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STRENGTHENING THE MANAGEMENT OF SOUTH PACIFIC BROADBILL SWORDFISH (*Xiphias Gladius*)

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SUBMITTED BY AUSTRALIA

DELEGATION PAPER FROM AUSTRALIA FOR WCPFC16

Strengthening the Management of South Pacific Broadbill Swordfish (*Xiphias gladius*)

Summary

WCPFC has an obligation to manage South Pacific Swordfish in the Convention Area, in a manner consistent with the objectives of the Convention. South Pacific Swordfish are a valuable resource and an important economic contributor to a number of WCPFC member fisheries, and presents a fishery development opportunity for Small Island Developing States (SIDS) and Participating Territories in the stock area.

In its current form, the swordfish CMM (CMM 2009-03) does not ensure the ongoing sustainability of Swordfish in this region, the ongoing economic viability of current fisheries nor future development opportunities for SIDS and Participating Territory fisheries, noting that:

- **Between the equator and 20°S** – There is currently no restriction on catch or effort for swordfish in this area, where catch on the high seas has increased substantially since CMM 2009-03 was developed. SC13 identified that the Commission should consider developing appropriate management measures for this area.
- **South of 20°S** – The most recent stock assessment estimated a 32% probability of overfishing. However, fully caught catch limits south of 20°S combined with recent catches north of 20°S would substantially increase the probability of overfishing and an overfished stock.
- **Sub-regional depletion** – The movement and aggregation behaviours of this species make it particularly vulnerable to subregional depletion, a key risk to the economic viability and development potential for coastal State fisheries in particular.
- **South East Pacific management** – there is potential connectivity between the south-eastern WCPFC area and the adjacent South East Pacific Ocean (SEPO). The SEPO has seen very substantial increases in catch, but has no CMM, and no stock assessment since 2011.

Recognising the above issues and risks, Australia is seeking the support of WCPFC members to strengthen CMM 2009-03, so as to ensure:

- the ongoing sustainability of the stock regionally
- ongoing economic viability of existing WCPFC member coastal State fisheries
- future development opportunities for WCPFC SIDS and Participating Territories.
- that even stronger management measures are not required in future (in response to an overfished stock) which could also impact tuna fisheries.

Australia proposes that a future revised measure would:

a) apply in EEZs and high seas throughout the whole area of the stock (consistent with Article 3 and Article 5).
b) be reflective of our current best understanding of swordfish science and its assessed status.
c) prevent further increases in fishing mortality on the stock to avoid future overfishing and an overfished stock (as per Article 5).
d) accomodate subregional zone based management approaches and limits and ensure compatible management and limits on the high seas (as per Article 8).
e) recognize the sovereign rights of coastal States to explore, exploit, conserve and manage HMS within areas under their national jurisdiction (as per Article 7).
f) recognize the special requirements of, and avoid transferring a disproportionate burden of conservation upon, SIDS and Participating Territories (as per Article 30).

g) seek the development of a consistent set of conservation and management measures for fish stocks that occur in both the WCPFC and IATTC Convention Areas (as per Article 22).

1. Purpose

This paper is to provide background information to support a discussion, at WCPFC16 and through 2020 leading into WCPFC17, of possible options for revising and strengthening CMM 2009-03, to ensure the future sustainability of South Pacific Swordfish in the Convention Area.

2. Process

Australia is providing this paper to support discussions with WCPFC members, both in session and in the margins, to canvass views on potential options for the strengthening of CMM 2009-03. Australia will then use discussions at WCPFC16 to inform its development of a draft revised CMM in early 2020, along with its associated 2013-06 assessment. These will be submitted to the SC16 and TCC16. SC and TCC feedback will be taken into account prior to submitting a final draft proposal for adoption to WCPFC17 in December 2020. Australia would be happy to engage with interested CMMs throughout the year to inform development of the draft and final proposals.

3. Background

Distribution and stock structure

Broadbill Swordfish is distributed throughout tropical, subtropical and temperate waters. Catches are taken throughout that area, predominantly by pelagic longline, with the highest catch areas being the north-west (off Japan), the south west (in the region of Australia and New Zealand) and the central sub-equatorial and south-eastern Pacific Ocean (Figure 1 below).

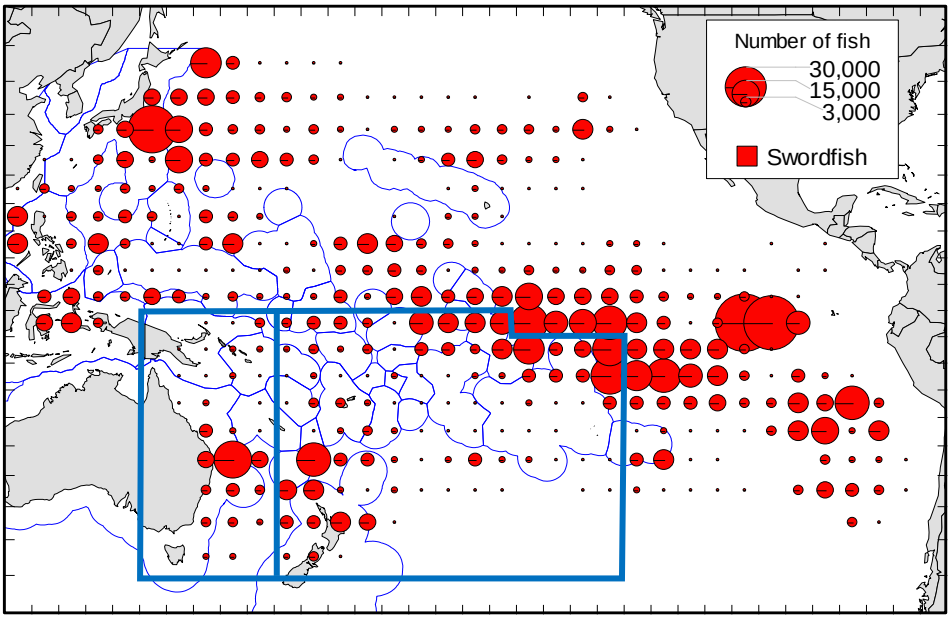


Figure 1 – Swordfish catches (red circles, scaled to level of catch) by 5 degrees in the Pacific Ocean for the period 2015 – 2018. The blue box defines the area of the 2017 Stock Assessment of South West Pacific Swordfish, which contains two subregions, a western region (Region 1) and central-eastern region (Region 2) *(Source: SPC, 2019)*

Electronic tagging, genetic, catch and CPUE data suggest (with some uncertainty) at least three stocks, being a western-central stock in the north Pacific, an Eastern Pacific stock and a western/central stock in the South Pacific. Additionally, while there remains some uncertainty around stock structure and mixing between subregions, satellite tagging data suggest:

- Relatively limited mixing across the Tasman Sea region (east and west of 160E) which has in part lead to the implementation of the current stock assessment spatial structure. Genetic research is underway to assess this further.
- Significant north-south movement of swordfish (in the Pacific and also other ocean basins – See Appendix B).
- A lack of pan-basin mixing/movement and numerous instances of swordfish returning to the subregion/area of release. (See Appendix B)

Catch data suggest the potential for some mixing of swordfish between the eastern area of the South Pacific Convention Area and the adjacent south-eastern Pacific (**SEPO**) stock.

Western Central South Pacific Ocean (WCSPO) fishery

In the **WCSPO** region, swordfish is seasonally targeted by the domestic Australian and New Zealand longline fleets, predominantly within their EEZs, and the distant water EU longline fleet operating on the high seas which is highly mobile and moves between areas over time. DWFN fleets also take a significant bycatch of swordfish on the high seas in the north-eastern WCSPO due to high levels of effort targeting tropical tuna.

Catches in the **WCSPO** increased rapidly from the late 1990s to early 2000s and have varied since around ~9000-11000 mt[1]. The stock assessment divides the area into a region off Australia (**Region 1**) and a central/eastern region (New Zealand to French Polynesia – **Region 2**). However, the CMM defines northern (0°-20°S) and southern (20°S-45°S) areas. Up to half of the catch is taken in the northeast quadrant (within Region 2 and between the equator and 20°S), with most of this attributed to DWFNs.

Catches in WCSPO **Region 2** increased from around 3000mt in mid 1990s to over ~9000mt by the mid-2000s, largely due to increases in catches by DWFNs in the north-eastern area and targeted high seas catch by the EU and New Zealand in zone longline fisheries in the southern area of that region.

Catches in WCSPO **Region 1** peaked at over 2500mt in late 1990s/early 2000s, then dropped to nearly half those levels due to a reduction in the Australian fishery (Figure 2) and implementation of much reduced TACs that aimed to avoid localised depletion and maintain economically viable catch rates in the fishery.

South East Pacific Fishery

It is worth noting that the region adjacent to WCSPO, the **south-eastern Pacific** (**SEPO**), has seen rapid and substantial increases in catches to over 28000 mt since the mid-2000s (Figure 3). It is recognised that there is potential for but uncertainty around the level of connectivity between the WCSPO stock and the SEPO stock.

[1] There is some variation between stock assessment catch data and WCPFC year book data and Australia is seeking clarification from SPC.

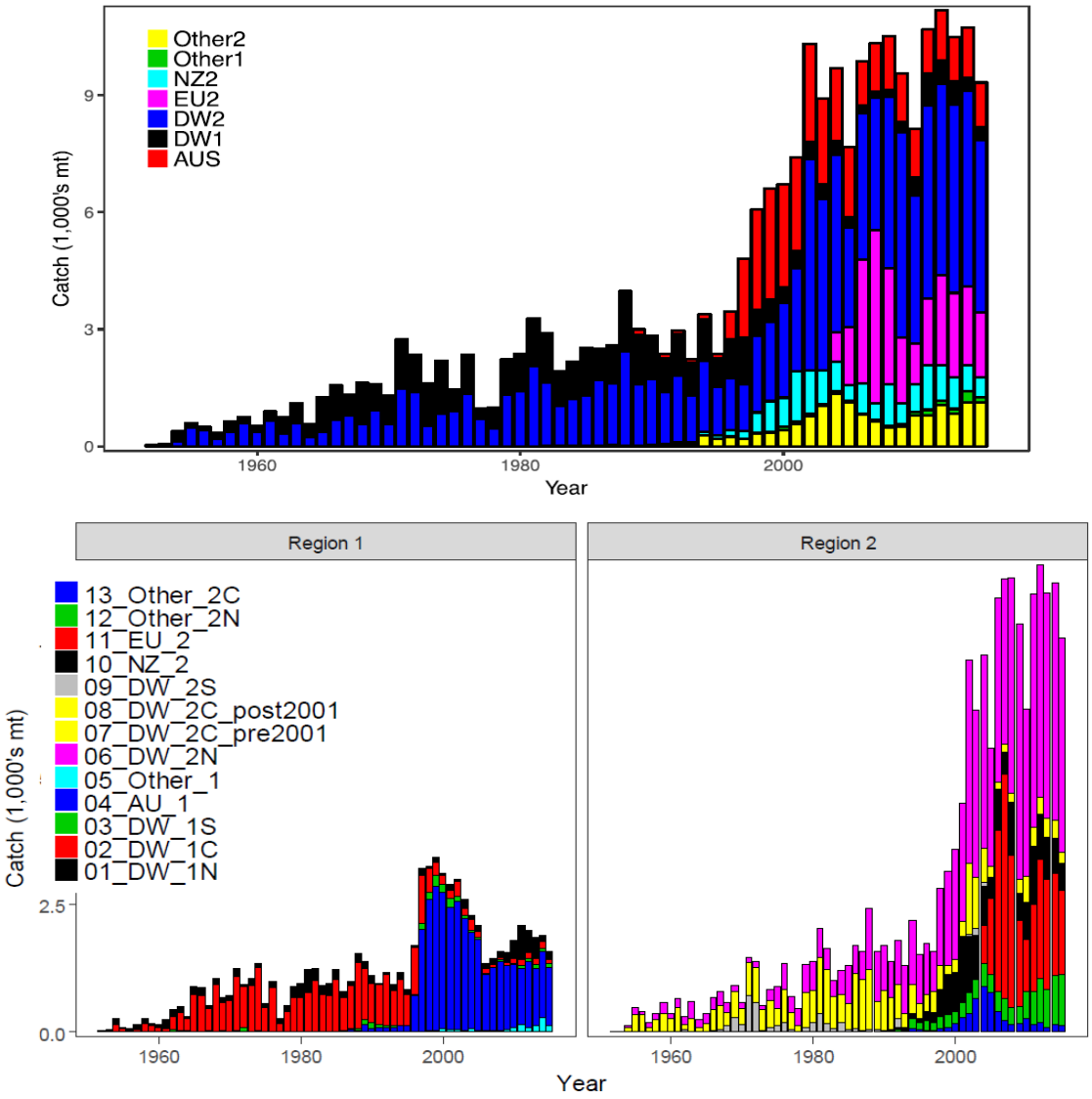


Figure 2 – Top – Total annual catches of Swordfish by flag or flag grouping: Top - in the WCPFC Area of the South Pacific; Bottom – By stock assessment area (western Region 1 and the much larger central-eastern Region 2). Source: SPC, 2017 – SC13-SA-WP-13;

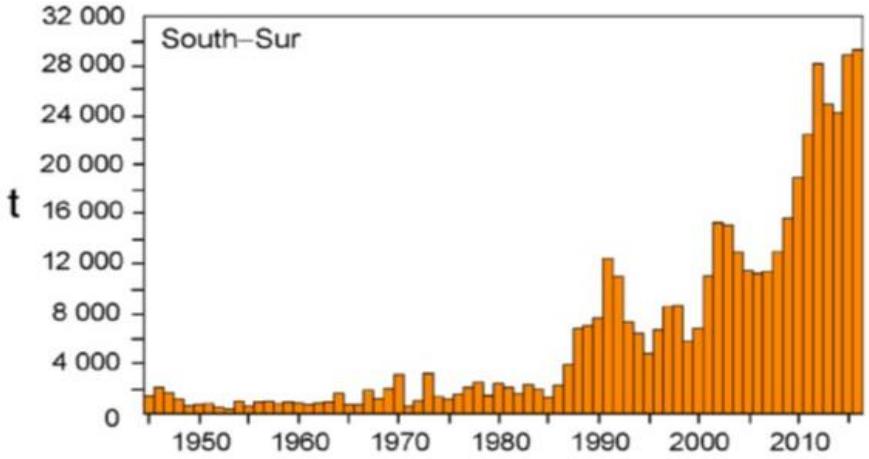


Figure 3 - Annual catches of Swordfish in the south-eastern Pacific Ocean (IATTC Area) (Sources: IATTC, 2018 - SC14 GN-WP-02)

WCPFC member catches in the WCSPO

Recent catch of WCSPO Swordfish by WCPFC member longline fleets are listed in Table 1. The CCMs accounting for the majority of catches in the recent period 2016-2018 are Chinese Taipei (21.1%), China (18.9%), the European Union (16.1%), Australia (13.4%), New Zealand (7.5%), Korea (5.9%) and Japan (4.6%). The remaining 12 CCMs with reported catch account for the remaining 12.6% of the catch. Low catch by the majority of SIDS and Participating Territory fleets in the South Pacific Ocean may be due to the gear selectivity of those longline fisheries that to date have targeted mainly albacore tuna, and so may not reflect the abundance of swordfish in those CCMs' national waters.

Table 1 – Catches of Swordfish (2016-18) by flag within the WCSPO Swordfish Stock Assessment area (Regions 1 and 2 combined) . Source – SPC 2019.

Flag	2016	2017	2018	Total	% of Total Catch
AU	1162	1066	854	3082	13.4
BZ	0	0	0	0	0.0
CK	23	56	26	105	0.5
CN	1289	1574	1481	4344	18.9
ES	1651	932	1123	3706	16.1
FJ	141	117	105	363	1.6
ID	640	3	3	646	2.8
JP	414	287	355	1056	4.6
KR	362	356	634	1352	5.9
NC	8	22	8	38	0.2
NU	0	0	0	0	0.0
NZ	755	504	463	1722	7.5
PF	100	147	218	465	2.0
PG	6	6	21	33	0.1
SB	0	0	55	55	0.2
TO	39	32	44	115	0.5
TV	3	12	2	17	0.1
TW	1618	1815	1425	4858	21.1
US	50	55	47	152	0.7
VU	118	411	360	889	3.9
WF	0	0	0	0	0.0
WS	4	16	11	31	0.1

4. **Stock Status**

The large increases in regional catch since the mid-1990s (Figure 2 above) are reflected by the most recent stock assessment (2017) which shows very large increases in fishing mortality (particularly on fish aged 4-6) and subsequent spawning biomass depletion ($SB_{latest}/SB_{F=0}$) through that period, to a median level of 0.35 overall. Depletion is greater in eastern Region 2 (0.25 in the diagnostic case) than the western Region 1 (0.40).

Currently, the stock assessment indicates the stock is still healthy (Table 3 below). SC13 noted that:

- *Based on the uncertainty grid adopted by SC13, the south west Pacific swordfish spawning biomass is likely above the 20%$_{SBF=0}$, biomass LRP adopted for tunas and the SB_{MSY} level (noting that the Commission has yet to adopted an LRP for south Pacific swordfish) and it is* ***highly likely that the stock is not in an overfished condition*** *(0% probability). Recent F is*

likely below FMSY, and it ***appears that the stock is not experiencing overfishing*** *(32% probability of overfishing).*

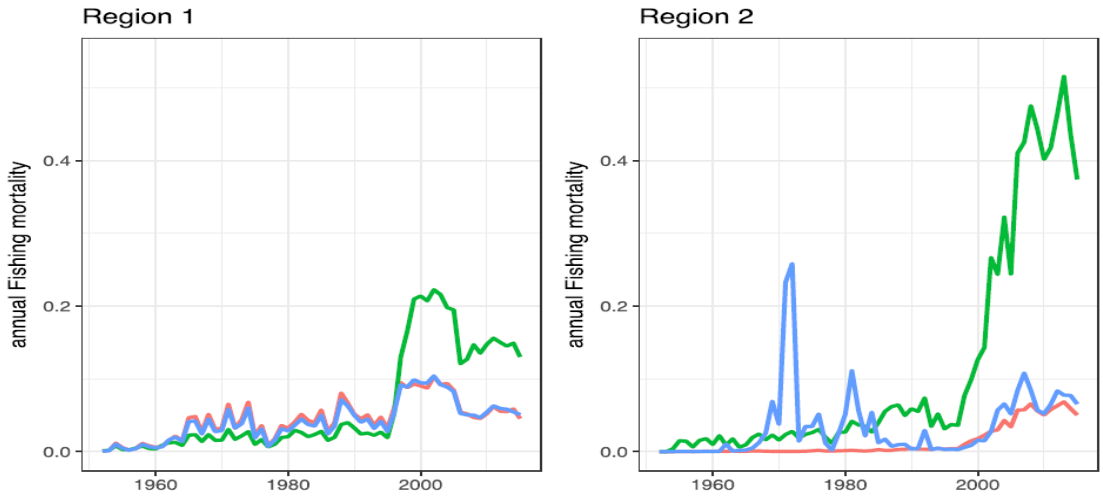


Figure 4 – Estimated annual average fishing mortality at age by age groups (red; ages 1-3; green – ages 4-6; blue – ages 7+), over time. (Source: SPC, 2017 – SC13-SA-WP-13)

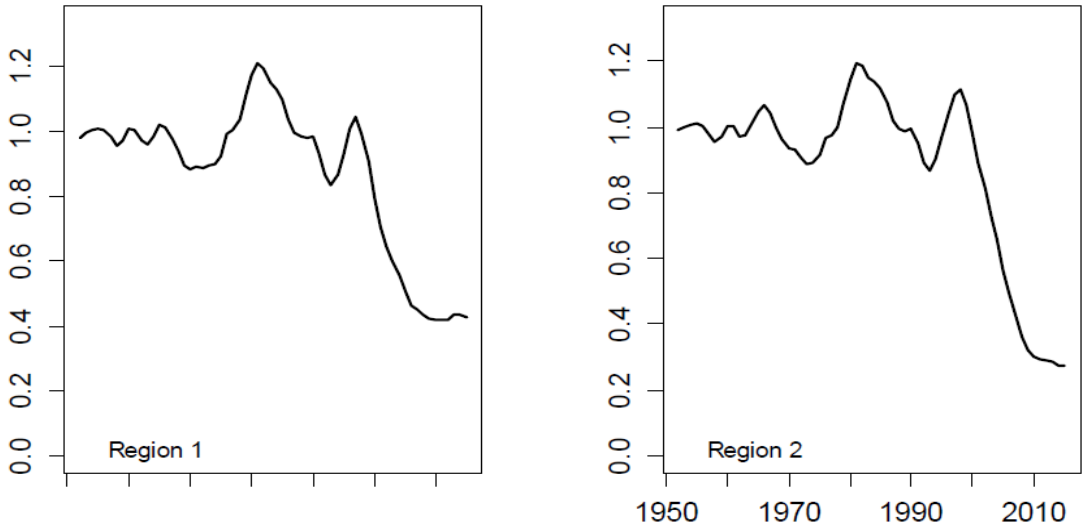


Figure 5 – Ratio of the exploited to unexploited spawning potential in Region 1 and Region 2 for the 2017 stock assessment diagnostic case model (Source: SPC, 2017 – SC13-SA-WP-13)

5. Scientific Committee Advice

Following its review of the 2017 stock assessment, the following scientific advice and recommendations were provided by SC13 and reaffirmed by SC14 and SC15 pertaining to the need for stronger management of South Pacific Swordfish:

- *While the stock was assessed in 2017 to be not overfished and not subject to overfishing, the SC noted:*
    - *The increase in fishing mortality and rapid decline in biomass through the mid-late 1990s to around 2010 and the subsequent more gradual decline in biomass since then.*
    - *Recent catches between the equator and 20-south continue to represent the largest component of the catch in Region 2 and represent half the total catches from the stock;*

    - *Catches in that area contribute substantially to fishing mortality and spawning biomass depletion levels in eastern Region 2 that are substantially higher than in the western Region 1.*
- *On the basis of this SC recommended that:*
    - *The Commission consider developing appropriate management measures for the area north of 20-south to the equator which is currently not covered by CMM 2009-03.*
    - *Current restrictions on catches south of 20°S also be maintained.*

6. Conservation and Management Measure

Noting the scientific advice from SC13 (above), Australia has undertaken a preliminary analysis of the current CMM 2009-03 against SC13 advice, available catch statistics, the 2017 stock assessment and other available information (See **Table 2 below**). On the basis of these preliminary analyses, Australia considers that CMM 2009-03 requires a significant revision and strengthening in order to ensure that the CMM is able to achieve the objectives of the Convention.

The preliminary analysis (Table 2) demonstrates that CMM 2009-03 does not ensure the ongoing sustainability of Swordfish in this region, the ongoing economic viability of current fisheries nor future development opportunities for SIDS and Participating Territory fisheries, noting that:

- **North of 20°S** – There is currently no restriction on catches of swordfish in this area, where catches on the high seas have increased substantially since CMM 2009-03 was developed. SC13 identified a need to develop appropriate measures for this area

- **South of 20°S** – CCMs were required to nominate a maximum total catch of swordfish that it shall be permitted to fish in the area south of 20°S (Table 3). Noting the most recent stock assessment estimated a 32% probability of overfishing, however, if these south of 20°S catch limits are fully caught and combined with recent catches north of 20S, this would substantially increase the probability of overfishing and an overfished stock.

- **Sub-regional depletion** – Swordfish are known to aggregate to seafloor features such as seamounts, ridges, banks and rises. In addition, satellite tagging has demonstrated in some areas a tendency to return to the subregion of release, suggesting some subregional fidelity (Appendix B). The movement and aggregation behaviours of this species make it particularly vulnerable to subregional depletion, a key risk to economic viability and development potential for coastal State fisheries in particular.

- **South East Pacific management** – there is potential connectivity between the south-eastern WCPFC area and the adjacent South East Pacific Ocean (SEPO). The SEPO has seen very substantial increases in catches to over 28000 mt, but IATTC has put no management measure in place, and there has been no stock assessment since 2011.

Table 2 – Preliminary analysis and commentary on CMM 2009-03. Note – this analysis has not yet attempted to examine all elements of the CMM. For example, paragraphs 6, 9, 10, 11 and 12 are not included. The table focusses on those elements that Australia considers need further discussion, revision or removal. Australia would welcome the views of other Members on these elements to informed its planned development of CMM text.

CMM Section	CMM 2009-03 Text	Analysis /Commentary
Preamble	***Noting*** *that the stock assessment undertaken for swordfish in the South Western Pacific region indicated an increase in south-west stock abundance in recent years and the model projections predict further increase at current levels of fishing mortality.*	**1. CMM 2009-03 is no longer "based on the best scientific evidence available"** (Article 5b of the Convention) **-** CMM 2009-03 was developed based on advice from the 2008 stock assessment, and is now out of step with findings and advice from the most recent assessment (in 2017). Numerous examples of this are provided in the table below. **2.** For example, the 2008 stock assessment assessed the "south-west" Pacific area, and was unsuccessful in attempting to include the South Central area in the full assessment (unlike the 2017 assessment, which does). Secondly, the 2017 assessment estimates biomass is declining, not increasing, with SC13 noting: *"The increase in fishing mortality and rapid decline in biomass through the mid-late 1990s to around 2010 and the subsequent more gradual decline in biomass since then."*
Preamble	***Noting*** *that due to the uncertainty in the 2008 stock assessment for South West Pacific swordfish, the SC recommended that there be no further increase in catch or effort in order to keep the stock above its associated reference points* ***Further noting*** *that the SC has recommended that there be no increases in fishing mortality for South-Central Pacific swordfish as a precautionary measure given the lack of a formal assessment and that constraining fishing mortality to current levels is recommended until there is better understanding of fishing impacts in the south central Pacific stock and the relationship between this*	1. **Catches from the stock have increased** - Average annual catches from the stock overall are substantially higher since 2009 than prior to 2009 [with much of this increase occurring in south-central Pacific, north of 20°S] 2. **Current catch "limits" are ineffective** - While acknowledging that fishing mortality should not be increased, CMM 2009-03 capped catches south of 20°S at historically high levels, and provided no restrictions north of 20°S, where catches are now much higher. 3. **Some uncertainties have been reduced** - Significant research into movement and biology (e.g age, growth and maturity) of swordfish has resulted in significant improvements to the regional assessment since 2009. However, a range of uncertainties remain.

	stock and other South Pacific stocks is more certain	
Preamble	***Acknowledging*** *IATTCs recognition of the importance of establishing complementary conservation and management measures for species of mutual interest, and that swordfish stocks in the central Pacific area likely to occur in waters under the competence of both the WCPFC and the IATTC.* ***Recognising*** *the need for both the IATTC and WCPFC to adopt conservation and management measures to provide for the sustainable management of swordfish stocks across the Pacific Ocean.*	1. **SEPO catches have increased** - Catches in the adjacent (and overlapping) south-eastern Pacific Ocean (IATTC area of competence, which includes the overlap area with WCPFC) have increased from under 16000 mt to over 28000 mt, which is above the estimated MSY level from the 2011 assessment (~25000) (IATTC Status of Stocks Report 2018). 2. **There is no IATTC CMM for the SEPO -** Complementary CMMs in the WCPFC and IATTC, for south Pacific Swordfish, have not been developed. Uncertainty remains around connectivity but catch patterns suggest there is some. The last Swordfish assessment in the SEPO was 2011 and the next is not scheduled until 2021, meaning the current status of that stock, in the face of substantially increased catch, is highly uncertain.
Preamble	***Recognising*** *that well managed stocks of swordfish in the central south Pacific represent an important source of long-term economic opportunities for the domestic fisheries of small island development States and participating Territories*	1. **The development aspirations and special requirements** (as per Article 30) of SIDS and participating Territories must continue to be recognised and incorporated/accounted for in any future revised measure, not just pertaining to the south-central Pacific area but across the southern Pacific stock area.
Para. #1	*Commission Members, Cooperating Non-Members and participating Territories (CCMs) shall exercise restraint through limiting the number of their fishing vessels for swordfish in the Convention Area south of 20°S to the number in any one year between the period 2000-2005 (listed in Annex 1)*	1. **Capacity limit measures are not effective –** measures that use the term "*vessels fishing for*" can be interpreted very differently among members (e.g. from only targeting swordfish to occasionally targeting swordfish to multi-species targeted sets), making them very difficult to assess compliance on, and creating some confusion/uncertainty in the CMS. Capacity limits do not directly address fishing mortality, the key parameter requiring control. For example, a very large vessel that can stay at sea for months has much greater catching power than a small vessel that can only fish for a few days or a week.
Para. #2	*In addition to vessel limits established under paragraph 1, CCMs shall exercise restraint through limiting the amount of*	1. **Limits south of 20°S are too high-** The most recent stock assessment estimated a 32% probability of overfishing. Were current catch limits in the area south of 20°S to be

	swordfish caught by vessels flagged to them in the Convention Area south of 20°S to the amount caught in any one year during the period 2000-2006	fully caught (i.e. if catches increase to >7419 mt – see Table 3 - from less than 3000 mt in 2017 – see Appendix A), the combination of those catches with recent catches north of 20°S (see below) would significantly increase the probability of overfishing and an overfished stock occurring.
Para. #3	*CCMs shall not shift their fishing effort for swordfish to the area north of 20°S, as a result of this measure.*	1. **Catches north of 20°S have substantially increased -** The intent of this provision was to help prevent increases in fishing mortality north of 20°S – however catches north of 20°S have increased substantially and SC13 noted: • *Recent catches between the equator and 20-south continue to represent the largest component of the catch in Region 2 and represent half the total catches from the stock;* • *Catches in that area contribute substantially to fishing mortality and spawning biomass depletion levels in eastern Region 2 that are substantially higher than in the western Region 1.*
Para. #4	*No later than 30 April 2010 CCMs shall nominate the maximum total catch of swordfish that it shall continue to be permitted to fish in the area south of 20°S. This amount shall be no more than their maximum verified catch declared to the Commission for any one year in the period 2000-2006.*	1. It appears that potentially not all CCMs that catch swordfish south of 20°S have nominated a limit. See Table 3 for currently nominated limits under the measure. 2. As noted by TCC15, the swordfish limits are not able to be verified by the Commission via independent data sources (i.e. other than CCMs reporting against these limits in the Part 1 report).
Para. #5	*Paragraphs 1 to 4 and paragraph 9 shall not prejudice the legitimate rights and obligations under interational law of small island developing States and participating Territory CCMs, in the Convention Area, who may wish to pursue a responsible level of development of their own fisheries in the Convention Area*	1. **The development aspirations and special requirements** (as per Article 30) of SIDS and participating Territories must continue to be recognised and genuinely incorporated/accounted for in any future revised measure
Para. #7	*CCMs shall cooperate to protect the long-term sustainability and economic viability of the fisheries for swordfish in the Southwest*	1. **Significant research has been conducted since 2009** to help improve and reduce uncertainties in the regional stock assessment, and some projects are in

	Pacific, and in particular shall cooperate on research to reduce uncertainty with regard to the status of swordfish stocks.	progress. The most recent stock assessment (2017) included the following research recommendations: • investigations into potential stock structure and connectivity. • developments to enable sex-disaggregated assessments in MFCL. • enhancement of sex-separated data collection. • Further analysis of available size data available • Further enhance the CPUE standardisation.
Para. #8	*CCMs shall report to the Commission the total number of vessels that fished for swordfish and the total catch of swordfish for the following:* *a. Vessels flying their flag anywhere in the Convention Area south of 20°S other than vessels operating under charter, lease or other similar mechanism, as part of the domestic fishery of another CCM* *b. Vessels operating under charter, lease or other similar mechanisms as part of their domestic fishery south of 20°S; and* *c. Any other vessels fishing within their waters south of 20°S* *This information shall be provided in Part 1 of each CCMs annual report. Initially this information will be provided in the template provided at Annex 2 for the period 2000-2009 and then updated annually.*	1. Reporting against this Paragraph is complicated by the difficulty in interpreting "vessels that fished for swordfish" (see above). A variety of approaches have been taken by individual CCMs in their Part 1 reporting.

Table 3 – Nominated maximum total catch of swordfish in the area south of 20S in 2009 (as per Para 4 of CMM 2009-03) (Source: https://www.wcpfc.int/node/2601 - Attachment 6)

CCM	CATCH (MT)
Australia	2,126
EU	3,170.36
Japan	588.00
Korea	42.25
New Zealand	1,027.00
Chinese Taipei	466.00
USA	74 vessels (Samoa)

Recognising the above issues and risks, as stated in the summary, Australia is seeking the support of WCPFC members to strengthen CMM 2009-03, so as to ensure:

- the ongoing sustainability of the stock regionally
- ongoing economic viability of existing WCPFC member coastal State fisheries
- future development opportunities for WCPFC SIDS and Participating Territories.
- that even stronger management measures are not required in future (in response to an overfished stock) which could also impact tuna fisheries.

Australia proposes that a future revised measure would:

a) apply to EEZs and high seas in the whole area of the stock (consistent with Article 3 and Article 5).
b) be reflective of our current best understanding of swordfish science and its assessed status
c) prevent further increases in fishing mortality on the stock to avoid future overfishing and an overfished stock (as per Article 5).
d) accomodate subregional zone based management approaches and limits and ensure compatible management and limits on the high seas (as per Article 8).
e) recognize the sovereign rights of coastal States to explore, exploit, conserve and manage HMS within areas under national jurisdiction (as per Article 7).
f) recognize the special requirements of, and avoid transferring a disproportionate burden of conservation upon, SIDS and Participating Territories (as per Article 30).

Australia looks forward to discussing this issue at WCPFC16, both in session and in the margins, to assist in gathering information that will enable the development of an appropriate draft proposal for strengthening the CMM and seek review (by SC and TCC and WCPFC) and adoption of a revised CMM by the Commission in 2020.

Appendix A – Catches of swordfish by latitude in the WCSPO to 2017

(Source – WCPFC-SC14-2018/GN-WP-01 (Rev 1 – 5 August 2018) – Overview of Tuna Fisheries in the Western and Central Pacific Ocean including economic conditions – 2017)

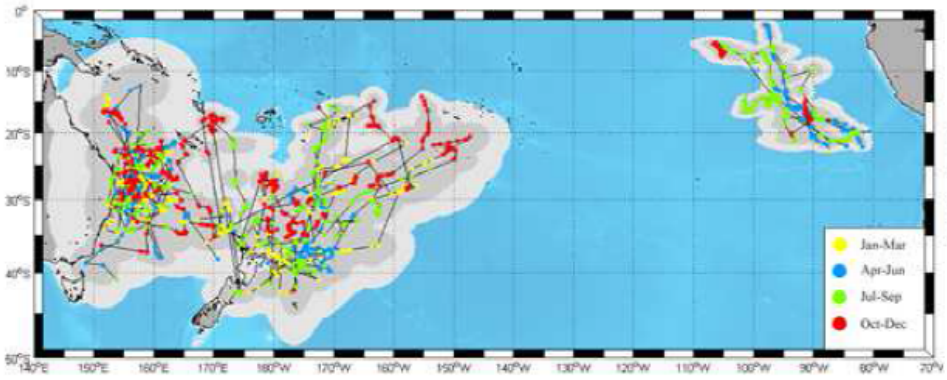
Table A1. Proportion of Longline SWORDFISH catch in the area north of 20°S in the WCPFC Convention Area south of the equator, 2000-2017. Source of data: AGGREGATE CATCH DATABASE; Excludes the Indonesian estimated SWORDFISH catches.

Year	WCPFC Area south of equator (MT)	North of 20°S in the WCPFC Area south of equator	
		MT	%
2000	5,257	1,918	36%
2001	5,903	2,171	37%
2002	8,620	3,819	44%
2003	6,477	3,168	49%
2004	7,605	3,640	48%
2005	6,648	2,330	35%
2006	8,859	3,192	36%
2007	9,348	2,904	31%
2008	9,234	4,129	45%
2009	7,506	4,293	57%
2010	6,227	3,433	55%
2011	8,484	4,994	59%
2012	8,792	4,899	56%
2013	8,267	4,594	56%
2014	8,476	4,773	56%
2015	7,825	4,167	53%
2016	6,507	3,433	53%
2017	6,709	3,775	56%

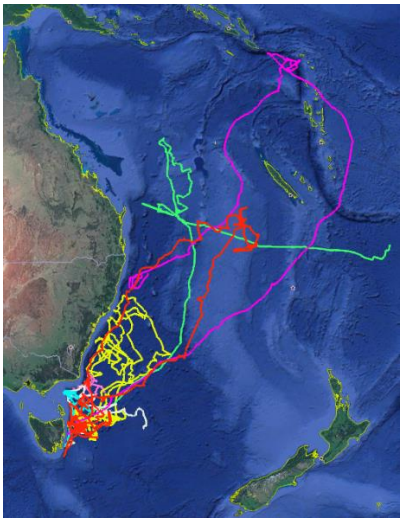
Table A2. Proportion of Longline SWORDFISH catch by 10° latitude band in the WCPFC Convention Area south of the equator, 2000-2017. Source of data: AGGREGATE CATCH DATABASE; Excludes the Indonesian estimated SWORDFISH catches.

Year	SWORDFISH CATCH - WCFPC Area south of equator									
	METRIC TONNES					%				
	0°-10°S	10°S-20°S	20°S-30°S	30°S-40°S	40°S-50°S	0°-10°S	10°S-20°S	20°S-30°S	30°S-40°S	40°S-50°S
2000	1,507	413	1,683	1,460	197	29%	8%	32%	28%	4%
2001	1,565	611	1,957	1,575	229	26%	10%	33%	27%	4%
2002	2,518	1,311	2,313	2,284	210	29%	15%	27%	26%	2%
2003	2,001	1,180	1,778	1,335	209	31%	18%	27%	21%	3%
2004	2,755	905	1,928	1,874	185	36%	12%	25%	25%	2%
2005	1,614	746	2,609	1,476	109	25%	11%	40%	23%	2%
2006	2,741	727	2,946	2,319	159	31%	8%	33%	26%	2%
2007	2,575	470	2,784	3,272	35	28%	5%	30%	36%	0%
2008	3,217	986	1,949	2,942	64	35%	11%	21%	32%	1%
2009	2,780	1,473	1,556	2,038	24	35%	19%	20%	26%	0%
2010	2,189	1,138	1,055	1,789	62	35%	18%	17%	29%	1%
2011	3,568	1,424	1,442	1,924	125	42%	17%	17%	23%	1%
2012	3,520	1,379	1,526	2,205	161	40%	16%	17%	25%	2%
2013	3,060	1,534	1,658	1,803	211	37%	19%	20%	22%	3%
2014	3,519	1,254	2,054	1,445	203	42%	15%	24%	17%	2%
2015	3,163	1,003	2,220	1,210	229	40%	13%	28%	15%	3%
2016	1,995	1,438	1,413	1,428	233	31%	22%	22%	22%	4%
2017	2,212	1,563	1,601	1,184	149	33%	23%	24%	18%	2%

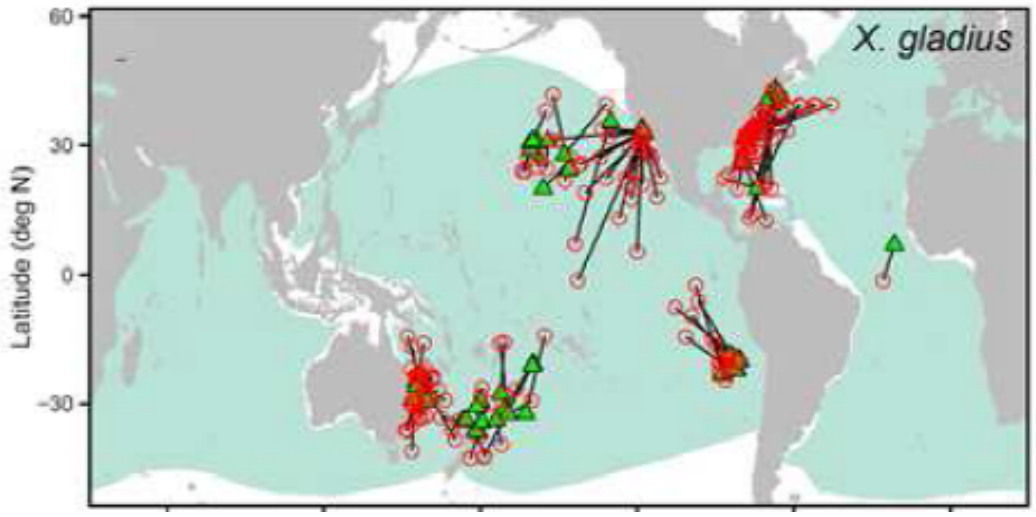
Appendix B – Electronic tagging based movements from a range of research studies



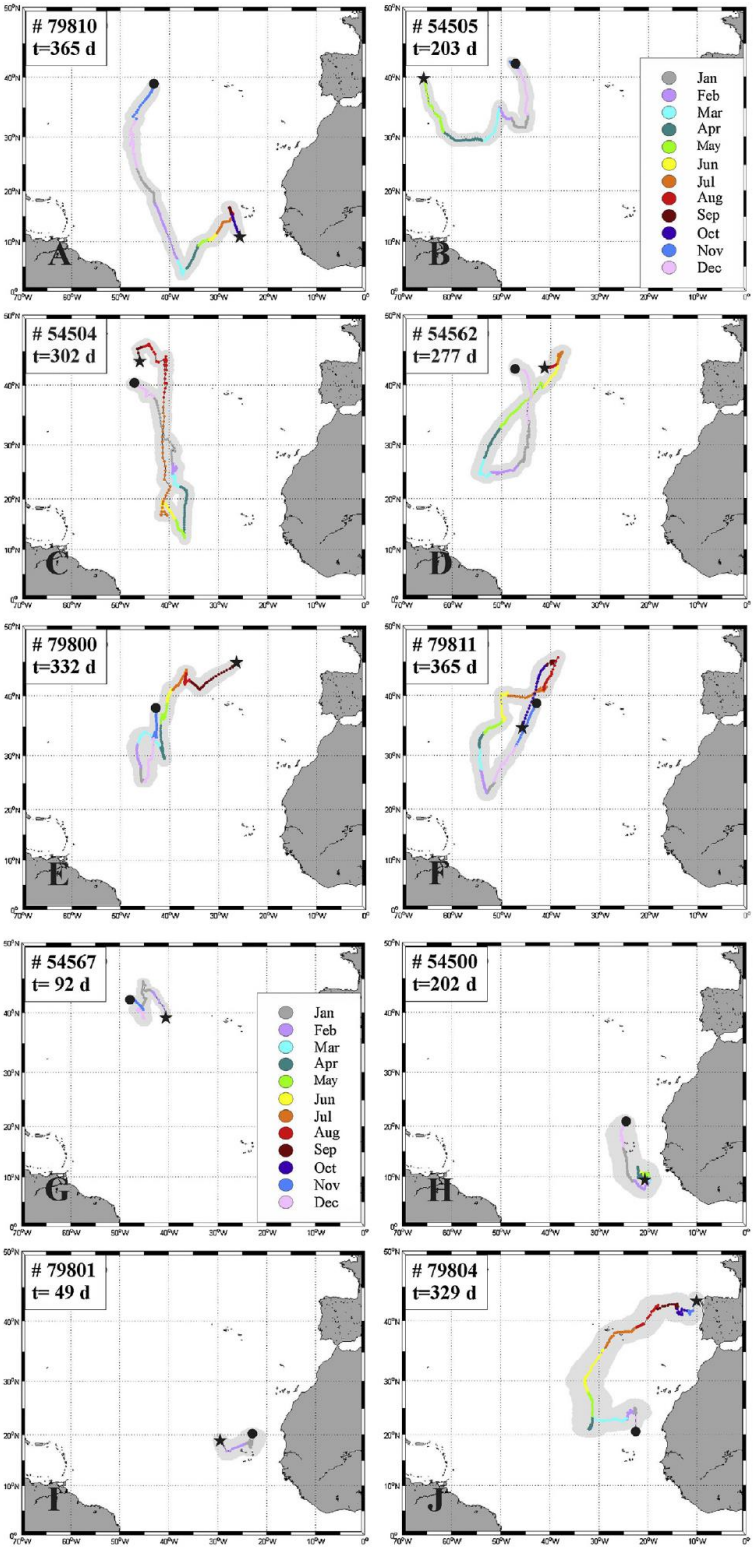
Evans K, Abascal F, Kolody D, Sippel T, Holdsworth J, Maru P. 2013. The horizontal and vertical dynamics of Swordfish in the South Pacific Ocean. Journal of Experimental Marine Biology and Ecology 450: 55 – 67. doi:10.1016/j.jembe.2013.10.025.



(Source – Tracey and Pepperell, 2018, Sean Tracey, pers comm. 2019)



Braun, C.D., Kaplan, M.B., Horodysky, A.Z. and Llopiz, J.K. (2015) Satellite telemetry reveals physical processes driving billfish behaviour. Animal biotelemetry 3(2).



wordfish tagged in the north Atlantic south of the Grand Bank (A–G) and north of Cape Verde islands (H–J). Fish t
ıber of tag (#). Days attached (*t*).

Abascal, F.J., Mejuto, J., Quintans, M., Garcia-Cortes, B., Ramos-Cartelle, A. (2015) Tracking of broadbill swordfish (Xiphias gladius) in the central and eastern North Atlantic. Fisheries Research 162(20-28).