of large yellowfin in the size range 120–130 cm were experienced (see Figure 57 – 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 successive years. The strong mode of large (120–135cm) yellowfin from (purse-seine) unassociated-sets in 2010 corresponds to good catches experienced during the early months of El Nino which transitioned into the strong La Niña event by the 3rd and 4th quarters (Figure 16–right and Figure 21–right). Lower catches of yellowfin occurred during 2009 and 2011 (compared to 2008 and 2010), 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).

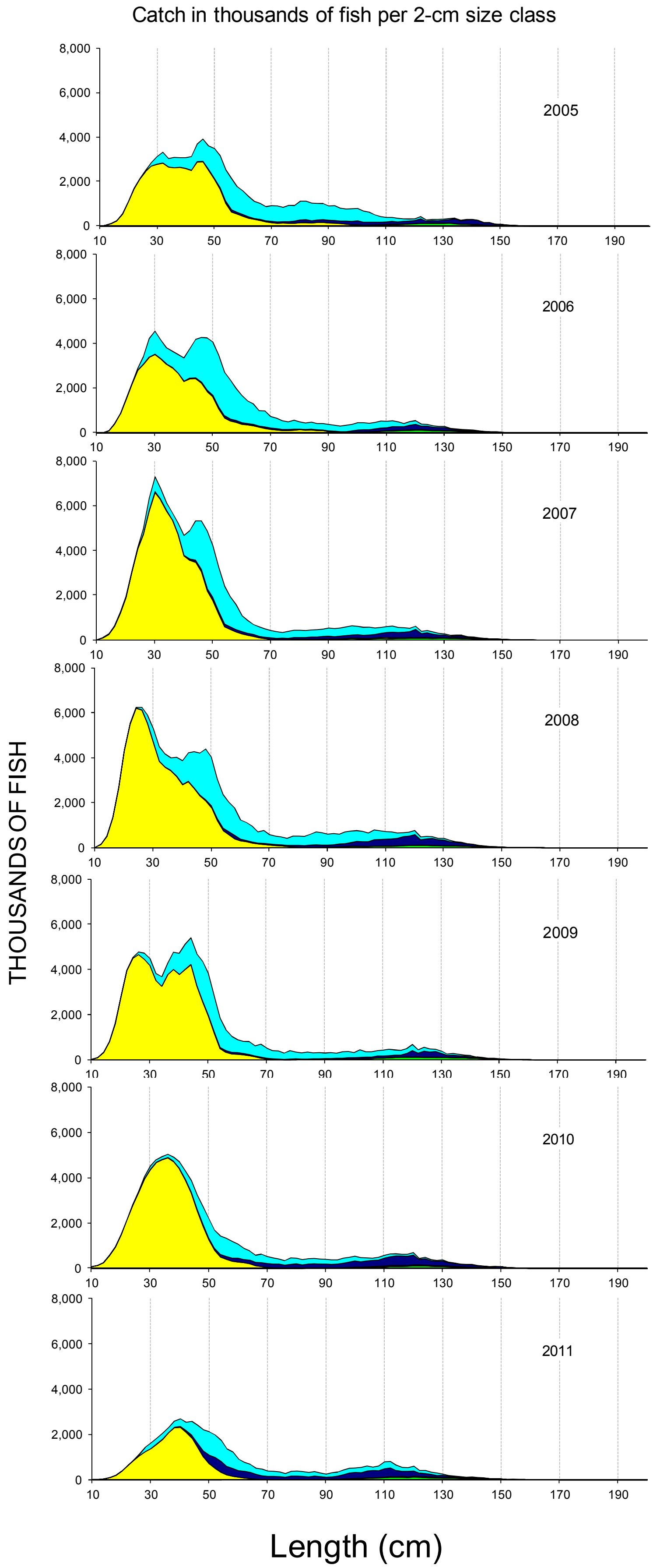

Figure 56. Annual catches (in number of fish) of yellowfin tuna in the WCPO by size and gear type, 2005–2011.

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

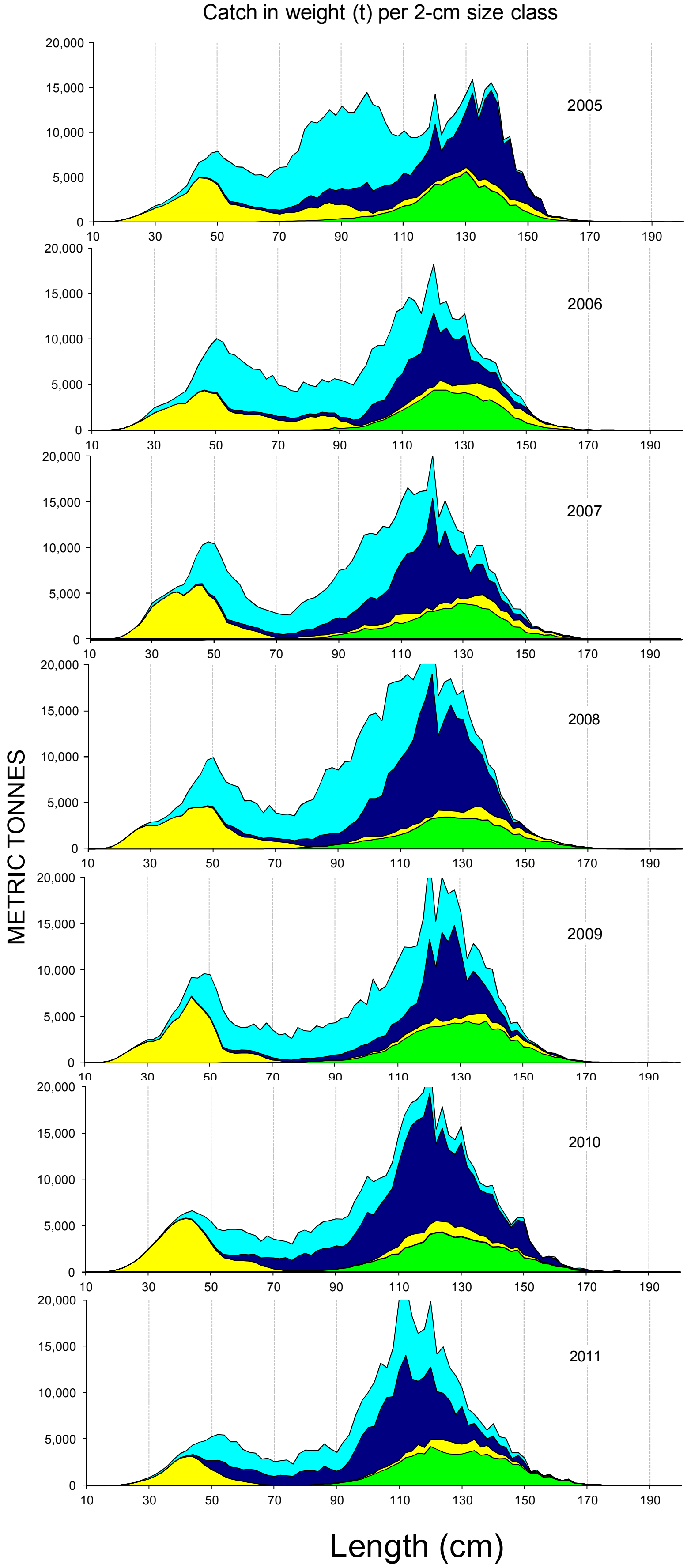

Figure 57. Annual catches (in metric tonnes) of yellowfin tuna in the WCPO by size and gear type, 2005–2011.

(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 290,000 mt (Figure 58), with Japanese longline vessels generally contributing over 80% of the catch until the early 1990s. The provisional 2011 bigeye catch for the **Pacific Ocean** (234,206 mt) was amongst the lowest experienced over the past decade.

The **purse-seine** catch in the **EPO** (56,527 mt in 2011) continues to account for a significant proportion (69%) of the total EPO bigeye catch despite being the lowest since 1989. The provisional 2011 EPO longline bigeye catch estimate (25,216 mt) is amongst the lowest experienced since 1960, reflecting to the reduction in effort by the Asian fleets. However, the EPO catch estimates are acknowledged to be preliminary[16] and may increase when more data become available.

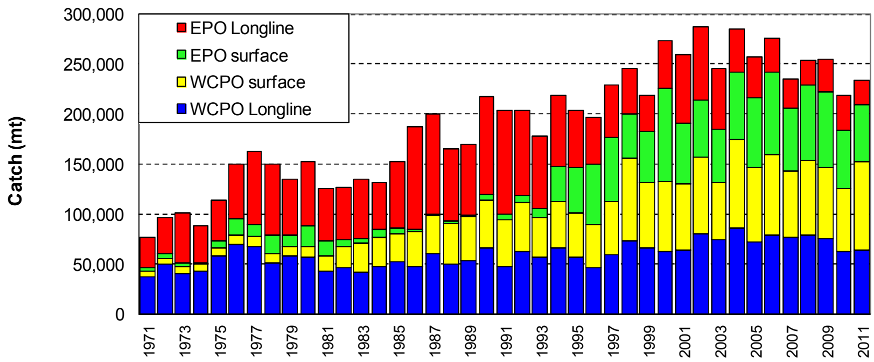

Figure 58. Pacific bigeye catch (mt) by gear
(excludes catches by "other" gears)

The **WCP–CA longline** bigeye catches have fluctuated between 72,000–96,000 mt since 1999, but the 2010 and 2011 catches (68,777 mt and 67,699 mt, respectively; 52% and 43% of total WCP-CA bigeye catch) are the lowest since 1997. In contrast, the provisional **WCP–CA purse seine** bigeye catch for 2011 was estimated to be 77,095 mt (51%) which was amongst the highest on record (Figure 59) and only the second first time the purse seine catch has exceeded the longline catch.

The **WCP–CA pole-and-line** fishery has generally accounted for between 2,800–6,700 mt (2-4%) of bigeye catch annually over the past decade. The "**other**" category, representing various gears in the Philippine, Indonesian[17] 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.

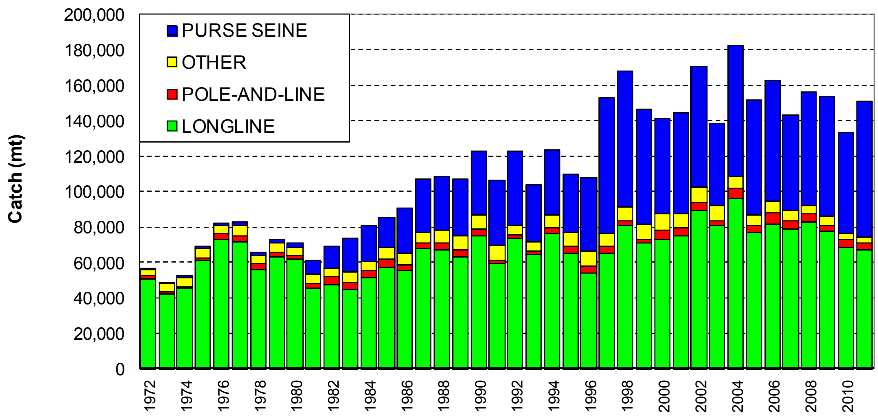

Figure 59. WCP–CA bigeye catch (mt) by gear

Figure 60 shows the spatial distribution of bigeye catch in the Pacific for the period 1990–2011. 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.

[16] Catch estimates for the EPO longline fishery for 2009-2011 and the EPO purse seine fishery for 2010-2011 are preliminary

[17] 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.

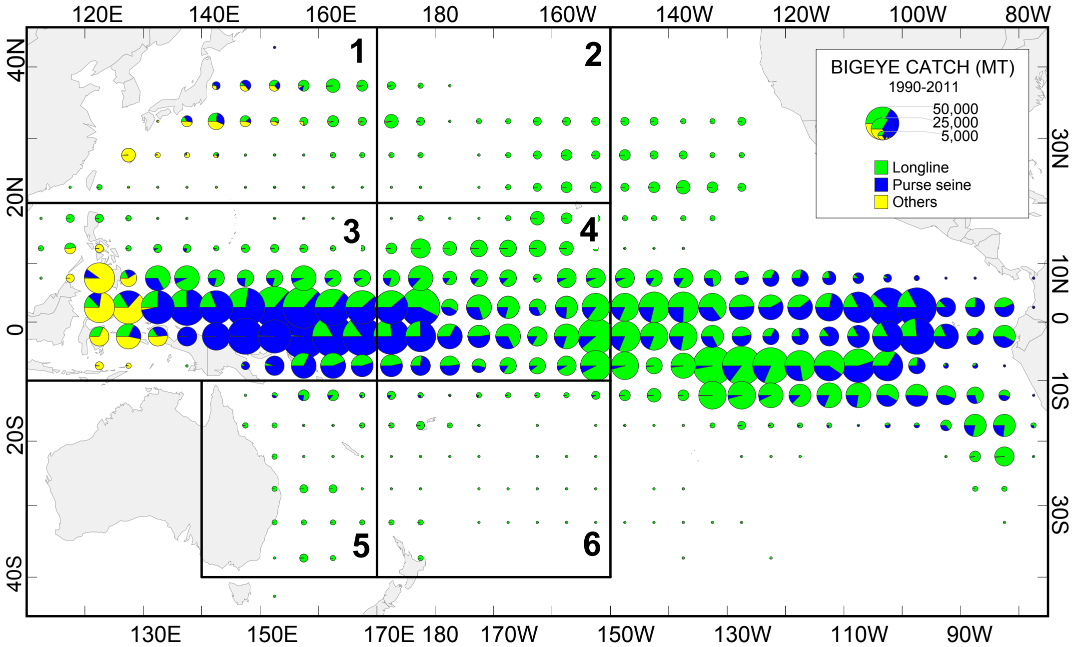

Figure 60. Distribution of bigeye tuna catch, 1990–2011.
The six-region spatial stratification used in stock assessment for the WCP–CA is shown.

As with skipjack and yellowfin tuna, the domestic surface fisheries of the Philippines and Indonesia (archipelagic waters) take relatively large numbers of small bigeye in the range 20–60 cm (Figure 61). The longline fishery clearly accounts for most of the catch (by weight) of large bigeye in the WCP–CA (Figure 61). 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 are generally in the range of 45–60 cm.

The age class of bigeye taken by associated purse seine sets in the size range 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. A strong year class represented by the mode of fish in the size range of about 25 cm in the Philippines/Indonesian domestic fisheries in 2008, appears to progress to a mode of 45-50 cm in the purse seine associated and Philippines/Indonesian domestic surface fisheries in 2009 and then possibly again in the associated-set catch in 2010 as 60-70cm fish (Figure 61).

In contrast to previous years, the majority of the associated-set purse seine catch in 2011 appears to come from fish larger than 75 cm, with a pulse of recruitment evident in the size data (WCPFC Databases), and perhaps a change in catchability due to the areas fished and conditions in the fishery.

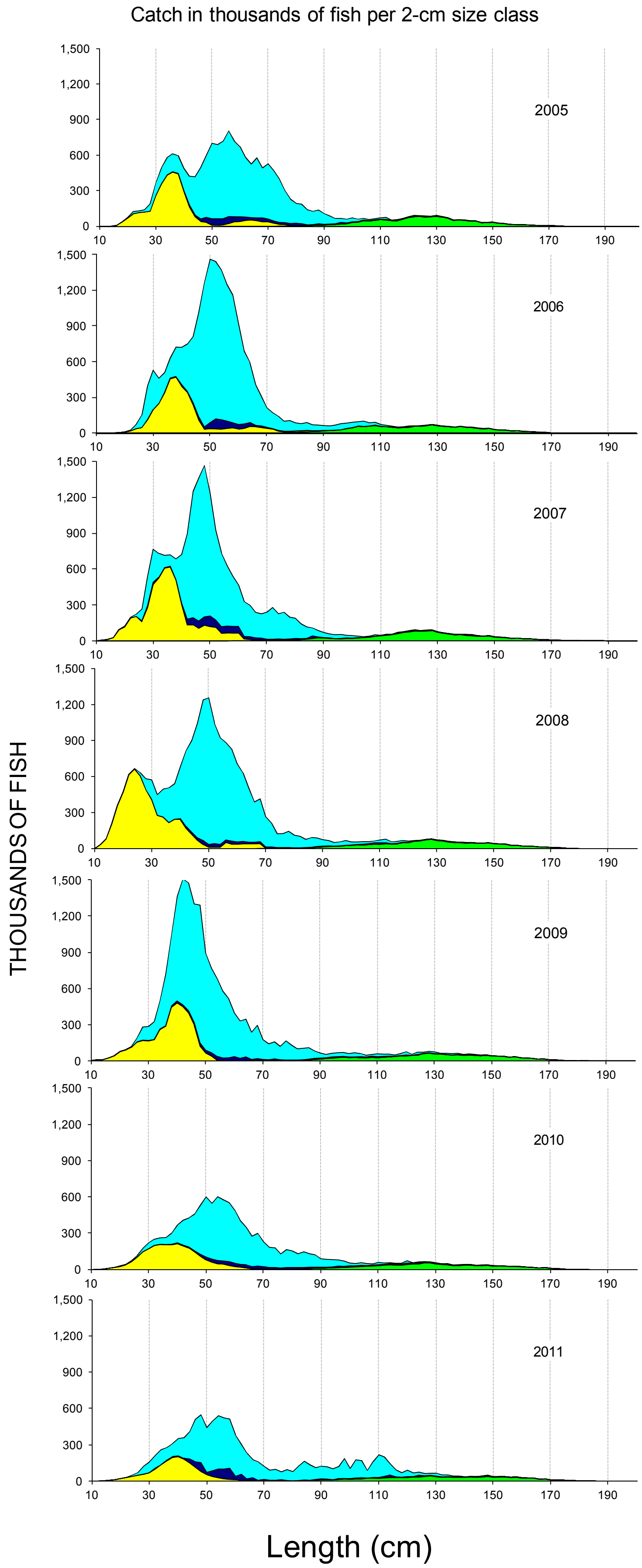

Figure 61. Annual catches (numbers of fish) of bigeye tuna in the WCPO by size and gear type, 2005–2011.

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

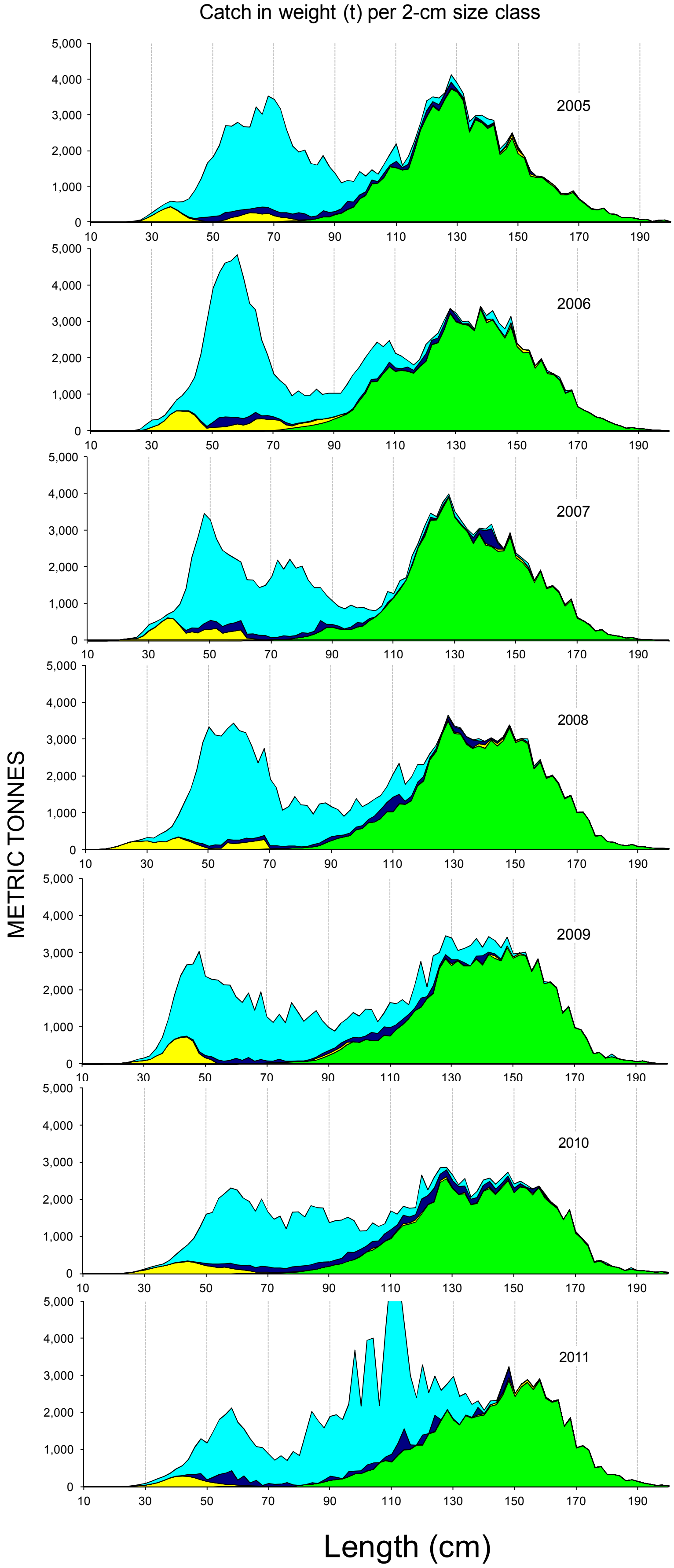

Figure 62. Annual catches (metric tonnes) of bigeye tuna in the WCPO by size and gear type, 2005–2011.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

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 2011 (75,258 mt) was the third highest on record (about 12,000 mt lower than the record catch in 2010 of 87,048 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 63), but has averaged <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 2011 (122,548 mt) was slighter lower than catches in recent years and around 25,000 mt lower that the record (147,782 mt in 2002).

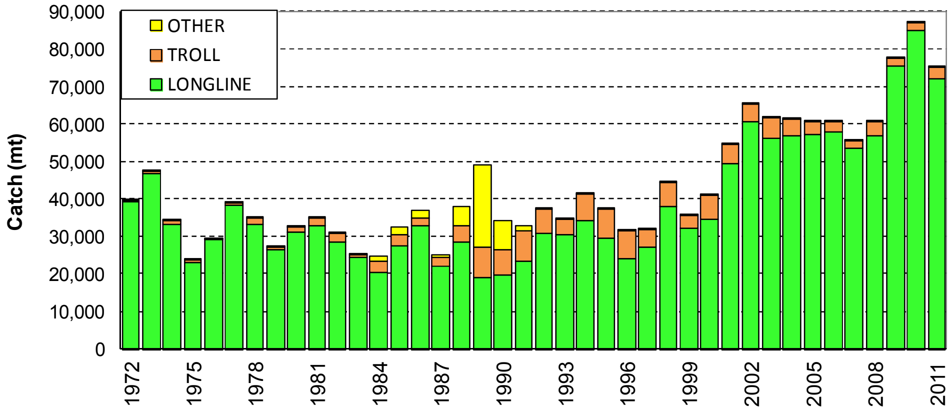

Figure 63. South Pacific albacore catch (mt) by gear ("Other" is primarily catch by the driftnet fishery.)

The longline catch of albacore is distributed over a large area of the south Pacific (Figure 64), 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.

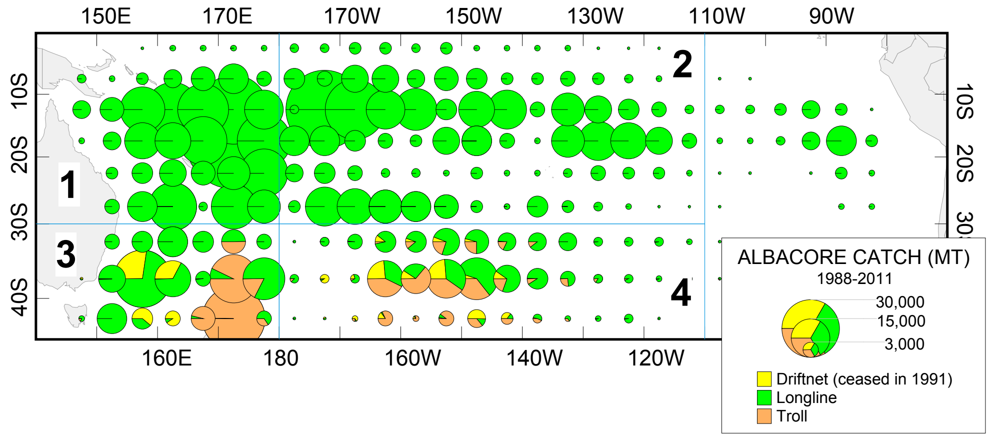

Figure 64. Distribution of South Pacific albacore tuna catch, 1988–2011.
The four-region spatial stratification used in stock assessment is shown.

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 65 and Figure 66). 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, 2009 and 2011).

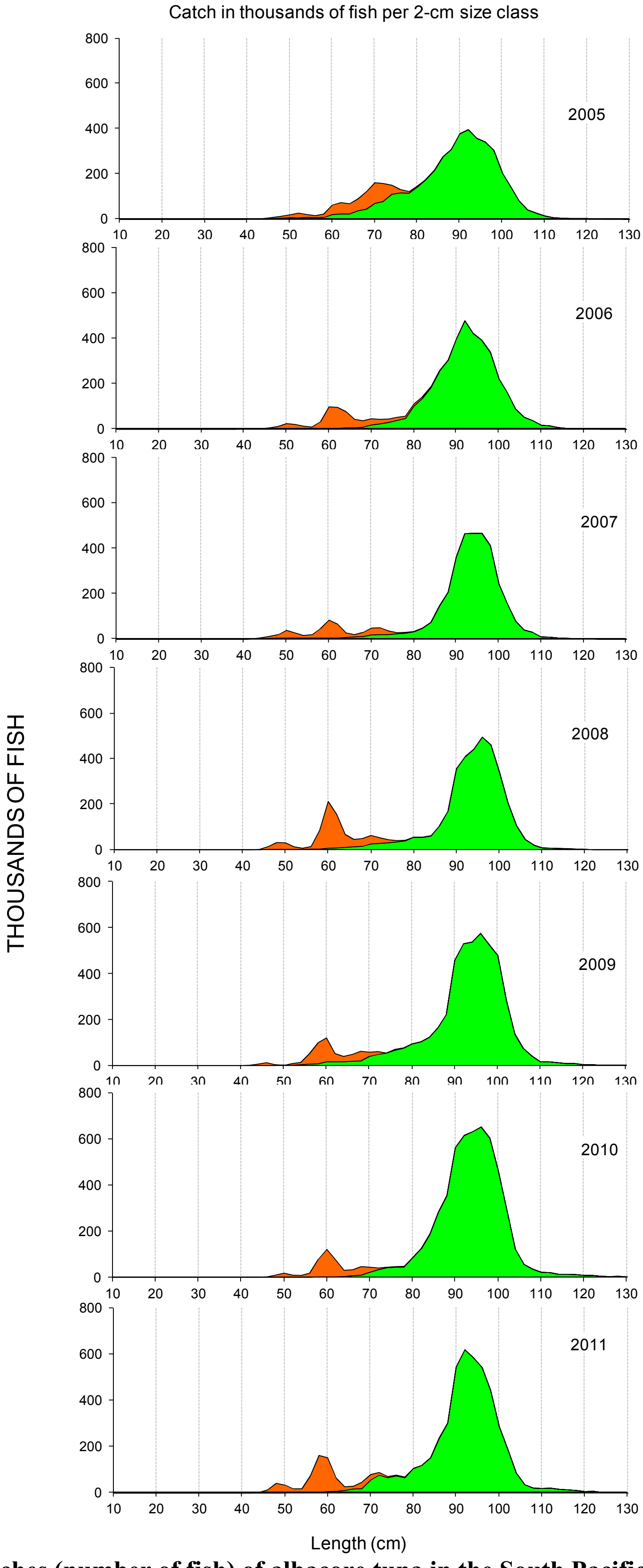

Figure 65. Annual catches (number of fish) of albacore tuna in the South Pacific Ocean by size and gear type, 2005–2011. **(green–longline; orange–troll)**

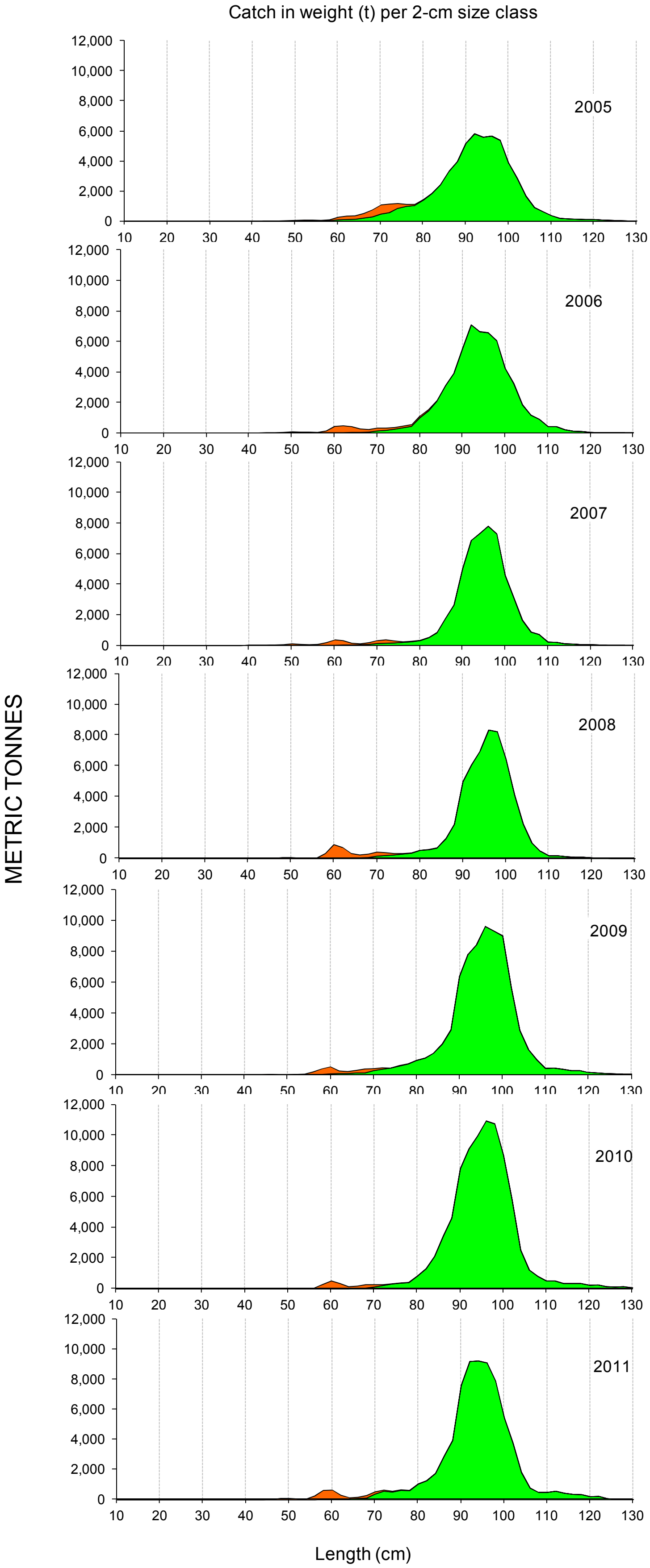

Figure 66. Annual catches (metric tonnes) of albacore tuna in the South Pacific Ocean by size and gear type, 2005–2011. **(green–longline; orange–troll);**

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 67), 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 around 10,000 mt in early 2000s, 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 20,000 mt in 2011, with contributions from the distant-water Asian fleet catches. These estimates do not include catches from the South American fleets catching swordfish. Also Phils/Indon catch not included (mostly north of equator)

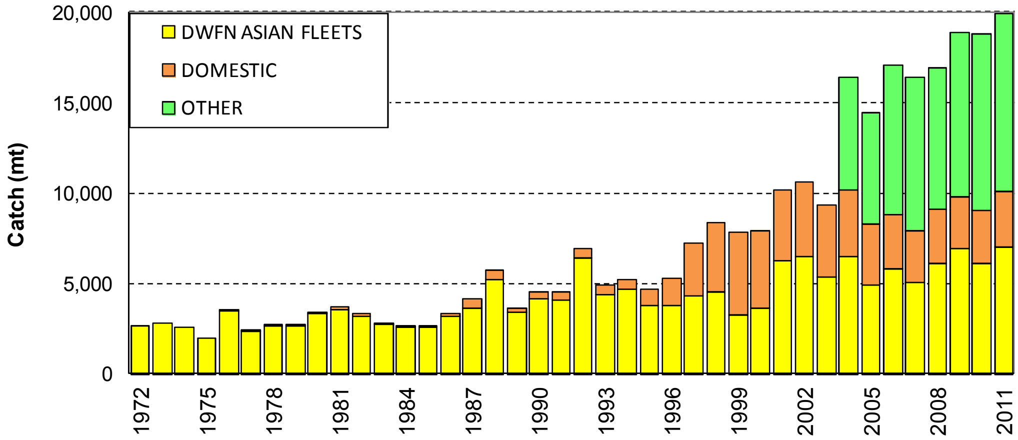

Figure 67. South Pacific longline swordfish catch (mt) by fleet

The longline catch of swordfish is distributed over a large area of the south Pacific (Figure 68). 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.

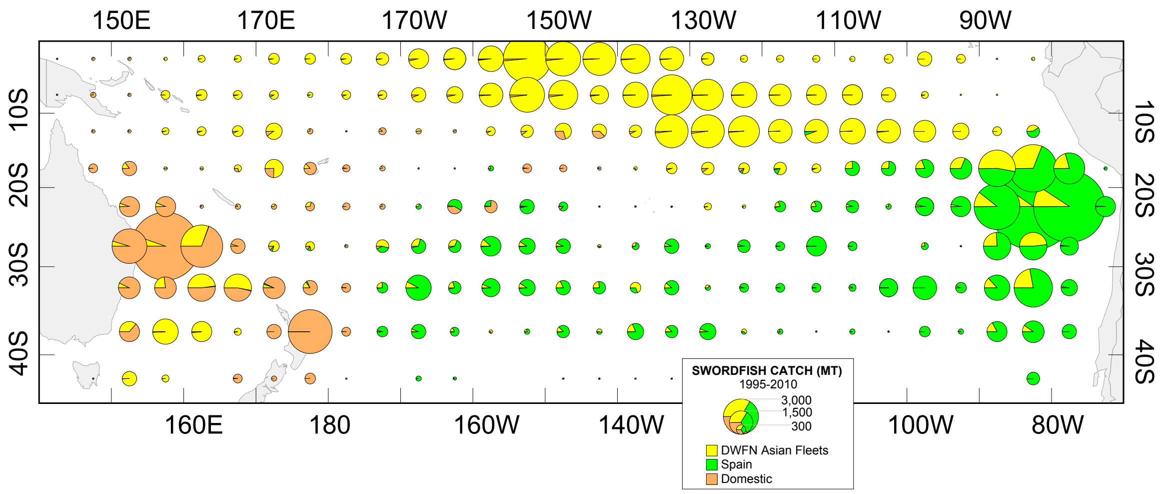

Figure 68. Distribution of South Pacific longline swordfish catch, 1995–2010.

The swordfish catch throughout the South Pacific Ocean are generally in the range of 110–170cm (lower jaw-fork length – Figures 69 and 70). 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.

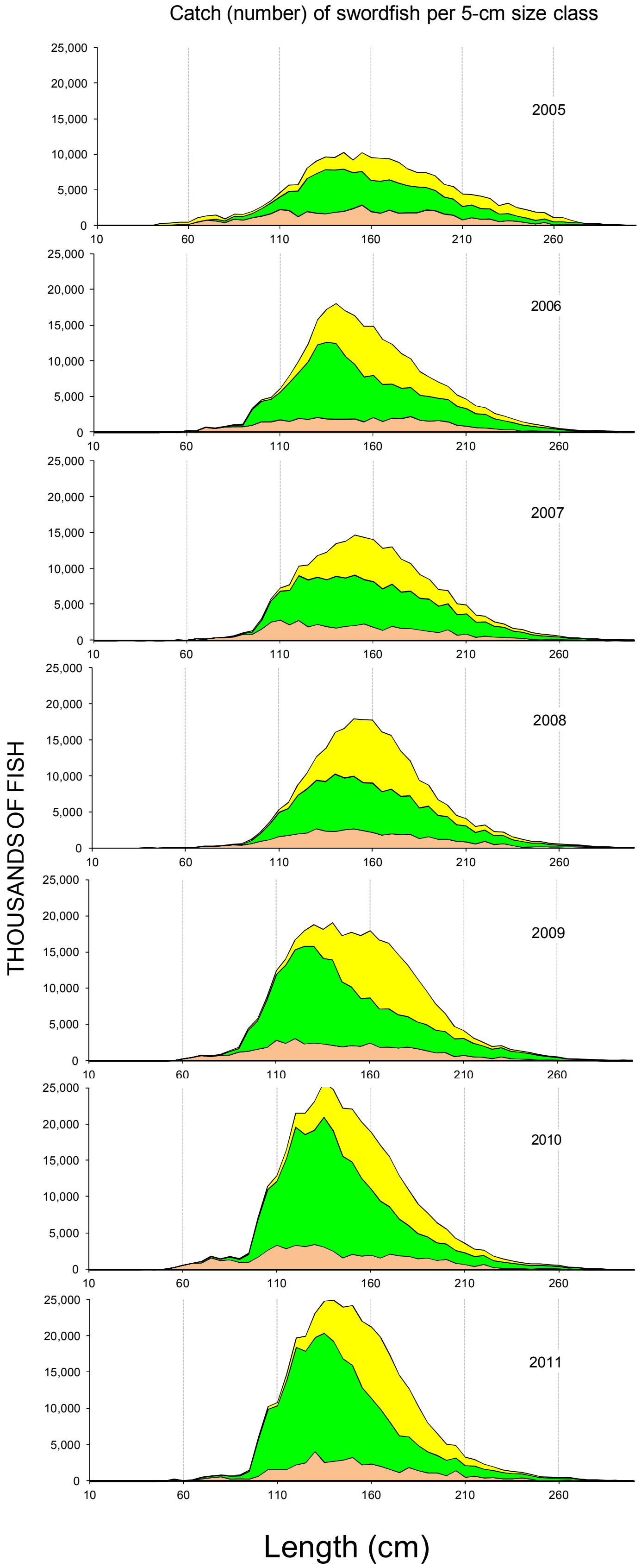

Figure 69. Annual catches (number of fish) of swordfish in the South Pacific Ocean by size and fleet, 2005–2011. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange– Domestic fleets)**

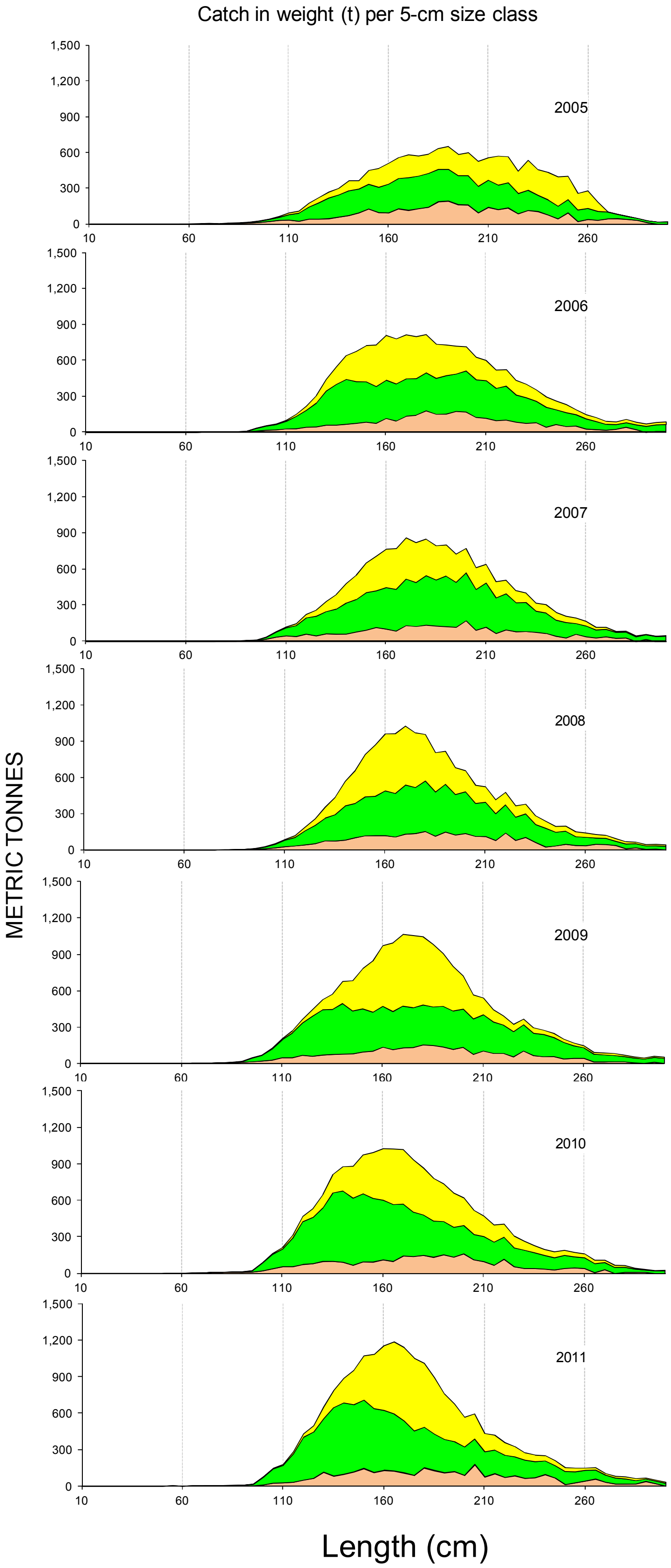

Figure 70. Annual catches (metric tonnes) of swordfish in the South Pacific Ocean by size and fleet, 2005–2011. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange–Domestic fleets)**

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