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Overview of Tuna Fisheries in the Western and Central Pacific Ocean, including Economic Conditions - 2017

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*Revision 1.

- Update to effort trend for recent years in Figure 3.1.2
- Enhancement to the size of the pies for 2017 catch by species on the right-hand side of Figure 3.7.3

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[2] Pacific Islands Forum Fisheries Agency (FFA), Honiara, Solomon Islands

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 (2017) and covering the most recent summary of catch estimates by gear and species.

The provisional total WCP–CA tuna catch for 2017 was estimated at **2,539,950 mt**, the lowest catch for six years, and around 340,000 mt below the record catch in 2014 (2,883,204 mt). The WCP–CA tuna catch (2,539,950 mt) for 2017 represented 78% of the total Pacific Ocean catch of 3,239,704 mt, and 54% of the global tuna catch (the provisional estimate for 2017 is 4,715,836 mt, at this stage, the fourth highest on record).

The **2017 WCP–CA catch of skipjack** (**1,624,162 mt** – 64% of the total catch) was the lowest since 2011, at nearly 375,000 mt less than the record in 2014 (2,000,608 mt). The **WCP–CA yellowfin catch** for 2017 (**670,890 mt** – 26%) was the highest recorded (more than 35,000 mt higher than the previous record catch of 2016), mainly due to increased catches in the purse seine fishery. The **WCP–CA bigeye catch** for 2017 (**126,929** mt – 5%) was the lowest since 2016 and mainly due to continued low longline catches. The **2017 WCP–CA albacore catch** (**117,969 mt** – 5%) was slightly lower than the average over the past decade and around 50,000 mt lower than the record catch in 2002 at 147,793 mt. The **south Pacific albacore** catch in 2017 (92,291 mt) was a record catch, primarily due to a record in the longline fishery (89,388 mt.); the 2017 catch was around 4,000-5,000 mt. more than the previous record catch in 2010 of 88,147 mt.

The provisional **2017 purse-seine catch of 1,812,474 mt** was slightly less than the most recent five-year average, and nearly 250,000 less than the record in 2014 (2,059,008 mt). While the total purse seine catch in 2017 was similar to the 2016 catch level, the species composition was clearly different. The 2017 purse-seine skipjack catch (1,280,311 mt; 71% of total catch) was the lowest since 2011 and nearly 350,000 mt lower than the record in 2014. In contrast, the 2017 purse-seine catch estimate for yellowfin tuna (472,279 mt; 26%) was the highest on record at nearly 50,000 mt higher than the previous record (423,788 mt in 2008); this record was mainly due to good catches of large yellowfin from unassociated-school set types in the west and central tropical WCP-CA areas (see Figure 3.4.8–right). The provisional catch estimate for bigeye tuna for 2017 (56,194 mt) was a decrease on the catch in 2016 and lower than the most recent five-year average.

The **provisional 2017 pole-and-line catch** (151,232 mt) was the lowest annual catch since the mid-1960s, with reduced catches in both the Japanese and the Indonesian fisheries.

The **provisional WCP–CA longline catch** (240,387 mt) for 2017 was lower than the average for the past five years. The WCP–CA albacore longline catch (96,280 mt – 40%) for 2017 was higher than the average catch over the past decade, and only 5,000 mt lower than the record of 101,816 mt attained in 2010. The provisional bigeye catch (58,164 mt – 25%) for 2017 was the lowest since 1996, presumably mainly due to continued reduction in effort in the main bigeye tuna fishery. The yellowfin catch for 2017 (83,399 mt – 35%) was lower than the average for the past decade and more than 20,000 mt less that the record for this fishery.

The 2017 **South Pacific troll albacore catch** (2,508 mt) was similar to catch levels experienced over the past four years. The New Zealand troll fleet (111 vessels catching 1,952 mt in 2017) and the United States troll fleet (13 vessels catching 556 mt in 2017) accounted for all of the 2017 albacore troll catch.

Market prices in 2017 generally improved with significant increases in prices for purse seine caught skipjack and yellowfin, pole and line caught skipjack and longline caught yellowfin, swordfish and striped marlin while longline caught albacore prices remained steady and longline caught bigeye prices were either steady or declined.

The total estimated delivered value of catch in the WCP-CA increased by 12% to US$5.84 billion during 2017. The value of the purse seine catch (US$3.40 billion) accounted for 58% of the value of the catch, the fishery's 2nd highest contribution to total catch value. The value of the longline fishery in 2017 (US$1.46 billion) was the lowest since 2007 and accounted for 25% of the value of the catch, its 2nd lowest contribution to total catch value. The 2017 values of the pole and line, and other catch were US$348 and US$631 million respectively. The value of the 2017 WCP–CA skipjack catch (US$2.98 billion) was the equal to the third highest recorded and 13% higher than 2016. The 2017 value of the WCP–CA yellowfin catch (US$1.9 billion) was the second highest recorded and 17% higher than 2016. The value of the WCP–CA bigeye catch in 2017 (US$0.65 billion) was at its lowest level since 2005. The 2017 value of the WCP–CA albacore catch (US$0.34 billion) was around that averaged over the past 10 years.

Economic conditions in the purse seine, tropical longline and southern longline fisheries of the WCP-CA showed mixed results. The southern longline fishery saw a further improvement in catch rates which drove the FFA economic conditions index to its highest level since 2009. Conversely, the tropical longline fishery index, which moved above its long term average in 2016 for the first time since 2010, fell back to below the long term average. In the purse seine fishery, despite significant falls in purse seine catch rates, higher prices resulted in the continuation of the good economic conditions in 2017, with the FFA purse seine fishery economic conditions index increasing marginally from 2016 to be at its third highest level since 1999.

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 – 2017. The review draws on the latest catch estimates compiled for the WCP–CA, found in Information Paper WCPFC–SC14 ST IP–1 *(Estimates of annual catches in the WCPFC Statistical Area – OFP, 2018)*. Where relevant, comparisons with previous years' activities have been included, although data for 2017, 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 2017 catches relative to those of recent years, but refers readers to the SC14 National Fisheries Reports, which offer more detail on recent activities at the fleet level.

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.

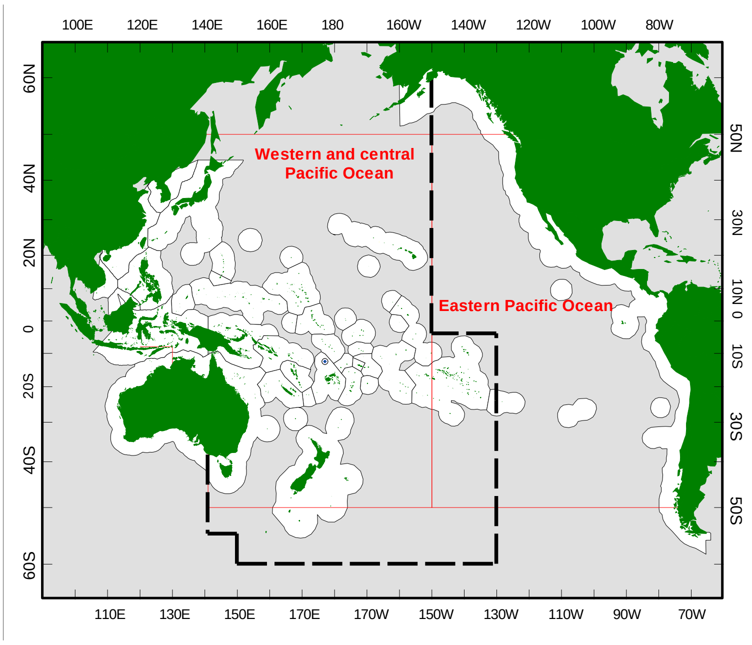

Figure 1.1 The western and central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Convention Area (WCP–CA in dashed lines)

2. TOTAL TUNA CATCH AND CATCH VALUE FOR 2017

Annual total catches of the four main tuna species (skipjack, yellowfin, bigeye and albacore) in the WCP–CA increased steadily during the 1980s and 1990s with the purse seine fleet clearly the dominant fishery in terms of catch volume. The increasing trend in total tuna catch continued through to 2009, then followed two years (2010-2011) of reduced catches, but returned to record levels in successive years over the period 2012–2014. Since the record in 2014, total catches have backed off slightly over the period 2015-2017 (Figure 2.1 and Figure 2.2).

The provisional total WCP–CA tuna catch for 2017 was estimated at **2,539,950 mt**, the lowest catch for six years, and around 340,000 mt below the record catch in 2014 (2,883,204 mt). For 2017, the **purse seine fishery** accounted for a catch of **1,812,474 mt** (71% of the total catch), with **pole-and-line** taking an estimated **151,232 mt** (7%), the **longline fishery** an estimated **240,387 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 (2,539,950 mt) for 2017 represented 78% of the total Pacific Ocean catch of 3,239,704 mt, and 54% of the global tuna catch (the provisional estimate for 2017 is 4,715,836 mt, at this stage, the fourth highest on record).

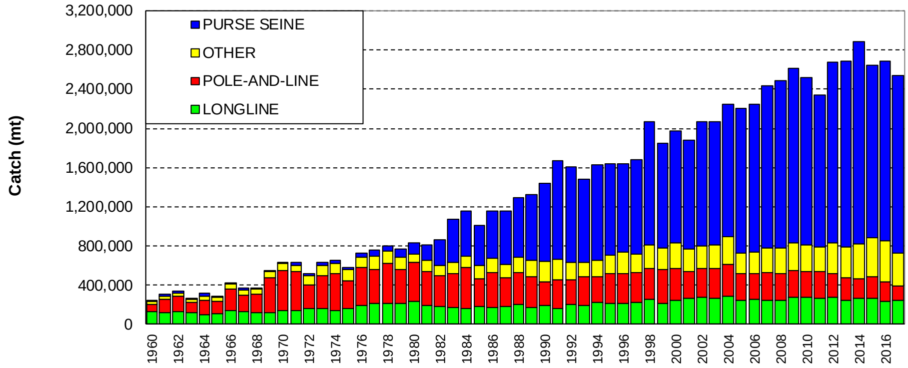

Figure 2.1 Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

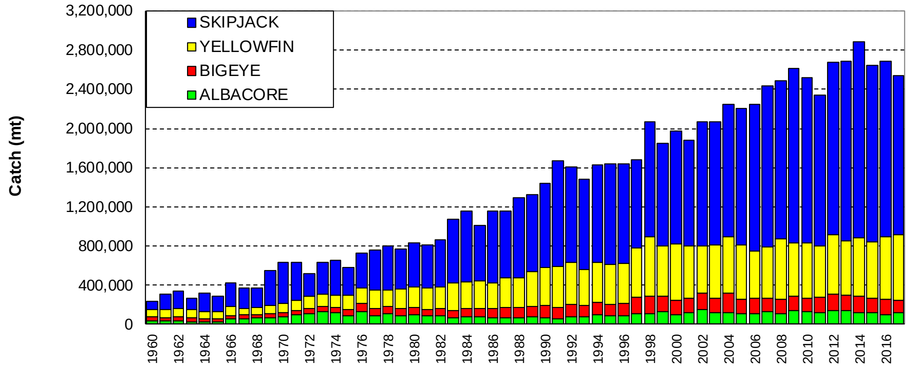

Figure 2.2 Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

The **2017 WCP–CA catch of skipjack** (**1,624,162 mt** – 64% of the total catch) was the lowest since 2011, at nearly 375,000 mt less than the record in 2014 (2,000,608 mt). The **WCP–CA yellowfin catch** for 2017 (**670,890 mt** – 26%) was the highest recorded (more than 35,000 mt higher than the previous record catch of 2016), mainly due to increased catches in the purse seine fishery. The **WCP–CA bigeye catch** for 2017 (**126,929** mt – 5%) was the lowest since 2016 and mainly due to continued low longline catches. The **2017 WCP–CA albacore**[1] **catch** (**117,969 mt** – 5%) was slightly lower than the average over the past decade and around 50,000 mt lower than the record catch in 2002 at 147,793 mt.

[1] includes catches of north and south Pacific albacore in the WCP–CA, which comprised 80% of the total Pacific Ocean albacore catch of 147,227 mt in 2017; the section 7.4 "Summary of Catch by Species - Albacore" is concerned only with catches of south Pacific albacore (92,291 mt in 2017 – a record), which made up approximately 63% of the Pacific albacore catch in 2017.

In **2017 the value of the provisional total WCP–CA tuna catch was $5.84 billion**[2] the fourth highest on record and 12% higher than for 2016. During 2017, the value of the purse seine catch ($3.40 billion) accounted for 58% of the value of the catch the fishery's 2nd highest contribution to the total catch value. The value of the longline fishery in 2017 ($1.46 billion) was the lowest since 2007 and accounted for 25% of the value of the catch its 2nd lowest contribution to the total catch value. The 2017 values of the pole and line, and other catch were $348 and $631 million respectively.

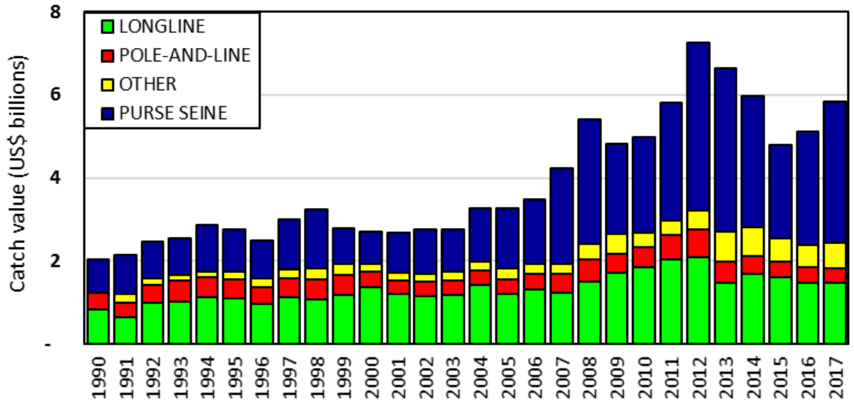

Figure 2.3 Catch value of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types.

The **value of the 2017 WCP–CA skipjack catch (US$2.98 billion)** was the equal third highest recorded and 13% higher than 2016. The **value of the WCP–CA yellowfin catch in 2017 (US$1.9 billion)** was the second highest recorded and 17% higher than 2016. The **value of the WCP–CA bigeye catch in 2017 (US$0.65 billion)** was at its lowest level since 2005. The **value of the WCP–CA albacore catch in 2017 (US$0.34 billion)** was around that averaged over the past 10 years.

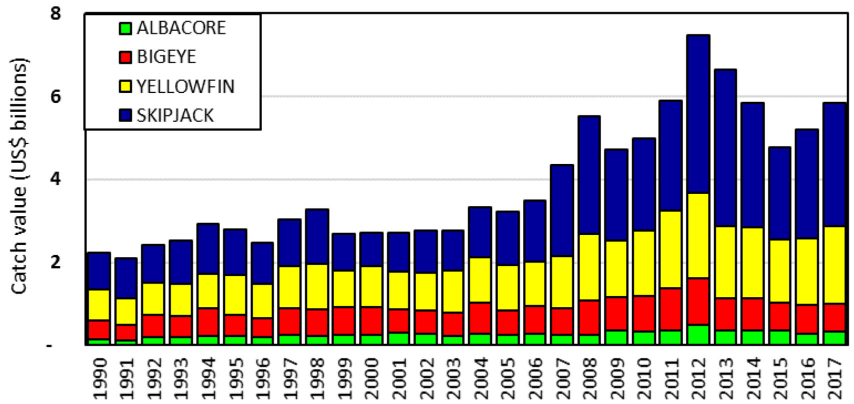

Figure 2.4 Catch value of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

[2] All $ amounts refer to US dollars unless otherwise specified.

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 65% of total tuna catch volume (with more than 2,000,000 mt in 2014). 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 (Figure 3.1.1), but declined to a low of 111 vessels in 2006 (due to reductions in the US fleet), before some rebound in recent years (129 vessels in 2017[3]). The Pacific Islands fleets have gradually increased in numbers over the past two decades to a level of 130 vessels in 2017 (Figure 3.3.1). The remainder of the purse seine fishery includes several fleets which entered the WCPFC tropical fishery during the 2000s (e.g. China, Ecuador, El Salvador, New Zealand and Spain).

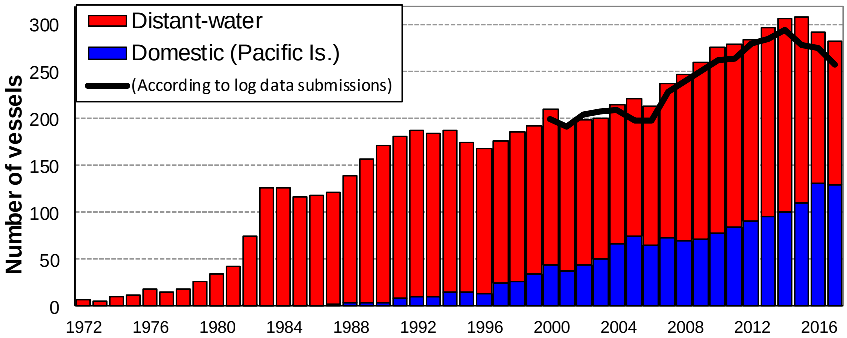

Figure 3.1.1 Number of purse seine vessels operating in the WCP–CA tropical fishery

(excludes Indonesia, Philippine and Vietnam domestic purse-seine/ringnet fleets)

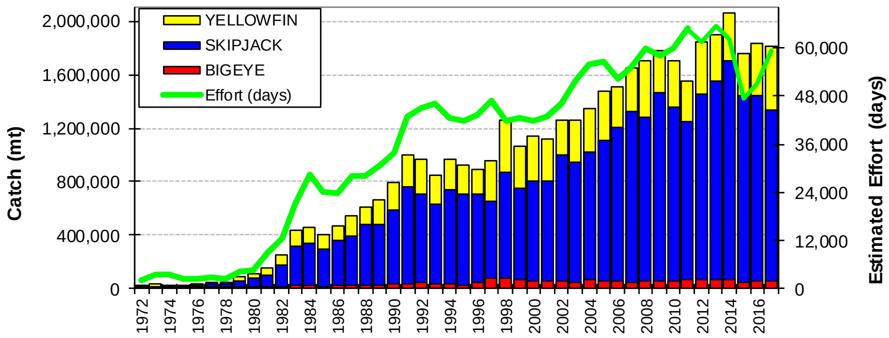

Figure 3.1.2 Purse seine catch (mt) of bigeye, skipjack and yellowfin and estimated fishing effort (days fishing and searching) in the WCP–CA

The total number of purse seine vessels was relatively stable over the period 1990-2006 (in the range of 180–220 vessels), but thence until 2014, the number of vessels gradually increased, attaining a record level of 307 vessels in 2014, before declining over the past two years (to 283 vessels in 2017). Table A3 in the APPENDIX provides data on purse seine vessel numbers, tuna catch and effort by set type and species in the tropical tuna purse seine fishery based on raised logsheet data, with 258 vessels reported as operating in the tropical tuna purse seine fishery in 2017 (according to submitted logbook data).

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 – 2-5%. Small amounts of albacore tuna are also taken in temperate water purse seine fisheries in the North Pacific.

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

- 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 1,500,000 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 2017 the number of active vessels by fleet was Japan (38), Korea (26), Chinese Taipei (31) and USA (34). In 2017, there was an additional 37 vessels in the category less than 200 GRT which are a part of the Japanese offshore purse seine fleet but not included here.

- Increased bigeye tuna purse seine catch estimates, coinciding with the introduction of drifting FADs (since 1997). Significant bigeye catch years have been 1997 (82,649 mt), 1998 (76,283 mt), 2004 (72,507 mt), 2011 (72,132 mt) and 2013 (74,599 mt) which correspond to years with a relatively high proportion of associated sets, increased bigeye tuna availability to the gear, and/or strong bigeye recruitment.

Total estimated effort tends to track the increase in the catch over time (Figure 3.1.2), with years of relatively higher catch rates apparent when the effort line intersects the histogram bar, which is particularly the case for years 2014–2016.

3.2 Provisional catch estimates, fleet size and effort (2017)

The provisional **2017 purse-seine catch of 1,812,474 mt** was slightly less than the most recent five-year average, and nearly 250,000 less than the record in 2014 (2,059,008 mt). While the total purse seine catch in 2017 was similar to the 2016 catch level, the species composition was clearly different. The 2017 purse-seine skipjack catch (1,280,311 mt; 71% of total catch) was the lowest since 2011 and nearly 350,000 mt lower than the record in 2014. In contrast, the 2017 purse-seine catch estimate for yellowfin tuna (472,279 mt; 26%) was the highest on record at nearly 50,000 mt higher than the previous record (423,788 mt in 2008); this record was mainly due to good catches of large yellowfin from unassociated-school set types in the west and central tropical WCP-CA areas (see Figure 3.4.8–right). The provisional catch estimate for bigeye tuna for 2017 (56,194 mt) was a decrease on the catch in 2016 and lower than the most recent five-year average.

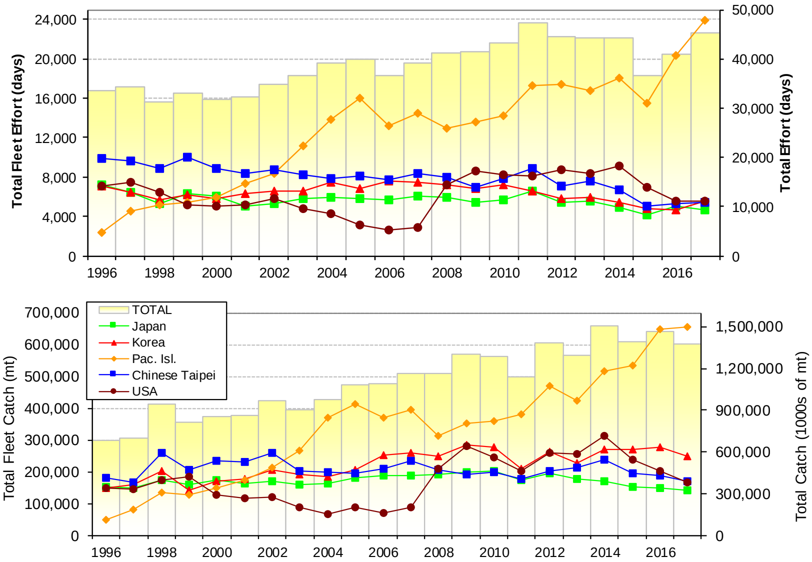

Figure 3.2.1. Trends in annual effort (top) and catch (bottom) estimates for the top five purse seine fleets operating in the tropical WCP–CA, 1996–2017.

Figure 3.2.1 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 was relatively stable over the period 2010–2014, before the clear decline in effort for 2015 and then a gradual recovery to the 2010-2014 levels through 2016 and 2017. In contrast, catches have tended to trend upwards over this period, suggesting increased efficiency and, in some instances, better catch rates. The decline in effort during 2015/2016 was related to several factors including reduced access to fishing areas for some fleets, economic conditions and simply a choice to fish in areas outside the WCPFC area; the maintenance of the high catch levels in 2015/2016 were due to good catch rates, in part due to the El Nino conditions.

The combined Pacific-Islands fleet has been clearly the highest producer in the tropical purse seine fishery since 2003 and unlike the other fleets shown in Figure 3.2.1, their catches continue to increase each year. 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 2017. 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 relatively 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 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. Since 2014, the catch/effort by the Chinese Taipei, Japan and US fleets have gradually declined while the catch/effort by the combined Pacific Islands fleet continued to increase.

The total number of combined Pacific-island fleet vessels has gradually increased over the past two decades, attaining its highest level in 2016 and 2017 (132 and 130 vessels, respectively); increases in recent years include the reflagging and chartering of vessels from the Asian fleets. 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; 19 vessels), Kiribati (19 vessels), Marshall Islands (10 vessels), PNG (Papua New Guinea; 67 vessels including their chartered vessels), Solomon Islands (10 vessels), Tuvalu (2 vessel) and Vanuatu (3 vessels).

The domestic Philippine purse-seine and ring-net fleets operate in Philippine and, since 2013 (as was the case prior to 2010). in the high seas pocket between Palau, Indonesia, FSM and PNG; this fleet accounted for 55,000-80,000 mt annually in the period since 2013. 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 2015 (~56,000 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 Indonesia purse seine catch has since recovered substantially (208,895 mt in 2017) apparently due to increased catches by the smaller-scale purse seine component of this fleet. Prior to 2009, the domestic fleets of Indonesia and Philippines accounted for about 13-16% of the WCP-CA total purse seine catch, although this proportion dropped below 10% since then, with a low in 2015 of only 6% but recovered to around 15% in 2017, mainly due to the relatively high Indonesian catch estimate.

Figure 3.2.2 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 dominate during recent years (68% of all sets for these fleets in 2017). The proportion of sets on drifting FADs in 2017 (27%) was higher than in recent years (in the range of 21–24% since 2012), and perhaps related to skipjack tuna being less available in unassociated sets, and therefore an increased preference to drifting FAD sets (particularly for the US fleet). The number and proportion (3% in 2017) of sets on natural logs is now stable at a much lower level than prior to 2010, 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 2017 = 40%: Figure 3.2.2–right) will be higher than the percentage of sets for drifting FADs (for 2017 = 27%: Figure 3.2.2–left). In contrast, the catch from unassociated schools in 2017 was 55% of the total catch, but taken from 68% of the total sets. Table A3 in the APPENDIX provides a more detailed breakdown of catch and effort by set type in 2000-2017 using available logsheet and observer data.

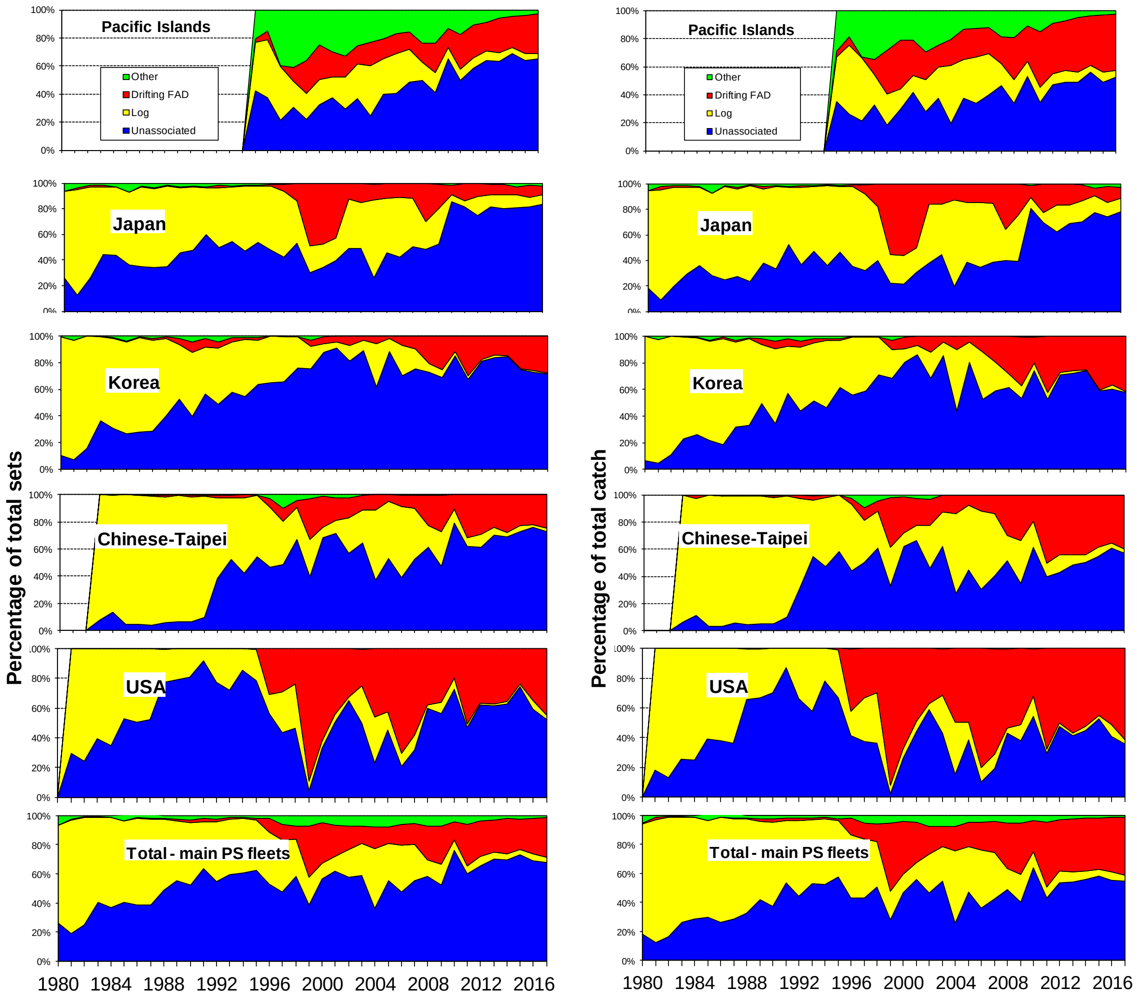

Figure 3.2.2 Time series showing the percentage of total sets (left) and total catch (right), by school type for the major purse-seine fleets operating in the WCP–CA.

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 3.3.1). Figure 3.4.2 (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 La Niña conditions during 2011 and a transition 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 strengthened in 2015 to a level not experienced in the fishery for almost 20 years (i.e. since 1997/1998). El Niño conditions continued into the first half of 2016 but then abruptly moved to a neutral state by the middle of the year which presided over the fishery into 2017.

In line with the prevailing ENSO conditions (neutral ENSO), fishing activity during 2017 was similar to 2012, with effort and catch mainly restricted to the western and central areas of the tropical WCP-CA (Figure 3.4.1 – left).

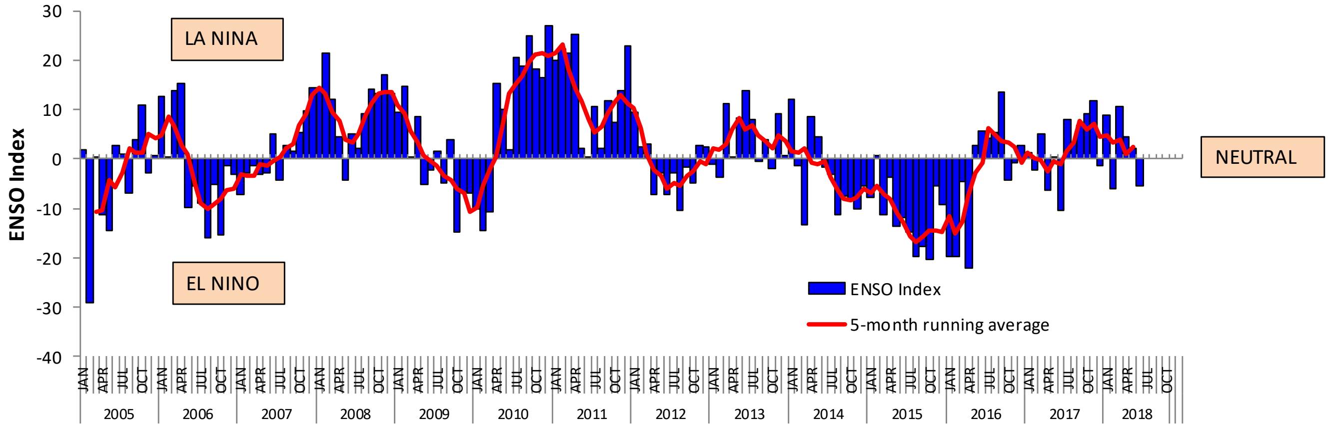

Figure 3.3.1 Trends in El Nino Southern Oscillation Index (ENSO), 2005-2018

3.4 Distribution of fishing effort and catch

Despite the FAD closure for certain periods in each year since 2010, drifting FAD sets remain an important fishing strategy (Figure 3.4.1–right), particularly to the east of 160°E. The relatively high proportion of unassociated sets in the eastern areas (e.g. Gilbert Islands) was a feature of the fishery in 2015–2016 (i.e. corresponding to El Nino conditions). The move to ENSO-neutral conditions during 2017 resulted in more effort in the area west of 160°E (Figure 3.4.1–bottom left) compared to recent years, and a higher use of drifting FADs in the area east of 160°E in 2017 (Figure 3.4.1–bottom left).

Figures 3.4.2 through 3.4.6 show the distribution of purse seine effort for the five major purse seine fleets during 2016 and 2017. In general, the distribution of effort for each fleet in 2017 is very similar to 2016 activities. The US fleet typically fishes in the more eastern areas and this was again the case during 2016/2017, 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 Asian fleets (Japan, Korean and Chinese Taipei) in 2016/2017 (Figures 3.4.2–3.4.5) is related to the areas they have access to and perhaps also related to fishing strategy (e.g. use of traditional fishing grounds, e.g. FSM, PNG and the Solomon Islands by the Japan fleet). During 2017, effort by the combined Pacific Islands fleet moved more to the west (e.g. into the domestic PNG fishery) compared to effort during 2016.

Figure 3.4.7 shows the distribution of catch by species for the past seven years, Figure 3.4.8 shows the distribution of skipjack and yellowfin catch by set type for the same period, and Figure 3.4.9 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 2017, 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 3.4.8–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. However, neutral ENSO conditions were experienced during 2017 and yet there was a record yellowfin catch in the purse seine fishery, which was mainly due to higher than average catches from unassociated sets in the western and central areas.

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, but in contrast, is dominated by drifting FAD sets in the area to the east of 160°E (Figure 3.4.9). During 2017, associated sets took more bigeye tuna in the east than in 2015/2016 (Figure 3.4.9), perhaps related to the retraction of the warm pool (and biomass) back to the west, and more drifting FADs used in the east (Figure 3.4.1–right); a shallower thermocline in the eastern tropical area in 2017 (after the recent strong El Nino of 2015-2016) also contributed to bigeye tuna being more available to the gear.

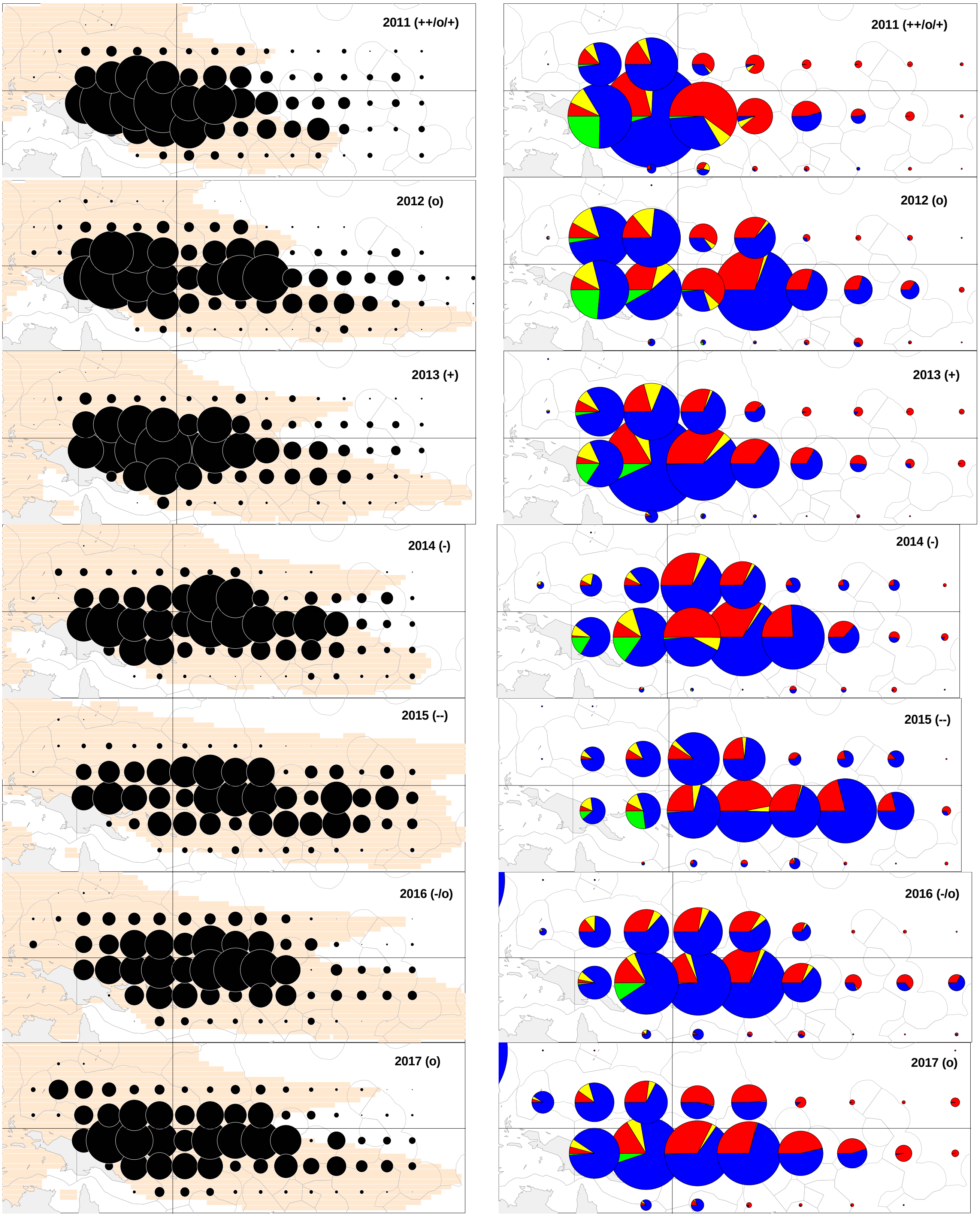

Figure 3.4.1 Distribution of purse-seine effort (days fishing – left; sets by set type – right), 2011–2017. (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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.

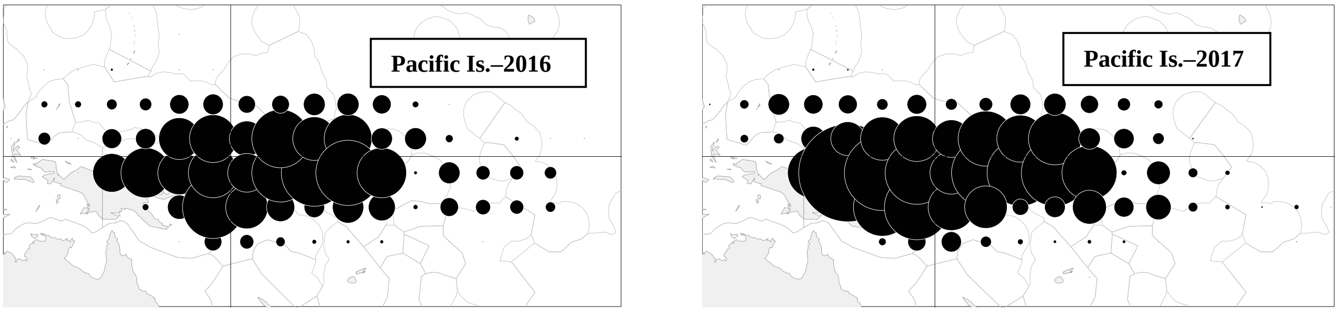

Figure 3.4.2 Distribution of effort by Pacific Islands fleets during 2016 and 2017
lines for the equator (0° latitude) and 160°E longitude included.

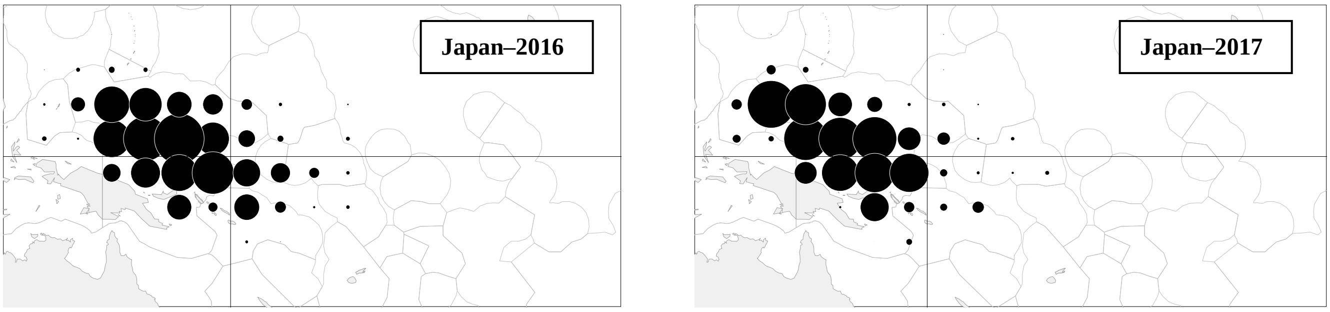

Figure 3.4.3 Distribution of effort by the Japanese purse seine fleet during 2016 and 2017
lines for the equator (0° latitude) and 160°E longitude included.

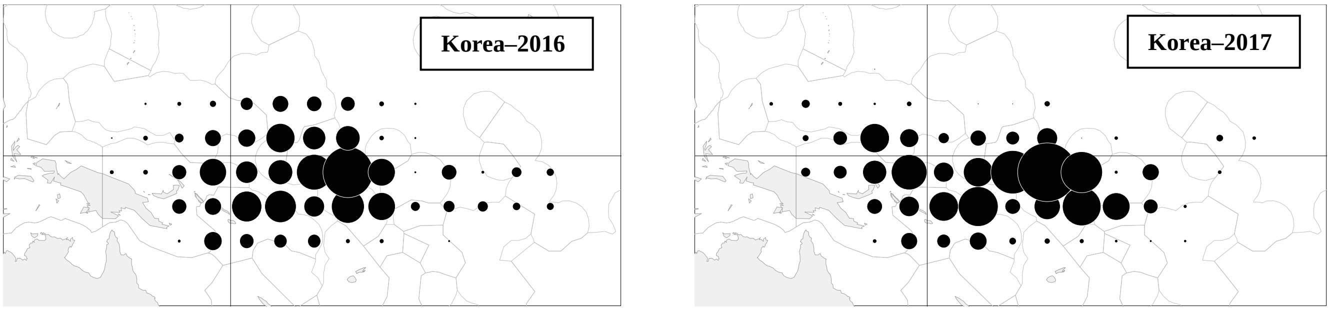

Figure 3.4.4 Distribution of effort by the Korean purse seine fleet during 2016 and 2017
lines for the equator (0° latitude) and 160°E longitude included.

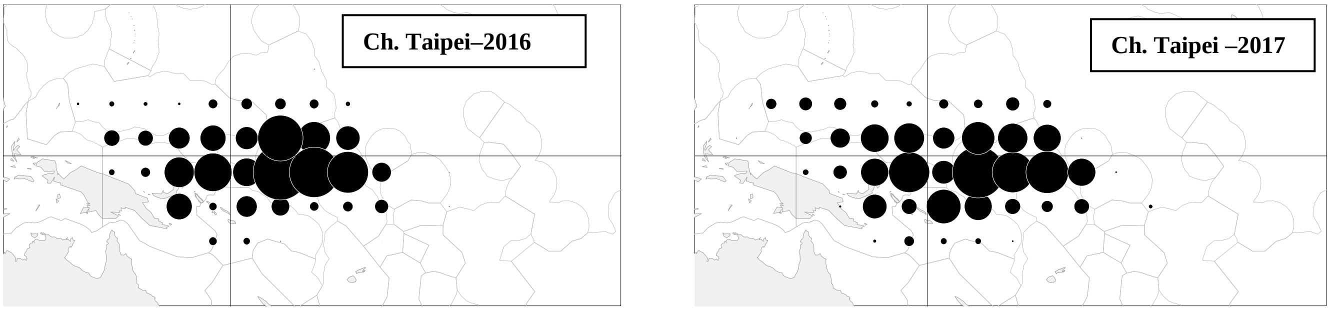

Figure 3.4.5 Distribution of effort by the Chinese-Taipei purse seine fleet during 2016 and 2017
lines for the equator (0° latitude) and 160°E longitude included.

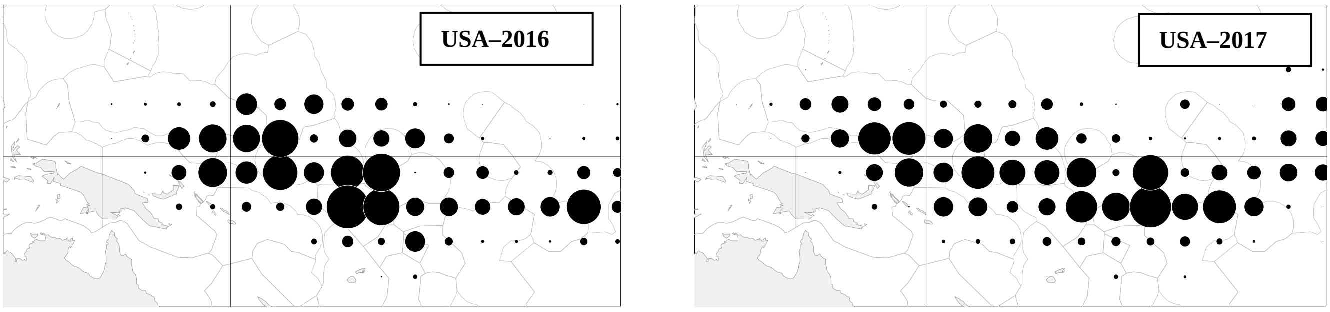

Figure 3.4.6 Distribution of effort by the US purse seine fleet during 2016 and 2017
lines for the equator (0° latitude) and 160°E longitude included.

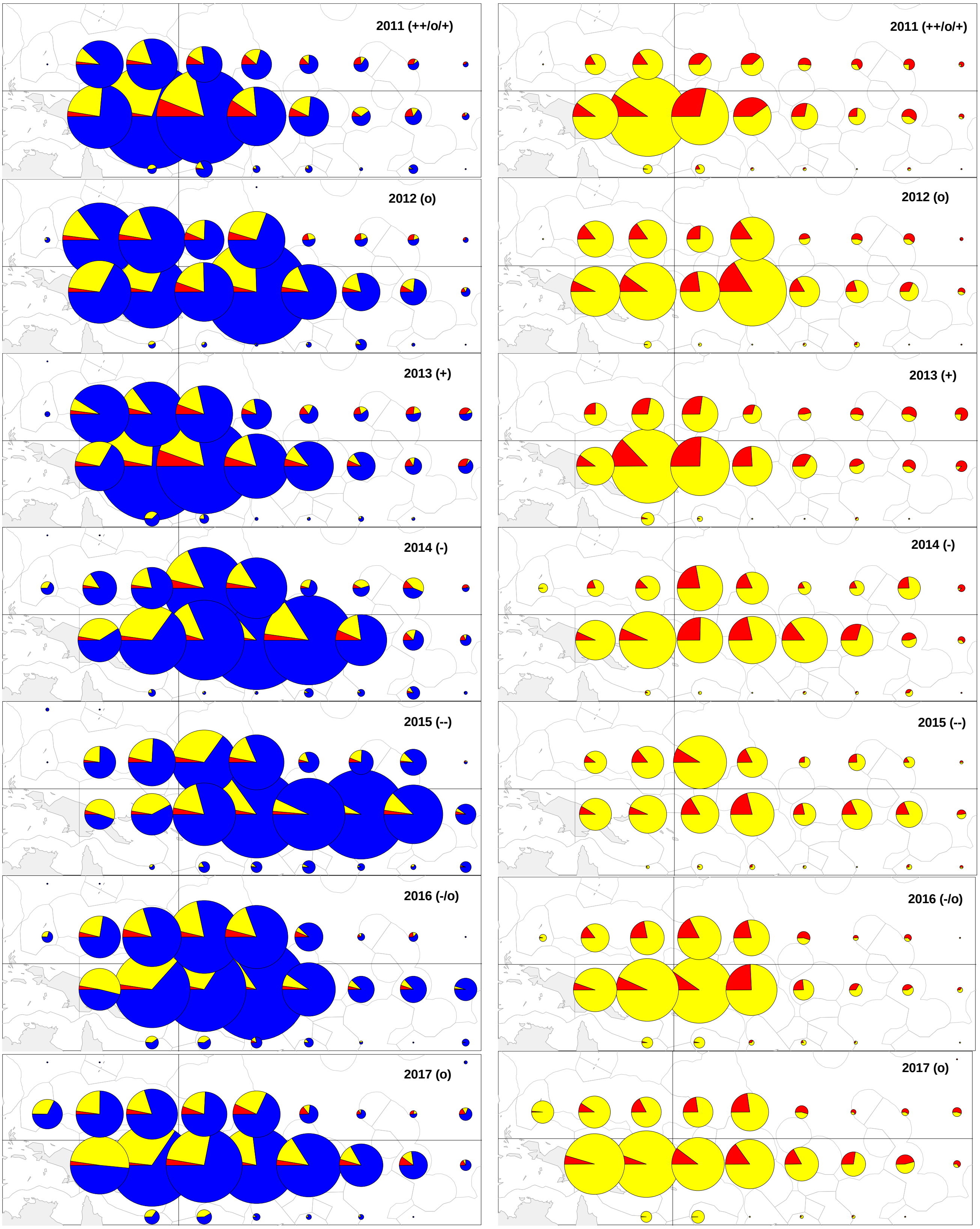

Figure 3.4.7 Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch (left) and purse-seine yellowfin/bigeye tuna catch only (right), 2011–2017 (Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).

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

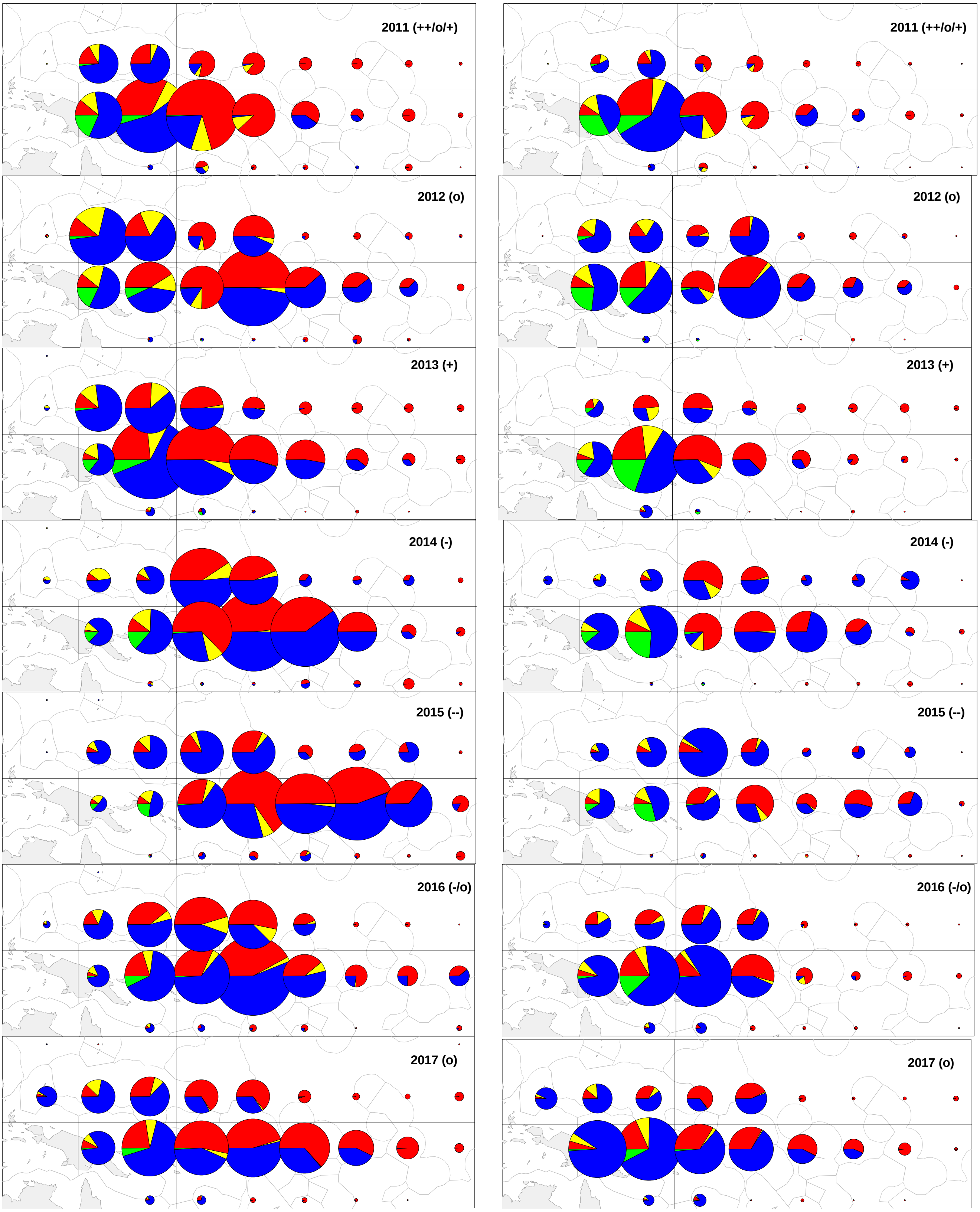

Figure 3.4.8 Distribution of skipjack (left) and yellowfin (right) tuna catch by set type, 2011–2017 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

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

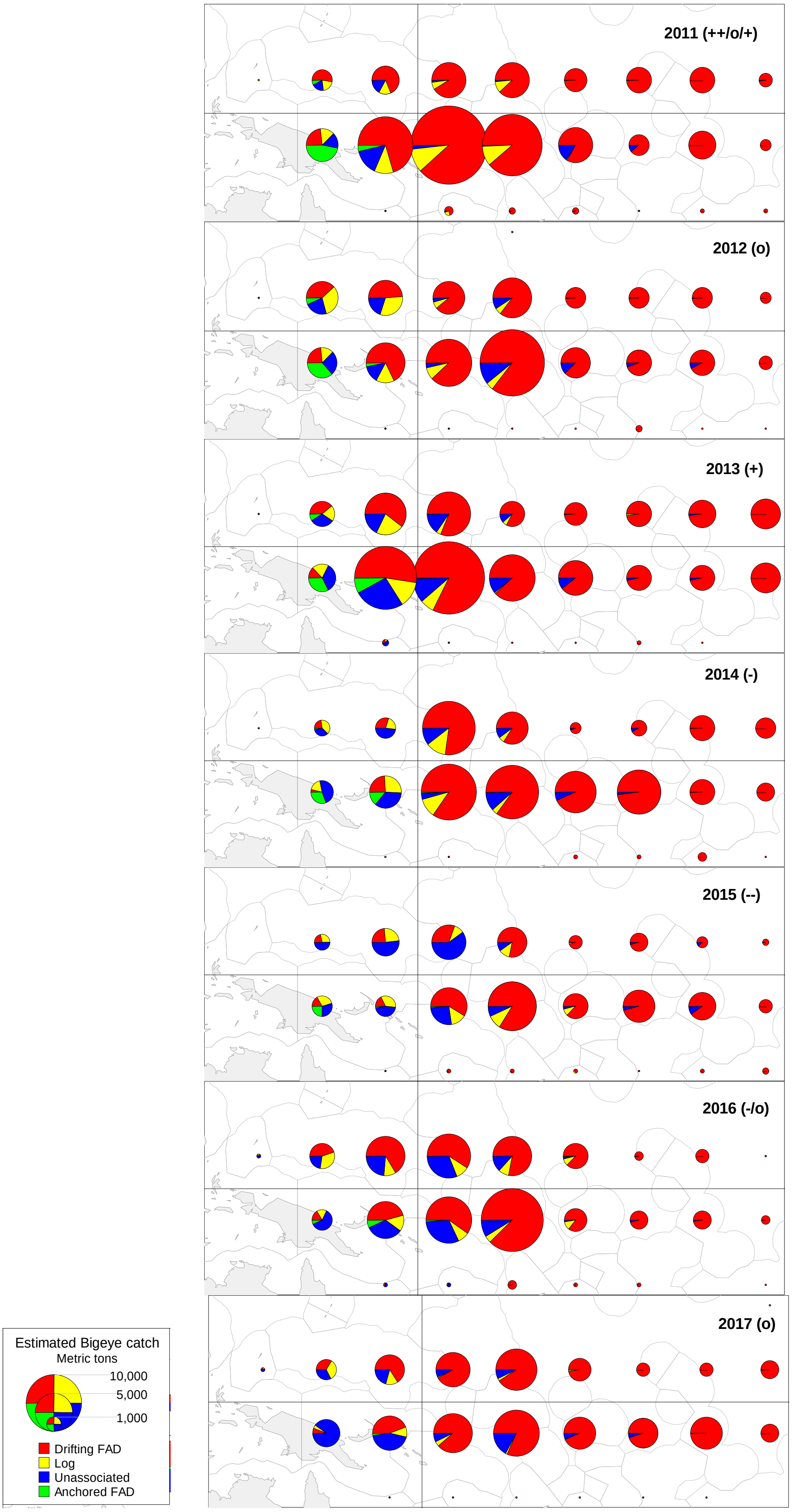

Figure 3.4.9 Distribution of estimated bigeye tuna catch by set type, 2011–2017 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).
ENSO periods are denoted by "+": La Niña; "-": El Niño; "o": transitional period.

3.5 Catch per unit of effort

Figure 3.5.1 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 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.

Purse seine skipjack CPUE clearly declined for all fleets in 2017 and was perhaps related to a change from the strong El Nino conditions of 2015/2016 (when skipjack were more available in certain areas of the tropical WCP-CA) to more ENSO-neutral conditions in 2017 (Figure 3.3.1); indeed, the 2017 purse seine skipjack CPUE by fleet was at similar levels to 2012, the last prolonged ENSO-neutral period. Over the entire time series, the trend for skipjack CPUE is clearly upwards, although, as noted, these graphs present nominal CPUE and do not take into account the increase in fishing efficiency. A possible indicator of an increase in fishing efficiency is the gradual reduction in average trip length over time, which is apparent in Figure 3.5.3.

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.

The purse seine yellowfin CPUE for free-schools in 2017 was amongst the highest levels for the past decade for most fleets and no doubt contributed to the record catch (see Figure 3.4.7–left and Figure 3.4.8–bottom–left for proportion of large yellowfin from free-schools in overall purse seine catch). In contrast, yellowfin catch rates on drifting FADs were relatively stable for most fleets in 2017, although remain at slightly 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 than the skipjack tuna CPUE. 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 efficiency 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 3.5.2). 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. The time series of bigeye catch rates for the Japanese fleet is now more in line with the other fleets as a result a new data submission with a revision to their species composition, although at this stage, the 2017 Japanese bigeye catch rate appears lower than the other fleets.

Figure 3.5.3 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 2018), 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. The pattern in high CPUE in the months immediately following the FAD closure periods is understood to be mainly due to the build-up of unexploited biomass which then becomes available through FADs. The drop in CPUE from late 2016 into the first 6-8 months of 2017 may simply be due to a return to conditions prior to the most recent El Nino of 2014–2016. It is also important to note that fluctuations in catch levels in certain periods are also influenced by economic conditions.

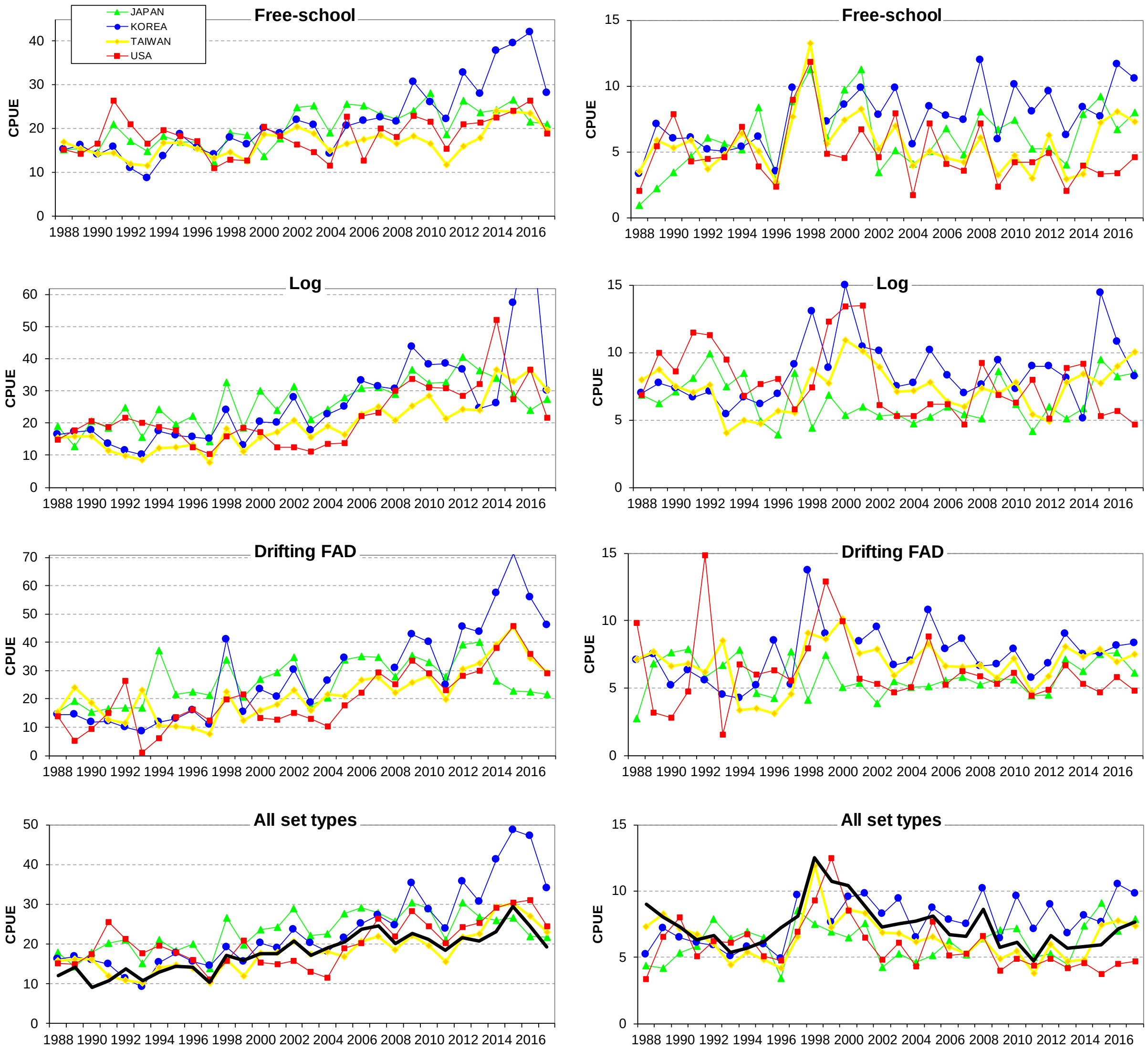

Figure 3.5.1 Skipjack tuna CPUE (mt per day–left) and yellowfin tuna CPUE (mt per day–right) by set-type, and all set types combined, for selected purse-seine fleets fishing in the tropical WCP–CA.

Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.
Thick black line for "All set types" represents **<u>the Pacific Islands purse seine fleets combined</u>**.

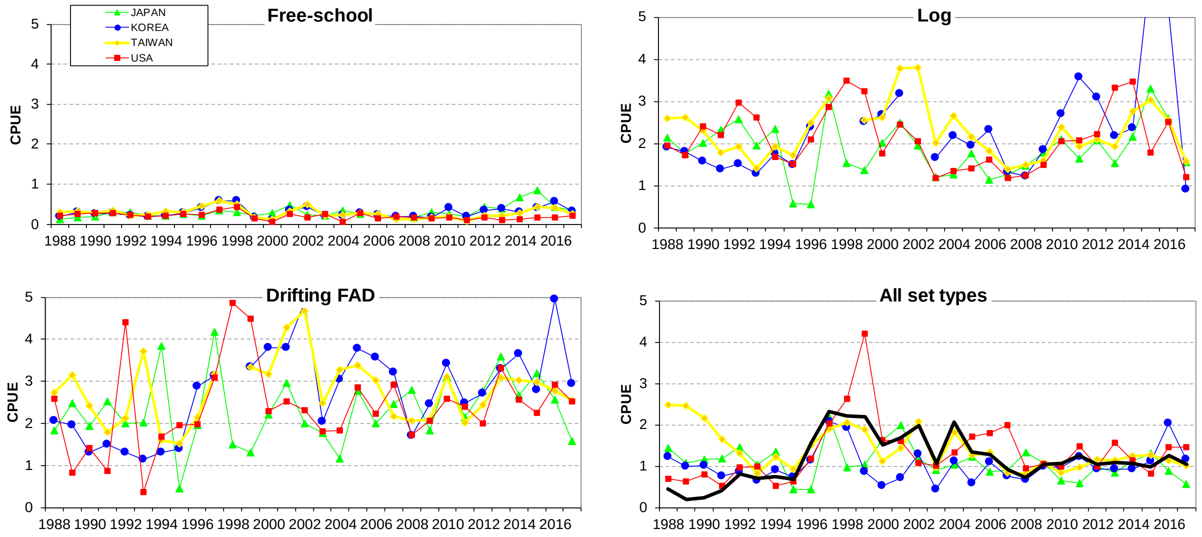

Figure 3.5.2 Estimated bigeye tuna CPUE (mt per day) by major set-type categories (free-school, log and drifting FAD sets) and all set types combined for Japanese, Korean, Chinese-Taipei and US purse seiners fishing in the tropical WCP–CA.

Effort and CPUE were partitioned by set type according to the proportions of total sets attributed to each set type.
Thick black line for "All set types" represents **the Pacific Islands purse seine fleets combined**.

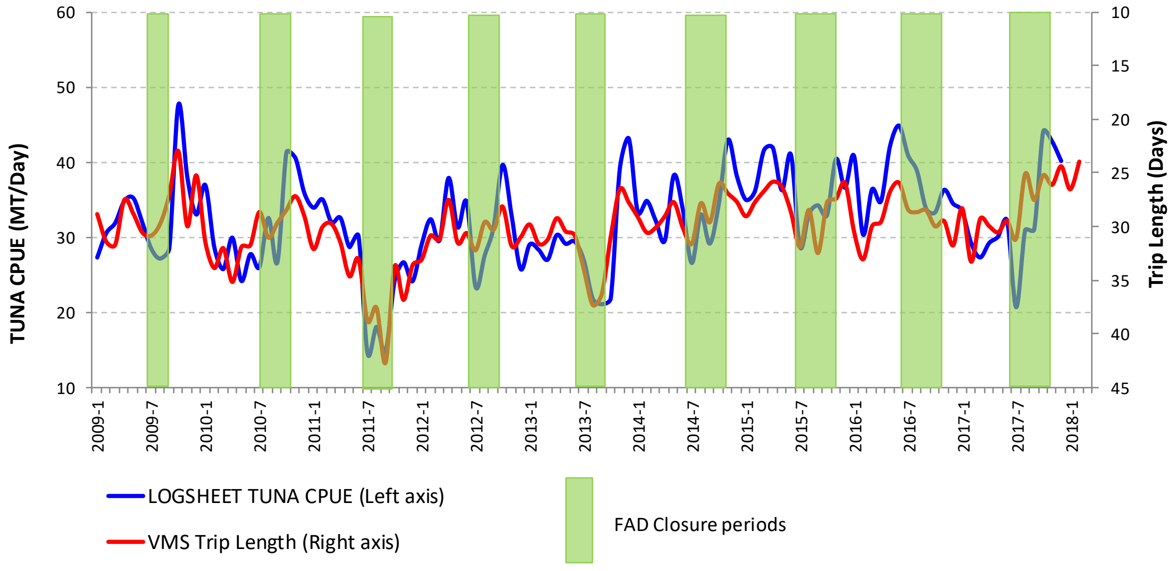

Figure 3.5.3 Monthly purse-seine tuna CPUE (mt/day) and average trip length (VMS days), 2005–2018

3.6 Species/Size composition of the catch

Figures 3.6.1 and 3.6.2 show the species and size composition of the purse seine catch for 2016 and 2017, by set type and broad area of the tropical fishery. Points of interest in the comparison of these graphs include:

- A higher catch of large yellowfin tuna east of 170°E from unassociated sets in 2017 compared with 2016;
- A higher proportion of the bigeye tuna in associated sets east of 170°E than in the west. Also, a higher proportion of bigeye tuna in 2017 than in 2016, for associated sets east of 170°E;
- A relative absence of medium-sized (75-95 cm) yellowfin tuna in the unassociated set catch to the east of 170°E compared to the area west of 170°E.

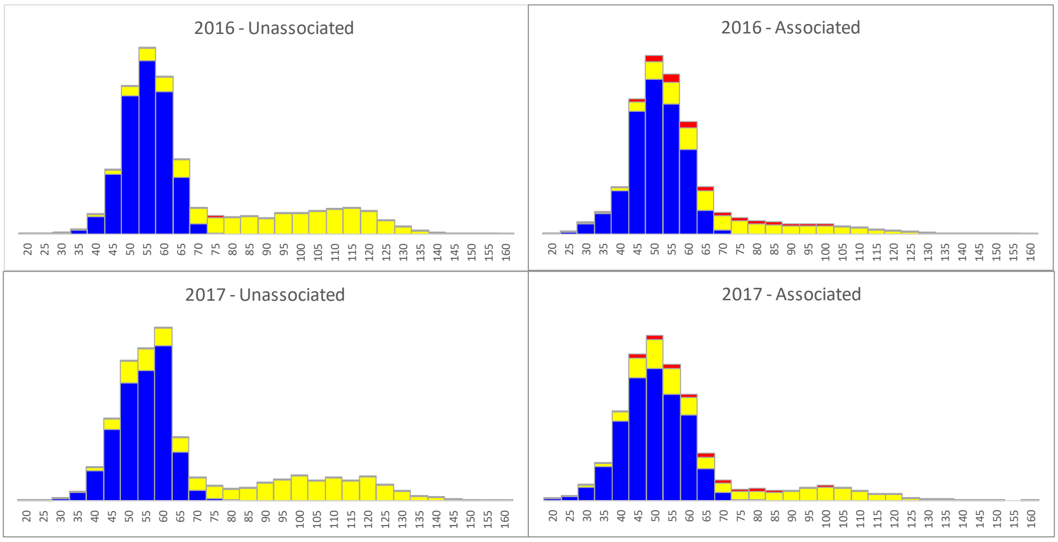

Figure 3.6.1 Species composition (MT: Y-axis) of the 2016 and 2017 purse seine catch, by set type and 5cm size categories (X-Axis) for the tropical fishery, west of 170°E.
Skipjack tuna–blue; Yellowfin tuna–yellow; Bigeye tuna–red

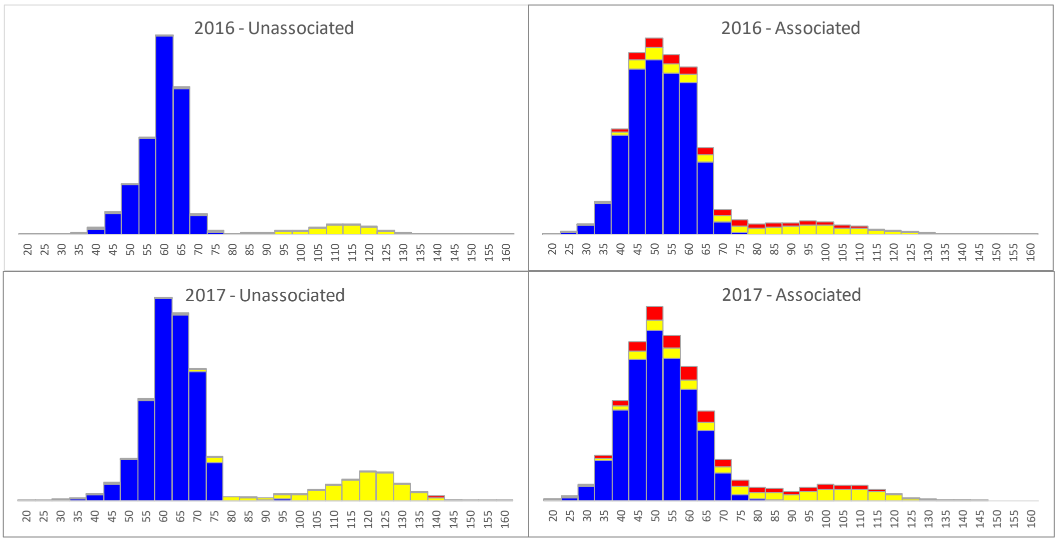

Figure 3.6.2 Species composition (MT: Y-axis) of the 2016 and 2017 purse seine catch, by set type and 5cm size categories (X-Axis) for the tropical fishery, east of 170°E.
Skipjack tuna–blue; Yellowfin tuna–yellow; Bigeye tuna–red

3.7 Seasonality

Figures 3.7.1 and 3.7.2 show the seasonal average CPUE for skipjack and yellowfin tuna in the purse seine fishery for the period 2010–2017, respectively. Figure 3.7.3 shows the distribution of effort by quarter for the period 2010-2016 in comparison to effort by quarter in 2017. Prior to implementation of the FAD closure, 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, which was at its lowest during the first six months, but higher thereafter. This situation corresponds to the seasonal eastwards extension 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 FAD closure implementation since 2009 has tended to reduce catch rates during those [FAD-closure] months, with relatively high catch rates experienced immediately following the last FAD-closure month.

The trend in monthly skipjack CPUE for 2017 was clearly below the 2010-2016 monthly average for Jan–July (and thereafter through to September), and for the remainder of 2017, catch rates were clearly above this average, suggesting an improvement in fishing conditions. The relatively poor conditions for skipjack catches in the first 7 months resulted in the relatively low skipjack catch for 2017. In contrast, the monthly yellowfin CPUE for 2017 was clearly well above the 2010-2016 average for the first 9 months (and the highest monthly CPUE for seven of these nine months), and contributed to the record yellowfin catch from this fishery in 2017 (Figure 3.7.2).

The neutral ENSO conditions during 2017 exhibited a similar quarterly pattern in the extent of the warm pool (i.e. surface water >28.5°C on average) as the average for 2010-2016 – contrast the shading representing sea surface temperature in each quarter in Figure 3.7.3. Relatively higher proportions of yellowfin tuna were experienced in PNG and southern FSM waters during the first two quarters of 2017, and then in the waters of Nauru, the Gilberts and Tuvalu in the 3rd quarter of 2017 (Figure 3.7.3–right). Also of note is the change in species composition in this area (Nauru/Gilberts/Tuvalu) from the 2nd quarter (with more skipjack and bigeye tuna) to the 3rd quarter 2017 (with more yellowfin tuna). By the 4th quarter 2017, higher catches of mainly skipjack tuna were being taken further east, in the waters of the Phoenix Group, Tokelau and eastern Tuvalu waters.

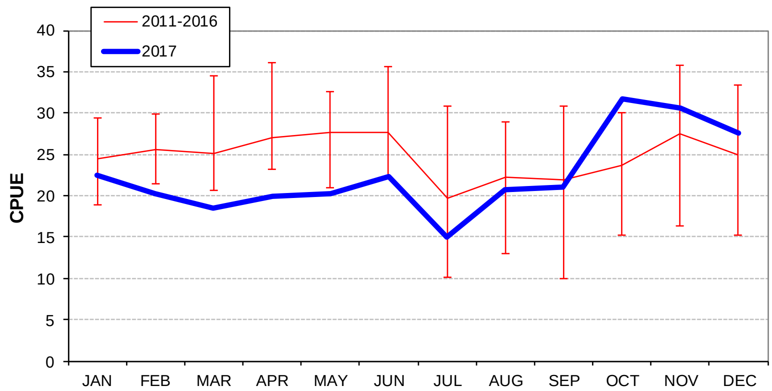

Figure 3.7.1 Average monthly skipjack tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2011–2017.

Red line represents the period 2011–2016 and the blue line represents 2017.
The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2011–2016.

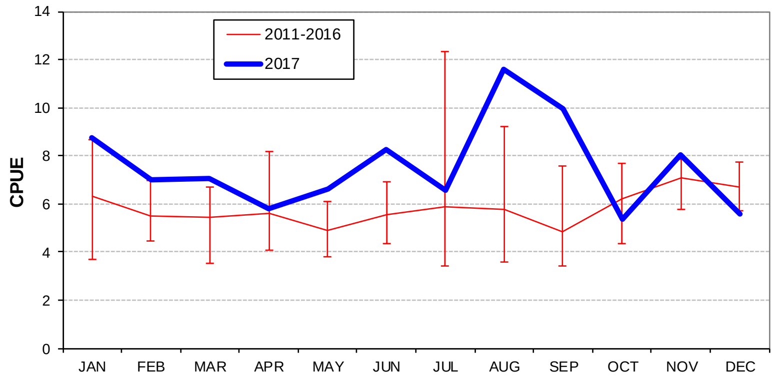

Figure 3.7.2 Average monthly yellowfin tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2011–2017.

Red line represents the period 2011–2016 and the blue line represents 2017.
The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2011–2016.

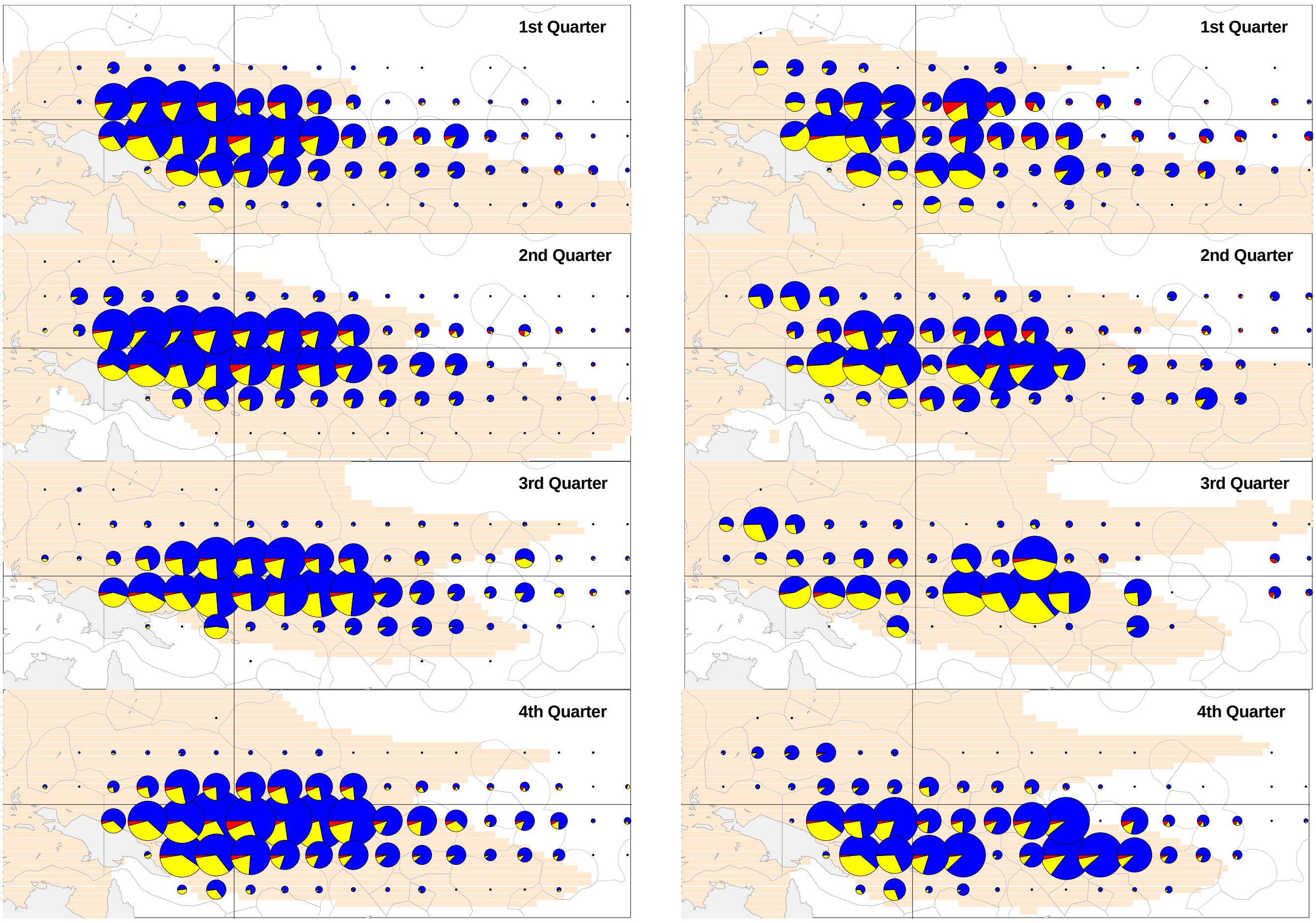

Figure 3.7.3 Quarterly distribution of purse-seine catch by species for 2000–2016 (left) and 2017 (right).

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

Pink shading represents the extent of average sea surface temperature >28.5°C by quarter for the period 2000–2016 (left) and 2017 (right)

3.8 Prices, catch value and overall economic conditions

3.8.1 Prices

Skipjack

After falling sharply in 2014 and 2015 global skipjack prices rebounded through 2016 and 2017. Thai import prices (c&f–carriage and freight) averaged $1,782/mt over 2017 (25% higher than 2016 and 50% higher than 2015) to be at their 3rd highest level on record in nominal terms although around 15% below 2012 record prices. Yaizu purse seine caught skipjack prices (ex-vessel) followed a similar trend, averaging $1,998/mt over 2017 (22% higher than 2016 and 48% higher than 2015) to be at their 2nd highest level on record and just 5% below 2012 levels.

In real terms (that is, adjusting for inflation[4]) the 2017 Thai import and Yaizu purse seine caught prices for skipjack were respectively the 5th and 3rd highest seen over the last 20 years and over 25% higher than the 20 year average.

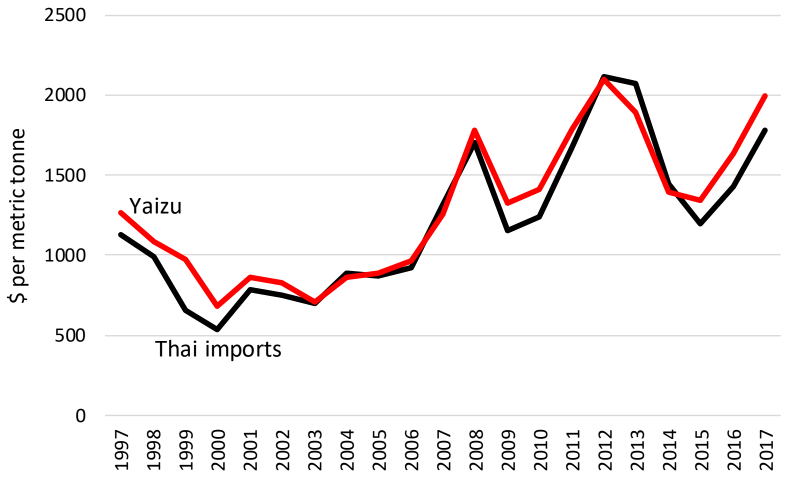

Figure 3.8.1 Annual skipjack prices, Thai imports (c&f) and Yaizu (ex-vessel)

Recent trends have seen prices decline from their 2017 highs. Market reports indicate that after reaching around $2,350/mt in October 2017 Bankgkok prices (4-7.5lbs, c&f) declined to around $1,500/mt by February 2018 before recovering to $1,800/mt in May and then declining once again to be around $1,400/mt in the first half of July[5].

Yellowfin

Thai import prices (c&f) for yellowfin which only saw a modest recovery in 2016 increased 28% in 2017 (to $2,058/mt) to be at their 4th highest level on record in nominal terms although 15% lower than 2012 record levels. Yaizu purse seine caught yellowfin prices (ex-vessel) fell 1% in 2017 to $2,291/mt to remain significantly below their 2011 highs.

3.8.2 Catch Value

The estimated delivered value of the purse seine tuna catch in the WCP-CA area for 2017 is $3.40 billion compared with $2.73 billion in 2016 an increase of

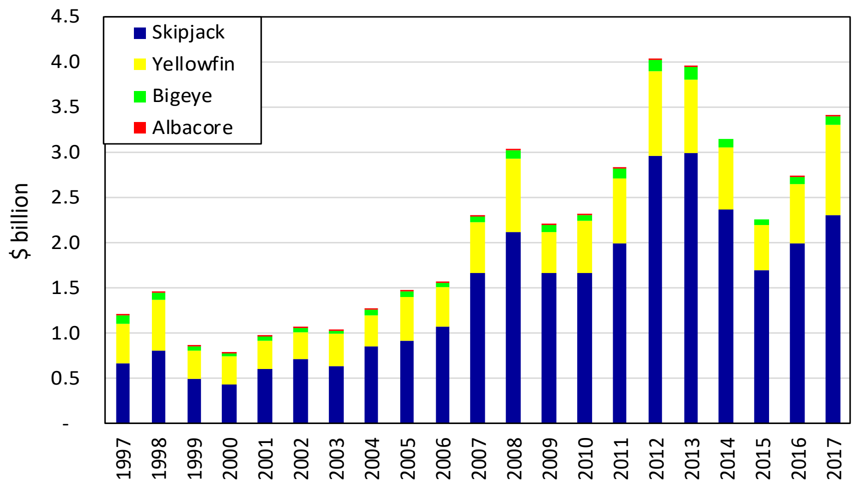

Figure 3.8.2 Value of the WCPFC-CA purse seine fishery tuna catch by species

[4] Based on the US CPI as measured by the Bureau of Labor Statistics All Urban Consumers CPI (www.bls.gov/cpi/data.htm)
[5] http://www.pnatuna.com/Tuna-Market-Intelligence and http://www.atuna.com/index.php/en/tuna-prices/skipjack-cfr-bangkok

$667 million (24%).[6] This represents the 3rd highest purse seine catch value level on record in nominal terms and the 4th highest in real terms. The increase in nominal value resulted from a $323 million (16%) increase in the value of the skipjack catch (worth $2.31 billion in 2017) and a $329 million (50%) increase in the value of the yellowfin catch. The increase in the value of the skipjack catch was driven by a 25% increase in average prices which more than offset the 7% decline in catch. The increase in the value of the yellowfin catch resulted from increases of 25% and 20% in average prices and catch respectively[7]. The greater rate of increase in the value of the yellowfin catch drove its contribution to the total value of the catch to 29%, its highest level since 2005.

3.8.3 Economic Conditions

Despite significant falls in purse seine catch rates, higher prices resulted in the continuation of the good economic conditions in 2017 with the FFA purse seine fishery economic conditions index increasing marginally from 2016 to its third highest level since 1999[8]. The index reading for 2017 was 138, that is, 38% higher than averaged over the period 1999-2017. Since 2012, the index has consistently outperformed the average and, with the exception of 2014 (when the index was marginally lower than that for 2007 and 2008), been significantly higher than in prior years. While the index in recent years has outperformed the average, there is considerable variation in the contribution of the different index components. In 2012, 2013 and 2017 the high index readings were driven primarily by high fish prices while above average catch rates were the main driver between 2014 and 2016.

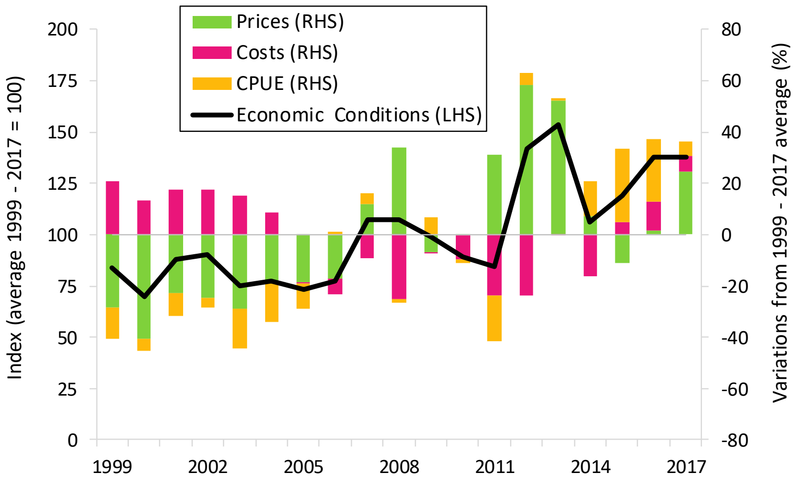

Figure 3.8.3 Purse seine fishery economic conditions index (LHS) and variance of component indices against average (1999-2017) conditions (RHS)

[6] The delivered value of each year's catch is 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. 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.

[7] Further details of the value of tuna catches in WCPFC Convention Area can be obtained here.

[8] Full details of the data and methodology used to derive the economic conditions indexes presented in this paper can be found in Skirtun, M and Reid, C. 2018, Analyses and projections for economic condition in WCPO fisheries, WCPFC-SC14-2018 ST- IP-06, Busan, Republic of Korea, August 8-16.

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).

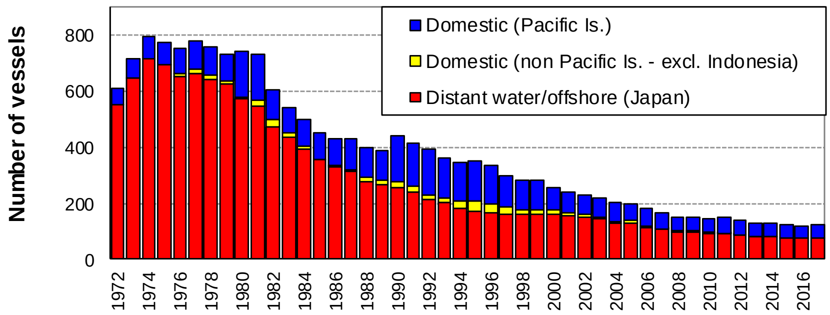

Figure 4.1.1 Pole-and-line vessels operating in the WCP–CA
(excludes pole-and-line vessels from the Japanese Coastal and Indonesian domestic fisheries)

Economic factors and technological advances in the purse seine fishery (primarily targeting the same species, skipjack) have resulted in a gradual decline in the number of vessels in the pole-and-line fishery (Figure 4.1.1) and in the annual pole-and-line catch during the past 15–20 years (Figure 4.1.2). 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 (44 vessels in 2017), 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. There is continued interest in pole-and-line fish associated with certification/eco-labelling.

4.2 Catch estimates (2017)

The provisional 2017 pole-and-line catch (151,232 mt) was the lowest annual catch since the mid-1960s, with reduced catches in both the Japanese and the Indonesian fisheries.

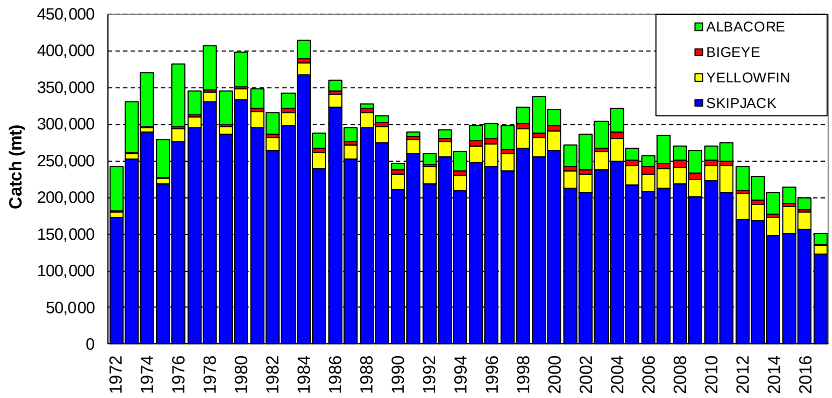

Figure 4.2.1 Pole-and-line catch in the WCP–CA

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 (70,533 mt in 2017), and the Indonesian fleets (79,759 mt in 2017), account for nearly all of the WCP–CA pole-and-line catch (99% in 2017). 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 (although the vessel numbers have been stable at around 75-80 over the past 5 years). 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 around 1,000 mt (586 mt in 2017 from 2 vessels).

Figure 4.2.2 shows the average distribution of pole-and-line effort for the period 1995–2017. 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 Hawai'i is not shown in this figure because spatial data are not available.

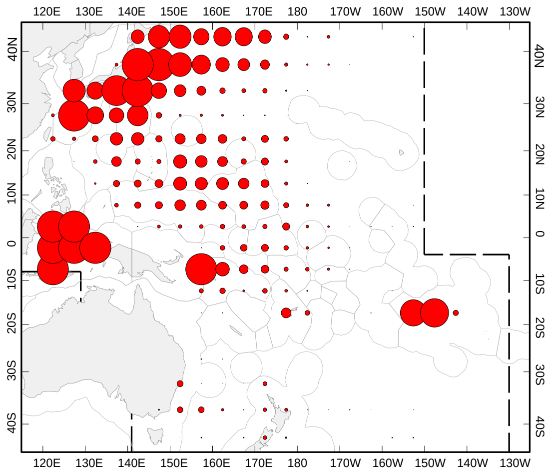

Figure 4.2.2 Average distribution of WCP–CA pole-and-line effort (1995–2017).

4.3 Prices and catch value

4.3.1 Prices

For the Japanese fleet, 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 taken in waters off Japan averaged ¥312/kg a 27% increase on 2016 prices. Yaizu prices for skipjack caught in waters south of Japan increased by a similar amount (23%) to ¥325/kg. In US dollar terms these represent prices of around $2,900/mt and $2,780/mt respectively. Prices in 2018 for skipjack caught in waters south of Japan for the period to May are 35% lower than for the same period in 2017.

4.3.2 Catch Value

The estimated delivered value of the total catch in the WCPFC pole and line fishery for 2016 is $348 million[9] a decline of $31 million (8%) on 2016 with the 24% decline in catch more than offsetting the 21% increase in the average unit price. The value of the pole and line catch declined by 47% between 2012 and 2017 driven by a continued contracting in catches in the fishery (down 38% between 2012 and 2017).

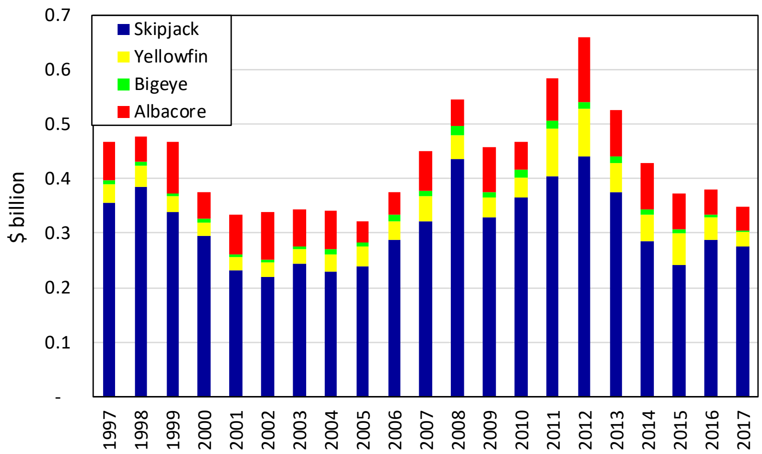

Figure 4.3.2 Value of the WCPFC-CA pole and line fishery tuna catch by species

[9] Delivered skipjack prices for the Japanese pole and line fleet are based on a weighted average of the Yaizu 'south' and 'other' pole and line caught skipjack prices. Delivered yellowfin price for the Japanese pole and line fleet are based on the Yaizu purse seine caught yellowfin price. All other prices are based on Thai import prices. All prices are converted into USD using representative exchange rates provided by the IMF.

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, 2017), 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 5.1.1), 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. In recent years, total vessel numbers are just above 3,000 vessels.

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.

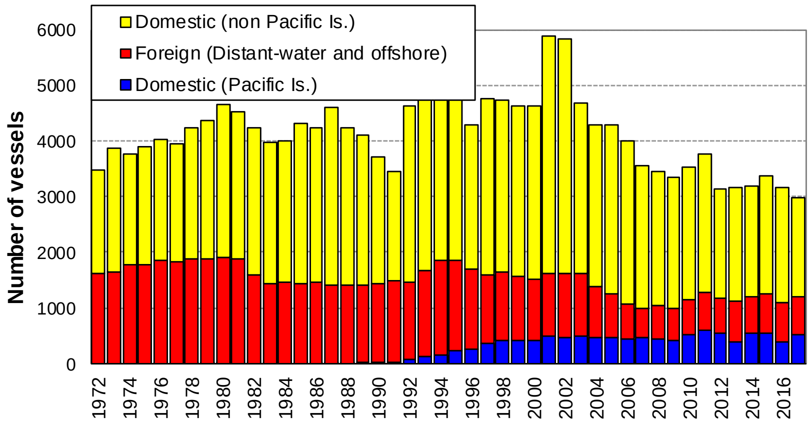

Figure 5.1.1 Longline vessels operating in the WCP–CA
(Available data does not make the distinction between foreign "distant-water" and "offshore")

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, PNG, Samoa, Solomon Islands, Tonga, Tuvalu 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.
- **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 and Portugal (one vessel started fishing in 2011).
- **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 and more recently, fishing at night using intense lights to attract prey for the tuna (these types of vessels are not included in Figure 5.1.1). The commercial handline fleets target large yellowfin tuna which comprise the majority of their overall catch (> 90%). The WCP-CA large-fish (yellowfin target) handline fishery took nearly 45,000 mt in 2017.

The WCP–CA longline tuna catch steadily increased from the early years of the fishery (i.e. the early 1950s) to 1980 (230,625 mt), but declined to 162,111 mt in 1984 (Figure 5.1.2). 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–40%; BET–25%; YFT–35% in 2017) differs from the period of the late 1970s and early 1980s, when yellowfin tuna contributed a higher proportion of catch (e.g. ALB–18%; BET–27%; YFT–54% in 1980).

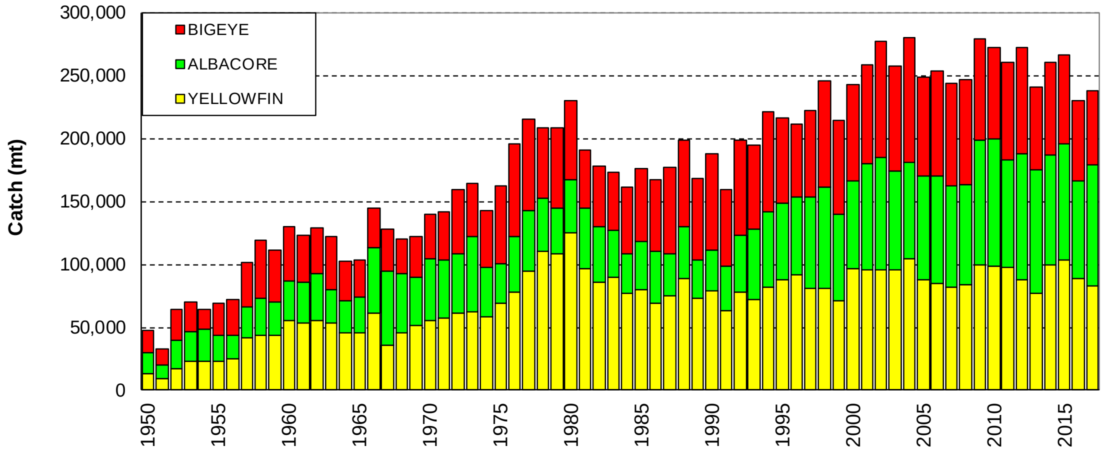

Figure 5.1.2 Longline catch (mt) of target tunas in the WCP–CA

5.2 Provisional catch estimates and fleet sizes (2017)

The provisional WCP–CA longline catch (240,387 mt) for 2017 was lower than the average for the past five years. The WCP–CA albacore longline catch (96,280 mt – 40%) for 2017 was higher than the average catch over the past decade, and only 5,000 mt lower than the record of 101,816 mt attained in 2010. The provisional bigeye catch (58,164 mt – 25%) for 2017 was the lowest since 1996, presumably mainly due to continued reduction in effort in the main bigeye tuna fishery (refer to Brouwer et al., 2018 for more detail), although catch estimates are likely to be revised upwards for the distant-water fleets in the coming months. The yellowfin catch for 2017 (83,399 mt – 35%) was lower than the average for the past decade and more than 20,000 mt less that the record for this fishery.

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 have continued 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 4,054 mt in 2017) and vessel numbers (366 in 2004 to 139 in 2017). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 4,531 mt in 2017, mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 82 vessels in 2017). The Korean distant-water longline fleet also experienced a decline in bigeye and yellowfin catches since the period of highest catches 15–20 years ago in line with a reduction in vessel numbers – from 184 vessels active in 2002 reduced to 96 vessels in 2017.

In contrast, the China longline fleet took (fleet) record catches of nearly 30,000 mt of albacore tuna in the WCP-CA and over 40,000 mt of albacore tuna in the Pacific Ocean, south of the equator, during 2017.

With domestic fleet sizes continuing to increase as foreign-offshore and distant-water fleets decrease (Figure 5.1.1), 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–SC14 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, as is the case with nominal 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 onwards. 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.

Nominal CPUE graphs are provided in the Appendix (Figures A7, A8 and A9), but this paper does not attempt to 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 5.4.1 shows the distribution of effort by category of fleet for the period 2000–2017. Effort by the **large-vessel, distant-water fleets** of Japan, Korea and Chinese-Taipei accounts 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 (see Figure 5.4.3), mainly in international waters.

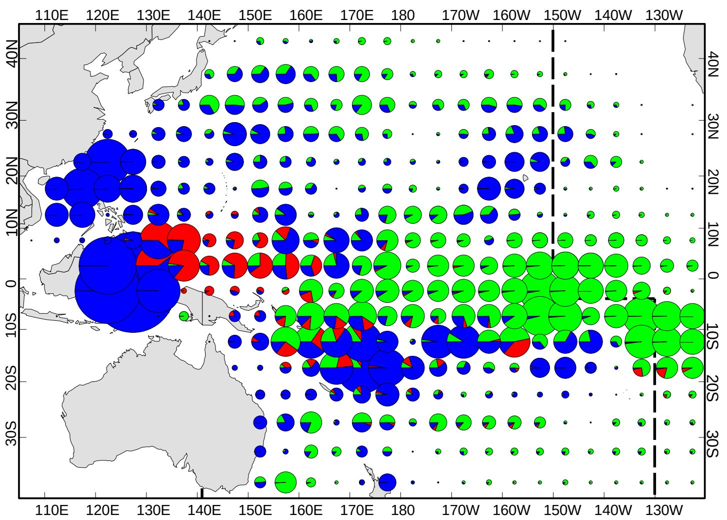

Figure 5.4.1 Distribution of longline effort for distant-water fleets (green), foreign-offshore fleets (red) and domestic fleets (blue) for the period 2000–2017.
(Note that distant-water effort for Chinese-Taipei and other fleets targeting albacore in the North Pacific is poorly covered)

Activity by the **foreign-offshore fleets** from Japan, mainland China and Chinese-Taipei is restricted to tropical waters, targeting bigeye and yellowfin for the fresh sashimi market; these fleets have limited overlap with the distant-water fleets. The substantial "**offshore**" effort in the west of the region is primarily by the Indonesian, Chinese-Taipei and Vietnamese **domestic fleets** targeting yellowfin and bigeye (the latter now predominantly using the handline gear).

The growth in **domestic fleets** targeting albacore tuna 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 5.4.2).

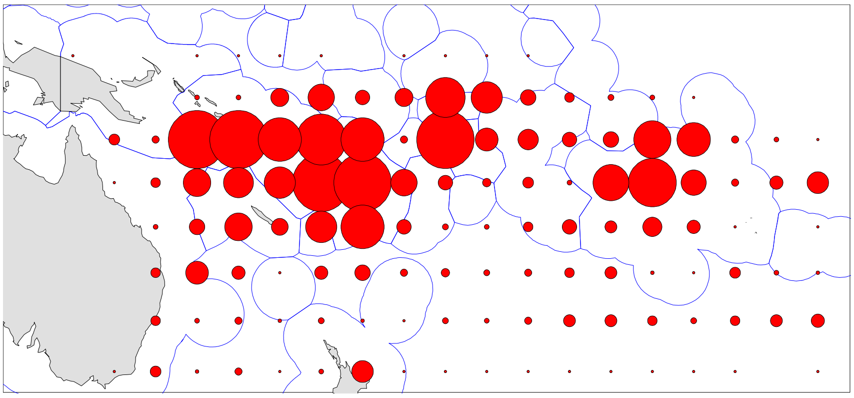

Figure 5.4.2 Distribution of effort for south Pacific albacore-target DOMESTIC longline fleets

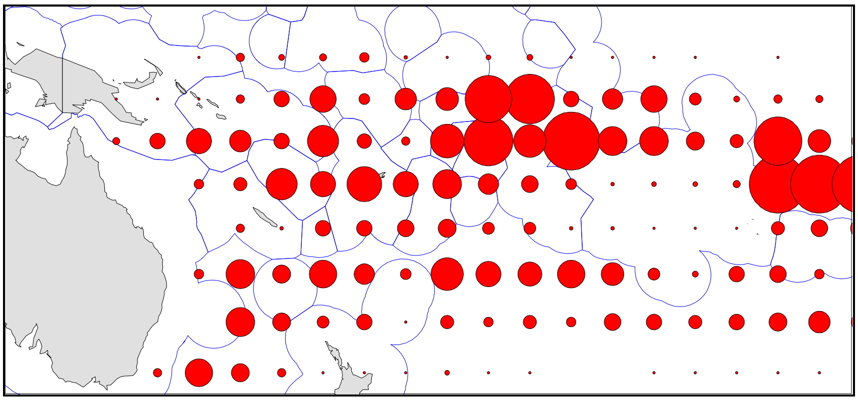

Figure 5.4.3 Distribution of effort for south Pacific albacore-target FOREIGN longline fleets

Figure 5.4.4 shows quarterly species composition by area for the period 2010–2016 and 2017. 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 central and eastern areas is evident when comparing the 2010-2016 quarterly averages (Figure 5.4.4 –left) with the 2017 catches (Figure 5.4.4 –right), particularly the 1st and 4th quarters.

The 2017 data are considered preliminary for some fleets, but nonetheless provide some insights into the fishery. For example, it is interesting to note the relatively high catches in the 2nd and 4th quarters in the area east of the Solomon Islands EEZ–adjacent high seas pocket–Tuvalu–north Fiji, compared to the average over 2010–2016.

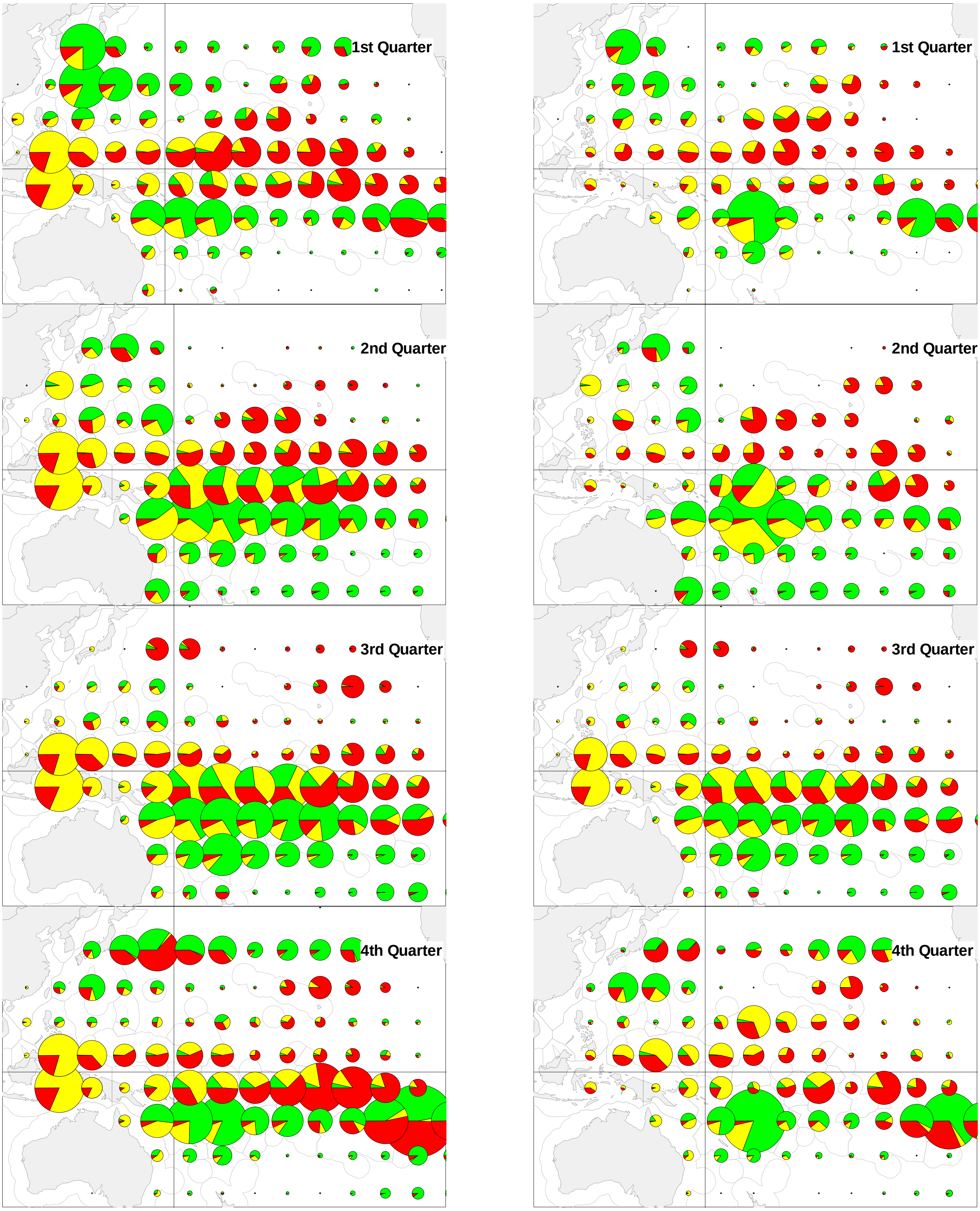

Figure 5.4.4 Quarterly distribution of longline tuna catch by species, 2010-2016 (left) and 2017 (right)
(Yellow–yellowfin; Red–bigeye; Green–albacore)
(Note that catches from some distant-water fleets targeting albacore in the North Pacific may not be fully covered; excludes the Vietnam HL/LL fishery)

5.5 Prices, catch value and overall economic conditions

5.5.1 Prices

There are a large number of markets and product forms in which longline caught tuna and billfish are sold. In this section we examine trends for selected longline fishery related price data series for yellowfin, bigeye, albacore, swordfish and striped marlin.

Yellowfin

Yellowfin prices in Japan recorded significant increases in 2017, with frozen prices at selected port prices up by 34% to ¥926/kg, Yaizu longline caught prices were up 32% to ¥819/kg and fresh prices at selected port prices were up 29% to ¥931/kg. While the increase in the average price of imported fresh yellowfin from Oceania in 2017 was modest at only 3% to ¥1,065, it has risen 22% since 2012. The other markets have also seen significant increases since 2012 with selected port prices for frozen yellowfin up 46% and Yaizu longline caught prices up 35%. These increases have resulted in all four price series being at or near their highest level in Yen over the period covered.

Prices for fresh yellowfin imports into the US in 2017 rose marginally (2%) to $9.27/kg. Since 2011 US fresh import prices have been relatively steady in a range of between $9.00 and $9.80/kg. The average annual exchange rate saw the Yen depreciate 3% against the US dollar in 2017 ($1:¥109) compared with 2016, moderating the increases seen in Japanese market prices when expressed in US dollars. In US dollar terms, 2017 Yaizu longline caught yellowfin prices averaged $7.30/kg with fresh yellowfin at selected port averaging prices $8.30/kg and fresh imports from Oceania $9.49/kg.

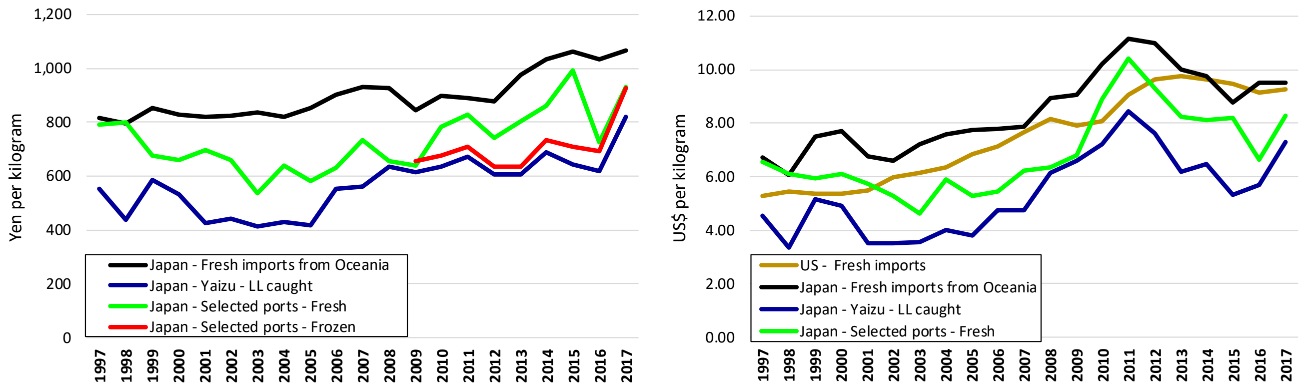

Figure 5.5.1 Japan and US Yellowfin in Yen (LHS) and US dollars (RHS)

Note: Japan fresh imports from Oceania are c.i.f prices, Yaizu and Japan selected port are ex-vessel prices and US imports are f.a.s prices. Frozen at selected ports excludes purse seine caught landings

Bigeye

In contrast to yellowfin, Japanese bigeye prices either remained steady or decline in 2017 with frozen prices at selected port prices down 9% to ¥937/kg, fresh prices at selected port prices down 7% to ¥1,353/kg and imported fresh bigeye from Oceania steady at ¥1,140/kg. Prices at selected ports increased by 15% between 2012 and 2015 but the falls seen in 2016 and 2017 erased most of these gains with 2017 price just 3% higher than that for 2012. The 2017 average price for fresh imports from Oceania was 6% higher than in 2012 while at selected ports it was down 2%.

Prices for fresh bigeye imports into the US were steady in 2017 at $8.77/kg. As was the case for yellowfin,e US fresh bigeye import prices have been relatively steady since 2011 in a range of between $8.60 and $9.00/kg. In US dollar terms, 2017 fresh prices at selected Japanese port prices fell 10% to $12.06/kg while imported fresh bigeye from Oceania fell 3% to $10.16/kg.

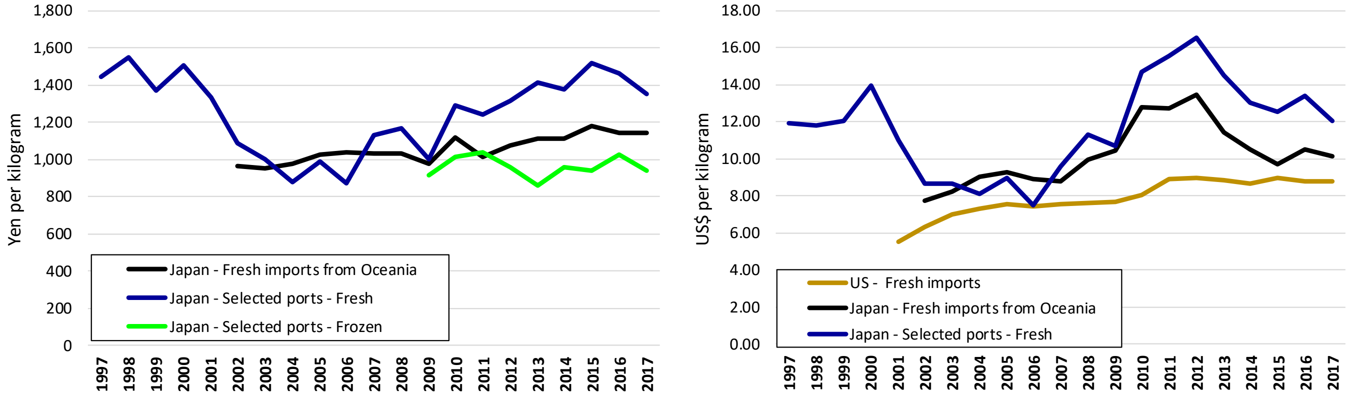

Figure 5.5.2 Japan and US bigeye prices in Yen (LHS) and US dollars (RHS)

Note: Japan fresh imports from Oceania are c.i.f prices, Japan selected ports are ex-vessel prices and US imports are f.a.s prices. Frozen at selected ports excludes purse seine caught landings

Albacore

Thai frozen import prices increased 2% in 2017 to average $2.98/kg. Thai frozen import prices were remarkably steady between 2014 and 2017 remaining in a narrow range between $2.88/kg and $3.02/kg. In the period to May 2018 Thai import prices have moved higher, increasing by 8% compared to the corresponding period in 2017.

US import and Japanese selected ports prices for fresh albacore declined 6% (to $4.72/kg) and 10% (to 3.41/kg) respectively in 2017.

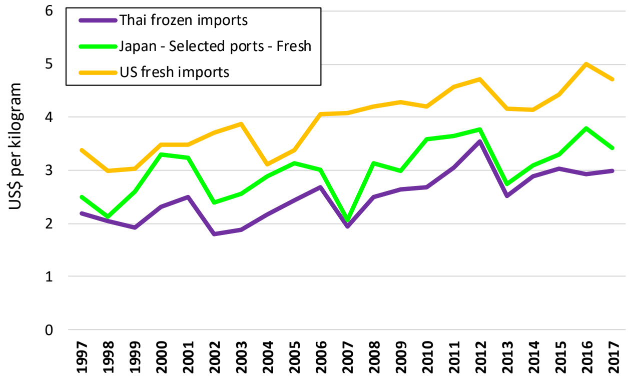

Figure 5.5.3 Albacore prices in US dollars

Note: Thai frozen imports are c.i.f prices, Japan selected ports are ex-vessel prices and US imports are f.a.s prices.

Swordfish and striped marlin

Fresh swordfish and striped marlin prices at selected Japanese ports have in recent years followed a similar path to fresh yellowfin increasing by 6% (to ¥1,006/kg) and10% (to ¥712/kg) respectively in 2017 to be up by 20% and 50% respectively, compared with 2012. US fresh swordfish, however, fell by 8% (to US$7.64/kg) in 2017 to be 11% lower than 2012 levels.

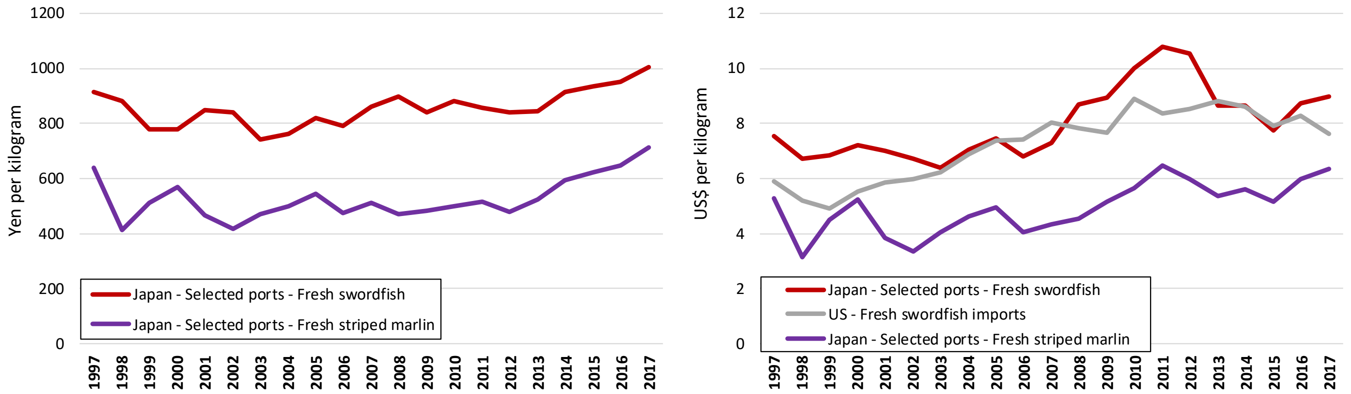

Figure 5.5.4 Japan and US swordfish and striped marlin prices in Yen (LHS) and US dollars (RHS)

Note: Japan selected ports are ex-vessel prices and US imports are f.a.s prices.

5.5.2 *Catch Value*

The estimated delivered value of the longline **tuna** catch in the WCPFC area for 2017 is $1.46 billion, down marginally on 2016.[10]

The value of the albacore catch value in 2017 increased by $59 million (26%) to $287 million to be at its highest level since 2012. This increase was primarily driven by a 24% increase in catch. The value of the longline yellowfin catch in 2017 fell 2% to $648 million as price increases were more than offset by a 6% fall in catch. The value of the longline bigeye catch in 2017 value fell 7% driven by a similar percentage fall in catch. At $524 million the value of the bigeye longline catch is at its lowest level since 2005.

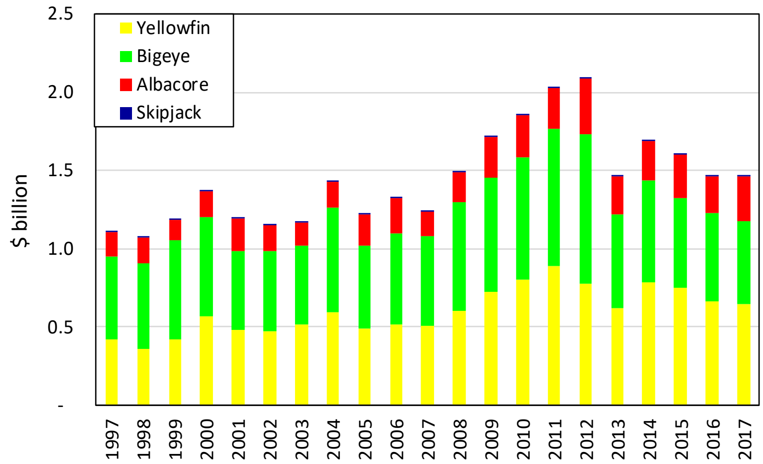

Figure 5.5.6 Value of the WCPFC-CA longline fishery tuna catch by species

5.5.3 *Economic conditions*

Economic conditions in the longline fishery are examined for two areas that are referred to as the tropical longline fishery, that is, the longline fishery between 10ºN and 10ºS in the WPCFC-CA excluding the waters of Indonesia, Philippines and Vietnam, and the southern longline fishery, that is, the longline fishery south of 10ºS in the WPCFC-CA.

Southern Longline

Economic conditions for the southern longline fishery followed a declining trend over the period from 1999 to 2014. Conditions were particularly poor in the period from 2011 to 2014, as a result of low catch rates and high fuel prices despite the fact that real fish prices were at their second highest and highest levels (for the period examined) in 2011 and 2012. Economic conditions have, however, improved significantly in recent years, owing to falling fuel costs and catch rates returning to around their long-term average level. In 2017 the southern longline economic conditions index stood at 108 its highest reading since 2009.

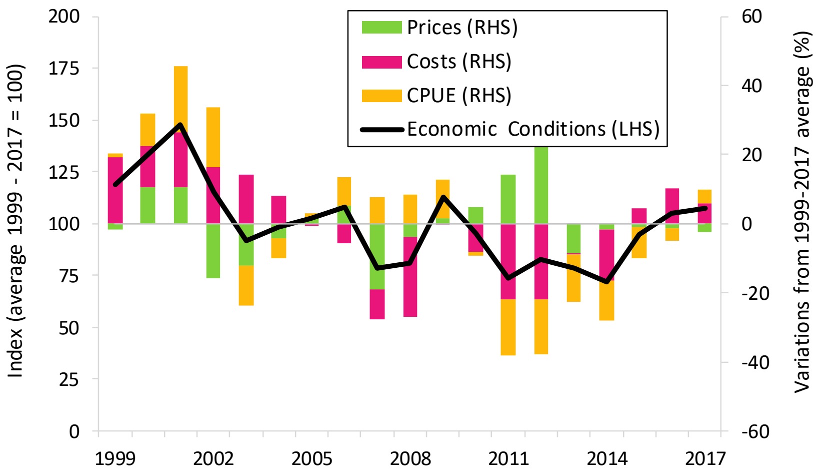

Figure 5.5.7 Southern longline fishery economic conditions index (LHS) and variance of component indices against average (1999-2017) conditions (RHS)

[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 non-export quality. For export quality the annual prices for Japanese fresh yellowfin and bigeye imports from Oceania are used, while it is simply assumed that non-export grade tuna attracted $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.

Tropical longline

Between 1999 and 2008 the tropical longline fishery saw a continuous and rapid decline in economic conditions as costs increased and prices and catch rates fell. This was followed by a significant improvement in economic conditions in 2009 as costs fell as a result of falls in the global fuel price and catch rates rose. Between 2011 and 2014 conditions were below average but stable and then improved noticeably in 2015 and 2016 driven by declines in fuel prices and increases in catch rates. After being around the long term average level in 2016 the economic conditions index fell in 2017 as catch rates fell to be 7% below the long term average.

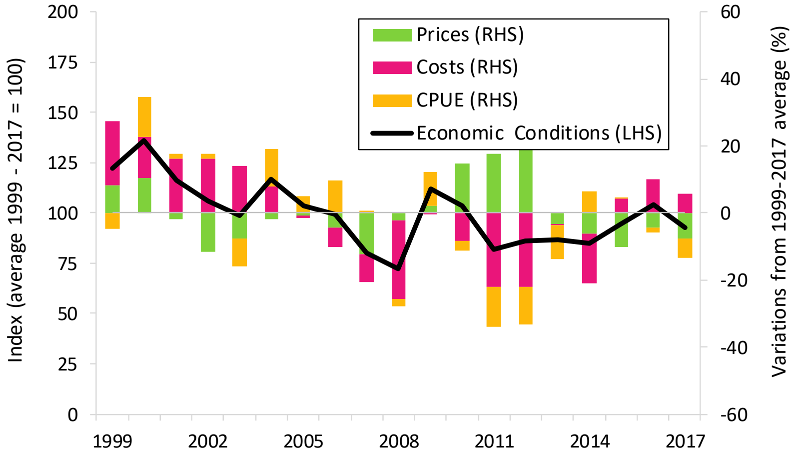

Figure 5.5.8 Tropical longline fishery economic conditions index (LHS) and variance of component indices against average (1999-2017) conditions (RHS)

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). Over the past decade, catches have declined to range from 2,000–4,000 mt, low catch levels which have not been experienced since prior to 1988 (Figure 6.1.1). 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.

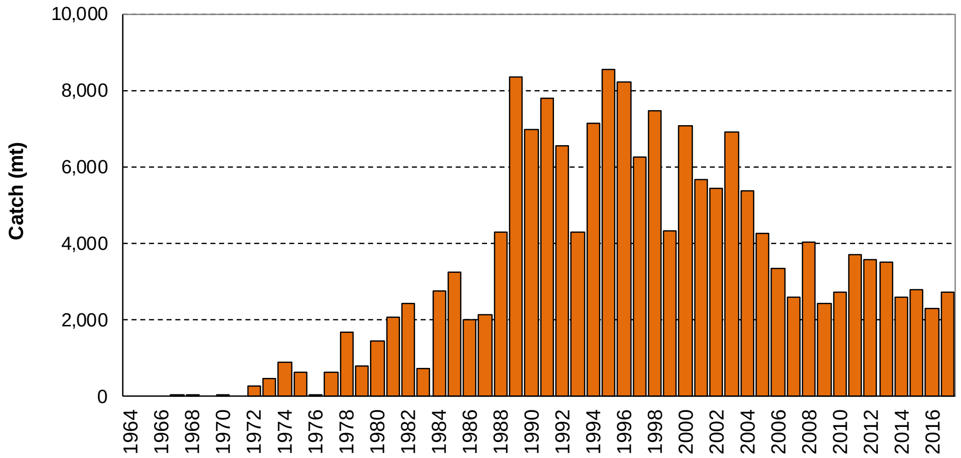

Figure 6.1.1 Troll catch (mt) of albacore in the south Pacific Ocean

6.2 Provisional catch estimates (2017)

The 2017 South Pacific troll albacore catch (2,508 mt) which is similar to catch levels experienced over the past four years. The New Zealand troll fleet (111 vessels catching 1,952 mt in 2017) and the United States troll fleet (13 vessels catching 556 mt in 2017) accounted for all of the 2017 albacore troll catch, although minor contributions have also come from the Canadian, the Cook Islands and French Polynesian fleets when their fleets were active in the past.

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 6.2.1 (2017 data for STCZ not yet available).

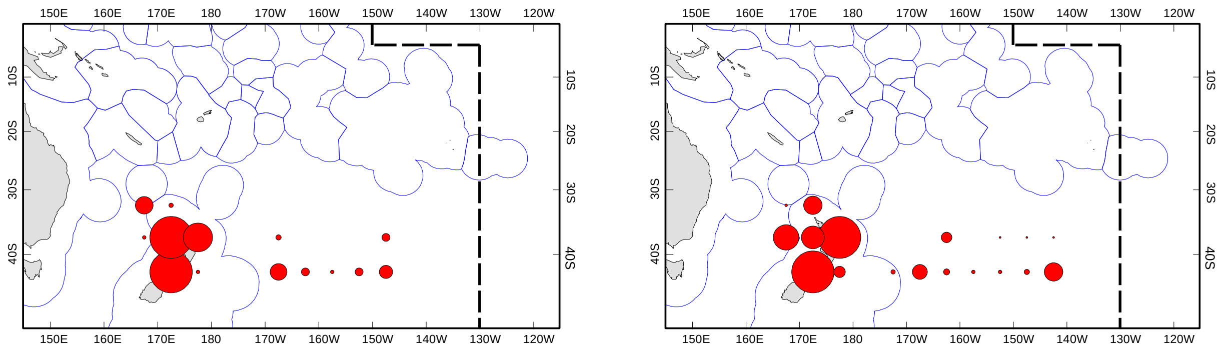

Figure 6.2.1 Distribution of South Pacific troll effort during 2015 (left) and 2016 (right)

7. SUMMARY OF CATCH BY SPECIES

7.1 SKIPJACK

Total skipjack catches in the WCP–CA have increased steadily since 1970, more than doubling during the 1980s, and continuing to increase in subsequent years. Annual catches have exceeded 1.5 million mt in the last five years (Figure 7.1.1). 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 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 have made up around 10% of the total skipjack catch in WCP–CA.

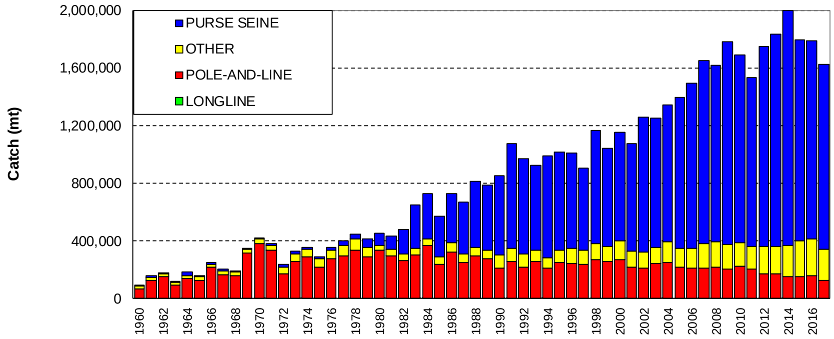

Figure 7.1.1 WCP–CA skipjack catch (mt) by gear

The 2017 WCP–CA skipjack catch of 1,624,162 mt was the lowest since 2011 and around 375,000 mt lower than the record in 2014 (2,000,608 mt), mainly due to low catches in the **purse-seine** fishery (1,280,311 mt – 79%). The **pole-and-line** catch (123,132 mt – 8%) was the lowest since 1963 and mainly due to a reduction in the Indonesian catch. The "**artisanal**" gears in the domestic fisheries including Indonesia, Philippines and Japan took 218,175 mt in 2017 (13% of the total catch). The **longline** fishery accounted for less than 1% of the total catch.

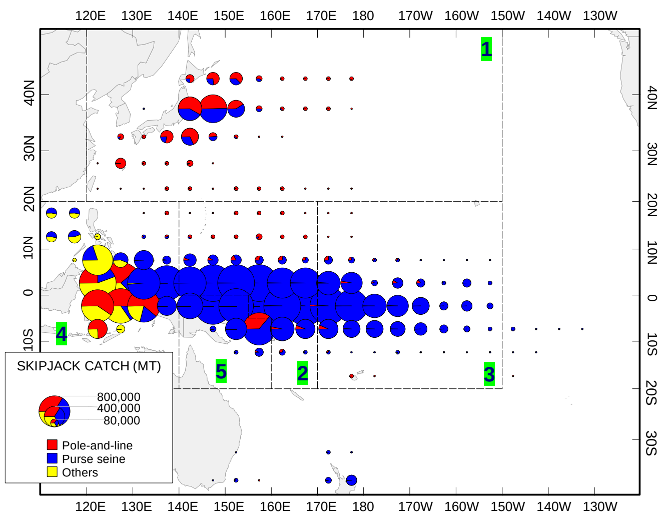

Figure 7.1.2 Distribution of skipjack tuna catch, 1990–2017.

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

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 7.1.2). 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 7.1.3). The dominant mode of the WCP–CA skipjack catch (by weight) for years 2011-2012 was in the size range between 40–60 cm, corresponding to 1–2+ year-old fish, although for years since 2013, most of the catch (by weight) was in the size range 50–70 cm (Figure 7.1.4). There was a greater proportion of medium-large (60–80 cm) skipjack caught in the purse seine fishery in recent years (unassociated, free swimming school sets account for most of the large skipjack). The overall purse-seine skipjack size distribution has been very similar for the last four years (2013–2017), although there were reduced catches from unassociated sets in 2017. Another feature of the skipjack catch over the last three years was the relatively large number of small fish (20-30 cm) in the Indonesia/Philippines domestic fisheries (Figure 7.1.4), which may reflect a change in the relative proportion of catch taken by the smaller purse seine vessels (e.g. the Indonesian *pajeko*) compared to the larger vessels in this fishery.

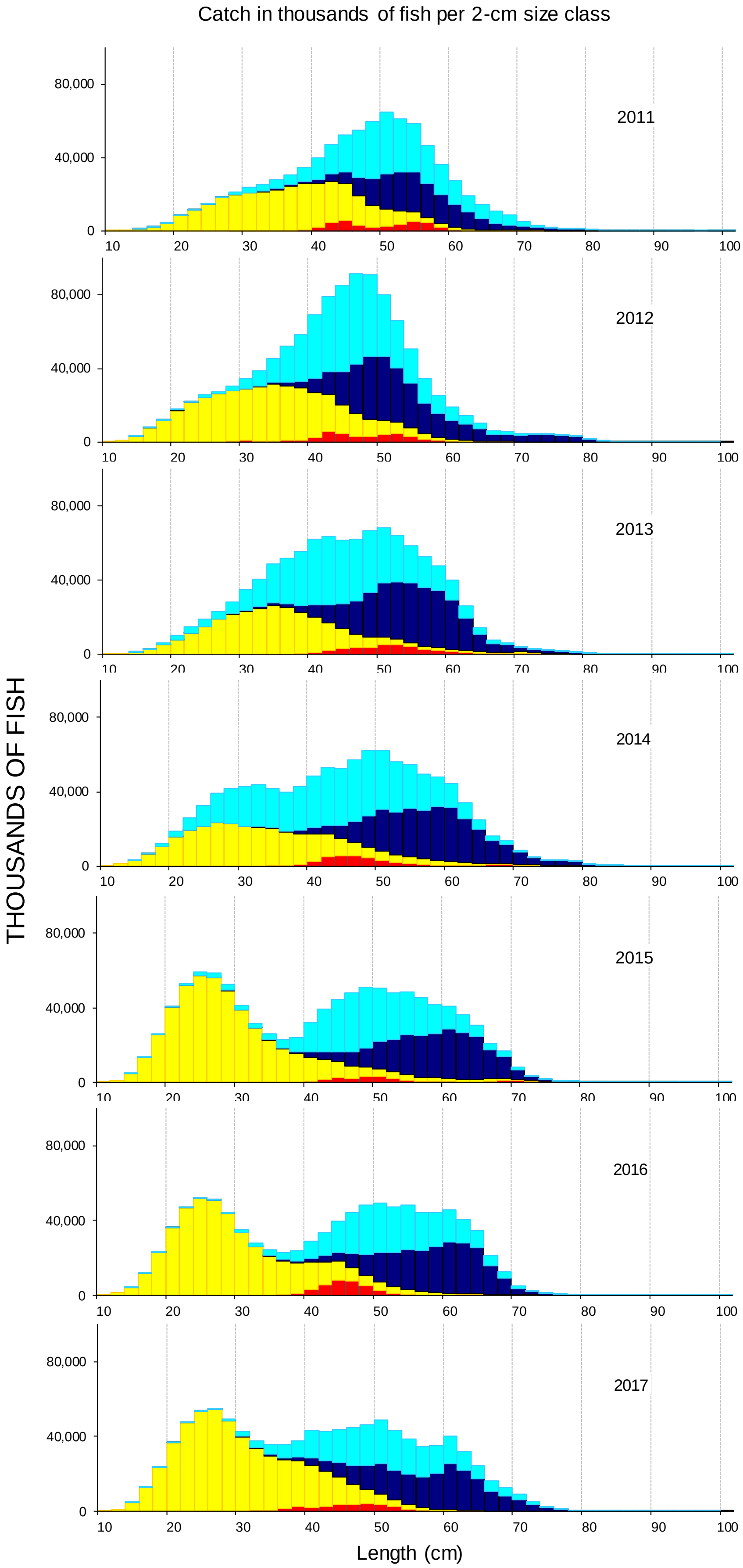

Figure 7.1.3 Annual catches (no. of fish) of skipjack tuna in the WCPO by size and gear type, 2011–2017.
(red–pole-and-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

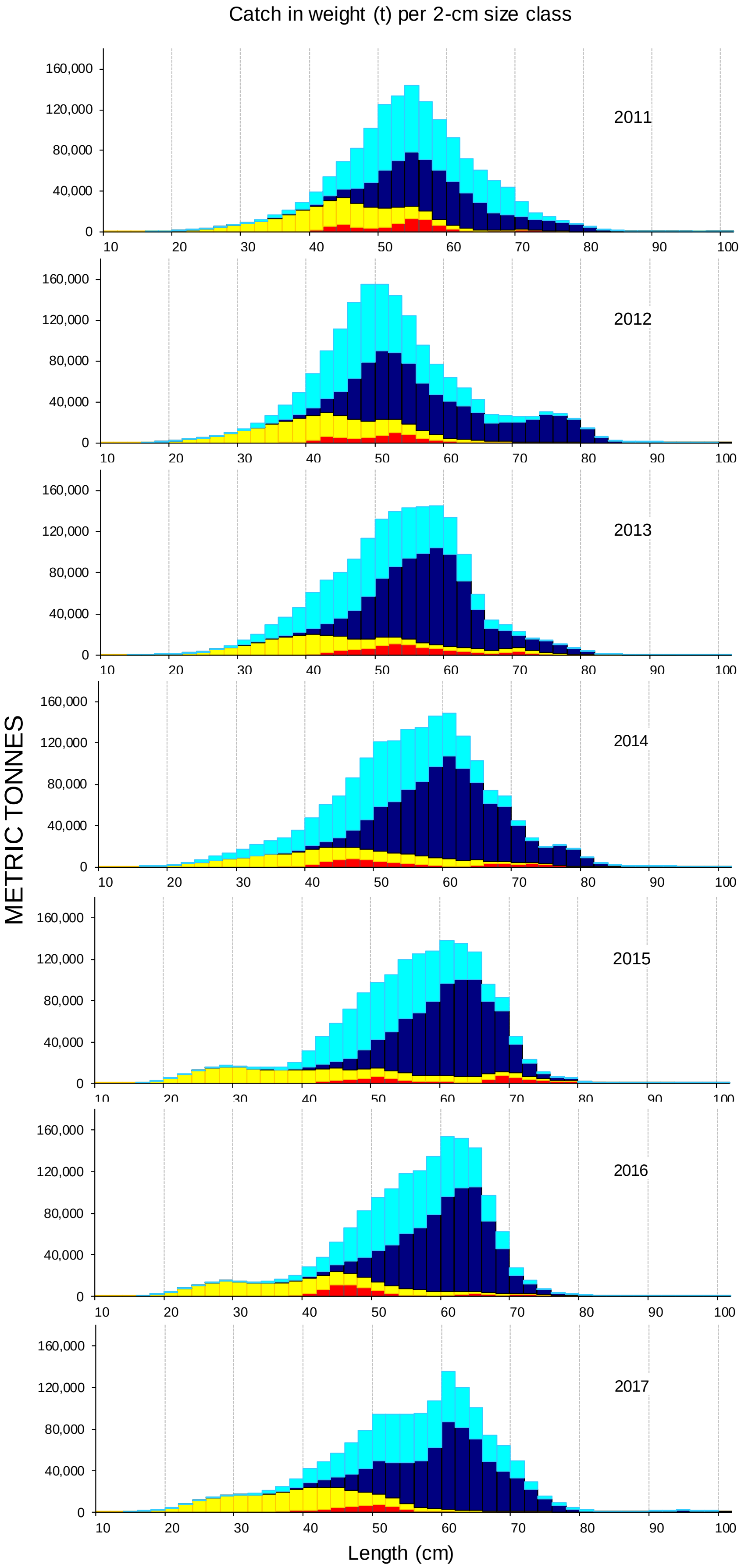

Figure 7.1.4 Annual catches (MT) of skipjack tuna in the WCPO by size and gear type, 2011–2017.
(red–pole-and-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

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 7.2.1), mainly due to increased catches in the purse seine fishery. The 2017 yellowfin catch (**670,890 mt**) was a record, more than 27,000 mt higher than the previous record in 2016 and mainly due to a record catch in the purse seine fishery (472,279 mt; 70%).

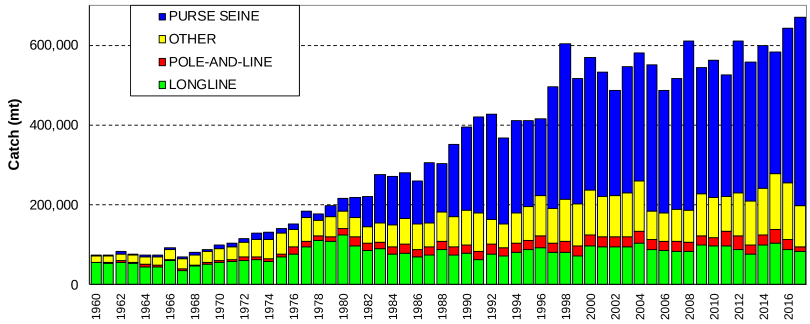

Figure 7.2.1 WCP–CA yellowfin catch (mt) by gear

The WCP–CA **longline** catch for 2017 (83,400 mt–14%) was amongst the lowest catches in the past ten years. Since the late 1990s, the **purse-seine** catch of yellowfin tuna has accounted for about 3-5 times the **longline** yellowfin catch.

The **pole-and-line** fisheries took 12,219 mt during 2017 (<2% of the total yellowfin catch) which is the lowest since the late 1970s and primarily due to a reduction in the Indonesian pole-and-line catch. Catches in the '**other**' category (103,000mt–15% in 2017) 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 7.2.2 shows the distribution of yellowfin catch by gear type for the period 1990–2017. 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.

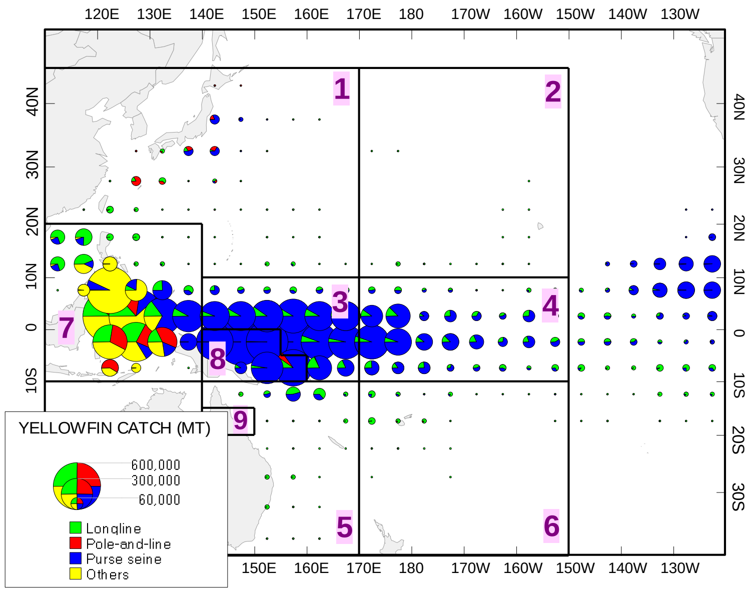

Figure 7.2.2 Distribution of yellowfin tuna catch in the WCP–CA, 1990–2017.

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 7.2.3), 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. Relatively large catches of large yellowfin tuna in the size range 120–130 cm from the purse seine unassociated sets appear in three of the last four years (2014, 2016 and 2017); 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, but this level of catch was not as strong in 2015. Note the two modes of small fish (25cm and 40 cm) in the Indonesia/Philippines fishery in years 2014 through to 2017. Figures 3.4.7 and 3.4.8, and Section 3.6 also provide some insights into the distribution of purse-seine yellowfin catch by area and size.

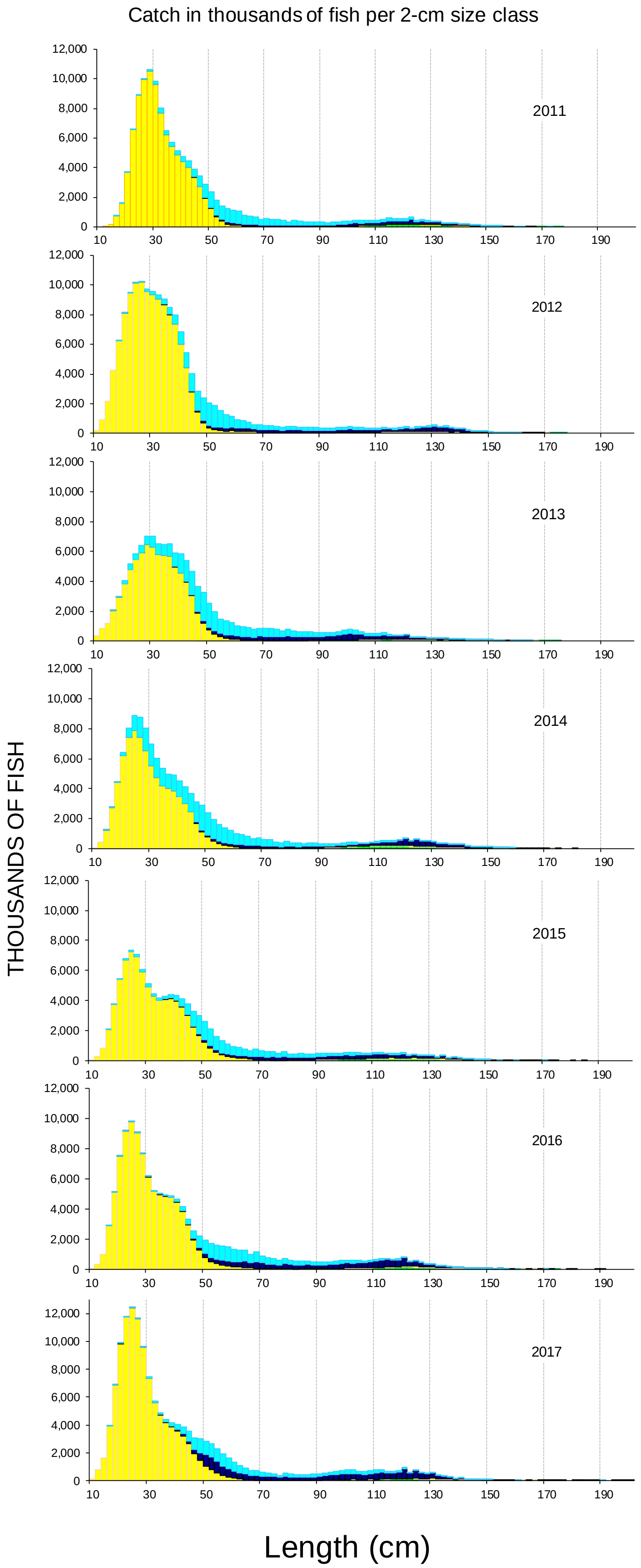

Figure 7.2.3 Annual catches (no. of fish) of yellowfin tuna in the WCPO by size and gear type, 2011–2017.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

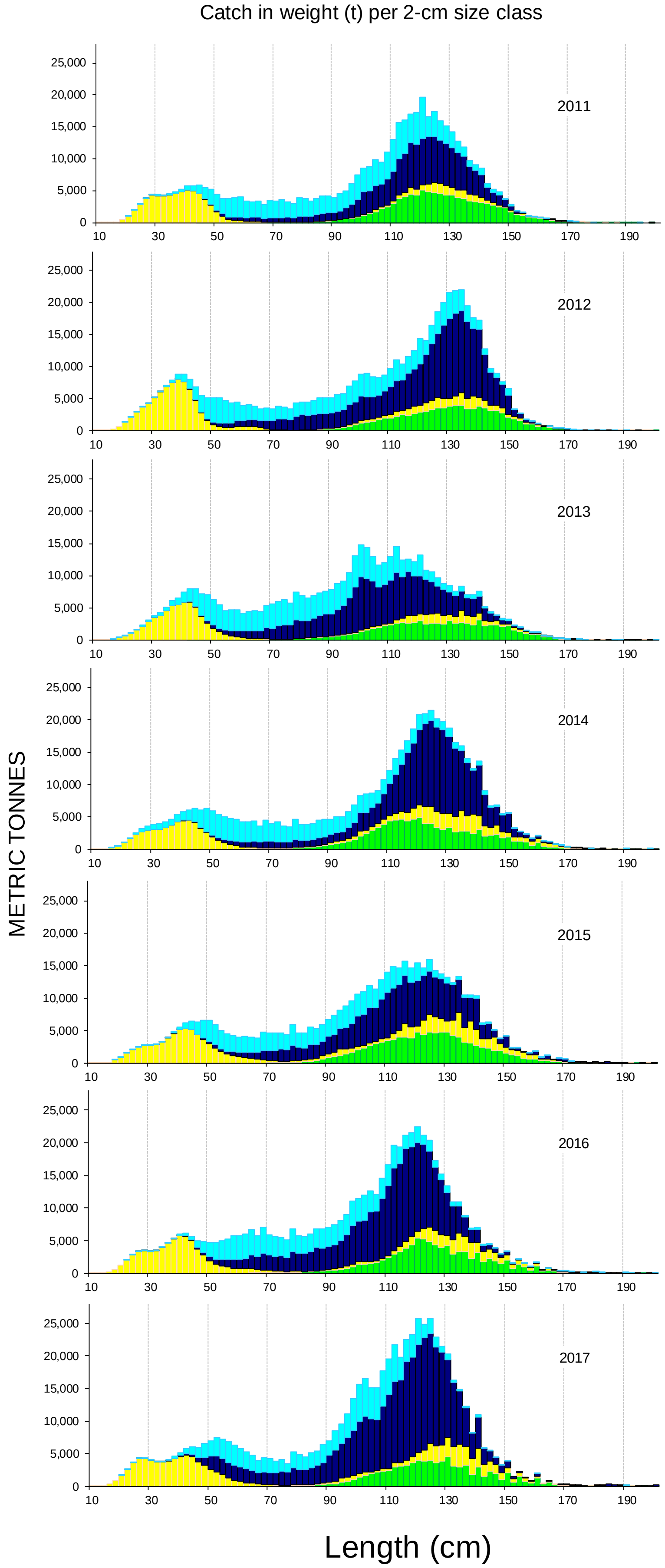

Figure 7.2.4 Annual catches (MT) of yellowfin tuna in the WCPO by size and gear type, 2011–2017.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.3 BIGEYE

The provisional **WCP-CA bigeye catch** (126,929 mt) was the lowest since 1996, mainly due to the relatively low **WCP-CA longline** bigeye catch (58,164 mt), although longline estimates for the previous calendar year are known to be preliminary at the writing of this paper. The provisional **WCP–CA purse seine** bigeye catch for 2017 was estimated to be 56,194 mt which was below the average for the past ten years (Figure 7.3.1). In 2013, the WCP-CA purse-seine bigeye catch exceeded the longline catch for the first time, and in the past two years, catch levels for both fisheries were very similar. The purse seine and longline fisheries accounted for 90% of the total WCP_CA bigeye catch in 2017.

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 (including troll) in the Philippine, Indonesian[11], Vietnam and Japanese domestic fisheries has accounted for an estimated 10,000–16,000 mt (3–7% of the total WCP–CA bigeye catch) over time.

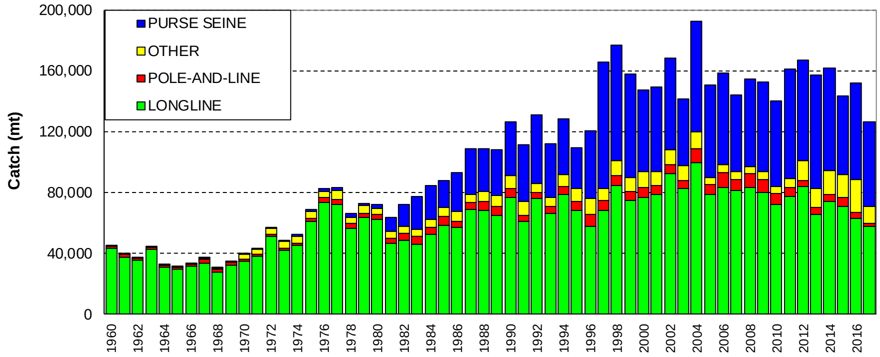

Figure 7.3.1 WCP–CA bigeye catch (mt) by gear

Figure 7.3.2 shows the spatial distribution of bigeye catch in the Pacific for the period 1990–2017. 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.

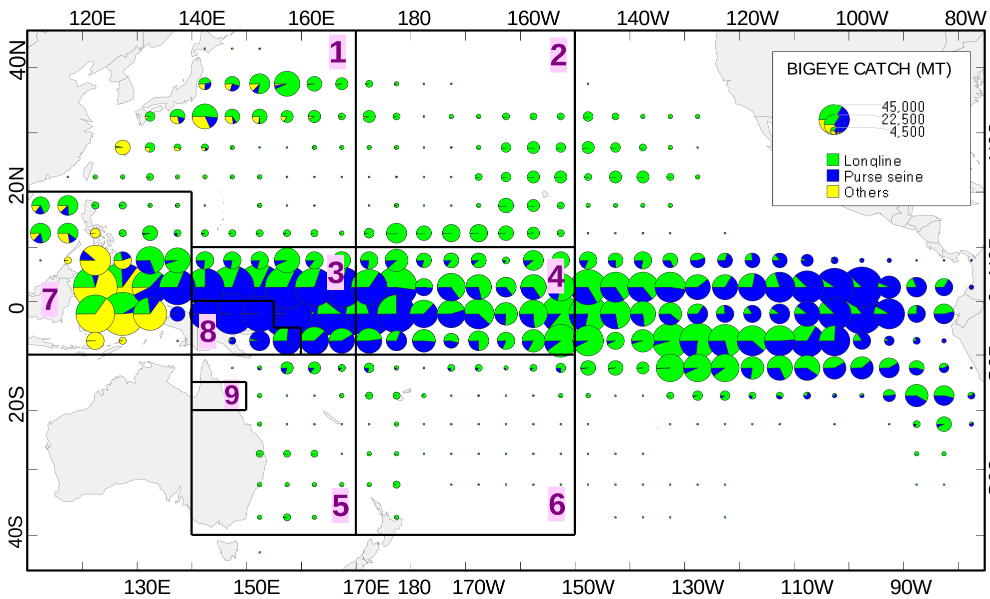

Figure 7.3.2 Distribution of bigeye tuna catch, 1990–2017.
The nine-region spatial stratification used in stock assessment for the WCP–CA is shown.

[11] Indonesia 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.

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 7.3.3). The longline fishery clearly accounts for most of the catch (by weight) of large bigeye in the WCP–CA (Figure 7.3.4). 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 possibly in other years for example, the mode in Philippines/Indonesian domestic fisheries in 2015 progressing to the mode in the purse seine associated catch 2016 (Figure 7.3.3).

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 2017 show that (i) the average size of longline-caught bigeye was larger than in previous years, with a narrower size range, (ii) the size composition of the purse seine associated-set catch is similar to recent years with most fish in the range 50–70 cm (although, a higher proportion of smaller fish in 2017), and (iii) the maintenance of relatively high numbers of bigeye tuna taken in unassociated sets (which is similar to recent years), with a small number exceeding 170cm in length.

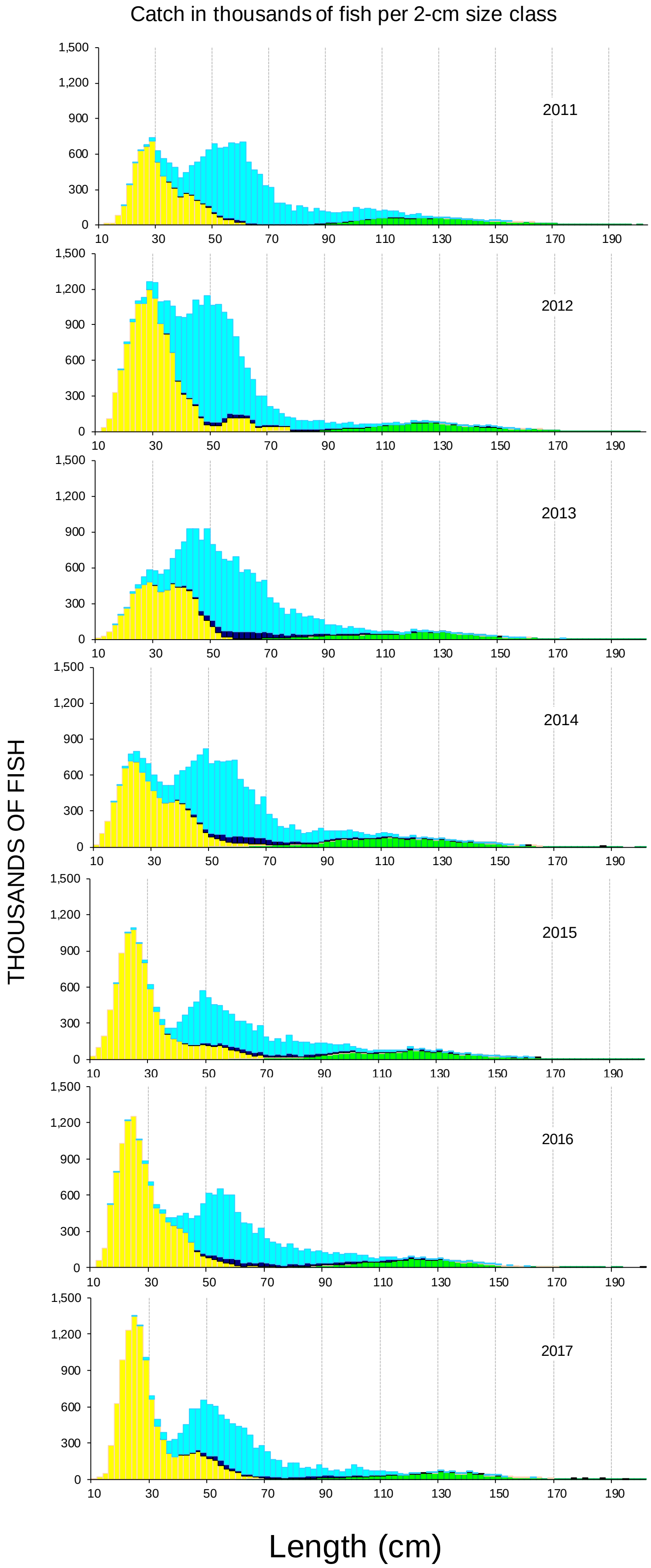

Figure 7.3.3 Annual catches (no. of fish) of bigeye tuna in the WCPO by size and gear type, 2011–2017.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

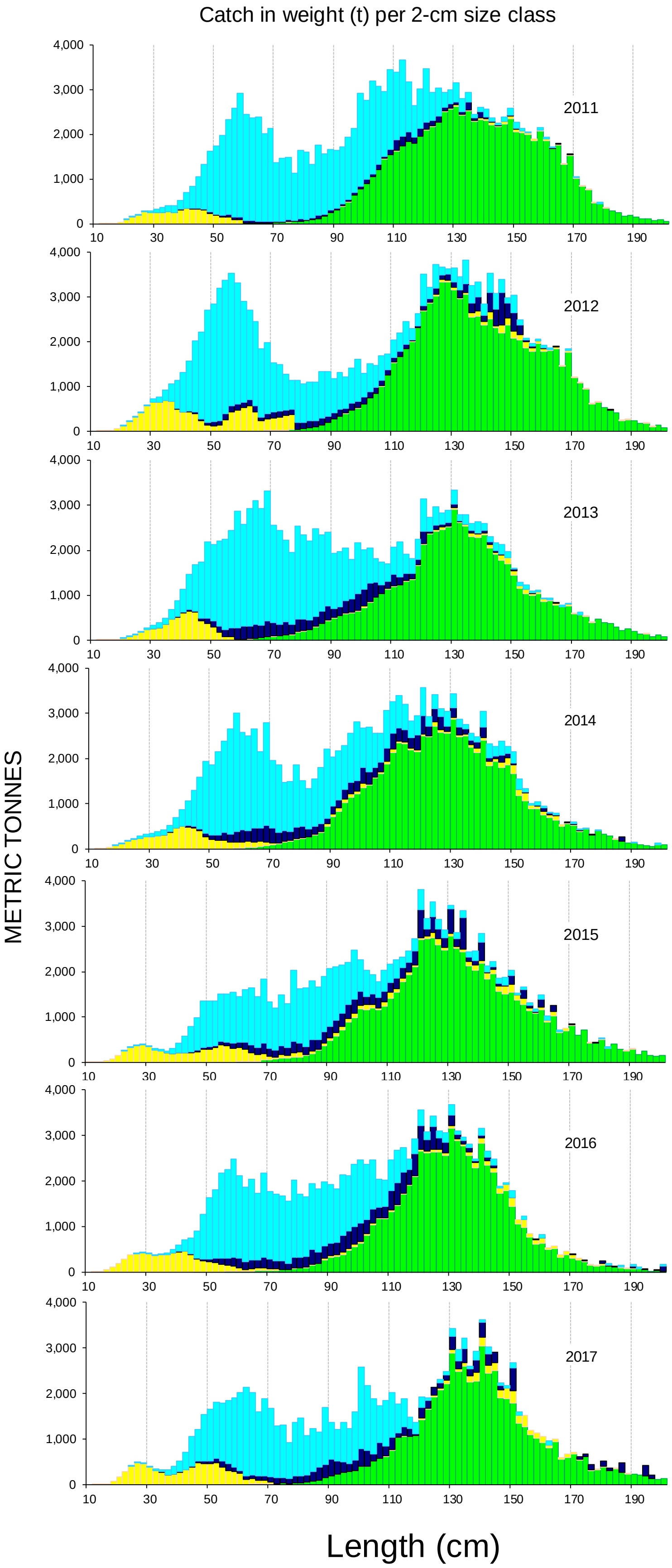

Figure 7.3.4 Annual catches (MT) of bigeye tuna in the WCPO by size and gear type, 2011–2017.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

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 2017 (92,291 mt) was a record catch, primarily due to a record in the longline fishery (89,388 mt.); the 2017 catch was around 4,000-5,000 mt. more than the previous record catch in 2010 of 88,147 mt.

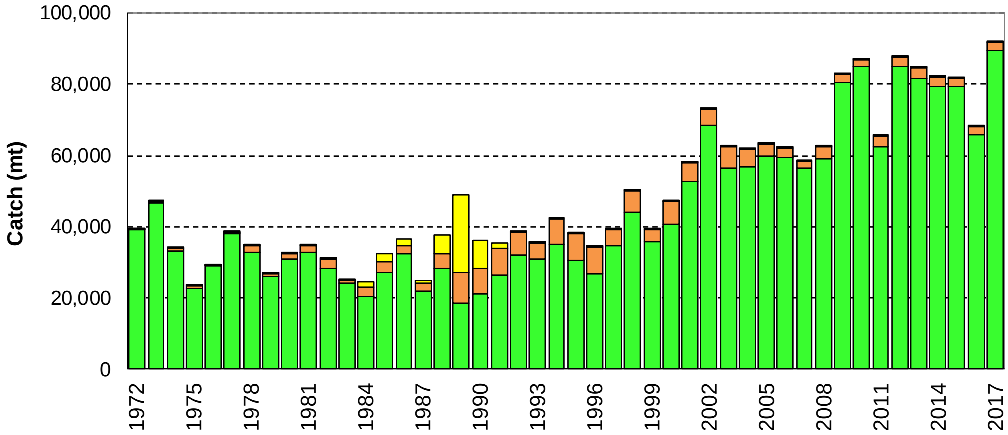

Figure 7.4.1 South Pacific albacore catch (mt) by gear ("Other" is primarily catch by the driftnet fishery.)

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% of the Pacific catch of albacore. The WCP–CA albacore catch for 2017 (117,969 mt), nearly 30,000 mt lower that the record (147,793 mt in 2002).

The longline catch of albacore is distributed over a large area of the south Pacific (Figure 7.4.2), but concentrated in the west. The Chinese-Taipei distant-water longline fleet catch is taken in all 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.

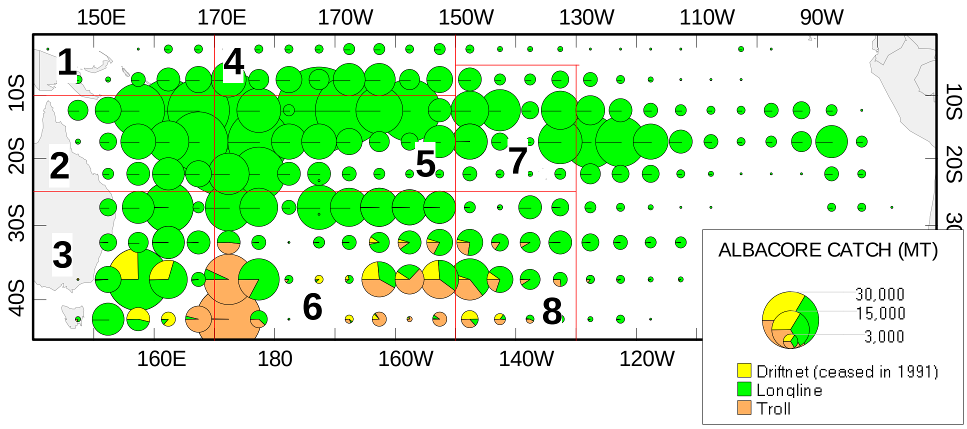

Figure 7.4.2 Distribution of South Pacific albacore tuna catch, 1988–2017.
The eight-region spatial stratification used in stock assessment is shown.

The longline fishery takes adult albacore in the narrow size range of 90–105cm and the troll fishery takes juvenile fish in the range of 45–80cm (Figure 7.4.3 and Figure 7.4.4). 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 average size in the longline catch for 2017 was larger than the other years shown here (2011–2016).

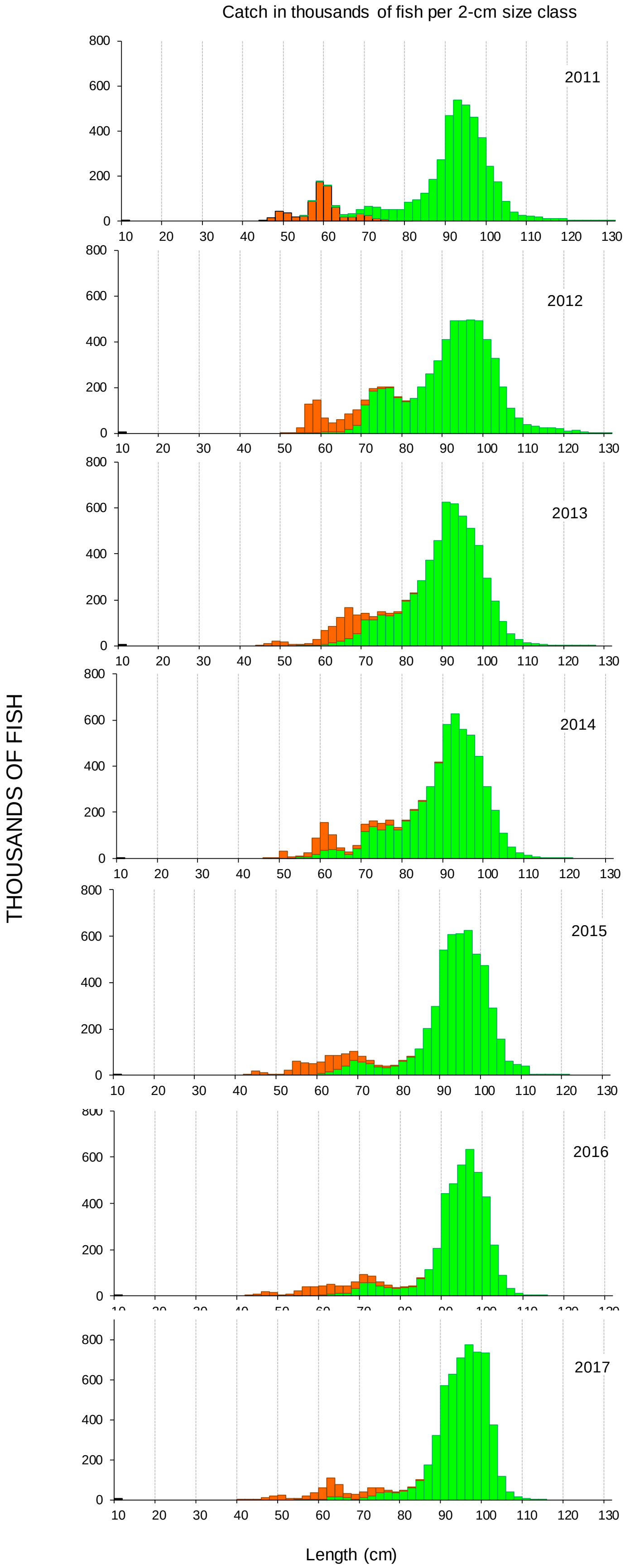

Figure 7.4.3 Annual catches (no. of fish) of albacore tuna in the South Pacific Ocean by size and gear type, 2011–2017. **(green–longline; orange–troll)**

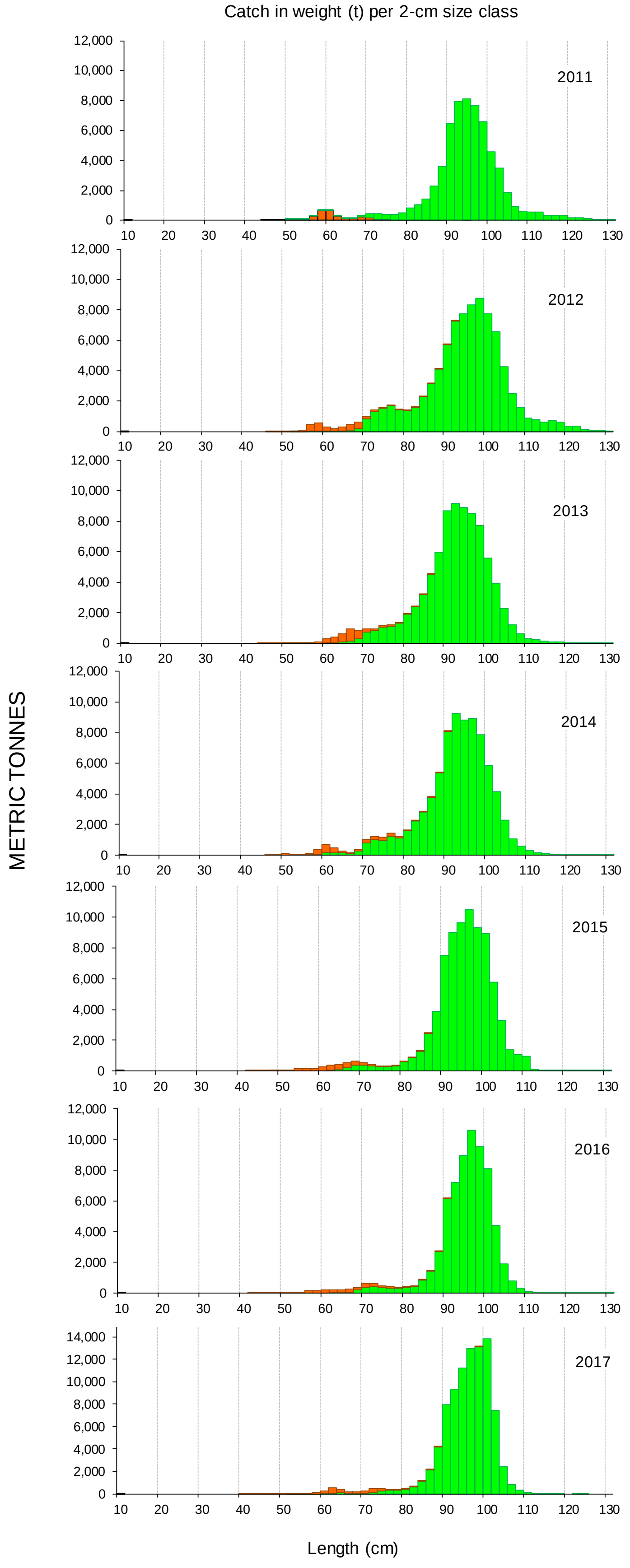

Figure 7.4.4 Annual catches (MT) of albacore tuna in the South Pacific Ocean by size and gear type, 2011–2017. **(green–longline; orange–troll);**

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 7.5.1), 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 period 2011-2017, with contributions from the distant-water Asian fleet catches. The 2017 catch estimate (21,966 mt) declined from the record 2015 catch, mainly due to a reduction in distant-water Asian fleet catches, although 2017 estimates for some fleets were provisional at the time of writing this paper.

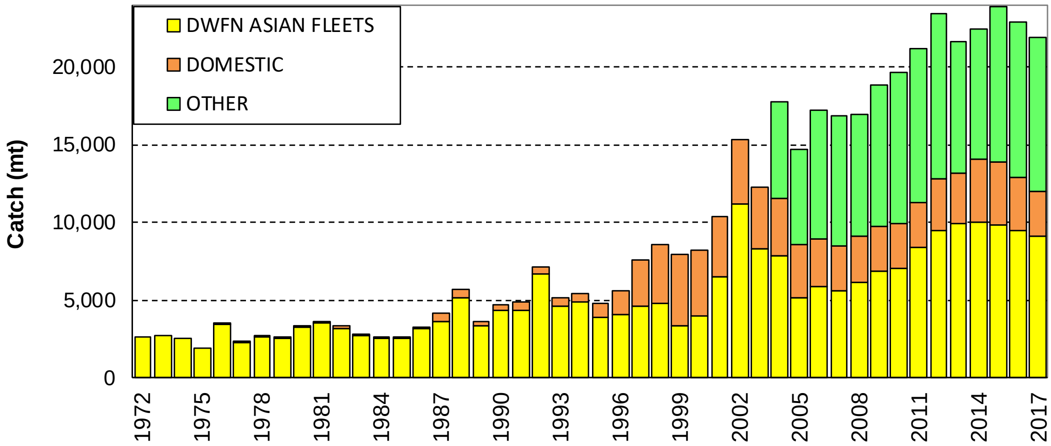

Figure 7.5.1 South Pacific longline swordfish catch (mt) by fleet

The longline catch of swordfish is distributed over a large area of the south Pacific (Figures 7.5.2 and A10). 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.

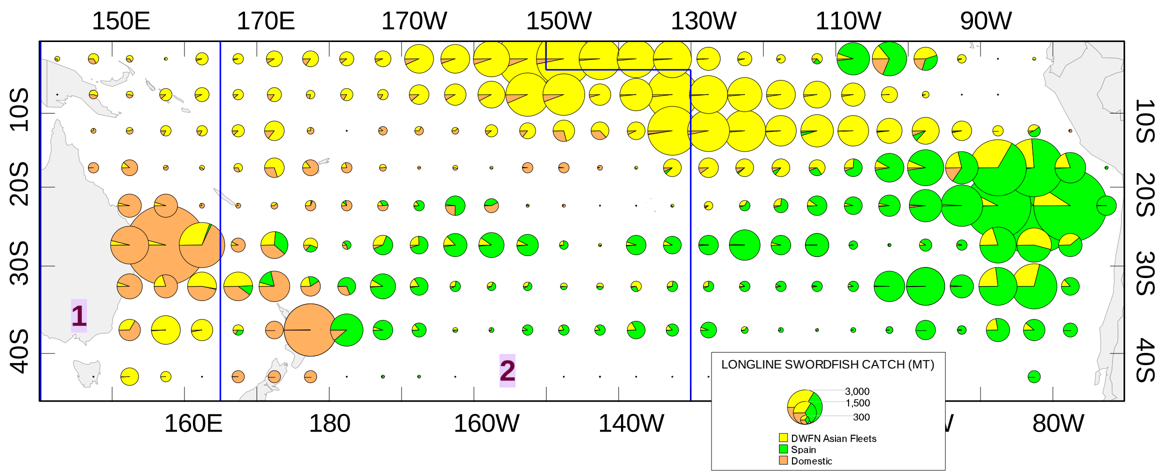

Figure 7.5.2 Distribution of South Pacific longline swordfish catch, 1995–2017.

The swordfish catch throughout the South Pacific Ocean are generally in the range of 110–170cm (lower jaw-fork length – Figures 7.5.3 and 7.5.4). 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.

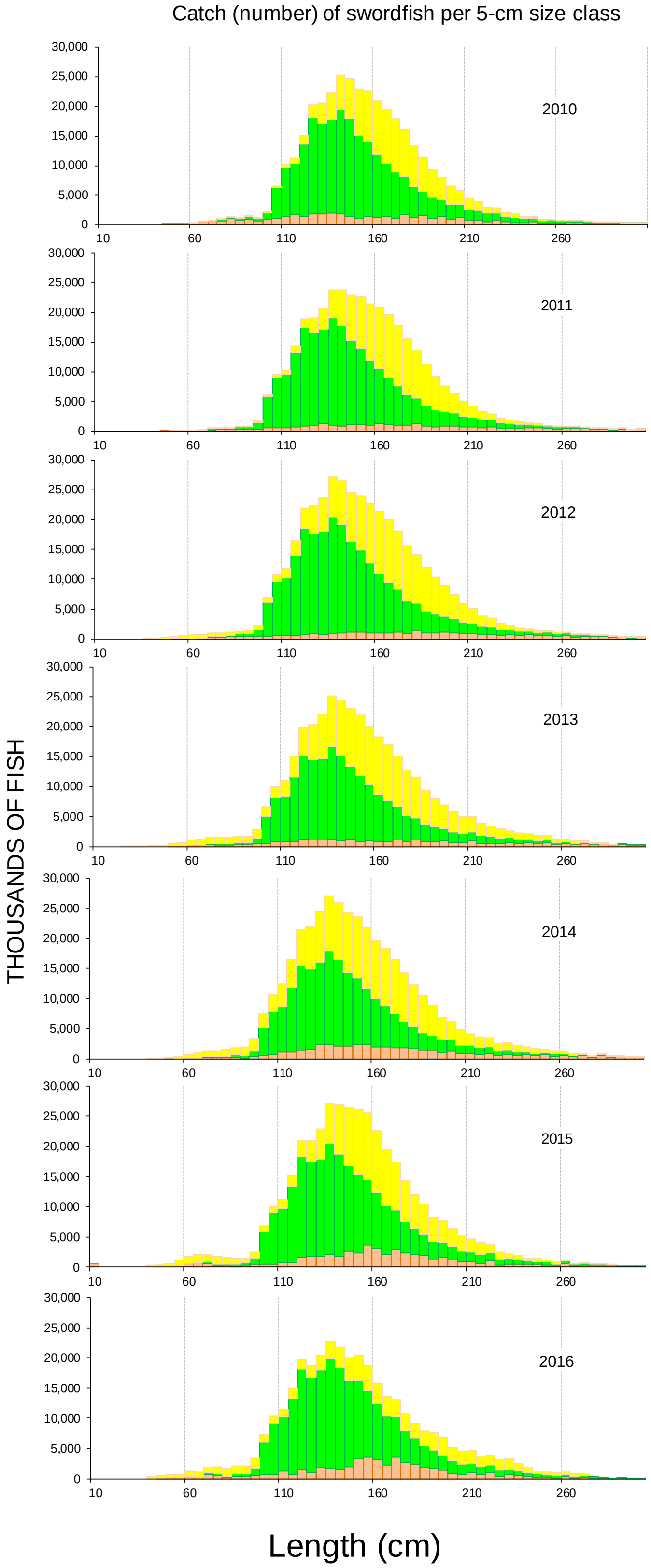

Figure 7.5.3 Annual catches (number of fish) of swordfish in the South Pacific Ocean by size and fleet, 2010–2016. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange– Domestic fleets)**
Spanish fleet size data not available for 2012-2017, so 2011 data have been carried over.

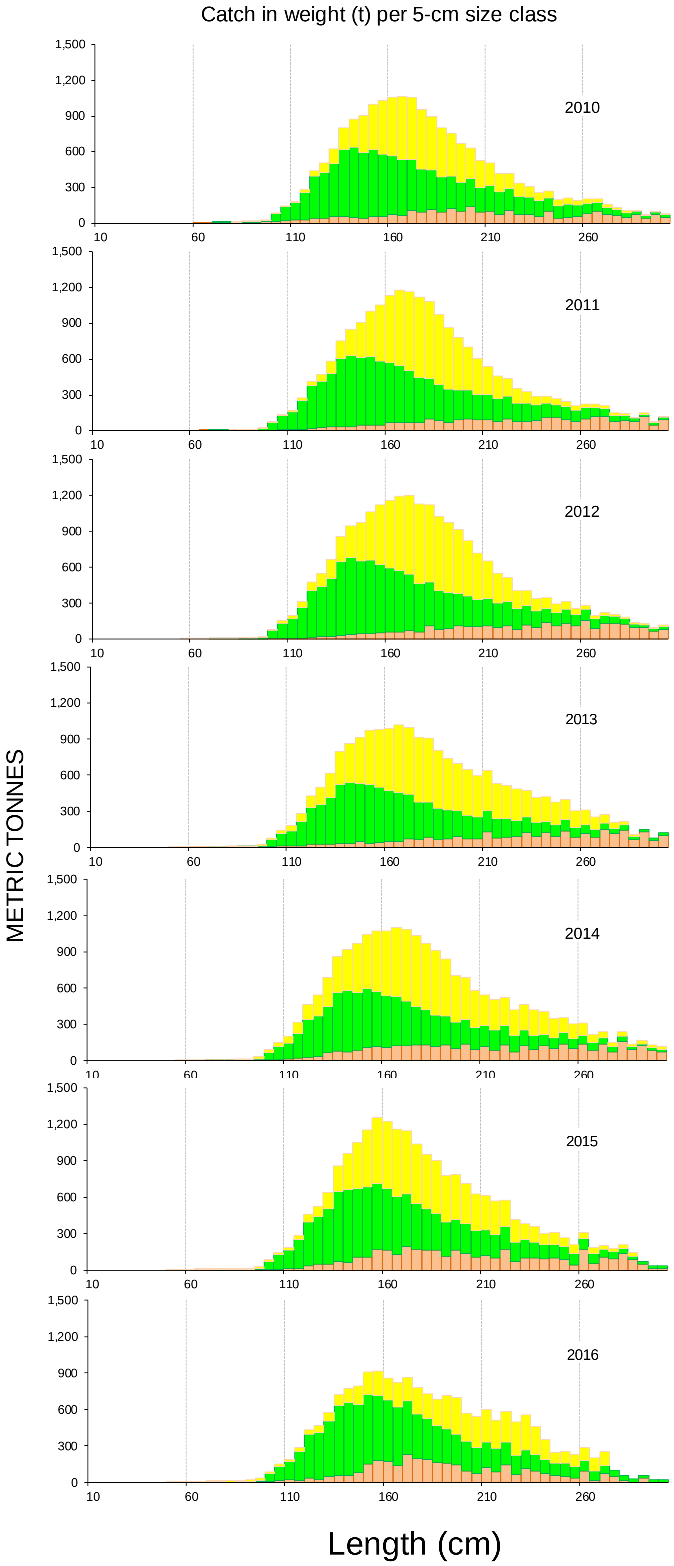

Figure 7.5.4 Annual catches (metric tonnes) of swordfish in the South Pacific Ocean by size and fleet, 2010–2016. (green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange–Domestic fleets)
Spanish fleet size data not available for 2012-2017, so 2011 data have been carried over.

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S. Brouwer, G. Pilling, P. Williams, S. & John Hampton (2018) A compendium of fisheries indicators for tuna stocks Working Paper SA-WP-02. Fourteenth Regular Session of the Scientific Committee of the WCPFC (SC14). Busan, Republic of Korea, 8–16 August 2018

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, 2000-2017. 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	5,257	1,918	36%
2001	5,903	2,171	37%
2002	8,620	3,819	44%
2003	6,477	3,168	49%
2004	7,605	3,640	48%
2005	6,648	2,330	35%
2006	8,859	3,192	36%
2007	9,348	2,904	31%
2008	9,234	4,129	45%
2009	7,506	4,293	57%
2010	6,227	3,433	55%
2011	8,484	4,994	59%
2012	8,792	4,899	56%
2013	8,267	4,594	56%
2014	8,476	4,773	56%
2015	7,825	4,167	53%
2016	6,507	3,433	53%
2017	6,709	3,775	56%

Table A2. Proportion of Longline SWORDFISH catch by 10° latitude band in the WCPFC Convention Area south of the equator, 2000-2017. 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	3,568	1,424	1,442	1,924	125	42%	17%	17%	23%	1%
2012	3,520	1,379	1,526	2,205	161	40%	16%	17%	25%	2%
2013	3,060	1,534	1,658	1,803	211	37%	19%	20%	22%	3%
2014	3,519	1,254	2,054	1,445	203	42%	15%	24%	17%	2%
2015	3,163	1,003	2,220	1,210	229	40%	13%	28%	15%	3%
2016	1,995	1,438	1,413	1,428	233	31%	22%	22%	22%	4%
2017	2,212	1,563	1,601	1,184	149	33%	23%	24%	18%	2%

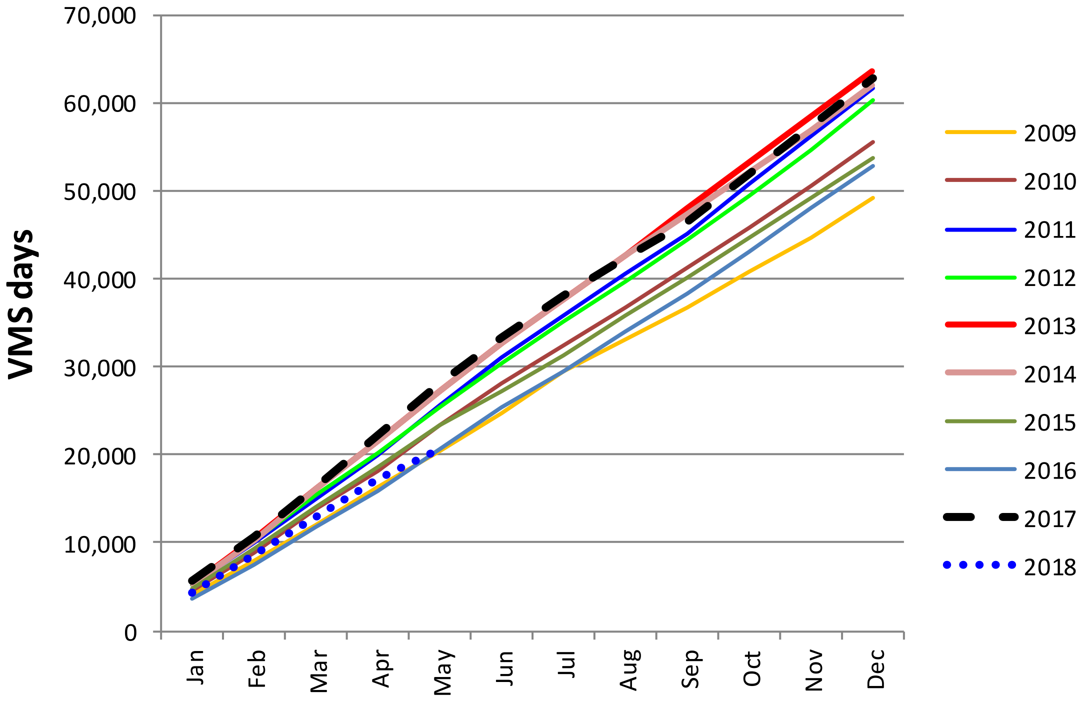


Figure A1. Cumulative purse seine effort by month, 2009-2017, as measured by VMS
(excludes days in port and an estimation of days in transit)

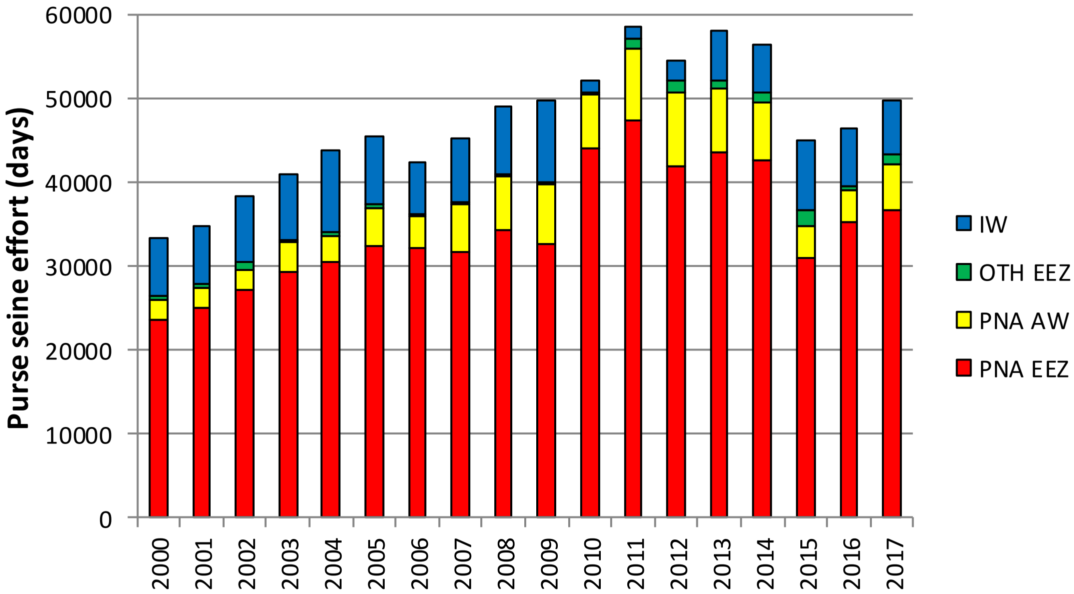


Figure A2. Purse seine effort (days fishing and searching) in the WCPFC Convention Area between 20°N and 20°S, excluding domestic purse seine effort in Philippines and Indonesia. Estimates are based on raised logsheet data.

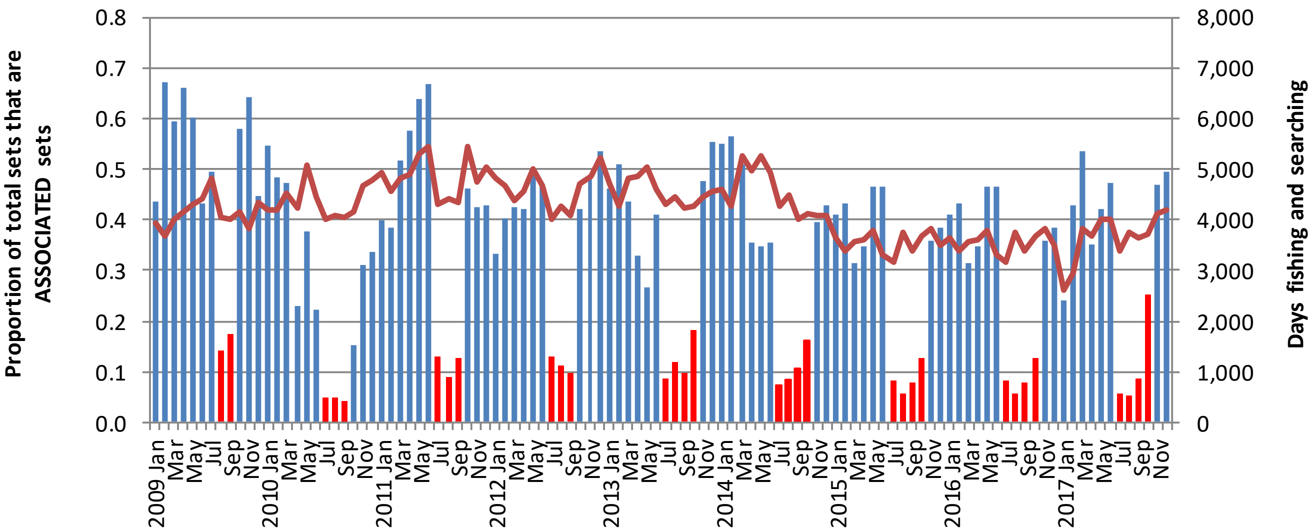


Figure A3. Proportion of the total purse seine fishing activity comprising associated sets, as indicated by logsheet data. Red bars indicate the FAD closure months. Total effort in days is shown by the plotted line. Activities in the domestic purse seine fisheries of Indonesia and Philippines are excluded**.**

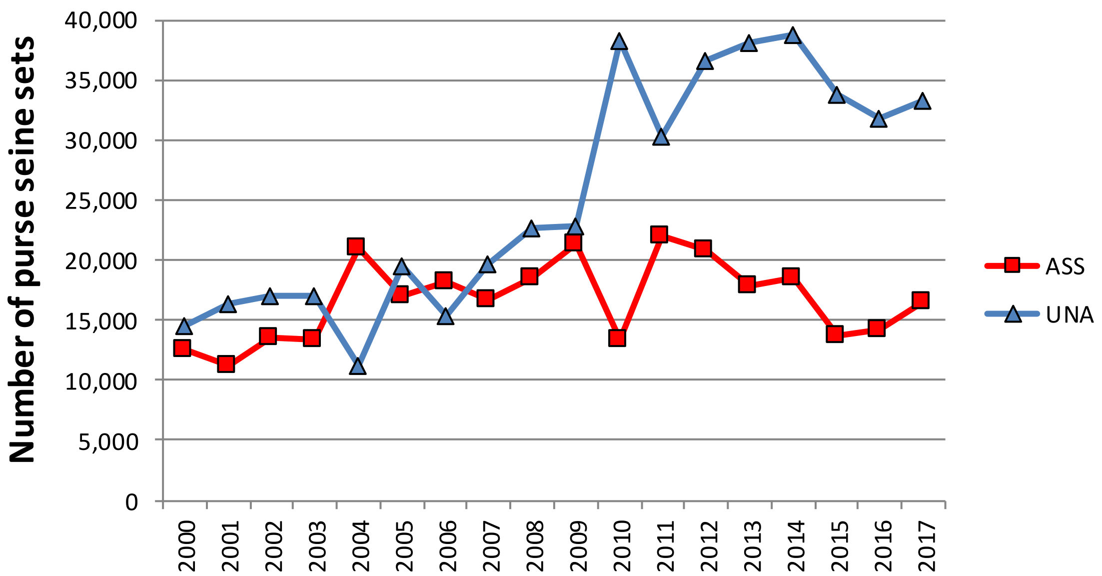
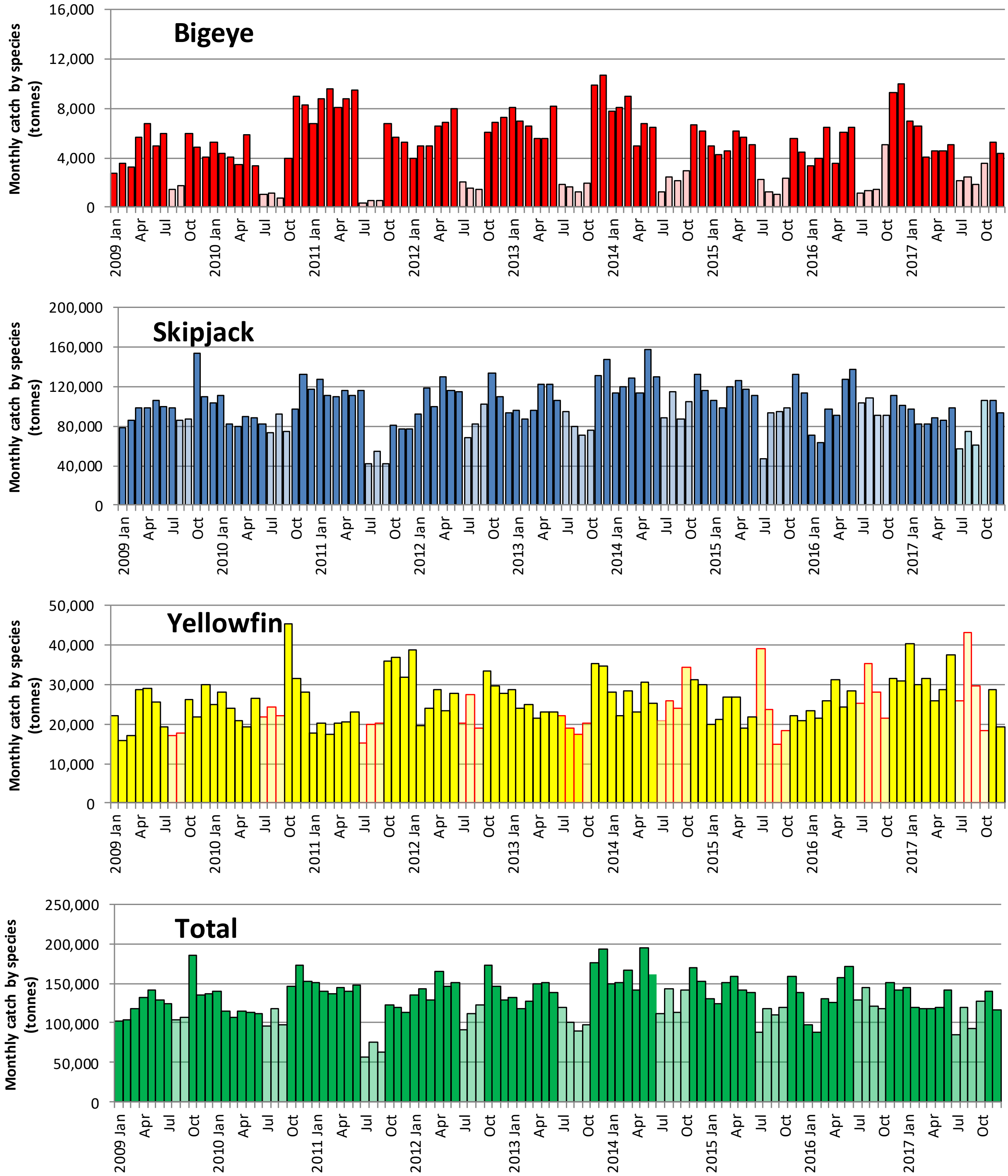


Figure A4. Number of associated (ASS) and unassociated (UNA) sets made in the WCPO tropical purse seine fishery, 2000 – 2017. Activities in the domestic purse seine fisheries of Indonesia and Philippines are excluded. Associated sets include animal-associated sets.



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.

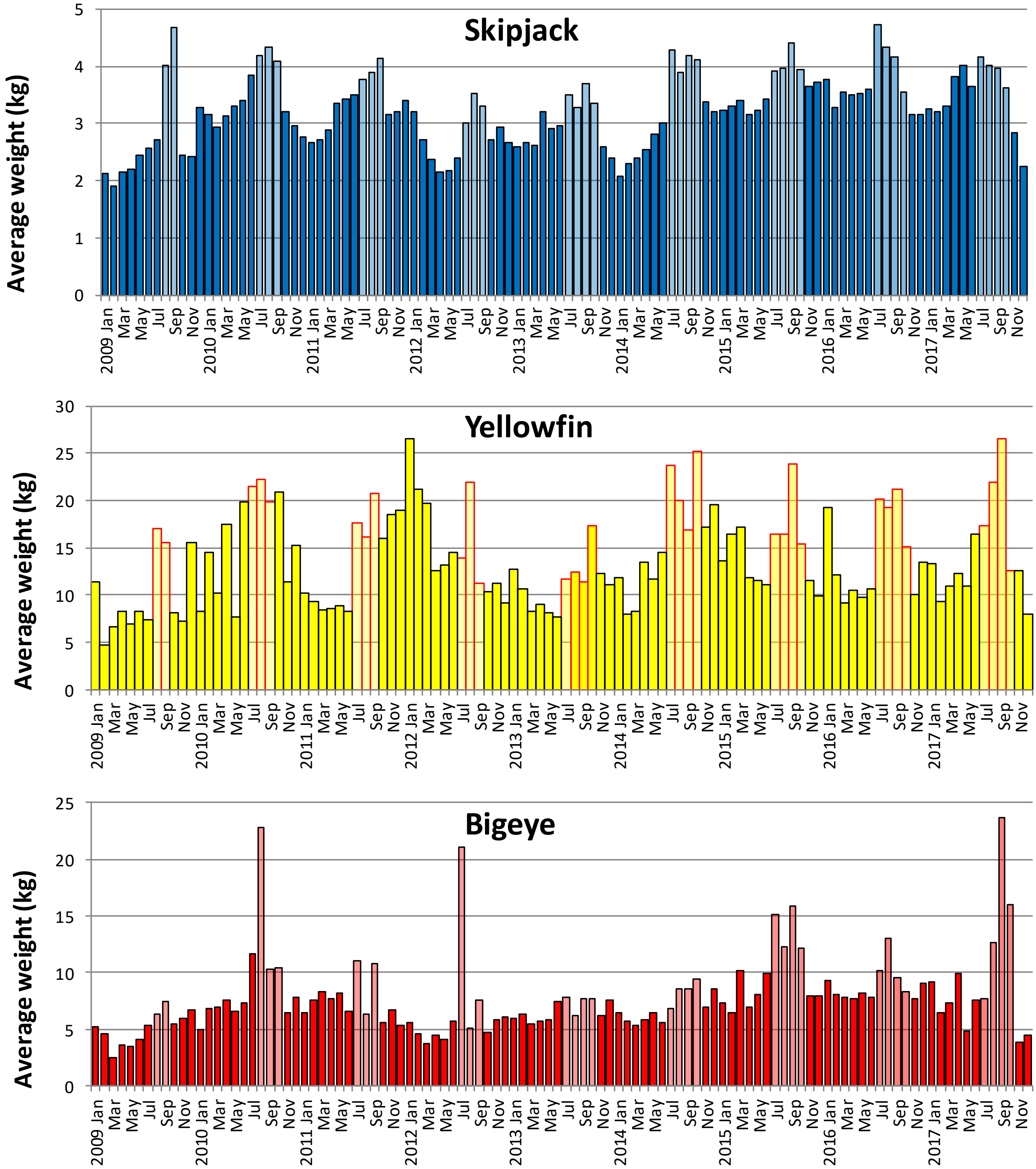


Figure A6. Monthly average weight of bigeye, skipjack and yellowfin tuna, estimated from observer sampling data, 2009-2017.

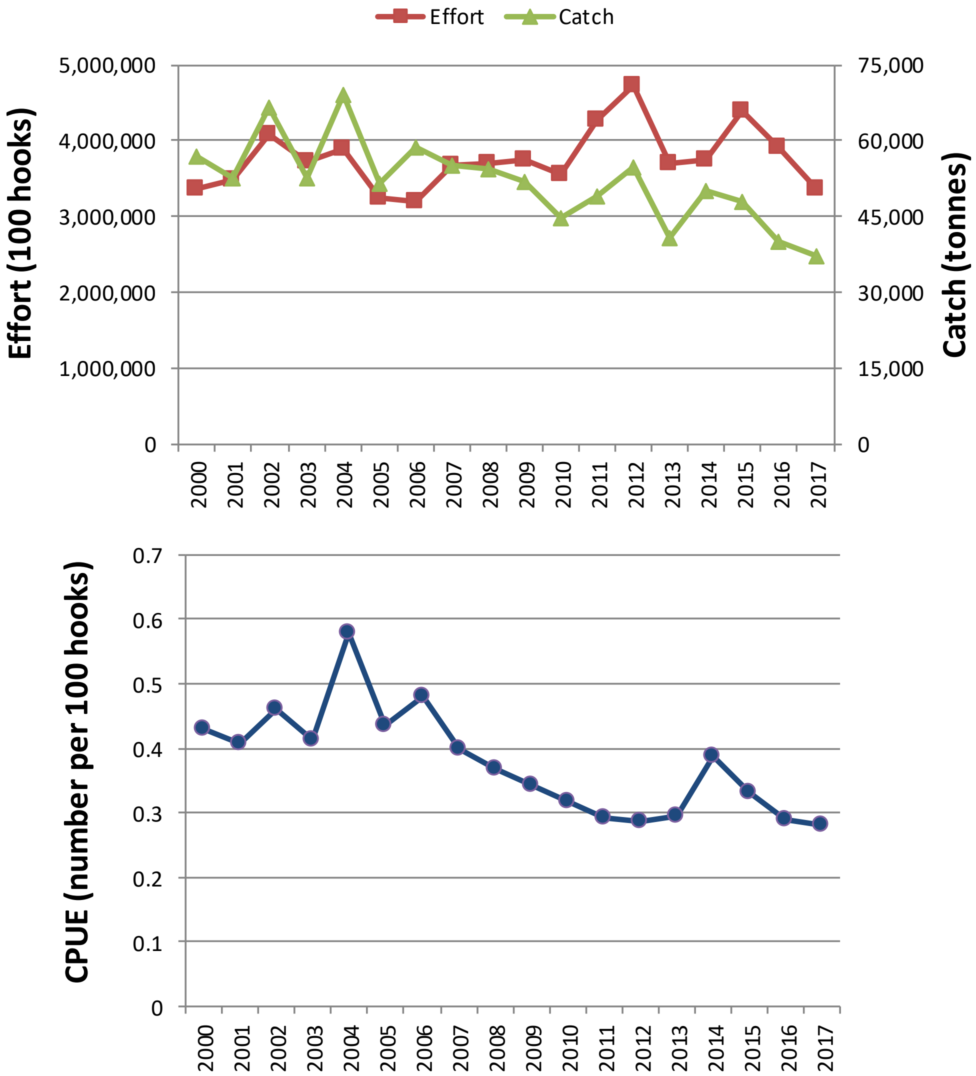


Figure A7. Estimates of longline effort and bigeye catch (upper panel) and bigeye nominal CPUE (lower panel) for the CORE area of the tropical WCPFC longline fishery (130°E - 150°W, 20°N - 10°S).
2017 data are provisional.

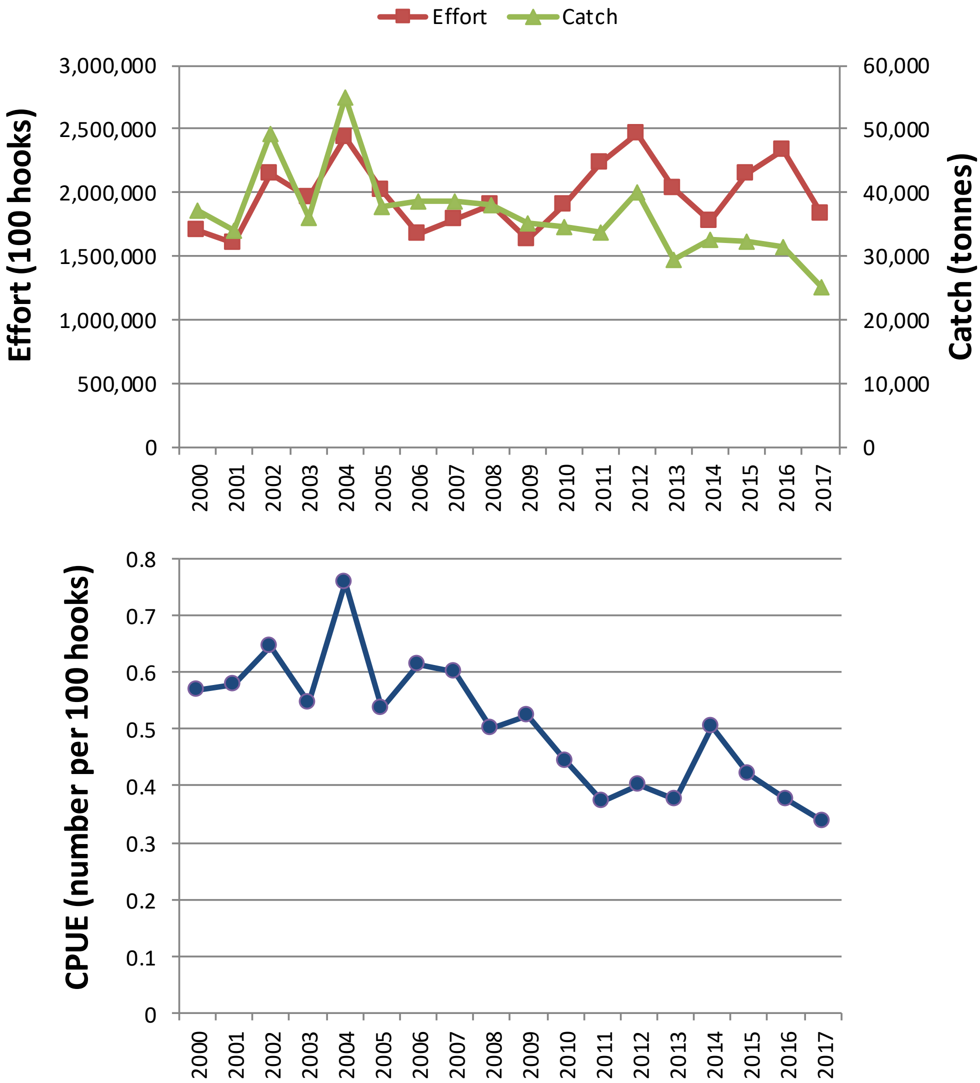


Figure A8. Estimates of longline effort and bigeye catch (upper panel) and bigeye nominal CPUE (lower panel) for the EASTERN area of the tropical WCPFC longline fishery (170°E - 150°W, 20°N - 10°S).
2017 data are provisional.

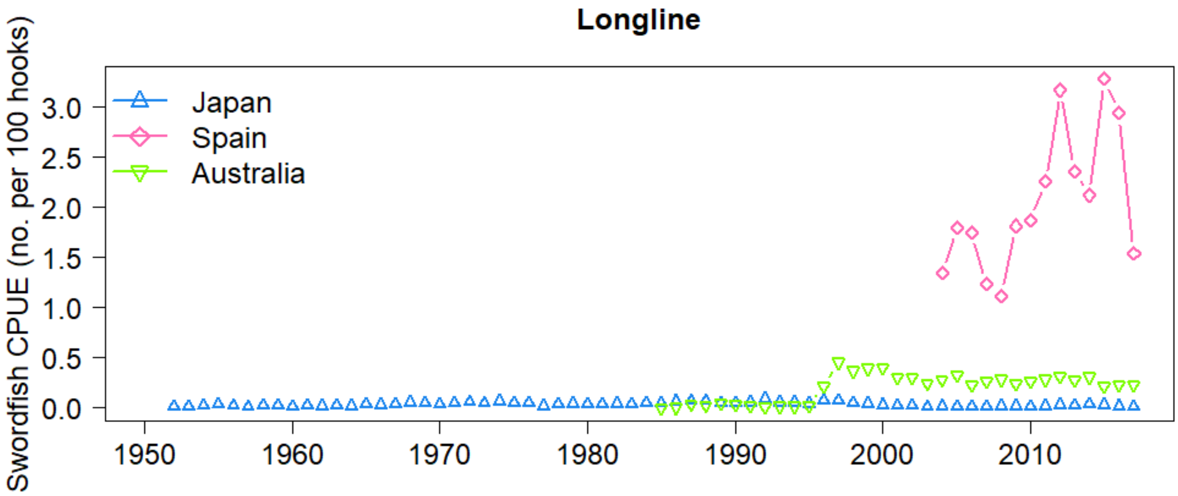


Figure A9. Trends in SWORDFISH nominal CPUE (number of fish per 100 hooks) over time for key LONGLINE fleets in the south Pacific Ocean.

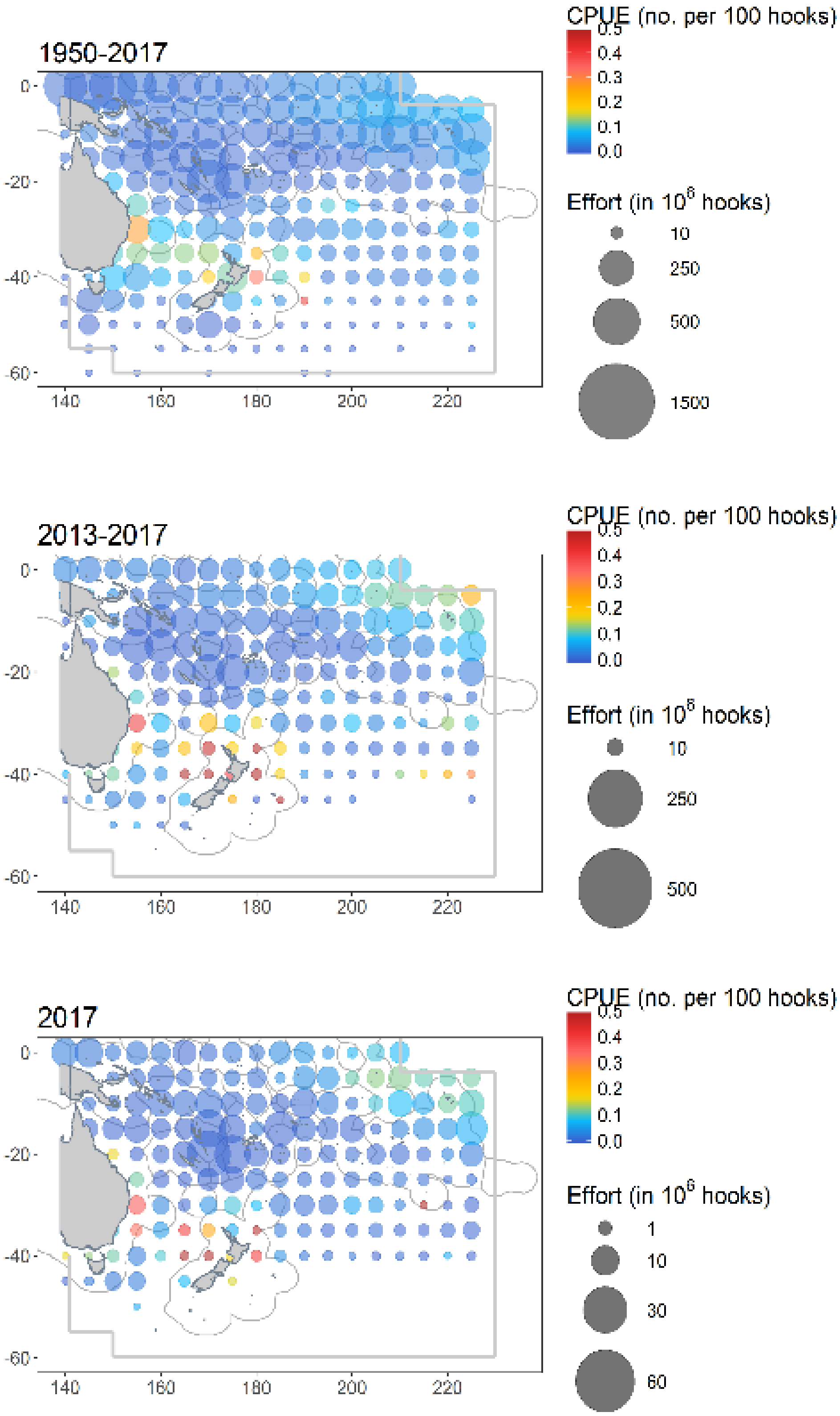


Figure A10. Distribution of South Pacific SWORDFISH longline CPUE and effort for the period 1950-2017 (top), 2013-2017 (middle) and 2017 (bottom).

Table A3. 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.

YEAR	VESSELS		DAYS	UNASSOCIATED SCHOOLS								ASSOCIATED SCHOOLS								TOTAL				
	YB	LOG			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	210	200	33,483	14,462	277,662	69%	121,979	30%	1,784	0%	401,425	12,563	303,613	59%	167,846	33%	41,813	8%	513,273	27,025	581,276	289,825	43,597	914,697
2001	195	192	34,738	16,347	327,545	67%	157,193	32%	5,882	1%	490,619	11,246	257,345	62%	116,711	28%	43,759	11%	417,815	27,594	584,890	273,904	49,641	908,434
2002	199	204	38,317	16,977	380,050	79%	95,051	20%	6,858	1%	481,959	13,612	385,002	67%	136,722	24%	50,244	9%	571,968	30,590	765,051	231,773	57,103	1,053,927
2003	200	208	40,938	17,013	373,482	71%	147,106	28%	3,935	1%	524,523	13,318	312,463	66%	125,149	27%	32,812	7%	470,424	30,332	685,945	272,255	36,747	994,947
2004	215	210	43,792	11,134	197,870	76%	59,839	23%	2,838	1%	260,546	20,998	531,621	66%	210,423	26%	61,426	8%	803,470	32,133	729,491	270,262	64,263	1,064,016
2005	221	198	45,583	19,494	406,916	75%	133,898	25%	5,478	1%	546,292	17,091	427,265	66%	173,502	27%	44,864	7%	645,631	36,585	834,181	307,401	50,342	1,191,924
2006	214	199	42,364	15,305	327,079	77%	93,580	22%	3,655	1%	424,314	18,153	605,051	76%	149,899	19%	45,857	6%	800,807	33,459	932,130	243,480	49,512	1,225,121
2007	237	229	45,328	19,648	429,210	77%	127,236	23%	3,262	1%	559,709	16,703	610,073	77%	147,198	19%	40,352	5%	797,623	36,351	1,039,283	274,434	43,614	1,357,332
2008	248	240	48,996	22,718	424,168	67%	202,407	32%	3,458	1%	630,032	18,474	558,367	73%	164,033	21%	48,266	6%	770,666	41,192	982,535	366,440	51,724	1,400,699
2009	261	251	49,695	22,803	484,673	82%	103,167	17%	3,895	1%	591,735	21,305	710,251	76%	175,193	19%	49,902	5%	935,347	44,108	1,194,924	278,361	53,797	1,527,082
2010	276	263	52,497	38,281	690,303	76%	212,281	23%	8,289	1%	910,874	13,313	425,718	74%	109,461	19%	43,736	8%	578,916	51,595	1,116,022	321,742	52,026	1,489,790
2011	279	267	58,990	30,305	430,234	76%	133,004	24%	3,245	1%	566,483	21,967	626,134	74%	149,687	18%	66,955	8%	842,776	52,272	1,056,367	282,690	70,200	1,409,258
2012	285	281	55,128	36,612	631,544	75%	207,779	25%	8,473	1%	847,796	20,753	614,561	77%	133,109	17%	53,700	7%	801,371	57,365	1,246,105	340,888	62,174	1,649,167
2013	297	287	54,669	38,014	652,196	81%	148,071	18%	8,839	1%	809,106	17,889	563,065	73%	150,375	19%	60,984	8%	774,424	55,904	1,215,261	298,446	69,823	1,583,531
2014	308	300	54,310	38,802	755,282	79%	194,908	20%	9,894	1%	960,083	18,498	650,935	78%	128,106	15%	54,675	7%	833,717	57,300	1,406,217	323,014	64,569	1,793,800
2015	306	291	42,602	33,710	693,275	79%	172,100	20%	10,798	1%	876,173	13,738	562,105	80%	101,998	15%	36,846	5%	700,950	47,449	1,255,380	274,099	47,644	1,577,123
2016	293	252	43,882	31,812	649,088	75%	210,998	24%	10,803	1%	870,889	14,247	541,804	77%	115,225	16%	47,185	7%	704,213	46,060	1,190,891	326,222	57,988	1,575,102
2017	282	258	47,091	33,315	529,634	68%	237,844	31%	9,051	1%	776,529	16,436	501,913	76%	120,724	18%	42,196	6%	664,834	49,752	1,031,547	358,568	51,247	1,441,363

Notes:

1. Estimates are based on aggregate data and raised logsheet data with species composition adjusted using observer sampling with grab sample bias correction. Note that these estimates may differ from the annual catch estimates provided by CCMs.
2. Estimates exclude domestic purse seine catch/effort in Philippines, Indonesia and Vietnam.
3. Two sources of estimates of vessel numbers are provided (i) those provided by CCMs with their annual catch estimates (and therefore appear in the WCPFC Yearbook) and (ii) estimates of vessel numbers from unraised operational data available to SPC.
4. The estimate of Japanese purse seine vessels fishing in the tropical fishery (20°N–20°S) has been determined by only considering vessel numbers in the categories >200 GRT.
5. There are several instances where vessel numbers from unraised logbook data are higher than the vessel numbers provided by the CCM. The reasons for these occurrences include: (i) situations where one vessel became inactive during the calendar year and was replaced by a new vessel – the vessel number from the operational data is based on a count of the total distinct vessels fishing throughout the year; (ii) instances where there are inconsistencies in the charter/flag assignment between the vessel numbers provided by CCMs and the operational logsheet data (e.g. Philippine-flagged vessels chartered to PNG – this will require follow-up and clarification with relevant CCMs).
6. ASSOCIATED covers sets on Drifting FAD, Log and Anchored FAD. Catch/effort for sets on ANIMALS is not shown separately but are included in the TOTAL.
7. Includes Catch and Effort in Archipelagic Waters.