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TRENDS IN THE SOUTH PACIFIC ALBACORE LONGLINE AND TROLL FISHERIES

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Trends in the south Pacific albacore longline and troll fisheries

Abstract

This paper presents a compendium of fishery indicators for south Pacific albacore tuna, as requested at TCC11 this year. Documented indicators include: total catch; catch by gear; and longline effort and nominal longline CPUE trends, along with their spatial patterns. Commentary provided includes comparisons of 2014 values to 2013 and to the average over 2009-13. Information provided includes data loaded into databases as of 14th October 2015. Note that catch levels and their distribution amongst areas may change as more data become available.

Transshipment data are available over the period from the inception of transshipment reporting (July 2010) to date. Data presented represent high seas transshipments only; they do not include in port or in zone transshipments. Monthly reported transshipment levels fluctuate notably, and may reflect logistical/operational factors rather than fishing activity. There is a notable peak in transshipment activity in September 2014 (2,662 mt) of which just over 70% was reported by Vanuatu (1,896 mt). Three of the four highest monthly transshipment totals are found between September 2013 and January 2014, each over 1,900 mt and primarily reported by China, Chinese Taipei and Vanuatu. It should be noted that transshipment levels are unlikely to be fully reported for the most recent months.

Due to the complex interactions between the major species-specific fisheries, it is difficult to correctly interpret the stock status-related implications from the trends in any indicators in isolation of other data sets and a population dynamics model. Therefore we also summarise the stock status from the most recent assessment (2015) and include an analysis of the potential stock consequences of recent fishing patterns on the south Pacific albacore stock relative to the agreed biomass limit reference point, using stochastic stock projections and incorporating the recommendations on inclusion of uncertainty from WCPFC-SC9. Based upon the 2015 stock assessment, and the level of uncertainty included within the projection analysis, there is a 20% chance that the south Pacific albacore stock will fall below the Limit Reference Point by 2033 under recent fishing effort levels. Overall decreases in vulnerable biomass (a CPUE proxy) of 14% in longline fisheries are estimated.

Introduction

At TCC7, some members requested a paper on south Pacific albacore be prepared by the Western and Central Pacific Fisheries Commission (WCPFC) Secretariat. That request indicated the paper should contain all available catch and transshipment data available, and should highlight trends. The paper was first prepared by the Secretariat for WCPFC8 in March 2012. It has since been updated frequently (e.g. WCPFC10-2013-IP02), taking into consideration further requests from members. A further request for an update of the paper was made at TCC11 this year.

The current paper presents trends within the south Pacific albacore fishery in terms of catch, effort and Catch per Unit Effort (CPUE) both spatially and temporally. Available information on transshipment patterns are presented, consistent with WCPFC10-2013-IP02. Following the request for further information to assist in the interpretation of the key observations, and noting that it is difficult to correctly interpret the stock status-related implications of trends in any indicators in isolation of other data sets and a population dynamics model, the potential consequences of recent fishing levels for future south Pacific albacore stock status are evaluated using stochastic projections.

The analyses presented are based on data available to SPC as of 14th October 2015. The overall catch and its distribution amongst spatial areas may change as more data become available. Catches and Vessel Monitoring System (VMS) effort in archipelagic waters have been excluded from analyses for the southern WCPFC Convention Area (WCP-CA) specifically. Please note that the figures may include or exclude specific fleets that are included in summaries made for other purposes (e.g. CMM tables) and therefore the reported values (catch, effort, CPUE, etc) may not be identical to those presented in other documents. Additional information by latitudinal zone, requested at WCPFC9, are posted as excel files annexed to this paper (WCPFC12-2015-14a and WCPFC12-2015-14b). These data are for south of the equator. The information on vessel numbers excludes archipelagic waters.

Patterns of longline and troll fishing

Two groups of fleets exploit south Pacific albacore, i.e. longliners and troll fisheries. In this section we examine trends in their catch, effort and catch rate (CPUE). Catch and effort information come primarily from logsheet returns, or for the high seas from the provision of aggregate catch from distant water fishing nations.

Catch

Annual catch estimates for albacore in the south Pacific (south of the equator) as a whole peaked in 2010 at just under 89,000 mt (all gears). 2014 catches (at just over 82,000 mt) were the fifth highest on record (Figure 1). Catch by longliners represented 97% of the catch weight in 2014 at 79,163 mt. The 2014 longline catch was 3% lower than in 2013, but equal to the 2009-13 average. Provisional other catch (approximately 2,230 mt; the majority (1,960 mt) being by troll vessels) was 36% lower than 2013, and 25% lower than the 2009-13 average. Catches in the eastern south Pacific were relatively high compared to 2013.

By comparison, 2014 south Pacific albacore longline and troll catches within the southern part of the WCP-CA[1] specifically (excluding archipelagic waters; Tables 1 and 2) were lower than preceding years, with longline catches comparable to levels in 2011. The 2014 longline catch of south Pacific albacore within the Convention Area is currently estimated to be 58,839 mt, 16% down on the catch in 2013, and 14% lower than the average over 2009-2013. High seas longline catch estimates represent 36% of the total, and have ranged from 25-39% of the total over the last 10 years. By flag, China and Solomon Islands had the highest catch estimates of south

[1] Note that these annual catch estimate-based tables approximate the southern area of the WCP-CA as far as possible, given that some EEZs and high seas area span the equator.

Pacific albacore in 2014 (14,507 mt and 14,260 mt respectively, the combined total representing 49% of the total catch; Table A1.1). 38% of the catch by those flags was taken on the high seas (Table A1.2).

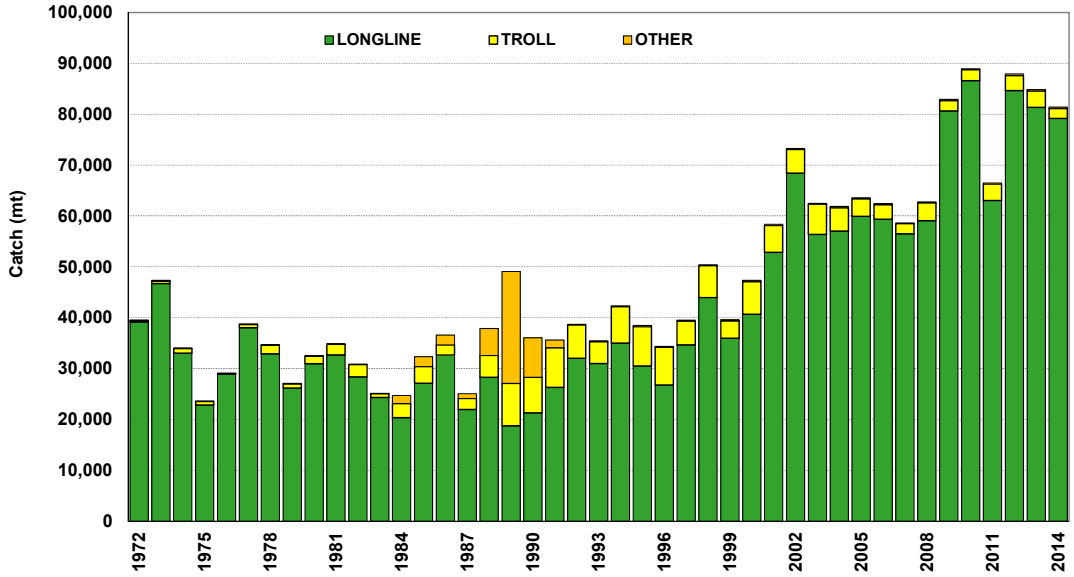

Figure 1. South Pacific albacore catch by gear (total south Pacific, incl archipelagic waters).

Four flag states reported troll catches during the period 2000 to 2014 within the WCP-CA, namely Canada, the Cook Islands, USA and New Zealand (Table A1.3). Troll activity has been reported only in the New Zealand EEZ and on the high seas (Table 2), totalling 2,221 mt in 2014, a 31% decrease over 2013 and an 18% decrease over the average 2009-2013. Catch estimates for 2014 were 284 mt for the high seas and 1,937 mt for the New Zealand EEZ.

The spatial pattern of south Pacific albacore catches over the long-term (1950-2014) and the last 5 years (2010-2014) is shown in Figure 2. In recent years, catches have been concentrated in the 10-20°S latitudinal band, with catches in the high seas in the 25-30°S latitudinal band and east of the French Polynesian EEZ remaining notable. Recent increases in catches (Figure 1) influence the historical pattern of spatial catch distribution, resulting in similar distributions.

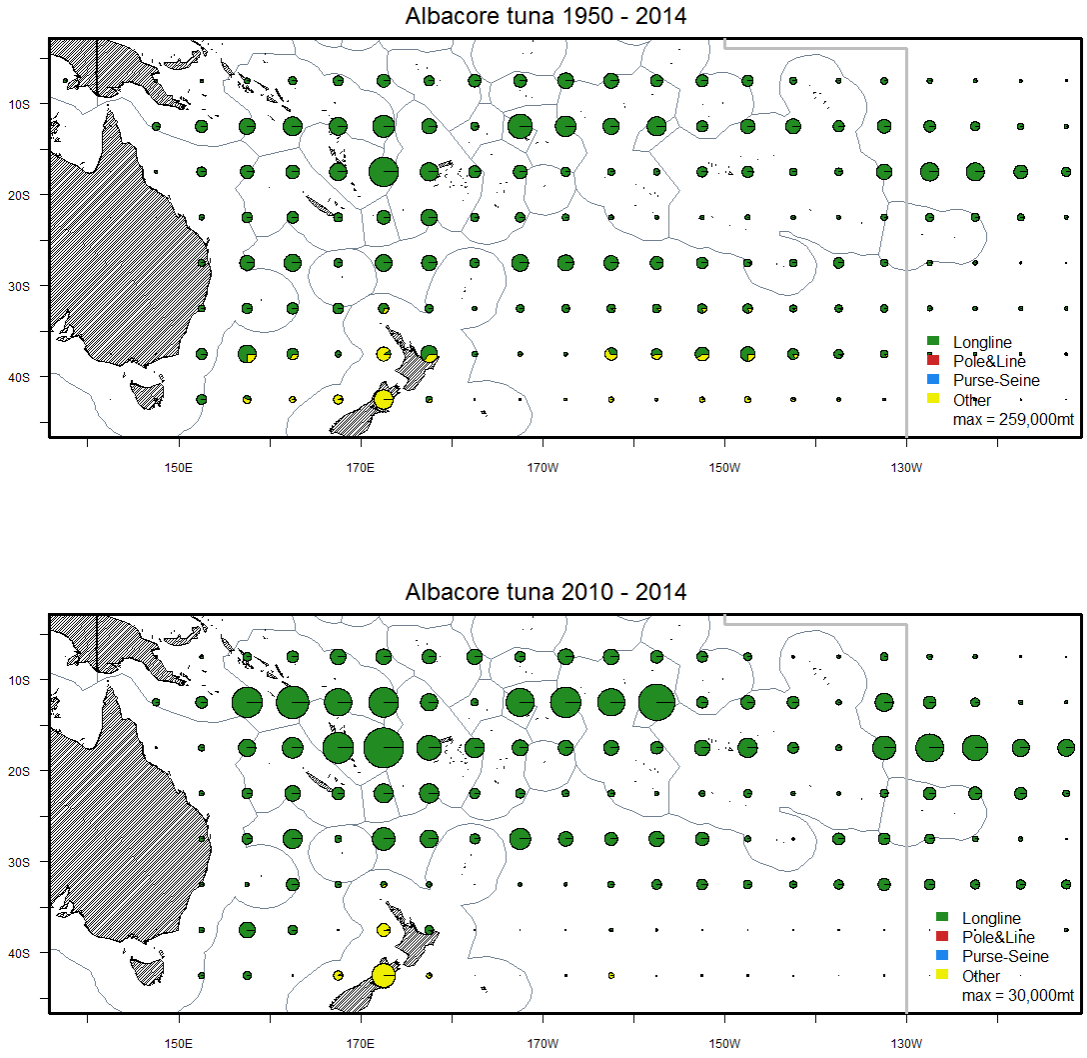

Figure 2. Albacore tuna catch distribution by gear type and 5x5 degree region in the south Pacific ocean for the period 1950-2014 (top) and 2010-2014 (bottom). Circle size represents catch volume with maximum circle size presented in the legends.

Table 1. Annual southern WCP-CA albacore longline catch estimates by EEZ and High Seas, 2000–2014.

Notes: Available operational and aggregate logsheet data raised to annual catch estimates. "EEZ" are approximate 200-mile boundaries; "High seas" is the high seas in the WCPFC Convention Area, south of the equator. Allocation of flag catch to EEZ is approximate due to the lack of operational logsheet data in some cases.

EEZ/High Seas	ANNUAL SOUTH PACIFIC ALBACORE LONGLINE CATCH ESTIMATES BY EEZ AND HIGH SEAS														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
American Samoa	626	3217	5353	3212	2019	2880	4078	4667	2963	3299	3125	2224	2596	1760	1277
Australia	359	554	505	391	587	622	2526	1867	1256	1471	706	627	529	592	515
Cook Islands		9	1112	1854	2172	2282	1954	3482	2491	5392	7302	6045	10703	6265	4897
Fiji	4382	7417	6327	4043	5999	5617	5609	3649	4376	5571	6004	4141	4225	3924	3447
High Seas	12640	21991	27876	25425	23546	21102	15371	12925	20687	27577	30547	17276	25272	22159	21356
Jarvis (USA)				53									0		0
Kiribati	271	744	775	709	838	238	301	677	386	1221	1331	562	1285	919	1630
Non-attributed non-high seas area	4	4	1	19	12	11	6	6	4	28	13	7	9		
New Caledonia	885	1015	1160	1087	1367	1579	1348	1312	1484	1611	1923	1732	1700	1712	1624
Niue			34			55	258	216	337	238	219			395	342
New Zealand	1334	2593	2522	2936	1246	602	496	277	382	422	460	418	266	302	311
French Polynesia	3463	4261	4555	3813	2210	2255	2849	3924	3064	3560	3482	3223	3590	3495	3743
Papua New Guinea	105	72	82	645	1529	2181	1790	1919	508	865	795	303	804	240	313
Solomon Islands	335	170	1097	953	2487	3955	8572	6793	8487	11537	9299	9750	10699	13258	8590
Tokelau									121			89	117	0	8
Tonga	858	1074	845	318	196	256	405	354	220	124	57	38	1611	3272	1384
Tuvalu	224	117	186	52	234	276	10	475	158	310	350	444	1018	1460	352
Vanuatu	2966	2882	2714	3020	4084	8361	10438	7035	6534	6248	3520	8249	4885	8325	8250
Wallis and Futuna						34						3			
Western Samoa	4067	4820	4205	2253	1233	1263	2113	3113	2342	2816	2529	1415	2037	1640	800
Total	32519	50940	59349	50783	49759	53569	58124	52691	55800	72290	71662	56546	71346	69718	58839

Table 2. Annual south Pacific albacore troll catch estimates by EEZ, 2000–2014.

Notes: Available operational and aggregate logsheet data raised to annual catch estimates. "EEZ" are approximate 200-mile boundaries (excluding archipelagic waters); "High seas" is the high seas in the WCPFC Convention Area, south of the equator.

EEZ/High Seas	ANNUAL SOUTH PACIFIC ALBACORE TROLL CATCH ESTIMATES BY EEZ AND HIGH SEAS														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
High Seas	3119	2515	1647	2262	1399	737	843	352	151	237	307	472	235	390	284
New Zealand	3336	2736	3012	3721	3212	2855	2043	1736	3352	1794	1832	2787	2727	2836	1937
Total	6455	5251	4659	5983	4611	3592	2886	2088	3503	2031	2139	3259	2962	3226	2221

Effort

It is challenging to identify the specific species being targeted by longline vessels, particularly within the aggregate data received from particular fleets fishing on the high seas. To more directly relate the patterns seen in effort to the declared south Pacific albacore catches, therefore, we have evaluated fishing effort south of 10°S to approximate south Pacific albacore targeting (noting that this will include longline effort targeting swordfish) and to attempt to exclude 'tropical' longline fishery effort.

Raised data for the southern WCP-CA south of 10°S (excluding archipelagic waters) were available up to 2014 (Figure 3). The number of deployed hooks in 2014 within the WCP-CA south of 10°S was 7% lower than in 2013, and 2% lower than the average over the last five years. However, overall longline effort, at 289 million hooks, was the fourth highest on record.

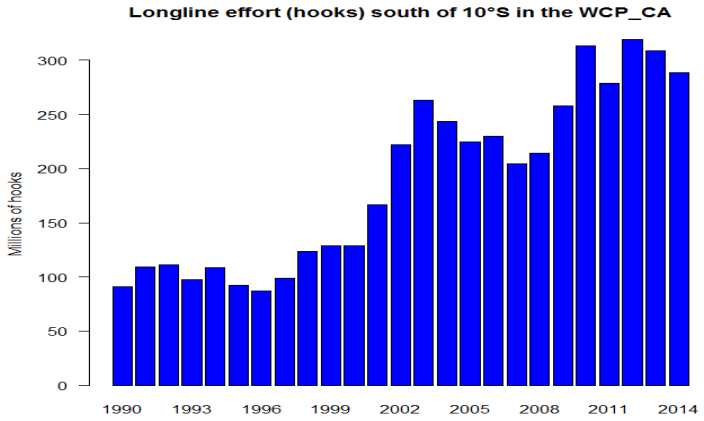

Figure 3. Temporal trends in effort (millions of hooks) in the southern longline fishery (WCP-CA south of 10°S; excluding effort in archipelagic waters).

Effort data from VMS provides the most 'up to date' information available, given that logsheet effort for recent years may be incomplete, thereby increasing the uncertainty in raised annual logsheet effort. VMS data analysed represents days at sea and includes fishing and transit activity, but excludes data close to port. As for the aggregate longline data, it does not allow information on the species targeted by vessels during fishing to be assessed. In turn, some trends over time may be influenced by increased coverage of VMS across longline vessels in the south Pacific, while data for certain EEZs may be incomplete or non-existent. A list of notes on the VMS data and a table of effort by high seas area are provided in Appendix 2. To overcome the absence of VMS data for some EEZs, data were augmented with logsheet information in these locations.

Effort south of 10°S grouped by EEZ and high seas suggests effort (VMS days at sea, augmented by logsheet days) within both EEZs and high seas has increased across the period 2009-2014, although overall effort in 2014 was the lowest since 2010. Total effort decreased by 18% from 2013 to 2014. The decrease appeared to have occurred primarily within EEZs (a 20% decrease from 2013) compared to the high seas (13% decrease). As a result, the proportion of overall effort continued to increase in the high seas over time, with over 30% of the VMS days occurring within the high seas in 2014 (Table 3). Between 44% and 88% of the international waters VMS

effort has been within the regions east of the Line Islands and French Polynesia, and the region north and northeast of New Zealand (Figure 4, Table A2.1).

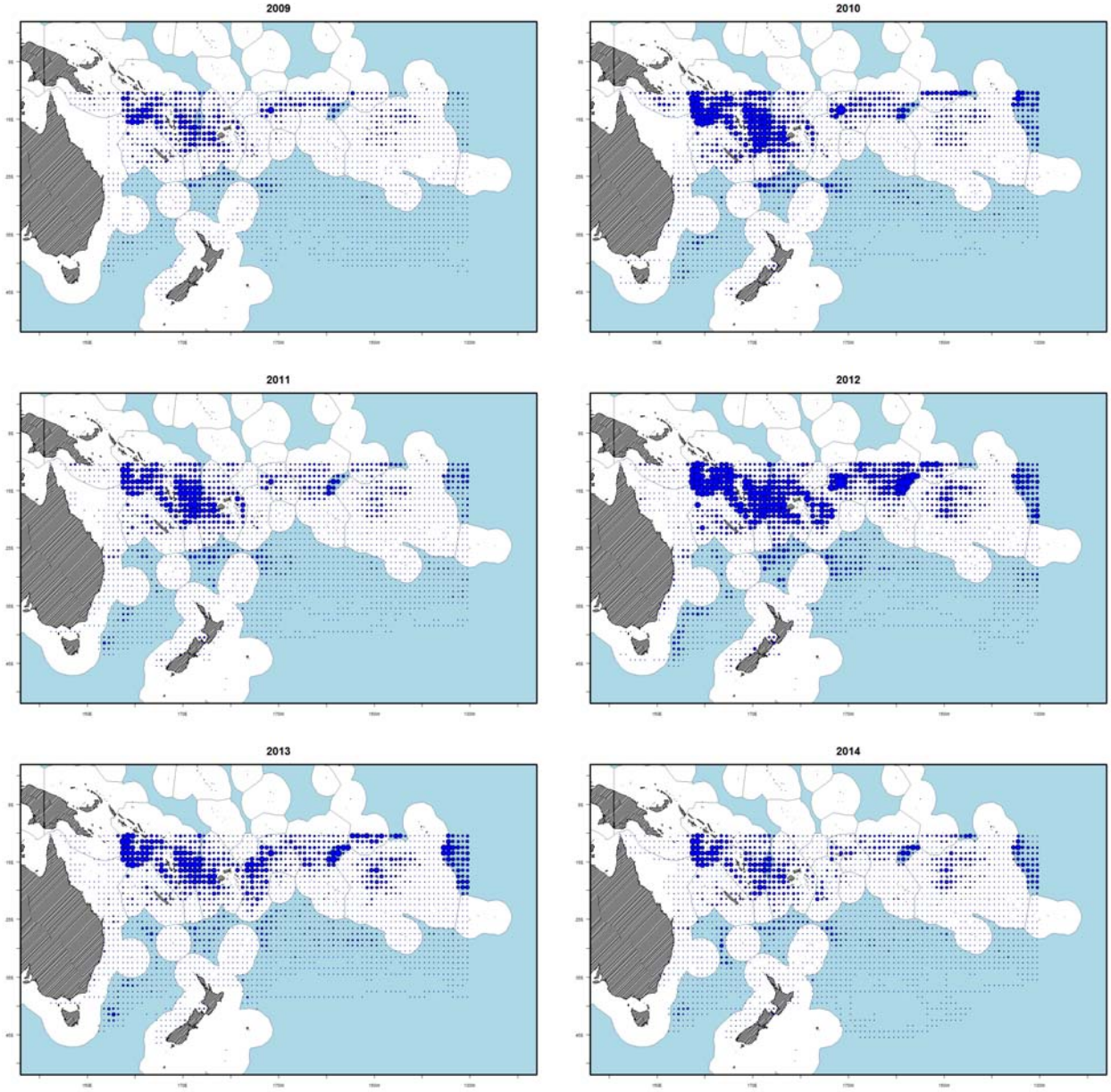

Figure 4. Longline VMS days at sea (augmented by logsheets) within the southern WCP-CA at 1°x1° (excluding archipelagic waters), south of 10°S. Maximum circle size = 1,383 days.

Table 3. Total VMS days at sea (augmented by logsheet information) by year and geographic area in the WCP-CA south of 10°S (excluding effort in archipelagic waters).

	2009	2010	2011	2012	2013	2014
EEZs	59,583	72,322	75,119	80,461	84,309	67,212
International waters (IW)	12,796	22,026	24,566	25,088	33,407	28,934
Total	72,379	94,348	99,685	105,549	117,716	96,146
% EEZs	82.3	76.7	75.4	76.2	71.6	69.9
% High Seas	17.7	23.3	24.6	23.8	28.4	30.1

Catch per unit effort

Figure 5 presents nominal longline south Pacific albacore CPUE series from key distant water fleets:

- Japanese longline CPUE in 2014 (1.44 fish per 100 hooks) was a 22% increase on 2013 and a 53% increase on 2009-13 average;
- Korean longline CPUE in 2014 (0.10 fish per 100 hooks) was a 38% decrease on 2013 and a 55% decrease on 2009-13 average;
- Chinese longline CPUE in 2014 (0.96 fish per 100 hooks) was a 13% decrease on both 2013 and on 2009-13 average;
- Chinese Taipei longline CPUE in 2014 (1.08 fish per 100 hooks) was a 3% increase on 2013 and an 11% increase on 2009-13 average.

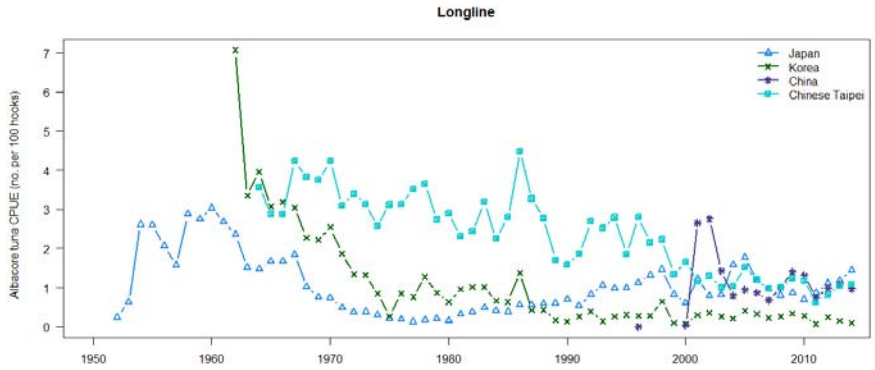

Figure 5. Trends in the nominal CPUE (number of fish per 100 hooks) over time for key distant water fleets in the south Pacific Ocean.

Examining longer term trends, the nominal CPUE for the Korean fleet has declined by 35% from the 1991-2000 average, while that for the Chinese Taipei fleet has declined by 51%. In contrast, that for the Japanese fleet has increased by 49% (from a low baseline level).

The relative spatial pattern of CPUE is presented in Figure 6 for two time periods. In the period 1985-1999, catch rates were relatively high across much of the southern WCP-CA, in particular

within high seas areas and the EEZs of New Caledonia, Vanuatu and Tonga. Catch rates in the recent period (2000-2014) are generally lower across the region, with northern Tonga, American Samoa and the Cook Islands latitudinal band of 15°S, as well as some high seas areas of lower effort, showing relatively high catch rates for that period. It is notable that increases in effort within particular 5°x5° squares are generally matched by declines in CPUE.

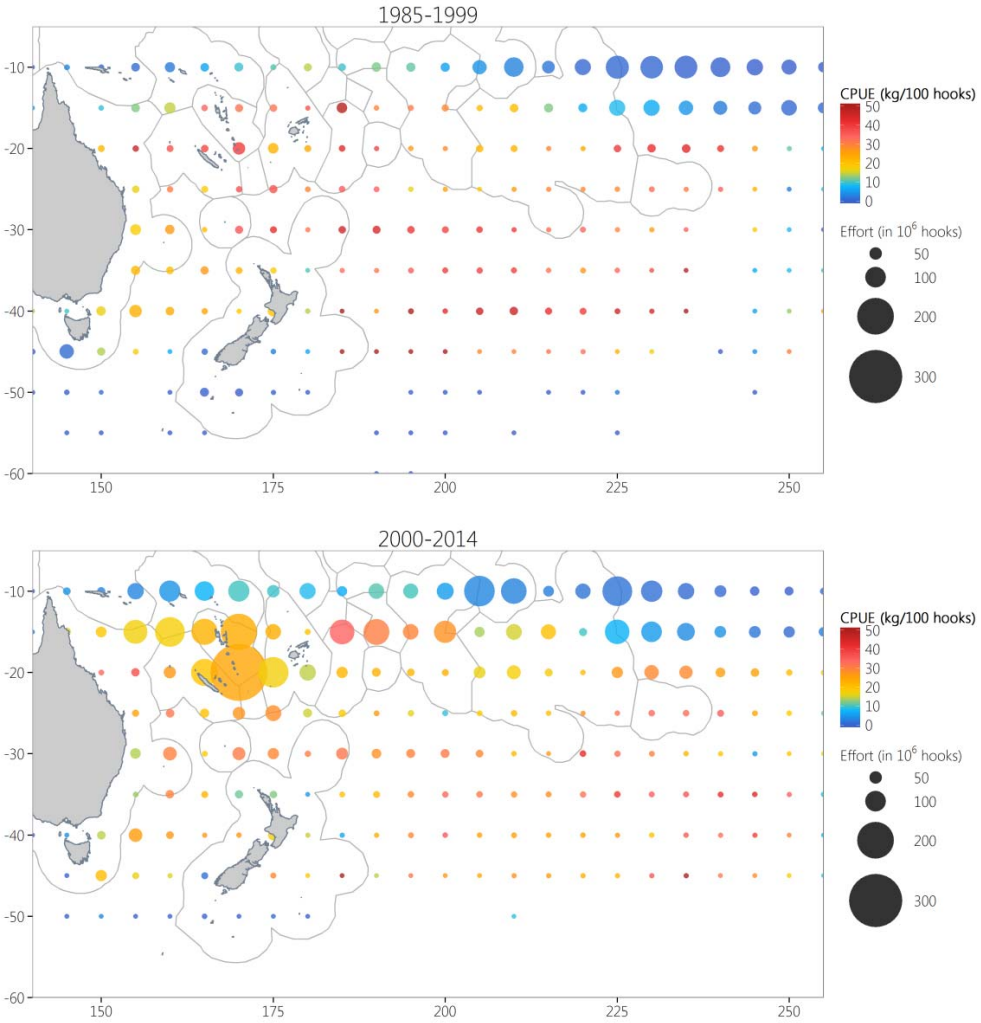

Figure 6. Albacore tuna longline CPUE distribution for the period 1985-1999 (top) and 2000-2014 (bottom). CPUE (kg/100 hooks) for a given 5°x5° square is indicated by the colour of the circle, while the relative size of the circle give an indication of the underlying effort over the period (millions of hooks).

Transshipment information

High seas transshipment data are available from July 2010 to August 2015 (Figure 7); no in port or in zone transshipment data are presented. Fluctuations in reported transshipments may reflect logistical/operational factors rather than fishing activity. It is noted that historically south Pacific albacore would have been offloaded directly to canneries (e.g. Pago Pago, American Samoa, or Levuka, Fiji) rather than being transshipped on the high seas. There is a notable peak in

transshipment activity in September 2014 (2,662 mt) of which just over 70% was reported by Vanuatu (1,896 mt). Three of the four highest monthly transshipment totals are found between September 2013 and January 2014, each over 1,900 mt and primarily reported by China, Chinese Taipei and Vanuatu. Total reported transshipments on the high seas declined in 2012 (Table 4), despite relatively high transshipment levels in July of that year. Further transshipment information by flag and month is presented in Appendix 3. It should be noted that transshipment levels are unlikely to be fully reported for the most recent months. Transshipment data for 2010 and 2011 should also be considered preliminary and subject to change.

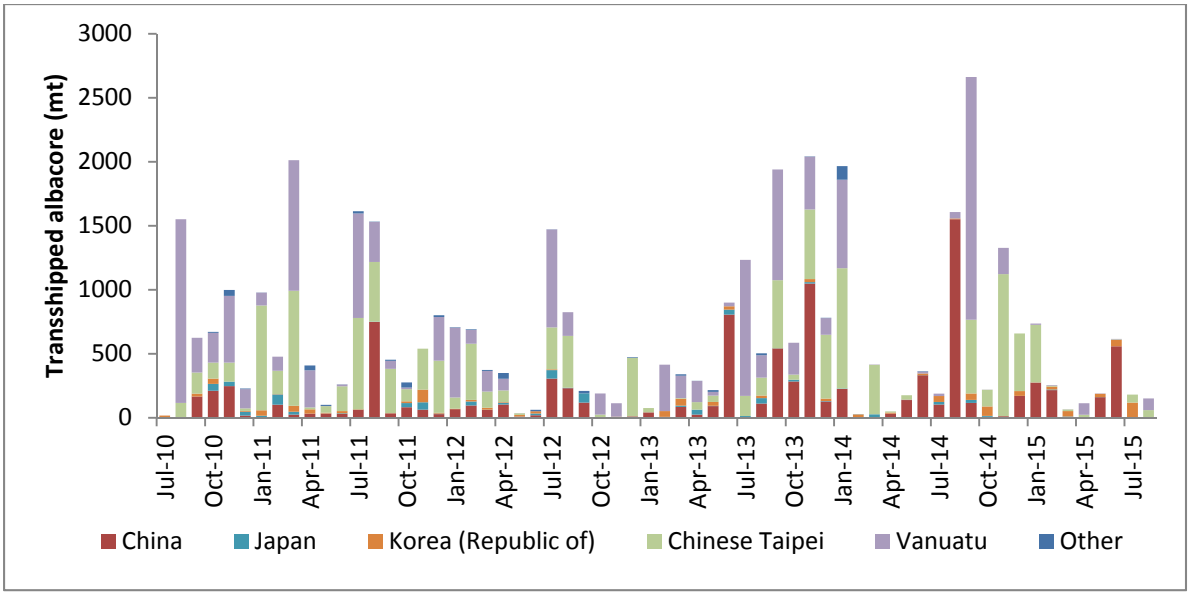

Figure 7. Reported transshipment (mt) by flag and month (July 2010 to August 2015). Source: WCPFC Transshipment Events Database (5 November 2015). 'Other' includes Belize, Indonesia, Philippines and Solomon Islands.

Table 4. Annual total and monthly average transshipment in mt (July 2010 to August 2015).

Year	Annual total	Monthly average
2010*	4,091	682
2011	9,454	788
2012	5,502	458
2013	9,321	777
2014	9,658	805
2015**	2,309	289

* 01 July to 31 December data only.
** 01 January to 31 August data only.

Albacore stock status

The last assessment for South Pacific albacore was performed in 2015 (Harley et al., 2015) and estimated the stock status averaged over the period 2009-2012 ('current') and 2013 ('latest'), relative to agreed reference points. This assessment contained significant improvements to the previous (2012) assessment including: improvements to the MULTIFAN-CL modelling framework, a regional disaggregated spatial structure, access to operational data for construction of CPUE indices and regional weights, age-length data to improve growth estimation, and additional tagging data. Further, the regional structure of the model was changed to cover the southern Convention area only, and therefore was better aligned with the other tuna assessments. Natural mortality was set at 0.3 in the reference case for consistency with the value used in assessments performed in other RFMOs.

SC11 provided advice to the Commission based upon the 'reference case' assessment model, and characterised uncertainty based upon 18 model runs describing dynamics under different levels of natural mortality, stock recruitment relationship steepness, and weighting of the input length data. Estimates are presented in Table 5, and the Majuro plot in Figure 8.

Table 5: Estimates of reference points and stock status from the last (2015) south Pacific albacore tuna stock assessments (southern WCPFC region only), based upon the single reference case run, and the 18 runs used to capture uncertainty (5th percentile, median and 95th percentile).

Management Quantity	2015 reference case	5%	Grid Median	95%
MSY (mt)	76,800	62,260	84,980	129,814
$SB_{latest}/SB_{F=0}$	0.40	0.30	0.44	0.60
$F_{current}/F_{MSY}$	0.39	0.13	0.34	0.62
SB_{latest}/SB_{MSY}	2.86	1.74	3.20	7.03
SB_{MSY}	57,430	35,762	59,180	90,778
$SB_{F=0}$	408,361	392,358	442,163	486,146

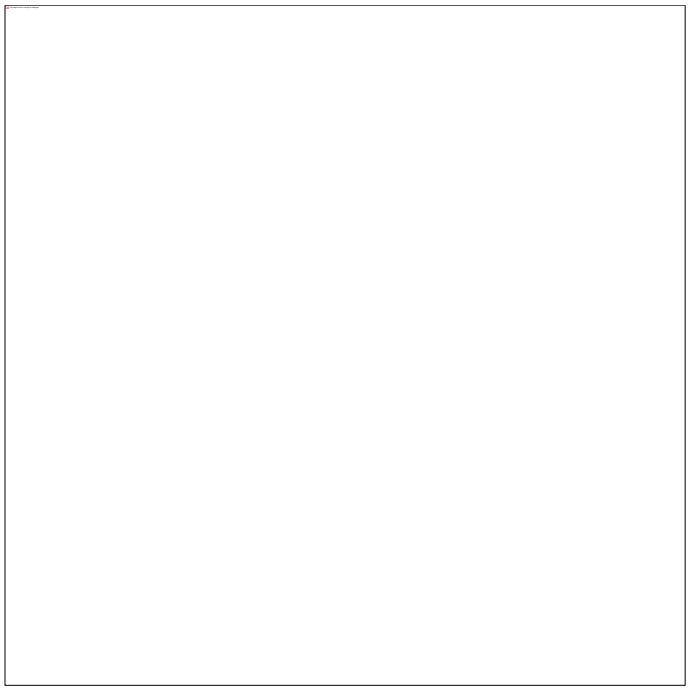

Figure 8: Temporal trend for the reference case model in stock status relative to $SB_{F=0}$ (x-axis) and F_{MSY} (y-axis). The red zone represents spawning potential levels lower than the agreed LRP which is marked with the solid black line ($0.2SB_{F=0}$). The orange region is for fishing mortality greater than F_{MSY} ($F=F_{MSY}$; marked with the black dashed line). The pink circle is $SB_{2013}/SB_{F=0}$ (where $SB_{F=0}$ was the average over the period 2003-2012).

As noted in previous Indicators papers (e.g. Harley and Williams, 2013), it is difficult to correctly interpret the stock status-related implications of trends in any indicators in isolation of other data sets and a population dynamics model.

To examine the potential consequences of recent fishing levels relative to the agreed biomass limit reference point for south Pacific albacore ($20\%SB_{2003\text{-}2012,\ F=0}$), stochastic 20-year effort-based projections were performed under different assumptions of population dynamics (defined by nine stock assessment runs from the 2015 Multifan-CL stock assessment, a subset of those selected by SC11 to present key uncertainties within SC11 advice and capturing uncertainty in stock recruitment steepness and natural mortality), and future conditions (variability in future recruitment around the stock-recruitment relationship), consistent with the recommendations on inclusion of uncertainty within projections from WCPFC-SC9 and in Berger et al. (2013).

Future southern longline and troll fisheries effort was modelled at levels equal to those seen in 2013 (status quo). Potential future adult (spawning) biomass levels relative to unfished levels were examined, and the probability that the south Pacific albacore stock may fall below the biomass Limit Reference Point was calculated (Figure 9).

Across the nine stock assessment models used within the analysis, the average stock status in 2013 (the last year of the assessment) was $SB/SB_{F=0} = 0.41$. Under recent relatively high fishing effort, the stock is predicted to continue to decline on average, falling to $SB/SB_{F=0} = 0.32$ in

2033. At this level, the risk of falling below the LRP is 20% (a 1 in 5 chance). Furthermore, the CPUE is estimated to decline by 14% from 2013 levels. Effort needed to be reduced by approximately 35% compared to 2013 levels in order to maintain the stock and catch rates at levels estimated for 2013.

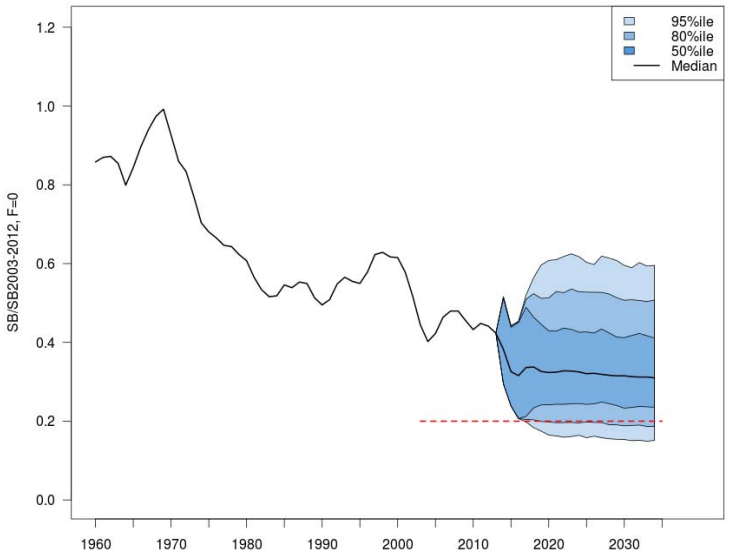

Figure 9. Stochastic projections of adult stock status under 2013 longline and troll effort levels. The limit reference point (20% $SB_{F=0}$) is indicated by horizontal dashed red line. Note: uncertainty from 1960 up to 2013 inclusive represents structural uncertainty only (median across the 9 assessment model runs presented for that period); uncertainty after 2013 represents both structural uncertainty and stochastic recruitment (1800 simulation runs).

Please note that analyses related to the bio-economics of the southern longline fishery and potential target reference points, along with further details of the approach used within the status quo projections presented above, are provided in the paper to the (MOW4) Harvest Strategy Workshop 2015.

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Appendix 1. Summaries of south Pacific albacore longline and troll catch, by flag/geographic region.

Table A1.1. Annual southern WCP-CA albacore longline catch estimates by Vessel Nation, 2000–2014.
Notes: Available operational and aggregate logsheet data raised to annual catch estimates (ACE). Differences in annual totals between this table and Table 1 result from rounding errors. Southern WCP-CA approximated - some EEZ and high seas areas span the equator.

Flag	ANNUAL SOUTH PACIFIC ALBACORE LONGLINE CATCH ESTIMATES BY FLAG														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Australia	381	591	553	490	667	743	2591	1925	1277	1523	745	653	572	647	579
Belize	191	4050	1472	885	353	7	0	164	7	26	10	105	32		
Cook Islands		2	490	1358	1869	2371	2223	2644	2224	1551	2423	2182	2757	1354	1276
China	2030	2495	2704	6002	5828	4026	7104	5415	15046	20080	12916	11848	24531	23845	14507
EU (Spain)					2	2	0	0	33	35	6	3	2	2	1
Fiji	5429	7269	7298	6318	10918	11065	11455	6943	9279	12099	8614	9973	9393	8694	7076
Federated States of Micronesia	0	0		0	0	0	0	0	0	0	1	1	169	667	344
Japan	2255	3358	2649	3144	4004	4649	3327	3082	2371	2825	2477	2176	2046	1818	1193
Kiribati	0	0		0	0						66	247	349	40	7
Korea	591	1729	2854	1394	746	2167	798	1082	1143	1201	970	450	898	762	661
New Caledonia	895	1020	1165	1111	1468	1590	1358	1324	1506	1649	1939	1736	1715	1714	1630
Niue						55	213	216	337	154	97				
New Zealand	1344	2614	2545	2971	1248	602	496	357	382	422	460	418	266	302	311
French Polynesia	3473	4261	4557	3846	2218	2426	2918	3957	3068	3560	3483	3225	3594	3512	3744
Papua New Guinea	105	72	82	645	1529	2181	1741	1556	437	807	791	245	693	234	305
EU (Portugal)												4	1	67	1
Solomon Islands	224	54	121	95	207	0					7712	895	0	0	14260
Tonga	862	1268	1189	611	182	283	414	390	220	124	57	34	20	13	25
Tuvalu												184	435	92	78
Chinese Taipei	9598	12821	16065	12240	8427	9261	9124	8973	7602	11551	13084	13337	11769	13600	7007
United States of America	1075	3861	6105	4234	2623	3058	4146	5298	3687	3937	4079	2750	3344	2187	1556
Vanuatu		655	5276	3186	6237	7820	8103	6250	4840	7930	9205	4661	6724	8527	3477
Wallis and Futuna												3			
Western Samoa	4067	4820	4223	2253	1233	1263	2113	3113	2342	2816	2529	1415	2038	1642	800
Total	32520	50940	59348	50783	49759	53569	58124	52689	55801	72290	71664	56545	71348	69719	58838

Table A1.2. Annual south Pacific albacore longline catch estimates by EEZ and Vessel Nation, 2000–2014.

Notes: Available operational and aggregate logsheet data raised to annual catch estimates. "EEZ" are approximate 200-mile boundaries; "High seas" is the high seas in the WCPFC Convention Area, south of the equator. Allocation of flag catch to EEZ may be approximate due to the lack of operational logsheet data in some cases.

EEZ/high seas	Flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
American Samoa	US	626	3217	5353	3212	2019	2880	4078	4667	2963	3299	3125	2224	2596	1760	1277
Australia	AU	359	554	505	391	587	622	2526	1867	1256	1471	706	627	529	592	515
Cook Islands	BZ				70											
	CK		2	490	1344	1866	2266	1954	2327	1918	1363	2207	2178	2724	1207	1226
	CN												148	2970	2223	3186
	FJ											117	378	321	78	0
	FM													156	653	321
	KI											31	224	246	29	0
	PF				14											
	CT			6	0	0		0	851	204	1775	2802	625	695	0	
	US		7	598	411	297	16		304	370	476	665	335	342	249	152
	VU				15	9					1778	1480	2157	3250	1826	11
	WS			18												
Fiji	CK						15									
	CN			77	82	212	353	288	215	149	376	409	301	429	304	198
	FJ	4118	6557	5526	3704	5699	5242	5313	3343	4213	5187	5532	3718	3794	3220	3246
	KR		0									11	69		38	
	NZ								80							
	CT	264	672	419	138	54	5	3	10	11	8	0	12	0	6	3
	VU		187	304	119	33	1	5	0	2		52	42	1	356	

EEZ/high seas	Flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
High Seas	AU	22	37	48	99	80	121	65	58	21	52	39	26	43	55	64
	BZ	31	2800	1472	805	2	7	0	19	0	2					
	CK			0	14	3	6	84	168	180	30	61	4	24	25	2
	CN	2028	2413	2464	5544	5170	2026	3146	2875	12390	14955	11554	7390	16131	12077	5252
	ES					2	2	0	0	33	35	6	3	2	2	1
	FJ	362	213	715	1341	2134	2198	2147	1069	1368	2137	1320	2488	2557	1884	1957
	FM	0	0		0	0	0	0	0	0	0	1	1	13	14	23
	JP	2069	3169	2462	2905	3977	4528	1881	1654	1382	1564	943	1656	1145	1247	1128
	KI				0							35	0	17	3	1
	KR	284	1069	1834	1095	441	1786	300	407	410	521	475	243	421	430	177
	NC	8	1	4	23	94	10	8	12	22	38	16	4	14	2	6
	NU							2								
	NZ	10	21	23	35	2	0	0	0	0	0	0	0		0	0
	PF	36		2	20	8	138	69	33	4		1	2	4	17	1
	PT												4	1	67	1
	SB	3	0		1	1						3051	150	0	0	5725
	TO	4	194	344	293	3	27	9	36						0	1
	CT	7335	11162	14301	11137	6518	4486	2549	2184	1398	2932	6185	3615	2438	3354	3745
	US	449	636	154	557	308	162	68	328	266	163	289	192	404	178	128
	VU		276	4053	1557	4803	5605	5043	4081	3213	5149	6571	1498	2057	2803	3145
	WS													1	2	1
Jarvis	US				53									0		0
Kiribati	BZ					351								32		
	CN	2	82		48	9	0	0	0	1	157	398	208	292	223	266
	FJ												16	40	29	154
	JP	43	84	53	40	27	11	2		9	38	19	13	45	8	9
	KI	0	0		0	0							23	46	3	1
	KR	225	578	699	262	240	135	134	190	140	262	378	98	348	185	349
	CT	1	0	22	129	116	28	14	267	111	292	51	152	406	428	620
	US	0	1													
	VU				229	96	65	151	219	126	472	485	51	76	44	231
New Caledonia	NC	885	1015	1160	1087	1367	1579	1348	1312	1484	1611	1923	1732	1700	1712	1624

EEZ/high seas	Flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Niue	CK							46			84	122			101	48
	FJ														293	276
	NU						55	211	216	337	154	97				
	CT			34			0									18
Non-attributed non-high seas area	FJ	2			17	5	9	4	4	4	14	13	7	8		
	NC	2	4	1	1	7	0	2						1		
	VU				1		2	0	2	0	14		0			
New Zealand	NZ	1334	2593	2522	2936	1246	602	496	277	382	422	460	418	266	302	311
French Polynesia	KR	27	0													
	PF	3437	4261	4555	3813	2210	2255	2849	3924	3064	3560	3482	3223	3590	3495	3743
Papua New Guinea	PG	105	72	82	645	1529	2181	1741	1556	437	807	791	245	693	234	305
	CT							49	363	71	58	4	59	110	6	8
Solomon Islands	BZ				10	0			145	7	24	10	105			
	CK							66		12	16			5	21	
	CN			17	102	164	439	1475	975	1315	2378	97	1079	1763	3075	
	FJ	9	2	171	58	437	284	785	614	1346	2660	336	1234	1349	1818	
	JP	103	69	133	196		110	1437	1428	980	1223	1471	506	855	563	55
	KI														5	
	KR		0	76	16	24	83	337	313	463	299	18	36	111	87	
	SB	221	54	121	94	206	0					4661	744	0	0	8535
	CT	2	44	272	170	898	2407	3325	2631	3794	4618	2635	5814	5714	5602	
	VU			307	307	757	632	1148	687	571	318	72	231	901	2086	
Tokelau	CK									33						
	FJ												72	91		2
	KI													26	0	5
	CT												17			
	US									88						
	VU															1
Tonga	CN													11	194	106
	FJ					17								29	120	0
	TO	858	1074	845	318	179	256	405	354	220	124	57	34	20	13	24
	CT												4	1551	2945	1254

EEZ/high seas	Flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tuvalu	CK								72	20	54	23		3		
	CN								1			0	77	0		
	FJ				30	189	99	1	147	14	121	179	150	496	182	134
	JP	41	36	2	3	0		0				43		0		
	KI													14		0
	KR	55	82	184	18	41	162	6	171	123	119	88	4	18	22	135
	TV												184	435	92	78
	CT	128	0		0	4	15	0		1		12	5	0	88	5
	US													1		
	VU							2	85		16	6	24	50	1076	0
Vanuatu	BZ	160	1251													
	CK						84	73	78	62	3	11				
	CN			146	226	273	1208	2196	1350	1192	2214	458	2644	2935	5748	5500
	FJ	937	497	885	1168	2436	3233	3204	1767	2333	1980	1116	1911	708	1070	1306
	JP							7								
	KR			62	4			21		7						
	CT	1869	943	1010	665	837	2321	3183	2667	2012	1868	1395	3034	855	1170	1355
	VU		192	612	958	537	1515	1754	1175	928	182	541	659	388	336	89
Wallis et Futuna	PF						34									
	WF												3			
Western Samoa	WS	4067	4820	4205	2253	1233	1263	2113	3113	2342	2816	2529	1415	2037	1640	800

Table A1.3. Annual south Pacific albacore troll catch estimates by flag, 2000–2014.

Flag	ANNUAL SOUTH PACIFIC ALBACORE TROLL CATCH ESTIMATES BY FLAG														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
CA	351	206	144		63	72	135	27				1			
CK	335	202	166	688	376	89	121	53							21
NZ	3336	2736	3012	3721	3212	2855	2043	1736	3352	1794	1832	2787	2727	2836	1937
US	2433	2107	1337	1574	960	576	587	272	151	237	307	471	235	390	263
TOTAL	6455	5251	4659	5983	4611	3592	2886	2088	3503	2031	2139	3259	2962	3226	2221

Appendix 2: Notes on the time series of longline VMS information in the South Pacific

The analysis summarises the longline VMS information available to SPC through the FFA and WCPFC over the period 2009-2014, by geographic region of the South Pacific. Effort in that database corresponds to days at sea (i.e. includes fishing and transiting). Please note:

- This analysis uses annual VMS data available up to and including December 2014;
- Effort represents total longline effort, not just that targeted at South Pacific albacore;
- VMS effort presented for EEZs includes that in archipelagic waters;
- Effort data for some countries (e.g. those with domestic longliners not on FFA VMS) will not be included within EEZ patterns;
- Effort for some countries (e.g. New Caledonia; French Polynesia) may be incomplete;
- Some trends may result from improved VMS coverage of vessels over time;
- EEZ effort excludes the Indonesian EEZ.

Table A2.1. Total VMS days at sea by year in International Waters, south of 10°S (Figure A1).

International waters code	2009	2010	2011	2012	2013	2014
I2	205	175	196	251	306	264
I5	1,587	5,878	4,898	5,284	11,049	8,437
I7	7,813	10,668	12,665	10,811	13,659	13,458
I8	1,814	2,856	3,425	2,383	2,968	2,774
I9	1,158	1,785	2,612	5,291	4,482	3,188
Total	12,576	21,362	23,796	24,021	32,463	28,122

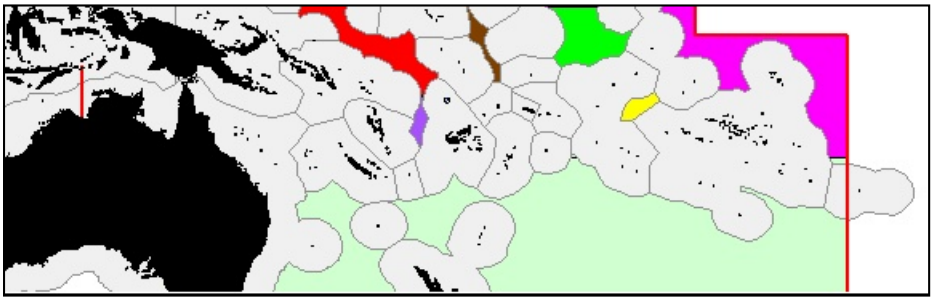

Figure A1. Map of International Waters in the southerly WCPFC-CA

Key:

Code	Area	Colour
H4	International waters between Tuvalu, Phoenix and Tokelau	Brown
H5	International waters between Phoenix and Line groups	Bright green
I2	Doughnut hole between FSM, Solomon Islands, Kiribati, RMI, Nauru and Tuvalu	Red
I5	International waters between Phoenix and Line groups and east of Line group	Pink
I7	High seas area to the east of Australia and New Zealand	Light green
I8	High seas pocket between Fiji and Vanuatu	Purple
I9	High seas pocket between the Cook Islands and French Polynesia	Yellow

Appendix 3. High Seas transshipment data for south Pacific albacore based on CMM 2009-06 reporting.

Table A3.1. High Seas transshipment data for SPA, by flag, year and month from July 2010 – August 2015
Notes:

1. The requirement to report (within 15 days of transshipment) high seas transshipment activities commenced in July 2010.
2. The data refer to high seas transshipments inside and outside the WCPFC Convention Area, and it should be noted that a proportion of the catches will likely have been caught within EEZs in the Convention Area and the IATTC Convention area.
3. Weights are in kg.

2010

CCM responsible for reporting for the Fishing Vessel	Jul	Aug	Sept	Oct	Nov	Dec
Belize					2,837	
China			166,000	210,668	247,192	17,091
Indonesia					44,170	869
Japan		900		53,543	35,437	30,000
Korea (Republic of)	16,984		22,303	41,890		6,389
Philippines				7,500		4,848
Chinese Taipei		115,000	165,552	125,298	147,809	20,582
Vanuatu		1,435,000	270,600	232,293	521,630	148,835
Total	16,984	1,550,900	624,455	671,192	999,075	228,614

2011

CCM responsible for reporting for the Fishing Vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Belize	2,015			36,000			710					
China	5,073	101,989	24,854	31,588	31,987	29,524	61,905	748,608	34,656	82,198	63,458	28,013
Indonesia				794	8,277				8,322	29,668		7,220
Japan	10,850	79,731	22,475		1,850	5,777	822	2,900		32,364	57,286	4,687
Korea (Republic of)	42,584	3,017	45,988	33,941	5,622	16,595	3,678		1,225	13,768	98,599	6,360
Philippines				400		500	17,303	2,284		10,346		6,723
Chinese Taipei	818,356	182,858	898,650	14,806	52,060	193,654	712,740	465,695	346,645	94,959	320,851	406,940
Vanuatu	100,000	110,000	1,020,165	290,970	597	13,700	816,794	313,038	62,000	12,857		341,175
Total	978,878	477,595	2,012,132	408,499	100,393	259,750	1,613,952	1,532,525	452,848	276,160	540,194	801,118

2012

CCM responsible for reporting for the Fishing Vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Belize							841					
China	67,701	95,807	61,927	103,977	8,055	20,149	305,884	231,568	118,390	6,507		11,276
Indonesia	1,894	4,820	1,900			11,505						4,656
Japan		31,016	1,774	12,999	1,575	13,449	66,858	2,597	72,544		3,281	
Korea (Republic of)	3,777	13,163	14,234	5,454	12,710	16,829	6,312				4,920	
Philippines	1,500		4,684						19,278			
Solomon Islands				45,500								
Chinese Taipei	87,183	438,492	127,178	91,510	12,089		326,644	406,037		18,305		457,106
Vanuatu	544,933	108,000	161,242	90,280	1,657		764,900	185,000		165,000	105,000	
Total	706,988	691,298	372,939	349,720	36,086	61,932	1,471,439	825,202	210,212	189,812	113,201	473,038

2013

CCM responsible for reporting for the Fishing Vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
China	42,364	7,376	84,590	24,498	90,383	805,828		110,513	542,675	282,996	1,048,906	127,757
Indonesia			6,891	286	5,800							2,403
Japan			9,481	38,422	3,100	39,089	13,602	42,460	147	14,639	10,539	2,765
Korea (Republic of)		45,342	53,797		29,523	26,676		20,268			24,377	18,848
Philippines			4,959		7,982			15,527			2,798	
Chinese Taipei	33,541		5,000	59,423	50,711		157,174	140,100	532,164	39,331	543,864	498,889
Vanuatu		361,951	175,489	165,000	28,228	28,496	1,062,757	174,754	864,995	249,017	412,360	130,000
Total	75,905	414,669	340,207	287,629	215,727	900,089	1,233,533	503,622	1,939,981	585,983	2,042,844	780,662

2014

CCM responsible for reporting for the Fishing Vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
China	224,998	875	26	31,578	138,573	331,788	102,822	1,551,373	115,965	6,825	12,505	171,219
Indonesia						3,728						
Japan	3,626		27,308		2,000	200	20,533		23,693	8,005		
Korea (Republic of)		25,297		8,844	3,393	13,958	46,724	6,004	49,970	74,214		37,621
Philippines		1,162										
Solomon Islands	105,420											
Chinese Taipei	940,429	636	386,115	8,688	31,399	529			576,390	129,558	1,109,509	449,172
Vanuatu	691,021		2,620			12,639	17,935	49,549	1,895,708	578	205,667	
Total	1,965,494	27,970	416,069	49,110	175,365	362,842	188,014	1,606,926	2,661,726	219,180	1,327,681	658,012

2015

CCM responsible for reporting for the Fishing Vessel	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
China	273,169	215,527	3,889	16	160,944	557,865	5,512	
Chinese Taipei	449,399	7,915	12,663	17,320		3,572	61,526	59,938
Japan	1,515	5,101	5,645	2,221	119			
Korea (Republic of)	2,444	22,212	43,063	3,759	25,975	50,251	113,491	
Vanuatu	9,294	5,049	409	90,697	2,505	4,601		91,604
Total	735,821	255,804	65,669	114,013	189,543	616,289	180,529	151,542