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OVERVIEW OF TUNA FISHERIES IN THE WESTERN AND CENTRAL PACIFIC OCEAN, INCLUDING ECONOMIC CONDITIONS – 2014

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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 (2014) and covering the most recent version of catch estimates by gear and species.

The provisional **total WCP–CA tuna catch for 2014** was estimated at **2,860,648 mt**, clearly the highest ever at 170,000 mt above the previous record catch in 2013 (2,690,881 mt); this catch represented 83% of the total Pacific Ocean catch of 3,486,124 mt, and 60% of the global tuna catch (the provisional estimate for 2014 is 4,783,629 mt, and when finalised is expected to be the highest on record mainly due to increased WCP-CA catches).

The **2014 WCP–CA catch of skipjack** (**1,957,693 mt** – 68% of the total catch) was the highest recorded, eclipsing the previous record of catch in 2013 by 115,000 mt (1,842,485 mt). The **WCP–CA yellowfin catch** for 2014 (**608,807 mt** – 21%) was also the highest recorded (5,000 mt higher than the record catch of 2008 – 603,244 mt) and mainly due to increased catches in several longline fisheries. The **WCP–CA bigeye catch** for 2014 (**161,299** mt – 6%) was slightly higher than in 2013, but relatively stable compared to the average over the past ten years. The **2014 WCP–CA albacore**[1] **catch** (**132,849 mt -** 5%) was slightly lower than in 2013 and about 15,000 mt lower than the record catch in 2002 at 147,793 mt. The WCP–CA albacore catch includes catches of north and south Pacific albacore in the WCP–CA, which comprised 76% of the total Pacific Ocean albacore catch of 173,702 mt in 2014. The **south Pacific** albacore catch in 2014 (83,033 mt) was the fourth highest on record (about 6,000 mt lower than the record catch in 2010 of 88,942 mt).

The provisional **2014 purse-seine catch of 2,020,627 mt** was the highest catch on record and more than 120,000 mt higher than the previous record in 2013 (1,899,627 mt). The 2014 purse-seine skipjack catch (1,587,018 mt; 79% of total catch) was the highest on record (about 105,000 mt higher than the previous record in 2013) and the main contributor to the total purse seine catch record. This exceptional catch could be due to a strong year-class in conjunction with environmental conditions resulting in a prolonged period where skipjack tuna were more available to the gear. The 2014 purse-seine catch estimate for yellowfin tuna (362,049 mt) was the third highest on record but at only 18% of the total catch, continuing the recent trend of a diminishing contribution in the overall catch. The provisional catch estimate for bigeye tuna for 2014 (67,367 mt) was the sixth highest on record and will be refined as further observer data for 2014 have been received and processed.

In line with the prevailing ENSO conditions, fishing activity during 2014 (El Niño-type conditions) expanded into the eastern tropical areas compared to 2013 (La Niña conditions). For the first time in many years, purse seine effort during 2014 in the area to the east of longitude 160°E was more pronounced than in the area to the west of this longitude (i.e. PNG, FSM and Solomon Islands). With the ENSO forecast for late 2015 predicting more pronounced El Nino conditions, the recent increased purse seine activity in the eastern tropical areas should therefore be maintained.

The **2014 pole-and-line catch (203,736 mt)** was the lowest annual catch since the late-1960s and continuing the trend in declining catches for three decades. Japanese distant-water and offshore fleets (100,347 mt in 2014), and the Indonesian fleets (102,093 mt in 2014), account for nearly all of the WCP–CA pole-and-line catch (99% in 2014).

The **provisional WCP–CA longline catch (268,795 mt) for 2014** was slightly above the average for the past five years. The WCP–CA albacore longline catch (91,414 mt – 34%) for 2014 was the lowest for three years, 12,000 mt. lower that the record of 103,466 mt attained in 2010. The provisional bigeye catch (73,898 mt – 27%) for 2014 was higher than in 2013 but still amongst the lowest catches

[1] includes catches of north and south Pacific albacore in the WCP–CA, which comprised 76% of the total Pacific Ocean albacore catch of 173,702 mt in 2014; the section 7.4 "Summary of Catch by Species - Albacore" is concerned only with catches of south Pacific albacore, which made up approximately 49% of the Pacific albacore catch in 2014.

since 1996. In contrast, the yellowfin catch for 2014 (101,552 mt – 38%) was the highest for more than ten years, with increased catches by a number of fleets.

The **2014 South Pacific troll albacore catch (2,221 mt)** was the lowest since 2010. The New Zealand troll fleet (153 vessels catching 1,937 mt in 2014) and the United States troll fleet (6 vessels catching 263 mt in 2014) typically account for most of the albacore troll catch.

Economic conditions in the tuna fisheries of the WCP-CA during 2014 were mixed compared with 2013. US dollar (USD) prices for canning lightmeat raw materials (skipjack and yellowfin) saw a year on year decline in 2014 of around 30% across major markets while prices for whitemeat raw materials increased by 10% to 20%. In contrast USD prices for longline sashimi products in 2014 were little changed from 2013.

The total value of the tuna catch in the WCP-CA declined year on year by around $810 million to be $5.8 billion in 2014. This decline was driven by the decline in the value of purse seine catch which, in turn, was driven by the decline in prices received by the purse seine fleet (Tables 1 & 2 below).

Table 1. Value of catch by gear (US$ millions)

Gear	2010	2011	2012	2013	2014
Longline	1,811	2,012	2,065	1,428	1,679
Purse seine	2,350	2,878	4,095	4,038	3,171
Pole and line	469	586	659	508	421
Troll	19	27	36	193	159
Other gears	308	386	593	425	348
GRAND TOTAL	4,957	5,888	7,448	6,591	5,779

Table 2. Value of catch by species (US$ millions)

Species	2010	2011	2012	2013	2014
Albacore	338	353	490	350	370
Bigeye	852	1,017	1,113	763	755
Skipjack	2,229	2,661	3,828	3,767	2,897
Yellowfin	1,538	1,857	2,017	1,712	1,756
GRAND TOTAL	4,957	5,888	7,448	6,591	5,779

Prices in the major markets for WCPO skipjack were lower in 2014 compared with 2013, underpinned by a mix of factors including persistently high raw material inventories due to generally good fishing conditions and, lower demand at the end markets. The Bangkok benchmark (4-7.5lbs) and Yaizu prices were lower by similar margins, down 30 and 26% respectively. Similar trends occurred in other markets with Thai Customs import and General Santos prices lower by 30%, the Japan markets (in USD terms) - Japan selected ports and Japan Customs imports - declined by 25% each while the Ecuador prices declined by 28%.

Yellowfin prices on canning markets were mostly down but at varying magnitudes; the Bangkok market price (20lbs+, c&f) down 20%, Thai import prices declined 21%, Yaizu down 2% (in USD terms) and General Santos (20lbs+, fob) down 30%. Bangkok yellowfin prices averaged $2,123/mt in 2014 compared to $2,638 in 2013.

Albacore prices experienced improvements during 2014 across markets; the Bangkok benchmark (10kg and up) increased 15% (following a 28% drop the previous year), Thai frozen imports 14% (-29%), Japan selected ports fresh (ex-vessel) 12% (-27%) and US imports fresh (f.a.s.) 19% (-12%).

The Yaizu price of pole and line caught skipjack in waters off Japan averaged $3,056/Mt in 2014, an increase of 26% compared to 2013. The Yaizu price of pole and line caught skipjack in waters south of Japan, however, however, by 6% to $2,243/mt. Overall, the pole and line price at Yaizu in 2014 averaged $2,356/Mt as against an average of $2,402 in 2013, representing a small decline of 2%.

The USD prices on the main markets for longline caught sashimi products (yellowfin and bigeye) in Japan showed marginal to moderate changes during 2014. The prices in 2014 for the Japan fresh yellowfin imports from all sources averaged $9.45/Kg, broadly comparable to 2013. The Yaizu port 2014 longline caught yellowfin fresh/frozen prices increased by 4% to $6.48/Kg. Similar trends occurred on US markets with the US fresh yellowfin import prices averaging $9.64 in 2014, the same as in 2013.

The Japan market prices for fresh bigeye imports from all sources weakened slightly by 2% to $9.47/Kg while Japan selected ports frozen prices rose by 2% to $9.03/Kg. In the US market the fresh bigeye import price in 2014 broadly maintained its 2013 level with a slight decline of 2%.

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 – 2014. The review draws on the latest catch estimates compiled for the WCP–CA, which can be found in Information Paper WCPFC–SC11 ST IP–1 *(Estimates of annual catches in the WCPFC Statistical Area – OFP, 2014)*. Where relevant, comparisons with previous years' activities have been included, although it should be noted that data for 2014, 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 2014 catches relative to those of recent years, but refers readers to the SC11 National Fisheries Reports, which offer more detail on recent activities at the fleet level.

For the first time, some additional tabular and graphical information that provide more information related to the recent condition of the fishery and certain WCPFC Conservation and Management Measures (CCMs) have been provided in an APPENDIX.

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 and several artisanal fisheries. These fisheries may be covered in future reviews, depending on the availability of more complete data.

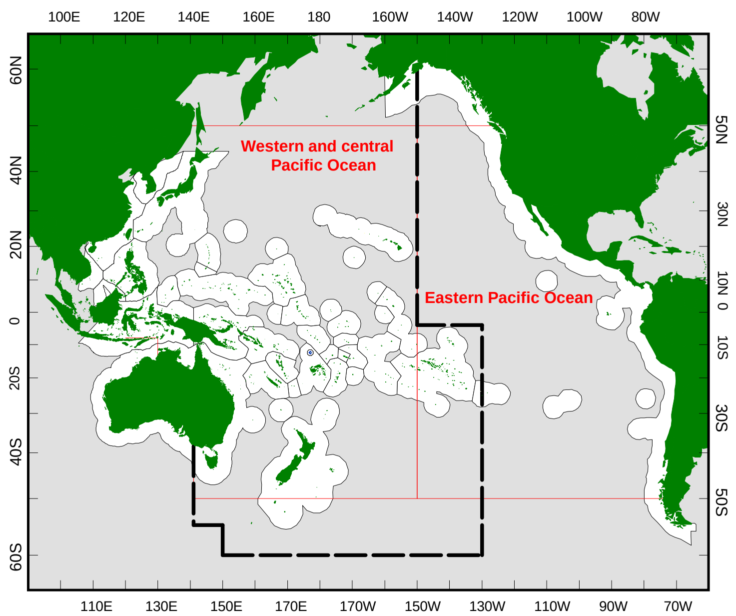

Figure 1. The western and central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Convention Area (WCP–CA in dashed lines)

2. TOTAL TUNA CATCH FOR 2014

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, noting an exceptional catch during 1998. The increasing trend in total tuna catch continued to 2009, then followed two years (2010-2011) of reduced catches, but returned to a record levels in 2012 and 2013 (Figure 2 and Figure 3).

The provisional total WCP–CA tuna catch for 2014 was estimated at **2,860,648 mt**, clearly the highest ever at 170,000 mt above the previous record catch in 2013 (2,690,881 mt). During 2014, the purse seine fishery accounted for a record catch of 2,020,627 mt (71% of the total catch), with pole-and-line taking an estimated 203,736 mt (7%), the longline fishery an estimated 268,795 mt (9%), and the remainder (13%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines. The WCP–CA tuna catch (2,860,548 mt) for 2014 represented 83% of the total Pacific Ocean catch of 3,486,124 mt, and 60% of the global tuna catch (the provisional estimate for 2014 is 4,783,629 mt, and when finalised is expected to be the highest on record mainly due to increased WCP-CA catches).

The **2014 WCP–CA catch of skipjack** (**1,957,693 mt** – 68% of the total catch) was the highest recorded, eclipsing the previous record of catch in 2013 by 115,000 mt (1,842,485 mt). The **WCP–CA yellowfin catch** for 2014 (**608,807 mt** – 21%) was also the highest recorded (5,000 mt higher than the record catch of 2008 – 603,244 mt) and mainly due to increased catches in several longline fisheries. The **WCP–CA bigeye catch** for 2014 (**161,299** mt – 6%) was slightly higher than in 2013, but relatively stable compared to the average over the past ten years. The **2014 WCP–CA albacore**[2] **catch** (**132,849 mt** - 5%) was slightly lower than in 2013 and about 15,000 mt lower than the record catch in 2002 at 147,793 mt.

The contribution to the **total estimated delivered value of the WCP-CA catch** of the different gears and species has changed dramatically over recent years. Prior to 2007 the relative contribution of both the longline and purse seine fisheries fluctuated between 30%-45%. However, since 2007 the contribution of the purse seine fishery has grown significantly reaching a high of 61% in 2013 with the longline contribution at just 22%. In 2014, the value of the purse seine and longline fisheries represented 55% and 29% of the total WPCFC-CA catch value (Figure 4 and Table 1). Similarly, the value of skipjack has also risen significantly over time, prior to 2006 the value of the skipjack catch was usually around 30-40% of the total catch value whereas between 2012 and 2014 it represented between 50 and 57% (Figure 5 and Table 2).

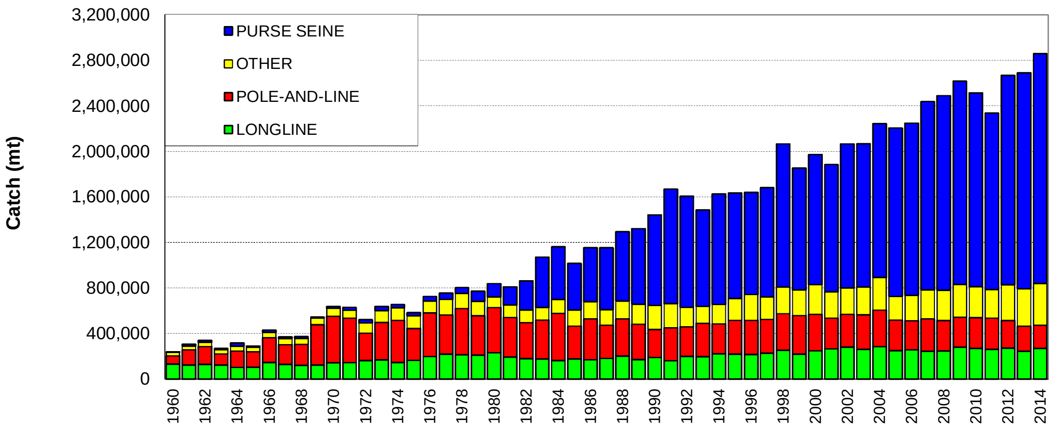

Figure 2. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

[2] includes catches of north and south Pacific albacore in the WCP–CA, which comprised 76% of the total Pacific Ocean albacore catch of 173,702 mt in 2014; the section 7.4 "Summary of Catch by Species - Albacore" is concerned only with catches of south Pacific albacore, which made up approximately 49% of the Pacific albacore catch in 2014.

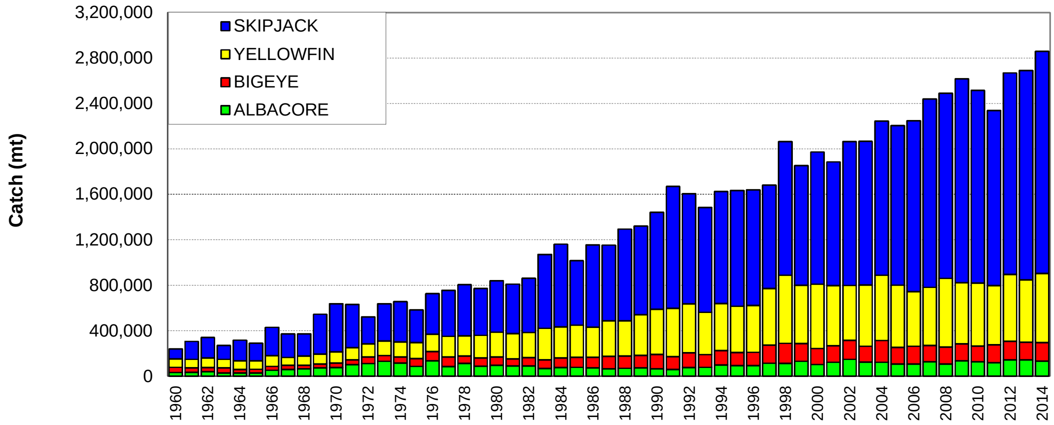

Figure 3. Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

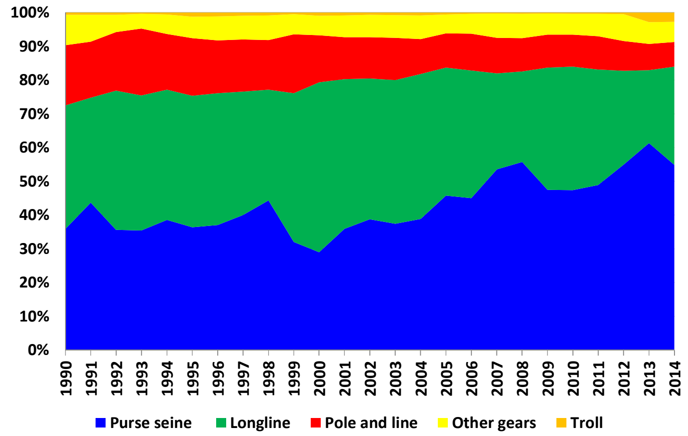

Figure 4. Relative share of gear type in the estimated delivered values of WCP-CA catch, 1990–2014.

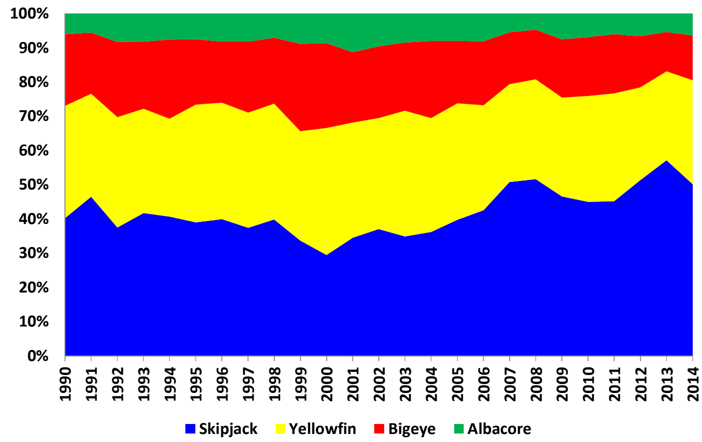

Figure 5. Relative share of species type in the estimated delivered values of WCP-CA catch, 1990–2014.

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 over 70% of total tuna catch volume (more than 1,750,000 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 combined numbered 163 vessels in 1992, but declined to a low of 111 vessels in 2006 (due to reductions in the US fleet), before some rebound in recent years (142 vessels in 2014[3]). The Pacific Islands fleets have gradually increased in numbers over the past two decades to a level of 95 vessels in 2014 (Figure 74). 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 seven years, the number of vessels has gradually increased, attaining a record level of 303 vessels[4] in 2013, with 302 vessels listed for 2014.

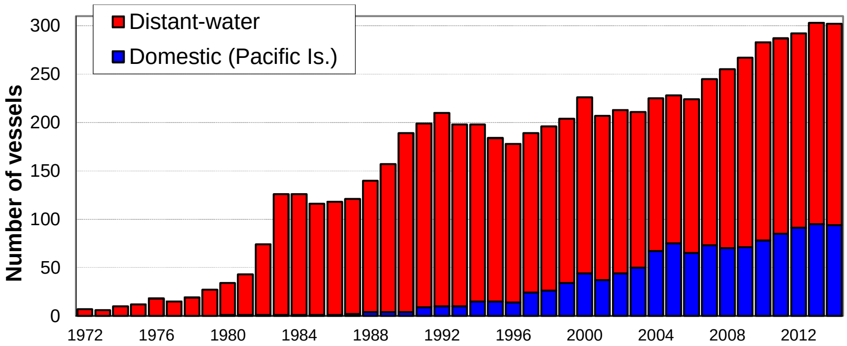

Figure 74. Number of purse seine vessels operating in the WCP–CA
(this does not include the Japanese Coastal purse seine fleet and the Indonesian, Philippine and Vietnamese domestic purse-seine/ringnet fleets which account for over 1,000 vessels)

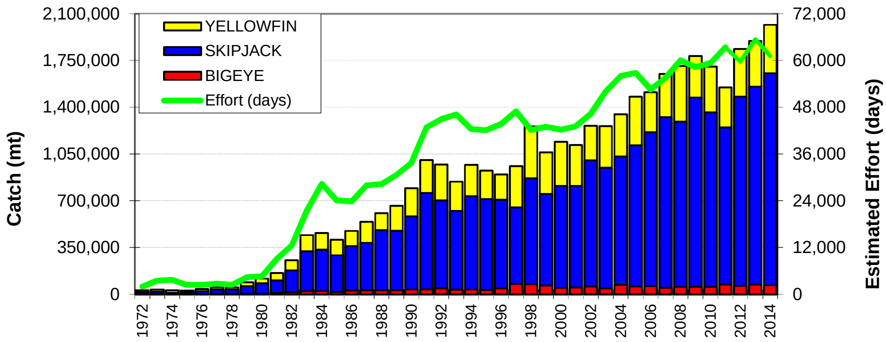

Figure 6. Purse seine catch (mt) of bigeye, skipjack and yellowfin and estimated fishing effort (days fishing and searching) in the WCP–CA

The WCP–CA purse-seine fishery is essentially a skipjack fishery, unlike those of other ocean areas. Skipjack generally account for 65–77% of the purse seine catch, with yellowfin accounting for 20–30% and bigeye accounting for only a small proportion (Figure). Small amounts of albacore tuna are also taken in temperate water purse seine fisheries in the North Pacific.

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

- Annual skipjack catches fluctuating between 600,000 and 850,000 mt prior to 2002, a significant increase in the catch during 2002, with catches now maintained well above 1,200,000 mt;
- Annual yellowfin catches fluctuating considerably between 300,000 and 400,000 mt. The proportion of large yellowfin in the catch is generally higher during El Niño years and lower during La Niña years, although other factors appear to affect purse seine yellowfin catch;

[3] The number of vessels by fleet in 1992 was Japan (38), Korea (36), Chinese-Taipei (45) and USA (44) and in 2014 the number of active vessels by fleet was Japan (40), Korea (28), Chinese Taipei (34) and USA (40). In 2014, there was an additional 40 vessels in the category less than 200 GRT which are a part of the Japanese offshore purse seine fleet but not included here.

[4] The vessel numbers presented here are based on the annual provisions of data to the WCFPC from each CCM. 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.

- Increased bigeye tuna purse seine catch estimates, coinciding with the introduction of drifting FADs (since 1997). Significant bigeye catch years have been 1997 (77,105 mt), 1998 (73,778 mt), 2004 (70,088 mt), 2011 (72,010 mt) and 2013 (72,574 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), with years of exceptional catches apparent when the effort line intersects the histogram bar (i.e. in 1998 and 2006, 2009, 2012 and 2014). The estimated purse seine effort in 2014 was clearly lower than in 2013, but resulted in a much higher catch suggesting better catch rates.

3.2 Provisional catch estimates, fleet size and effort (2014)

The provisional **2014 purse-seine catch of 2,020,627 mt** was the highest catch on record and more than 120,000 mt higher than the previous record in 2013 (1,899,627 mt). The 2014 purse-seine skipjack catch (1,587,018 mt; 79% of total catch) was the highest on record (about 105,000 mt higher than the previous record in 2013) and the main contributor to the total purse seine catch record. This exceptional catch could be due to a strong year-class in conjunction with environmental conditions resulting in a prolonged period where skipjack tuna were more available to the gear, but further investigation is warranted. The 2014 purse-seine catch estimate for yellowfin tuna (362,049 mt) was the third highest on record but at only 18% of the total catch, continuing the recent trend of a diminishing contribution in the overall catch. The provisional catch estimate for bigeye tuna for 2014 (67,367 mt) was the sixth highest on record and will be refined as further observer data for 2014 have been received and processed.

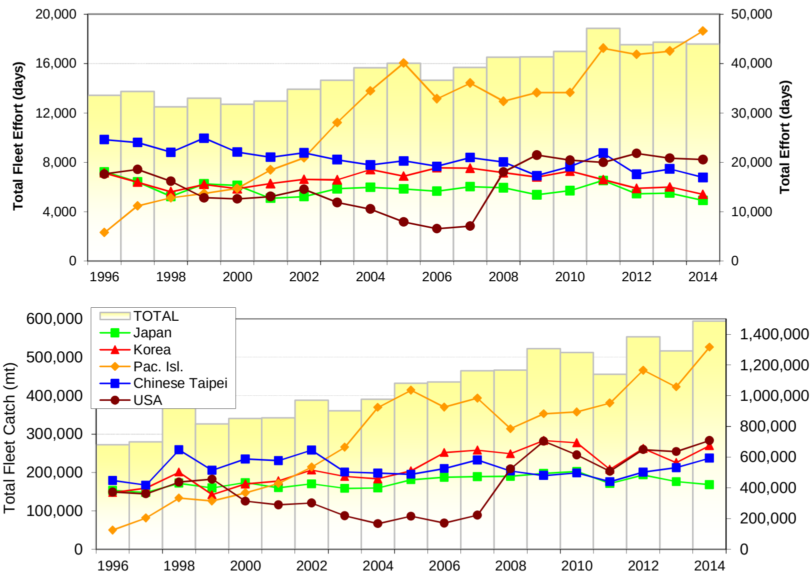

Figure 8. Trends in annual effort (top) and catch (bottom) estimates for the top five purse seine fleets operating in the tropical WCP–CA, 1996–2014.

Figure 8 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 "main-fleet" effort has been relatively stable over the past 5 years (with the exception of slightly higher effort in 2011 coinciding with poor catch rates), but catches have tended to trend upwards over this period, suggesting increased efficiency and, in some instances, better catch rates.

The combined Pacific-Islands fleet has been clearly the highest producer in the tropical purse seine fishery since 2003. There was a hiatus in the Pacific-Islands fleet development in 2008 (when some vessels reflagged to the US purse-seine fleet) but catch/effort has picked up in recent years and catch by this component of the fishery was clearly at its highest level in 2014. 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 Pacific Islands fleet until 2005 corresponded to an increase in vessel numbers, and to some extent, mirrors the decline in US purse seine catch, vessel numbers and effort over this period. However, the US purse-seine fleet commenced a significant rebuilding phase in late 2007, with vessel numbers more than doubling in comparison to recent years, but still below the fleet size in the early-mid 1990s. The increase in vessel numbers in the US purse seine fleet is reflected in the sharp increase in their catch and effort since 2007 (the US catch has been on par with the Korea purse seine fleet over the past four years, although effort by the Korean purse seine fleet in the past three years was clearly lower than the US effort, suggesting higher catch rates or potential issues with effort reporting by the Korean fleet).

The total number of Pacific-island domestic vessels has gradually increased over the past two decades, attaining its highest level in 2014 (85 vessels). The combined Pacific-islands purse seine fleet cover vessels fishing under the FSM Arrangement, bilateral agreements and domestically-based vessels and comprise vessels from the Federated States of Micronesia (FSM; 10 vessels), the Kiribati (14 vessels), Marshall Islands (10 vessels), PNG (Papua New Guinea; 51 vessels including their chartered vessels), Solomon Islands (5 vessels), Tuvalu (1 vessel) and Vanuatu (3 vessels).

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 190,000-250,000 mt annually in the period 2004-2009. The high seas pocket closure (2010- 2012) 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. With an exemption under CMM 2012-01 and CMM 2014-01, the domestic-based Philippine fleet resumed activities in the high seas pocket between Palau, Indonesia, FSM and PNG in 2013 and activities over the past two years have been reported in the SC10 and SC11 Philippines National Reports (WCPFC Part 1 Reports). Prior to 2013, the domestic Indonesian purse-seine fleet accounted for a catch similar level to the Philippines domestic fishery but generally has not fished in high seas areas. During 2013, the Indonesian fleet catch increased substantially (215,582 mt) with increased on-shore processing facilities and more vessels entering the fishery, although the purse seine catch in 2014 (145,000 mt) dropped considerably from this level, mainly due to the introduction of a ban on transhipment-at-sea for vessels not built in Indonesia (which is nearly all of the current fleet). The domestic fleets of Indonesia and Philippines have usually accounted for about 13-20% of the WCP-CA total purse seine catch, although for the period 2010-2012, it was only 8-12% due to high seas closure (in the case of the Philippines), and lower vessel numbers/catches for the Indonesian fleet.

Figure 9 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 been predominate during recent years but were not as high in 2014 (66% of all sets for these fleets) as in 2010 (76%). The proportion (24%) of sets on drifting FADs in 2014 remains consistent with recent years and amongst the highest over the past decade (the number of drifting FAD sets was the third highest ever). The number and proportion (4%) of sets on natural logs continues to decline in line with the improvements in technology/efficiency involving drifting FAD use. 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 2014 = 37%: Figure 9–right) will be higher than the percentage of sets for drifting FADs (for 2014 = 24%: Figure 9–left). In contrast, the catch from unassociated schools in 2014 was 53% of the total catch, but taken from 66% of the total sets. The APPENDIX provides a more detailed breakdown of catch and effort by set type in 2009-2014 using available logsheet and observer data.

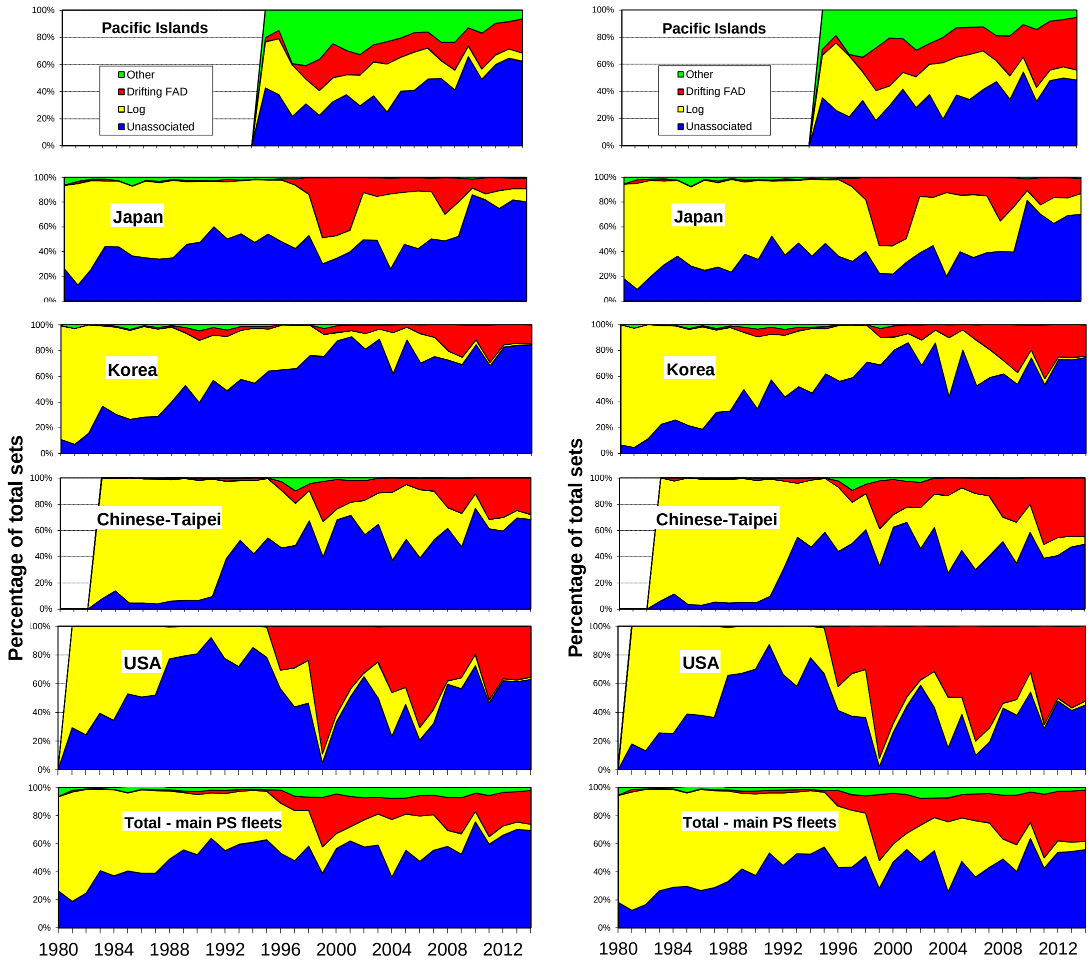

Figure 9. Time series showing the percentage of total sets (left) and total catch (right), by school type for the major purse-seine fleets operating in the WCP–CA.

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 10). Figure 11 (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.

The WCP–CA fishery experienced a prolonged La Niña state throughout 2008 and into early 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 half of 2011. It weakened, and then strengthened toward the end of 2011. The fishery experienced a return to neutral ENSO conditions during 2012. Weak-moderate La Niña conditions were experienced during 2013, then neutral conditions into early 2014. El Niño conditions developed during 2014 and has persisted into early-mid 2015, with a forecast of more pronounced El Niño conditions in late 2015 to a level not experienced in the fishery for almost 20 years (i.e. since 1997/1998).

In line with the prevailing ENSO conditions, fishing activity during 2014 (El Niño-type conditions) expanded into the eastern tropical areas compared to 2013 (La Niña conditions). For the first time in many years, purse seine effort during 2014 in the area to the east of longitude 160°E (Figure 11 – left) was more pronounced than in the area to the west of this longitude (i.e. PNG, FSM and Solomon Islands). With the ENSO forecast for late 2015 predicting more pronounced El Nino conditions, the recent increased purse seine activity in the eastern tropical areas should therefore be maintained.

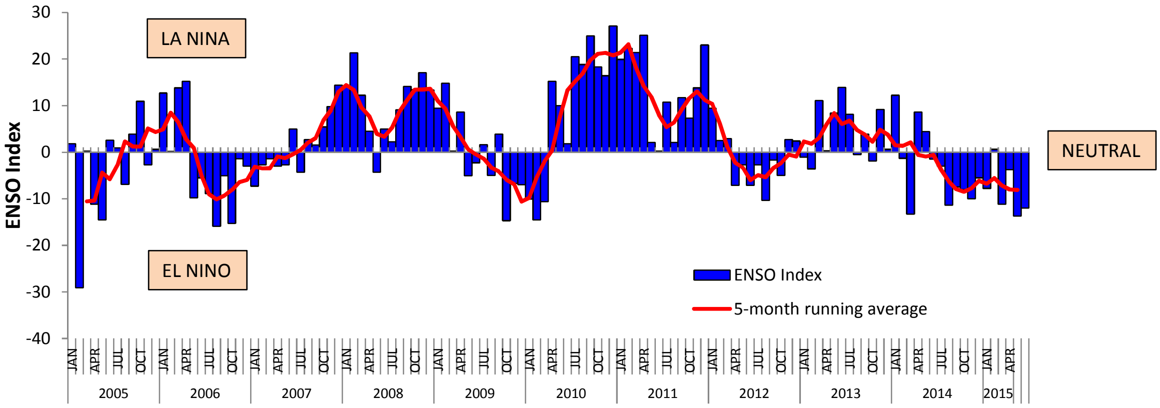

Figure 10. Trends in El Nino Southern Oscillation Index (ENSO), 2005-2015

3.4 Distribution of fishing effort and catch

Despite the FAD closure for certain periods in each year since 2010, drifting FAD set remain an important fishing strategy (Figure 11–right), particularly to the east of 160°E where most of the purse seine effort was directed during 2014. The relatively high proportion of unassociated sets in the eastern areas (e.g. Gilbert Islands) was a feature of the fishery in 2014. The FAD closure periods (since 2010) have clearly contributed to an increase in unassociated sets, although in some years (e.g. 2010 and 2014), 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 12 through 16 show the distribution of purse seine effort for the five major purse seine fleets during 2013 and 2014. The weak-moderate La Nina regime prevailing in 2013 resulted in effort by most fleets concentrated in the western tropical areas of the fishery (PNG, FSM and Solomon Islands). The move to El Nino-like conditions in 2014 resulted in effort by most fleets extending eastwards into Nauru, Gilbert/Phoenix groups of Kiribati and Tuvalu waters. The US fleet typically fishes in the more eastern areas and this was again the case during 2014, with effort extended into the Phoenix Islands, the Cook Islands, Tokelau and the adjacent eastern high seas areas with hardly any effort west of 160°E. The difference in areas fished by the Korean and Chinese Taipei fleets in 2013 compared to 2014 (Figures 14 and 15) is a good example of the conditions that existed in respective years. In contrast, effort by the Japanese fleet was more aligned to their traditional fishing grounds in FSM, PNG and the Solomon Islands (perhaps related to restricted access to other waters).

Figure 17 shows the distribution of catch by species for the past seven years, Figure 18 shows the distribution of skipjack and yellowfin catch by set type for the same period, and Figure 19 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, in years 2008 and 2012, 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. In contrast, associated sets usually account for a higher proportion of the skipjack catch (than yellowfin), in the respective total catch of each species (Figure 16–left). Higher proportions of yellowfin in the overall catch (by weight) usually occur during El Niño years as fleets have access to "pure" schools of large yellowfin that are more available in the eastern tropical areas of the WCP–CA. There was some evidence of this in 2014 (under El Nino-like conditions), with significant catches of large yellowfin taken in the fishery (Figure 17, Figure 18–right and Figure 60). In contrast, there were lower yellowfin tuna catches from unassociated sets in the central/eastern areas during 2013 (under La Nina-like conditions) which is understood to be the primary reason for the low overall yellowfin tuna catch in that year. The distribution of catch by species and set type during 2014 was similar to 2012 (an ENSO-neutral year), but in contrast to 2013 (a La Nina year), with a concentration of catch/effort in the western tropical areas (e.g. PNG, FSM and Solomon Islands).

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 19). Most of the total bigeye tuna catch comes from drifting FAD sets to the east of 160°E and this was again the case in 2014.

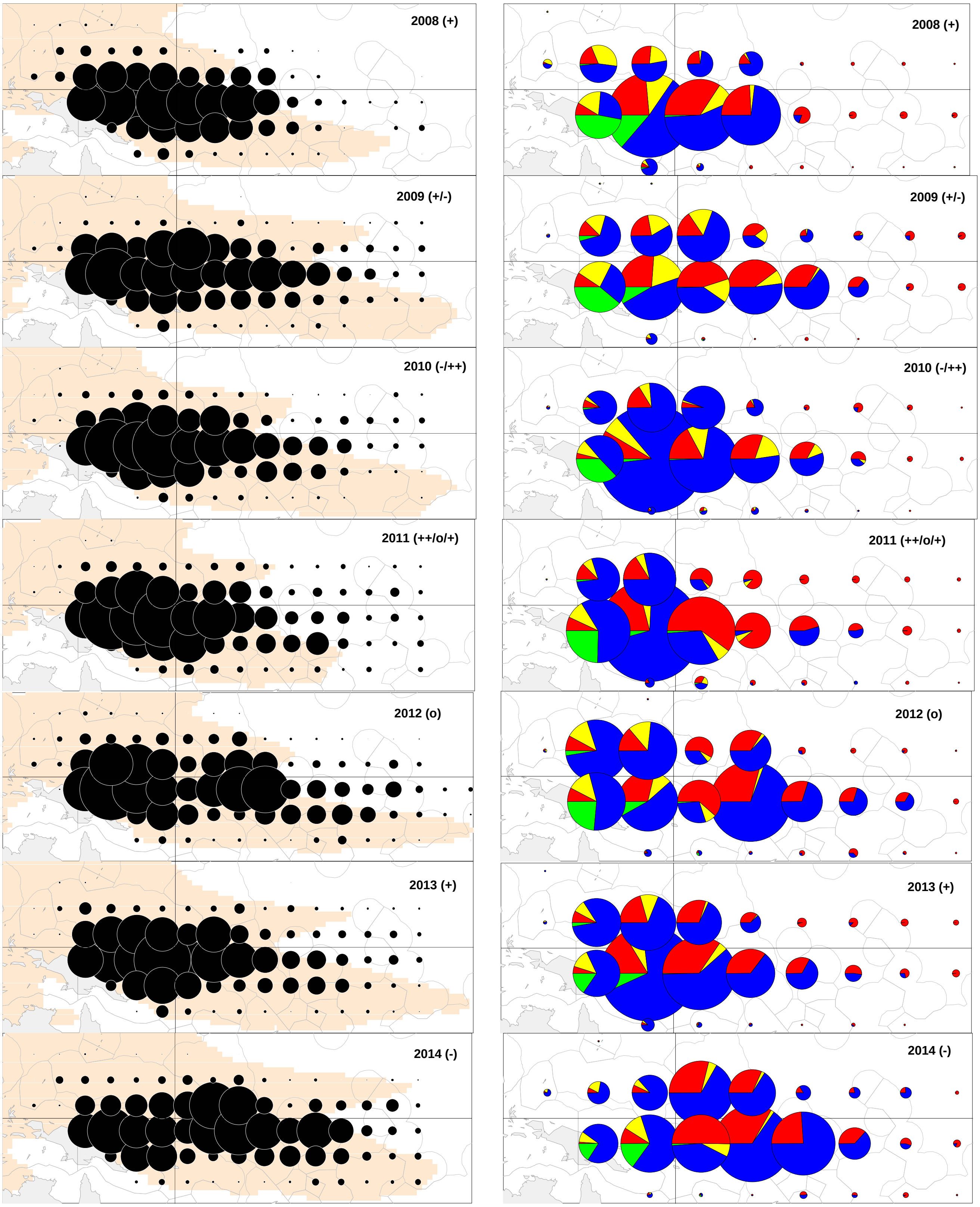

Figure 11. Distribution of purse-seine effort (days fishing – left; sets by set type – right), 2008–2014. (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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 12. Distribution of effort by Pacific Islands fleets during 2013 and 2014
lines for the equator (0° latitude) and 160°E longitude included.

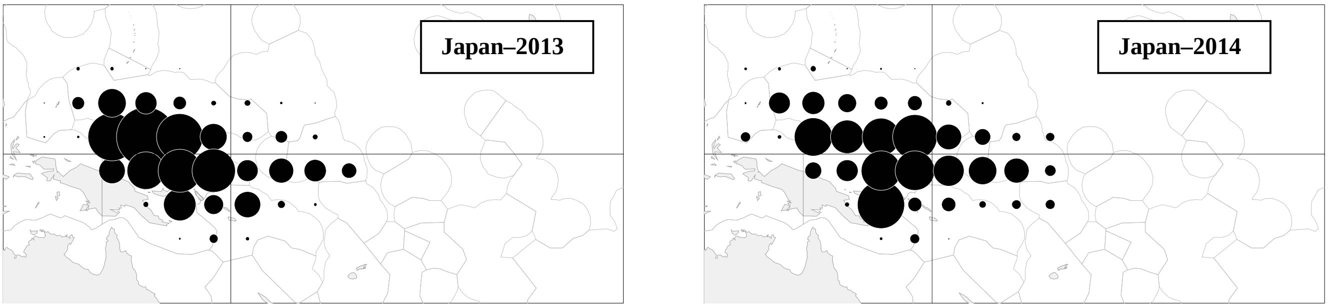

Figure 13. Distribution of effort by the Japanese purse seine fleet during 2013 and 2014
lines for the equator (0° latitude) and 160°E longitude included.

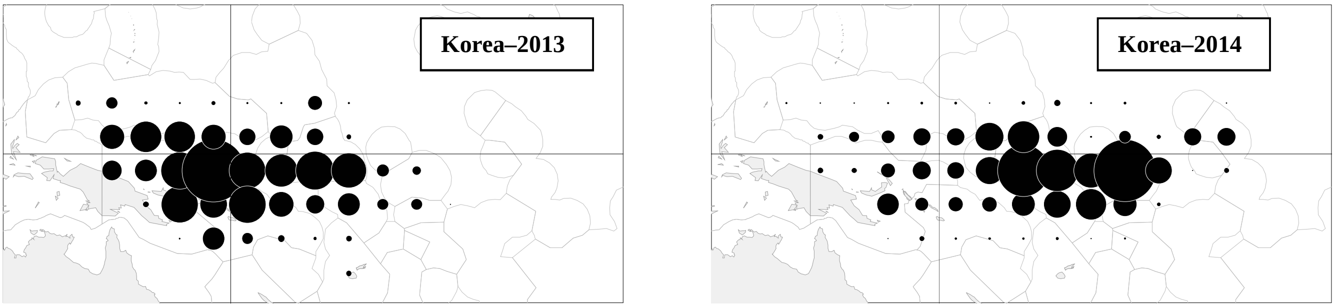

Figure 14. Distribution of effort by the Korean purse seine fleet during 2013 and 2014
lines for the equator (0° latitude) and 160°E longitude included.

Figure 15. Distribution of effort by the Chinese-Taipei purse seine fleet during 2013 and 2014
lines for the equator (0° latitude) and 160°E longitude included.

Figure 16. Distribution of effort by the US purse seine fleet during 2013 and 2014
lines for the equator (0° latitude) and 160°E longitude included.

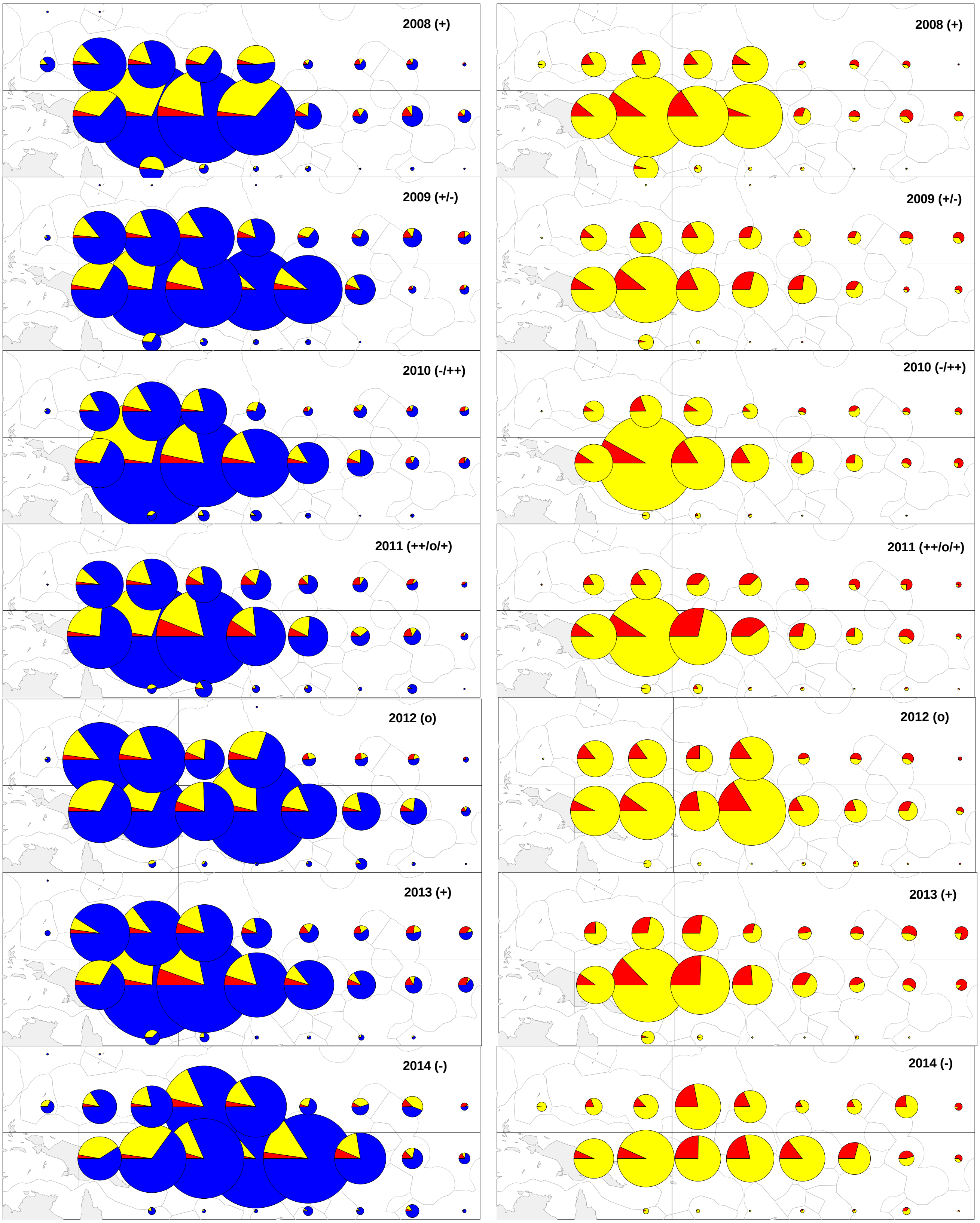

Figure 17. Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch (left) and purse-seine yellowfin/bigeye tuna catch only (right), 2008–2014 (Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).

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

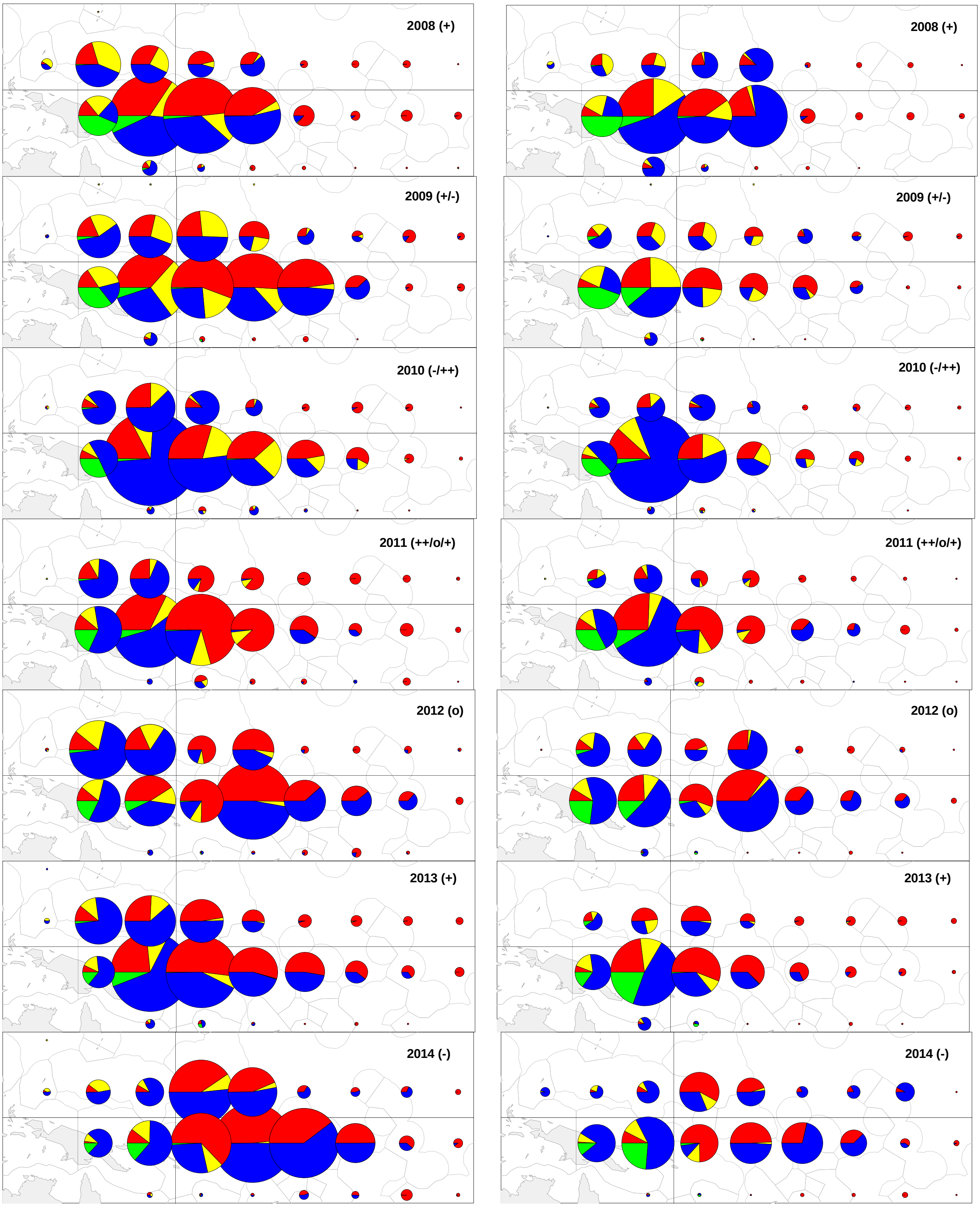

Figure 18. Distribution of skipjack (left) and yellowfin (right) tuna catch by set type, 2008–2014 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

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

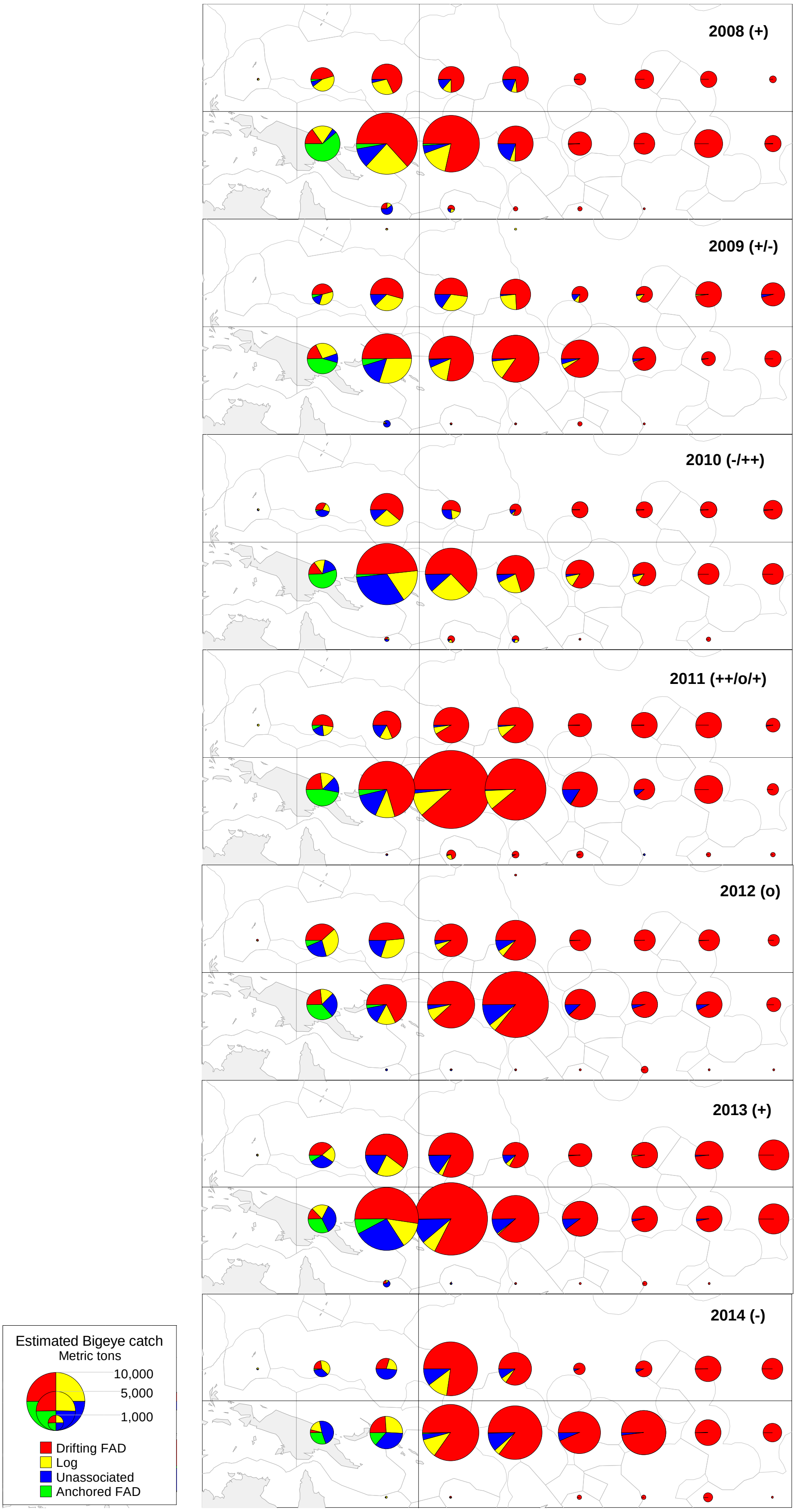

Figure 19. Distribution of estimated bigeye tuna catch by set type, 2008–2014 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).
ENSO periods are denoted by "+": La Niña; "-": El Niño; "o": transitional period.

3.5 Catch per unit of effort

Figure 20 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. Recent reviews of the available logsheet data used to determine nominal CPUE (see APPENDIX 1 in Tidd et al., 2015) highlight an apparent change in reporting behaviour with a clear increase in the reporting of transit days (over days searching); since transit days are not included as purse seine effort (and days searching is included), this change will inevitably result in a positive bias in the nominal CPUE data presented herein.

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. 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.

Overall purse seine skipjack CPUE for 2014 was clearly above the levels of recent years and, for several fleets, clearly the highest on record. The 2014 skipjack catch rates were lower for the Japanese fleet and related to concentrating their effort in the western areas where catch rates were lower than the eastern tropical areas; Figure A16 in the APPENDIX confirms that CPUE in the east was higher than in the west during 2014. Over the entire time series, the trend for skipjack CPUE is clearly upwards.

The purse seine yellowfin CPUE clearly increased for free-schools in 2014, and was related to the prevailing El Nino conditions with large yellowfin more available to vessels fishing in the eastern tropical areas (see Figure 17–right). In contrast, the yellowfin catch rates on drifting FADs declined for all fleets in 2014 (compared to 2013), but are still at elevated levels compared to the average over the last 10 years. The long-term time series for yellowfin CPUE shows more inter-annual variability and overall, a flatter trend in than the skipjack tuna CPUE; the recent change in reporting behaviour (Tidd et al., 2015) would suggest the yellowfin CPUE trend is declining, if this was taken into consideration. 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.

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 21). The trends in estimated bigeye tuna CPUE since 2000 varies by fleet and set type with no clear pattern evident; drifting FADs account for the highest catches and most variability.

Figure 22 shows the inverse relationship between monthly CPUE (total tuna catch (mt) per day) and average trip length estimates (from logsheets and VMS); logsheet trip length tends to fluctuate in synchrony with CPUE, with shorter trips corresponding to higher CPUE. Average trip length (from VMS data) generally compares well to average trip length (from logsheet data), but as logsheet coverage declines (e.g. early 2015), estimates from these two sources tend to diverge since available logsheets are probably not representative. The FAD closure period each year (commencing in 2010) generally coincides with a decline in total tuna CPUE, with longer trips and apparent difficulties obtaining consistent catches from free-swimming schools. In November 2013 (just after the FAD closure period of 2013), the total tuna CPUE rebounded strongly with high catch rates which were maintained into 2014. The main reason for the strong rebound appears to be related to a strong skipjack recruitment pulse in the last quarter which provided better catches from drifting FAD sets. During the 2014 FAD months (and unlike previous years), the relatively high total tuna CPUE was maintained which suggests free-swimming schools were more available. The logsheet catch/effort data used to determine total tuna CPUE are not complete for early 2015, but if average trip length (as determined by VMS data) is an indicator, then total tuna CPUE in the first half of 2015 appears to be at record levels.

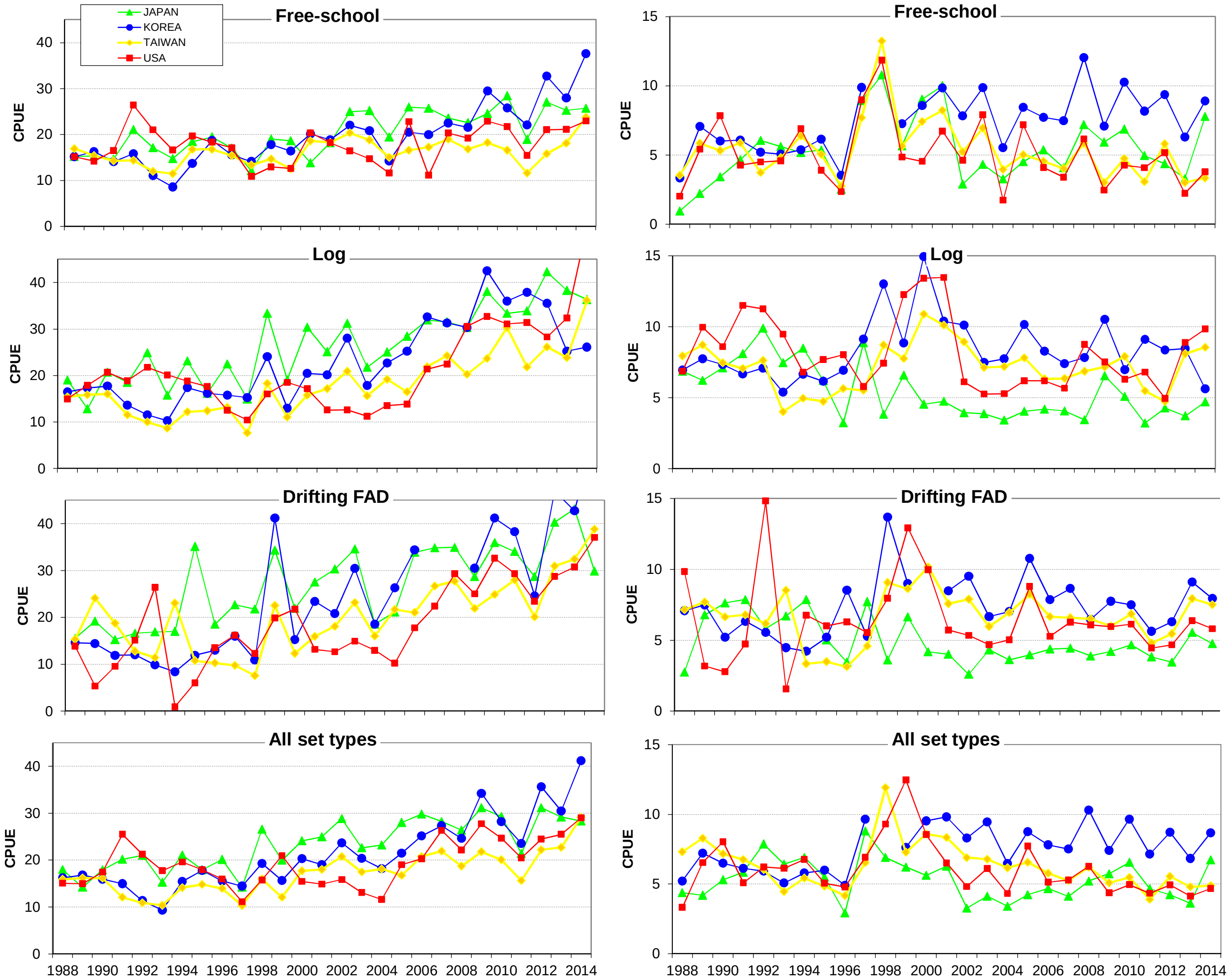

Figure 20. **Skipjack tuna CPUE (mt per day–left) and yellowfin tuna CPUE (mt per day–right) by set-type, and all set types combined, for selected purse-seine fleets fishing in the tropical WCP–CA.**
Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.

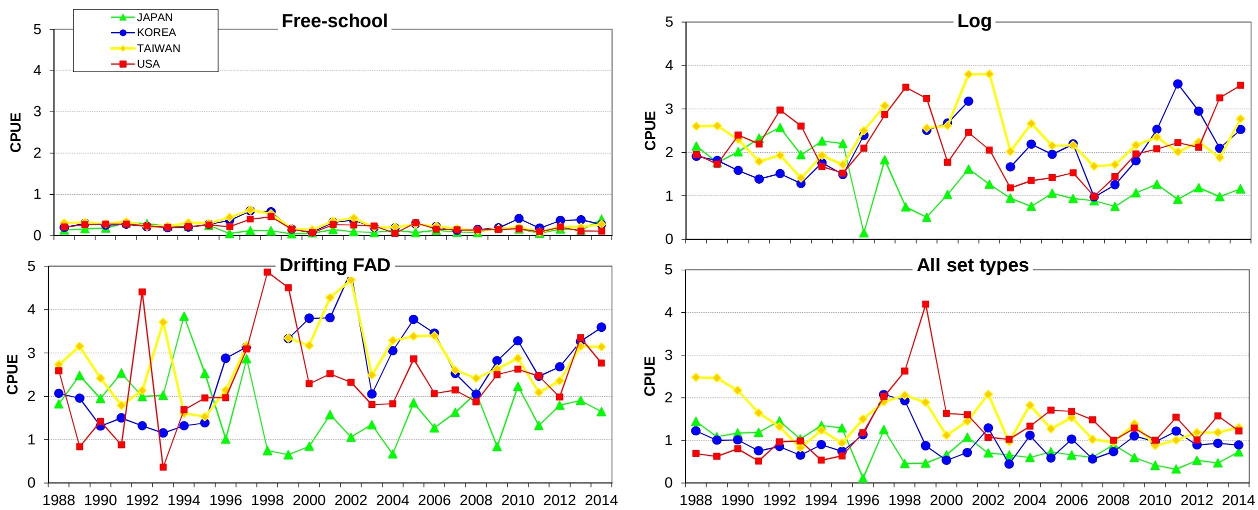

Figure 21. **Estimated bigeye tuna CPUE (mt per day) by major set-type categories (free-school, log and drifting FAD sets) and all set types combined for Japanese, Korean, Chinese-Taipei and US purse seiners fishing in the tropical WCP–CA.**
Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.

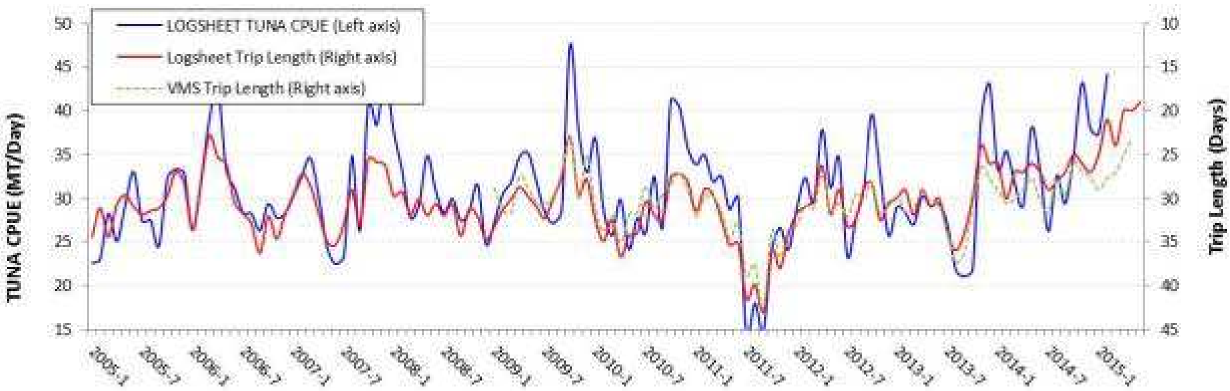

Figure 22. Monthly purse-seine tuna CPUE (mt/day) and average trip length **(Logsheet days and VMS days, excluding port visits and transit), 2005–2015.**

3.6 Seasonality

Figure 23 shows the seasonal average CPUE for skipjack (left) and yellowfin (right) in the purse seine fishery for the period 2000–2014, and Figure 24 shows the distribution of effort by quarter for the period 2000-2013 in comparison to effort by quarter in 2014. Over the period 2000–2013, 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 2000-2013, 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 trend in monthly skipjack CPUE for 2014 was above the 2000-2013 monthly averages, reflecting very good conditions for skipjack catches in the fishery. Unlike previous years, there was no apparent decline in the 2014 monthly skipjack CPUE during the FAD-closure months, with fleets experiencing good catch rates from free-swimming schools in the absence of FAD fishing. The fishery experienced very high (record) monthly skipjack CPUE in several months during 2014 (February, May, August and November: Figure 23–left). The monthly yellowfin CPUE for 2014 was slightly below the long-term monthly averages but with a similar trend of lower catch rates in the first six months and higher catch rates the latter six months (Figure 23 – right).

The El Nino-like conditions that developed during 2014 are evident with the more eastwards extension of the warm pool (i.e. surface water >28.5°C on average) for the 2^{nd}-4^{th} quarters 2014 when compared to the long-term average (2000-2013 – contrast the shading representing sea surface temperature in each quarter in Figure 24). The distribution of effort and catch in 2014 (Figure 24–right) was no doubt influenced by these conditions and resulted in most of the catch being taken in the eastern areas during ALL quarters. This situation is in contrast with the long-term average (Figure 24–left) where the majority of the purse seine catch is taken in the area west of 160°E during the first two quarters and only changing with the seasonal eastern extension of the fishery in the second half of the year. Catches in the third quarter of 2014 (when the FAD closure was in force) do not appear to be as constrained as in recent years for the same quarter, confirming good catch rates from free-swimming schools, although it is evident there were only small catches of bigeye tuna which is consistent with other years.

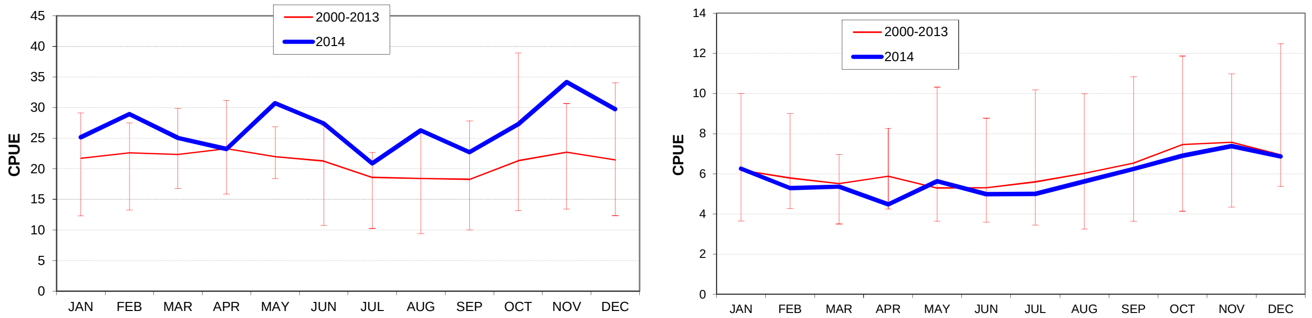

Figure 23. **Average monthly skipjack (left) and yellowfin (right) tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2000–2014.**
Red line represents the period 2000–2013 and the blue line represents 2014.
The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2000–2013.

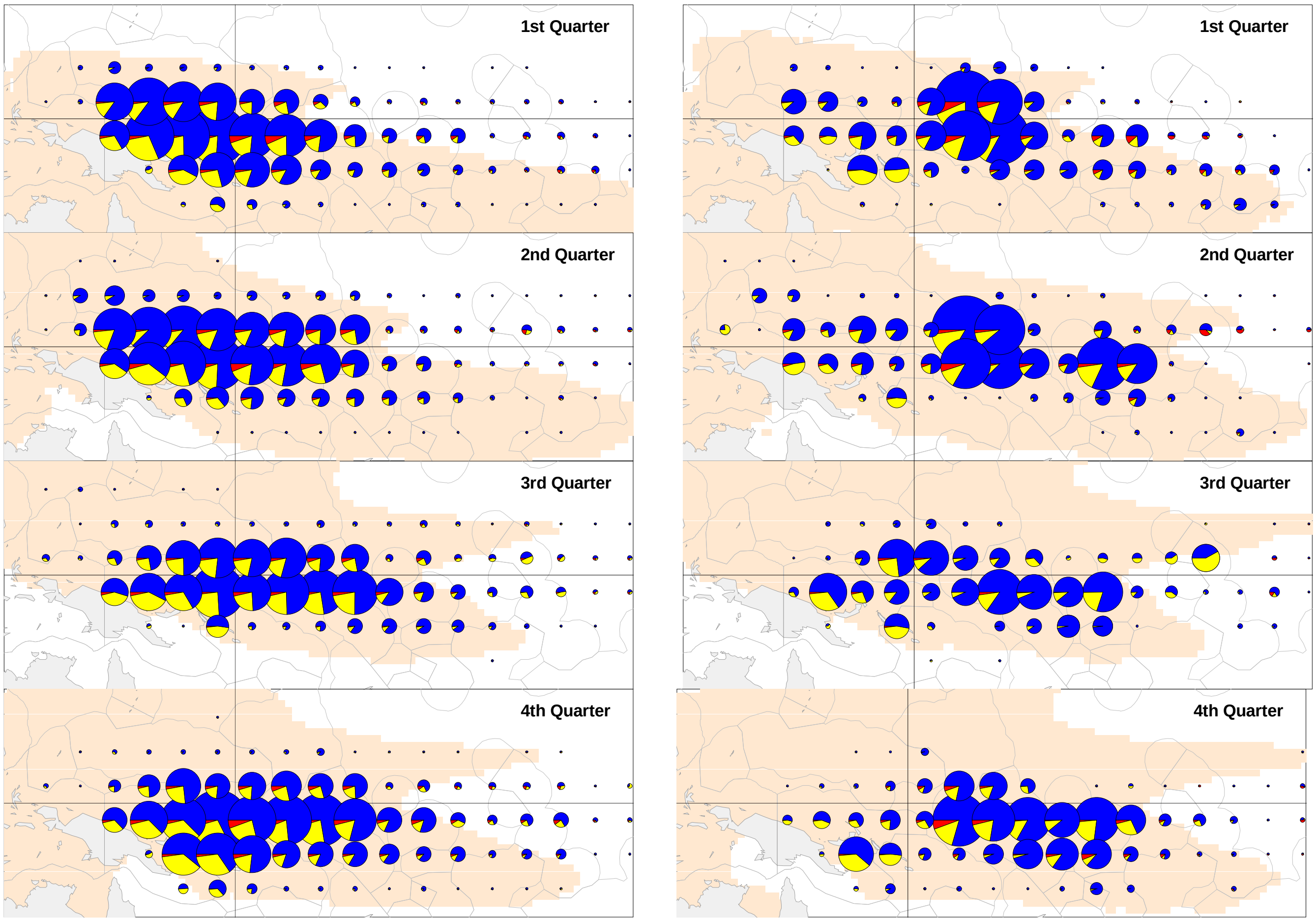

Figure 24. **Quarterly distribution of purse-seine catch by species for 2000–2013 (left) and 2014 (right).**
(Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye)
Pink shading represents the extent of average sea surface temperature >28.5°C by quarter for the period 2000–2013 (left) and 2014 (right)

3.7 Economic overview of the purse seine fishery

3.7.1 Price trends – Skipjack

Prices in the major markets for WCPO skipjack were lower in 2014 compared with 2013, underpinned by a mix of factors including persistently high raw material inventories due to generally good fishing and, lower demand at the end markets. The Bangkok benchmark (4-7.5lbs) and the Yaizu prices followed the same trend, down 30% and 26% respectively. The recent downward trend began in earnest in the second quarter of 2013 reversing the long-term uptrend in prior years (Figure 25). Similar trends occurred in other markets with the Thai Customs import and the General Santos prices lower by 30%, the Japan markets (in USD terms)[5] - Japan selected ports and Japan Customs imports - declined by 25% each while the Ecuador prices declined by 28%.

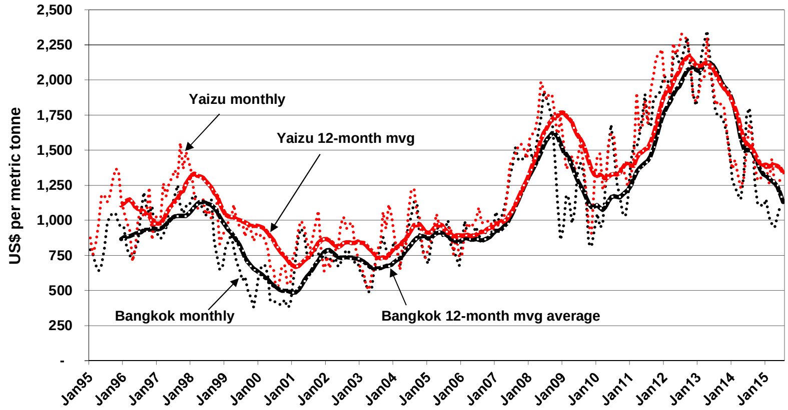

Figure 25. Skipjack prices, Bangkok (4-7.5lbs, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

The Bangkok benchmark skipjack price (4-7.5lbs) reduced from a peak of $2,350/Mt in April 2013 to a low of $1,500/Mt in December 2013. This downward trend continued to the end of the first quarter of 2014 when prices bottomed out in April at $1,150/Mt, the lowest since December 2010. Contributing factors to the decline in prices included high inventories of raw material held by processors and slow sales of processed goods exacerbated by exceptionally good catches following the FAD closure.

Over the rest of 2014, despite a spike in prices over the period May to July that saw prices rising from $1150 /Mt in April to $1800/Mt in July (typical of the lead up to the FAD closure), Bangkok prices declined sharply over the following months to reach $1,100 in December and further to a new low of $950/Mt by April 2015. This decline in prices was against the backdrop of generally favourable fishing conditions (see above) resulting in higher catch rates compared to the previous year, high inventories and slow movement of final products at end markets.

Since this time the Bangkok market has risen with skipjack prices (4-7.5lbs c&f) in mid-July reportedly around $1,250/Mt or 32% higher than the low in April although still considerably lower (31%) against the same month in 2013. Other markets have not as yet displayed such significant change in trends; Yaizu prices, for example, reached $1,293/Mt in June, only 6% up from the low in April. Nonetheless, prices in the first half of 2015 are still lower on that seen over the same period in 2014. For example, the Bangkok skipjack prices (January to July period) are 23% lower, the Yaizu prices (January to June) 3% lower and the Thai import prices (January to June) 15% lower.

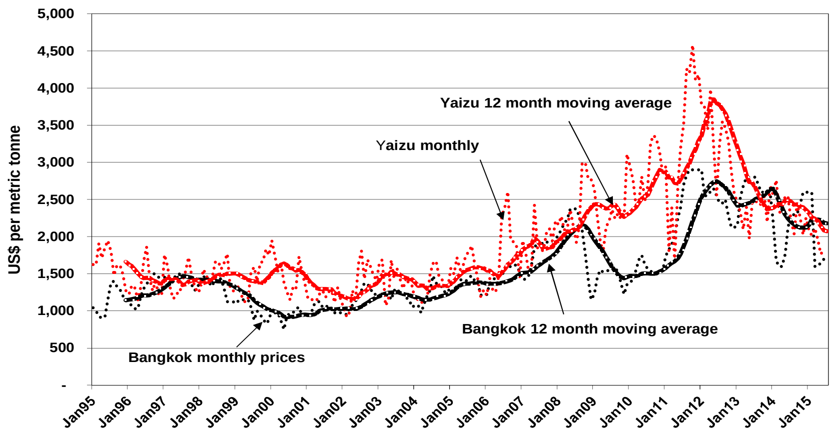

Figure 26. Yellowfin prices, Bangkok (20lbs and up, c&f) and Yaizu (ex-vessel) monthly and 12 month moving average

[5] The JPY depreciated against the USD over the year by 8% during 2014, to JPY120 per USD. This depreciation began as of 2013 following appreciation over the years 2007 to 2012 that was preceded by relatively stable but weak rates.

3.7.2 Price trends – Yellowfin

Yellowfin prices on canning markets were mostly down but at varying magnitudes; the Bangkok market price (20lbs+, c&f) down 20%, Thai import prices declined 21%, Yaizu down 2% (in USD terms) and General Santos (20lbs+, fob) down 30%. Bangkok yellowfin prices averaged $2,123/Mt in 2014 compared to $2,638/Mt in 2013. Bangkok prices remained at around $2,540/Mt through the last quarter of 2014 but fell rapidly over the first Quarter of 2015 to a low of $1,600/Mt in March/April. As with skipjack prices the yellowfin purse seine prices have recovered moderately to be around $1,700/Mt in mid-July.

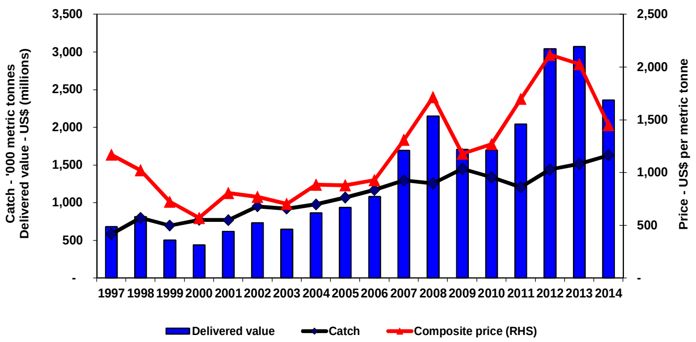

Figure 27. Skipjack in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

Japan Yaizu prices on the other hand declined only marginally in 2014, by 2% to $2,392/Mt (in JPY terms prices actually rose 6%). The price decline came wholly during the latter half when prices lowered by 10%. Over the first half of 2015, Yaizu prices averaged $1,988/Mt down by 13% against the first and second halves of 2014. An estimated 20%-25% of the Japanese purse seine yellowfin catch is sold as low grade sashimi product and this is factored in the price variations.

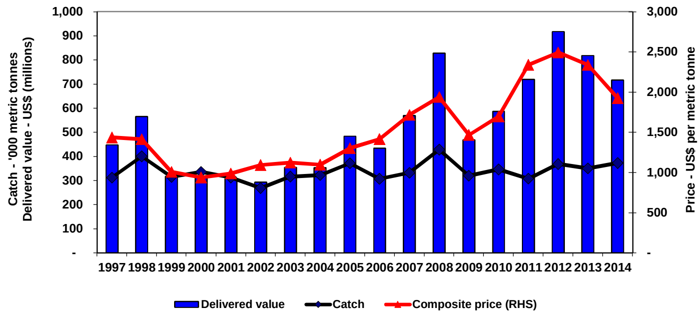

Figure 28. Yellowfin in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

At General Santos, yellowfin prices (20lbs+, fob) averaged $2,149/Mt, a significant 30% drop from $3,053/Mt in 2013. Price volatility prevailed during the months of the first half of the year with price range between $1,725/Mt and $2600 but was steady at $2,225/Mt throughout the second half and the first two months of 2015. Since then prices have fallen by 19% to $1,850/Mt in mid-July. Prices in General Santos over the period January to July 2015 are 7% lower compared to the average price in the same period in 2014.

3.7.3 Value of the Purse-seine Catch

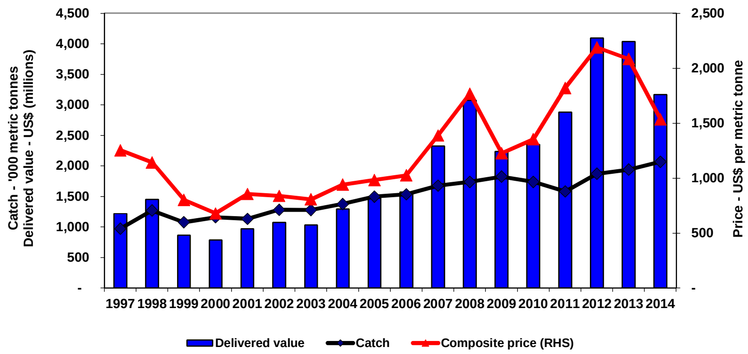

Figure 29. All tuna in the WCPFC purse seine fishery – Catch, delivered value of catch and composite price

As a means of examining the effect of the changes in prices and catch levels, estimates of the "delivered" value of the purse seine fishery tuna catch in the WCPFC Area from 1997 to 2014 were obtained (Figures 27-29). 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.[6]

The estimated delivered value of the entire purse seine tuna catch in the WCP-CA area for 2014 is $3,171 million compared with $4,038 million in 2013. This represents a decrease of $867 million (21%) from 2013.

[6] 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.

This decrease resulted from the $711 million (23%) decrease in the delivered value of the skipjack catch (worth $2,359 million in 2014) resulting from the decline in the skipjack composite price, -29%, that more than offset the 7% increase in catch) as well as the decline of $101 million (12%) in the value of the yellowfin catch caused by the 18% drop in the yellowfin composite price that more than offset the 6% increase in yellowfin catch[7]

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).

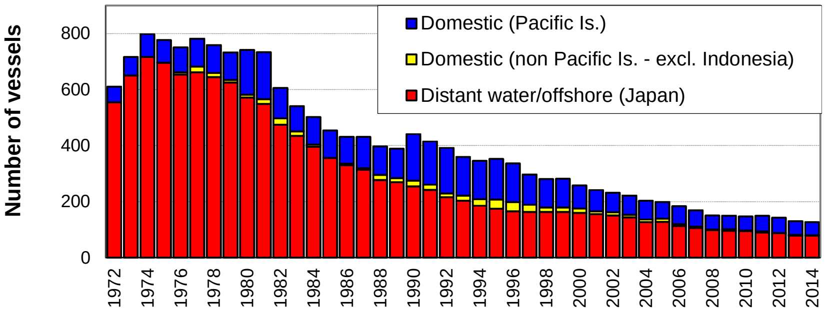

Figure 30. Pole-and-line vessels operating in the WCP–CA
(excludes pole-and-line vessels from the Japanese Coastal and Indonesian domestic fisheries)

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 30) and in the annual pole-and-line catch during the past 15–20 years (Figure 31). 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 Fiji, Palau and Papua New Guinea are no longer active, only one vessel is now operating (occasionally) in Kiribati, and fishing activity in the Solomon Islands fishery during the 2000s was reduced substantially from the level experienced during the 1990s. Several vessels continue to fish in Hawai'i, and the French Polynesian *bonitier* fleet remains active (43 vessels in 2014), but an increasing number of vessels have turned to longline fishing. Vessel and catches from Indonesian pole-and-line fleet have also declined over recent years. However, there is at least one initiative underway to revitalize the domestic pole-and-line fisheries with increased interest in pole-and-line fish associated with certification/ecolabelling.

[7] 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).

4.2 Catch estimates (2014)

The provisional 2014 pole-and-line catch (203,736 mt) was the lowest annual catch since the late-1960s and continuing the trend in declining catches for three decades.

Skipjack tends to account for the majority of the catch (~70-83% 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 (5–16%) and a small component of bigeye tuna (1–4%) make up the remainder of the catch. There are only five pole-and-line fleets active in the WCPO (French Polynesia, Japan, Indonesian, Kiribati and Solomon Islands). Japanese distant-water and offshore fleets (100,347 mt in 2014), and the Indonesian fleets (102,093 mt in 2014), account for nearly all of the WCP–CA pole-and-line catch (99% in 2014). 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 2014 reduced to only 79 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 with catches generally less than 1,000 mt (649 mt in 2014).

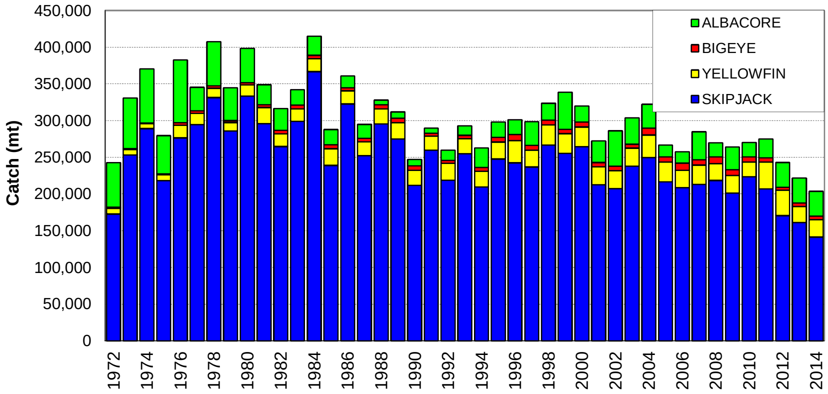

Figure 31. Pole-and-line catch in the WCP–CA

Figure 32 shows the average distribution of pole-and-line effort for the period 1995–2014. 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.

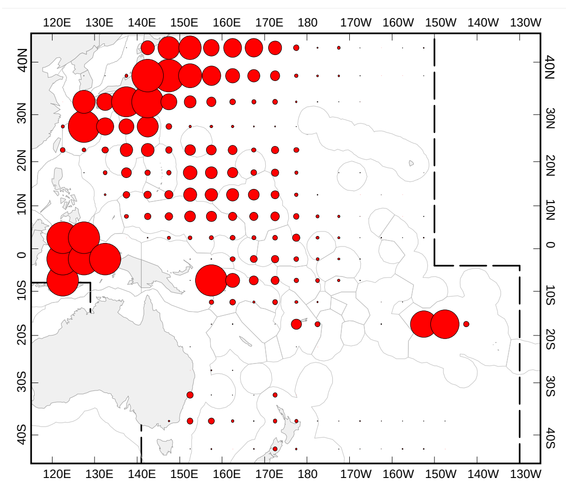

Figure 32. Average distribution of WCP–CA pole-and-line effort (1995–2014).

4.3 Economic overview of the pole-and-line fishery

4.3.1 Market conditions

Japan skipjack pole and line fishing is seasonal with the period of southern skipjack pole and line fishing normally between November and June and then both near shore albacore and eastern offshore skipjack mainly during the period from July to October.

The price of pole and line caught skipjack at Yaizu in 2014 averaged $2,356/Mt compared with $2,402 in 2013, a slight decline of 2%. The price of catch in waters off Japan averaged $3,056/Mt (¥323/kg), an increase of 26% (37% in JPY terms) compared to 2013. The price of skipjack caught in waters south of Japan decreased, however, by 6% to $2,243/Mt (+2% to ¥237).

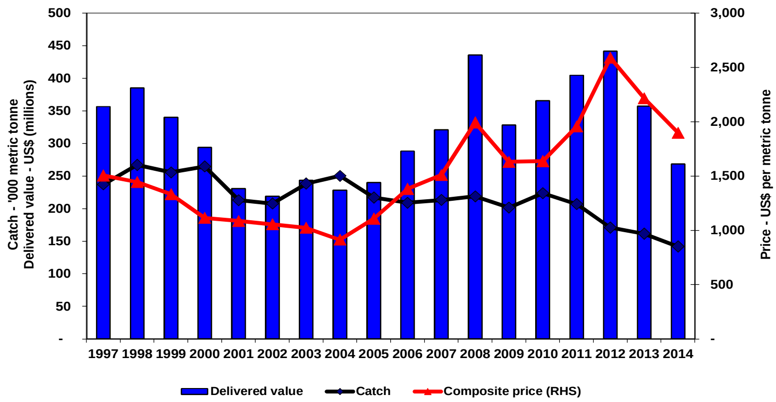

Figure 33. Skipjack in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

Over the first half of 2015 Yaizu pole and line prices have continued to deteriorate. The overall average at $2,187/Mt is 17% lower than in the latter half of 2014 and 9% lower than the comparable period last year. The southern pole and line component averaged $2,211/Mt that is lower by 8% over the previous half year and 9% lower than the first half of 2013. The near shore / eastern offshore pole and line price averaged $2,093, lower by 38% against the average for the latter half of 2014 but 8% higher against prices in the same period last year .

As a means of examining the effect of the changes in price and catch levels over the period 1997-2014, 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 33 and 34. The estimated delivered value of the total catch in the WCPFC pole and line fishery for 2014 is $506 million.[8] This is a decrease of $153 million (23%) on 2013 caused by declines in catch and prices, 9% and 16% respectively.

The estimated delivered value of the skipjack catch in the WCPFC pole and line fishery for 2014 is $421 million. This represents a decline of 17% ($87 million) compared to 2013 and results from decreases of 17% (18,000 Mt) in catch 10% in the composite price.

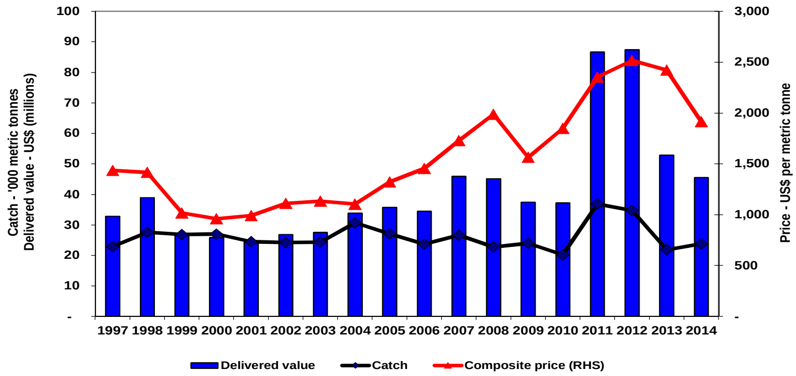

Figure 34. All tuna in the WCPFC pole and line fishery – Catch, delivered value of catch and composite price

[8] 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, 2014), 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 3,000 and 6,000 for the last 30 years (Figure 35), 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.

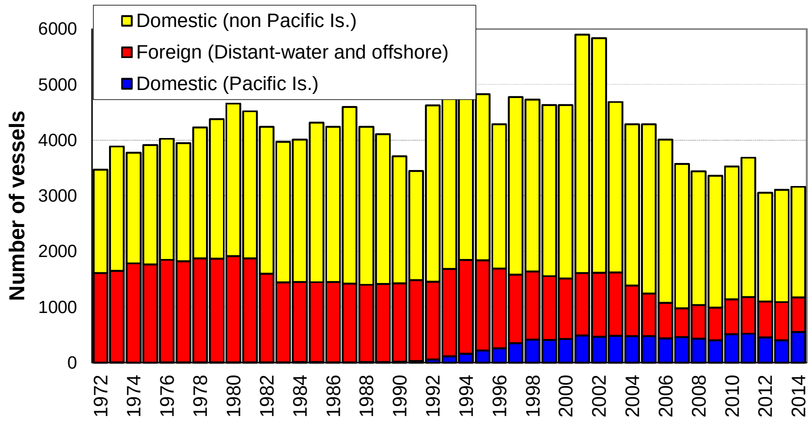

Figure 35. Longline vessels operating in the WCP–CA
(Available data does not make the distinction between foreign "distant-water" and "offshore")

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, Kiribati, 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, although the latter fleet has not fished recently. Vessel numbers have stabilised in recent years but they may also vary depending on charter arrangements.
- **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. The Portuguese fleet (one vessel) started fishing in 2011.
- **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 Vietnam 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 35). The commercial handline fleets target large yellowfin tuna which comprise the majority of their overall catch (> 90%).

The WCP–CA longline tuna catch steadily increased from the early years of the fishery (i.e. the early 1950s) to 1980 (226,229 mt), but declined to 155,402 mt in 1984 (Figure 36). 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–34%; BET–28%; YFT–38% in 2014) 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).

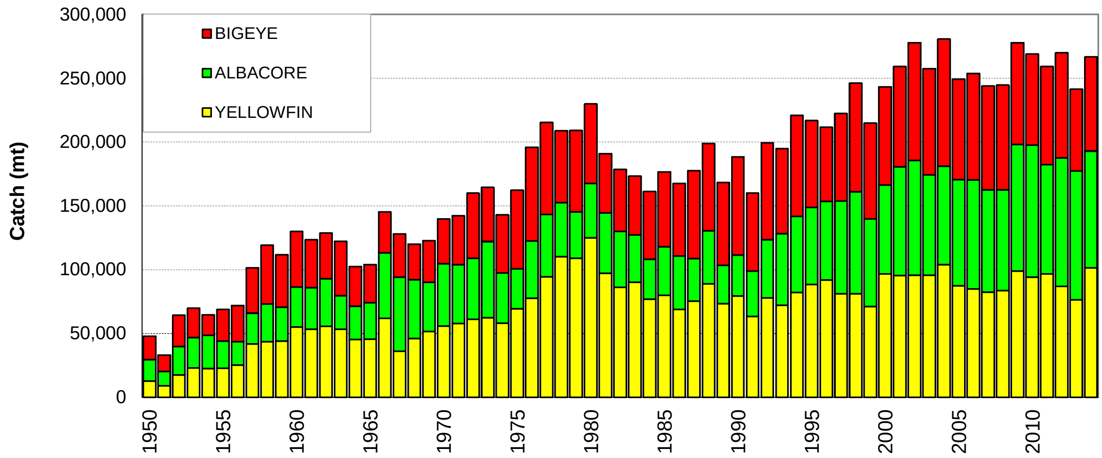

Figure 36. Longline catch (mt) of target tunas in the WCP–CA

5.2 Provisional catch estimates and fleet sizes (2014)

The provisional WCP–CA longline catch (268,795 mt) for 2014 was slightly above the average for the past five years. The WCP–CA albacore longline catch (91,414 mt – 34%) for 2014 was the lowest for three years, 12,000 mt. lower that the record of 103,466 mt attained in 2010. The provisional bigeye catch (73,898 mt – 27%) for 2014 was higher than in 2013 but still amongst the lowest catches since 1996. In contrast, the yellowfin catch for 2014 (101,552 mt – 38%) was the highest for more than ten years, with increased catches by a number of fleets.

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 catches are now at a similar level as the 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, but with variations in areas fished and target species. The Japanese distant-water and offshore longline fleets have experienced a substantial decline in both bigeye catches (from 20,725 mt in 2004 to 8,812 mt in 2014) and vessel numbers (366 in 2004 to 111 in 2014). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 6,006 mt (in 2014), mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 62 vessels in 2014). The Korean distant-water longline fleet also experienced declines in bigeye and yellowfin catches over the past decade in line with a reduction in vessel numbers – from 184 vessels active in 2002 reduced to 108 vessels in 2008, but back to 113 vessels in 2014.

With domestic fleet sizes continuing to increase as foreign-offshore and distant-water fleets decrease (Figure 35), 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–SC10 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.

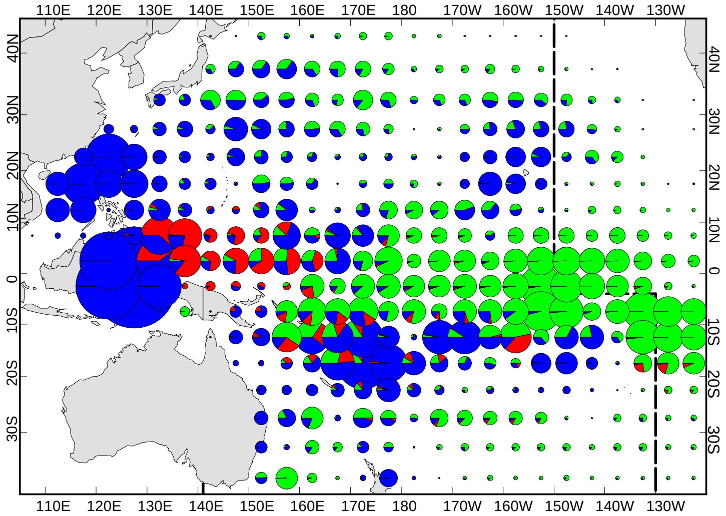

Figure 37. Distribution of longline effort for distant-water fleets (green), foreign-offshore fleets (red) and domestic fleets (blue) for the period 2000–2014.

(Note that distant-water effort for Chinese-Taipei and other fleets targeting albacore in the North Pacific is poorly covered)

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 and CPUE standardisation papers regularly prepared as WCPFC Scientific Committee (SC) papers.

5.4 Geographic distribution

Figure 37 shows the distribution of effort by category of fleet for the period 2000–2014. 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.

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, Chinese-Taipei and Vietnamese **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 fleets in this category are the Cook Islands, Samoan, Fijian, French Polynesian, Solomon Islands (when chartering arrangements are active) and Vanuatu fleets (Figure 38).

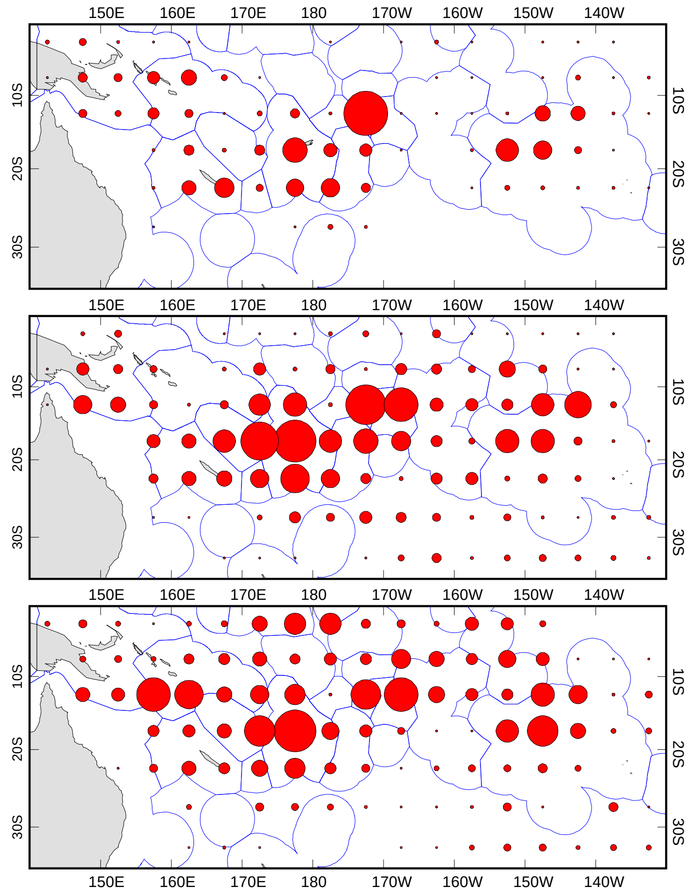

Figure 38. Distribution of south Pacific-island fleet longline effort for 1999 (top), 2004 (middle) and 2014 (bottom). Note that 2014 includes estimated effort for charter vessels assigned according to the WCPFC CMM on charter notification.

Figure 39 shows quarterly species composition by area for the period 2000–2013 and 2014. 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 in the tropical eastern areas is evident when comparing the 2000-2013 quarterly averages (Figure 39–left) with the 2014 catches (Figure 39–right). The 2014 data are considered preliminary for some fleets, but nonetheless show an apparent decline in the catches of south Pacific Albacore in the west, increased albacore catches in sub-tropical area east of French Polynesia (10°-20°S) in the 4th quarter, and an absence of catch in the area from the Gilbert Group to Line Group (0°-5°N) in the 3rd and 4th quarters, possibly due to the prevailing El Nino conditions.

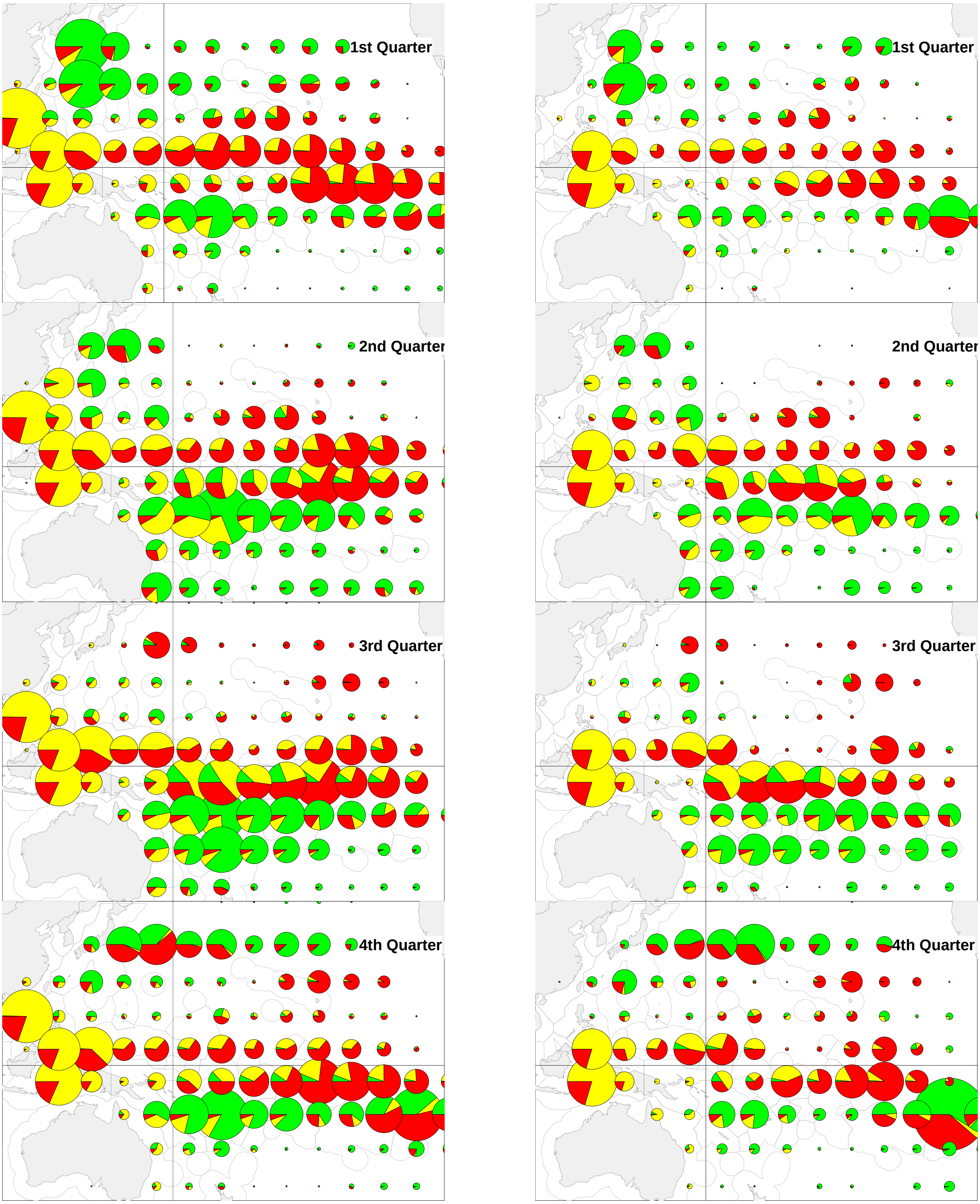

Figure 39. Quarterly distribution of longline tuna catch by species, 2000-2013 (left) and 2014 (right)
(Yellow–yellowfin; Red–bigeye; Green–albacore)
(Note that catches from some distant-water fleets targeting albacore in the North Pacific may not be fully covered)

5.5 Economic overview of the longline fishery

5.5.1 Price trends – Yellowfin

Japan fresh yellowfin import prices (c.i.f., USD) in 2014, from all sources, was steady (+9% in JPY terms) while Yaizu port fresh & frozen prices (ex-vessel) improved by a moderate 4% (+13%) continuing the recent trend where of moderate improvements against increasingly tight supply conditions as well as the substantial weakening of the JPY currency (Figure 40). US import prices (f.a.s.) in 2014 also remained steady relative to 2013.

The average price in 2014 for the Japan fresh yellowfin prices from all sources averaged $9.45/Kg, broadly comparable to 2013 average price. Over the first four months of 2015, however, the overall import prices fell by 9% to $8.62/Kg to the same period in 2014.

The Yaizu port 2014 longline caught yellowfin fresh/frozen prices (ex-vessel) increased by 4% to $6.48/Kg. Over the first half of 2015, however, the prices have reduced by 17% compared to the prices in first half of 2014.

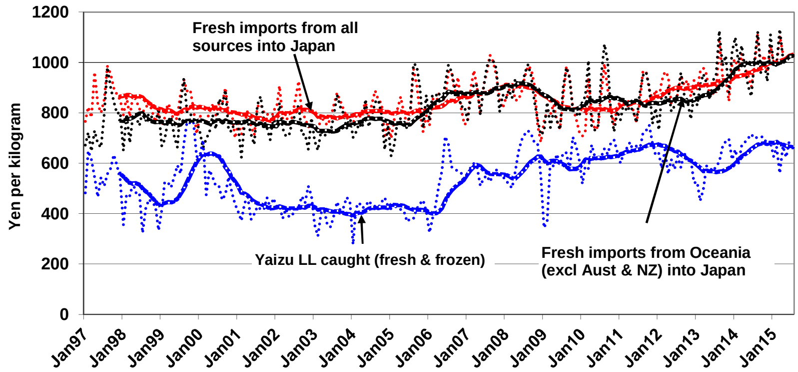

Figure 40. Yellowfin prices in $: US fresh imports (f.a.s.), Japanese fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

Over the long-term the yellowfin Japanese markets (JPY terms) have been on uptrend, but only because of improvements in recent years as, the in the earlier years, prices were stagnant and even declining. Broadly, there has been overall downtrend in demand in Japan for yellowfin (and bigeye) as reflected in its annual import trends; fresh yellowfin imports have steadily declined over the years with imports in 2014 at just more than 8,000 Mt being the lowest on record that represents a decline of 19% on last year's and 78% from a high of 36,500 Mt in 2001. In US$ terms, the Japanese prices for longline caught yellowfin have shown overall steady upward long-term trends till 2012 but have declined since (reflective of the strengthening of the JPY when it started to weaken substantially).

The US fresh yellowfin import prices from all sources averaged $9.64 (f.a.s.) in 2014, generally comparable to the levels in the previous three years but 20% up on 2010. Over the first half of 2015, prices have shown continuing stability to be less than 1% higher than during the first half of 2014. Imports of fresh yellowfin have been broadly steady at around 16,000 Mt annually over recent years. Imports from Oceania which declined significantly between 2001 and 2011 have now stabilized at around 1,200 mt.

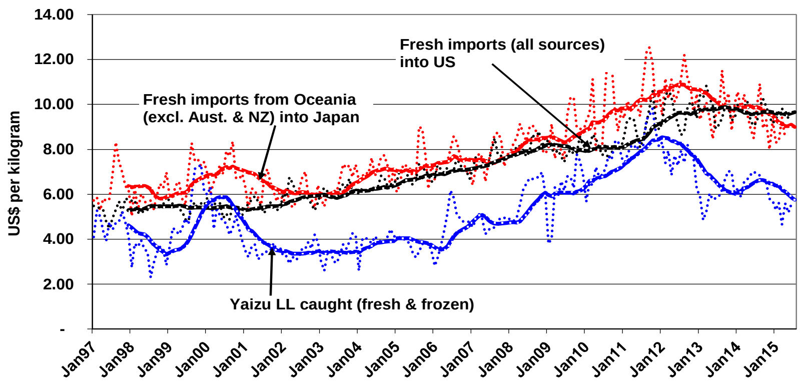

Figure 41. Yellowfin prices on Japanese markets; fresh imports from all sources (c.i.f.), fresh imports from Oceania (c.i.f.) and Yaizu longline caught (ex-vessel)

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

5.5.2 Price trends – Bigeye

The Japan market prices for fresh bigeye imports (US$ terms) from all sources weakened slightly by 2% (+6% in JPY terms) while Japan selected ports frozen prices rose by 2% (+11%). These developments were against reportedly sluggish fishing conditions for bigeye with the consequent running down of inventories in Japan. Prices have trended up moderately over the past three years (Figure 42).

The Japan market price for fresh imports in 2014 averaged $9.47/Kg (c.i.f., equivalent of ¥1,002/Kg) and $9.03/Kg (ex-vessel, ¥956/Kg) for frozen landings at Japan selected ports.

Over the first half of 2015, the overall import price for fresh bigeye from all sources was at $9.00/Kg (¥1,076/Kg), respectively -7% and 1% on the first and second half averages of 2014.

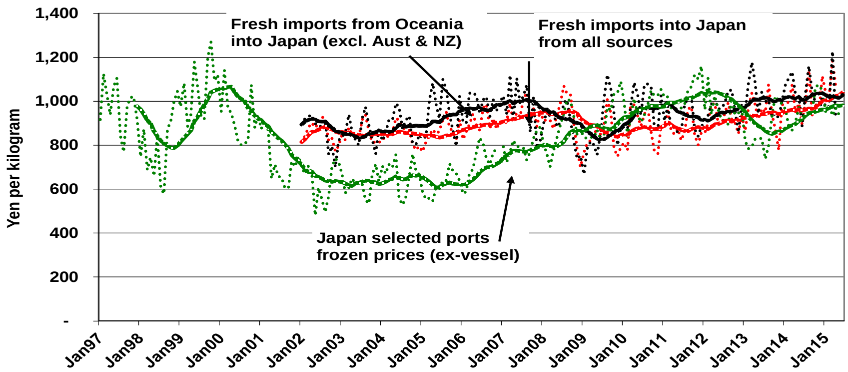

Figure 42. Bigeye prices on Japanese markets; fresh imports all sources (c.i.f.), fresh imports from Oceania (c.i.f.) and Japan selected ports (ex-vessel)

Sources: Ministry of Finance (www.customs.go.jp), FFA Tuna Industry Advisor, and US National Marine and Fisheries Service (swr.nmfs.noaa.gov)

For frozen landings at Japan selected ports the overall price during the first half of 2015 was $8.00/Kg (¥956/Kg), respectively 11% up and 13% down on the first half and second half averages in 2014.
As for fresh yellowfin, the trends in the Japanese market prices for fresh bigeye (JPY terms) were stagnant and even declining in earlier years but there have been upturns in recent years. The volume of fresh imports has been on downtrend; fresh bigeye imports have steadily declined over the years with imports in 2014 at 10,000 Mt being the lowest on record that represents a decline of 13% on last year's and 55% from a high of 22,000 Mt in 2002. In US$ terms, the Japanese prices for longline caught bigeye have shown overall steady upward long-term trends till 2012 but have declined since (because of the exchange rate factor).

In the US market the fresh bigeye import price in 2014 broadly maintained its 2013 level with a slight decline of 2%. Import volumes for fresh bigeye into the US have also been on a long-term declining trend. Imports in 2014 came to 4,126 Mt, a moderate 3% increase on 2013 but substantially down by 44% on the past peak of more than 7,000 Mt in 2003.

5.5.3 Price trends – Albacore

Albacore prices experienced improvements during 2014 across markets; the Bangkok benchmark (10kg and up) increased 15% (following a 28% drop the previous year), Thai frozen imports 14% (-29%), Japan selected ports fresh (ex-vessel) 12% (-27%) and US imports fresh (f.a.s.) 19% (-12%). The price increase in Bangkok market was against supply shortages and increased demand especially over the first half of 2014 and to a lesser extent in the third quarter of the year. Nonetheless, while the overall trend in albacore prices during 2014 reversed the previous year's trend, prices remained well below the 2012 levels when prices were at their peaks. Many of the forces that caused prices to plummet in recent years remain unresolved including oversupply of raw material attributed to the high catch levels from the expansion in

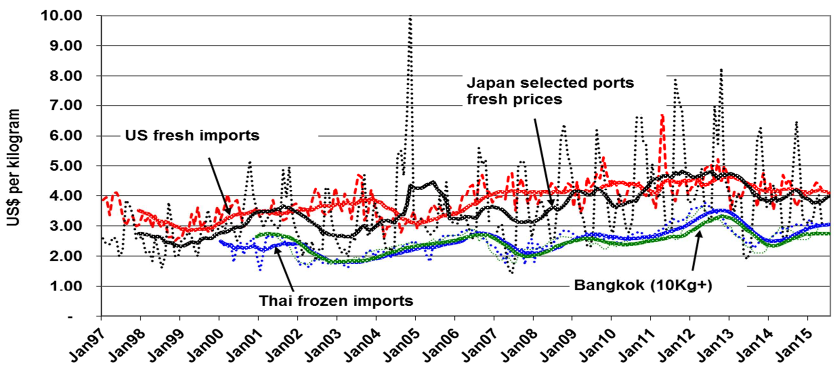

Figure 43. Albacore prices in $: Thai frozen imports, Japan fresh / frozen selected ports (ex-vessel) and US fresh imports (f.a.s.)

the number of Chinese mini-longline vessels, the entry into the Pacific of Taiwanese longline vessels from the Indian Ocean as they switched away from bigeye targeting because of deteriorating economic conditions in that fishery, and stagnant demand in the US for canned albacore. These developments took adverse toll on markets and on many Pacific Islands fleets.

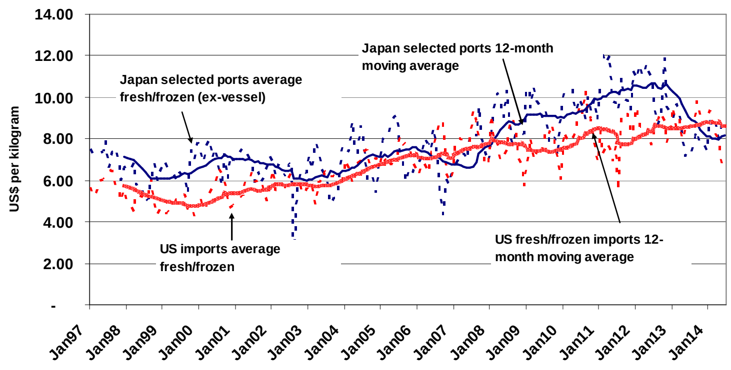

Figure 44. Swordfish prices in $: Japan selected ports fresh/frozen (ex-vessel) and US fresh/frozen import prices (f.a.s.)

There has continued to be a marked recovery in albacore prices recently with the Bangkok price trending up from $2,600 at the end of 2014 to US$3,100 in May but reducing somewhat to $3,000 in July 2014. The increase in price reflected the limited supply over this period.

5.5.4 Price trends – Swordfish

The US swordfish market weighted average price (fresh and frozen, f.a.s.) averaged $8.60/Kg in 2014, lower by 3% compared to the 2013 average that follows from a rise of 3% in 2013. Against the moderate price decrease, the volume of imports rose by 20% to more than 7,000 Mt while in value terms the increase was 17% to $61 million. The long-term trend of swordfish prices in the US market has been up from around $5.00/Kg to almost $9.00/Kg over the years, there have been apparent stagnancies in between years (Figure 44).

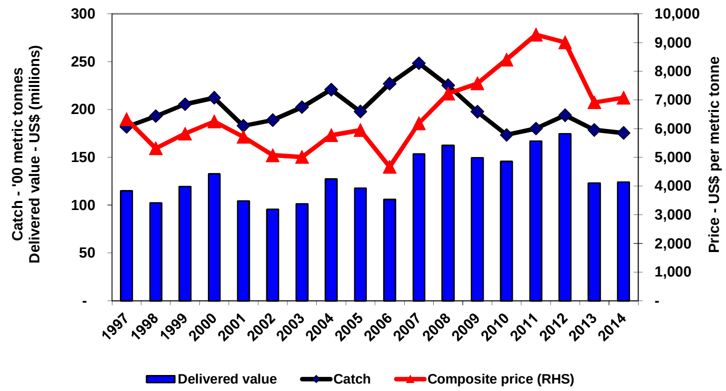

Figure 45. Swordfish in the WCPFC-CA longline fishery – Catch, value and price

A broadly similar trend is shown for the Japan market based on landings data at Japan selected major ports although clear declines have occurred in the last several years (Figure 43). The weighted ex-vessel average price for swordfish at Japan selected ports in 2014 was $8.18 (¥866/Kg), a marginal more than 1% increase (+10% in JPY terms) from the previous year's while the landed volume rose by 4% to 4,000 mt.

In the first half of 2015, the US fresh import prices averaged $7.55/Kg $8.56/Kg, a decrease of 12% as imports declined 20% compared to the same period last year. The Japan market prices, based on landings at Japan major ports, averaged ¥886/Kg ($8.62/Kg), the same as in the corresponding period last year while landings rose significantly 30%.

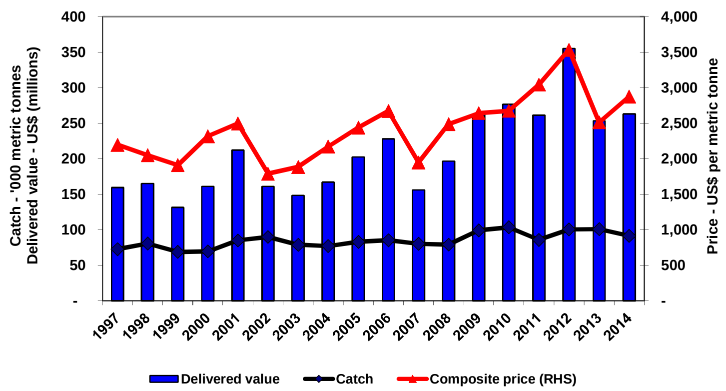

Figure 46. Albacore in the WCPFC longline fishery – Catch, delivered value of catch and composite price

For purposes of estimating the annual value of swordfish taken in the WCP-CA, the Japan selected ports fresh and frozen market prices (ex-vessel) are used with the assumption that all DW longline fleets of Japan and Taiwan along with all Korean longline catches are frozen and the remaining catches constitute fresh deliveries.[9] The estimated delivered value of the longline swordfish catch in the WCP-CA for 2014 is $124 million, only marginally up by less than 1% on the estimated value of the catch in 2014 resulting from moderate price increases of more than 2% that more than offset the less than 2% decrease in catch (17,850 to 17,539 Mt).

5.5.5 Value of the longline catch (excluding swordfish)

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 2014 was obtained (Figures 46–49). 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.[10]

The estimated delivered value of the longline tuna catch in the WCPFC area for 2014 is $1,685 million. This represents an increase of $251 million (18%) on the estimated value of the catch in 2013. The value of all target species registered increases - albacore catch value increased by $10 million (4%), bigeye by $53 million (9%) and yellowfin by $188 million (31%).

The albacore catch was estimated to be worth $263 million in 2014, a 4% increase on 2013 resulting from the 14% increase in the composite price that more than offset the 9% decrease in the estimated catch. The bigeye catch was estimated to be worth $627 million in 2014, an increase of 9% compared to 2013 accounted for by the 15% increase in catch as against the decline of 5% in price. The estimated delivered value of the yellowfin catch was $792 million in 2014, an increase of 32% accounted for by the 33% increase in catch as price reduced marginally by less than 1%.

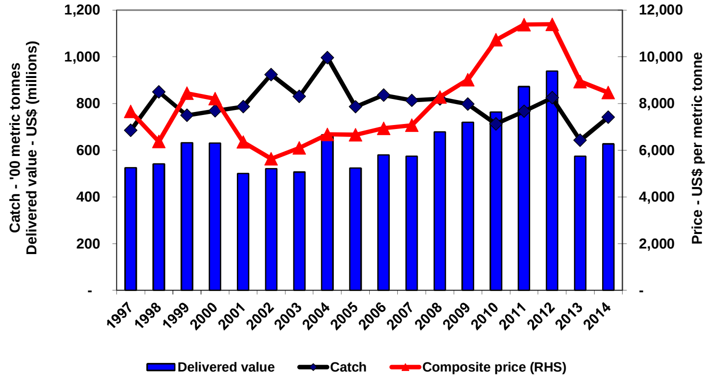

Figure 47. Bigeye in the WCPFC longline fishery – Catch, delivered value of catch and composite price

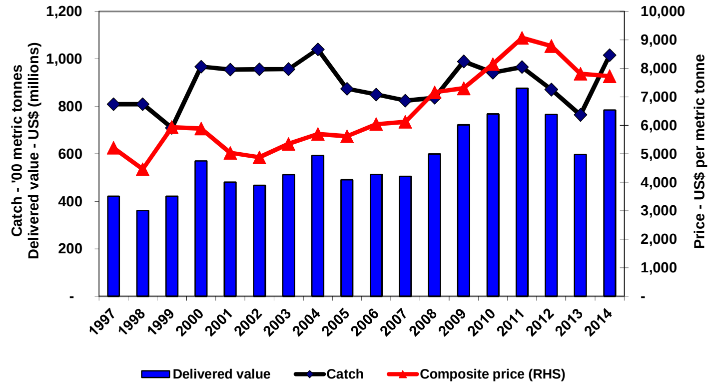

Figure 48. Yellowfin in the WCPFC longline fishery – Catch, delivered value of catch and composite price

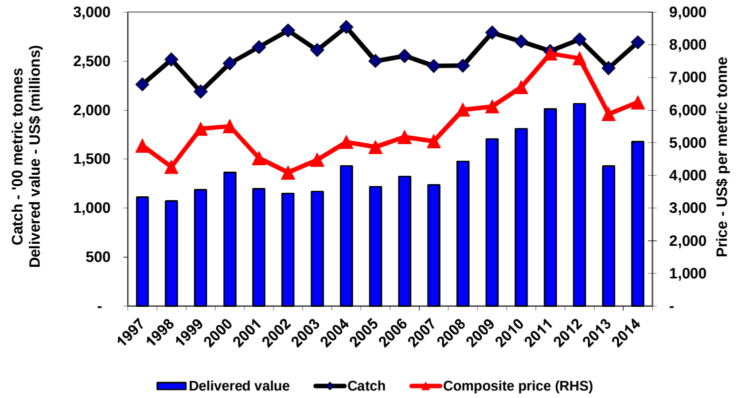

Figure 49. All tuna in the WCPFC longline fishery – Catch, delivered value of catch and composite price

[9] The Japan market prices are used given the larger portion of swordfish catch in the WCP-CA is accounted for by Japanese fleets.

[10] 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 $1.50/kg throughout the period 1997-2013. 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.

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 50). 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.

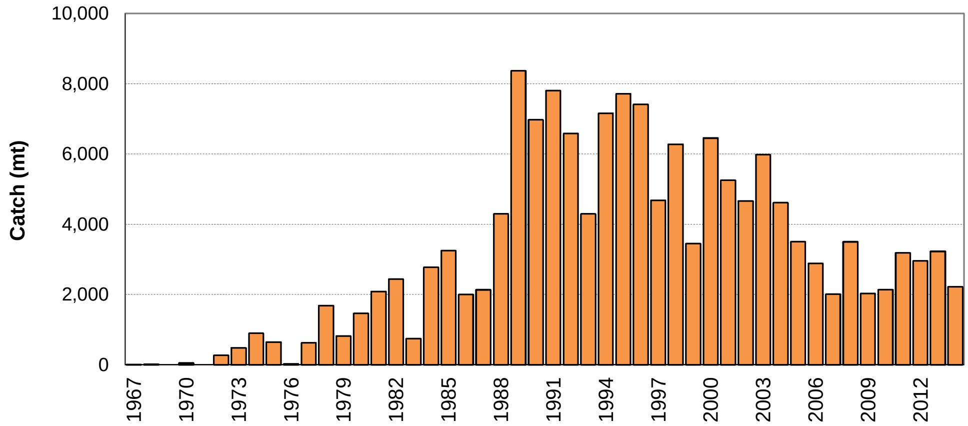

Figure 50. Troll catch (mt) of albacore in the south Pacific Ocean

6.2 Provisional catch estimates (2014)

The 2014 South Pacific troll albacore catch (2,221 mt) was the lowest since 2010. The New Zealand troll fleet (153 vessels catching 1,937 mt in 2014) and the United States troll fleet (6 vessels catching 263 mt in 2014) 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 the case for only the Cook Islands fleet during 2014).

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 51.

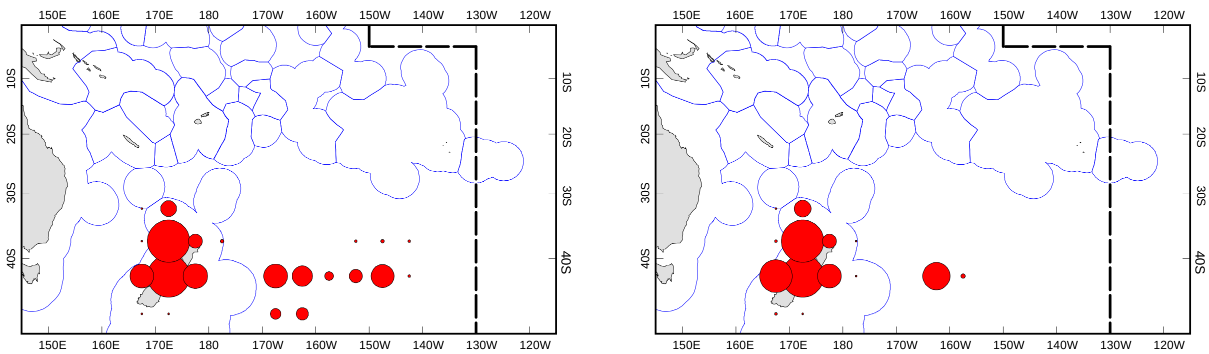

Figure 51. Distribution of South Pacific troll effort during 2013 (left) and 2014 (right)

7. SUMMARY OF CATCH BY SPECIES

7.1 SKIPJACK

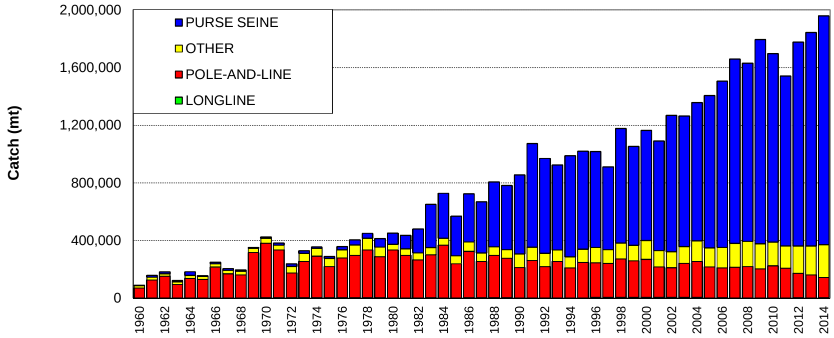

Figure 52. WCP–CA skipjack catch (mt) by gear

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 52). 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 2014 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 20–28% of the total skipjack catch in WCP–CA).

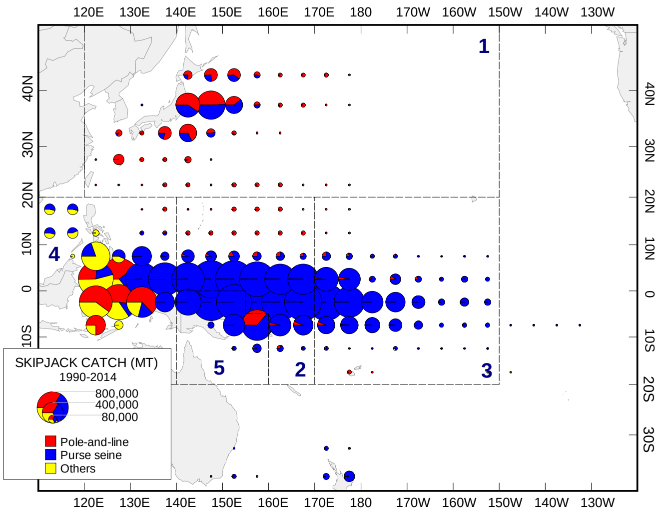

Figure 53. Distribution of skipjack tuna catch, 1990–2014.

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

The 2014 WCP–CA skipjack catch of 1,957,693 mt was the highest catch recorded, mainly due to a record skipjack catch taken in the **purse seine** fishery (1,587,018 mt in 2014 – 81%); this catch level was more than 115,000 mt higher than the previous record in 2013. A declining proportion of the catch was taken by the **pole-and-line** gear (141,466 mt – 7%) and the "**artisanal**" gears in the domestic fisheries of Indonesia, Philippines and Japan (145,980 mt – 9%). 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 53). 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.

The Philippines and Indonesian domestic fisheries (archipelagic waters) account for most of the skipjack catch in the 20–40 cm size range (Figure 54). 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 54). There was a greater proportion of medium-large (60–80 cm) skipjack caught in the purse seine fishery in 2010 (unassociated, free swimming school sets account for most of the large skipjack). In contrast, the WCP–CA skipjack purse-seine catch in 2009 comprised of younger fish from associated schools. The overall purse-seine skipjack size distribution in 2014 is almost identical to 2013 and similar to 2010 (with relatively larger fish); most of the catch by weight in 2014 was roughly shared between unassociated and associated schools, with a clear mode of relatively large fish (60 cm) from unassociated schools dominant.

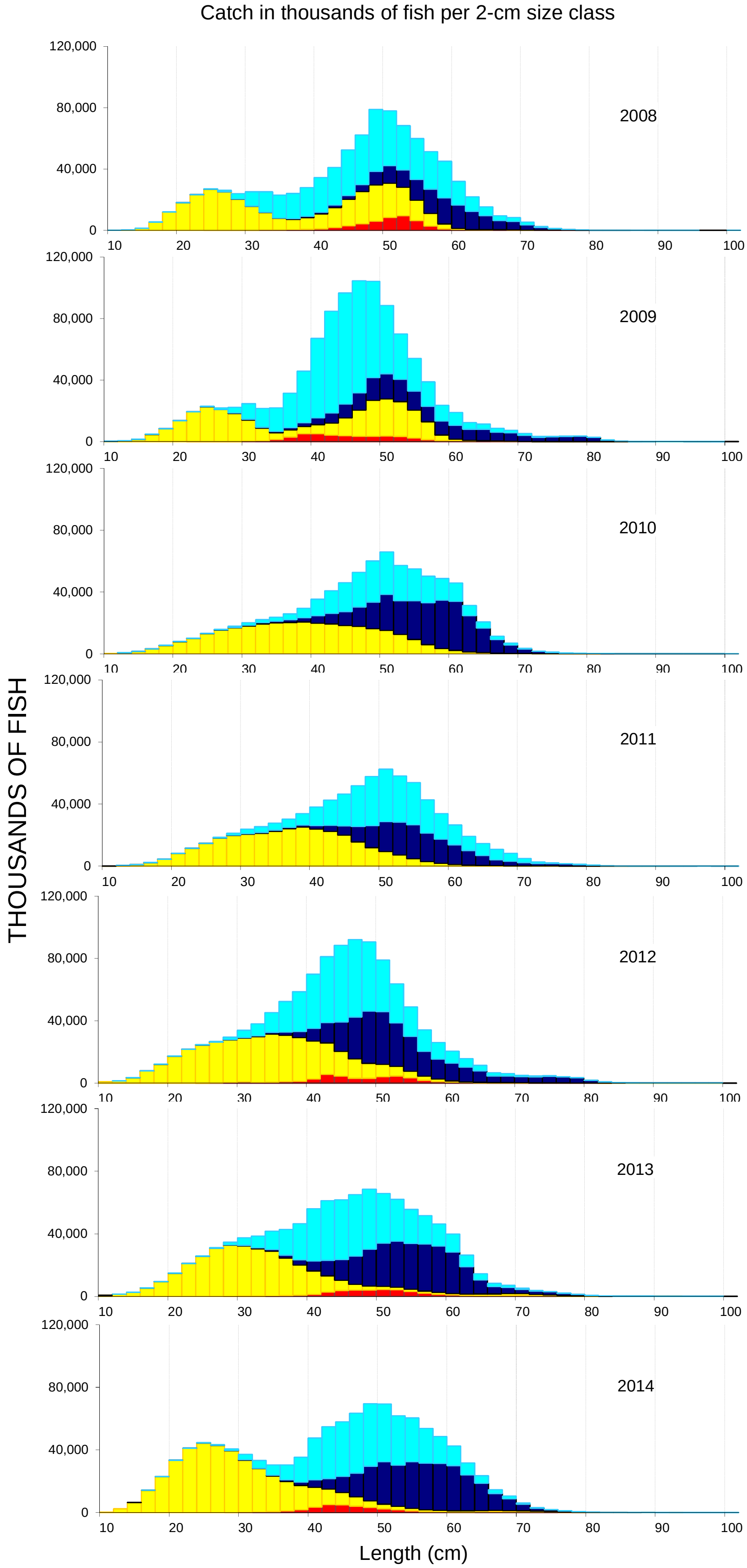

Figure 54. Annual catches (numbers of fish) of skipjack tuna in the WCPO by size and gear type, 2007–2014.

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

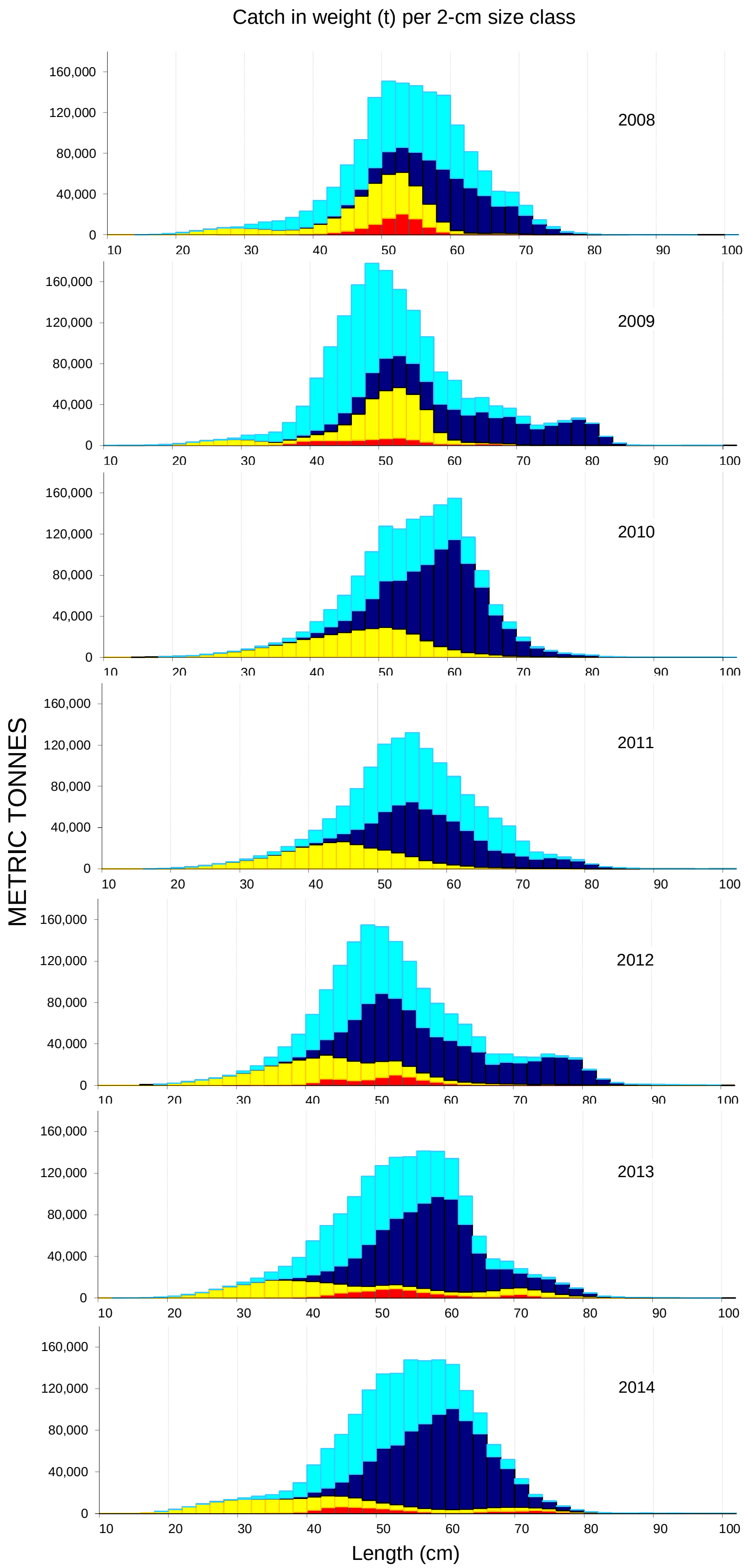

Figure 55. Annual catches (metric tonnes) of skipjack tuna in the WCPO by size and gear type, 2008–2014.

(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 has slowly increased over time but since 1998, jumped to a new level with annual catches regularly exceeding 500,000 mt (Figure 56), mainly due to increased catches in the purse seine fishery. The 2014 yellowfin catch (**608,807 mt**) was a record catch resulting from increased contributions for several gears. The yellowfin catch in the **purse-seine** fishery (362,049 mt – 59% of the total yellowfin tuna catch) was the third highest on record, even though it contributed a relatively low proportion (18%) of the total purse seine catch. The WCP–CA **longline** catch for 2014 (101,552 mt–17%) was the highest in ten years, with several fleets (e.g. China, Indonesia and Korea) reporting increased catches. Since the late 1990s, the **purse-seine** catch of yellowfin tuna has accounted for about 3-5 times the **longline** yellowfin catch.

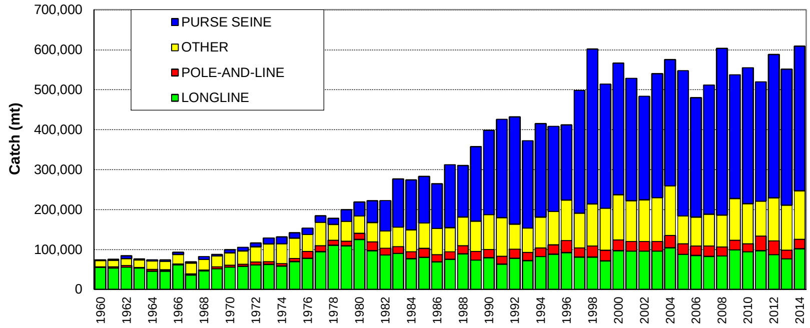

Figure 56. WCP–CA yellowfin catch (mt) by gear

The **pole-and-line** fisheries took 23,760 mt during 2014 (4% of the total yellowfin catch) which is slightly less than the 10-year average for this fishery. Catches in the '**other**' category (106,000mt–18% in 2014) are largely composed of yellowfin taken by various assorted gears (e.g. troll, ring net, bagnet, gillnet, large-fish handline, small-fish hook-and-line and seine net) in the domestic fisheries of the Philippines and eastern Indonesia. Figure 57 shows the distribution of yellowfin catch by gear type for the period 1990–2014. 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.

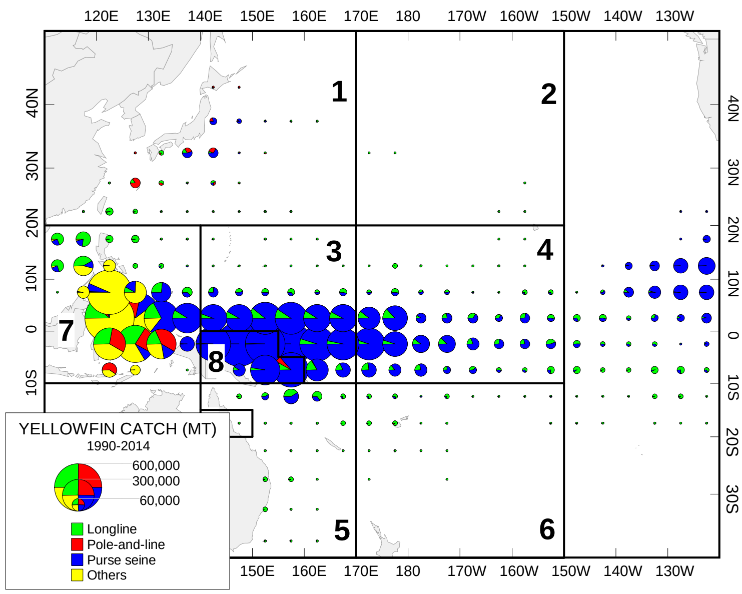

Figure 57. Distribution of yellowfin tuna catch in the WCP–CA, 1990–2014.

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

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 58), 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. Increased catches of large yellowfin tuna in the size range 120–130 cm from the purse seine unassociated sets appear on a biennial basis over the past seven years (2008, 2010, 2012 and 2014 – see Figure 59). Inter-annual variability in the size of yellowfin taken exists in all fisheries. 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 18–right and Figure 24–right). Likewise in 2014, the El Nino-like conditions in the latter half of the year no doubt contributed to increased catches of large yellowfin in the eastern tropical WCP-CA.

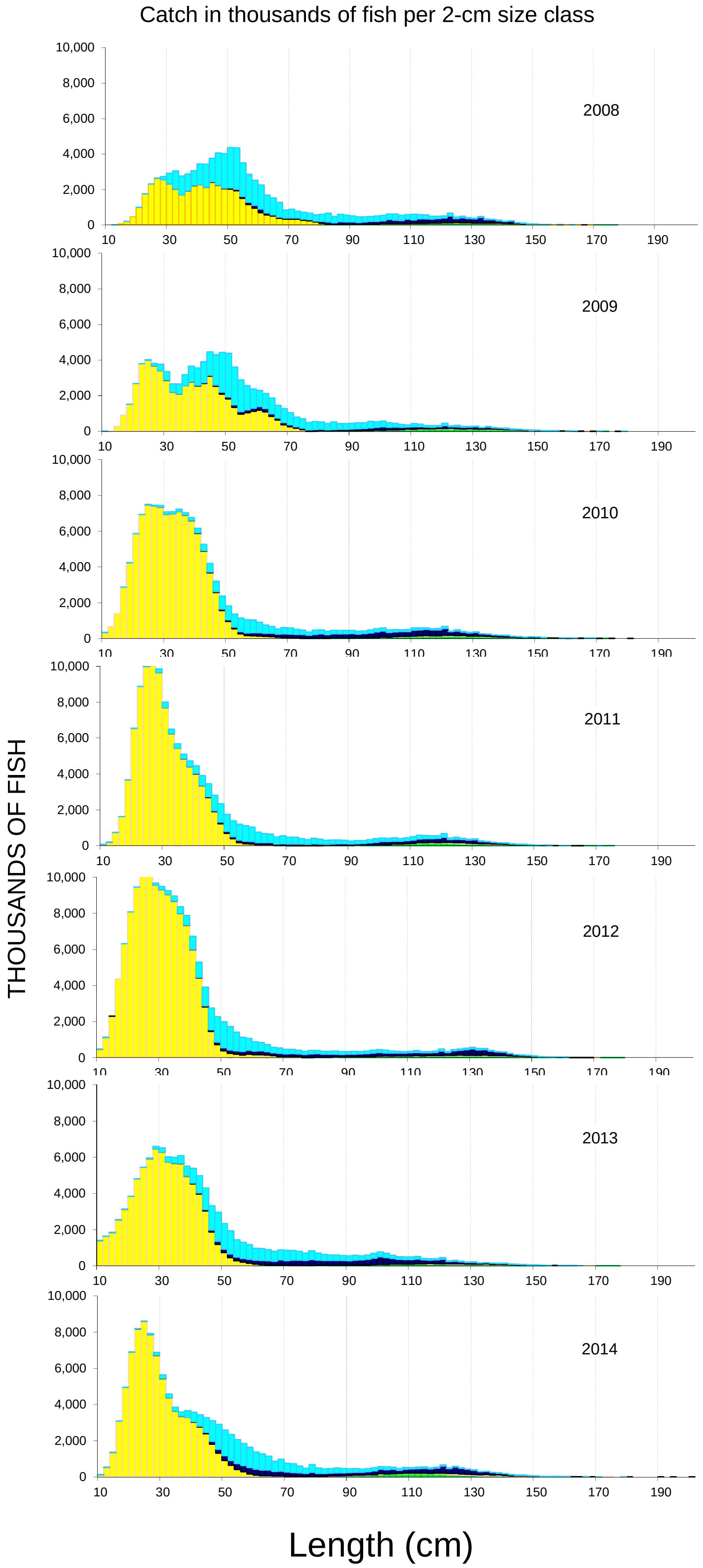

Figure 58. Annual catches (in number of fish) of yellowfin tuna in the WCPO by size and gear type, 2008–2014.

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

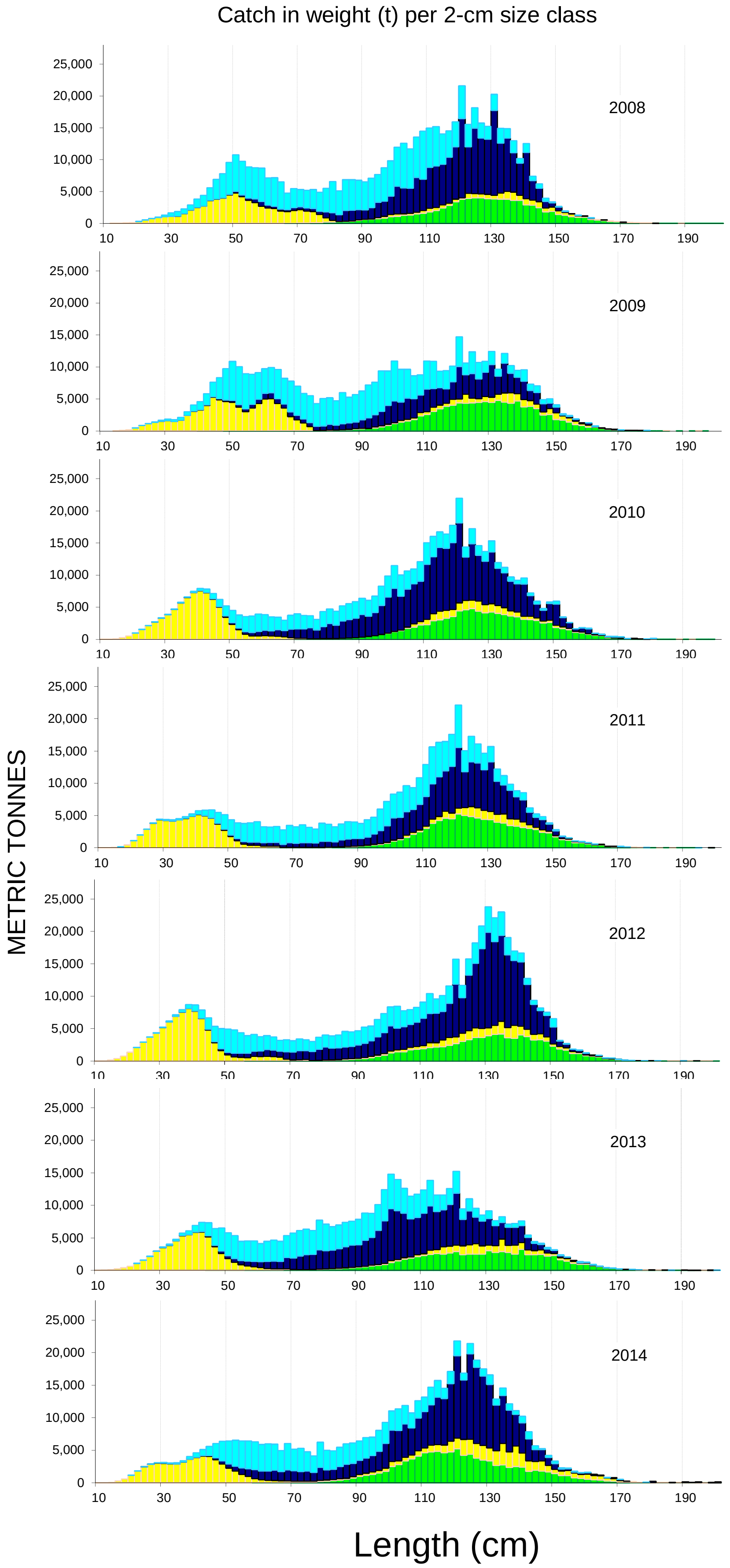

Figure 59. Annual catches (in metric tonnes) of yellowfin tuna in the WCPO by size and gear type, 2008–2014.

(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 60), with Japanese longline vessels generally contributing over 80% of the catch until the early 1990s. The provisional 2014 bigeye catch for the **Pacific Ocean** (248,133 mt) was about 22,000 mt higher than in 2013 and slightly higher than the average for the past ten years.

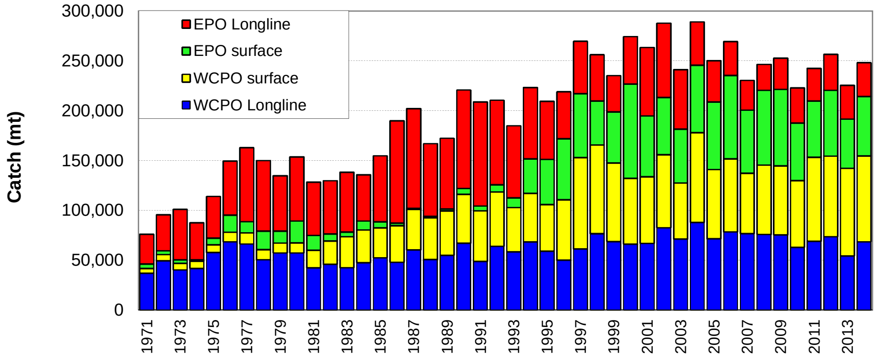

Figure 60. Pacific bigeye catch (mt) by gear
(excludes catches by "other" gears)

The **purse-seine** catch in the **EPO** (provisionally 59,600 mt in 2014) continues to account for a significant proportion (64%) of the total EPO bigeye catch. The provisional 2013 EPO longline bigeye catch estimate (33,915 mt; 2014 estimate not yet available) is around the average for the last seven years but well below the catches prior to 2006, when effort by the Asian fleets was higher. However, the EPO catch estimates are acknowledged to be preliminary[11] and may increase when more data become available.

The provisional **WCP-CA longline** bigeye catch for 2014, at 73,898 mt is amongst the lowest for the past 20-year. The provisional **WCP–CA purse seine** bigeye catch for 2014 was estimated to be 67,367 mt (52%) which is amongst the highest for this fishery (Figure 61). In 2013, the WCP-CA purse-seine bigeye catch exceeded the longline catch for the first time, although the prior long-term trend of a higher longline catch returned in 2014.

The **WCP–CA pole-and-line** fishery has generally accounted for between 3,000–10,000 mt (2-6%) of bigeye catch annually over the past decade. The "**other**" category, representing various gears in the Philippine, Indonesian[12] and Japanese domestic fisheries, has accounted for an estimated 4,000–15,000 mt (3–7% of the total WCP–CA bigeye catch) in recent years.

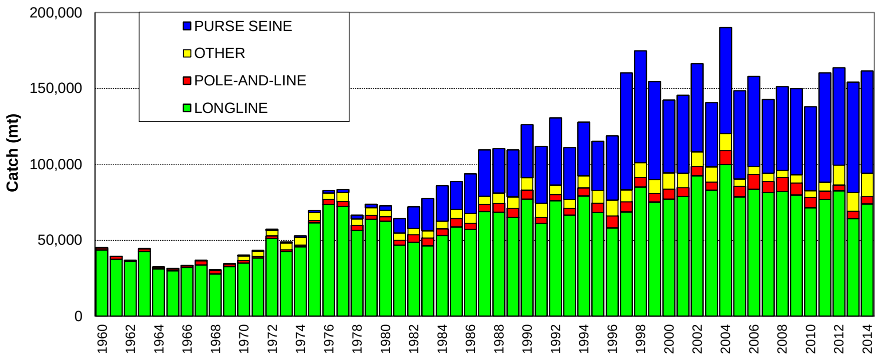

Figure 61. WCP–CA bigeye catch (mt) by gear

Figure 62 shows the spatial distribution of bigeye catch in the Pacific for the period 1990–2014. The majority of the WCP–CA catch is taken in equatorial areas, both by purse seine and longline, but with some longline catch in sub-tropical areas (e.g. east of Japan and off the east coast of Australia). In the equatorial areas, much of the longline catch is taken in the central Pacific, continuous with the important traditional bigeye longline area in the eastern Pacific.

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[11] Catch estimates for the EPO longline fishery for 2013-2014 and the EPO purse seine fishery for 2013-2014 are preliminary

[12] 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. Bigeye tuna estimates in the Indonesian troll fishery were provided for the first time for 2013.

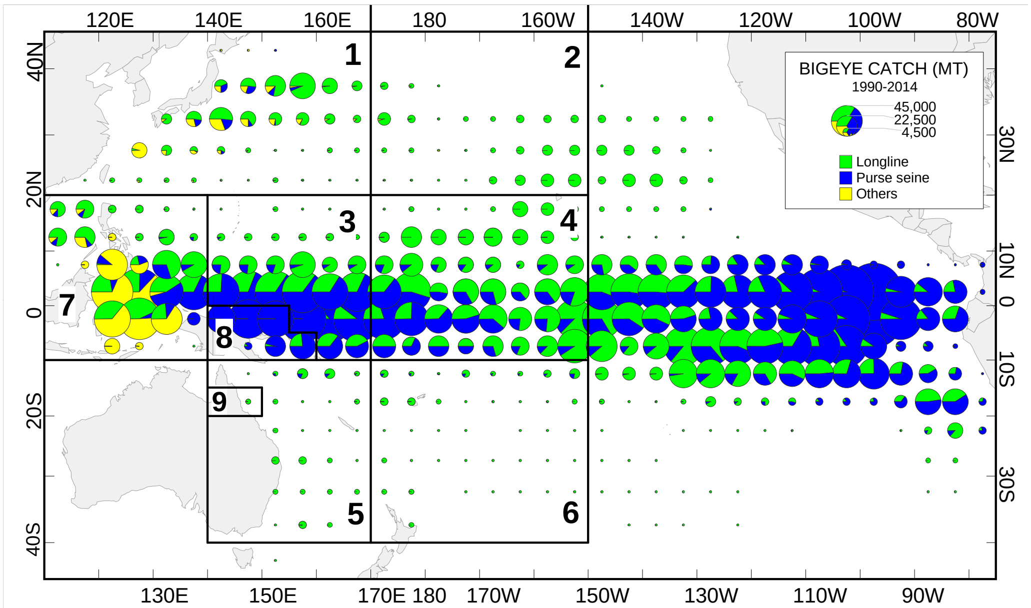

Figure 62. Distribution of bigeye tuna catch, 1990–2014.
The nine-region spatial stratification used in stock assessment for the WCP–CA is shown.

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 63). The longline fishery clearly accounts for most of the catch (by weight) of large bigeye in the WCP–CA (Figure 63). 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 80–170+ 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 majority of associated-set bigeye tuna are generally in the range of 45–75 cm.

A year class represented by the mode of fish in the size range of about 25-30 cm in the Philippines/Indonesian domestic fisheries in 2011, appears to progress to a mode of 50-60 cm in the purse seine associated in 2012 and then possibly again in the associated-set and longline catch in 2013 (Figure 63).

In contrast to other years, the majority of the associated-set purse seine catch in 2011 appears to come from larger fish (i.e. 80-120cm), 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. These age classes (i.e. those predominant in 2011) are possibly represented as the large fish (130-150cm) taken in unassociated sets during 2012 (Figure 63). The graphs for 2014 show that (i) the average size of longline-caught bigeye was smaller than in previous years, (ii) the size composition of the purse seine associated-set catch is similar to 2013, but with less fish and (iii) the maintenance of relatively high numbers of bigeye tuna taken in unassociated sets (which is similar to 2013).

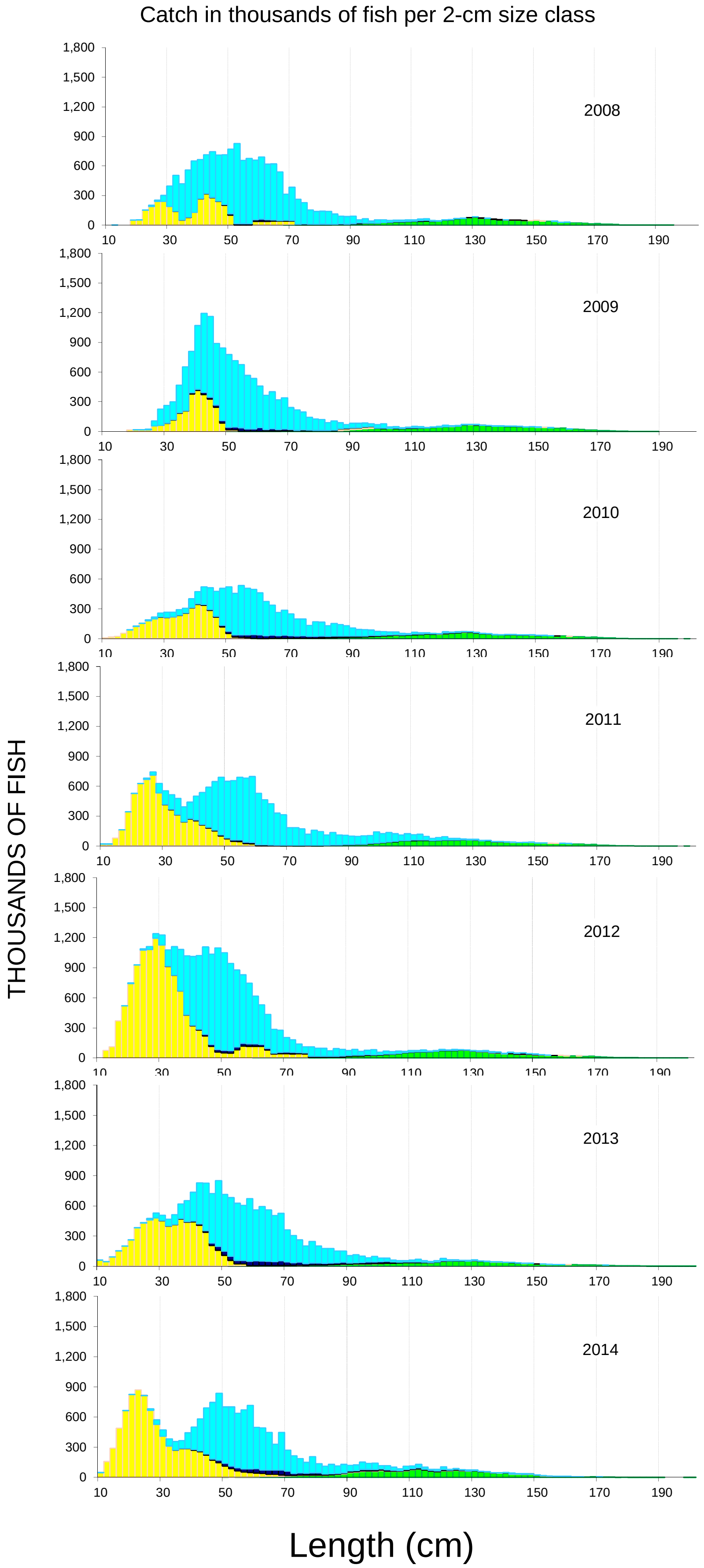

Figure 63. Annual catches (numbers of fish) of bigeye tuna in the WCPO by size and gear type, 2008–2014.

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

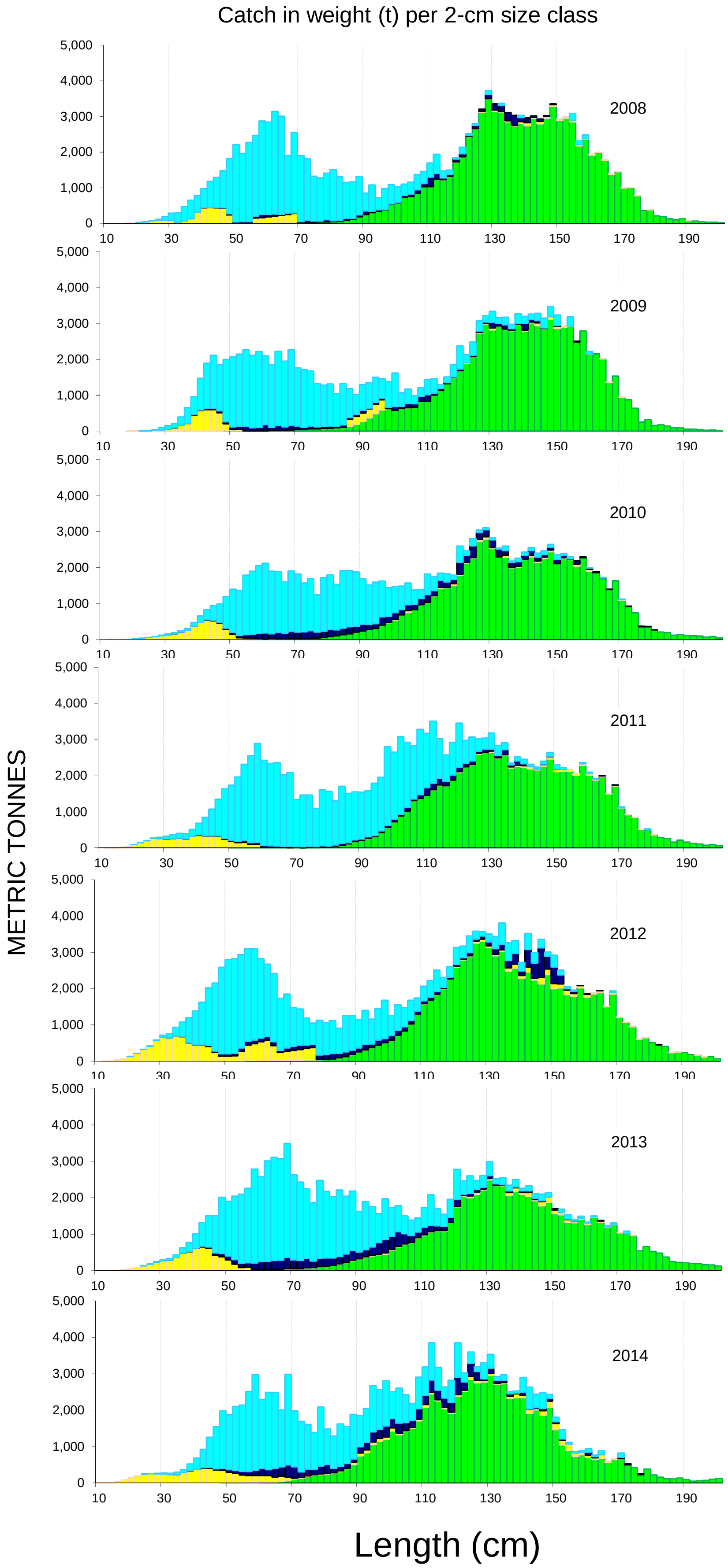

Figure 64. Annual catches (metric tonnes) of bigeye tuna in the WCPO by size and gear type, 2008–2014.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.4 SOUTH PACIFIC ALBACORE

Prior to 2001, south Pacific albacore catches were generally in the range 25,000–50,000 mt, with a significant peak 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 2014 (83,033 mt) was the fourth highest on record (about 6,000 mt lower than the record catch in 2010 of 88,942 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 65), 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 2014 (132,849 mt) was the fifth highest on record and 15,000 mt lower that the record (147,793 mt in 2002).

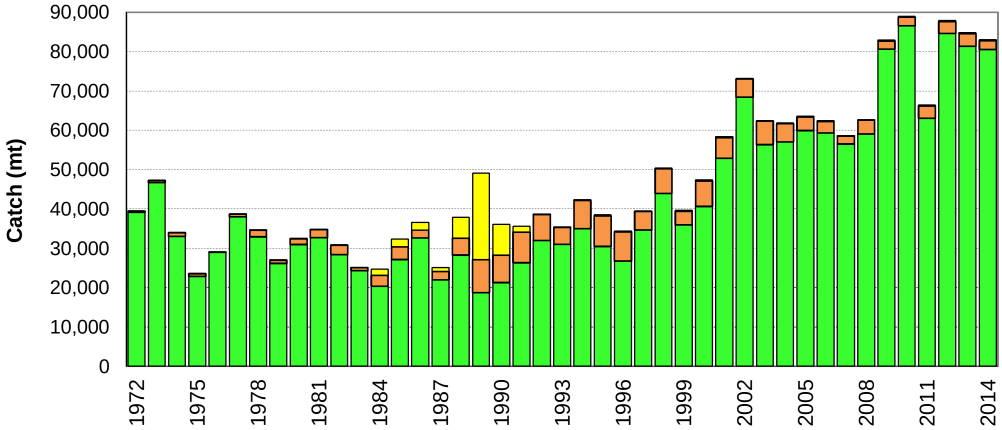

Figure 65. South Pacific albacore catch (mt) by gear ("Other" is primarily catch by the driftnet fishery.)

The longline catch of albacore is distributed over a large area of the south Pacific (Figure 66), 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.

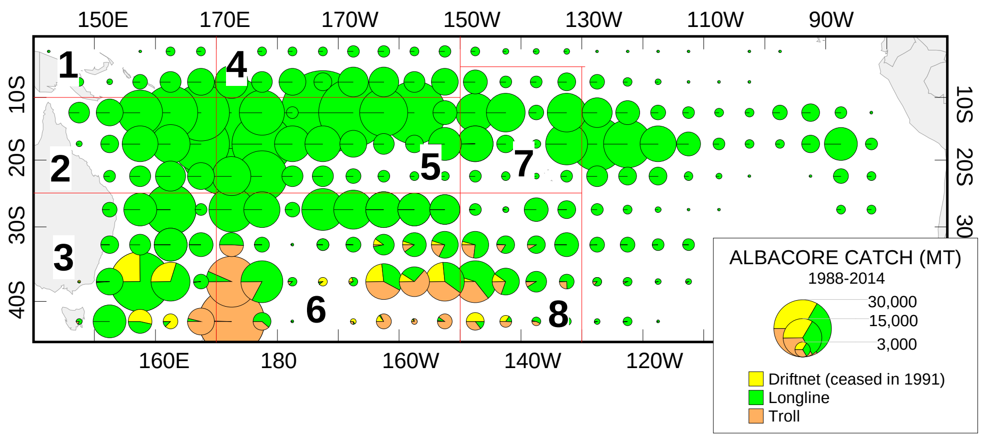

Figure 66. Distribution of South Pacific albacore tuna catch, 1988–2014.
The eight-region spatial stratification used in stock assessment is shown.

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 67 and Figure 68). Juvenile albacore also appear in the longline catch from time to time (e.g. fish in the range 60–70cm sampled from the longline catch). The mode of longline-caught albacore in 2013–2014 is at a slightly smaller size-class than most of the other years presented here.

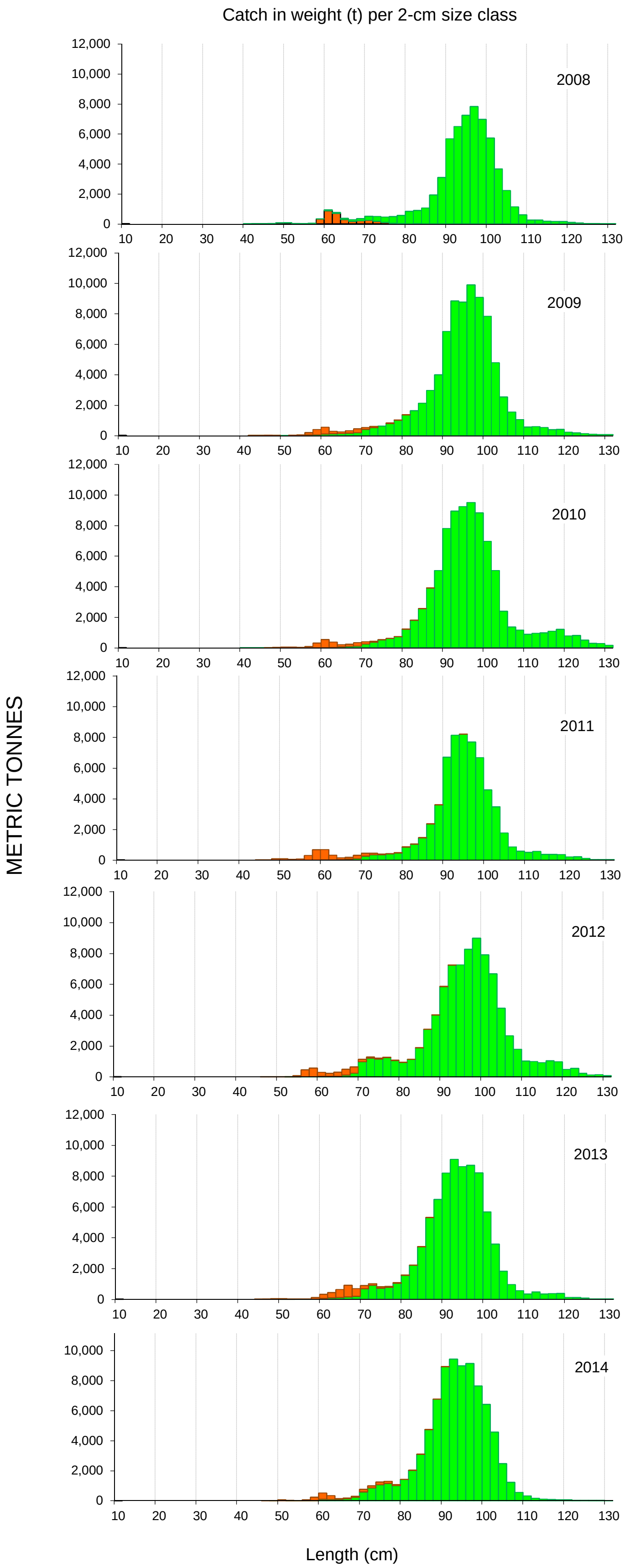

Figure 67. Annual catches (number of fish) of albacore tuna in the South Pacific Ocean by size and gear type, 2008–2014. **(green–longline; orange–troll)**

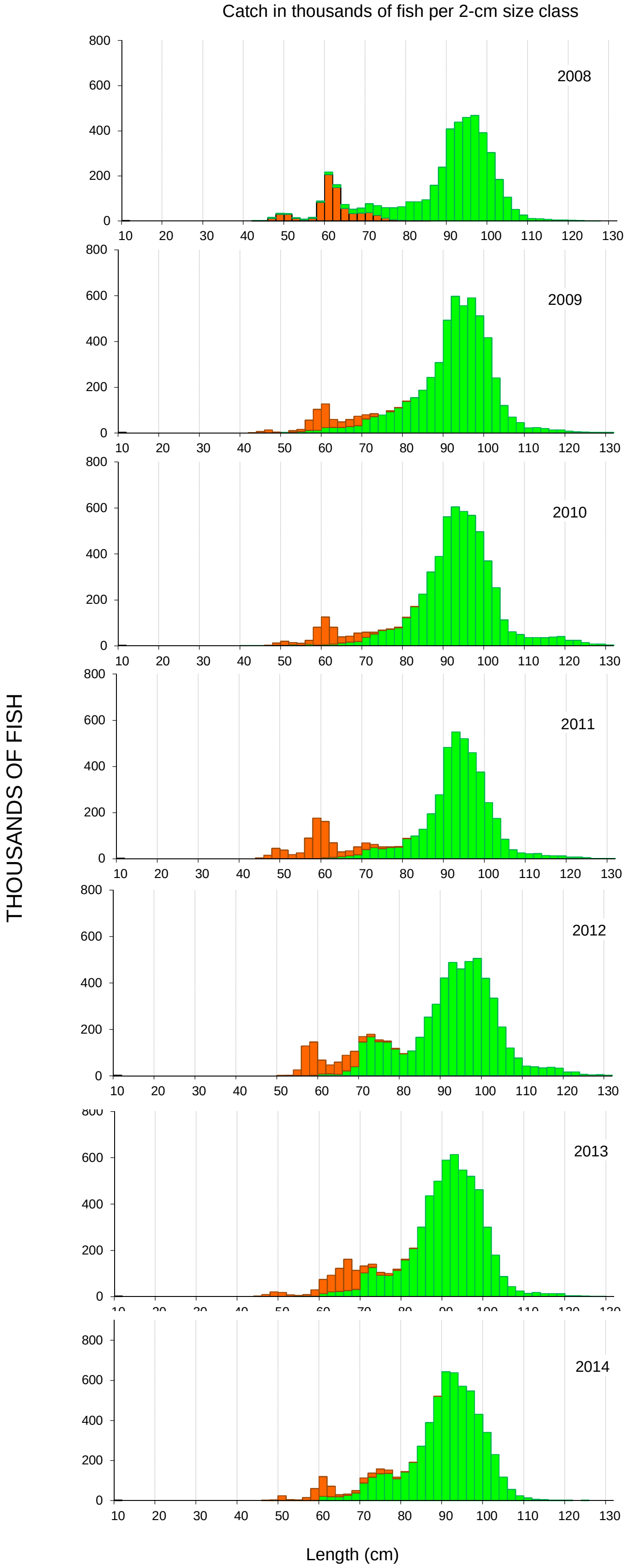

Figure 68. Annual catches (metric tonnes) of albacore tuna in the South Pacific Ocean by size and gear type, 2008–2014. **(green–longline; orange–troll);**

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 69), 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 total swordfish catches increasing significantly to a new level of around 15,000 mt, and then to more than 20,000 mt over the past three years, with contributions from the distant-water Asian fleet catches. These estimates do not include catches from the South American fleets catching swordfish and the South Pacific Spanish longline fleet catch estimate for 2014 was not available at the time of writing this paper.

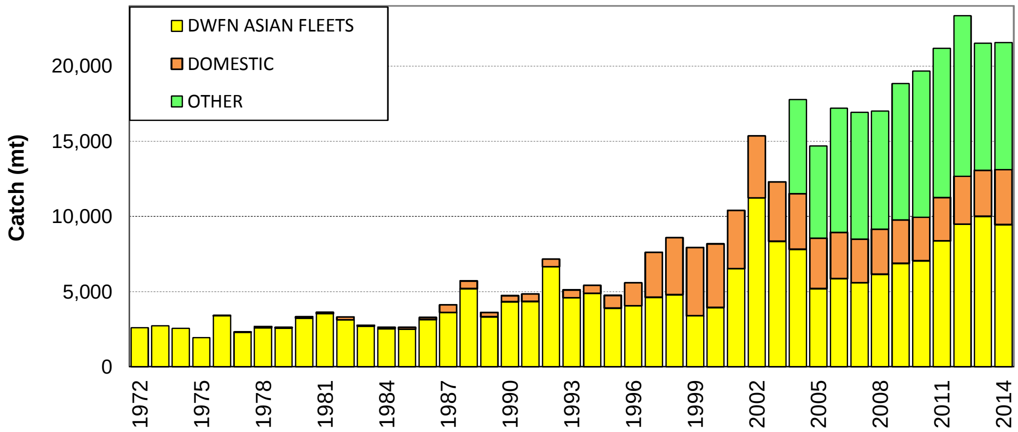

Figure 69. South Pacific longline swordfish catch (mt) by fleet

The longline catch of swordfish is distributed over a large area of the south Pacific (Figure 70–data covering entire south Pacific for 2011/2014 yet to be provided for some fleets). 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.

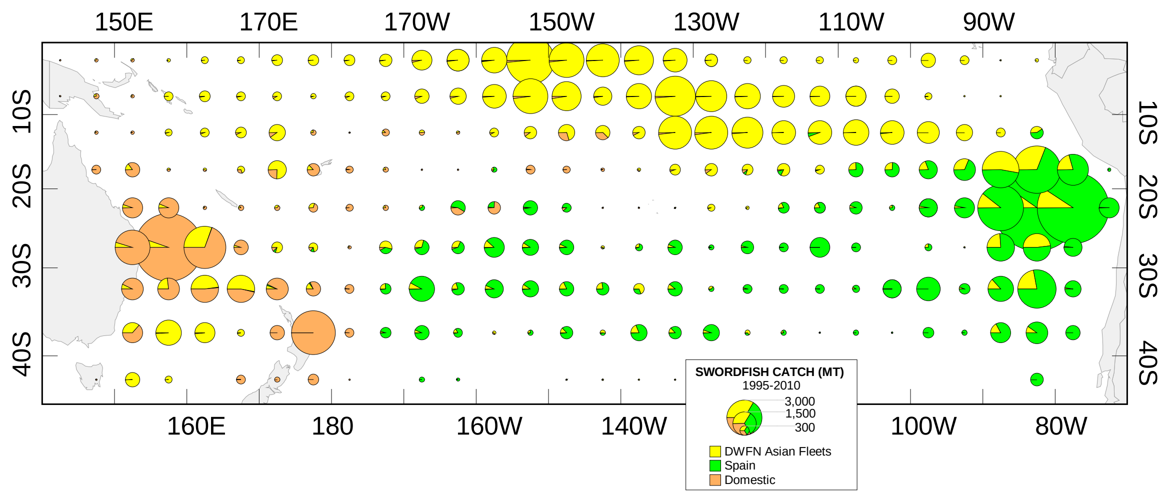

Figure 70. Distribution of South Pacific longline swordfish catch, 1995–2010.

The swordfish catch throughout the South Pacific Ocean are generally in the range of 110–170cm (lower jaw-fork length – Figures 71 and 72). 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.

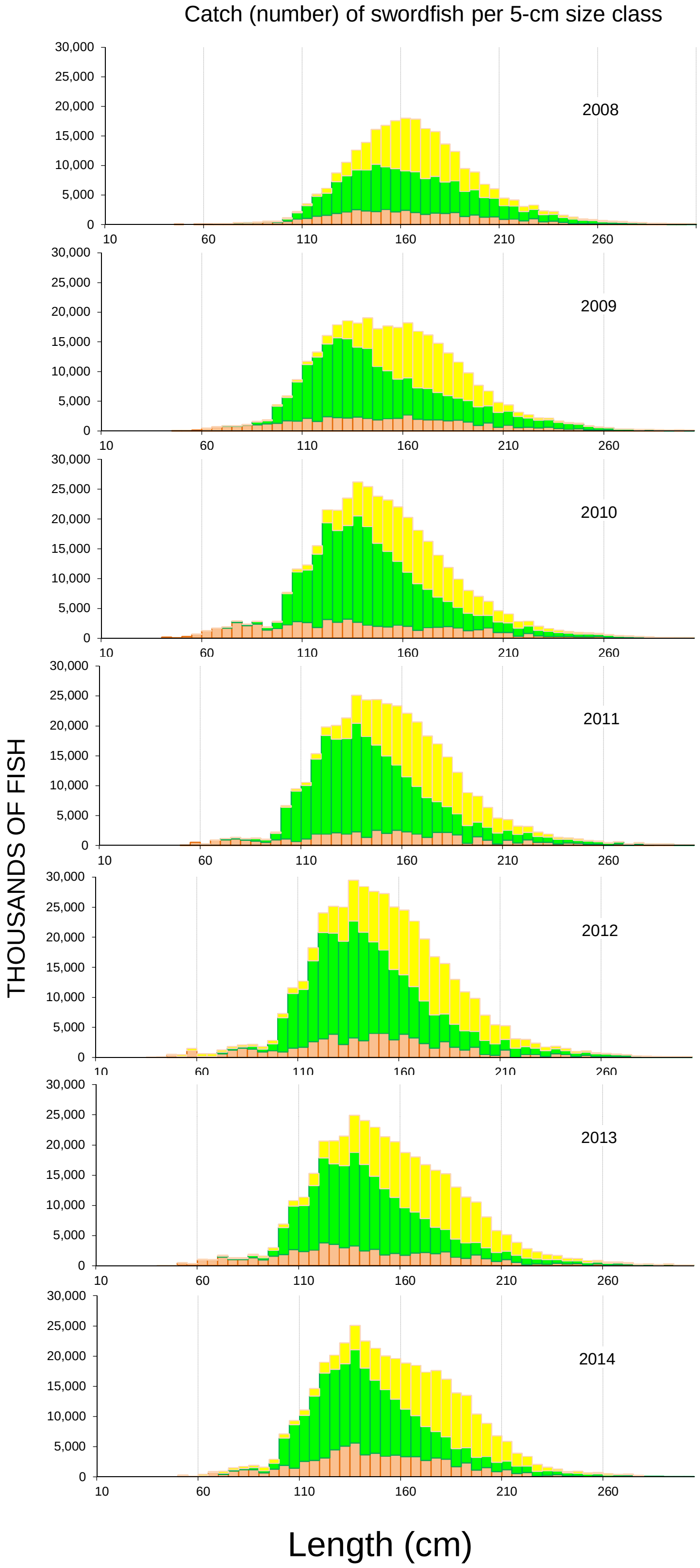

Figure 71. Annual catches (number of fish) of swordfish in the South Pacific Ocean by size and fleet, 2008–2014. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange– Domestic fleets)**
2012, 2013 and 2014 data are provisional (data for some fleets have yet to be provided, so 2011 data have been carried over).

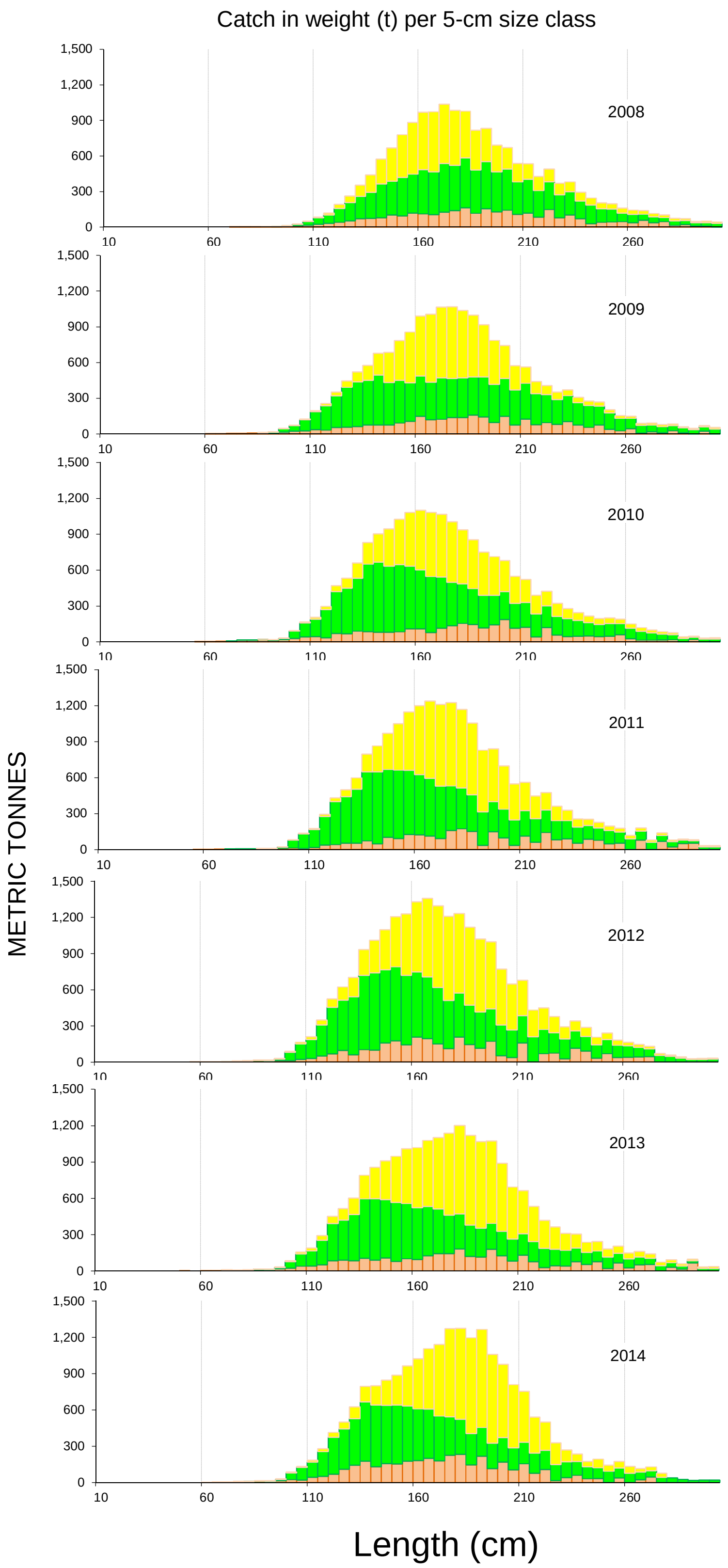

Figure 72. Annual catches (metric tonnes) of swordfish in the South Pacific Ocean by size and fleet, 2008–2014. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange–Domestic fleets)**
2012, 2013 and 2014 data are provisional (data for some fleets have yet to be provided, so 2011 data have been carried over).

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APPENDIX - ADDITIONAL INFORMATION

Table A1. Proportion of Longline SWORDFISH catch in the area north of 20°S in the WCPFC Convention Area south of the equator, 2000-2014. Source of data: AGGREGATE CATCH DATABASE; Excludes the Indonesian estimated SWORDFISH catches.

Year	WCPFC Area south of equator (MT)	North of 20°S in the WCPFC Area south of equator	
		MT	%
2000	5,259	1,920	37%
2001	5,938	2,175	37%
2002	8,636	3,829	44%
2003	6,503	3,181	49%
2004	7,647	3,660	48%
2005	6,553	2,359	36%
2006	8,892	3,469	39%
2007	9,136	3,046	33%
2008	9,158	4,203	46%
2009	7,870	4,253	54%
2010	6,233	3,327	53%
2011	8,877	4,957	56%
2012	9,074	4,907	54%
2013	8,249	4,538	55%
2014	6,830	4,728	69%

Table A2. Proportion of Longline SWORDFISH catch by 10° latitude band in the WCPFC Convention Area south of the equator, 2000-2014. Source of data: AGGREGATE CATCH DATABASE; Excludes the Indonesian estimated SWORDFISH catches.

Year	SWORDFISH CATCH - WCFPC Area south of equator									
	METRIC TONNES					%				
	0°-10°S	10°S-20°S	20°S-30°S	30°S-40°S	40°S-50°S	0°-10°S	10°S-20°S	20°S-30°S	30°S-40°S	40°S-50°S
2000	1,507	413	1,683	1,460	197	29%	8%	32%	28%	4%
2001	1,565	611	1,957	1,575	229	26%	10%	33%	27%	4%
2002	2,518	1,311	2,313	2,284	210	29%	15%	27%	26%	2%
2003	2,001	1,180	1,778	1,335	209	31%	18%	27%	21%	3%
2004	2,755	905	1,928	1,874	185	36%	12%	25%	25%	2%
2005	1,614	746	2,609	1,476	109	25%	11%	40%	23%	2%
2006	2,741	727	2,946	2,319	159	31%	8%	33%	26%	2%
2007	2,575	470	2,784	3,272	35	28%	5%	30%	36%	0%
2008	3,217	986	1,949	2,942	64	35%	11%	21%	32%	1%
2009	2,780	1,473	1,556	2,038	24	35%	19%	20%	26%	0%
2010	2,189	1,138	1,055	1,789	62	35%	18%	17%	29%	1%
2011	3,542	1,415	1,748	2,048	125	40%	16%	20%	23%	1%
2012	3,525	1,383	1,682	2,324	161	39%	15%	19%	26%	2%
2013	2,986	1,551	1,695	1,805	211	36%	19%	21%	22%	3%
2014	3,556	1,172	1,240	694	167	52%	17%	18%	10%	2%

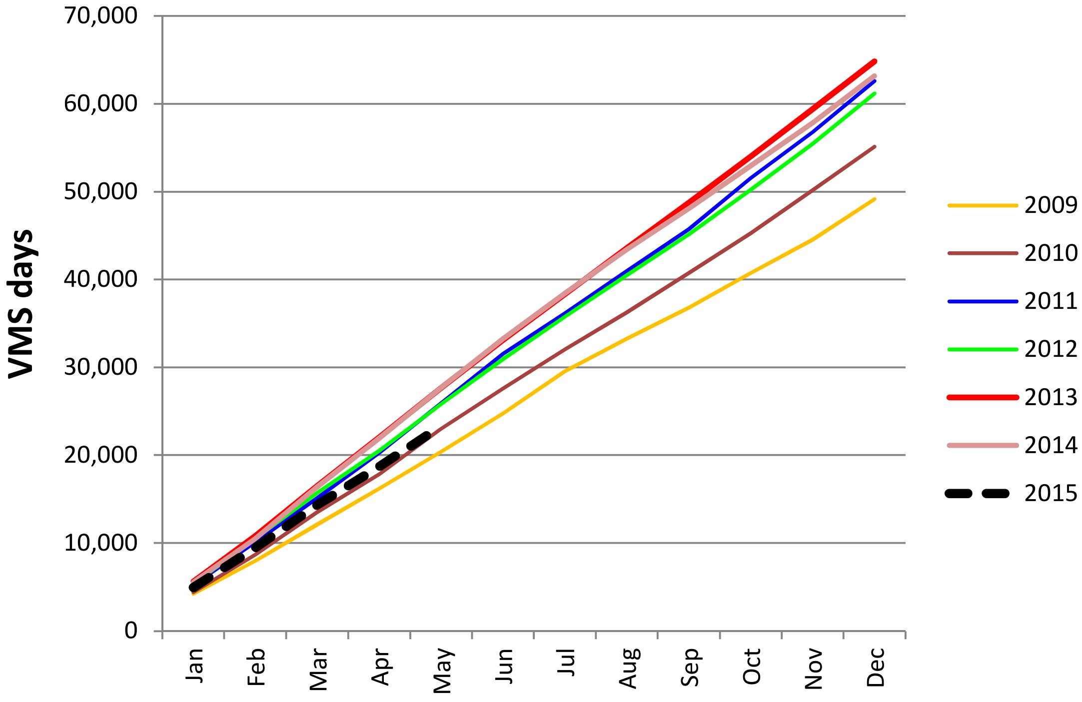


Figure A1. Cumulative purse seine effort by month, 2009-2015, as measured by VMS (days in port and transit days omitted).

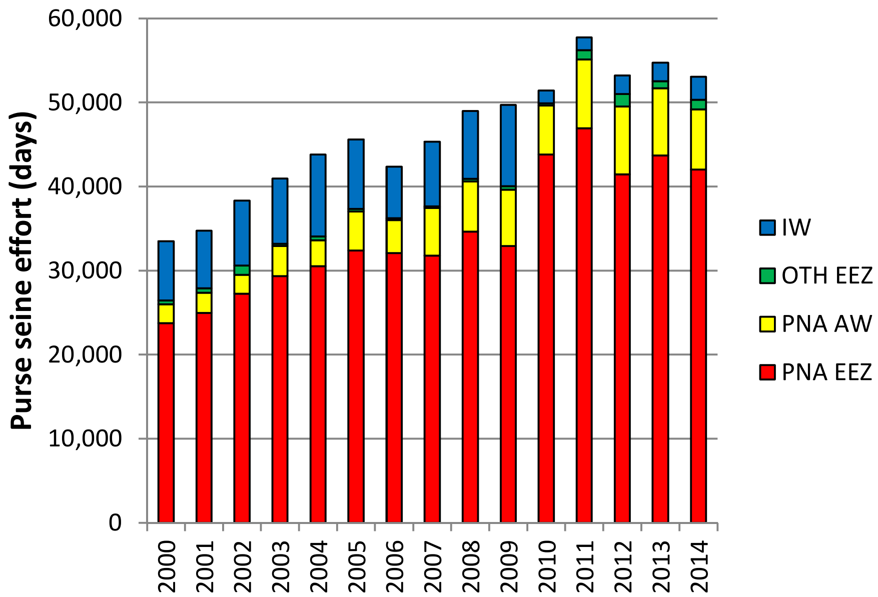


Figure A2. Purse seine effort (days fishing and searching) in the WCPFC Convention Area between 20°N and 20°S, excluding domestic purse seine effort in Philippines and Indonesia. Estimates are based on raised logsheet data.

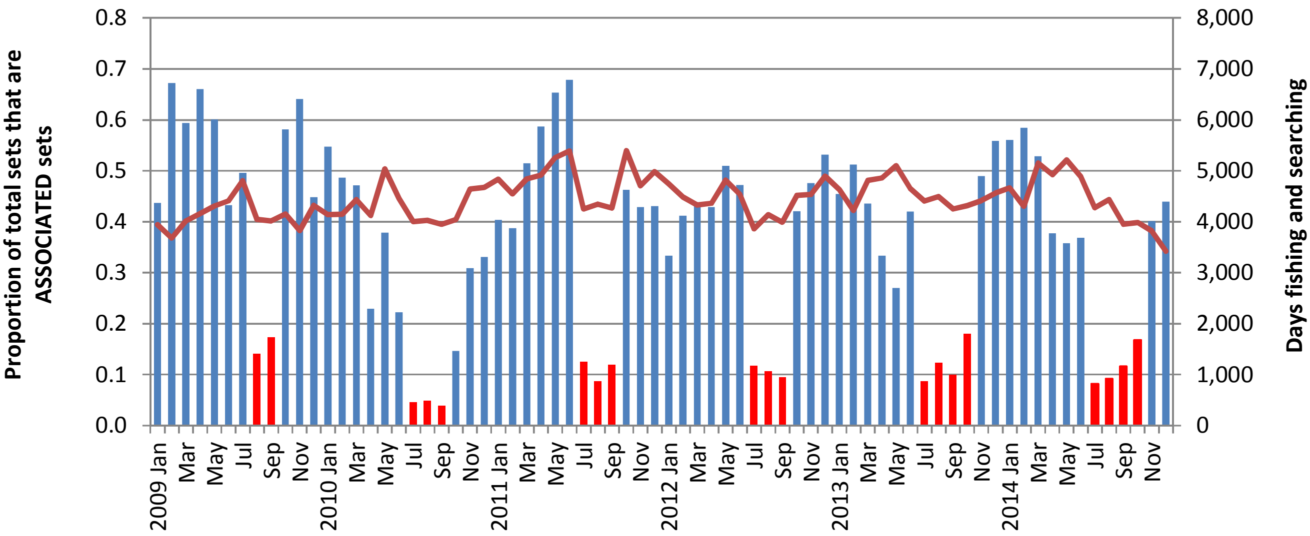


Figure A3. Proportion of the total purse seine fishing activity comprising associated sets, as indicated by logsheet data. Red bars indicate the FAD closure months. Total effort in days is shown by the plotted line. Activities in the domestic purse seine fisheries of Indonesia and Philippines are excluded**.**

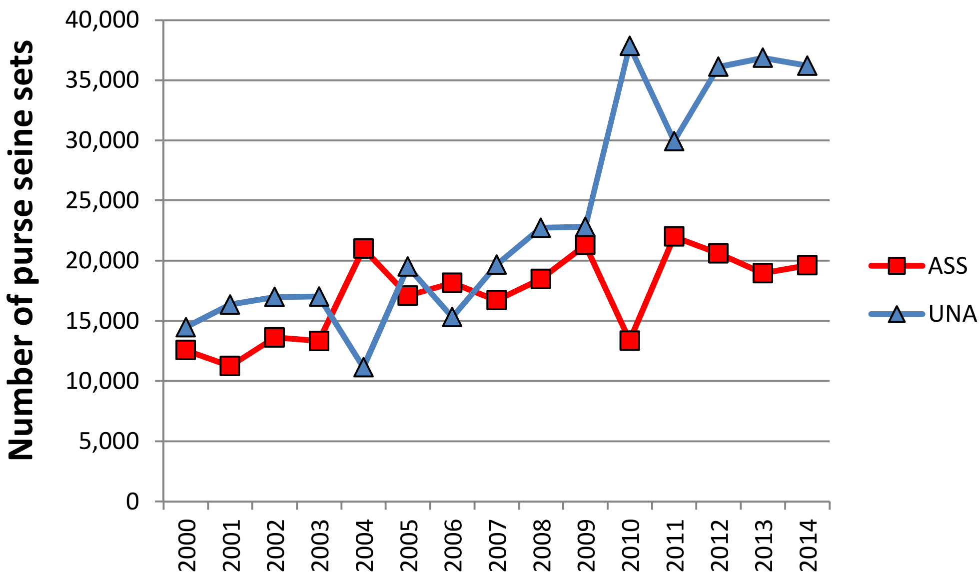
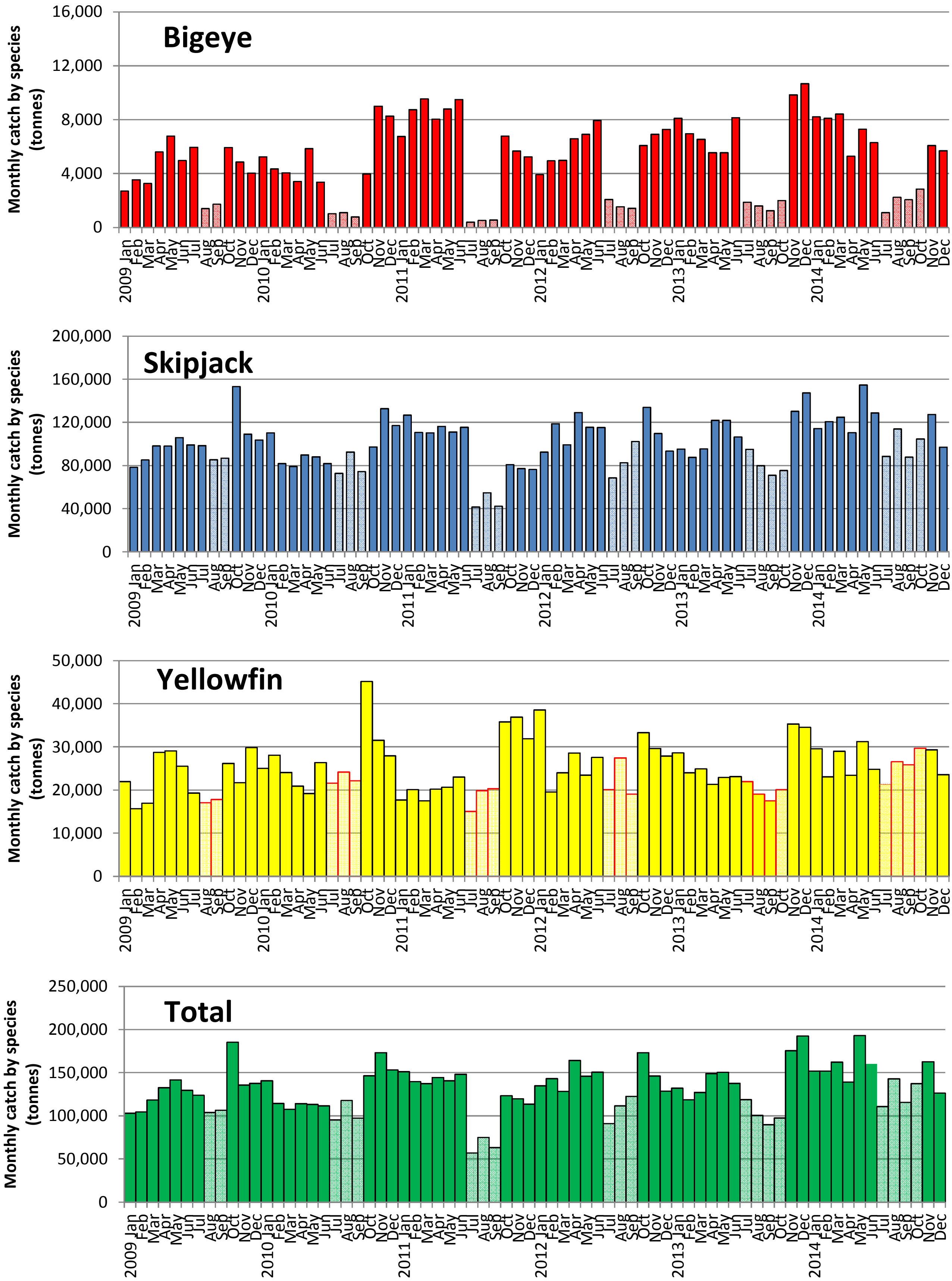


Figure A4. Number of associated (ASS) and unassociated (UNA) sets made in the WCPO tropical purse seine fishery, 2000 – 2014. Activities in the domestic purse seine fisheries of Indonesia and Philippines are excluded. Associated sets include animal-associated sets.



FigureA5. Monthly catch by species (raised logsheet data with species composition adjusted using observer sampling with grab sample bias correction). FAD closure months are shaded in lighter colour. Data excludes the domestic fisheries of Indonesia and Philippines.

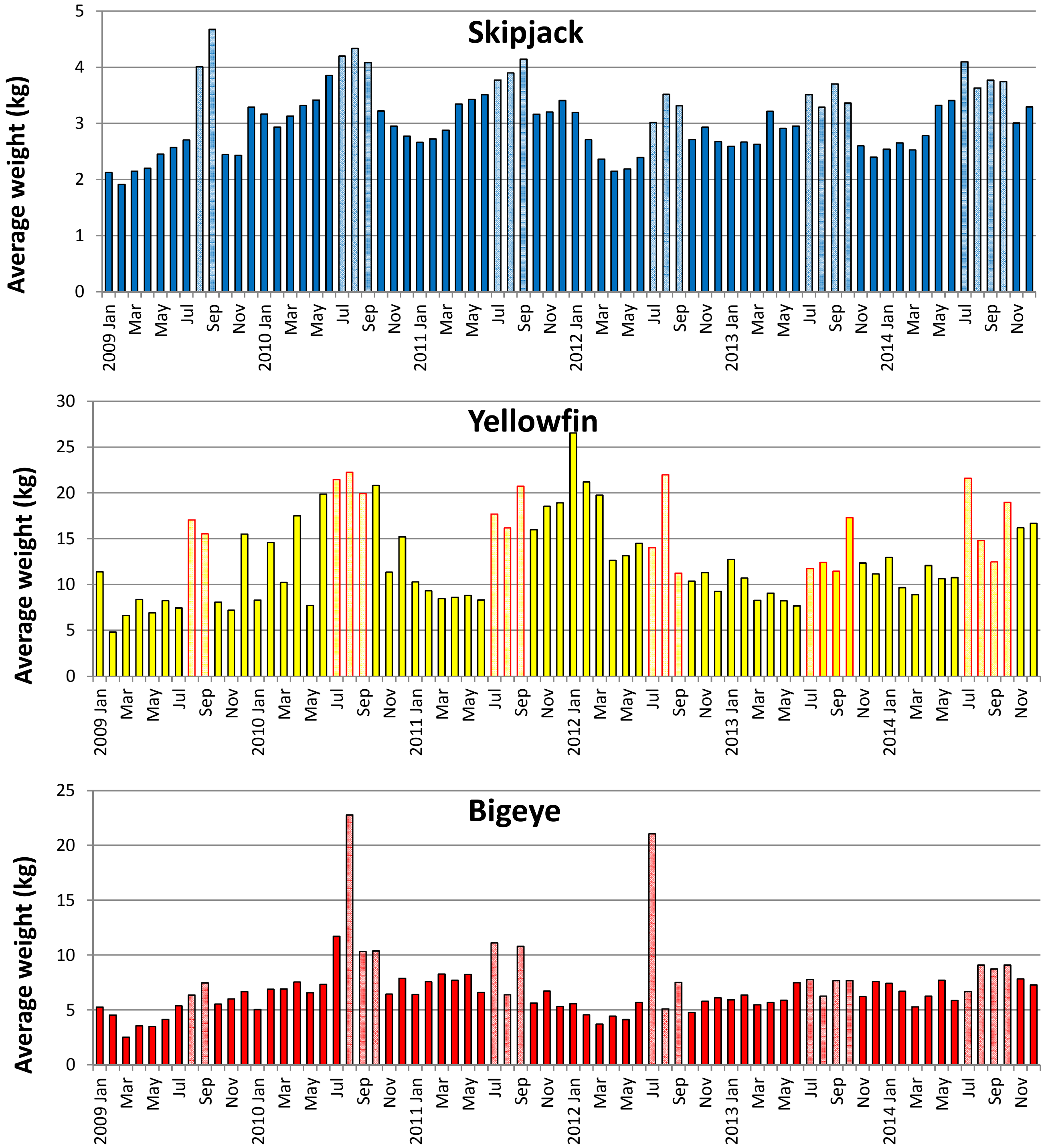


Figure A6. Monthly average weight of bigeye, skipjack and yellowfin tuna, estimated from observer sampling data, 2009-2014.

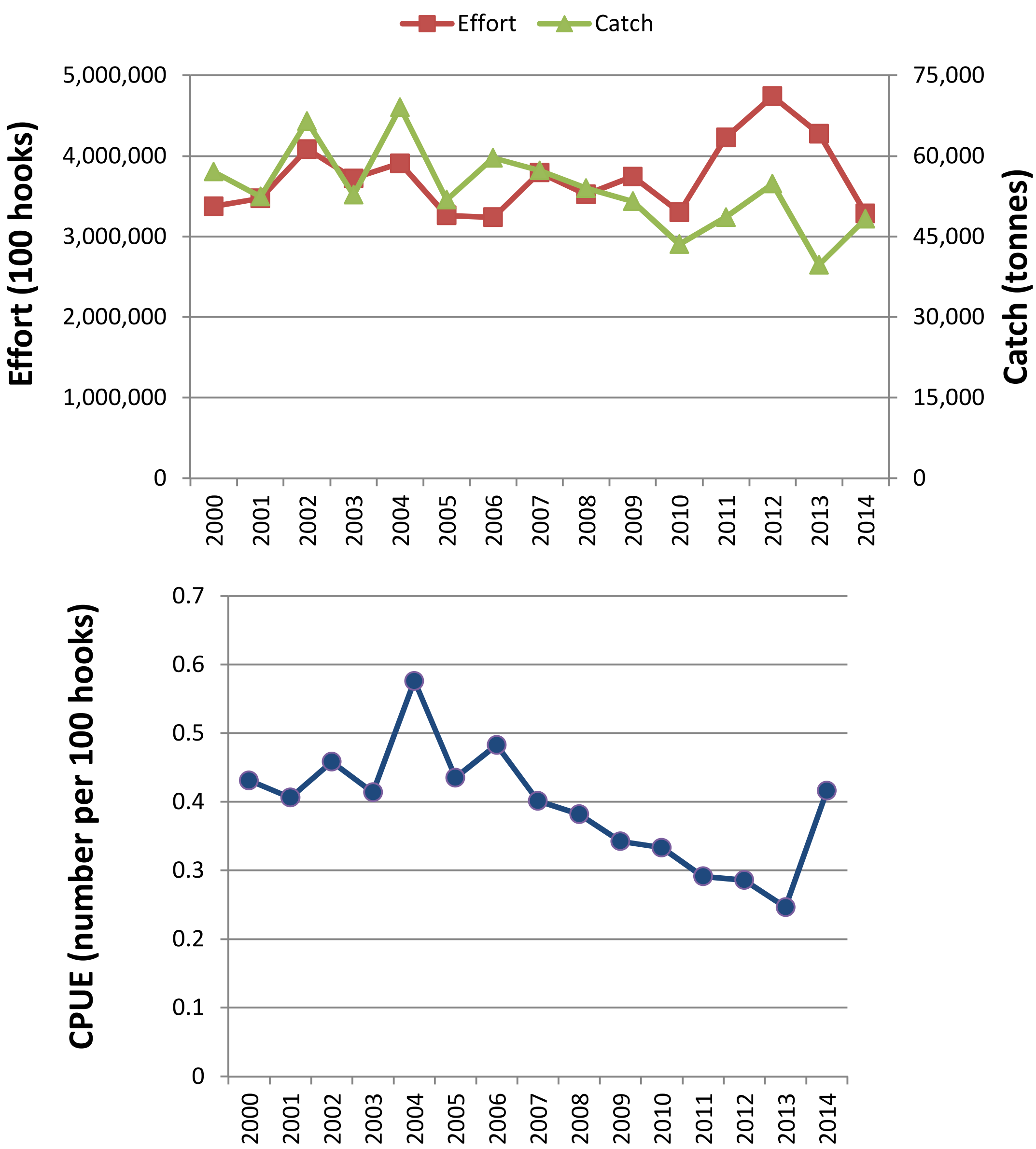


Figure A7. Estimates of longline effort and bigeye catch (upper panel) and bigeye CPUE (lower panel) for the CORE area of the tropical WCPFC longline fishery (130°E - 150°W, 20°N - 10°S).
2014 data are provisional.

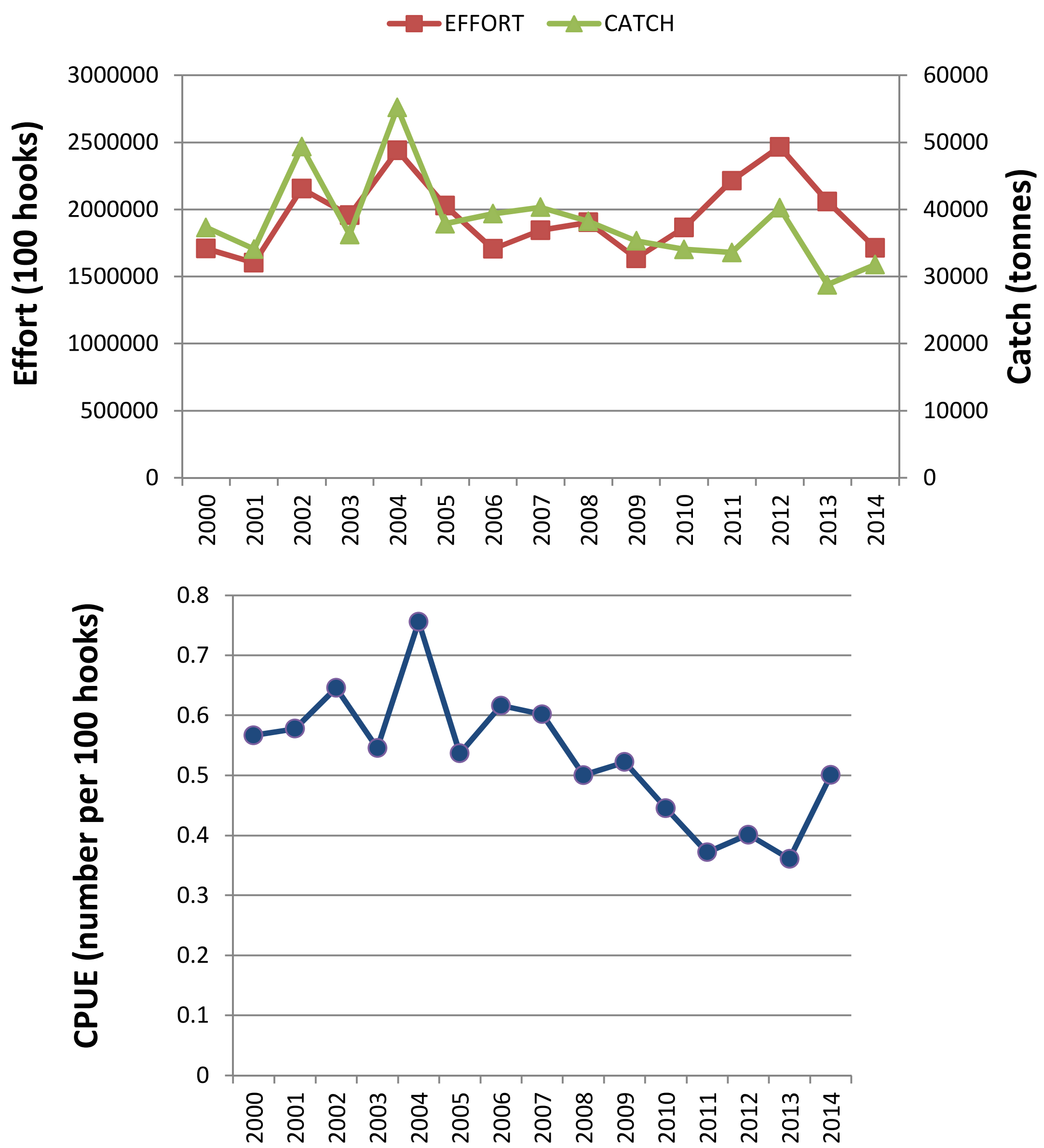


Figure A8. Estimates of longline effort and bigeye catch (upper panel) and bigeye CPUE (lower panel) for the EASTERN area of the tropical WCPFC longline fishery (170°E - 150°W, 20°N - 10°S).
2014 data are provisional.

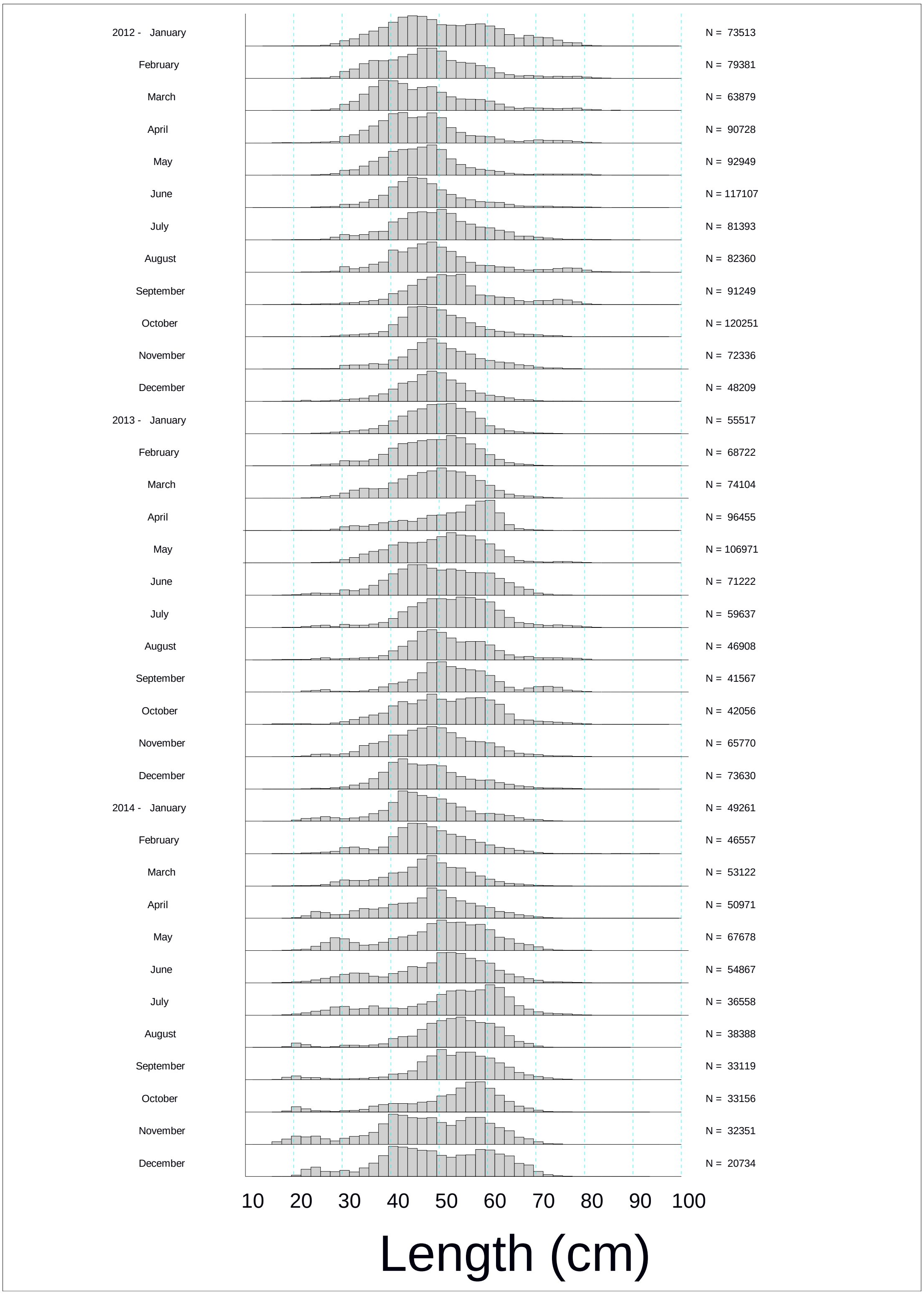


Figure A9. Monthly purse seine SKIPJACK length frequency histograms for the tropical WCPFC area, 2012-2014.

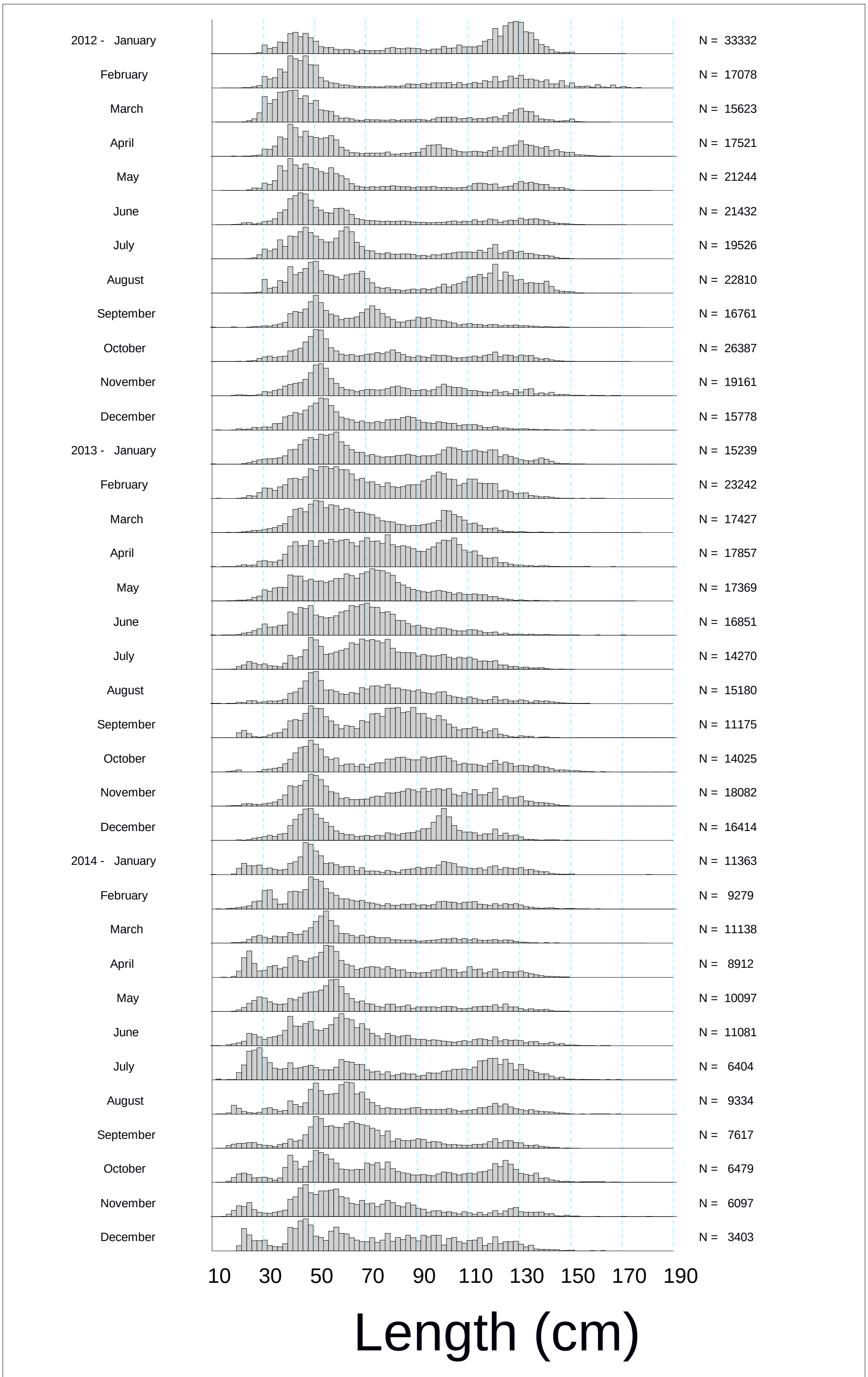


Figure A10. Monthly purse seine YELLOWFIN TUNA length frequency histograms for the tropical WCPFC area, 2012-2014.

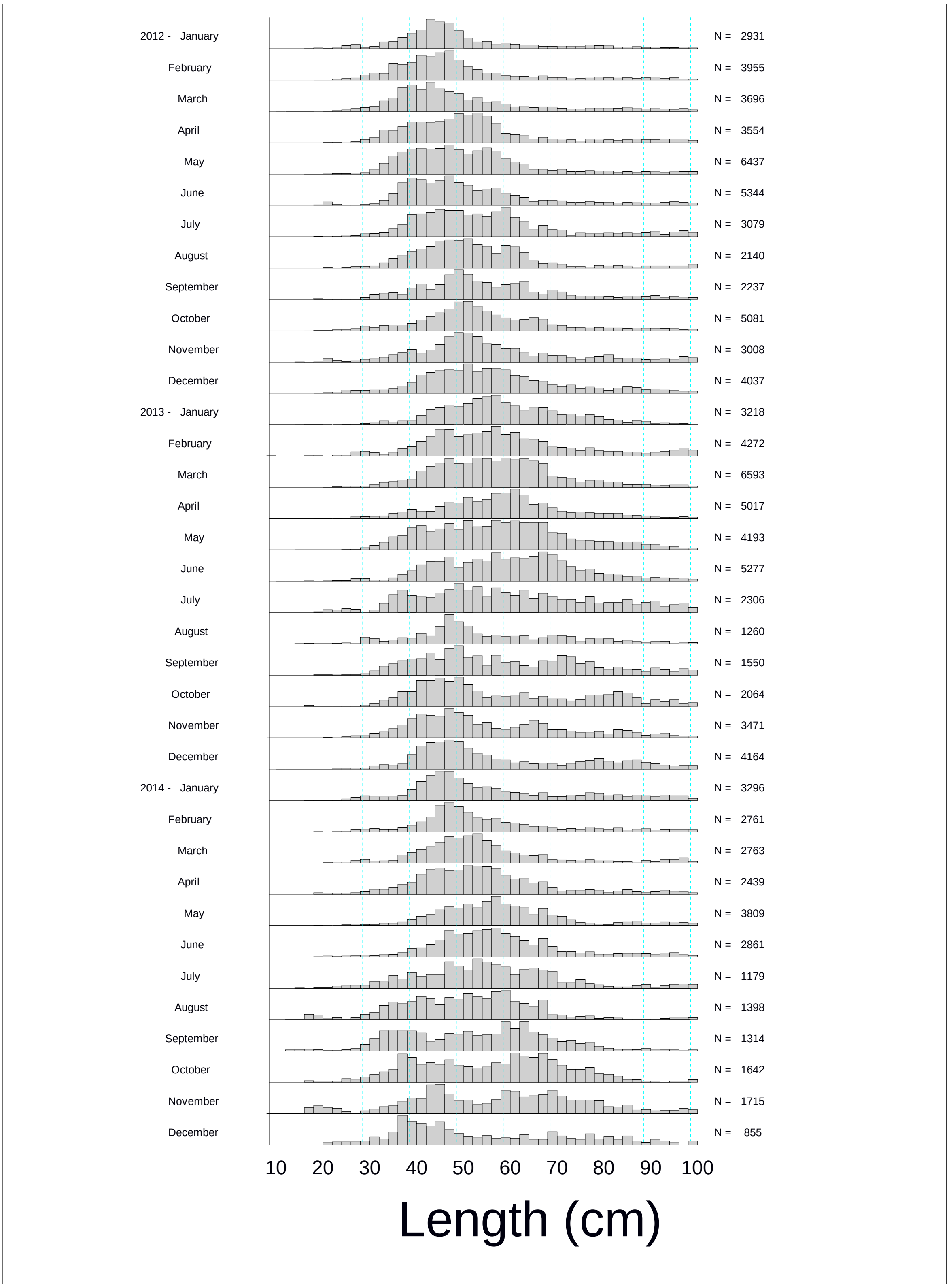


Figure A11. Monthly purse seine BIGEYE TUNA length frequency histograms for the tropical WCPFC area, 2012-2014.

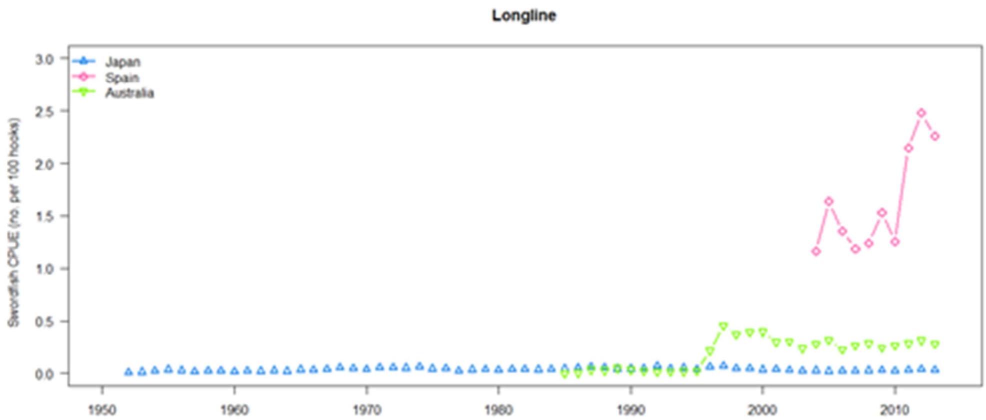


Figure A12. Trends in SWORDFISH nominal CPUE (number of fish per 100 hooks) over time for key LONGLINE fleets in the south Pacific Ocean.

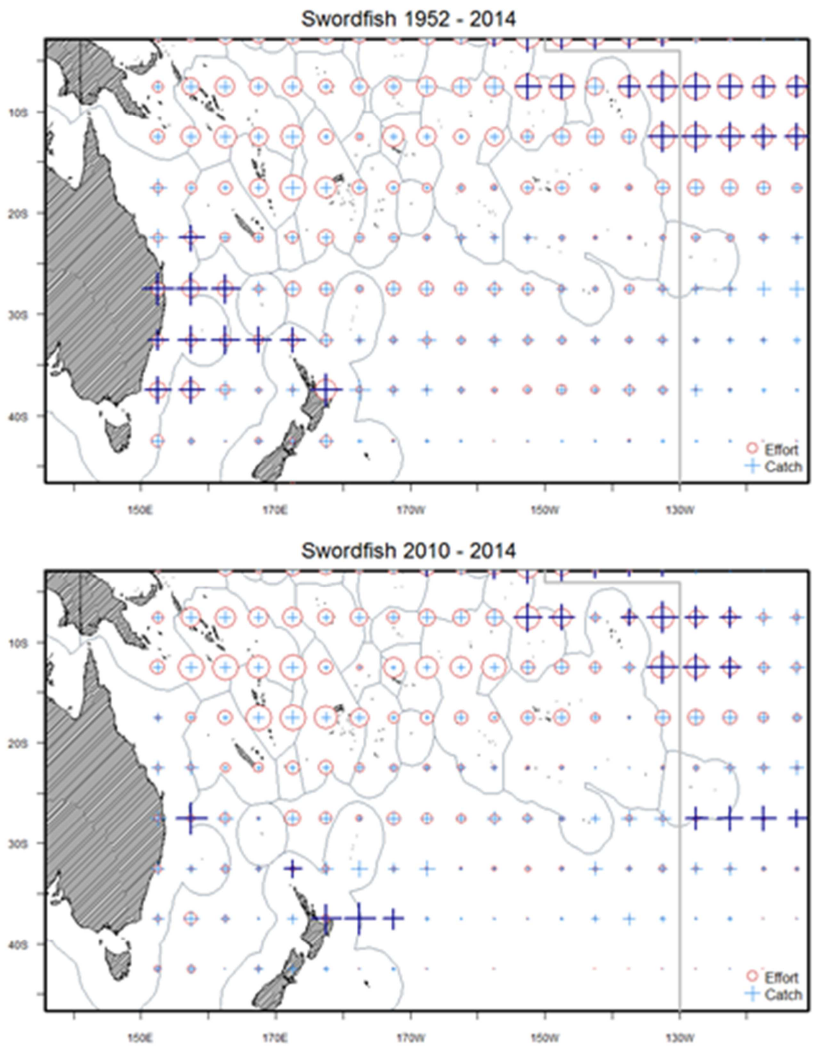


Figure A13. South Pacific SWORDFISH longline catch (+) and effort (circles) distribution for the period 1950-2014 (top) and 2009-2014 (bottom).

The top 15% of 5x5 degree squares for catch have bolded '+'. The relative size of the + and circle give an indication of the CPUE for the square. Where the + is larger than the circle, CPUE is high.

Table A14. Purse seine tuna catch and effort by set type and species in the WCPFC Convention Area between 20°N and 20°S, excluding domestic purse seine effort in Philippines, Indonesia and Vietnam. Estimates are based on raised logsheet data with species composition adjusted using observer sampling with grab sample bias correction. Associated sets include animal-associated sets.

YEAR	DAYS	UNASSOCIATED SCHOOLS								ASSOCIATED SCHOOLS								TOTAL				
			SKIPJACK		YELLOWFIN		BIGEYE		TOTAL		SKIPJACK		YELLOWFIN		BIGEYE		TOTAL		SKJ	YFT	BET	TOTAL
		SETS	MT	%	MT	%	MT	%	MT	SETS	MT	%	MT	%	MT	%	MT	SETS	MT	MT	MT	MT
2000	33,483	14,462	278,692	70%	120,258	30%	1,301	0%	400,251	12,563	305,473	60%	164,474	33%	36,511	7%	506,458	27,025	584,166	284,732	37,811	906,708
2001	34,738	16,347	328,074	67%	155,069	32%	5,375	1%	488,517	11,246	260,544	63%	112,493	27%	39,768	10%	412,804	27,594	588,617	267,562	45,142	901,321
2002	38,317	16,977	381,632	79%	92,602	19%	6,277	1%	480,512	13,612	384,335	68%	133,577	24%	47,810	9%	565,722	30,590	765,967	226,179	54,087	1,046,233
2003	40,938	17,013	374,398	72%	144,239	28%	3,414	1%	522,051	13,318	315,359	68%	120,063	26%	31,585	7%	467,007	30,332	689,757	264,302	34,999	989,057
2004	43,792	11,134	198,765	77%	58,343	23%	2,411	1%	259,520	20,998	535,415	67%	204,274	26%	58,660	7%	798,348	32,133	734,180	262,617	61,071	1,057,868
2005	45,583	19,494	407,919	75%	132,233	24%	5,059	1%	545,211	17,091	428,956	67%	169,674	27%	42,121	7%	640,751	36,585	836,875	301,907	47,180	1,185,962
2006	42,364	15,305	328,723	78%	90,208	21%	3,320	1%	422,251	18,153	607,810	76%	144,437	18%	44,382	6%	796,628	33,459	936,532	234,645	47,702	1,218,879
2007	45,328	19,648	430,166	77%	125,117	22%	2,917	1%	558,199	16,703	612,428	77%	142,411	18%	38,363	5%	793,202	36,351	1,042,594	267,527	41,279	1,351,401
2008	48,996	22,718	425,880	68%	199,493	32%	3,059	1%	628,432	18,474	561,914	73%	159,059	21%	45,485	6%	766,457	41,192	987,794	358,552	48,543	1,394,889
2009	49,695	22,803	486,764	82%	100,253	17%	3,599	1%	590,616	21,305	714,491	77%	169,345	18%	47,196	5%	931,032	44,108	1,201,255	269,598	50,796	1,521,649
2010	51,681	37,837	686,308	76%	208,861	23%	7,992	1%	903,161	13,354	431,067	74%	107,206	19%	42,421	7%	580,694	51,192	1,117,375	316,067	50,413	1,483,855
2011	57,734	29,935	427,708	76%	130,074	23%	2,644	1%	560,426	21,985	635,328	75%	148,707	18%	67,872	8%	851,907	51,920	1,063,037	278,782	70,515	1,412,333
2012	53,217	36,120	630,861	76%	196,394	24%	7,865	1%	835,120	20,592	629,788	78%	122,680	15%	52,747	7%	805,216	56,713	1,260,649	319,074	60,613	1,640,336
2013	54,727	36,861	635,625	81%	143,537	18%	7,636	1%	786,798	18,957	591,860	74%	149,727	19%	60,427	8%	802,013	55,819	1,227,484	293,264	68,063	1,588,811
2014	53,051	36,205	710,182	79%	181,921	20%	8,189	1%	900,292	19,598	661,973	78%	135,363	16%	55,456	7%	852,792	55,804	1,372,155	317,285	63,645	1,753,085

Figure A15. Trends in purse seine vessel numbers and aggregated Gross Registered Tonnage (GRT).
(Source : FFA Regional Vessel History database; GT converted to GRT for Japanese vessels)
For more comprehensive information on purse seine capacity, refer to
SC11\MI-WP-06 - Estimating productivity change in the PS fishery, and
SC11\MI-WP-10 Estimating potential vessel limits for the tropical tuna given existing available yields and current patterns of fishing.

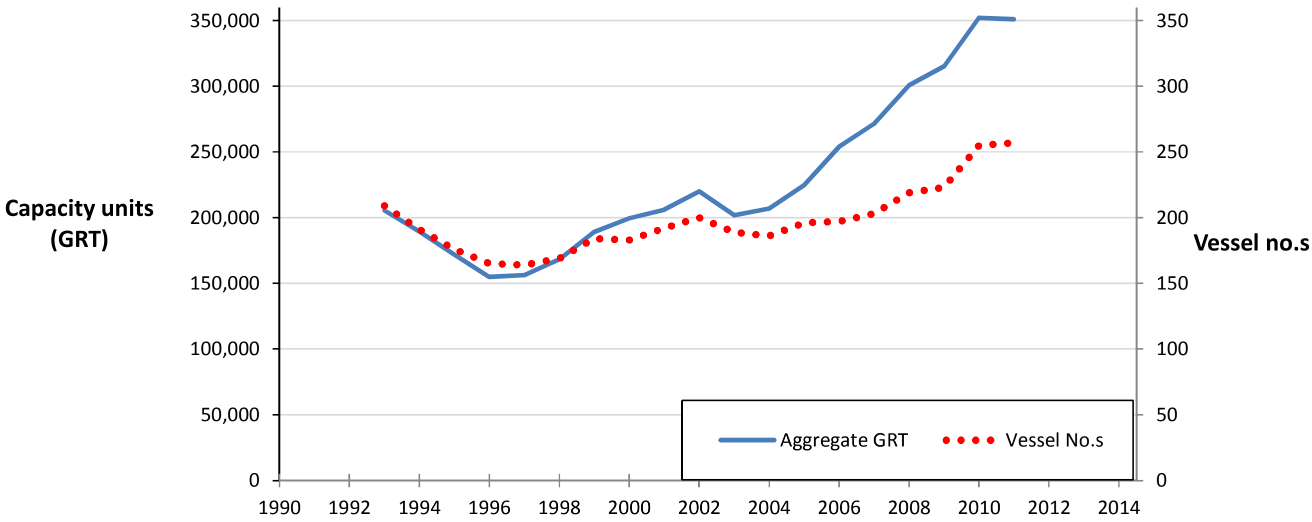


Figure A16. Trends in the differential of total tuna catch CPUE (mt/day) in the tropical WCP-CA purse seine fishery west and east of 160°E, with the quarterly average of Southern Oscillation Index (SOI)
(Source: Aggregated logbook data for traditional purse seine fleets of Chinese Taipei, Korea, Japan and USA)