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Catch and effort data summaries to support discussions on the new South-west Pacific SWORDFISH CMM

WCPFC19-2022-IP08
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Paper prepared by

Oceanic Fisheries Programme (OFP)
Pacific Community (SPC)

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1. Tables

Table 1. Longline SWORDFISH catch in the area north/south of 20°S, WCPFC Area south of the equator.

Source of data: AGGREGATE CATCH DATABASE, 2000–2021,adjusted to align to catch estimates provided for the WCFPC Area, south of the equator; Excludes the Indonesian estimated SWORDFISH catches.

Year	WCPFC Area south of equator (MT)	North of 20°S in the WCPFC Area south of equator		South of 20°S in the WCPFC Area south of equator	
		MT	%	MT	%
2000	6,256	2,287	37%	3,969	63%
2001	6,155	2,254	37%	3,901	63%
2002	6,684	2,889	43%	3,795	57%
2003	6,747	3,013	45%	3,734	55%
2004	8,127	3,910	48%	4,217	52%
2005	6,419	2,266	35%	4,153	65%
2006	8,334	3,172	38%	5,162	62%
2007	10,061	3,129	31%	6,932	69%
2008	9,850	4,610	47%	5,240	53%
2009	7,704	4,400	57%	3,304	43%
2010	6,986	3,839	55%	3,147	45%
2011	8,742	5,135	59%	3,607	41%
2012	10,494	5,851	56%	4,643	44%
2013	9,810	5,476	56%	4,334	44%
2014	9,628	5,408	56%	4,220	44%
2015	8,698	4,476	51%	4,222	49%
2016	7,919	4,089	52%	3,830	48%
2017	7,442	4,212	57%	3,230	43%
2018	7,312	4,074	56%	3,238	44%
2019	5,846	3,189	55%	2,657	45%
2020	5,509	2,645	48%	2,864	52%
2021	5,543	2,347	42%	3,196	58%
Average	7,739	3,758	49%	3,982	51%

Table 2. Proportion of Longline SWORDFISH catch by 10° latitude band in the WCPFC Area south of the equator.

Source of data: AGGREGATE CATCH DATABASE, 2000–2021,adjusted to align to catch estimates provided for the WCFPC Area, south of the equator; 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	1,789	498	2,002	1,734	233	29%	8%	32%	28%	4%
2001	1,615	639	2,035	1,628	237	26%	10%	33%	26%	4%
2002	1,930	959	1,992	1,612	191	29%	14%	30%	24%	3%
2003	1,828	1,185	2,009	1,496	229	27%	18%	30%	22%	3%
2004	2,933	977	2,058	1,962	197	36%	12%	25%	24%	2%
2005	1,542	724	2,742	1,306	104	24%	11%	43%	20%	2%
2006	2,475	697	3,125	1,975	62	30%	8%	37%	24%	1%
2007	2,563	566	3,526	3,345	61	25%	6%	35%	33%	1%
2008	3,594	1,016	2,353	2,844	43	36%	10%	24%	29%	0%
2009	2,832	1,569	1,500	1,688	116	37%	20%	19%	22%	1%
2010	2,480	1,359	1,394	1,685	69	35%	19%	20%	24%	1%
2011	3,664	1,471	1,490	1,988	129	42%	17%	17%	23%	1%
2012	4,202	1,650	1,821	2,630	192	40%	16%	17%	25%	2%
2013	3,647	1,828	1,973	2,105	256	37%	19%	20%	21%	3%
2014	3,988	1,420	2,317	1,666	237	41%	15%	24%	17%	2%
2015	3,371	1,105	2,339	1,551	332	39%	13%	27%	18%	4%
2016	2,360	1,729	1,858	1,698	274	30%	22%	23%	21%	3%
2017	2,439	1,774	1,760	1,306	164	33%	24%	24%	18%	2%
2018	2,978	1,096	1,493	1,571	174	41%	15%	20%	21%	2%
2019	1,557	1,633	1,260	1,278	118	27%	28%	22%	22%	2%
2020	1,326	1,320	1,321	1,441	102	24%	24%	24%	26%	2%
2021	1,148	1,199	1,909	1,159	127	21%	22%	34%	21%	2%
Average	2,557	1,201	2,013	1,803	166	33%	16%	26%	23%	2%

Table 3. Longline SWORDFISH target/bycatch for EEZs and high seas areas in the WCPFC Area south of the equator

Year	Swordfish catch (MT) in WCPFC South of the equator								
	EEZ				High Seas				Total
	Bycatch	%	Target	%	Bycatch	%	Target	%	
2000	893	14%	3,462	55%	1,900	30%	0	0%	6,256
2001	792	13%	3,144	51%	2,219	36%	0	0%	6,155
2002	860	13%	2,998	45%	2,827	42%	0	0%	6,684
2003	785	12%	2,407	36%	3,555	53%	0	0%	6,747
2004	1,043	13%	2,013	25%	4,388	54%	683	8%	8,127
2005	759	12%	1,830	29%	2,586	40%	1,244	19%	6,419
2006	746	9%	1,600	19%	2,884	35%	3,104	37%	8,334
2007	676	7%	1,687	17%	3,480	35%	4,217	42%	10,061
2008	902	9%	1,807	18%	3,731	38%	3,410	35%	9,850
2009	1,406	18%	1,711	22%	2,866	37%	1,721	22%	7,704
2010	1,369	20%	1,452	21%	3,170	45%	994	14%	6,986
2011	2,106	24%	1,640	19%	3,565	41%	1,431	16%	8,742
2012	2,463	23%	1,827	17%	4,073	39%	2,131	20%	10,494
2013	2,041	21%	1,803	18%	4,186	43%	1,780	18%	9,810
2014	2,471	26%	1,743	18%	3,734	39%	1,680	17%	9,628
2015	1,725	20%	1,860	21%	3,776	43%	1,337	15%	8,698
2016	1,264	16%	1,717	22%	3,287	42%	1,651	21%	7,919
2017	812	11%	1,553	21%	4,145	56%	932	13%	7,442
2018	745	10%	1,305	18%	4,139	57%	1,123	15%	7,312
2019	772	13%	989	17%	2,891	49%	1,194	20%	5,846
2020	705	13%	784	14%	2,605	47%	1,415	26%	5,509
2021	426	8%	917	17%	2,423	44%	1,778	32%	5,543

Notes:

1. Swordfish target fisheries comprise the EU-Spanish (high seas), Australia (EEZ) and New Zealand (EEZ)
2. Source: Annual catch estimates by EEZ/high seas areas adjusted to swordfish catch estimates provided for the WCPFC Area, south of the equator (may differ from aggregate catch/effort data). See ANNEX 1.
3. Includes estimated weight of SWO discards

Table 4. Longline SWORDFISH target/bycatch for EEZs and high seas areas, by broad area

Year	Swordfish catch (MT) in WCPFC South of the equator															
	Area #1				Area #2				Area #3				Area #4			
	EEZ		High Seas		EEZ		High Seas		EEZ		High Seas		EEZ		High Seas	
	Bycatch	Target	Bycatch	Target	Bycatch	Target	Bycatch	Target	Bycatch	Target	Bycatch	Target	Bycatch	Target	Bycatch	Target
2000	150	97	156	0	642	0	993	0	84	3,362	729	0	13	3	22	0
2001	157	108	320	0	507	0	1,170	0	102	3,035	627	0	24	0	102	0
2002	291	71	431	0	397	0	1,432	0	130	2,923	828	0	39	4	136	0
2003	237	71	544	0	248	0	1,849	0	111	2,336	660	0	187	0	501	0
2004	292	28	436	0	417	0	2,630	19	107	1,985	822	141	223	0	500	523
2005	271	40	377	0	264	0	1,424	1	95	1,790	610	69	129	0	175	1,174
2006	279	32	229	0	284	0	2,221	0	69	1,569	296	32	114	0	115	3,072
2007	217	26	168	0	338	0	3,034	5	72	1,661	221	107	50	0	57	4,105
2008	241	46	640	0	535	0	2,867	2	75	1,761	175	34	52	0	49	3,373
2009	471	79	914	0	775	0	1,645	79	109	1,632	243	138	52	0	64	1,504
2010	426	37	658	0	723	0	2,033	2	117	1,415	412	344	103	0	67	648
2011	578	48	727	0	1,351	0	2,253	0	124	1,593	347	490	53	0	41	941
2012	670	70	802	0	1,554	0	2,639	0	146	1,757	345	1,264	93	0	65	867
2013	408	64	567	0	1,451	0	2,951	0	122	1,739	376	963	59	0	68	817
2014	632	41	340	0	1,627	0	2,810	0	154	1,702	524	759	58	0	60	921
2015	427	34	411	0	1,147	0	2,802	0	91	1,826	499	1,181	60	0	64	156
2016	253	29	350	0	802	0	2,304	0	142	1,688	544	1,144	67	0	88	507
2017	164	41	535	0	426	0	3,149	0	106	1,512	276	716	116	0	185	216
2018	172	45	389	0	348	0	3,202	0	91	1,260	288	607	133	0	260	516
2019	223	56	288	0	377	0	2,202	0	93	933	178	666	78	0	224	528
2020	91	19	192	0	428	0	1,811	0	102	765	284	937	85	0	318	478
2021	82	31	170	0	236	0	1,891	0	52	886	179	812	55	0	184	966

Source: Annual catch estimates by EEZ/high seas areas adjusted to swordfish catch estimates provided for the WCPFC Area, south of the equator (may differ from aggregate catch/effort data). See ANNEX 1. Refer to the broad areas in the map below for the WCPFC Area south of the equator. The four regions are split by dividing lines at latitude 20S and longitude 175W.

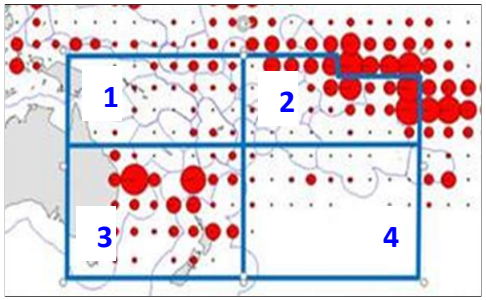

Table 5. Longline SWORDFISH catch by flag in the WCPFC Area south of the equator

flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AMERICAN SAMOA	1	0	0	0	0	8	38	13	7	8	2	12	52	28	25	32	50	56	47	4	2	2
AUSTRALIA	2,696	2,267	2,275	2,039	1,784	1,730	1,136	1,353	1,483	1,315	942	916	1,157	1,062	1,183	1,150	992	1,066	854	729	576	615
BELIZE	3	128	10	417	117	44	23	7	4	2	7	19	10	43	0	0	0	0	0	0	0	0
CHINA	0	0	29	862	582	434	1,210	1,890	2,192	1,661	1,025	1,808	2,280	2,038	2,275	2,037	1,289	1,574	1,481	968	437	479
COOK ISLANDS	0	0	13	164	170	97	98	36	17	11	78	41	140	16	14	18	25	56	44	30	26	12
EU-PORTUGAL												197	222	223	107	177	168	0	0	0	0	0
EU-SPAIN					683	1,244	3,104	4,217	3,410	1,721	994	1,431	2,131	1,780	1,680	1,337	1,651	932	1,123	1,194	1,415	1,778
FIJI	118	115	170	160	261	177	210	86	85	107	90	128	128	128	167	122	141	117	105	118	106	62
FRENCH POLYNESIA	47	79	70	117	86	79	83	68	80	71	80	89	116	128	142	109	101	150	218	170	179	174
FSM													4	7	4	15	38	6	5	51	8	10
JAPAN	914	825	842	581	670	444	371	434	442	503	560	641	675	538	393	357	414	287	357	152	152	131
KIRIBATI	0	0	0	0	0	0	0	0	0	0	0	0	10	10	20	0	9	24	5	37	139	35
NEW CALEDONIA	40	41	46	48	17	12	10	19	15	7	8	10	10	9	14	9	8	22	8	24	9	10
NEW ZEALAND	975	1,027	920	635	538	348	581	392	347	418	535	738	686	777	583	713	755	504	463	264	219	302
NIUE						1	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
PAPUA NEW GUINEA	12	22	22	30	73	98	80	82	81	79	93	125	177	114	114	2	6	6	21	15	0	0
REPUBLIC OF KOREA	1,120	1,100	1,116	636	758	470	388	139	455	505	782	992	985	933	550	433	362	356	634	356	322	322
SAMOA	123	27	14	12	4	1	3	5	6	5	7	5	5	3	4	5	4	16	11	21	27	10
SOLOMON ISLANDS	5	2	3	3	3	0	0	0	0	0	74	10	0	0	202	167	33	0	55	82	95	46
CHINESE TAIPEI	172	473	963	883	1,667	791	828	1,147	1,067	1,152	1,482	1,426	1,471	1,625	1,778	1,517	1,618	1,815	1,425	1,408	1,485	1,108
TONGA	29	44	42	25	10	18	21	31	28	22	26	22	19	26	37	42	39	32	44	33	16	9
TUVALU												10	38	6	3	6	3	12	2	1	1	1
VANUATU	1	5	149	135	704	423	148	140	131	117	200	122	178	316	333	450	213	411	410	189	295	437
WALLIS AND FUTUNA												0	0	0	0	0	0	0	0	0	0	0
	6,256	6,155	6,684	6,747	8,127	6,419	8,334	10,061	9,850	7,704	6,986	8,742	10,494	9,810	9,628	8,698	7,919	7,442	7,312	5,846	5,509	5,543

Notes

1. Source: Annual catch estimates by EEZ/high seas areas adjusted to swordfish catch estimates provided for the WCPFC Area, south of the equator (may differ from aggregate catch/effort data). See ANNEX 1.

Table 6. Longline SWORDFISH catch by EEZ/high seas areas in the WCPFC Area south of the equator

Area	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
_High Seas	1,900	2,219	2,827	3,555	5,071	3,830	5,988	7,697	7,141	4,587	4,164	4,996	6,204	5,966	5,414	5,113	4,938	5,077	5,262	4,085	4,020	4,201
AMERICAN SAMOA	0	0	0	0	0	2	21	4	1	1	0	5	20	9	7	9	23	33	33	2	1	1
AUSTRALIA	2,499	2,130	2,084	1,773	1,481	1,498	1,030	1,298	1,461	1,293	921	905	1,141	1,028	1,161	1,147	964	1,050	842	725	565	615
COOK ISLANDS		0	13	161	170	94	85	34	16	17	79	67	328	91	68	64	78	70	46	86	32	30
FIJI	102	125	164	121	174	112	133	64	61	73	71	73	65	66	81	79	102	85	86	85	74	45
FRENCH POLYNESIA	103	79	70	116	86	77	79	68	80	71	80	89	116	128	142	109	101	150	218	170	179	174
KIRIBATI	440	428	381	152	342	183	169	189	397	907	723	1,377	1,383	1,251	1,678	1,182	575	113	15	90	230	61
NEW CALEDONIA	40	41	46	48	17	12	10	19	15	7	8	10	10	9	14	9	8	22	8	24	9	10
NEW ZEALAND	963	1,014	913	634	532	333	571	389	346	418	532	735	686	775	583	713	754	503	463	264	219	302
NIUE			0			1	2	2	0	0	2			3	2	1	0	0	1	3	2	1
PAPUA NEW GUINEA	12	22	22	30	73	98	81	86	84	82	93	128	180	116	134	9	60	64	80	62	25	8
SAMOA	123	27	14	12	4	1	3	5	6	5	7	5	5	3	4	5	3	7	6	10	13	6
SOLOMON ISLANDS	7	5	30	35	57	47	62	86	145	152	164	191	183	144	183	115	94	87	85	91	58	55
TOKELAU									0			7	14	0	6	18	19	21	10	17	27	8
TONGA	29	37	39	21	10	18	20	30	28	22	26	28	62	74	50	52	62	35	44	41	23	14
TUVALU	14	18	27	5	13	21	3	16	7	14	75	24	35	60	24	16	58	50	75	70	4	2
VANUATU	25	9	53	84	97	93	78	75	62	52	40	103	61	88	77	57	80	75	36	22	28	10
WALLIS AND FUTUNA						0						0										
	6,256	6,155	6,684	6,747	8,127	6,419	8,334	10,061	9,850	7,704	6,986	8,742	10,494	9,810	9,628	8,698	7,919	7,442	7,312	5,846	5,509	5,543

Notes

1. Source: Annual catch estimates by EEZ/high seas areas adjusted to swordfish catch estimates provided for the WCPFC Area, south of the equator (may differ from aggregate catch/effort data). See ANNEX 1.

Table 7. Longline SWORDFISH catch by flag in the HIGH SEAS of the WCPFC Area south of the equator

flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AMERICAN SAMOA	1	0	0	0	0	6	17	9	5	6	1	5	25	17	18	22	27	23	14	2	1	1
AUSTRALIA	197	137	191	266	303	232	106	55	22	22	21	11	16	34	22	3	29	16	12	4	11	0
BELIZE	0	127	10	416	114	44	23	4	2	1	7	19	7	43								
CHINA	0	0	28	850	573	420	1,197	1,840	2,165	1,364	795	1,141	1,546	1,252	1,537	1,408	998	1,446	1,416	883	298	442
COOK ISLANDS			0	4	0	3	12	2	1	0	1	0	0	0		0	0	2	4	3	6	2
EU-PORTUGAL												197	222	223	107	177	168					
EU-SPAIN					683	1,244	3,104	4,217	3,410	1,721	994	1,431	2,131	1,780	1,680	1,337	1,651	932	1,123	1,194	1,415	1,778
FIJI	3	3	14	28	47	26	22	11	7	14	8	28	28	33	37	28	18	14	15	16	26	11
FRENCH POLYNESIA	0	0	0	1	0	2	4	0	0	0	0	0	0	0			0		0	0		
FSM	0	0		0	0	0	0	0	0	0	0	0	0	1	1	2	2	0	0	1	1	0
JAPAN	893	792	805	565	658	431	342	393	364	426	453	567	529	457	370	342	360	229	304	109	129	124
KIRIBATI				0								0	1	4	3	0	2	12	1	1	28	4
NEW CALEDONIA	0			0	0	0		0	0	0	0	0	0	0	0	0	0	0	0			
NEW ZEALAND	12	13	7	1	6	15	10	3	1	0	3	3		2	0		1	1		0		
NIUE							0															
PAPUA NEW GUINEA																	3	3				
REPUBLIC OF KOREA	632	687	738	492	542	349	254	9	262	201	389	537	557	600	192	163	184	272	553	289	315	318
SAMOA															0		0	2	2	0	0	
SOLOMON ISLANDS	0	0		0	0						13	2	0	0	32	31	3	0	1	2	45	0
CHINESE TAIPEI	161	452	945	865	1,594	755	798	1,069	810	754	1,350	995	1,066	1,374	1,314	1,336	1,342	1,732	1,413	1,397	1,459	1,086
TONGA	0	7	3	4	1	0	1	1						1	2			2	1			
TUVALU												3	2	0	1	0	0	2	0	0	1	0
VANUATU	0	2	85	63	549	302	99	84	92	77	128	57	72	146	98	264	147	390	401	185	284	436
WALLIS AND FUTUNA												0	0	0	0	0	0	0	0	0	0	0
	1,900	2,219	2,827	3,555	5,071	3,830	5,988	7,697	7,141	4,587	4,164	4,996	6,204	5,966	5,414	5,113	4,938	5,077	5,262	4,085	4,020	4,201

Notes

1. Source: Annual catch estimates by EEZ/high seas areas adjusted to swordfish catch estimates provided for the WCPFC Area, south of the equator (may differ from aggregate catch/effort data). See ANNEX 1.

2. Figures

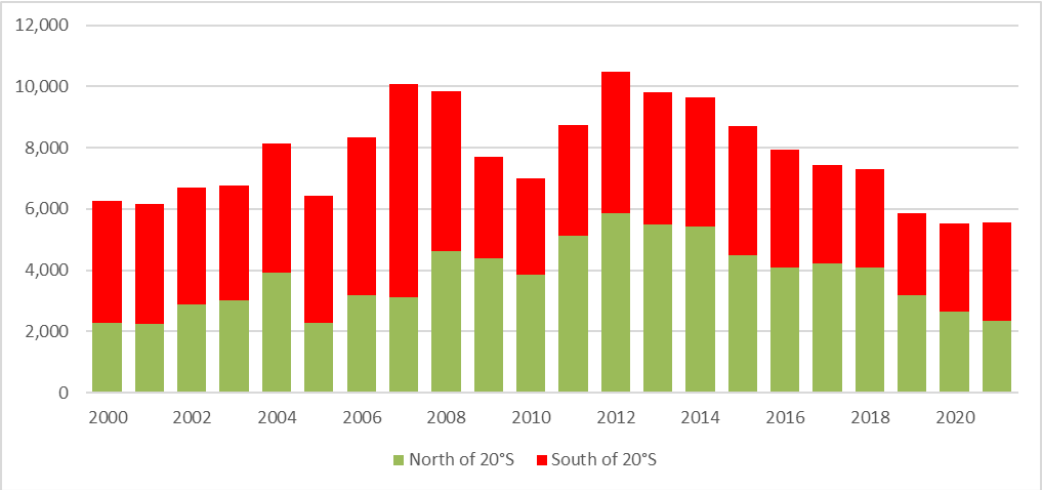

Figure 1. Longline SWORDFISH catch in the area north/south of 20°S, WCPFC Area south of the equator.
(see Table 1 notes)

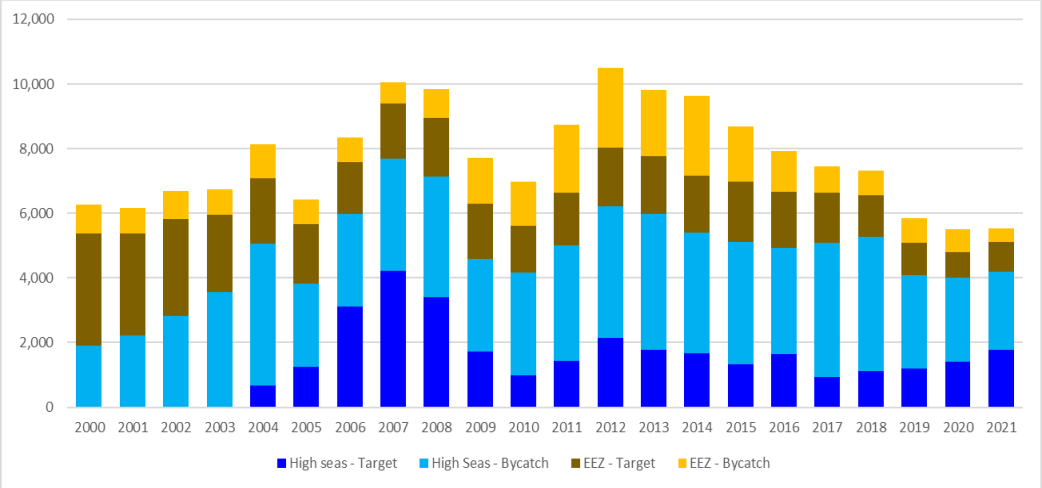

Figure 2. Longline SWORDFISH for EEZs and high seas areas in the WCPFC Area south of the equator
(see Table 3 notes)

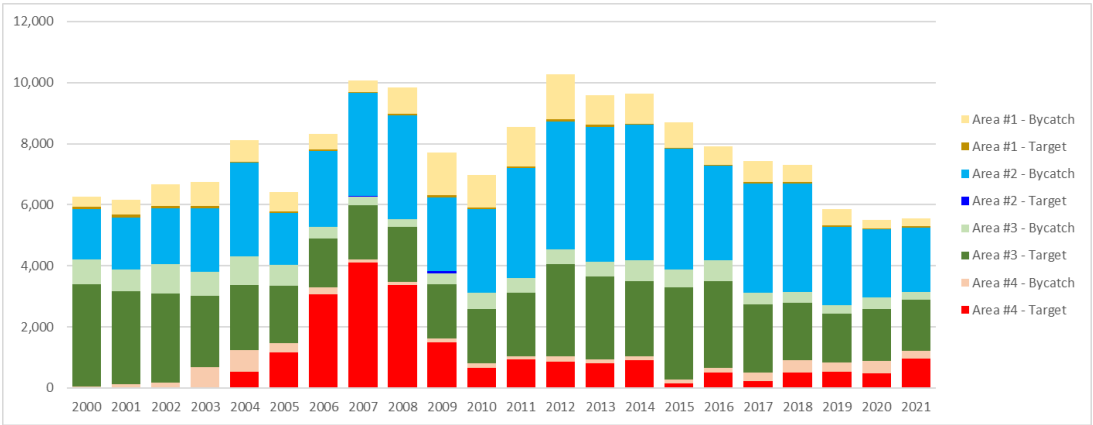

Figure 3. Longline SWORDFISH by broad area in the WCPFC Area south of the equator
(see Table 4 notes and map)

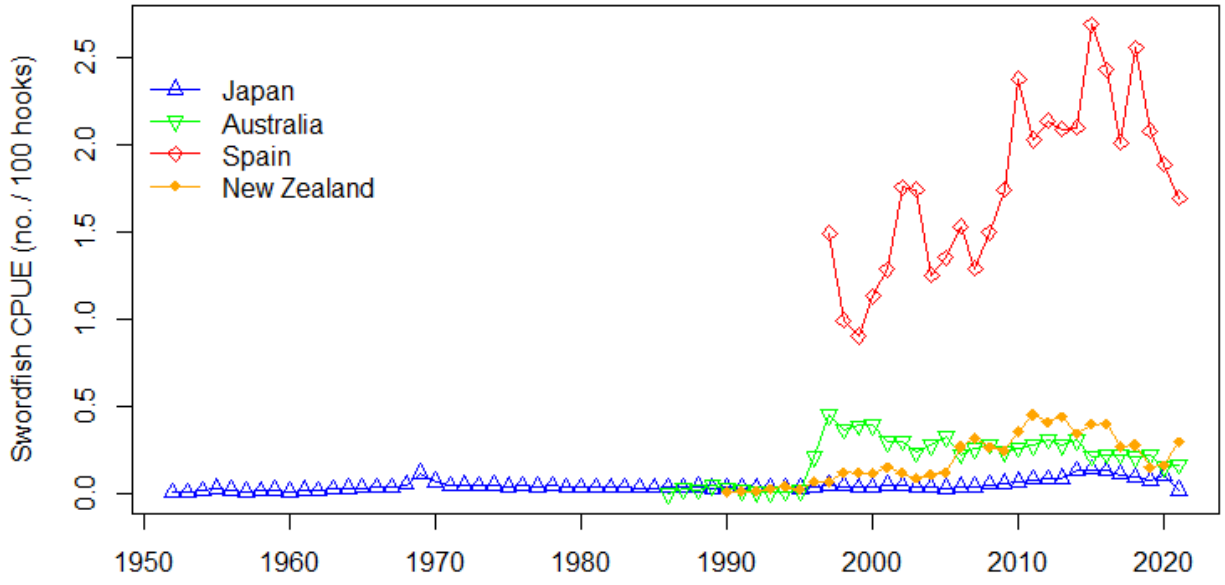

Figure 4. Annual trends in SWORDFISH nominal CPUE for key LONGLINE fleets in the south Pacific Ocean.

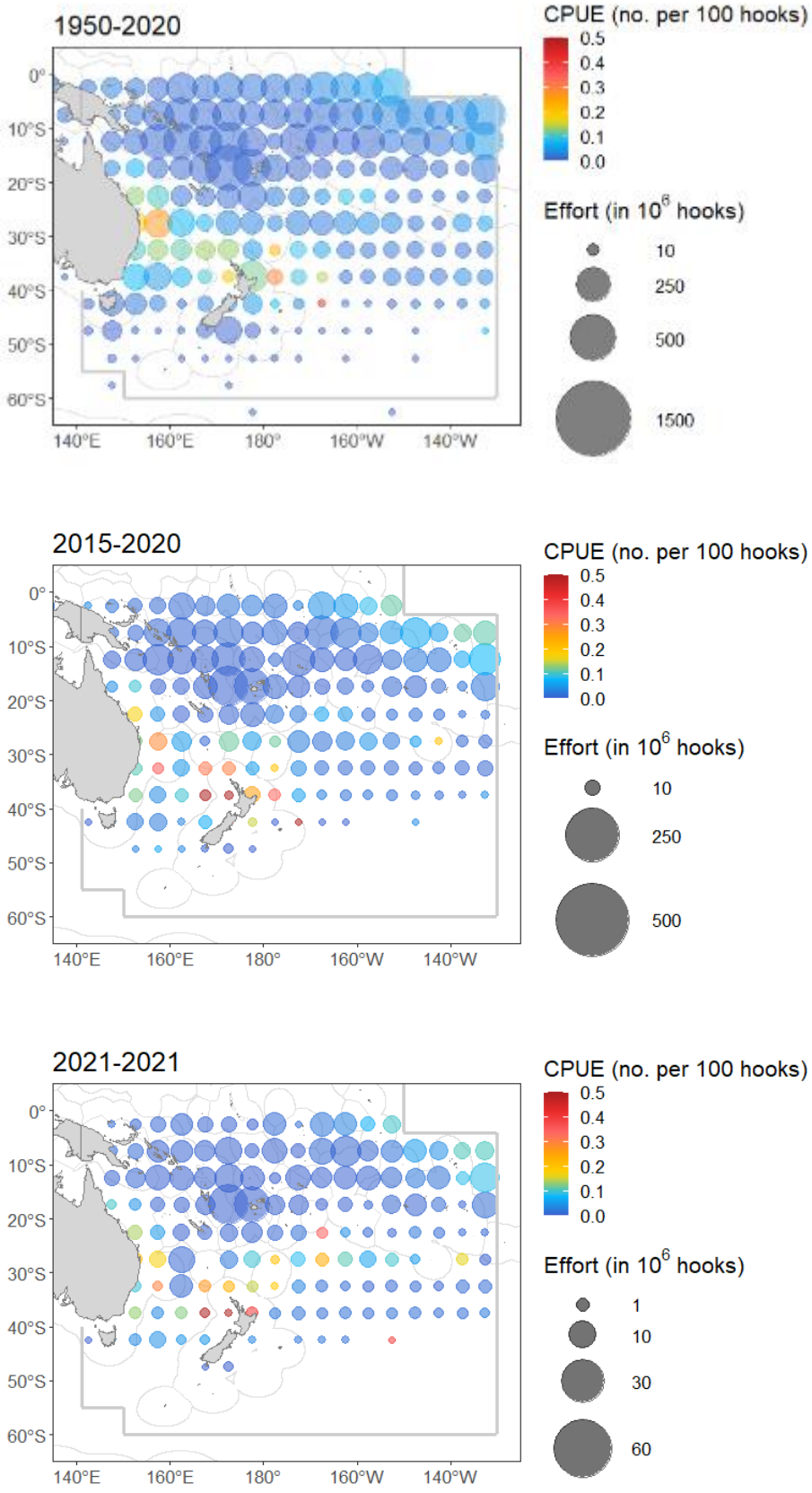

Figure 5. Distribution of South Pacific SWORDFISH longline CPUE and effort for selected periods
Periods: 1950-2020 (top), 2015-2020 (middle) and 2021 (bottom).

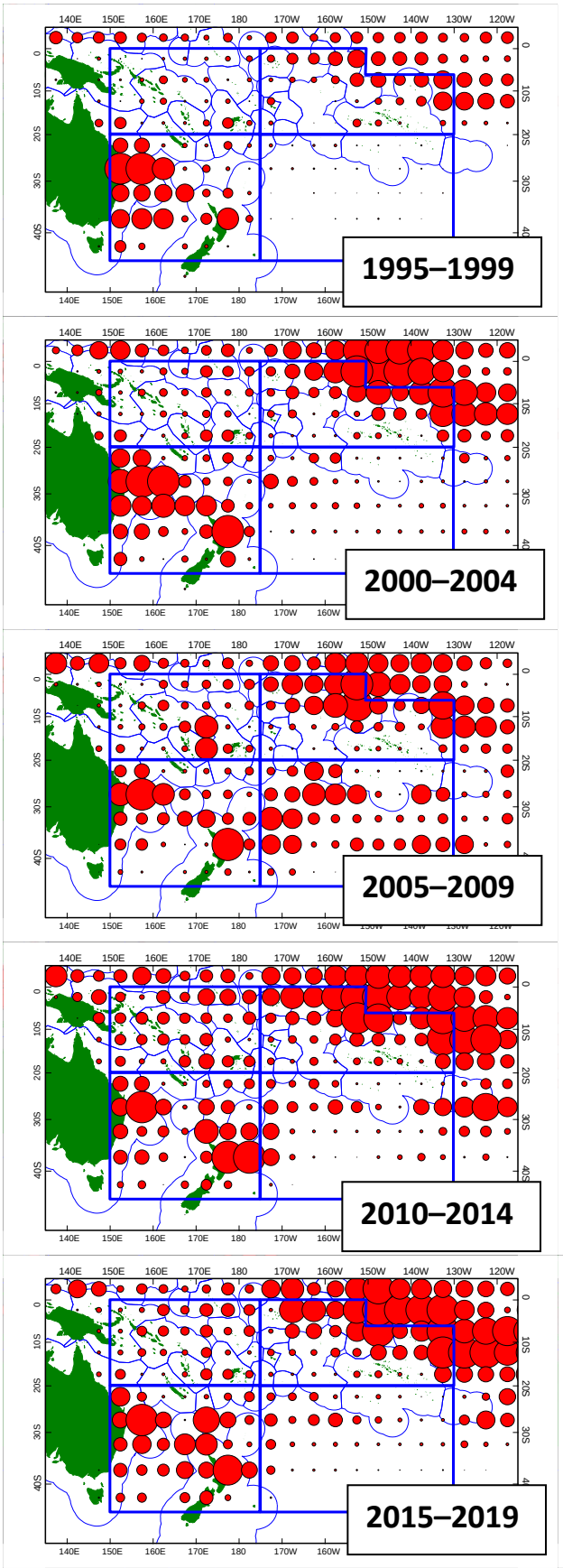

Figure 6 Distribution of South Pacific longline swordfish catch (numbers), by 5-year periods.
Periods: 1995–1999, 2000-2004, 2005–2009, 2010–2014, 2015–2019, 2020-2021

3. ANNEX 1 – Notes on available data sources for Southwest Pacific (SWPAC) Swordfish catches

Background

Australia's proposal for the future management of the south-west Pacific Swordfish stock through a revised WCPFC CCM includes provisions for high seas and EEZ based catch limits. In both cases the proposed measure covers catches in the area of the stock, that is, the WCPFC Management area south of the equator. As such, the WCPFC will require supporting information that includes historical annual "best" catch estimates for each longline fleet by EEZ/high seas areas (south of the equator) for the period 2000-2021 (current year). This information will help WCPFC members understand the implications of the proposed measure and negotiate the final outcomes.

The following attempts to

a) explain the available data sources (see Table A1), and issues in generating historical annual catch estimates for each longline fleet by EEZ/high seas areas from these data sources.
b) describe the current method used to produce the best estimate of SWPAC swordfish catch estimates by year, flag and area to ensure that (i) WCPFC members are aware of the origin of the estimates, (ii) WCPFC members are aware of the differences with estimates determined from other methods or other data sources, (iii) there is consistency in how future estimates related to the potential new CMM for SWPAC swordfish is generated.

In summary, the method proposed herein acknowledges that the best available information is the annual swordfish catch estimates for the WCPFC Area south of the equator, which is provided by the CCM flag state each year in their scientific data provision (before the 30th April deadline), and so the catches from all other data sources have been aligned to these estimates where used in the tables/graphs presented in this paper.

The estimates of SWPAC swordfish catch by EEZ/high seas areas for the years prior to 2017/2018 (when operational catch/effort data were first provided for the distant-water longline fleets) are acknowledged to be uncertain.

Table A1. Sources of data

Source of SWO catch data	Notes of how this source of data is generated	How used in estimates of Flag EEZ/HS catches of SWPAC SWO
1. Annual catch estimates (ACE) by FLAG for the WCPFC Area	– Produced by the Flag state CCM – Represents the best, raised estimate for the WCPFC Area – In some cases, not sure how CCM has determined this catch estimates. – May be sourced from logbooks (visual estimates of weights) or landings (actual weights) – see source #5 below.	– Source data #1 are not directly used, but should reconcile with the SWPAC SWO Estimates by Flag, EEZ/HS areas
2. Annual catch estimates (ACE) by FLAG for the WCPFC Area, south of the equator	– Produced by the Flag state CCM and submitted at the same time as Source Data #1 above – In some cases, not sure how CCM has determined this catch estimates. – Represents the best, raised estimate for the WCPFC Area south of the equator –	– This source should align with Source data #1 since it is provided by CMM flag state. – This source of data should represent the best estimate of SWPAC SWO catch estimate by flag and any estimate of finer scale resolution estimates (i.e. by flag and EEZ/HS areas) should IDEALLY reconcile with this, even though they may be source from different data/methodologies. (see below)
3. Annual catch estimates by FLAG and EEZ/High seas area for the WCPFC Area	– Produced by SPC – Applies the ACE (Source Data #1) SWO catch for WCPFC Area to the best estimates catch % in each EEZ/high seas area based on logbook data (See Source #5) and/or VMS data where logbooks do not exist or low coverage.	– This source will align with ACE for the WCPFC Area, but not necessarily the ACE for the WCPFC area south of the equator since there are some EEZs/HS areas that straddle the equator.
4. Aggregated longline catch/effort data by 5°x5° lat/lon cells and month/year for the WCPFC Area	– Submitted by flag State CCMs as either aggregate data, or operational data (see source data #5 below), which has been raised to represent the ACE (best estimates) for the entire WCPFC Area either by the flag state or SPC. – Note the source of data may be different to the source of data used for ACE (data source #1 above) which may be landings data (i.e. actual weighed catch).	– These data do not have a breakdown by EEZ/HS area, so can't be used for estimates of Flag EEZ/HS catches of SWPAC SWO. – However, there may need to be some reconciliation with estimates for the sum of SWPAC SWO catch estimates by flag, EEZ/HS area (see Source #3) with SWPAC SWO estimates from aggregate data (Source of data #4) ?
5. Operational longline catch/effort data by fishing operations for the WCPFC Area	– Submitted by flag State CCMs – Coverage usually not 100% – Coverage of distant-water longline fleets prior to 2017/2018 is low and biased to activities in EEZs only.	– Not directly used since coverage is usually not 100%, particularly prior to 2017/2018 – May be used in the process to generate Data Sources #3, and #4 (and maybe #1 and #2).
6. Estimate SWPAC Swordfish annual catch by Flag and EEZ/HS areas	– Data generated by the method described below – Provides historic Flag and EEZ/high seas catches of south-west Pacific (SWPAC) SWORDFISH	–

Current method to estimate SWPAC Swordfish annual catch by Flag and EEZ/HS areas

Steps

1. We acknowledge that Data Source #3 provides the best available estimate for SWO catch by EZ/HS areas in the South WCPFC area (Data Source #6) but does not necessarily reconcile with Data Source #2 (estimates of SWO in the WCPFC Area south of the equator). The following steps are used to improve the consistency between the estimates in Data Source #3 and Data Source #2.
2. Considering Data Source #3 as the first step to producing Data Source #6. Several EEZs/high seas areas straddle the equator (Kiribati Island groups, FSM, Nauru, high seas area I2, high seas area I5, FSM, Nauru, Howland and Baker Island EEZ, Jarvis Island EEZ) -- see Figure A1.

   While the EEZs of FSM, Nauru, Howland/Baker and Jarvis straddle the equator, these have been ignored at this stage on the basis that :

   i. There are no historical catches in Howland and Baker and Jarvis (US EEZs) over the past 20+ years according to logbook data held by SPC.
   ii. There is <1 mt SWO catch / year on average taken in the FSM and NR EEZ south of the equator – most LL SWO catch is taken in FSM EEZ north of equator. For Nauru, there has not been much longline activity over past 20 years and a review of licensing arrangements may be necessary to confirm the small catches reported in logsheet in the NR EEZ.

   Indonesia EEZ catch has also been excluded at this stage.

3. To ensure estimates of SWO catches in these EEZs/HS areas (in Step 2 above) represent areas south of the equator only, the % SWO catch south of the equator (by Year/EEZ/HS Area) obtained available operational swordfish catch data (Data Source #5) are applied respectively (by year/EEZ/HS area) to SWO catch in the Data Source #3 (see Step 1 above). This produces SWO catch which is then aligned to the WCPFC area south of the equator.

4. We acknowledge that Data Source #2 is the best estimate available for the broad WCPFC Area south of the equator. To ensure consistency between Data Source #2 and the result from Step 3, the following steps are taken:
   i. The data from Step 3 needs to be aligned to Data Source #2 (Annual SWO catch estimates (ACE) by FLAG for the WCPFC Area, south of the equator). This step is done by applying the (sum of SWO catch by year/flag from Data source #2) divided by the (sum of SWO catch by year/flag from Data source #3) to the SWO catch in the data from step 1, that is,

   SWO adjusted catch (Data source [DS] #6) =

$$\text{SWO unadjusted catch (DS \#6)} * \frac{\sum \text{(DS \#2 sum of SWO by year/flag)}}{\sum \text{(DS \#3 sum of SWO by year/flag)}}$$

   This step will ensure better consistency in the SWO catch in Data Source #6 with the Data Source #2.

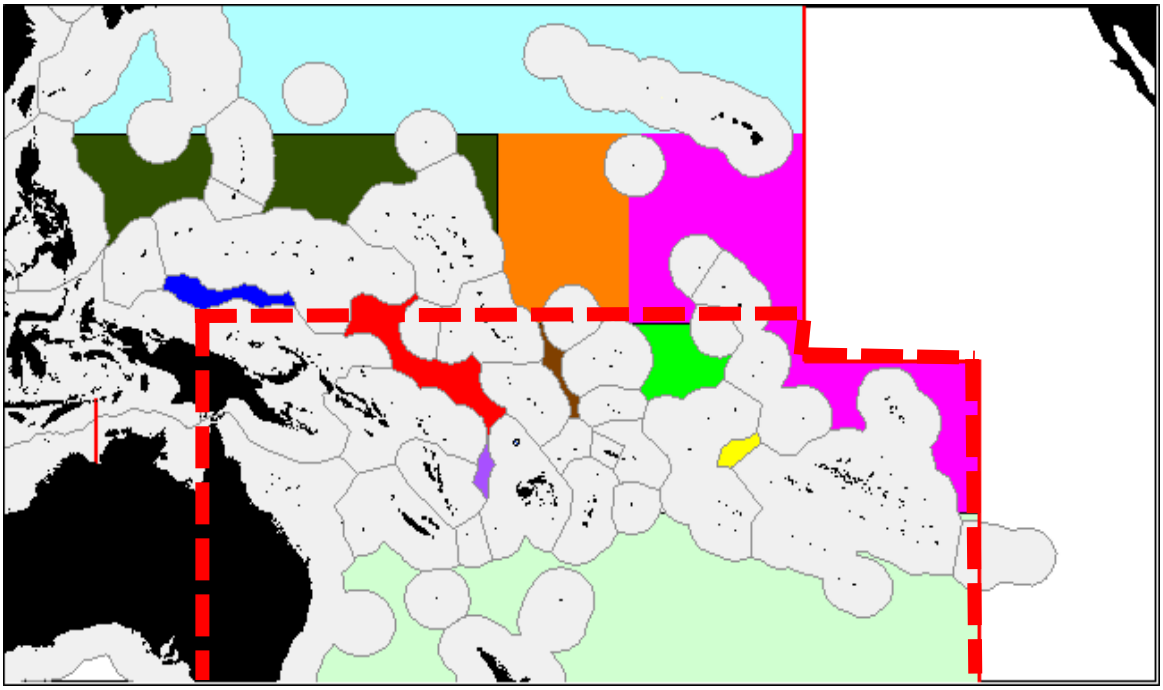

Figure A1. WCPFC Area showing EEZs and high seas areas (see table below)

I1	Doughnut hole between PNG and FSM	BLUE
I2	Doughnut hole between FSM, Solomons, Kiribati, Marshall Is. Nauru, Tuvalu	RED
I3	International waters east of the Philippines to Guam, above FSM, around Marshalls, up to 20°N and west of 175°E (not including areas I1, I2 and I8)	DARK GREEN
I4	International waters east of Marshall Islands and Kiribati, from the equator up to 20°N and east of 175°E to 170°W	ORANGE
I5	International waters around Line Group from the equator up to 20°N, east of 170°W to 150°W, and south of the equator to 20°S from 155°W-130°W	CRIMSON
I6	The reminder of International waters not covered above in the Northern hemisphere of the WCP-CA	LIGHT BLUE
I7	The reminder of International waters not covered above in the Southern hemisphere of the WCP-CA	LIGHT GREEN
I8	International waters bordered by Fiji, Solomon Is and Vanuatu	PURPLE
I9	International waters between the Cook Islands and French Polynesia	YELLOW
H4	International waters between Tuvalu, Phoenix and Tokelau, from the equator down to 10°S and east of 175°E to 170°W	BROWN
H5	International waters between Phoenix and Line Groups, from the equator down to 10°S, east of 170°W to 155°W (excludes IW between CK and PF = Area "I9")	IRIDESCENT GREEN