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OVERVIEW OF TUNA FISHERIES IN THE WCPO, INCLUDING ECONOMIC CONDITIONS – 2018

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OVERVIEW OF TUNA FISHERIES IN THE WESTERN AND CENTRAL PACIFIC OCEAN, INCLUDING ECONOMIC CONDITIONS – 2018

WCPFC-SC15-2019/GN WP-1

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ABSTRACT

This paper provides a broad description of the major fisheries in the WCPFC Statistical Area (WCP-CA) highlighting activities during the most recent calendar year (2018) and covering the most recent summary of catch estimates by gear and species.

The provisional total WCP–CA tuna catch for 2018 was estimated at **2,716,396 mt**, the second highest on record, at around 170,000 mt below the record catch in 2014 (2,885,044 mt). The WCP–CA tuna catch (2,716,396 mt) for 2018 represented 81% of the total Pacific Ocean catch of 3,373,512 mt, and 55% of the global tuna catch (the provisional estimate for 2018 is 4,930,621 mt, which is the second highest and only 6,000 mt from the record global catch in 2014).

The **2018 WCP–CA catch of skipjack** (**1,795,048 mt** – 66% of the total catch) was the fifth highest, at nearly 215,000 mt less than the record in 2014 (2,008,934 mt). The **WCP–CA yellowfin catch** for 2018 (**666,971 mt** – 25%) was the second highest recorded (only 15,000 mt lower than the record catch of 2017); the past three years have been the highest annual yellowfin catches. The **WCP–CA bigeye catch** for 2018 (**142,402** mt – 5%) was the lower than the previous 10-year average, but around 15,000 mt higher than in 2017. The **2018 WCP–CA albacore catch** (**108,974 mt** – 4%) was amongst the lowest for the past twenty years, and nearly 40,000 mt lower than the record catch in 2002 at 147,793 mt. The **south Pacific albacore** catch in 2018 (68,454 mt), was a significant decline on the record catch in 2017 (93,290 mt). This decline is primarily due to a drop in the longline fishery (from 90,627 mt in 2017 to 65,410 mt in 2018), which may be related in part to the absence of any catch reported by the China longline fleet in the Eastern Pacific Ocean, south of the equator.

The provisional **2018 purse-seine catch of 1,910,725 mt** was the second highest on record, at nearly 150,000 mt less than the record in 2014 (2,059,008 mt). The 2018 purse-seine skipjack catch (1,469,520 mt; 77% of total catch) was the second highest on record, only 11,000 mt lower than the record in 2014 (1,481,038 mt). The 2018 purse-seine catch for yellowfin tuna (374,062 mt; 20%) was over 100,000 mt lower than the record catch in 2017 (480,176 mt) but still amongst the highest annual catches for this fishery. The provisional catch estimate for bigeye tuna for 2018 (64,119 mt) was the highest since 2014 and slightly higher than the past ten-year average.

The **provisional 2018 pole-and-line catch** (170,038 mt) was slightly higher than the 2017 catch which was the lowest annual catch since the mid-1960s, due to reduced catches in both the Japanese and the Indonesian fisheries.

The **provisional WCP–CA longline catch** (254,850 mt) for 2018 was at the average level for the past five years. The WCP–CA albacore longline catch (84,930 mt – 34%) for 2018 was the lowest for ten years, and around 16,000 mt lower than the record of 101,820 mt attained in 2010. The provisional bigeye catch (71,305 mt – 28%) for 2018 was higher than the recent five-year average, but well down on the bigeye catch levels experienced in the 2000s (e.g .the 2004 longline bigeye catch was 99,705 mt). The yellowfin catch for 2018 (94,543 mt – 38%) was at the average level for the past five years and more than 30,000 mt less that the record for this fishery (1980: 125,113 mt).

The 2018 **South Pacific troll albacore catch** (2,847 mt) which was the highest catch for five years. The New Zealand troll fleet (144 vessels catching 2,272 mt in 2018) and the United States troll fleet (16 vessels catching 475 mt in 2018) accounted for all of the 2018 albacore troll catch.

Market prices in 2018 were mixed with prices for purse seine caught product generally declining after significant increases in 2016 and 2017, although yellowfin prices at Yaizu continued to move higher. Yaizu prices for pole and line caught skipjack also saw significant declines. Prices for longline caught yellowfin were mixed with prices for fresh imports into the US and Japan increasing while fresh and frozen prices at Japanese ports declined. Prices for longline caught bigeye in 2018 rose by between 5% and 14% across the selected markets. Thai imports prices for albacore have risen significantly since

2017 with the 2018 average being the highest seen since 2012 while for June 2019 (the latest period for which data is available) the average price exceeded $4,000/mt for the first time.

The total estimated delivered value of the tuna catch in the WCP-CA increased by 1% to $6.01 billion in 2018. The value of the purse seine catch ($3.26 billion) accounted for 54% of the total value of the tuna catch. The value of the longline fishery increased 16% to $1.72 billion accounting for 29% of the total value of the tuna catch. The value of the pole and line catch continued to decline to be at $343 million in 2018 with the catch by other gears valued at $669 million. The 2018 WCP–CA skipjack catch was valued at $2.95 billion, the yellowfin catch at $1.92 billion, the bigeye catch at $780 million its highest level since 2014, and the albacore catch at $360 million.

Economic conditions in 2018 in the purse seine, tropical longline and southern longline fisheries of the WCP-CA showed mixed results. In the tropical purse seine fishery despite falls in prices and increases in fuel costs a surge in catch rates saw the continuation of good economic conditions. In the southern and tropical longline fishery after recent improvements economic conditions have again deteriorated as catch rates fall and fuel costs rise.

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 – 2018. The review draws on the latest catch estimates compiled for the WCP–CA, found in Information Paper WCPFC–SC15 ST IP–1 *(Estimates of annual catches in the WCPFC Statistical Area – OFP, 2019)*. Where relevant, comparisons with previous years' activities have been included, although data for 2018, 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 2018 catches relative to those of recent years, but refers readers to the SC15 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.

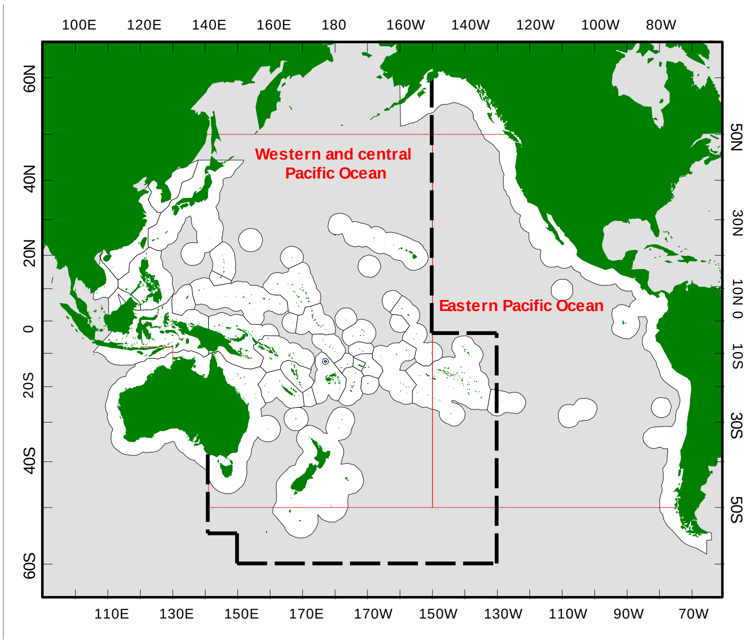

Figure 1.1 The western and central Pacific Ocean (WCPO), the eastern Pacific Ocean (EPO) and the WCPFC Convention Area (WCP–CA in dashed lines)

2. TOTAL TUNA CATCH AND CATCH VALUE FOR 2018

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 2015-2018 (Figure 2.1 and Figure 2.2).

The provisional total WCP–CA tuna catch for 2018 was estimated at **2,716,396 mt**, the second highest on record, at around 170,000 mt below the record catch in 2014 (2,885,044 mt). For 2018, the **purse seine fishery** accounted for a catch of **1,910,725 mt** (70% of the total catch), with **pole-and-line** taking an estimated **170,038 mt** (6%), the **longline fishery** an estimated **254,850 mt** (9%), and the remainder (14%) taken by troll gear and a variety of artisanal gears, mostly in eastern Indonesia and the Philippines. The WCP–CA tuna catch (2,716,396 mt) for 2018 represented 81% of the total Pacific Ocean catch of 3,373,512 mt, and 55% of the global tuna catch (the provisional estimate for 2018 is 4,930,621 mt, which is the second highest and only 6,000 mt from the record global catch in 2014).

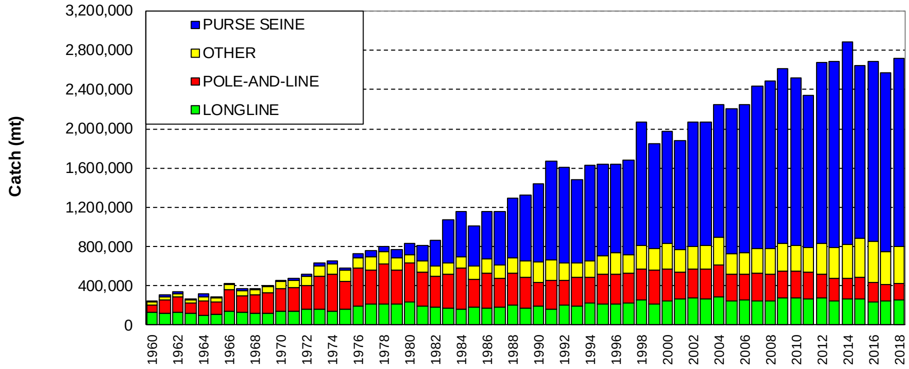

Figure 2.1 Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types

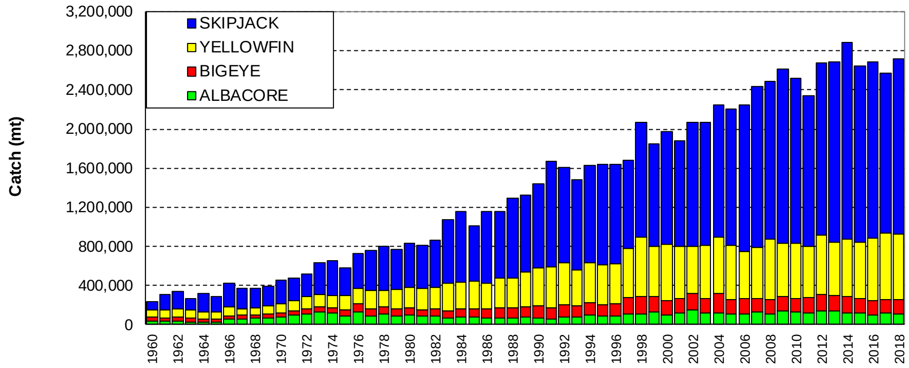

Figure 2.2 Catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

The **2018 WCP–CA catch of skipjack** (**1,795,048 mt** – 66% of the total catch) was the fifth highest, at nearly 215,000 mt less than the record in 2014 (2,008,934 mt). The **WCP–CA yellowfin catch** for 2018 (**666,971 mt** – 25%) was the second highest recorded (only 15,000 mt lower than the record catch of 2017); the past three years have been the highest annual yellowfin catches. The **WCP–CA bigeye catch** for 2018 (**142,402** mt – 5%) was lower than the previous 10-year average, but around 15,000 mt higher than in 2017. The **2018 WCP–CA albacore**[1] **catch** (**108,974 mt** – 4%) was amongst the lowest for the past twenty years, and nearly 40,000 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 124,871 mt in 2018; the section 7.4 "Summary of Catch by Species - Albacore" is concerned only with catches of south Pacific albacore (68,454 mt in 2018), which made up approximately 55% of the Pacific albacore catch in 2018.

In **2018 the value of the provisional total WCP–CA tuna catch was $6.01 billion**[2] marginally higher than for 2017 and the highest since 2013. During 2018 the value of the purse seine catch ($3.26 billion) accounted for 54% of the total value of the tuna catch. The value of the longline fishery increased by 16% in 2018 to be at $1.72 billion and account for 29% of the total value of the tuna catch. The value of the pole and line catch continued to decline to be at $343 million while the catch by other gears was valued at $669 million.

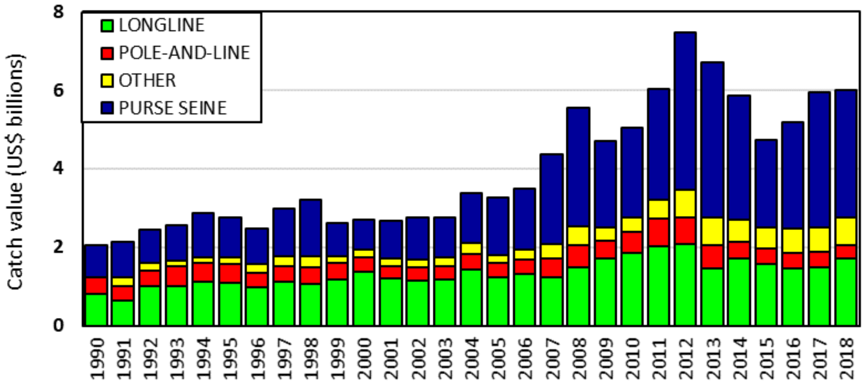

Figure 2.3 Catch value of albacore, bigeye, skipjack and yellowfin in the WCP–CA, by longline, pole-and-line, purse seine and other gear types.

The **value of the 2018 WCP–CA skipjack catch (US$2.95 billion)** was marginally (2%) lower than for 2017 and accounted for 49% of the total value of the tuna catch. The **value of the WCP–CA yellowfin catch in 2018 ($1.92 billion)** was the second highest recorded although less than 1% higher than in 2017. The **value of the WCP–CA bigeye catch rose 20% to $780 million** to be at its highest level since 2014. The **value of the WCP–CA albacore catch in 2017 ($360 million)** fell 2.5% as price increases were offset by declines in catch.

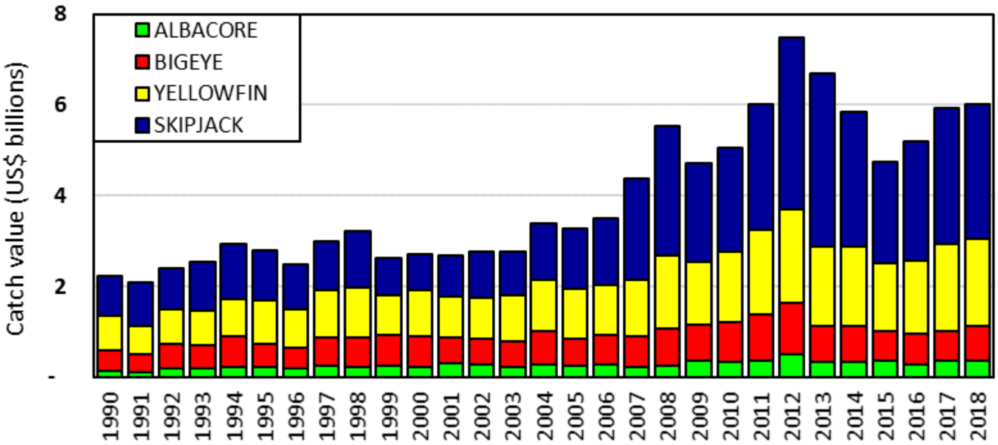

Figure 2.4 Catch value of albacore, bigeye, skipjack and yellowfin in the WCP–CA.

[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 (up to 129 vessels in 2017 and 122 vessels in 2018[3]). The Pacific Islands fleets have gradually increased in numbers over the past two decades to a level of 130 vessels in 2017 and 126 vessels in 2018 (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).

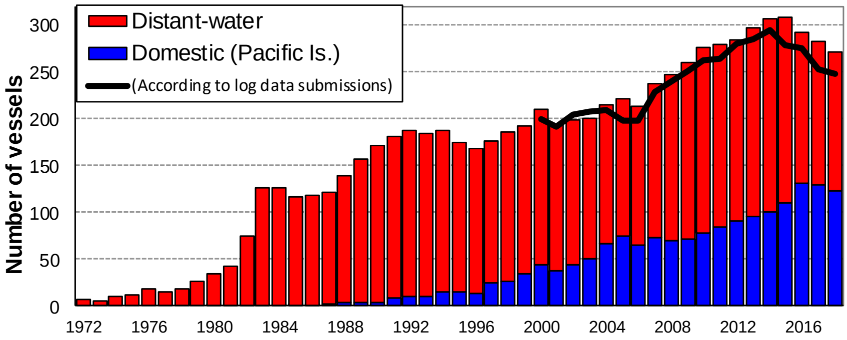

Figure 3.1.1 Number of purse seine vessels operating in the WCP–CA tropical fishery
(excludes Indonesia, Philippine and Vietnam domestic purse-seine/ringnet fleets)

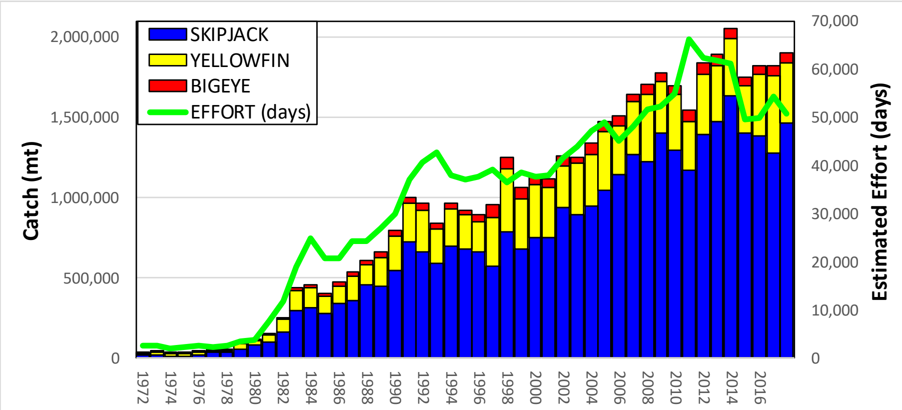

Figure 3.1.2 Purse seine catch (mt) of bigeye, skipjack and yellowfin and fishing effort (days fishing and searching) in the WCP–CA
(**EFFORT**: excludes Indonesia, Philippine and Vietnam domestic purse-seine/ringnet fleets)

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 308 vessels in 2015, before steadily declining since (to 271 vessels in 2018). Further declines are expected in 2019 with the recent announcement of a significant reduction in vessels from one component of the US purse seine fleet. 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 249 vessels reported as operating in the tropical tuna purse seine fishery in 2018 (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 skipjack catches now maintained well above 1,200,000 mt;

[3] The number of vessels by fleet in 1992 was Japan (38), Korea (36), Chinese-Taipei (45) and USA (44) and in 2018 the number of active vessels by fleet was Japan (34), Korea (27), Chinese Taipei (27) and USA (34). In 2018, there was an additional 34 vessels in the category less than 200 GRT which are a part of the Japanese offshore purse seine fleet but not included here.

- Annual yellowfin catches fluctuating considerably between 300,000 and 400,000 mt, with a significant catch (record) of 480,000 mt taken in 2017. 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;
- Increased bigeye tuna purse seine catch estimates, coinciding with the introduction of drifting FADs (since mid-late 1990s). Significant bigeye catch years have been 1997 (82,649 mt), 1998 (76,283 mt), 2004 (72,507 mt), 2011 (72,132 mt) and 2013 (72,201 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 clearly intersects the histogram bar (i.e. in 1998 and 2006–2009, 2014–2018).

3.2 Provisional catch estimates, fleet size and effort (2018)

The provisional **2018 purse-seine catch of 1,910,725 mt** was the second highest on record, at nearly 150,000 mt less than the record in 2014 (2,059,008 mt). The 2018 purse-seine skipjack catch (1,469,520 mt; 77% of total catch) was the second highest on record, only 12,000 mt lower than the record in 2014 (1,481,038 mt). The 2018 purse-seine catch for yellowfin tuna (374,062 mt; 20%) was over 100,000 mt lower than the record catch in 2017 (480,176 mt) but still amongst the highest annual catches for this fishery. The provisional catch estimate for bigeye tuna for 2018 (64,119 mt) was the highest since 2014 and slightly higher than the past ten-year average.

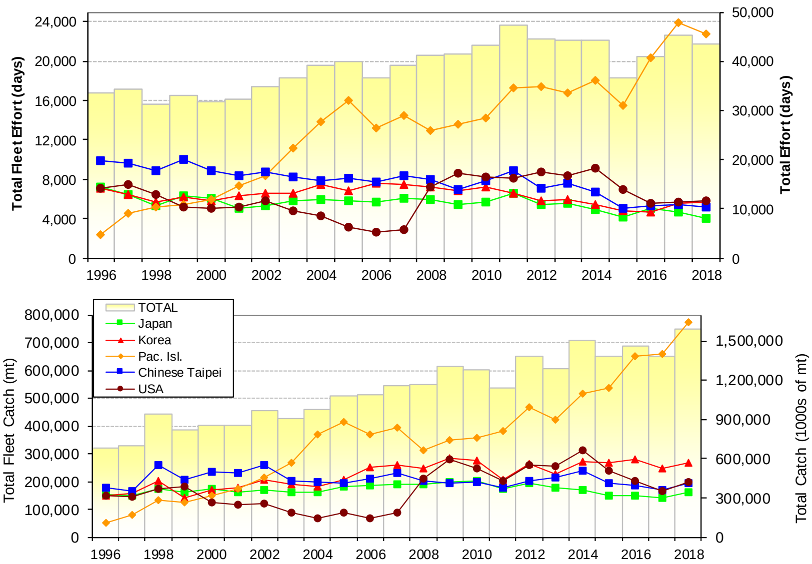

Figure 3.2.1. Trends in annual effort (top) and catch (bottom) estimates for the top five purse seine fleets operating in the tropical WCP–CA, 1996–2018.

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 to 2017 and 2018. In contrast, catches have tended to trend upwards over this period, suggesting increased efficiency and, in some instances, better catch rates; interestingly, the 2018 catch for the "main fleets" was the highest ever. 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 drop in effort from 2017 to 2018 appears to be primarily related to a decline in vessel numbers (Figure 3.1.1).

The combined Pacific-Islands fleet has been clearly the most dominant in the tropical purse seine fishery since 2003 and unlike the other fleets shown in Figure 3.2.1, their recent 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 2018. The combined Pacific-islands fleet catch in 2018 (782,731 mt) was close to the combined catch from the other fleets shown in Figure 3.2.1 (combined 2018 catch for Japan, Korea, Chinese Taipei and USA was 820,216 mt). 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 have 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 these 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; 22 vessels in 2018), Kiribati (21 vessels), Marshall Islands (13 vessels), PNG (Papua New Guinea; 55 vessels including their chartered vessels), Solomon Islands (10 vessels), Tuvalu (1 vessel) and Vanuatu (2 vessels). Nauru purse seine vessels (2) entered the fishery for the first time in 2018.

The domestic Philippine purse-seine and ring-net fleets operate in Philippine waters 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 a catch in the range 55,000-80,000 mt annually in the period since 2013. Prior to 2013, the domestic Indonesian purse-seine fleet accounted for a similar catch 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 more on-shore processing facilities and more vessels entering the fishery. However, 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 recovered (214,605 mt in 2017) apparently due to increased catches by the smaller-scale purse seine component of this fleet, although the provisional 2018 catch was back to 108,734 mt. 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 10% in 2018.

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 (64% of all sets for these fleets in 2018). The proportion of sets on drifting FADs in 2018 (31%) was the highest for nearly twenty years (second highest ever after 1999 at 35%), but acknowledging the FAD closure period has only been in place for the past ten years so effort directed towards drifting FADs was only two-thirds of the year (eight out of the 12 months in 2018). The increase in FAD sets is perhaps related to skipjack tuna being less available in unassociated sets, and therefore an increased preference to drifting FAD sets. The number and proportion (4% in 2018) 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 2018 = 44%: Figure 3.2.2–right) will be higher than the percentage of sets for drifting FADs (for 2018 = 31%: Figure 3.2.2–left). In contrast, the catch from unassociated schools in 2018 was 49% of the total catch, but taken from 64% of the total sets. Table A3 in the APPENDIX provides a more detailed breakdown of catch and effort by set type in 2000-2018 using available logsheet and observer data.

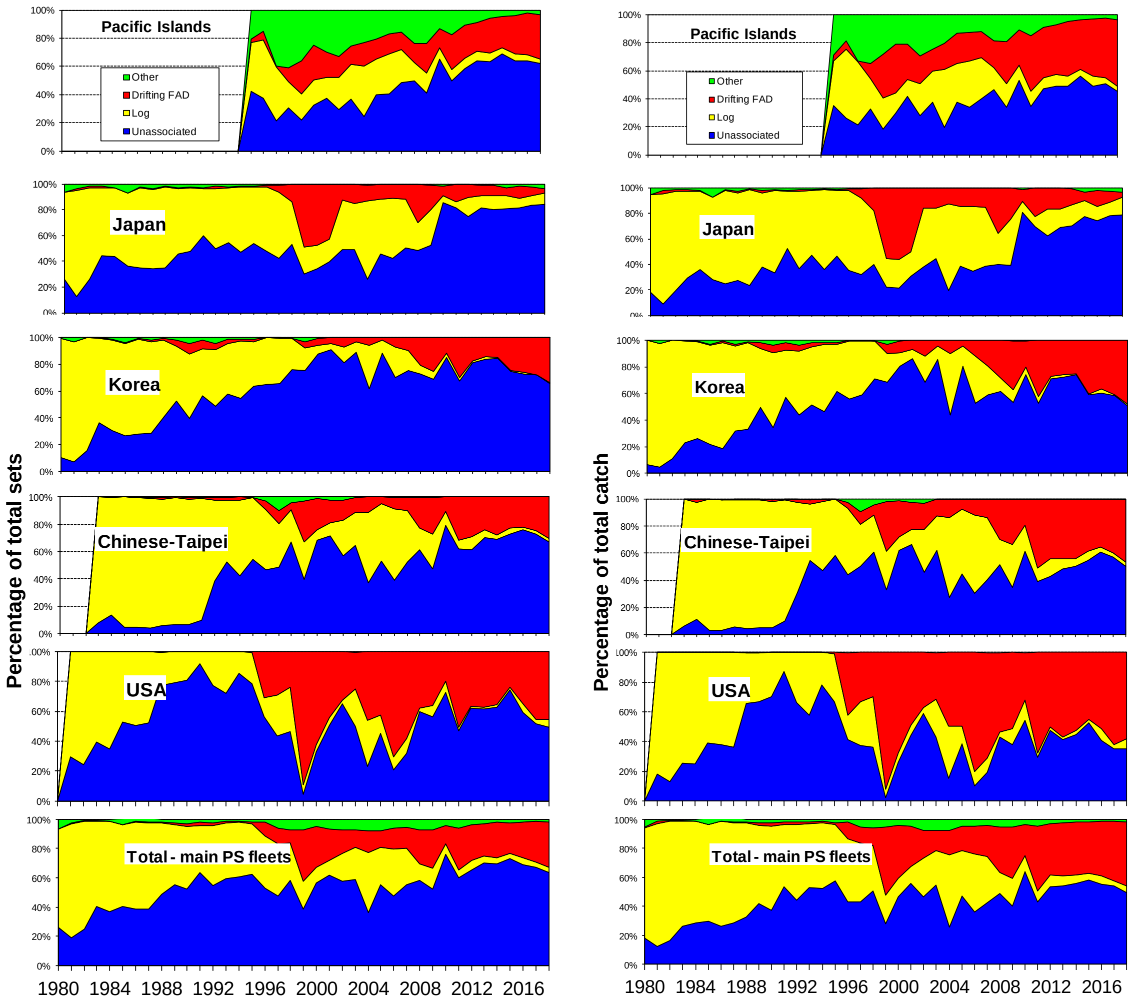

Figure 3.2.2 Time series showing the percentage of total sets (left) and total catch (right), by school type for the major purse-seine fleets operating in the WCP–CA.

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 weak-moderate La Niña conditions 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. La Nina conditions developed in late 2017 and continued into the early months of 2018, before transitioning through a neutral state in mid-2018, to weak El Nino conditions by the end of 2018.

With La Nina conditions in the first quarter of 2018, fishing activity/catches were restricted to the western areas compared to recent years' average (see Figure 3.7.3), but by the fourth quarter 2018 (with the switch to El Nino conditions), the fishery extended further to the eastern areas (than recent years' average).

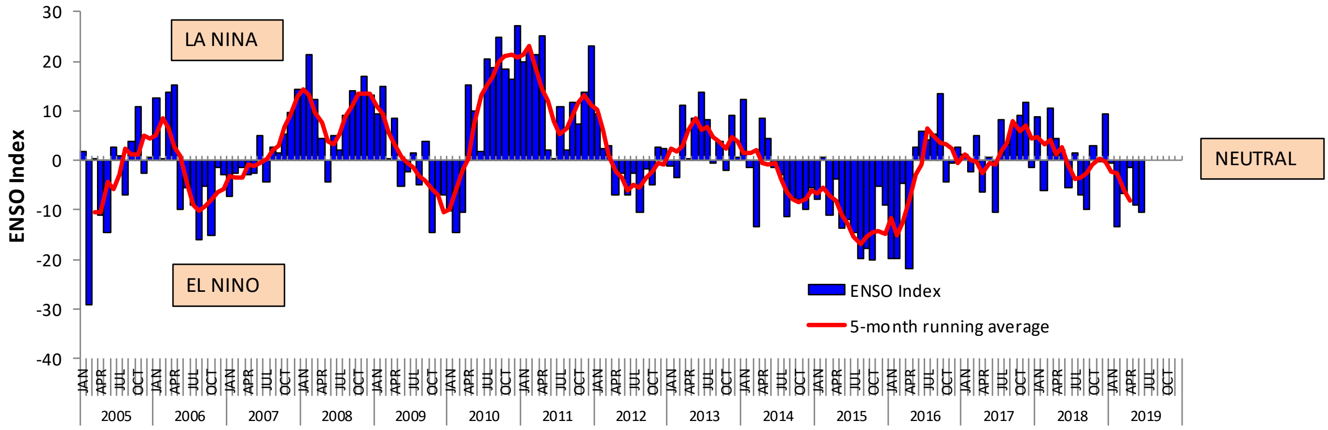

Figure 3.3.1 Trends in El Nino Southern Oscillation Index (ENSO), 2005-2019

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, then weak La Nina during 2017 into early 2018 resulted in more effort in the area west of 160°E (Figure 3.4.1–bottom left; Figure 3.7.3–right) compared to recent years, and a higher use of drifting FADs in the area east of 160°E (Figure 3.4.1–bottom left). By late 2018, weak El Nino conditions presided over the fishery and relatively high catches were taken in the eastern tropical areas, in and adjacent to the waters of Tokelau and the Phoenix Group (Figure 3.7.3).

Figures 3.4.2 through 3.4.6 show the distribution of purse seine effort for the five major purse seine fleets during 2017 and 2018. In general, the distribution of effort for each fleet in 2018 is very similar to 2017 activities, although some fleets (combined Pacific Island, Korea and USA) extending activities further east in the latter months of 2018. The US fleet typically fishes in the more eastern areas and this was again the case during 2017/2018, with effort extended into the Phoenix Islands, the Cook Islands, Tokelau and the adjacent eastern high seas areas with less effort west of 160°E. The difference in areas fished by the Asian fleets (Japan, Korean and Chinese Taipei) in 2017/2018 (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 2018, effort by the combined Pacific Islands fleet moved slightly to the east (e.g. lower proportion of effort in the domestic PNG fishery) compared to effort during 2017.

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 (although this was not as obvious in 2018). 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, it appears that most of the yellowfin catch east of 160°E was from drifting FAD (associated) sets during 2018 (Figure 3.4.8–right).

The estimated bigeye catch in the area to the west of 160°E tends to be taken by a mixture of set types, but in contrast, is dominated by drifting FAD sets in the area to the east of 160°E, which is very clear for 2018 (Figure 3.4.9–bottom).

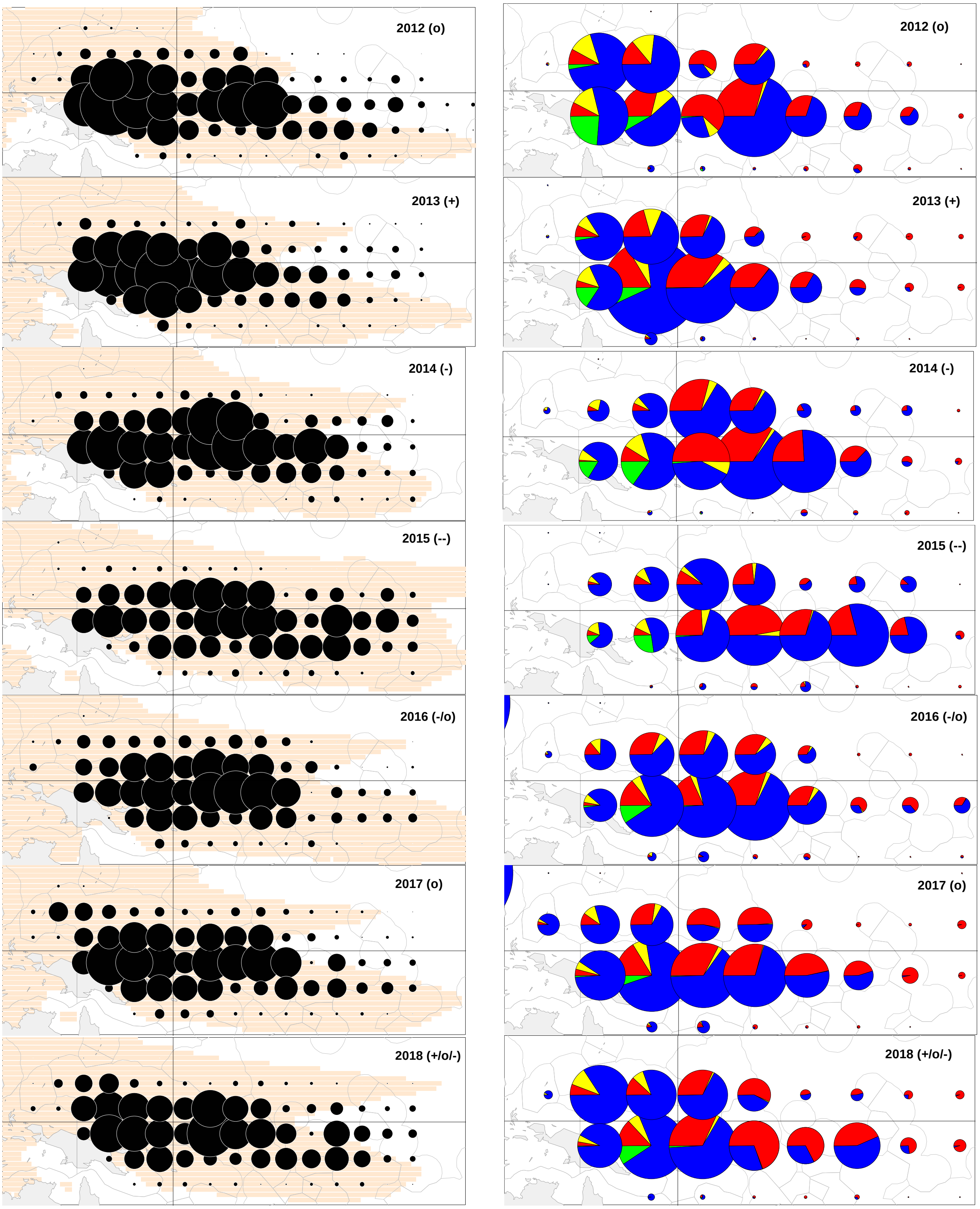

Figure 3.4.1 Distribution of purse-seine effort (days fishing – left; sets by set type – right), 2012–2018. (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

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

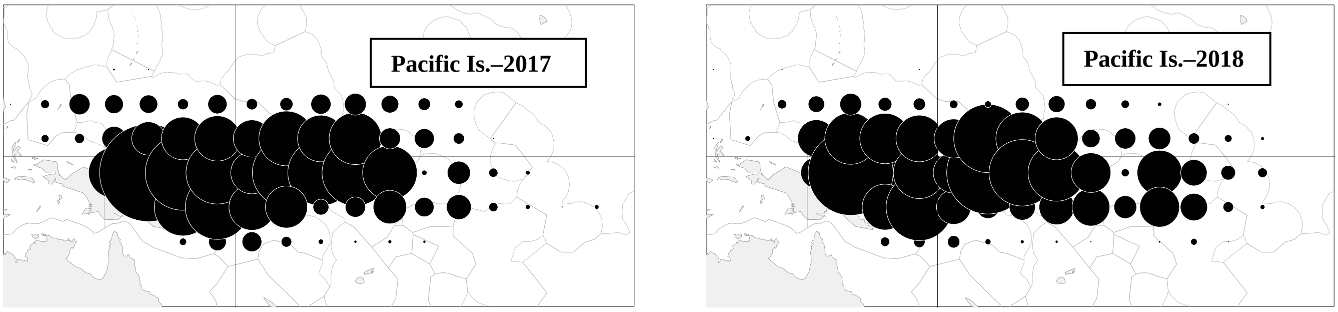

Figure 3.4.2 Distribution of effort by Pacific Islands fleets during 2017 and 2018
lines for the equator (0° latitude) and 160°E longitude included.

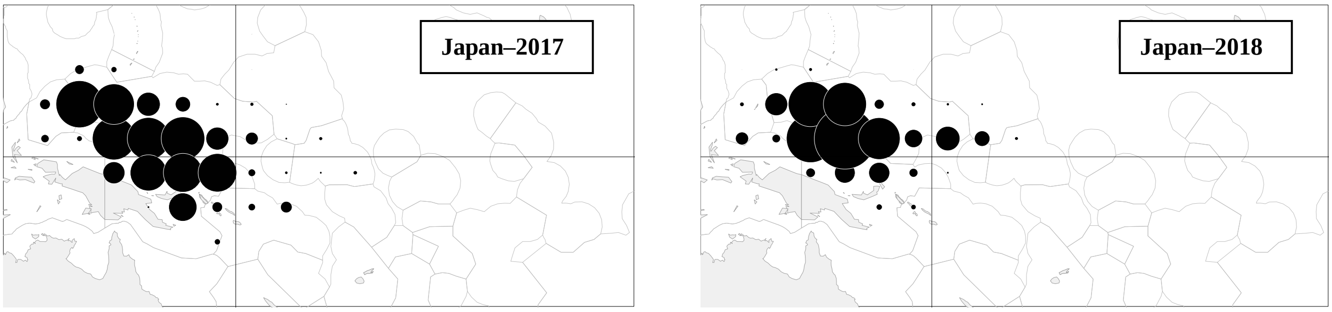

Figure 3.4.3 Distribution of effort by the Japanese purse seine fleet during 2017 and 2018
lines for the equator (0° latitude) and 160°E longitude included.

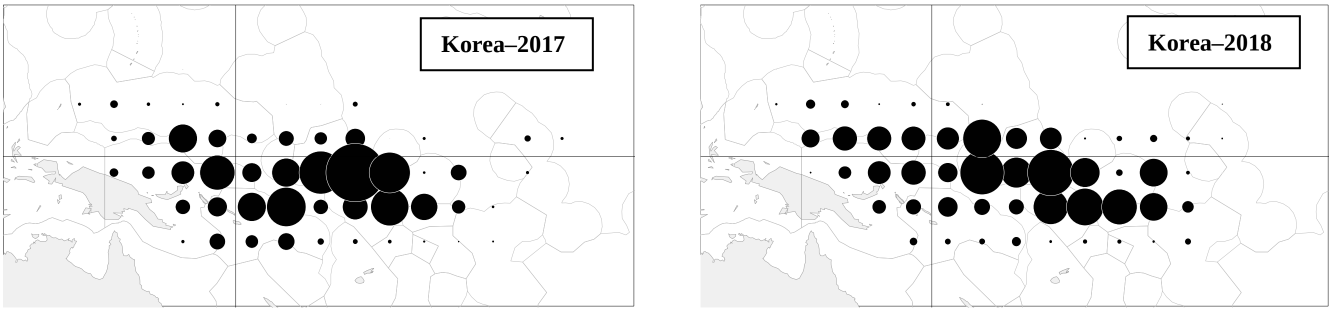

Figure 3.4.4 Distribution of effort by the Korean purse seine fleet during 2017 and 2018
lines for the equator (0° latitude) and 160°E longitude included.

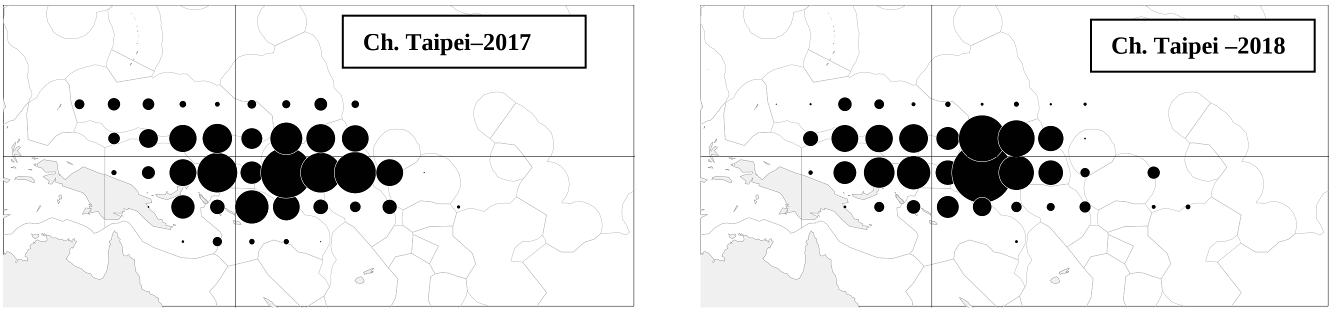

Figure 3.4.5 Distribution of effort by the Chinese-Taipei purse seine fleet during 2017 and 2018
lines for the equator (0° latitude) and 160°E longitude included.

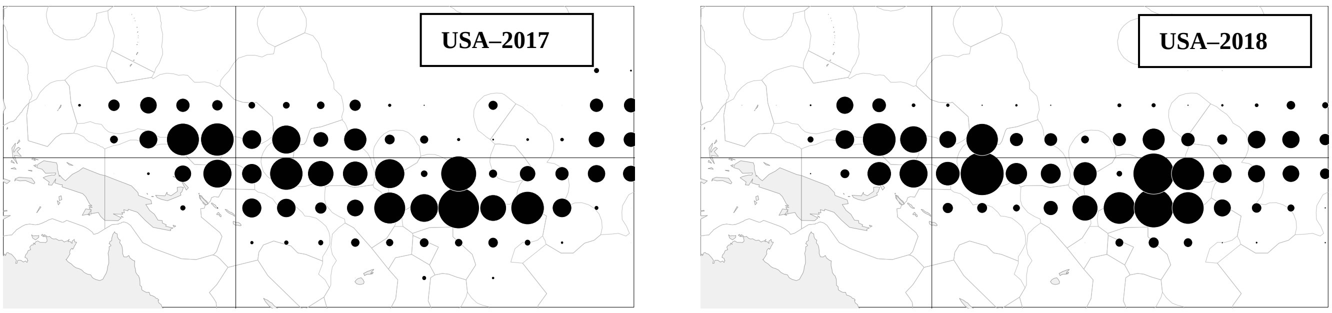

Figure 3.4.6 Distribution of effort by the US purse seine fleet during 2017 and 2018
lines for the equator (0° latitude) and 160°E longitude included.

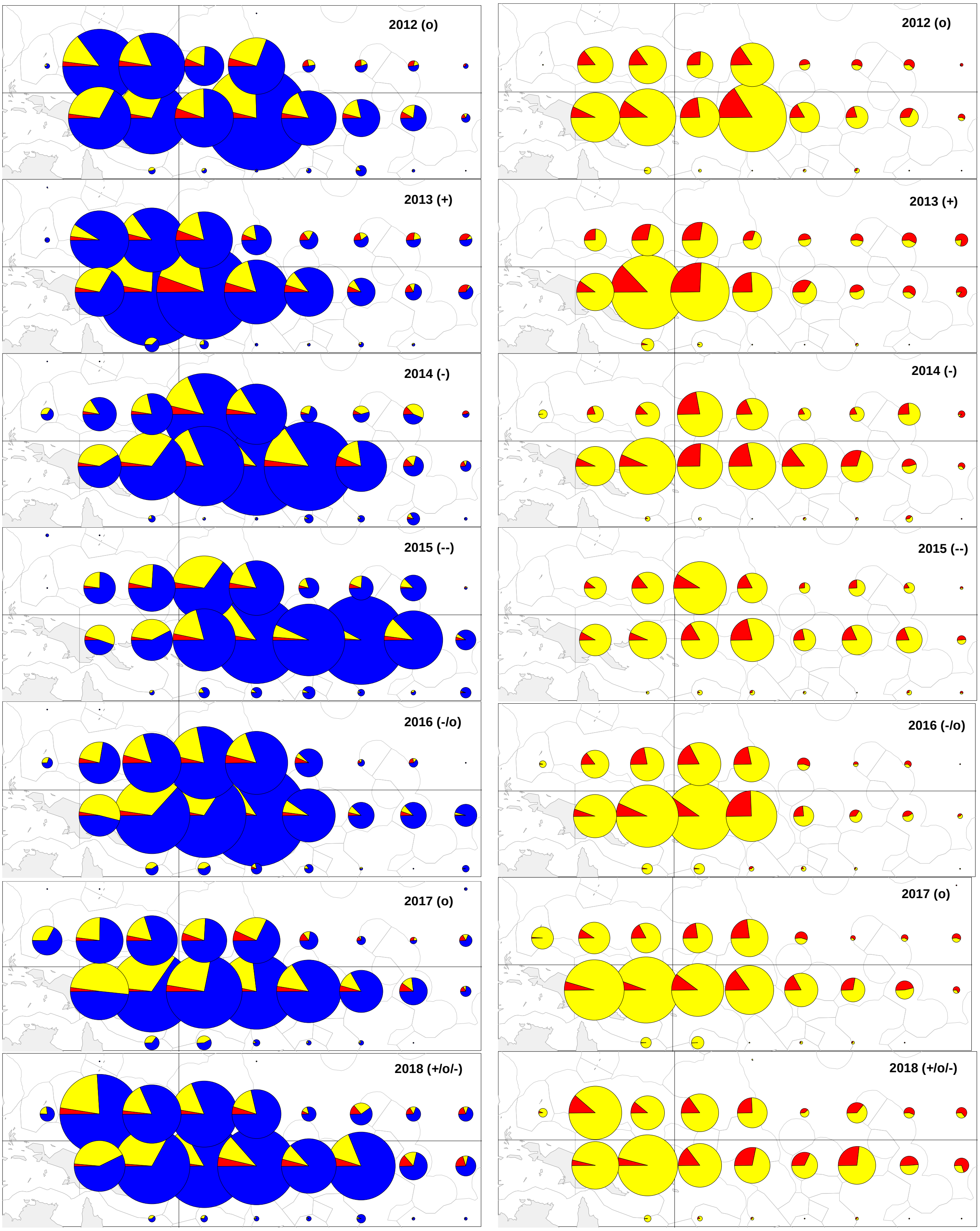

Figure 3.4.7 Distribution of purse-seine skipjack/yellowfin/bigeye tuna catch (left) and purse-seine yellowfin/bigeye tuna catch only (right), 2012–2018
(Blue–Skipjack; Yellow–Yellowfin; Red–Bigeye).
ENSO periods are denoted by "+": La Niña; "-": El Niño; "o": transitional period.

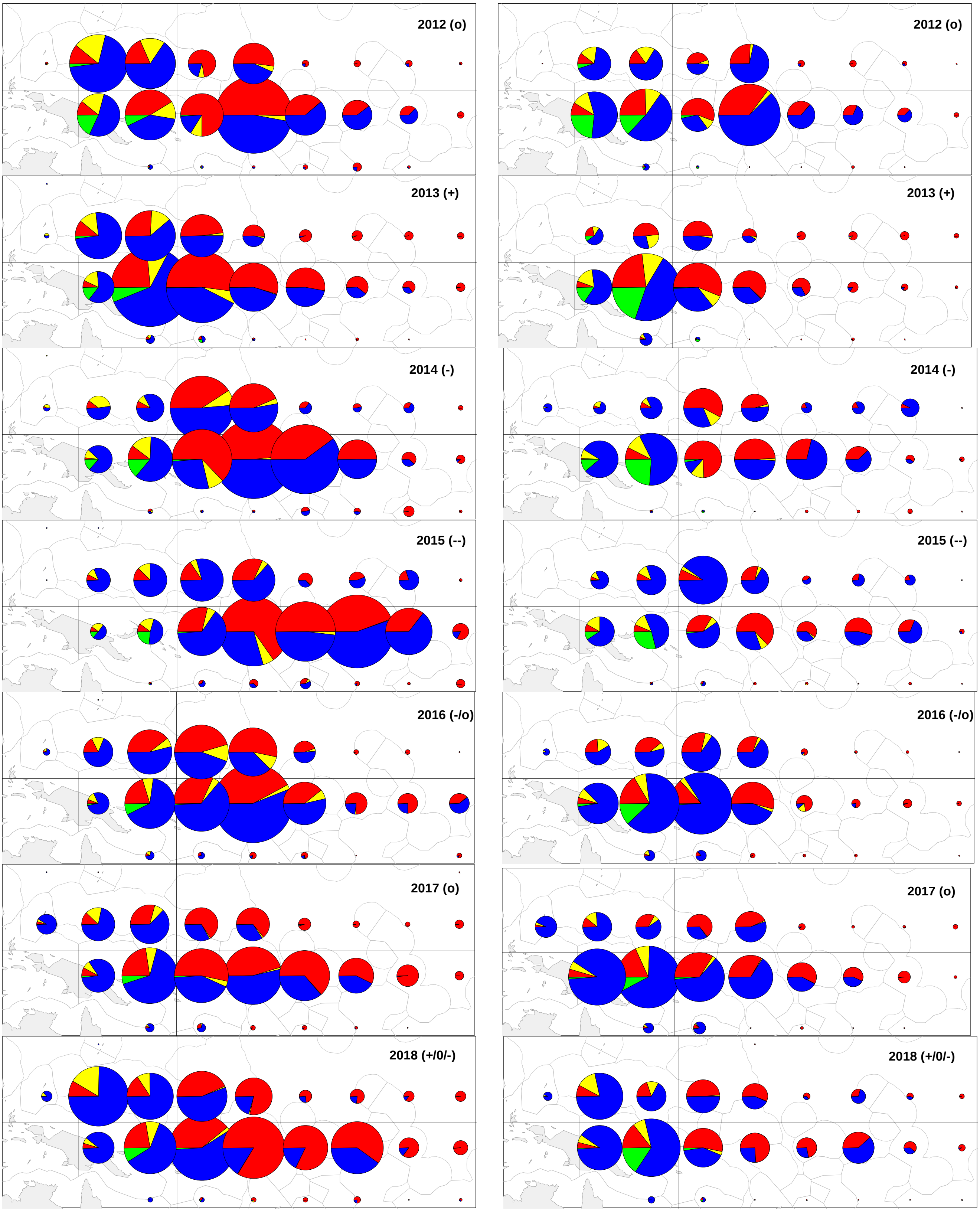

Figure 3.4.8 Distribution of skipjack (left) and yellowfin (right) tuna catch by set type, 2012–2018 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).

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

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

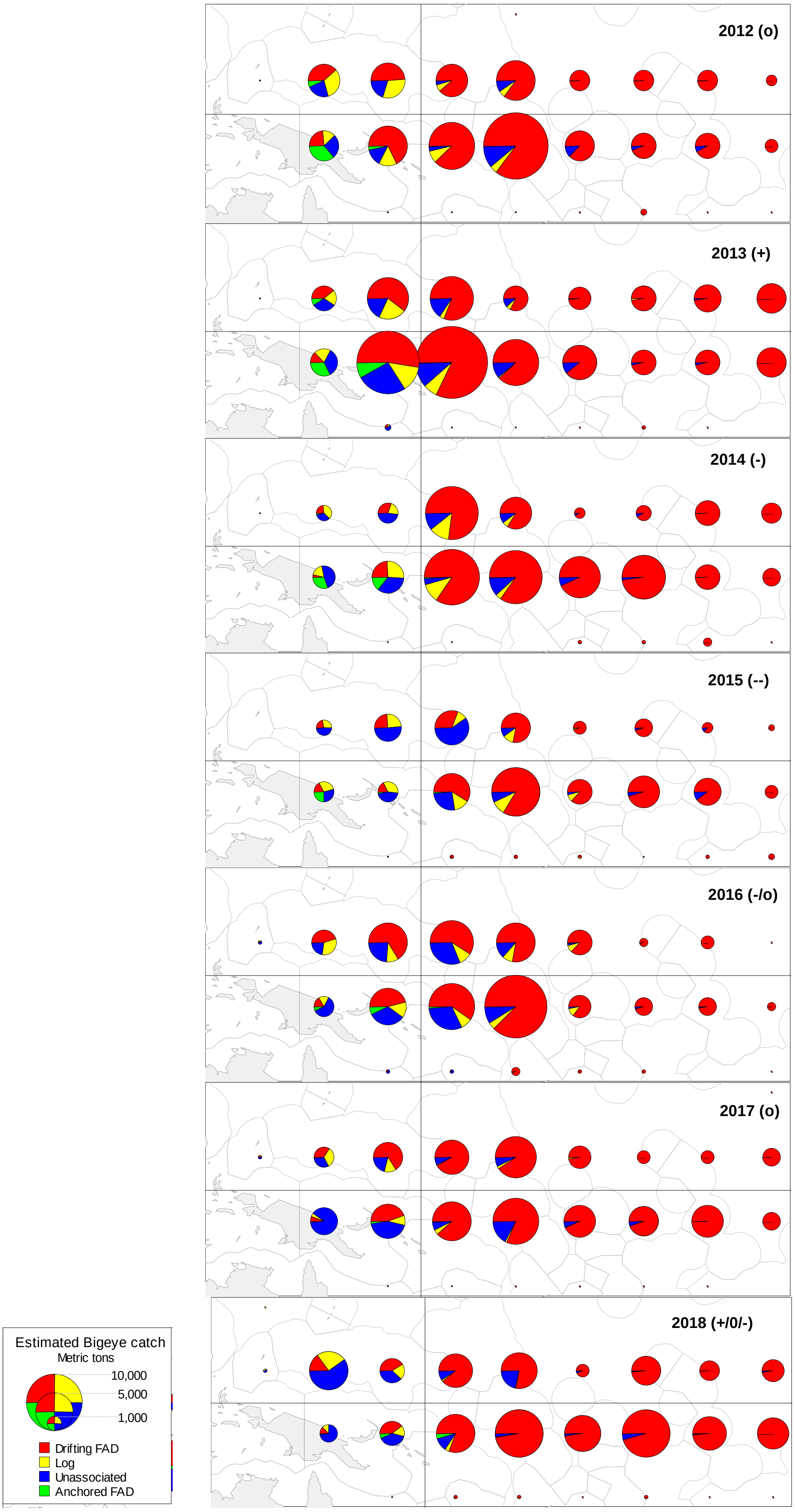

Figure 3.4.9 Distribution of estimated bigeye tuna catch by set type, 2012–2018 (Blue–Unassociated; Yellow–Log; Red–Drifting FAD; Green–Anchored FAD).
ENSO periods are denoted by “+”: La Niña; “-”: El Niño; “o”: transitional period.

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 rebounded in 2018 for all fleets after the relatively low level in 2017, influenced to some extent by increased drifting FAD use and increases in CPUE for each of the set types. 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 the linear trend of VMS trip length, which is estimated to decrease from 31 days in early 2009 to 27.8 days by mid-2018 (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 2018 clearly dropped for some fleets (Korea and Chinese Taipei) but increased for others (USA and Japan), perhaps due to respective areas of activity (Japan fish mainly in the waters of FSM and PNG and the US purse seine fishery extends to the far eastern areas of the tropical WCPO; in contrast, the activities of the Korean and Chinese Taipei fleets are mainly in the central tropical WCPO; see Figures 3.4.3–3.4.6). Yellowfin catch rates on drifting FADs were relatively stable for the US and Chinese Taipei fleets during 2018, but the CPUE for the Korean fleet clearly dropped while the CPUE for the Japanese fleet clearly increased; as for CPUE for unassociated sets, this trend is perhaps related to the respective areas fished. 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, and the increased use in 2018 contributed to the highest bigeye catch since 2014.

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. For 2018, the total tuna CPUE dropped during the full-fishery, mandatory FAD closure months (July–September, as would be expected), but clearly rebounded in the following months (October-December). It is also important to note that fluctuations in catch levels in certain periods are also influenced by economic conditions.

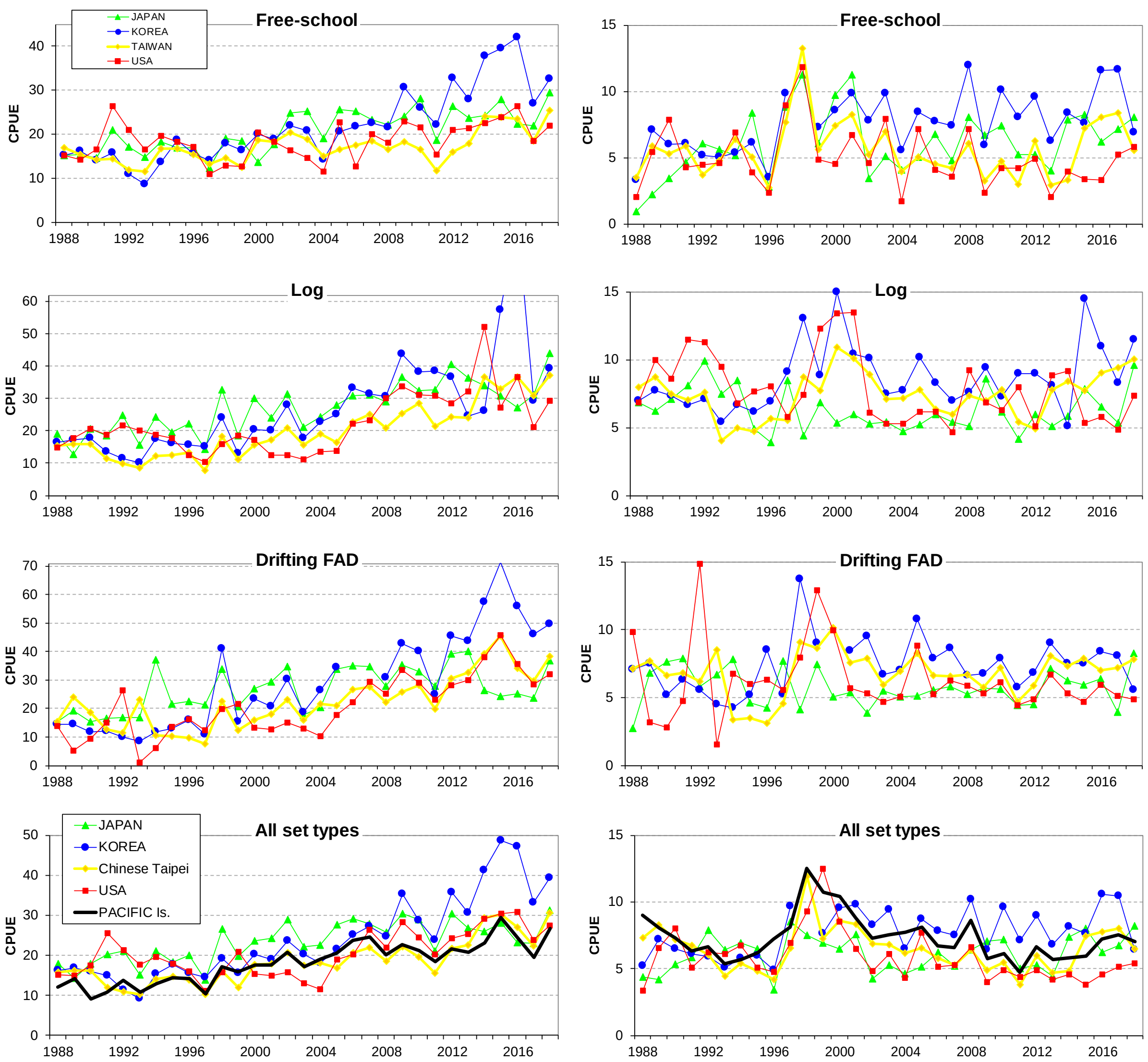

Figure 3.5.1 Skipjack tuna CPUE (mt per day–left) and yellowfin tuna CPUE (mt per day–right) by set-type, and all set types combined, for selected purse-seine fleets fishing in the tropical WCP–CA.

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 **the Pacific Islands purse seine fleets combined**.

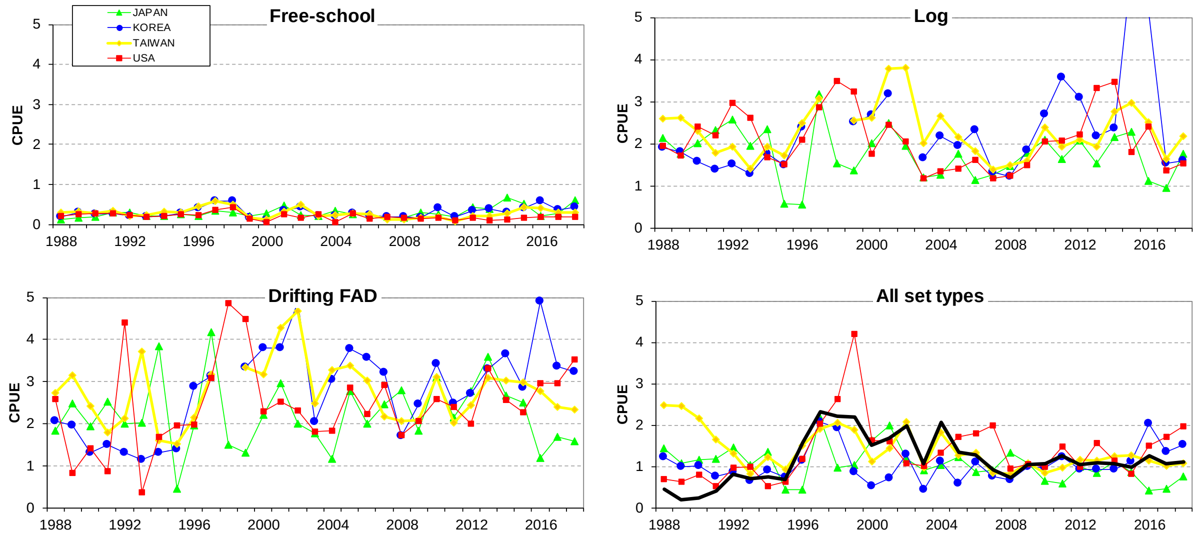

Figure 3.5.2 Estimated bigeye tuna CPUE (mt per day) by major set-type categories (free-school, log and drifting FAD sets) and all set types combined for Japanese, Korean, Chinese-Taipei and US purse seiners fishing in the tropical WCP–CA.

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**.

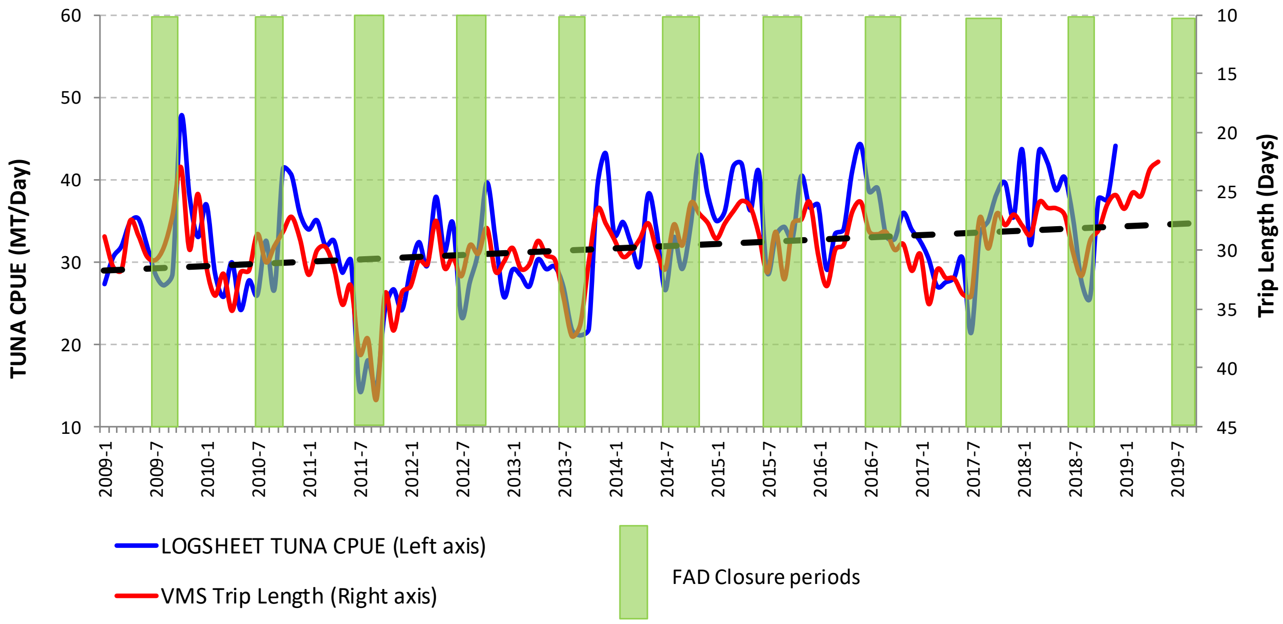

Figure 3.5.3 Monthly purse-seine tuna CPUE (mt/day) and average trip length (VMS days), 2005–2019

Dashed, black line represents the linear trend on VMS Trip length.
For 2018, only the full-fishery, mandatory FAD closure period (July-Sept) is shown and acknowledges that flag states must choose an additional two-month FAD closure period as per the requirements in CMM 2017-01 para. 17.

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 2017 and 2018, by set type and broad area of the tropical fishery. Points of interest in the comparison of these graphs include:

- A broader range of skipjack tuna (to 75 cm) in the area east of 170°E from unassociated sets in 2018 compared with 2017, but also compared to the associated sets in 2018 for the same area;
- A higher proportion of the bigeye tuna in associated sets east of 170°E than in the west;
- Fewer large yellowfin tuna in the unassociated set catch in the area west of 170°E in 2018 compared to 2017. 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 in 2017.

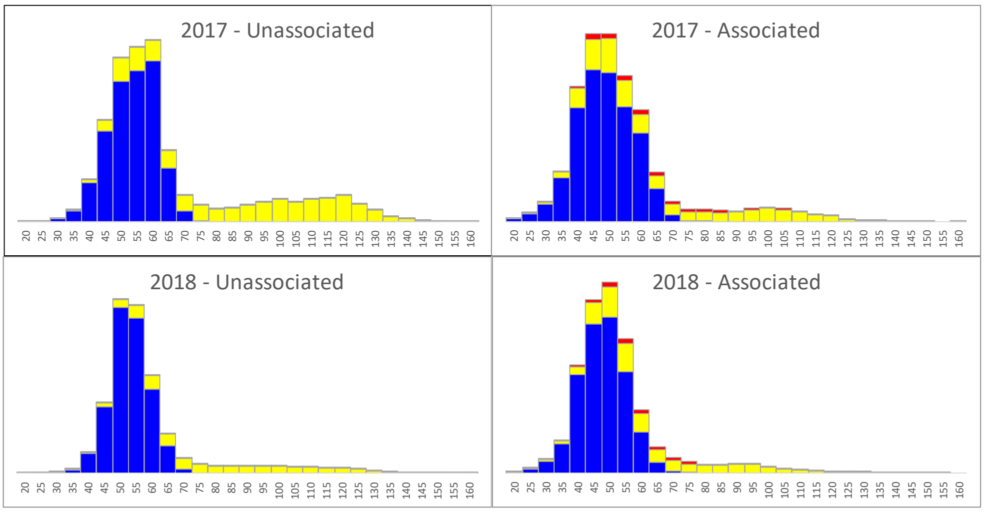

Figure 3.6.1 Species composition (MT: Y-axis) of the 2017 and 2018 purse seine catch, by set type and 5cm size categories (X-Axis) for the tropical fishery, west of 170°E.

Skipjack tuna–blue; Yellowfin tuna–yellow; Bigeye tuna–red

Source : observer data

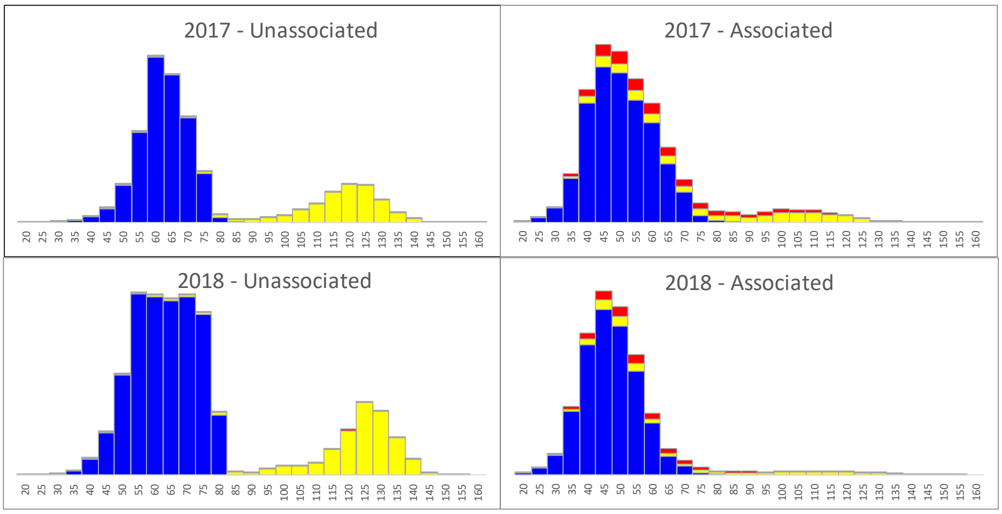

Figure 3.6.2 Species composition (MT: Y-axis) of the 2017 and 2018 purse seine catch, by set type and 5cm size categories (X-Axis) for the tropical fishery, east of 170°E.

Skipjack tuna–blue; Yellowfin tuna–yellow; Bigeye tuna–red

Source : observer data

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 2012–2018, respectively. Figure 3.7.3 shows the distribution of effort by quarter for the period 2012-2017 in comparison to effort by quarter in 2018. 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 2018 was mostly above the 2012-2017 monthly average for Jan–July, with September as the only month clearly below this average; the latter months of 2018 were around their respective averages for skipjack tuna CPUE. The relatively good conditions for skipjack catches in the first 7 months appeared to be in line with the weak La Nina (which transitioned to neutral conditions by mid-2018) with most of the catch taken west of 170°E (Figure 3.7.3). The monthly yellowfin CPUE for 2018 was similar to skipjack CPUE, with months March-July, then October-December at, or above, the 2012-2017 average (Figure 3.7.2).

The quarterly extent of the warm pool (i.e. surface water >28.5°C on average) in 2018 compared to the average for 2012-2017 (Figure 3.7.3) shows that the weak La Nina conditions in early 2018 tended to restrict the fishery to the western tropical areas (compared to the 2012-2017 average) for the first two quarters. However, by the fourth quarter 2018, in weak El Nino conditions, the warm pool had extended further east (than the average) and relatively good catches were experienced as far east as Tokelau, the Phoenix Group and adjacent high seas. Note the relative absence of bigeye tuna in the catch by species during the 3rd quarter (FAD closure) for all periods.

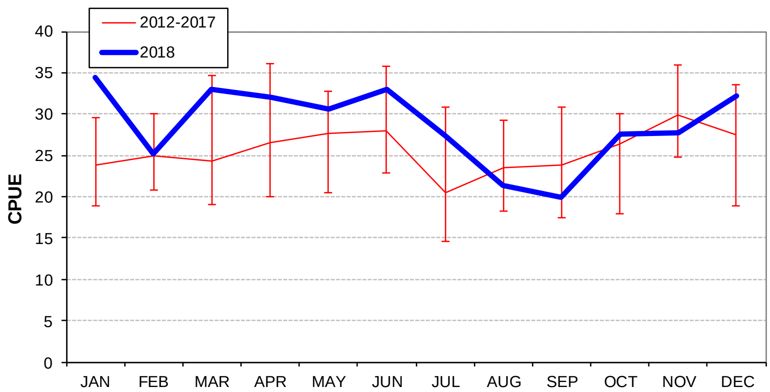

Figure 3.7.1 Average monthly skipjack tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2012–2018.

Red line represents the period 2012–2017 and the blue line represents 2018.
The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2012–2017.

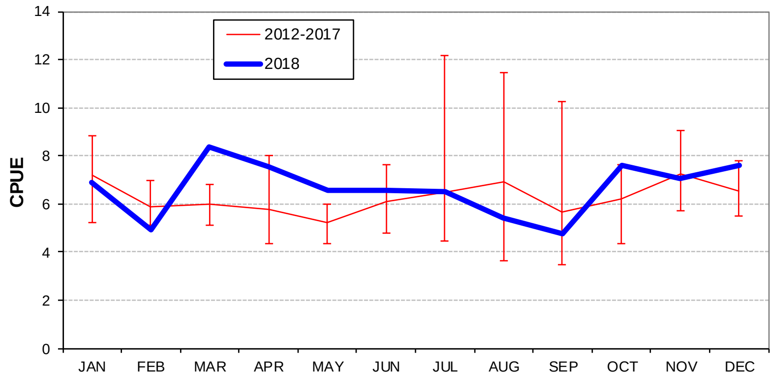

Figure 3.7.2 Average monthly yellowfin tuna CPUE (mt per day) for purse seiners fishing in the tropical WCP–CA, 2012–2018.

Red line represents the period 2012–2017 and the blue line represents 2018.
The bars represent the range (i.e. minimum and maximum) of monthly values for the period 2012–2017.

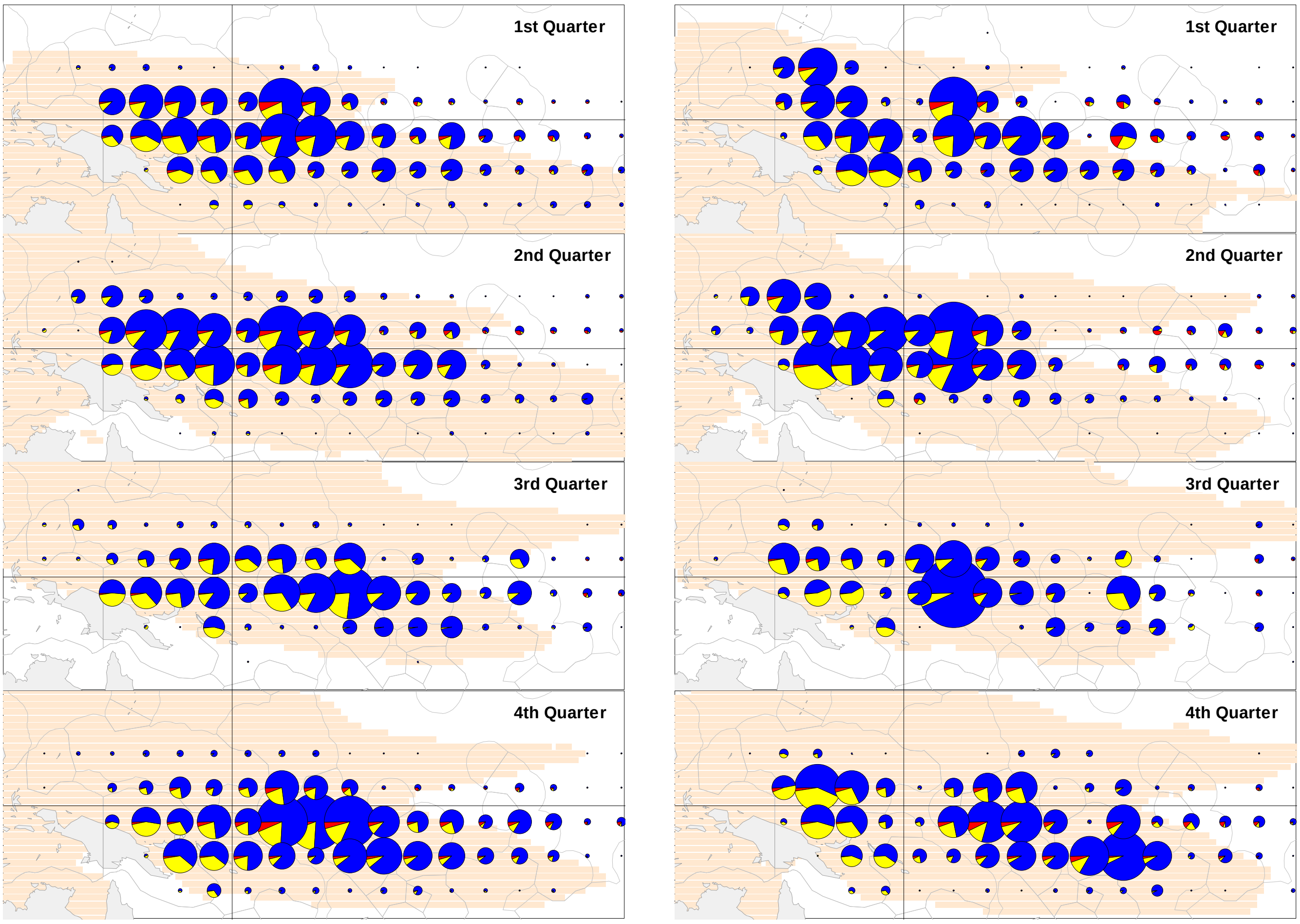

Figure 3.7.3 Quarterly distribution of purse-seine catch by species for 2012–2017 (left) and 2018 (right).

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

Pink shading represents the extent of average sea surface temperature >28.5°C by quarter for the period 2012–2017 (left) and 2018 (right)

3.8 Prices, catch value and overall economic conditions

3.8.1 Prices

Skipjack

Following significant rises in 2016 and 2017 global skipjack prices declined in 2018. The price of Thai imports (c&f) fell 8% to average $1,641/mt over 2018 while Yaizu purse seine caught skipjack prices (ex-vessel) fell around 25% to average ¥165/kg ($1,499/mt). In real terms (that is, adjusting for inflation[4]) 2018 Thai import and Yaizu purse seine caught USD skipjack prices were 15% higher and 2% lower than their 20 year averages respectively. Prices have continued to decline in 2019 with Thai imports averaging $1,445/mt and Yaizu prices averaging ¥150/kg ($1,360/mt) to the end of June. Bangkok market reports indicate prices (c&f) for 4-7.5lbs skipjack were around $1,000/mt at the end of June. The recent price falls has seen the Bangkok skipjack (4-7.5lbs, c&f) price index fall back to levels similar to that of the FAO Food Price Index which has been relatively steady since 2015 (Figure 3.8.2).

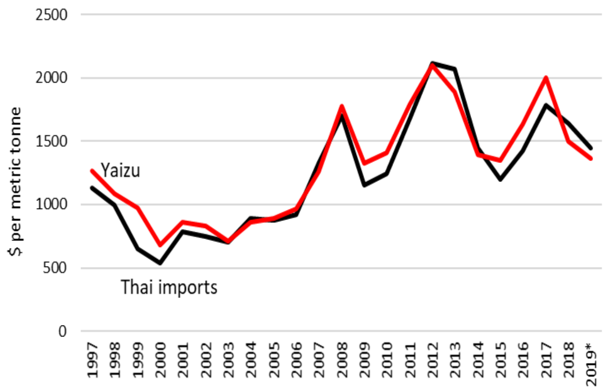

Figure 3.8.1 Annual skipjack prices, Thai imports (c&f) and Yaizu (ex-vessel)
Note: *For the period January to June

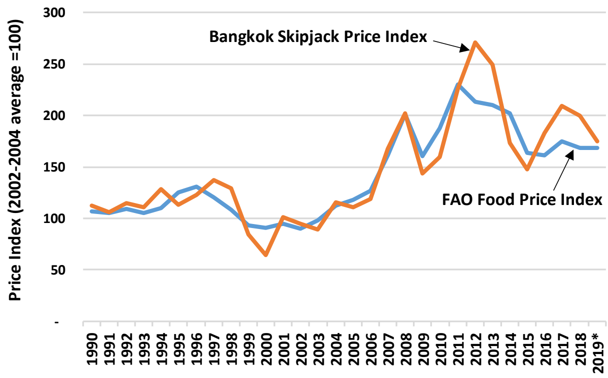

Figure 3.8.2 FAO Food Price Index and Bangkok 4-7.5lbs skipjack price (c&f) index
Note: *For the period January to June

Yellowfin

In 2018 Thai import prices (c&f) for yellowfin averaged $1,954/mt down 5% on 2017 levels while Yazi purse seine caught yellowfin prices (ex-vessel) rose by around 4% to ¥281/kg ($2,548/mt). In real terms Thai import prices were 8% higher in 2018 than the 20 year average while 2018 Yaizu real prices were around their 20 year average.

Prices over the period to the end of June 2019 are similar levels to that seen in 2018 with Thai import prices averaging $1,948/mt and Yaizu prices averaging ¥286/kg ($2,586/mt).

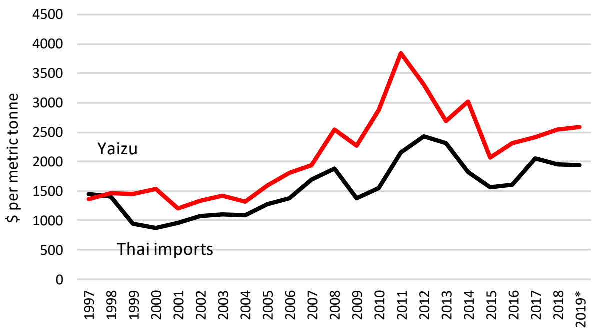

Figure 3.8.3 Annual yellowfin prices, Thai imports (c&f) and Yaizu (ex-vessel)
Note: *For the period January to June

[4] Based on the US CPI as measured by the Bureau of Labor Statistics All Urban Consumers CPI (www.bls.gov/cpi/data.htm)

3.8.2 Catch Value

The estimated delivered value of the purse seine tuna catch in the WCP-CA area for 2018 is $3.26 billion compared with $3.42 billion in 2017 a decline of $166 million (5%).[5] This represents the 4th highest purse seine catch value level on record in nominal terms and the 6th highest in real terms. The decline in nominal value was driven by a significant (24%) decline in the value of the yellowfin catch which fell from around $1 billion to $760 million due to the decline in the yellowfin catch. The value of the skipjack catch increased by 3% with a 14% rise in catch more than offsetting price declines. The value of the skipjack catch represented 73% of the total value of the purse seine catch in 2018 while yellowfin contributed 23%.

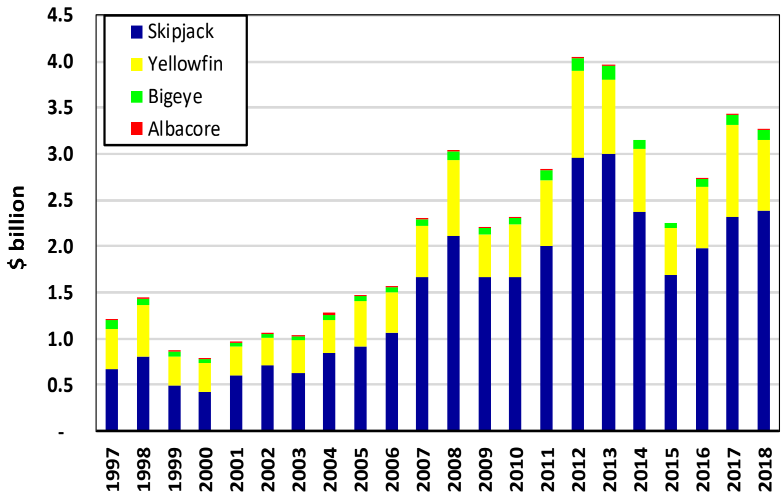

Figure 3.8.4 Value of the WCPFC-CA purse seine fishery tuna catch by species

3.8.3 Economic Conditions in the tropical purse seine fishery

Economic conditions indexes for the major WCPFC-CA tuna fisheries has been presented to SC for a number of years. These indexes assess economic conditions in a fishery based on relative fish price, fishing cost (excluding license and access fee payments) and catch rates over the past 20 years (that is, 1997-2018). Together, information from the three components are combined into a single value expressed as an index against the average value over the preceding 20 years, set to 100, and provide a relative measure of changes in economic conditions over time. Values below 100 suggest that the fishery is experiencing below average economic conditions, while values of over 100 show periods in which economic conditions in the fishery are relatively favourable.[6] It is important to note that the indexes relate to the fishery not the vessels operating within it and, as such, while favourable economic conditions may be indicative of the ability of the fishery to generate significant profits they do not indicate which parties, e.g. vessel owners or coastal states, these profits accrue to.

Despite falls in prices and increases in fuel costs a surge in catch rates saw the continuation of good economic conditions in 2018 with the tropical purse seine fishery[7] economic conditions index rising to 141 equal to the record level set in 2012. 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 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 high catch rates were the main driver between 2014 and 2016 and in 2018. While above average economic conditions in the fishery have been sustained in the fishery since 2012 effort levels declined 22% between 2011 and 2018. This contrast to the situation between 1999 and 2006 when low prices resulted in economic conditions in the fishery being consistently below the recent 20-year average yet effort in the fishery expanded 26%.

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[5] 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.

[6] Full details of the methodology used to derive the economic conditions indexes presented 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.

[7] The tropical purse seine fishery economic conditions index is based on the fishery that lies between 10ºN and 10ºS of the WPCFC-CA, excluding the waters of Indonesia, Philippines and Vietnam.

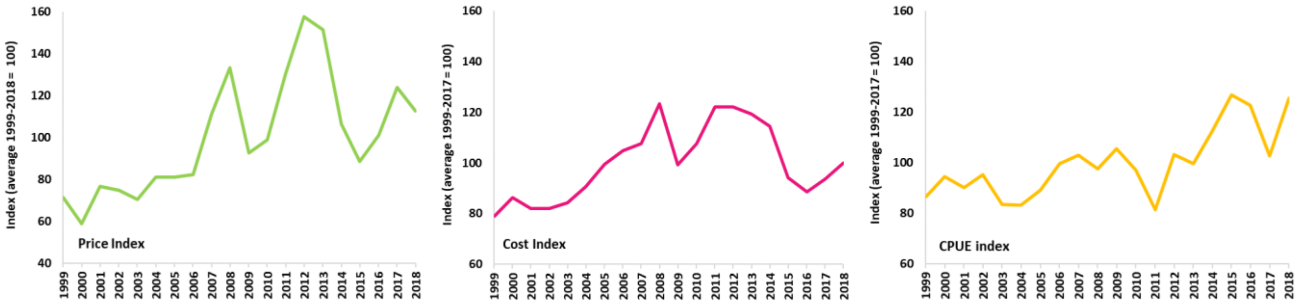

Figure 3.8.5 Tropical purse seine fishery economic conditions component indexes

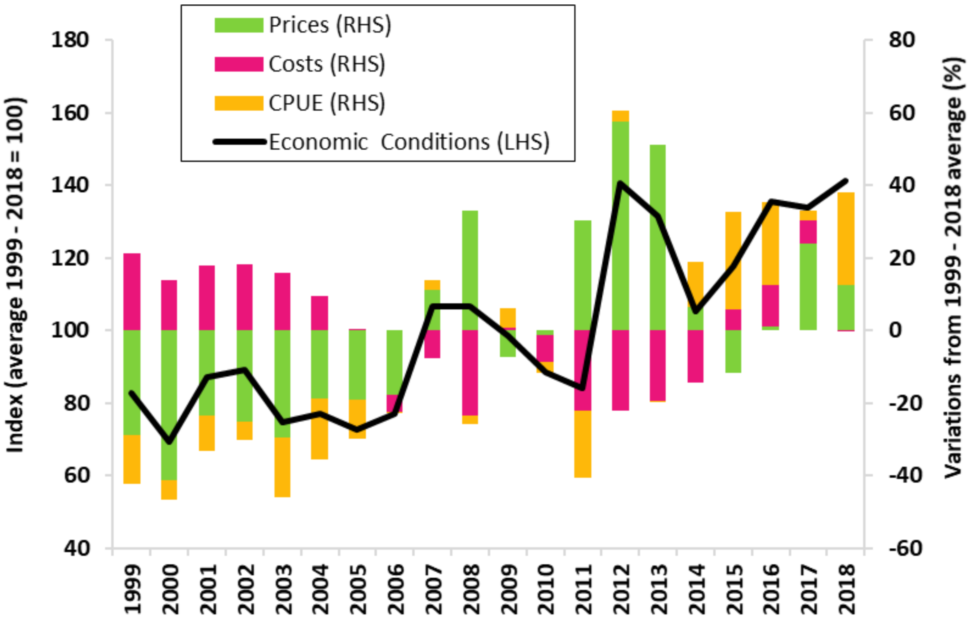

Figure 3.8.6 Tropical purse seine fishery economic conditions index (LHS) and variance of component indices against average (1999-2017) conditions (RHS)

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).

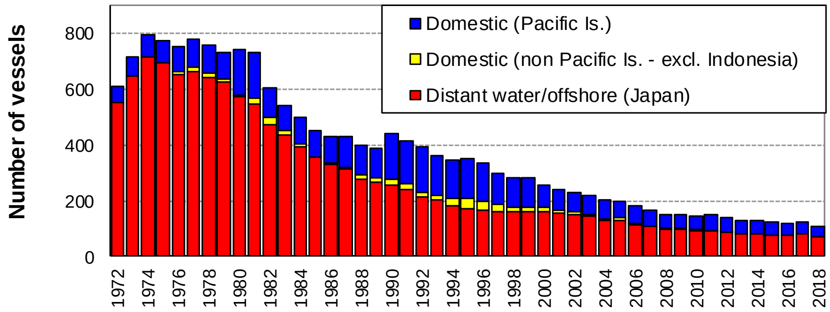

Figure 4.1.1 Pole-and-line vessels operating in the WCP–CA
(excludes pole-and-line vessels from the Japanese Coastal and Indonesian domestic fisheries)

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 (36 vessels in 2018), 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 (2018)

The provisional 2018 pole-and-line catch (170,038 mt) was slightly higher than the 2017 catch which was the lowest annual catch since the mid-1960s, due to reduced catches in both the Japanese and the Indonesian fisheries.

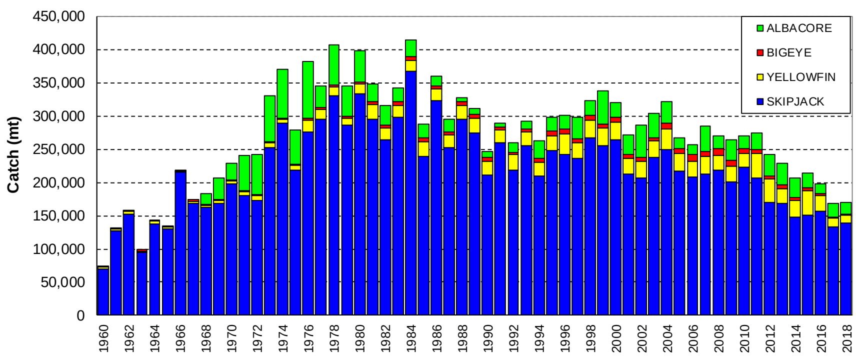

Figure 4.2.1 Pole-and-line catch in the WCP–CA

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 2018), and the Indonesian fleets (79,759 mt in 2017; the 2018 catch estimate was being reviewed at the time of writing this paper), account for nearly all of the WCP–CA pole-and-line catch (99% in 2018). 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 (1,080 mt in 2018 from 4 vessels).

Figure 4.2.2 shows the average distribution of pole-and-line effort for the period 1995–2018. 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.

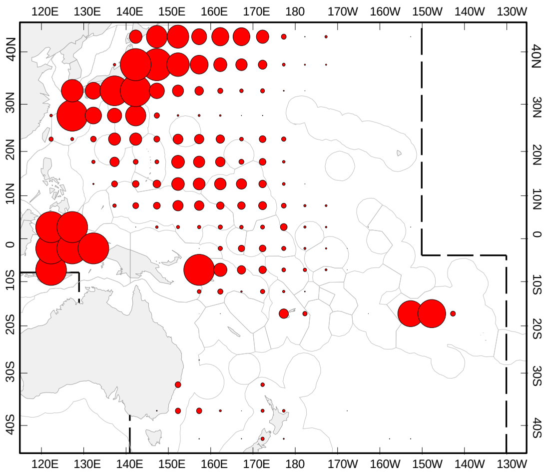

Figure 4.2.2 Average distribution of WCP–CA pole-and-line effort (1995–2018).

4.3 Prices and catch value

4.3.1 Prices

The pole and line catch is dominated by the fleets of Japan and Indonesia with small catches taken by the fleets of Solomon Islands and French Polynesian. 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 Yaizu price for pole and line caught skipjack taken in waters off Japan averaged ¥214/kg over 2018 a 32% decline on 2017 prices. Yaizu prices for skipjack caught in waters south of Japan fell by a similar amount (28%) to ¥234/kg. In US dollar terms these represent prices of $2,083/mt and $1,936/mt respectively. Prices for skipjack caught in waters south of Japan for the period to June 2019 averaged ¥223/kg, 13% lower than for the same period in 2018.

4.3.2 Catch Value

The estimated delivered value of the total catch in the WCPFC pole and line fishery for 2016 is $343 million[8] a decline of $55 million (14%) on 2017. The decline in catch values came despite a small increase in catch levels as prices in Japan saw significant declines.

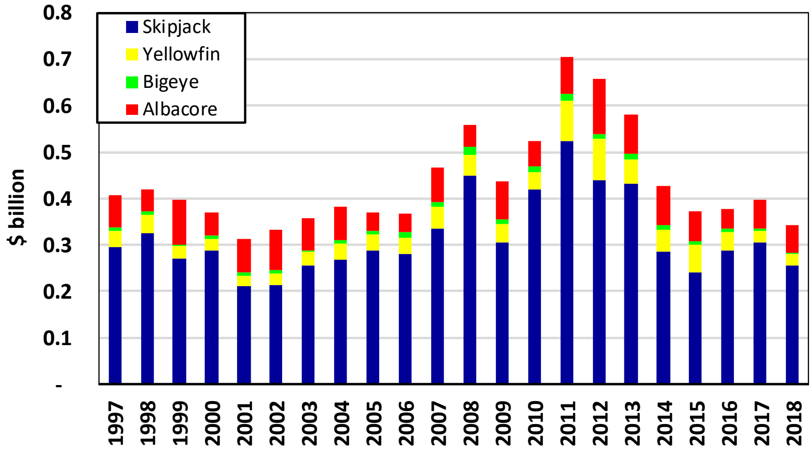

Figure 4.3.1 Value of the WCPFC-CA pole and line fishery tuna catch by species

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[8] Delivered skipjack prices for the Japanese pole and line fleet are based on a weighted average of the Yaizu 'south' and 'other' pole and line caught skipjack prices. Delivered yellowfin price for the Japanese pole and line fleet are based on the Yaizu purse seine caught yellowfin price. All other prices are based on Thai import prices. 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, 2019), 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 have dropped below 3,000 vessels for the first time since the 1960s (a provisional estimate of 2,781 vessels in 2018, a 17% drop on the vessels in 2015, mainly due to a decline in the category of non-Pacific Islands domestic fleets.

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.

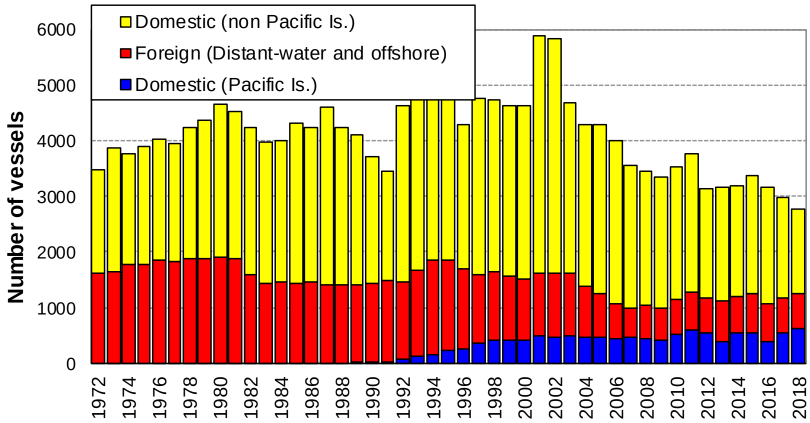

Figure 5.1.1 Longline vessels operating in the WCP–CA
(Available data does not make the distinction between foreign "distant-water" and "offshore")

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 42,000 mt in 2018.

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–34%; BET–28%; YFT–38% in 2018) 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).

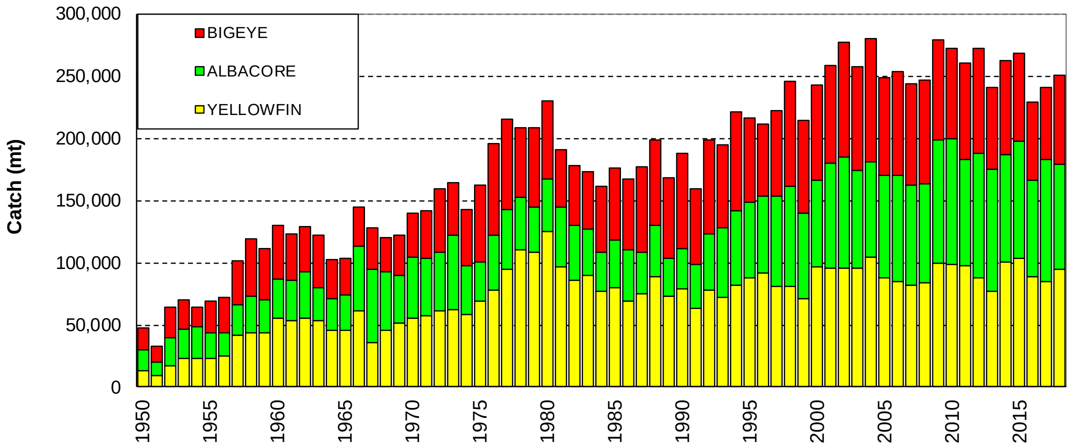

Figure 5.1.2 Longline catch (mt) of target tunas in the WCP–CA

5.2 Provisional catch estimates and fleet sizes (2018)

The provisional WCP–CA longline catch (254,850 mt) for 2018 was at the average level for the past five years. The WCP–CA albacore longline catch (84,930 mt – 34%) for 2018 was amongst the lowest for ten years, and around 16,000 mt lower than the record of 101,820 mt attained in 2010. The provisional bigeye catch (71,305 mt – 28%) for 2018 was higher than the recent five-year average, but well down on the bigeye catch levels experienced in the 2000s (e.g .the 2004 longline bigeye catch was 99,705 mt). The yellowfin catch for 2018 (94,509 mt – 38%) was at the average level for the past five years and more than 30,000 mt less that the record for this fishery (1980: 125,113 mt).

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 4,625 mt in 2018) and vessel numbers (366 in 2004 to 93 in 2018). The Chinese-Taipei distant-water longline fleet bigeye catch declined from 16,888 mt in 2004 to 5,470 mt in 2018, mainly related to a substantial drop in vessel numbers (137 vessels in 2004 reduced to 75 vessels in 2018). The Korean distant-water longline fleet experienced some 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 2018.

In contrast, the China longline fleet catches of albacore tuna have been amongst the highest ever in recent years (this fleet caught over 22,000 mt of albacore tuna in the WCP-CA during 2018).

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–SC15 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 2000–2018. 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.

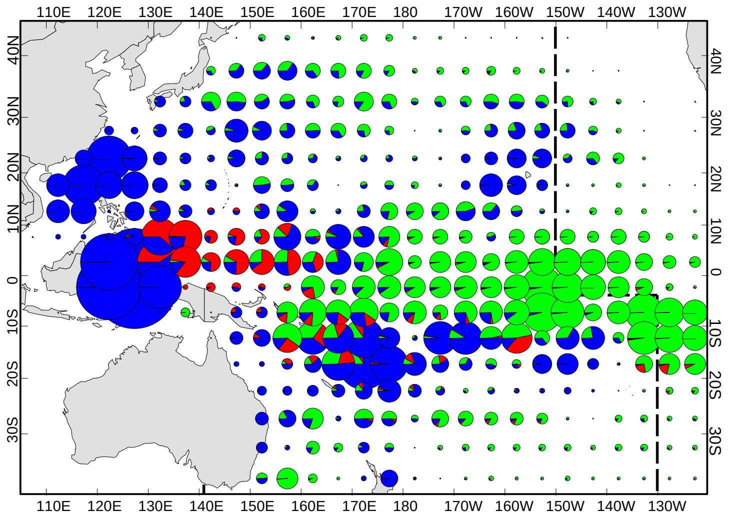

Figure 5.4.1 Distribution of longline effort for distant-water fleets (green), foreign-offshore fleets (red) and domestic fleets (blue) for the period 2000–2018.
(Note that distant-water effort for Chinese-Taipei and other fleets targeting albacore in the North Pacific is poorly covered)

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).

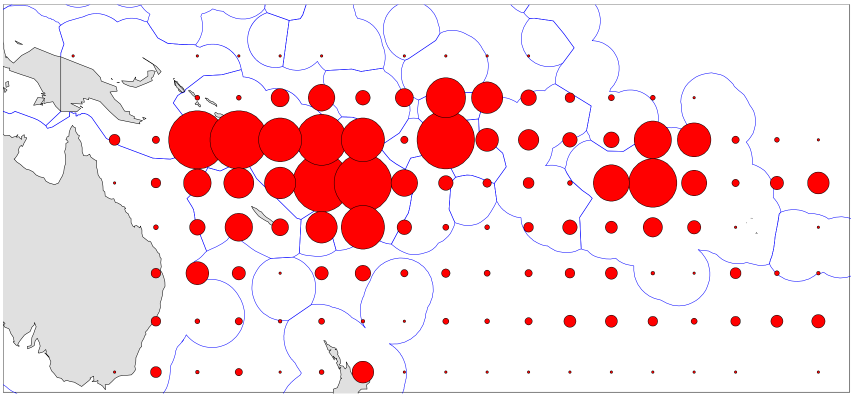

Figure 5.4.2 Distribution of effort for south Pacific albacore-target DOMESTIC longline fleets

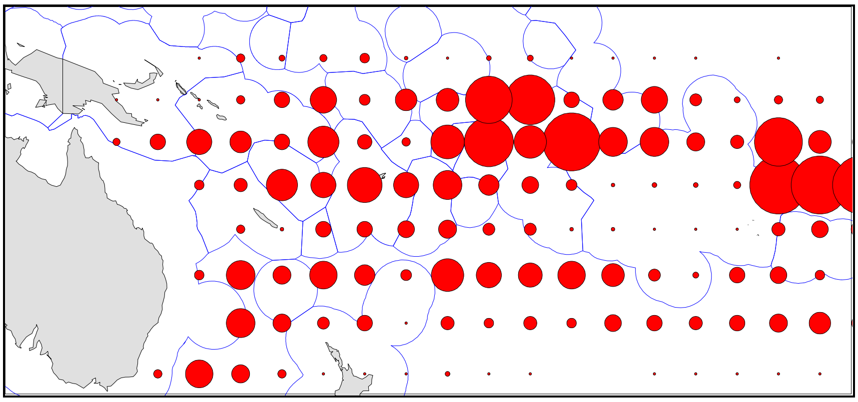

Figure 5.4.3 Distribution of effort for south Pacific albacore-target FOREIGN longline fleets

Figure 5.4.4 shows quarterly species composition by area for the period 2010–2017 and 2018. 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 2010-2017 quarterly averages (Figure 5.4.4 –left) with the 2018 catches (Figure 5.4.4 –right), particularly the 1st and 4th quarters.

The 2018 data are considered preliminary for some fleets, but nonetheless provide some insights into the fishery. For example, it is interesting to note the change in species composition for the cell/area bounded by 0°–10°S, 160°-170°W (predominately high seas north of Cook Islands and between Phoenix and Line Groups, but also including parts of these EEZs); from the 3rd to 4th quarters of 2018, the species composition went from an equal amount of albacore, bigeye and yellowfin tuna in the catch to a catch which comprised close to 75% bigeye tuna, and very little albacore tuna in the catch (by the 4th quarter).

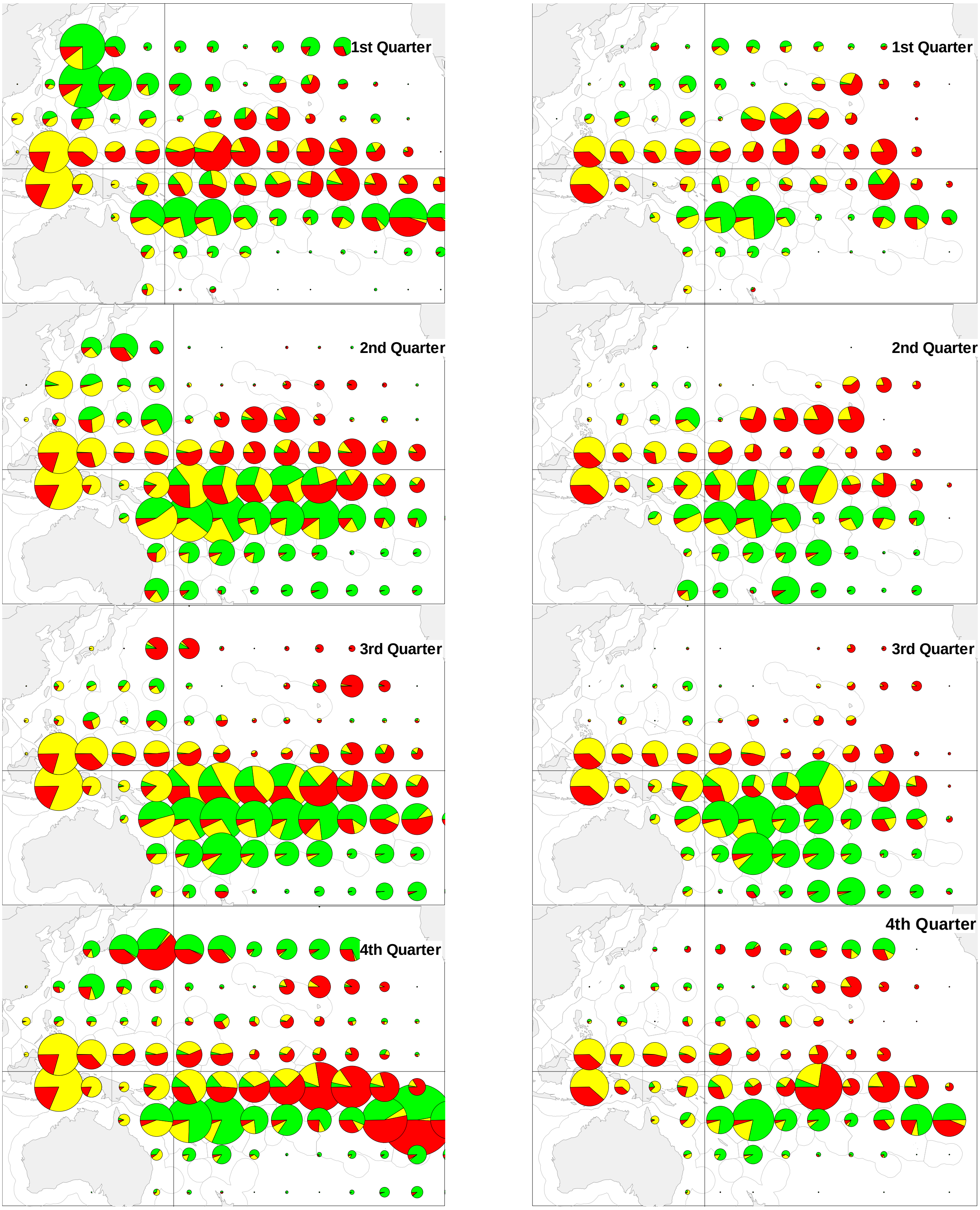

Figure 5.4.4 Quarterly distribution of longline tuna catch by species, 2010-2017 (left) and 2018 (right*)*

(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 trends for selected longline fishery related price data for yellowfin, bigeye, albacore, swordfish and striped marlin are provided.

Yellowfin

Following significant increases in yellowfin prices across all markets in 2017 the picture was more mixed in 2018. Frozen prices at selected Japanese ports declined 13% to ¥806/kg, Yaizu longline caught prices declined 11% to ¥732/kg and fresh prices at selected port prices declined 7% to ¥869/kg compared with the rises of around 30% seen in 2017 across all these markets. The average price of imported fresh yellowfin from Oceania, which saw only a small increase (3%) in 2017, rose a further 5% in 2018 to average ¥1,116/kg. Despite the declines seen in 2018 prices for all markets remain relatively high compared with before 2017.

Prices for fresh yellowfin imports into the US in 2018 rose 9% to $10.12/kg breaking out of the $9.00 and $9.80/kg range seen between 2011 and 2017. In US dollar terms, 2018 Yaizu longline caught yellowfin averaged $6.63/kg with fresh yellowfin at selected port at $7.87/kg and fresh imports from Oceania $10.11/kg.[9]

Japanese imports fresh bigeye from Oceania have averaged ¥945/kg over the period to May in 2019 while fresh bigeye imports into the US have averaged $10.23/kg over the same period.

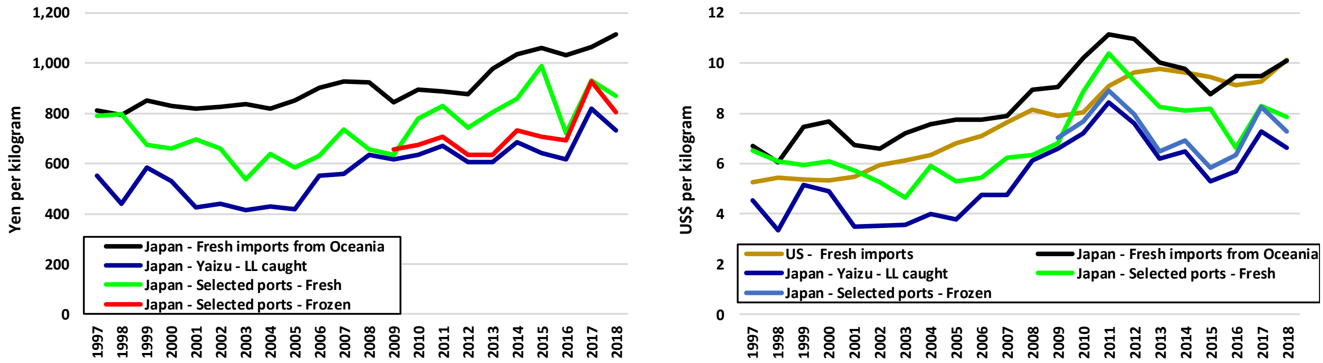

Figure 5.5.1 Japan and US Yellowfin in Yen (LHS) and US dollars (RHS)
Note: Japan fresh imports from Oceania are c.i.f prices, Yaizu and Japan selected port are ex-vessel prices and US imports are f.a.s prices. Frozen at selected ports excludes purse seine caught landings

[9] The average annual exchange rate saw the Yen appreciate 2% against the US dollar in 2018 ($1:¥110).

Bigeye

In contrast to yellowfin Japanese bigeye prices, which in 2017 either remained steady or declined, increased in 2018. Frozen prices at selected port prices increased 14% to ¥1,068/kg, fresh prices at selected port prices increased 5% to ¥1,421/kg and imported fresh bigeye from Oceania increased 6% to ¥1,209/kg.

Prices for fresh bigeye imports into the US in 2018 rose 11% to $9.77/kg after been steady in a range of $8.60 and $9.00/kg between 2011 and 2017. In US dollar terms, 2017 fresh prices at selected Japanese ports prices rose 7% to $12.87/kg while imported fresh bigeye from Oceania rose 8% to $10.95/kg.

Japanese imports fresh bigeye from Oceania have averaged ¥1,170/kg over the period to May in 2019 while fresh bigeye imports into the US have averaged $9.36/kg over the same period.

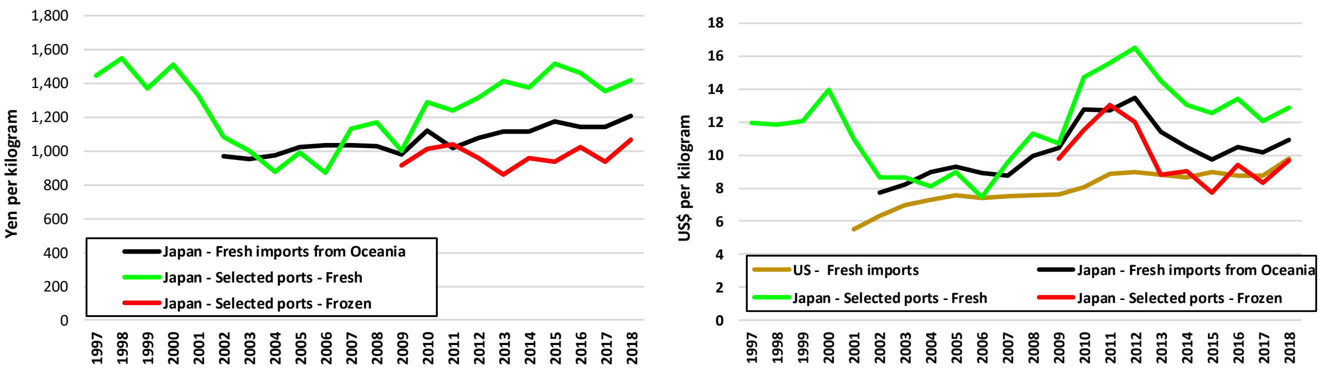

Figure 5.5.2 Japan and US bigeye prices in Yen (LHS) and US dollars (RHS)
Note: Japan fresh imports from Oceania are c.i.f prices, Japan selected ports are ex-vessel prices and US imports are f.a.s prices. Frozen at selected ports excludes purse seine caught landings

Albacore

Thai frozen import prices (c&f) increased 13% in 2018 to average $3.37/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 June 2019 Thai import prices have moved higher averaging $3.86/kg and for the first time the June 2019 price exceeded $4/kg ($4,000/mt).

Japanese selected ports prices in USD for fresh albacore also rose by 13% in 2018 to average $3.48/kg while the US imports average $4.65/kg (down 2%).

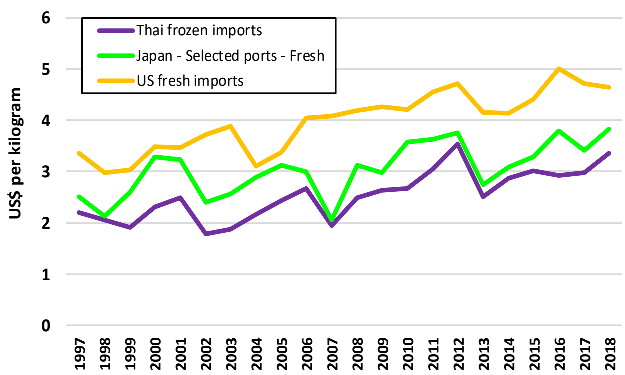

Figure 5.5.3 Albacore prices in US dollars
Note: Thai frozen imports are c&f prices, Japan selected ports are ex-vessel prices and US imports are f.a.s prices.

Swordfish and striped marlin

Fresh swordfish and striped marlin prices at selected Japanese ports fell 3% (to ¥979/kg) and 1% (to ¥707/kg) respectively in 2018 following significant increases in 2017. US fresh swordfish fell for the 2nd consecutive year to average US$7.34/kg in 2018 its lowest level since 2006.

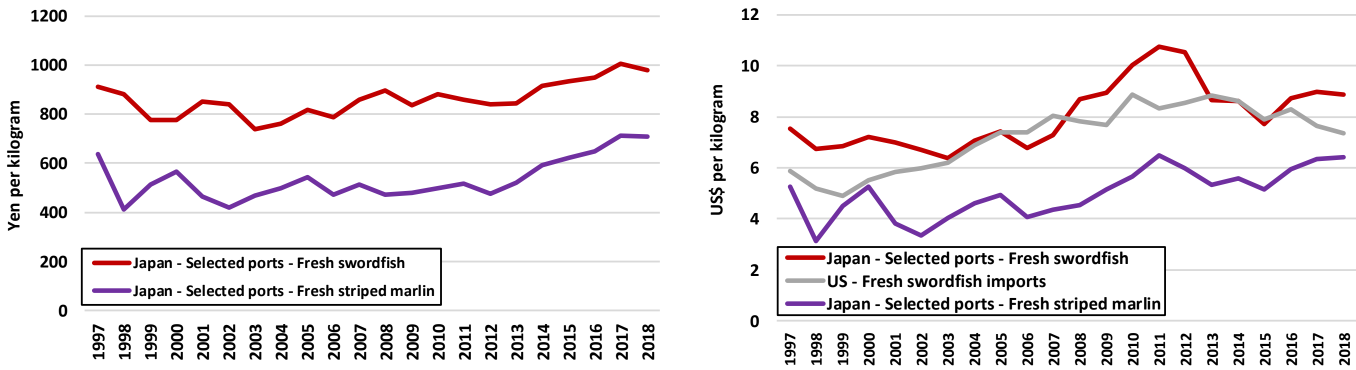

Figure 5.5.4 Japan and US swordfish and striped marlin prices in Yen (LHS) and US dollars (RHS)

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 2018 is $1.72 billion increase of 16% on 2017.[10]

The value of the longline yellowfin catch in 2018 rose 16% to $768 million while the value of the bigeye catch rose 26% to $660 million. These increases were driven primarily by higher catches with the annual catch value for both species being their highest level since 2014. The value of the albacore catch in 2018 fell by 2.5% despite a 14% decline in catch as prices rose.

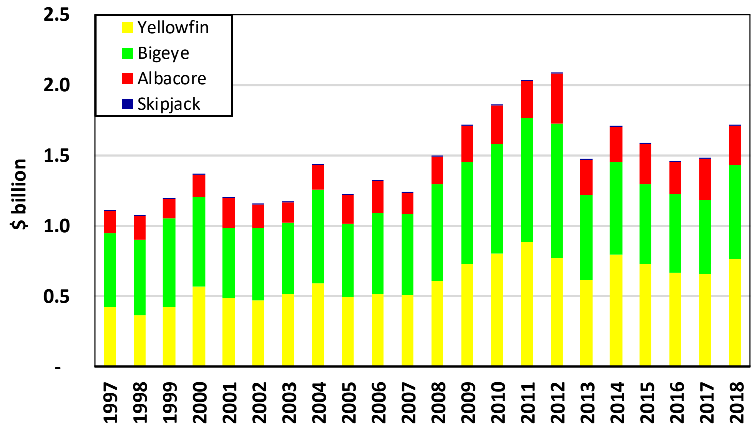

Figure 5.5.5 Value of the WCPFC-CA longline fishery tuna catch by species

[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.

5.5.3 Economic conditions

Economic conditions in the longline fishery are examined for two areas, these are referred to as the southern longline fishery, that is, the longline fishery south of 10ºS in the WPCFC-CA and 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.

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 elevated levels in 2011 and at 20 year highs in 2012. Economic conditions improved significantly between 2014 and 2017 to be 3% higher than the 20-year average in 2017 as catch rates rose and fuel costs declined while prices remained around their long-term average. The initial improvement in economic condition occurred as effort levels declined, effort level in 2016 were 32% below their 2012 peak. With improved economic conditions effort returning to the fishery effort levels jumped in 2017, increasing by 30% on 2016 levels. In 2018 economic conditions fell as catch rates declined and fuel costs rose.

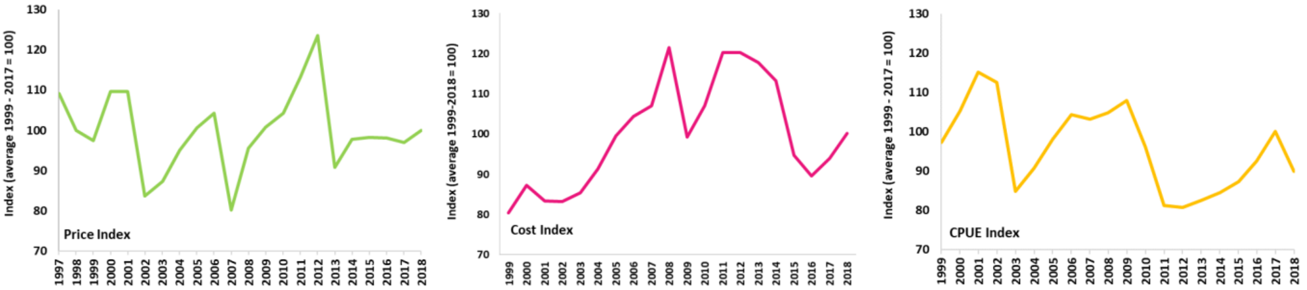

Figure 5.5.6 Southern longline fishery economic conditions component indexes

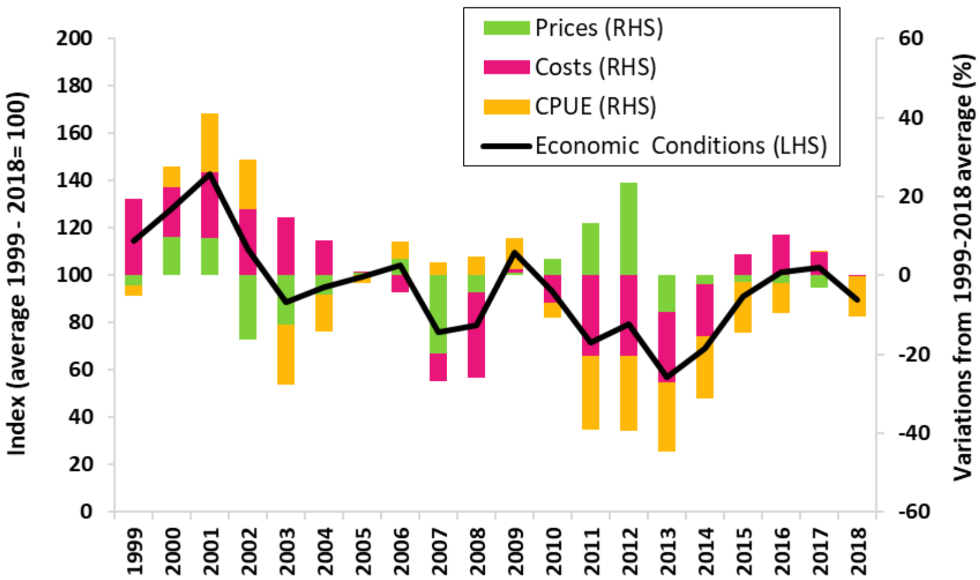

Figure 5.5.7 Southern longline economic conditions index (LHS) and variance of component indices against average

Tropical longline

Following a recovery in economic conditions between 2013 and 2016 as fuel costs fell and catch rates recovered conditions returned in 2016 to above 20-year average levels for the first time since 2010. In the last 2 years, however, economic conditions have deteriorated as fuel prices rose and catch rates fell driving the index back below the 20-year average. Effort fell to 20 year lows in 2017 before rebound sharply in 2018 (up 21%), however, catch rates continued the recent decline that started in 2015 following the sharp increase seen in 2014.

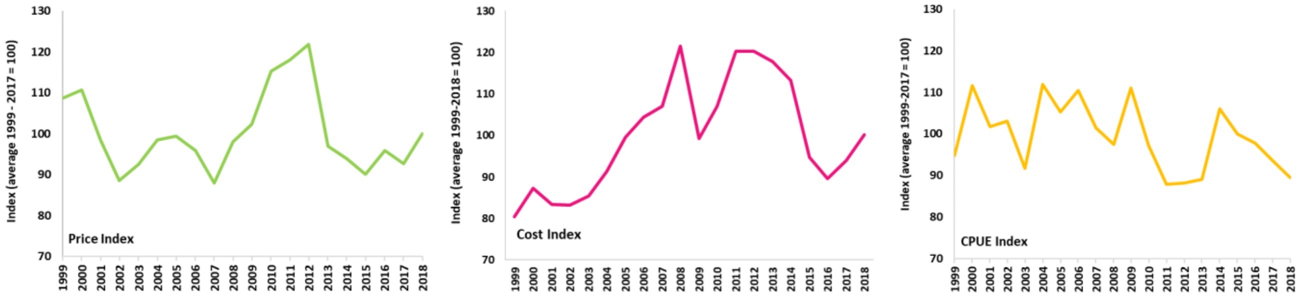

Figure 5.5.8 Tropical longline fishery economic conditions component indexes

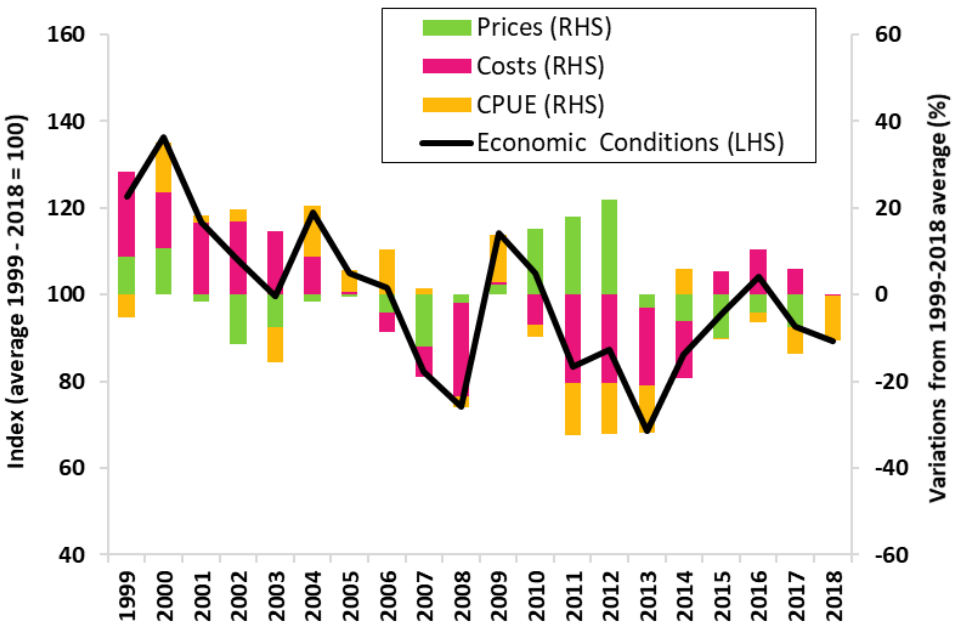

Figure 5.5.9 Tropical longline economic conditions index (LHS) and variance of component indices against average (1999-2017) conditions (RHS)

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.

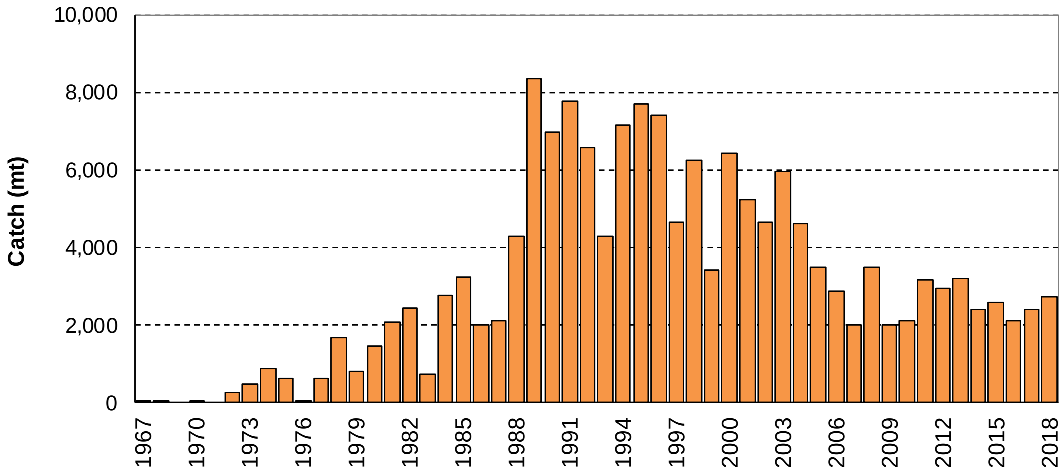

Figure 6.1.1 Troll catch (mt) of albacore in the south Pacific Ocean

6.2 Provisional catch estimates (2018)

The 2018 South Pacific troll albacore catch (2,731 mt) which was the highest catch for five years. The New Zealand troll fleet (144 vessels catching 2,272 mt in 2018) and the United States troll fleet (16 vessels catching 475 mt in 2018) accounted for all of the 2018 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.

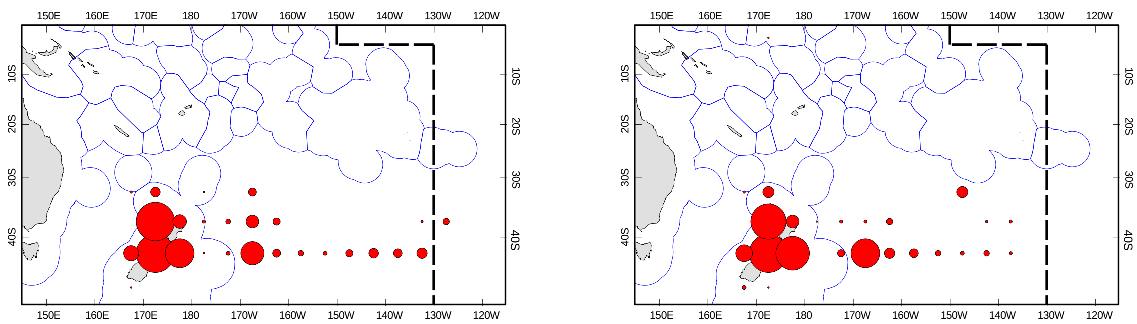

Figure 6.2.1 Distribution of South Pacific troll effort during 2017 (left) and 2018 (right)

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 decade (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.

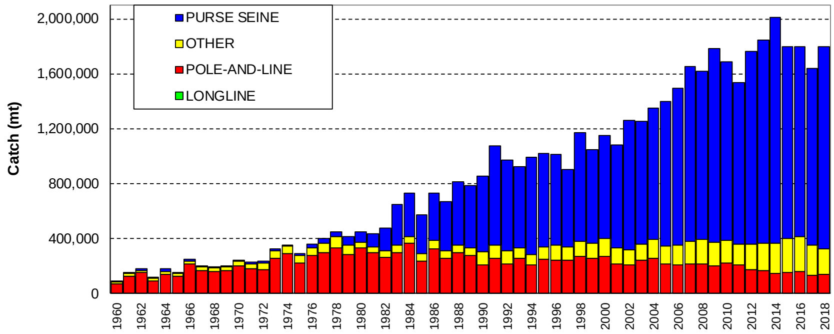

Figure 7.1.1 WCP–CA skipjack catch (mt) by gear

The 2018 WCP–CA skipjack catch of 1,795,048 mt was very similar to the 2016 catch level and around 213,000 mt lower than the record in 2014 (2,008,934 mt). Catch in the **purse-seine** fishery for 2018 (1,469,520 mt – 82%) increased substantially over the low catch level experienced in 2017. The **pole-and-line** catch for 2018 (138,534 mt – 8%) increased slightly over 2017 level (which was the lowest catch since 1963, mainly due to a reduction in the Indonesian catch). The "**artisanal**" gears in the domestic fisheries including Indonesia, Philippines and Japan took 180,499 mt in 2018 (10% of the total catch) and was the lowest for seven years. The **longline** fishery accounted for less than 1% of the total catch.

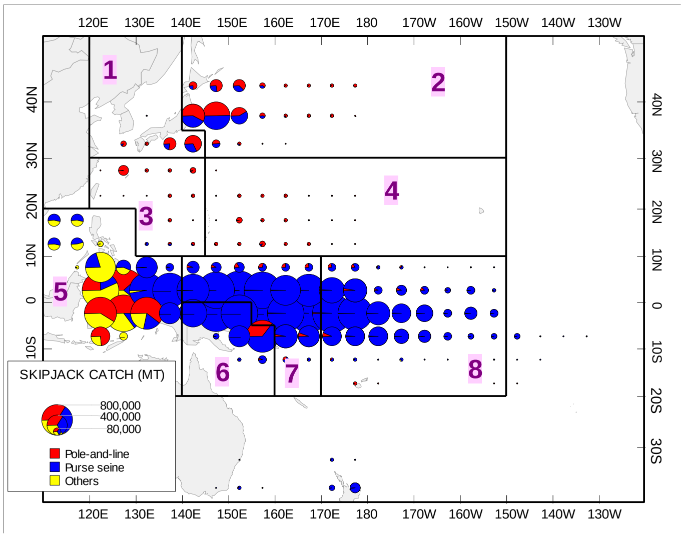

Figure 7.1.2 Distribution of skipjack tuna catch, 1990–2018.

The eight-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 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 years 2013–2017), although there were reduced catches from unassociated sets in 2017. Most of the purse seine skipjack catch (by weight) was in the range 50-60 cm in 2018. Skipjack catch in the Indonesia/Philippines domestic fisheries since 2015 were mostly in the range 20–30 cm (Figure 7.1.4), reflecting a higher proportion of catch taken by the smaller purse seine vessels (e.g. the Indonesian *pajeko*) compared to the larger vessels in this fishery.

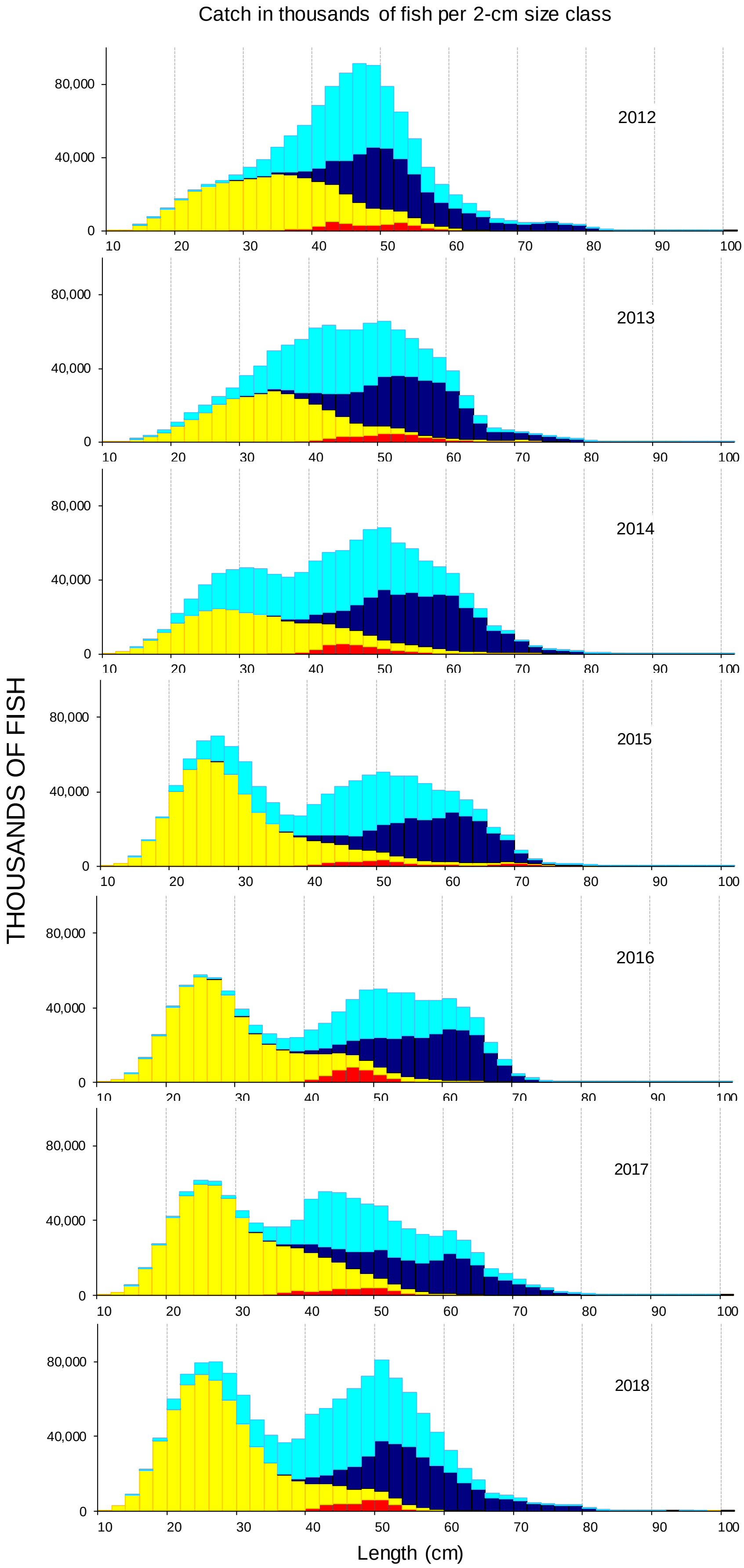

Figure 7.1.3 Annual catches (no. of fish) of skipjack tuna in the WCPO by size and gear type, 2012–2018.
(red–pole-and-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

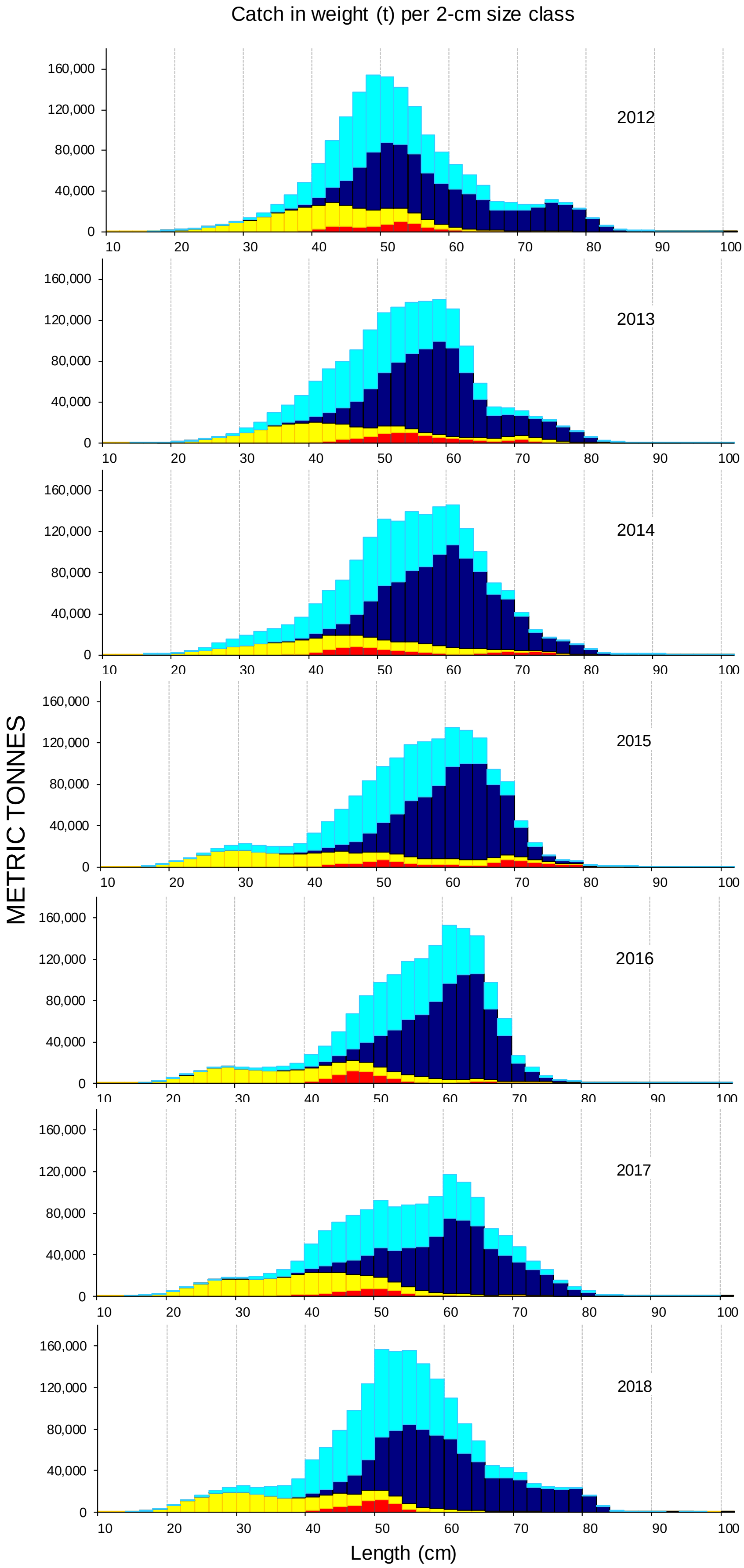

Figure 7.1.4 Annual catches (MT) of skipjack tuna in the WCPO by size and gear type, 2012–2018.
(red–pole-and-line; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.2 YELLOWFIN

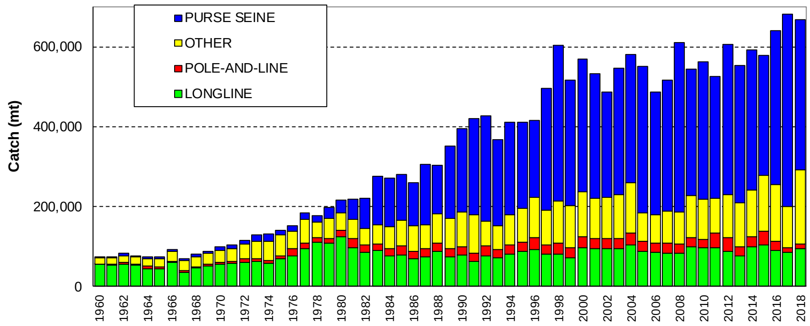

Figure 7.2.1 WCP–CA yellowfin catch (mt) by gear

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 2018 yellowfin catch (**666,971 mt**) was the second highest on record, at only 15,000 mt less than the previous record in 2017 and mainly due to a relatively high catch in the purse seine fishery (374,062 mt – 56%), but also record high catch levels from the "other" category, mainly small-scale fisheries in Indonesia/Philippines (provisional estimate is 183,103 mt – 27% of the total catch).

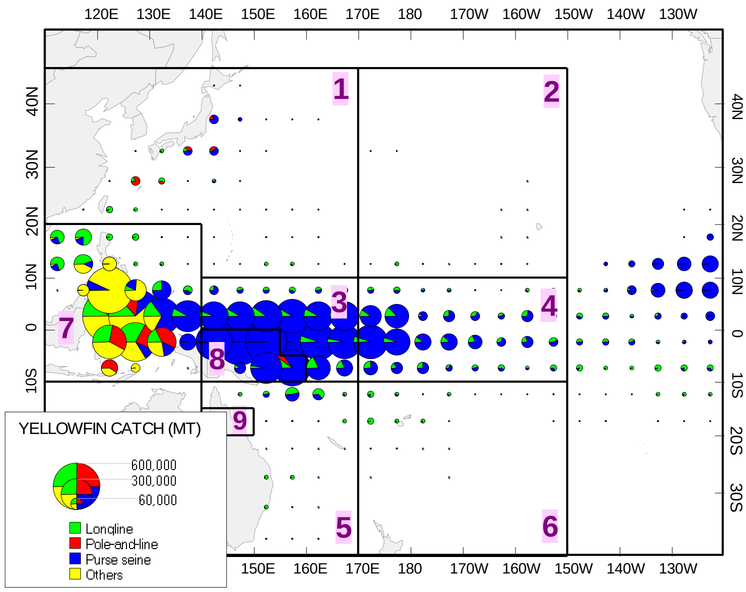

Figure 7.2.2 Distribution of yellowfin tuna catch in the WCP–CA, 1990–2018.
The nine-region spatial stratification used in stock assessment is shown.

The WCP–CA **longline** catch for 2018 (94,509 mt–14%) was on par with the average over the past five 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 12,201 mt during 2018 (~2% of the total yellowfin catch) which is the lowest since the late 1970s.

Catches in the '**other**' category are largely composed of yellowfin taken by various assorted gears (e.g. troll, ring net, bagnet, gillnet, large-fish handline, small-fish hook-and-line and seine net) in the domestic fisheries of the Philippines and eastern Indonesia. Figure 7.2.2 shows the distribution of yellowfin catch by gear type for the period 1990–2018. 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.

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 three years. 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 there are two modes of small fish (< 50 cm) and one mode of large fish (>100 cm from the handline gear) in the Indonesia/Philippines domestic fisheries over the past five years. 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.

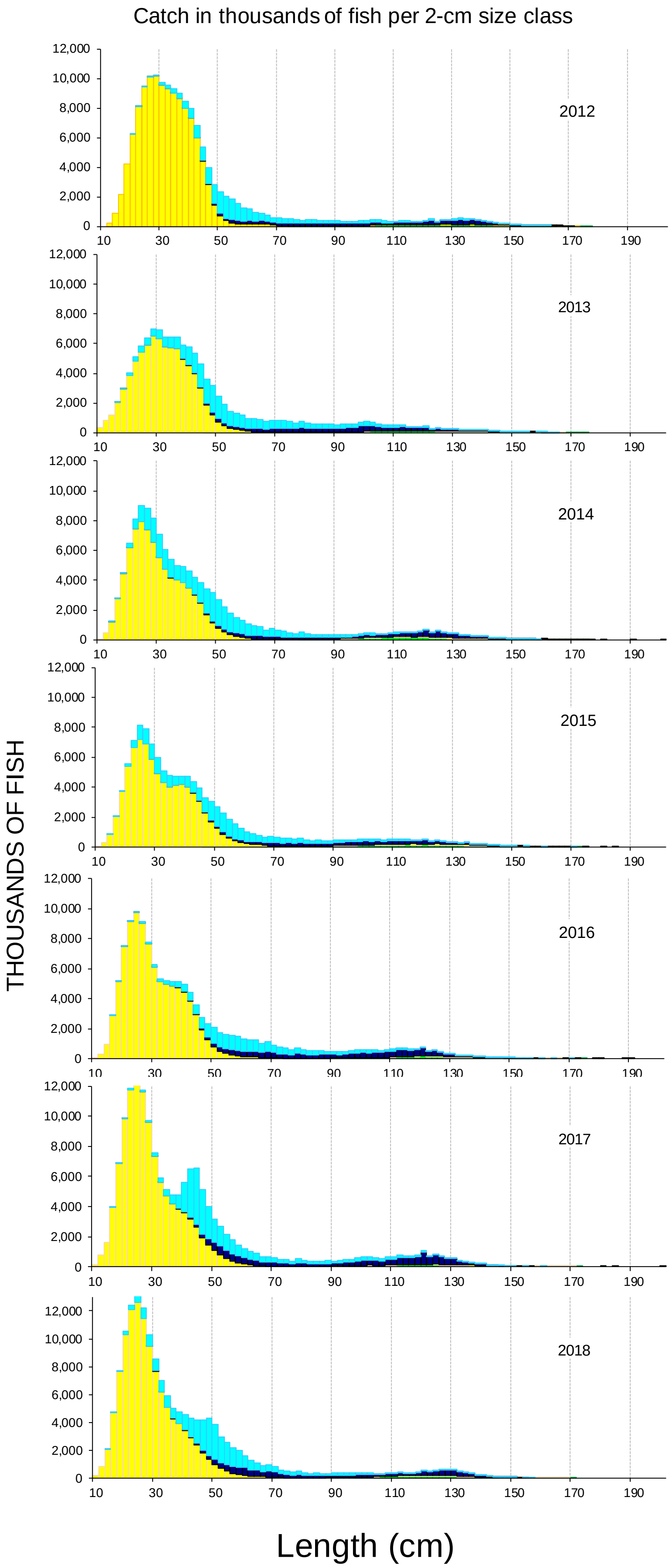

Figure 7.2.3 Annual catches (no. of fish) of yellowfin tuna in the WCPO by size and gear type, 2012–2018.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

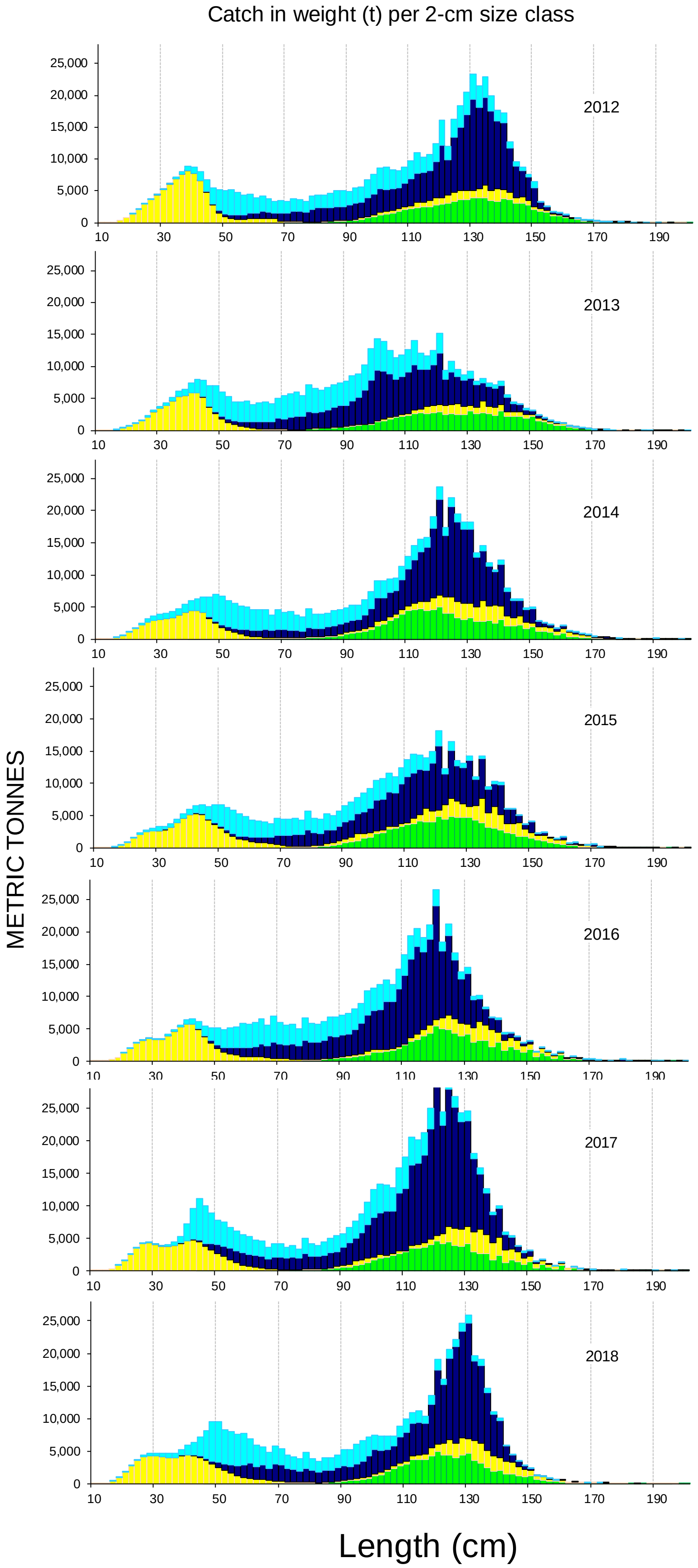

Figure 7.2.4 Annual catches (MT) of yellowfin tuna in the WCPO by size and gear type, 2012–2018.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

7.3 BIGEYE

The provisional **WCP-CA bigeye catch** (145,402 mt) was on par with the recent five-year average and a recovery on the low catch in 2017 (which was the lowest since 1996). The **WCP-CA longline** bigeye catch (71,305 mt) was higher than the recent five-year average and on par with the average catch over the past decade. The provisional **WCP–CA purse seine** bigeye catch for 2018 was estimated to be 64,119 mt which was higher 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, but the longline fishery catch in subsequent years was mostly higher than the purse seine fishery catch. The purse seine and longline fisheries accounted for 93% of the total WCP_CA bigeye catch in 2018.

The **WCP–CA pole-and-line** fishery has generally accounted for between 1,000–10,000 mt (1-6%) 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 8,000–16,000 mt (3–7% of the total WCP–CA bigeye catch) over time.

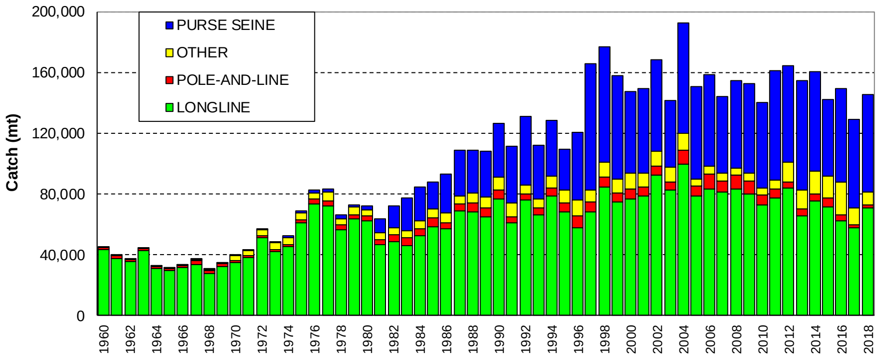

Figure 7.3.1 WCP–CA bigeye catch (mt) by gear

Figure 7.3.2 shows the spatial distribution of bigeye catch in the Pacific for the period 1990–2018. 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.

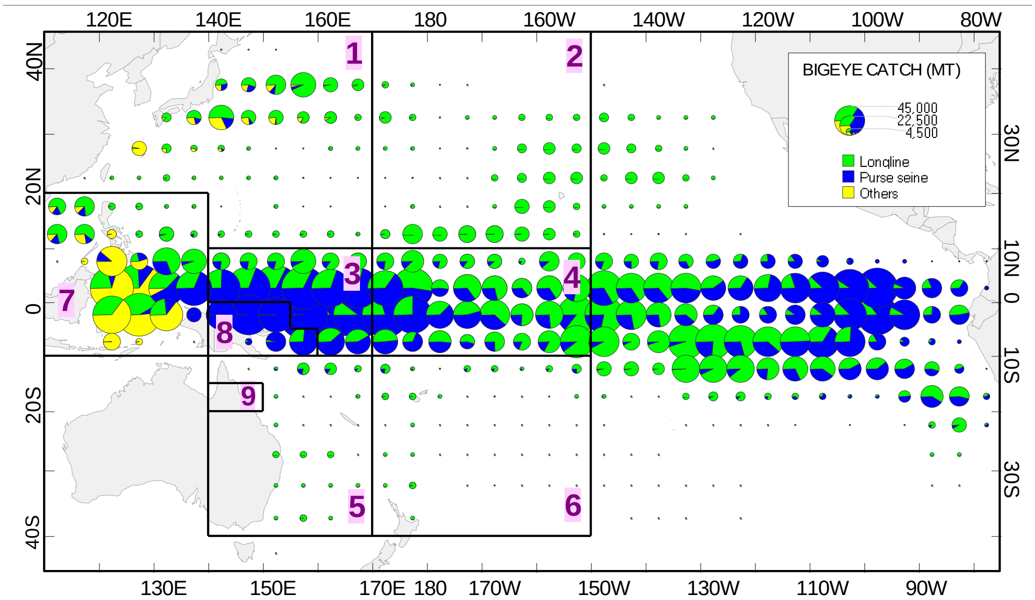

Figure 7.3.2 Distribution of bigeye tuna catch, 1990–2018.
The nine-region spatial stratification used in stock assessment for the WCP–CA is shown.

[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.

There are several examples where a year class represented by the mode of fish in the size range of about 25-30 cm in the Philippines/Indonesian domestic fisheries, appears to progress to a mode of 50-60 cm in the purse seine associated in the following year (Figure 7.3.3).

The size composition of bigeye tuna by fishery is very similar over the past three years (2016–2018), although it is clear there were less bigeye taken in the Philippines/Indonesia domestic fisheries in 2018.The graphs for 2018 show that (i) the average size of longline-caught bigeye was similar to 2017, and larger than in years prior to 2017, 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, less fish >80 cm in 2018), and (iii) the maintenance of relatively high numbers of bigeye tuna taken in unassociated sets (which is similar to recent years), but very few exceeding 170cm in length, compared to 2017 (for example).

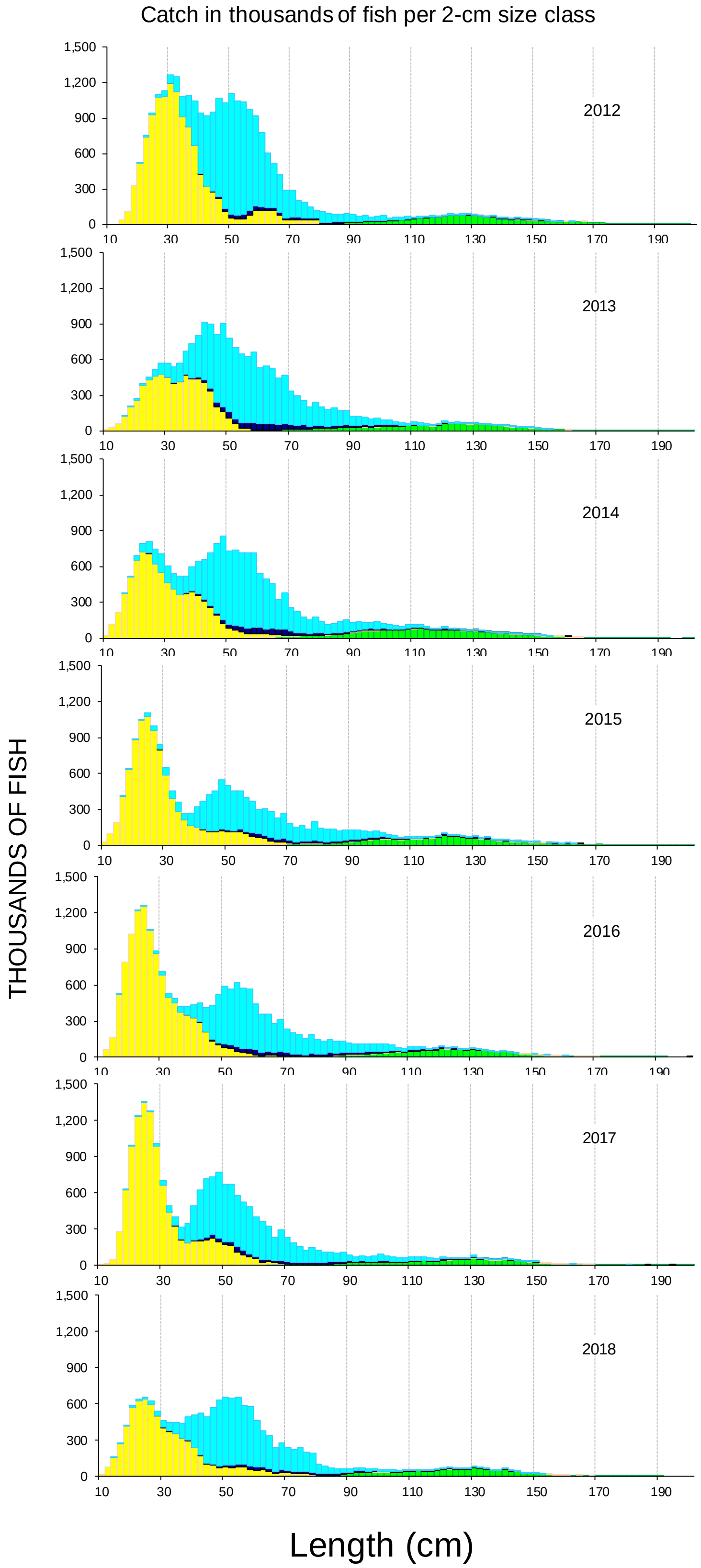

Figure 7.3.3 Annual catches (no. of fish) of bigeye tuna in the WCPO by size and gear type, 2012–2018.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

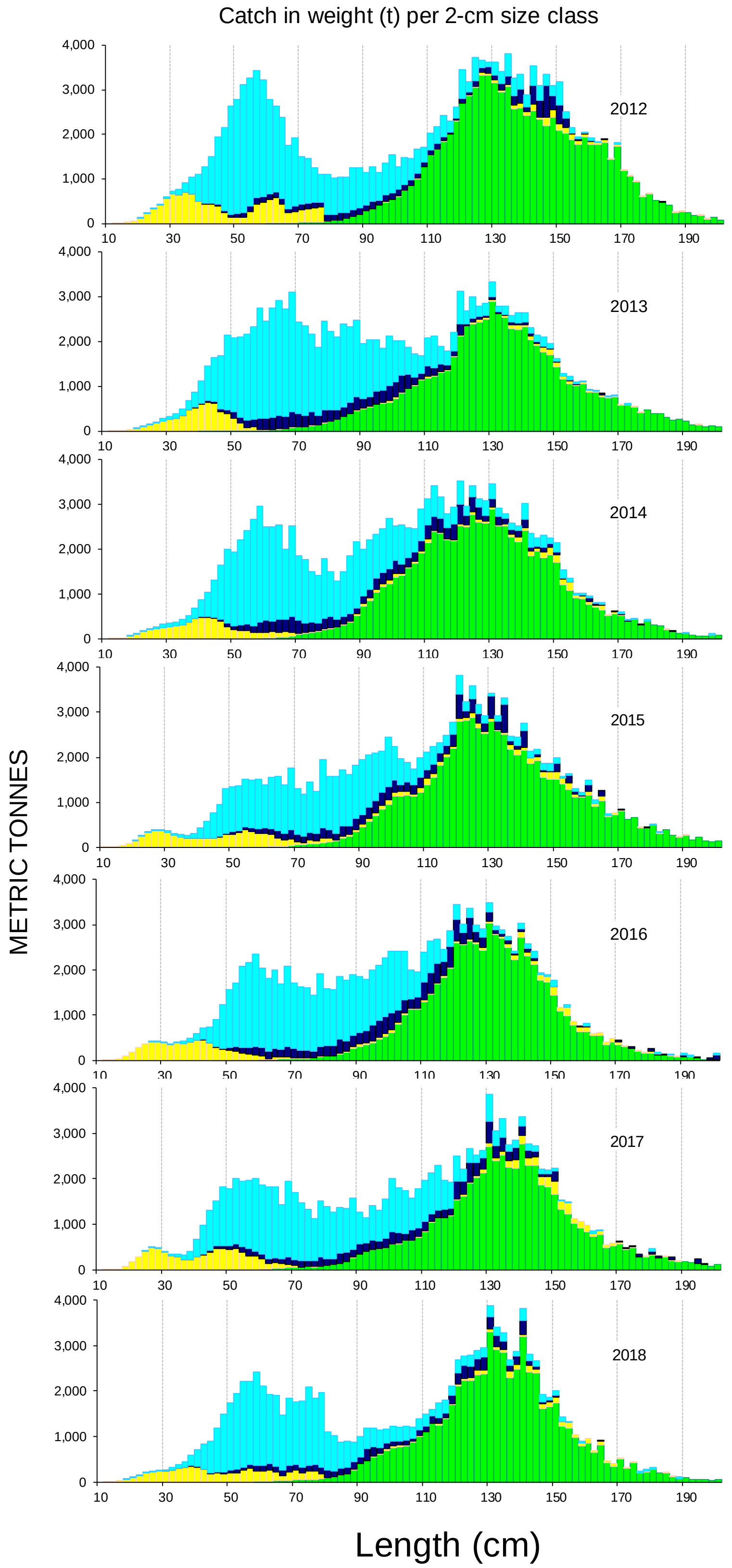

Figure 7.3.4 Annual catches (MT) of bigeye tuna in the WCPO by size and gear type, 2012–2018.
(green–longline; yellow–Phil-Indo archipelagic fisheries; light blue–purse seine associated; dark blue–purse seine unassociated)

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 2018 (68,454 mt), a significant decline on the record catch in 2017 (93,290 mt). This decline is primarily due to a drop in the longline fishery (from 90,627 mt in 2017 to 65,410 mt in 2018), which may be related in part to the absence of any catch reported by the China longline fleet in the Eastern Pacific Ocean, south of the equator.

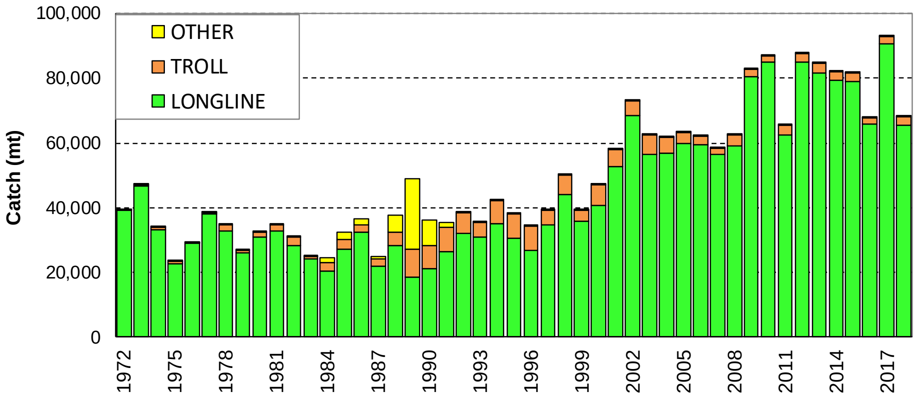

Figure 7.4.1 South Pacific albacore catch (mt) by gear ("Other" is primarily catch by the driftnet fishery.)

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 2018 (108,974 mt) was nearly 40,000 mt lower than the record (147,793 mt in 2002), and about 15,000 mt lower than the 2017 catch.

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.

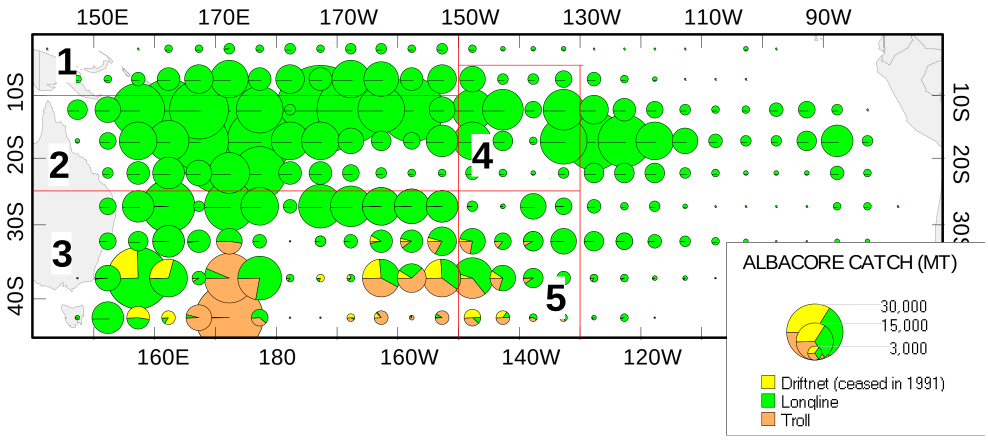

Figure 7.4.2 Distribution of South Pacific albacore tuna catch, 1988–2018.
The five-region spatial stratification used in stock assessment is shown.

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 size distribution in the longline catch for 2018 was very similar to 2017 (and other years shown here).

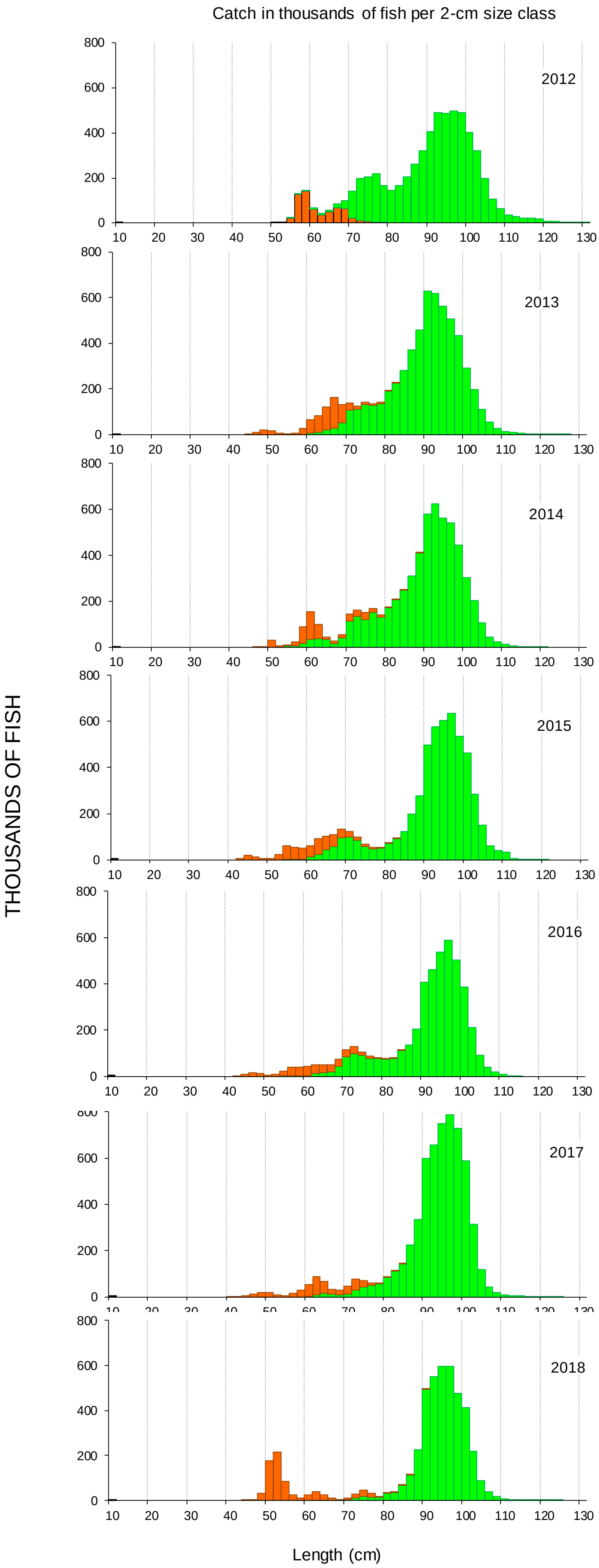

Figure 7.4.3 Annual catches (no. of fish) of albacore tuna in the South Pacific Ocean by size and gear type, 2012–2018. **(green–longline; orange–troll)**

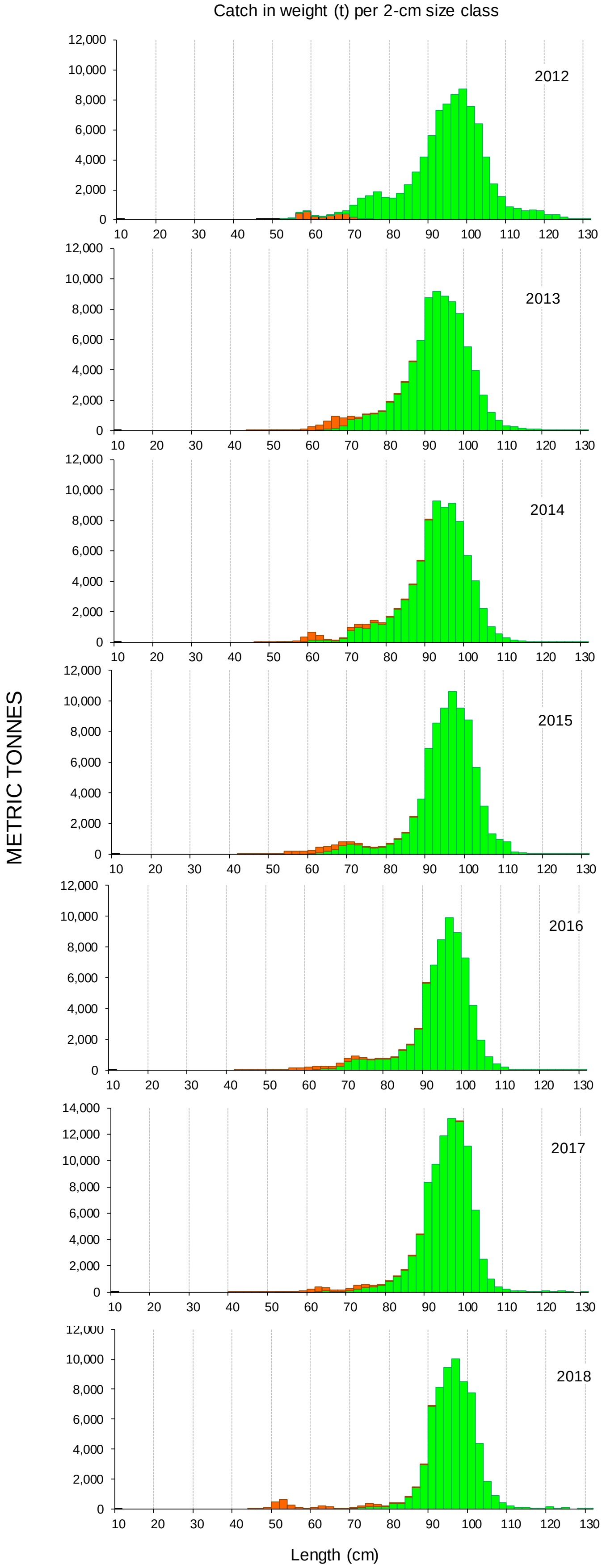

Figure 7.4.4 Annual catches (MT) of albacore tuna in the South Pacific Ocean by size and gear type, 2012–2018. (green–longline; orange–troll);

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 (accounting for most of the OTHER category in Figure 7.5.1) 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 2018 catch estimates for the South Pacific (19,637 mt) declined from the record 2015 catch, mainly due to a reduction in distant-water Asian fleet catches, although 2018 estimates for some fleets were provisional at the time of writing this paper. The catch of swordfish for the WCP-CA south of the equator (Figure 7.5.2) in 2018 was 7,239 mt, a continuation in the decline of annual catches since 2012.

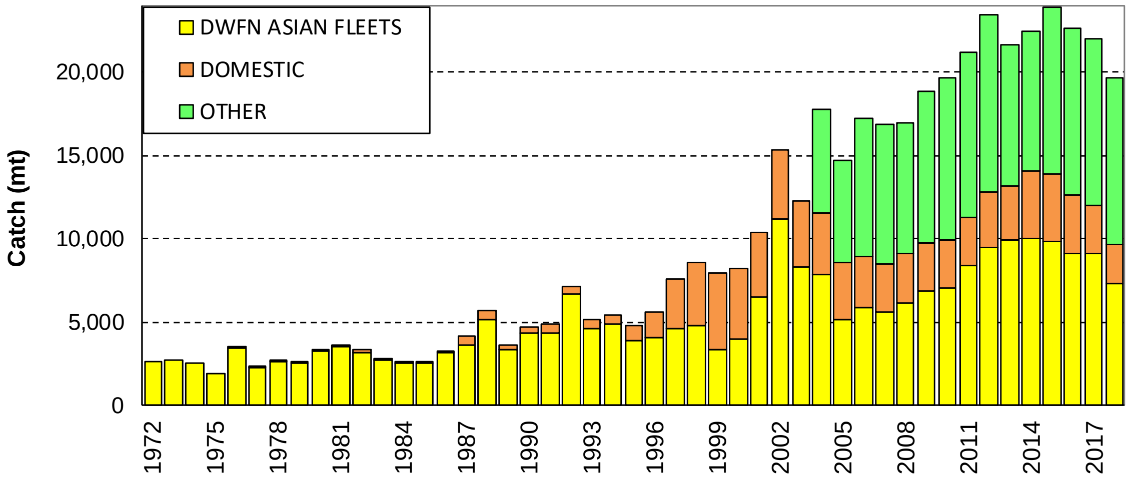

Figure 7.5.1 South Pacific longline swordfish catch (mt) by fleet

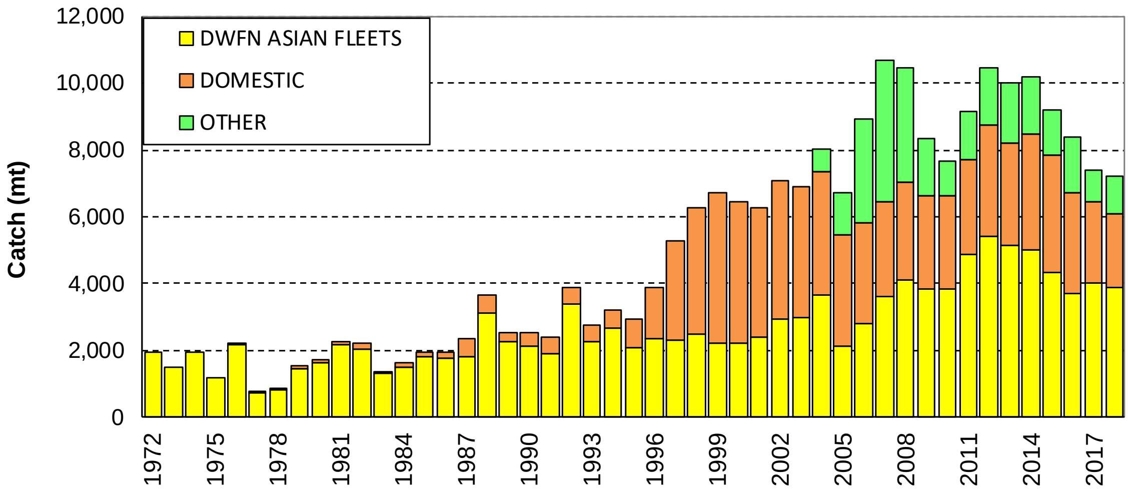

Figure 7.5.2 WCP–CA (south of equator) longline swordfish catch (mt) by fleet

The longline catch of swordfish is distributed over a large area of the south Pacific (Figures 7.5.3 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.

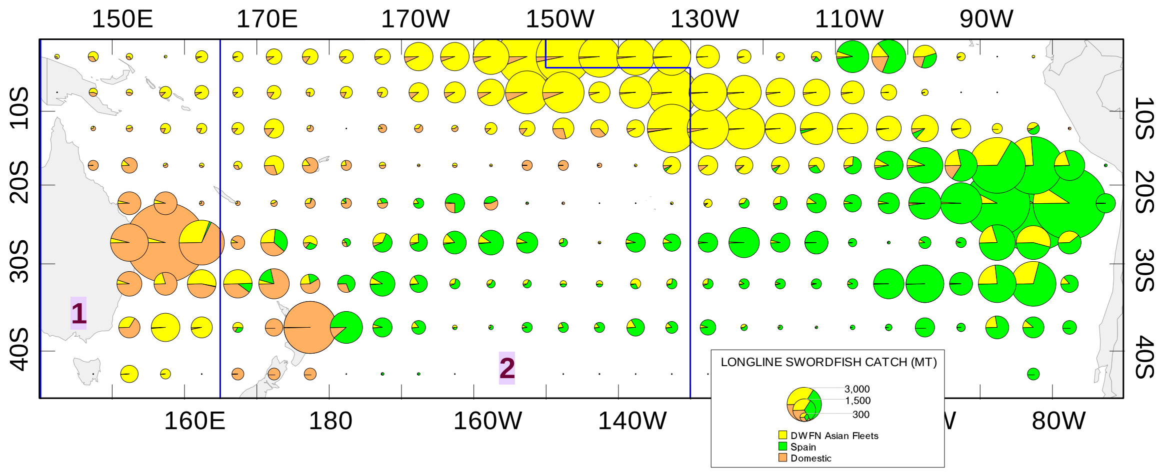

Figure 7.5.3 Distribution of South Pacific longline swordfish catch, 1995–2018.

The swordfish catch throughout the South Pacific Ocean are generally in the range of 110–250cm, and a mean around 180 cm (lower jaw-fork length – Figures 7.5.4 and 7.5.5). 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 Spanish fleet generally catch larger swordfish than the distant-water Asian fleets, which could be related to area fished.

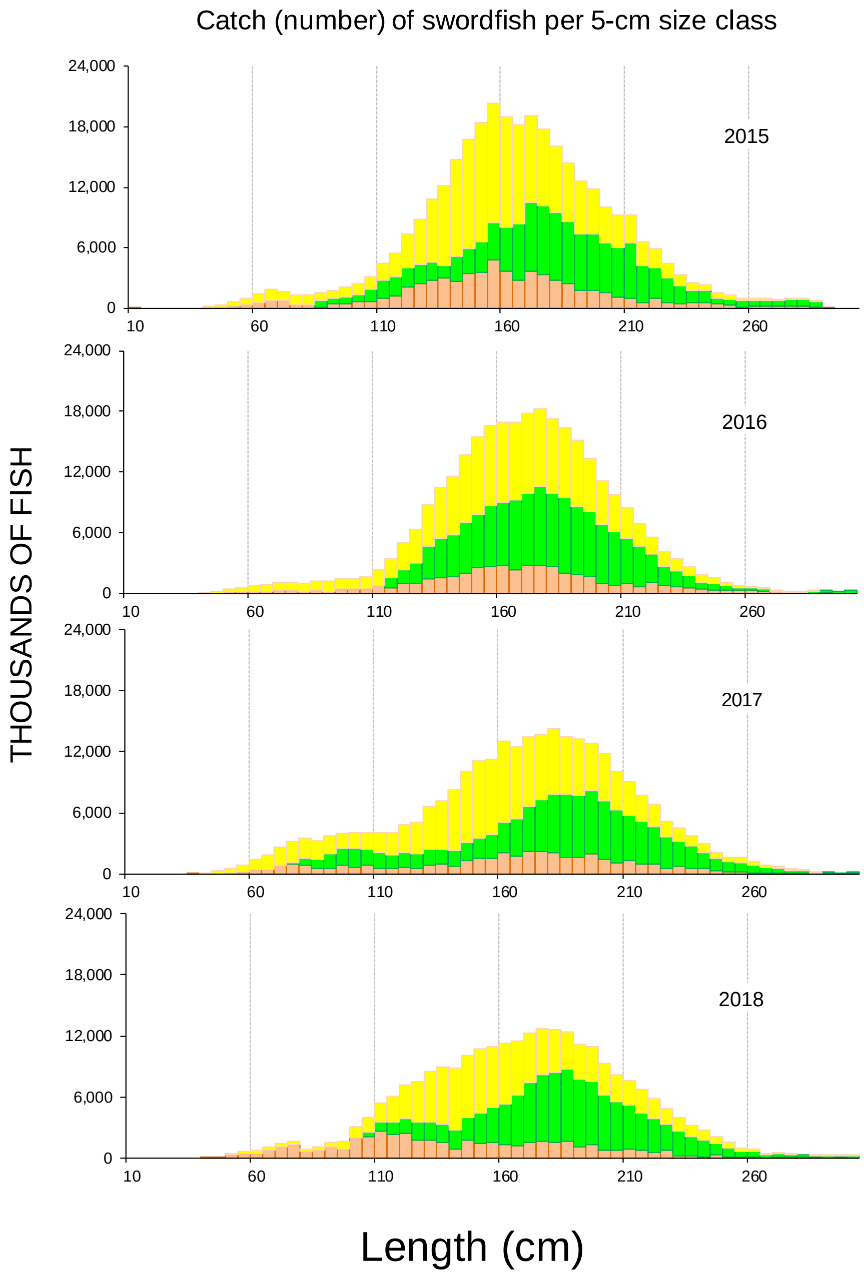

Figure 7.5.4 Annual catches (number of fish) of swordfish in the WCP–CA (south of the equator) by size and fleet, 2015–2018. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange– Domestic fleets)**

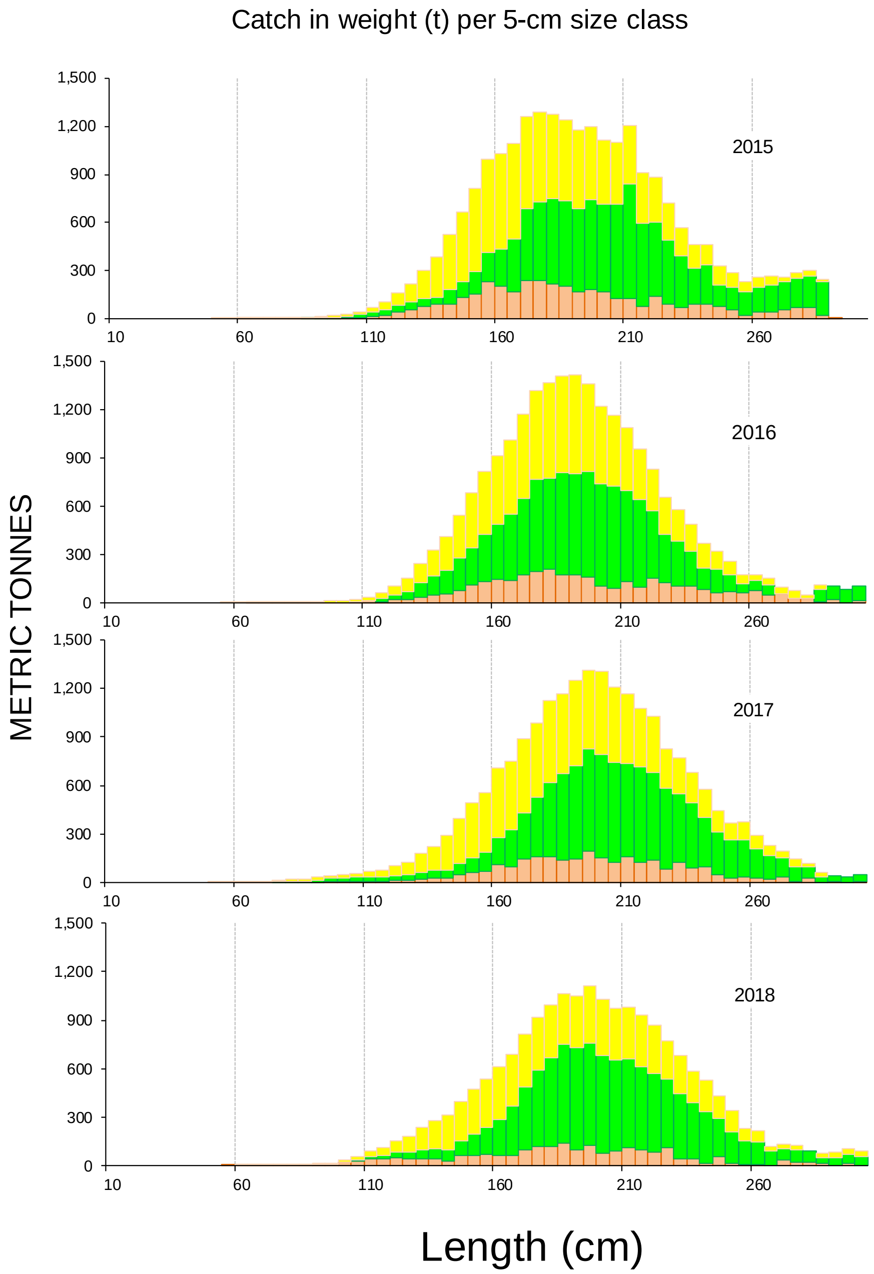

Figure 7.5.5 Annual catches (metric tonnes) of swordfish in the WCP–CA (south of the equator) by size and fleet, 2015–2018. **(green–Spanish fleet catch; yellow–distant-water Asian fleet catch; orange–Domestic fleets)**

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APPENDIX - ADDITIONAL INFORMATION

Table A1. Proportion of Longline SWORDFISH catch in the area north of 20°S in the WCPFC Convention Area south of the equator, 2000-2018. 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	5,263	1,923	37%
2001	5,949	2,180	37%
2002	8,668	3,843	44%
2003	6,516	3,192	49%
2004	7,634	3,663	48%
2005	6,672	2,354	35%
2006	8,848	3,369	38%
2007	9,455	2,940	31%
2008	8,838	4,137	47%
2009	7,495	4,282	57%
2010	6,259	3,468	55%
2011	8,463	4,973	59%
2012	8,792	4,900	56%
2013	8,236	4,594	56%
2014	8,471	4,769	56%
2015	7,833	4,172	53%
2016	6,510	3,432	53%
2017	6,746	3,789	56%
2018	6,935	3,883	56%
Average	7,557	3,677	49%

Table A2. Proportion of Longline SWORDFISH catch by 10° latitude band in the WCPFC Convention Area south of the equator, 2000-2018. 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	1,508	415	1,683	1,460	197	29%	8%	32%	28%	4%
2001	1,565	615	1,964	1,575	229	26%	10%	33%	26%	4%
2002	2,512	1,331	2,331	2,284	210	29%	15%	27%	26%	2%
2003	2,002	1,190	1,779	1,335	209	31%	18%	27%	20%	3%
2004	2,747	916	1,935	1,851	186	36%	12%	25%	24%	2%
2005	1,604	750	2,851	1,359	109	24%	11%	43%	20%	2%
2006	2,631	738	3,316	2,097	66	30%	8%	37%	24%	1%
2007	2,410	530	3,313	3,144	57	25%	6%	35%	33%	1%
2008	3,225	912	2,109	2,553	38	36%	10%	24%	29%	0%
2009	2,756	1,526	1,459	1,642	112	37%	20%	19%	22%	1%
2010	2,285	1,183	1,223	1,506	62	36%	19%	20%	24%	1%
2011	3,551	1,422	1,442	1,924	125	42%	17%	17%	23%	1%
2012	3,520	1,380	1,526	2,205	161	40%	16%	17%	25%	2%
2013	3,060	1,534	1,658	1,769	215	37%	19%	20%	21%	3%
2014	3,510	1,259	2,054	1,448	201	41%	15%	24%	17%	2%
2015	3,161	1,010	2,220	1,212	229	40%	13%	28%	15%	3%
2016	1,995	1,438	1,414	1,431	234	31%	22%	22%	22%	4%
2017	2,213	1,575	1,608	1,198	150	33%	23%	24%	18%	2%
2018	2,827	1,056	1,448	1,449	155	41%	15%	21%	21%	2%
Average	2,583	1,094	1,965	1,760	155	34%	14%	26%	23%	2%

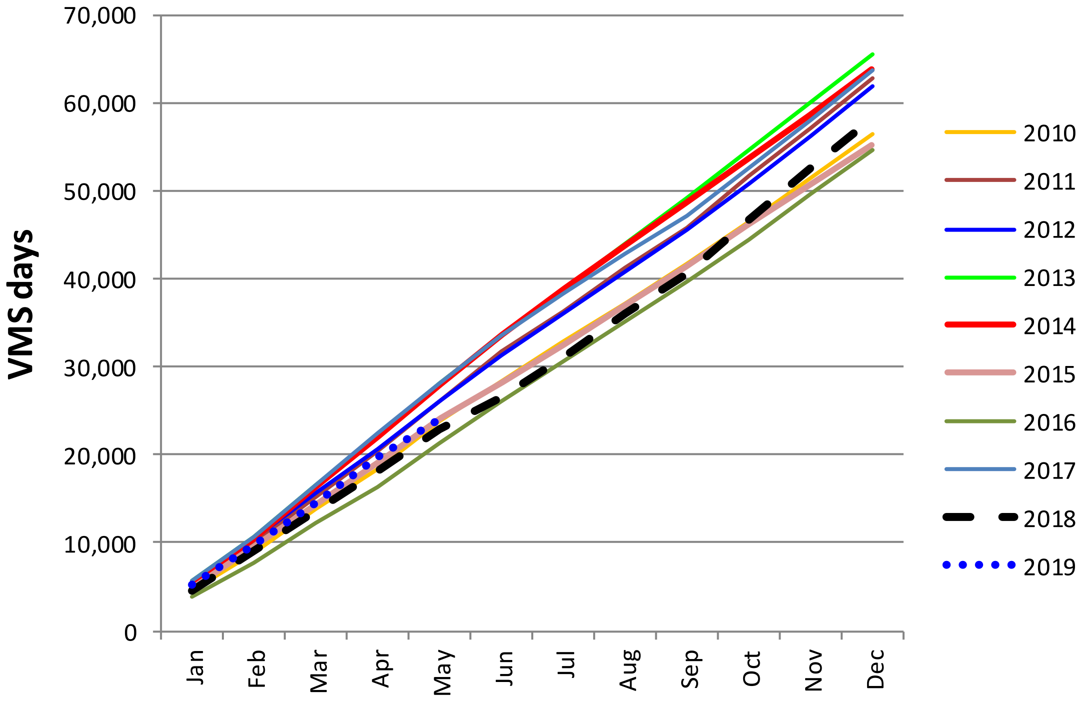


Figure A1. Cumulative purse seine effort by month, 2009-2019, as measured by VMS
(excludes days in port and an estimation of days in transit)

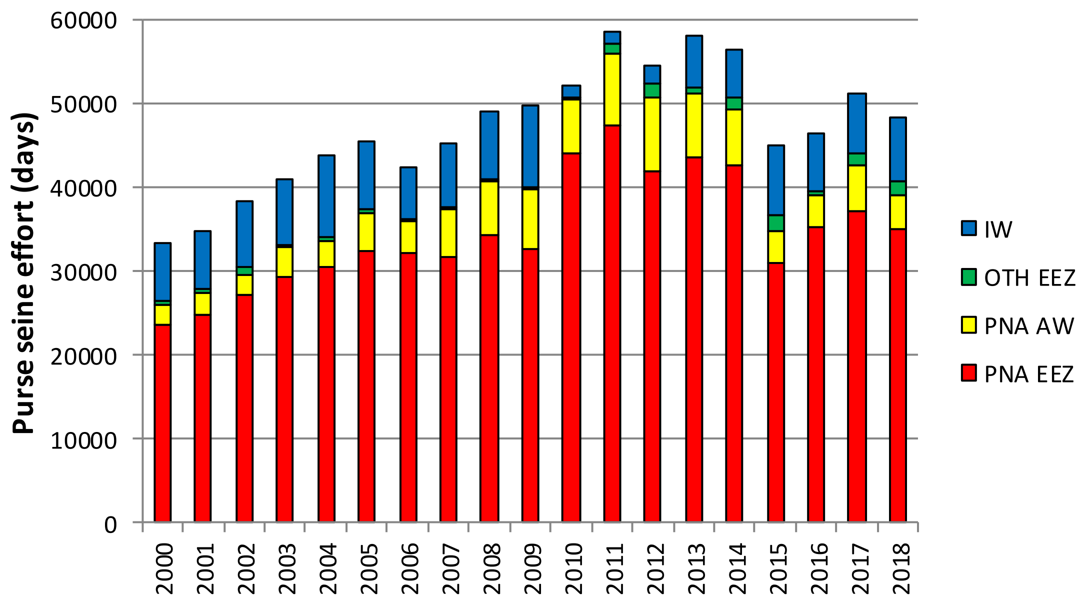


Figure A2. Purse seine effort (days fishing and searching) in the WCPFC Convention Area between 20°N and 20°S, excluding domestic purse seine effort in Philippines and Indonesia. Estimates are based on raised logsheet data.

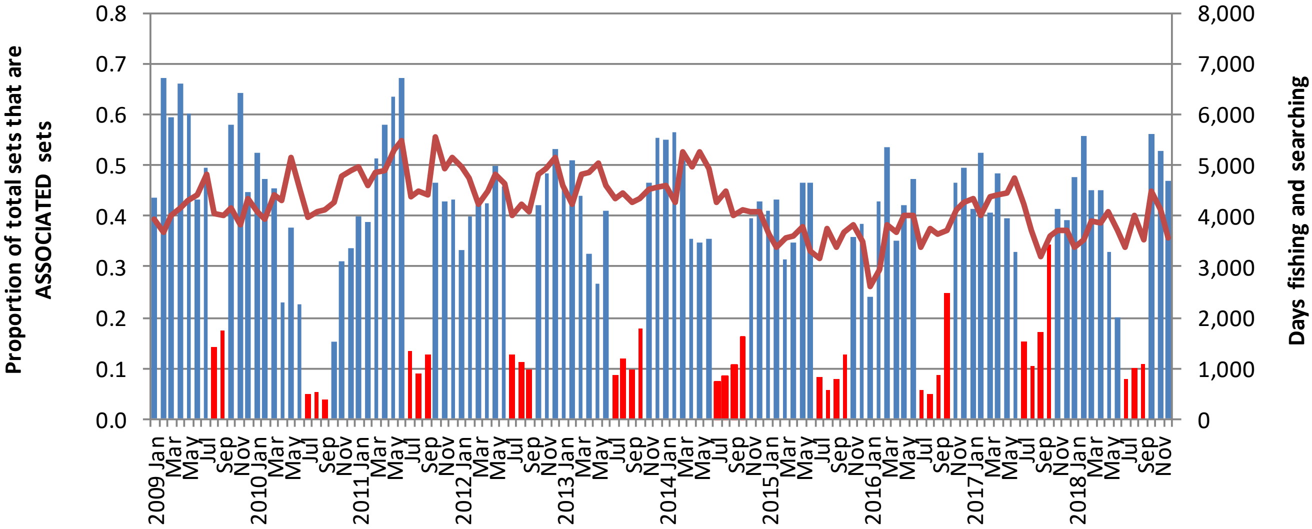


Figure A3. Proportion of the total purse seine fishing activity comprising associated sets, as indicated by logsheet data. Red bars indicate the FAD closure months. Total effort in days is shown by the plotted line. Activities in the domestic purse seine fisheries of Indonesia and Philippines are excluded**.**

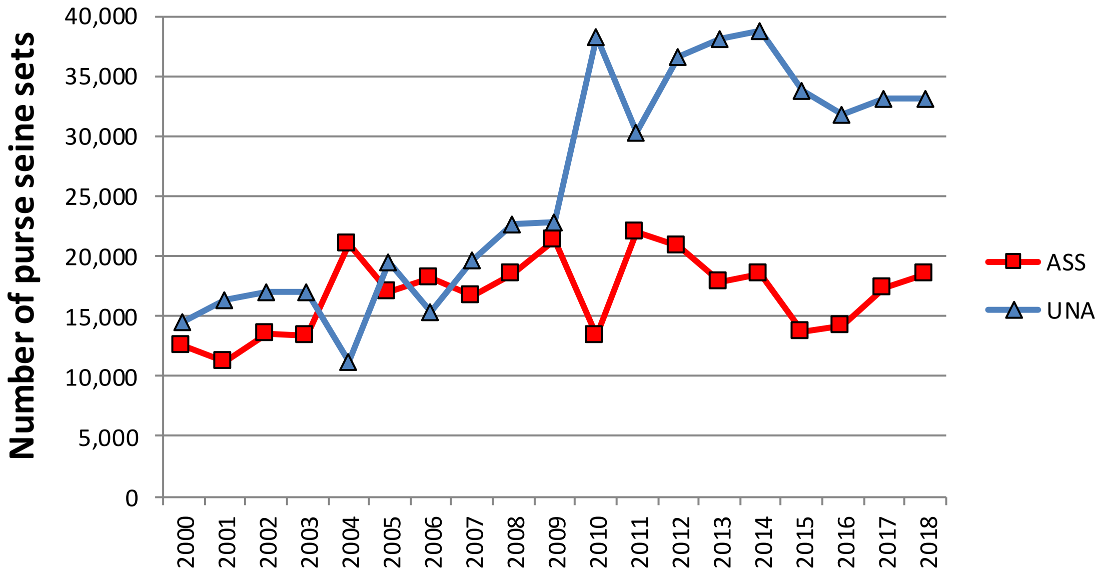
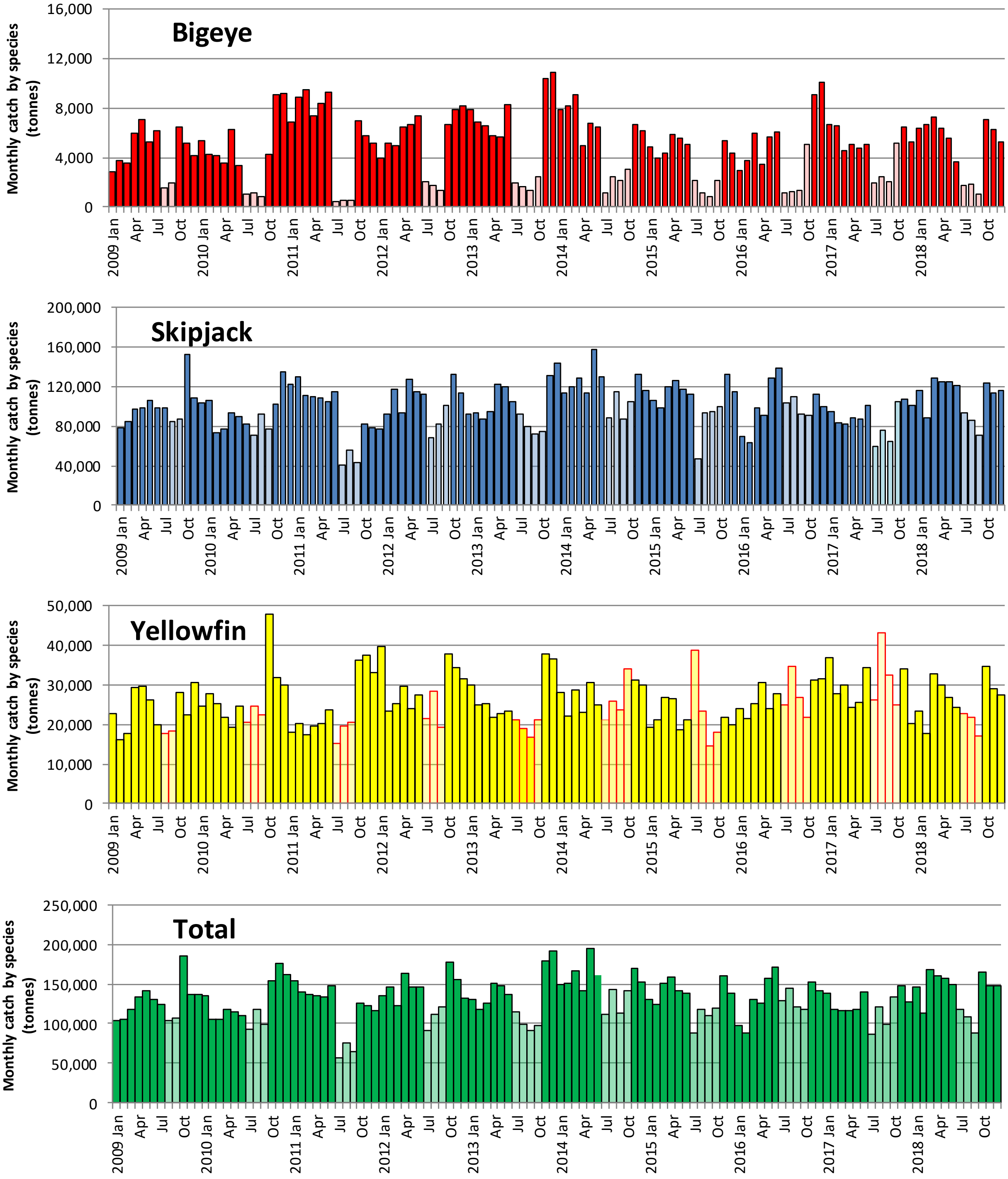


Figure A4. Number of associated (ASS) and unassociated (UNA) sets made in the WCPO tropical purse seine fishery, 2000 – 2018. Activities in the domestic purse seine fisheries of Indonesia and Philippines are excluded. Associated sets include animal-associated sets.



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.

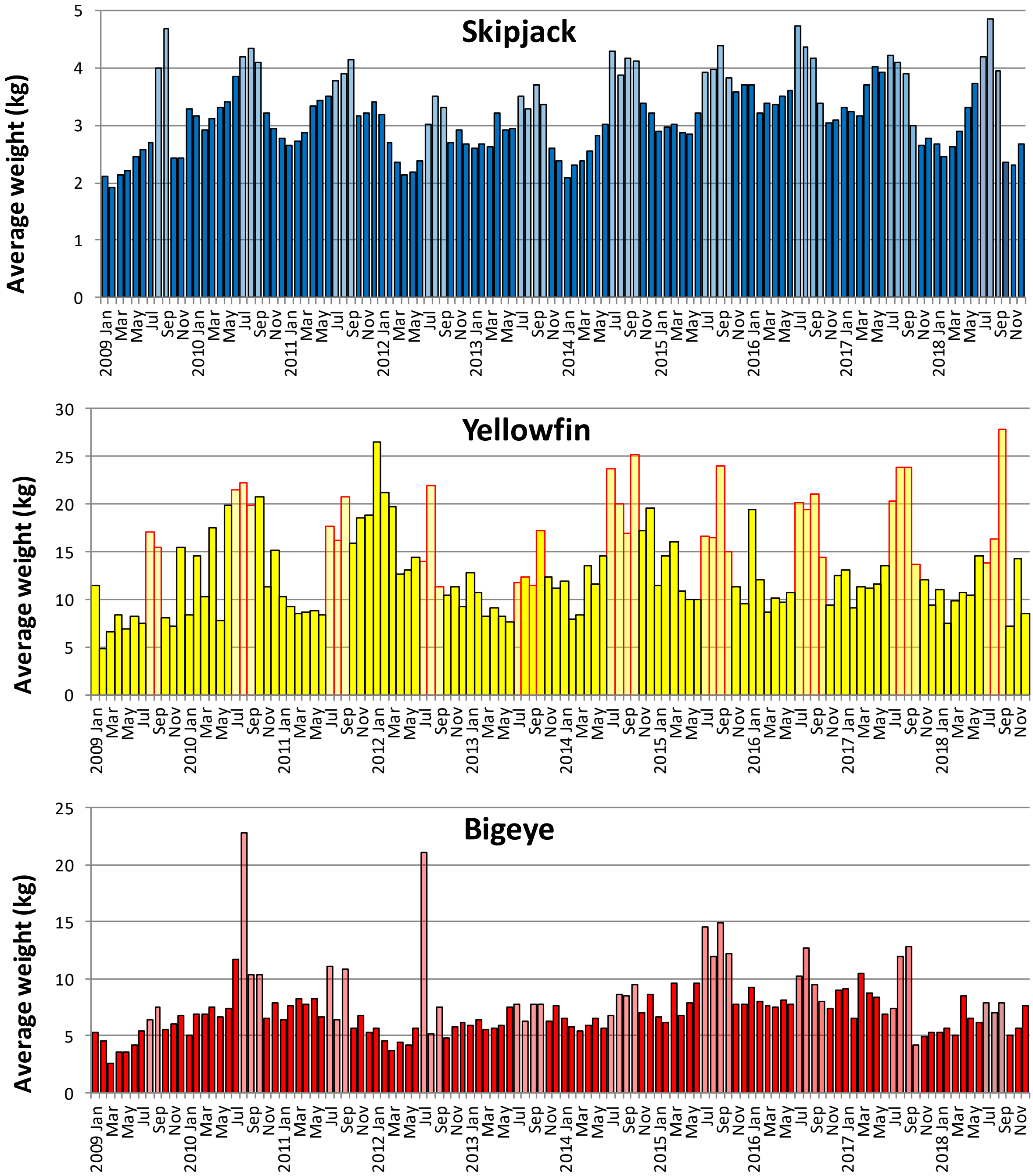


Figure A6. Monthly average weight of bigeye, skipjack and yellowfin tuna, estimated from observer sampling data, 2009-2018.

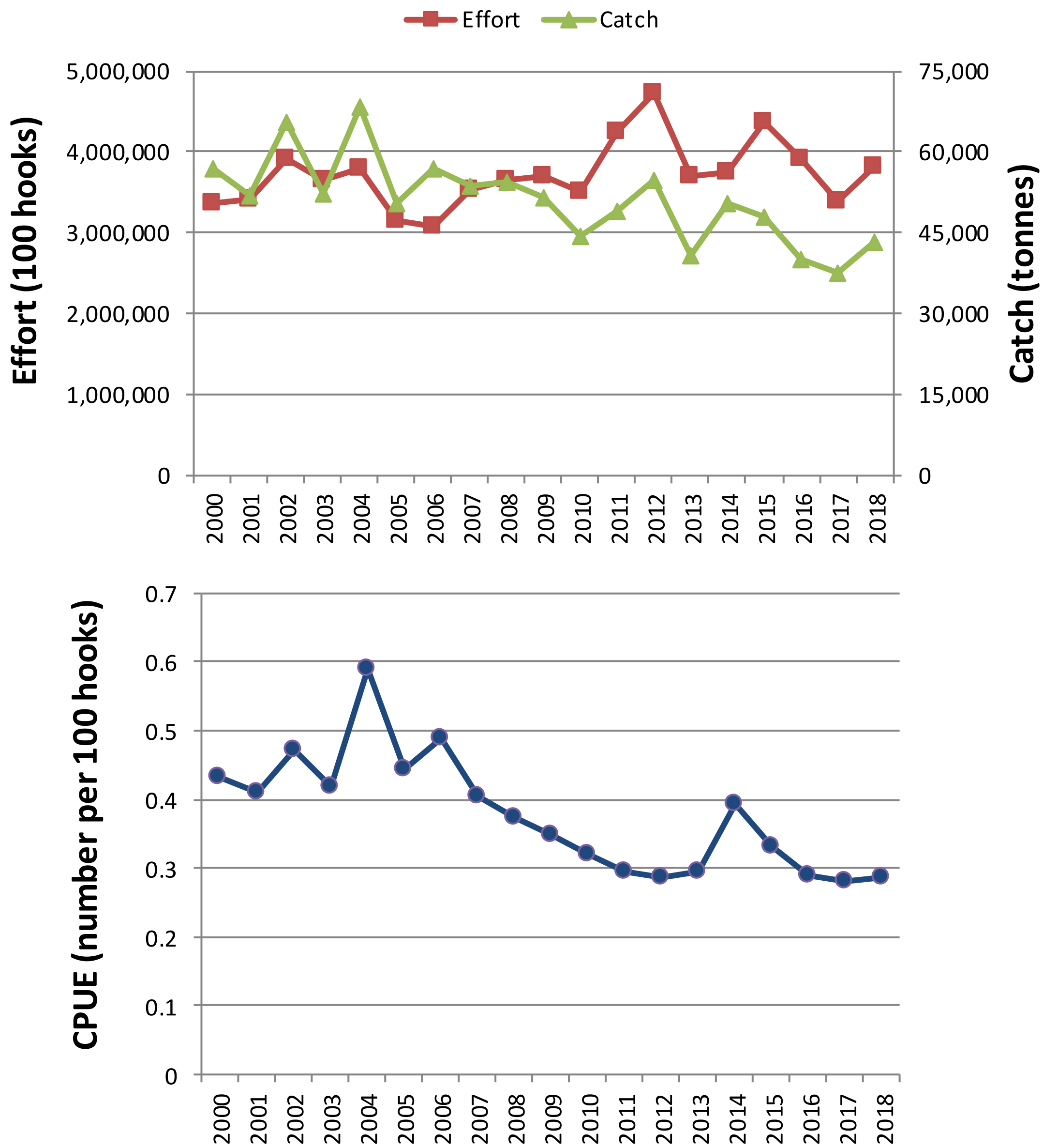


Figure A7. Estimates of longline effort and bigeye catch (upper panel) and bigeye nominal CPUE (lower panel) for the CORE area of the tropical WCPFC longline fishery (130°E - 150°W, 20°N - 10°S).
2018 data are provisional.

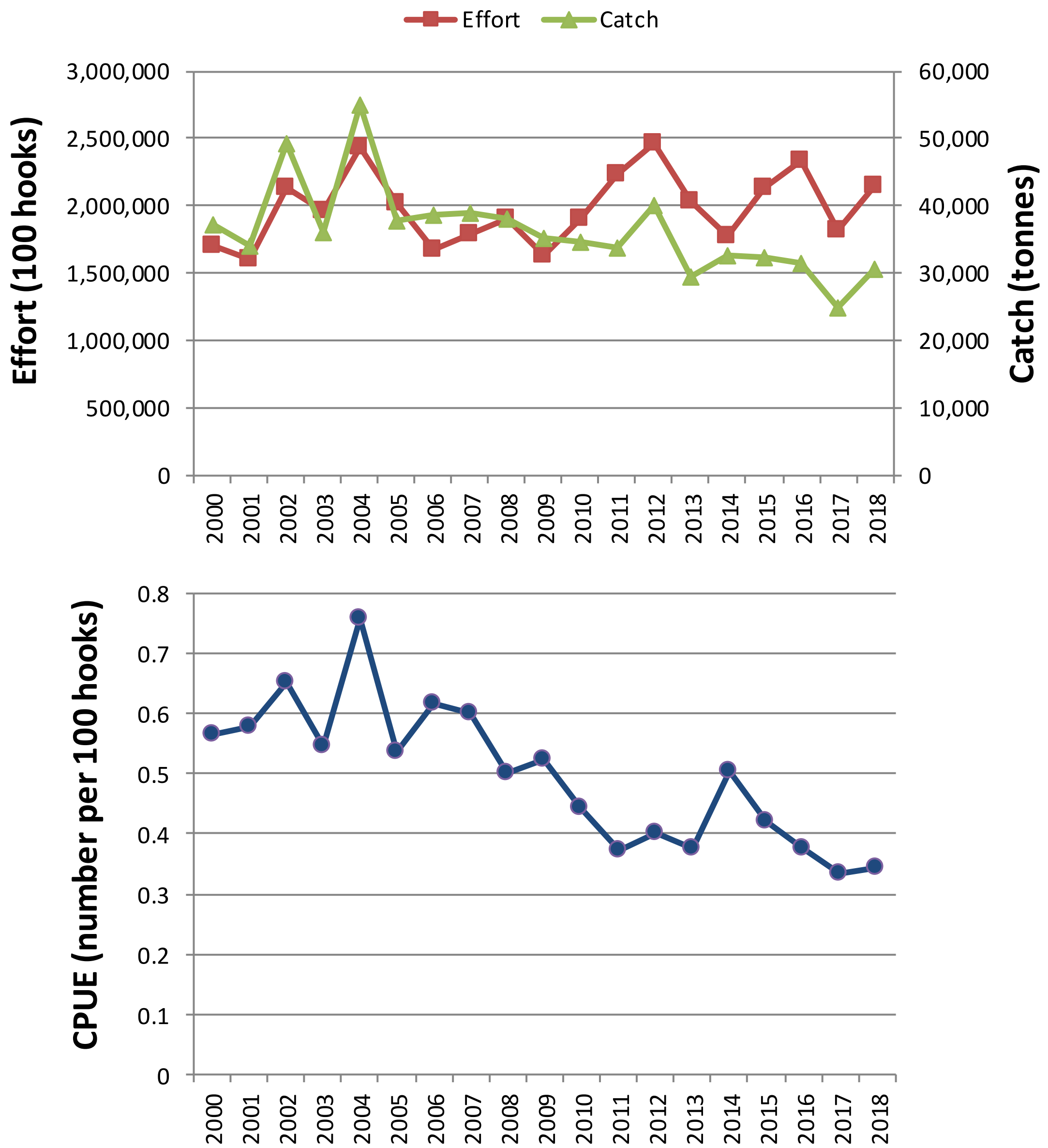


Figure A8. Estimates of longline effort and bigeye catch (upper panel) and bigeye nominal CPUE (lower panel) for the EASTERN area of the tropical WCPFC longline fishery (170°E - 150°W, 20°N - 10°S). 2018 data are provisional.

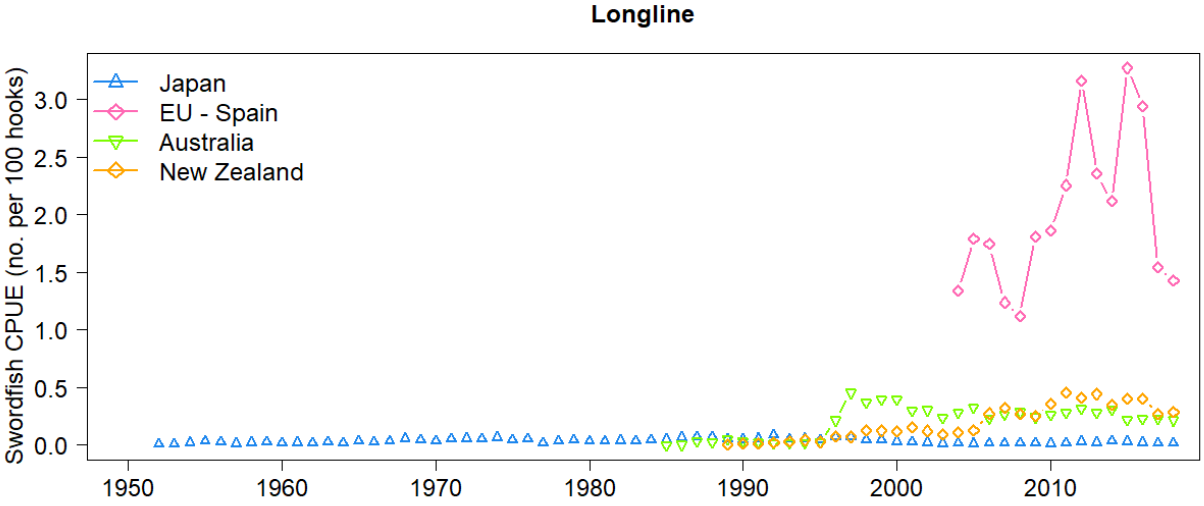


Figure A9. Trends in SWORDFISH nominal CPUE (number of fish per 100 hooks) over time for key LONGLINE fleets in the south Pacific Ocean.

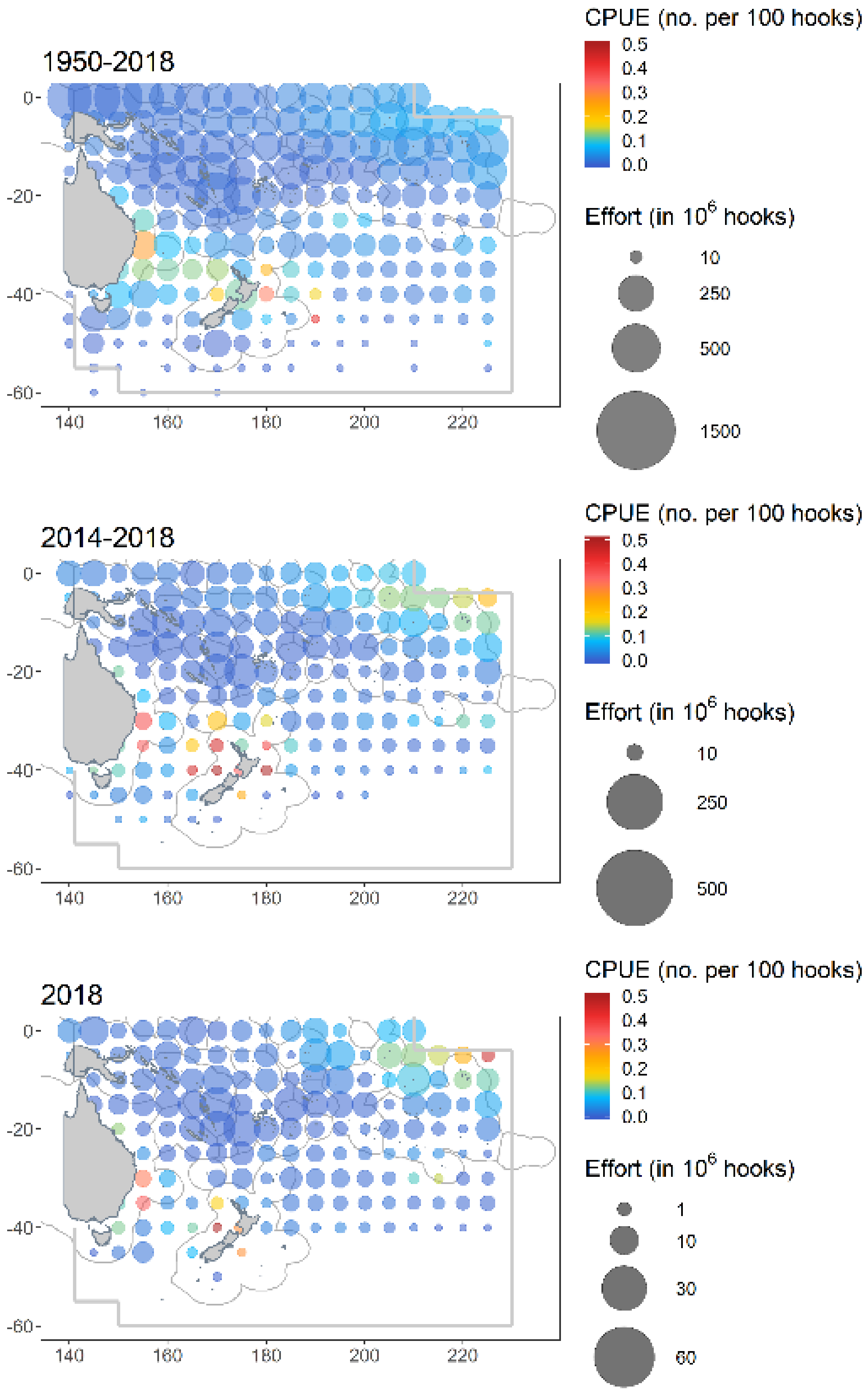


Figure A10. Distribution of South Pacific SWORDFISH longline CPUE and effort for the period 1950-2018 (top), 2014-2018 (middle) and 2018 (bottom).

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	265	52,497	38,281	691,962	76%	210,805	23%	8,107	1%	910,874	13,313	426,149	74%	108,494	19%	44,272	8%	578,916	51,595	1,118,112	319,299	52,379	1,489,790
2011	279	269	58,928	30,270	431,027	76%	131,697	23%	3,272	1%	565,997	21,946	626,259	74%	149,538	18%	66,422	8%	842,219	52,216	1,057,286	281,235	69,694	1,408,216
2012	285	283	55,128	36,612	630,621	74%	208,547	25%	8,629	1%	847,796	20,753	614,286	77%	133,365	17%	53,719	7%	801,371	57,365	1,244,907	341,912	62,348	1,649,167
2013	297	289	54,669	38,014	651,060	81%	149,171	18%	8,876	1%	809,106	17,889	563,246	73%	150,375	19%	60,804	8%	774,424	55,904	1,214,306	299,546	69,679	1,583,531
2014	308	302	54,310	38,802	755,017	79%	195,096	20%	9,970	1%	960,083	18,498	650,649	78%	127,968	15%	55,100	7%	833,717	57,300	1,405,666	323,064	65,070	1,793,800
2015	306	291	42,598	33,704	697,604	80%	169,017	19%	9,599	1%	876,220	13,739	563,651	81%	100,734	14%	36,162	5%	700,547	47,443	1,261,255	269,751	45,761	1,576,767
2016	293	259	43,914	31,839	653,587	75%	208,634	24%	10,239	1%	872,460	14,237	543,385	77%	114,603	16%	45,600	7%	703,587	46,076	1,196,972	323,237	55,839	1,576,048
2017	282	278	48,497	33,175	524,460	68%	238,561	31%	8,954	1%	771,975	17,370	523,914	76%	120,511	17%	47,143	7%	691,568	50,545	1,048,374	359,072	56,097	1,463,543
2018	272	257	45,600	33,085	630,958	76%	186,332	23%	9,174	1%	826,464	18,531	674,570	80%	120,528	14%	49,972	6%	845,070	51,616	1,305,528	306,860	59,146	1,671,533

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.