



**Australian Government**

**Australian Fisheries Management Authority**

**Tropical Tuna and Billfish Fisheries  
Resource Assessment Group  
TTRAG 19**

**Meeting Minutes**

**30-31 August 2017**

**Mooloolaba**

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# 1 Preliminaries

## 1.1 Welcome and Apologies

1. The Chair, Dr Cathy Dichmont, opened the TTRAG 19 meeting at 9:10am.
2. The following participants were in attendance at the meeting:

<b>Members</b>	
Dr Cathy Dichmont	Chair
Dr Don Bromhead	AFMA Member
Dr Rob Campbell	Scientific member, CSIRO
Mr James Larcombe	Scientific member, ABARES
Mr Gary Heilmann	Industry member
Mr John Abbot	Industry member
Dr Julian Pepperell	Recreational member
Dr John Tisdell	Economics Member, UTAS
<b>Invited Participants</b>	
Mr Paul Williams	Industry
Mr David Ellis	Industry Association, Tuna Australia
<b>Observer</b>	
Ms Natalie Rivero	AFMA
<b>Executive Officer</b>	
Ms Georgia Langdon	AFMA
<b>Members not present</b>	
Dr Rich Hillary	Scientific member, CSIRO
Mr Pavo Walker	Industry

## 1.2 Pecuniary interest declarations

3. The Chair asked all participants present at the meeting to declare any conflict of interest with the agenda under item 1.2. Each participant with a declared conflict of interest was then asked to leave the room while the remaining members discussed their individual claims.
4. The attendees declared their conflict of interests as follows:

Member/ participant	Declared Interests
<b>Mr John Abbott</b>	Owns an ETBF boat SFR, and ETBF quota SFRs, and also holds a state licence fish receiver permit. <i>Declared an interest in Agenda items 4 and 6.</i>

<b>Mr Don Bromhead</b>	Employee of AFMA, which includes a salary. Is the Manager of the tropical tuna fisheries. No pecuniary interest in tropical tuna fisheries. <i>No conflict of interest declared.</i>
<b>Dr Robert Campbell</b>	Employee of CSIRO, no pecuniary interest in Australian tropical tuna fisheries. Is actively engaged in research on the Eastern and Western Tuna and Billfish Fisheries. PI of the following research project: “ <i>Data management, provision of fishery indicators and implementation of the harvest strategies for Australia's tropical tuna fisheries</i> ”. <i>Declared a conflict of interest in Agenda item 4.</i>
<b>Dr Cathy Dichmont (Chair)</b>	Has a consulting company, but has no pecuniary interests in the tuna fisheries. <i>Declared a conflict of interest in Agenda item 5.</i>
<b>Mr David Ellis</b>	Previously involved in the Southern Bluefin Tuna Fishery, has a consultancy company and is the CEO of the industry association, Tuna Australia. Has tenure on the Aquaculture allocation board. <i>Declared a conflict of interest in Agenda items 3.6, 4 and 5.</i>
<b>Mr Gary Heilmann</b>	Industry member, director of a processing company, no longer holds ETBF boat or quota SFRs. <i>Declared an interest in Agenda items 3 and 5</i>
<b>*Dr Rich Hillary</b>	Employee of CSIRO, no pecuniary interest in Australian tropical tuna fisheries. Is the PI for the Management Strategy Evaluation (MSE) project for the tropical tuna and billfish species.
<b>Mr James Larcombe</b>	Employee of ABARES, involved in fisheries research, primarily through engagement with the Western Central Pacific Fisheries Commission. Has no pecuniary interest in the Australian Tropical Tuna Fisheries. <i>Declared a conflict of interest in Agenda item 5.</i>
<b>Dr Julian Pepperell</b>	Independent fisheries consultant and representative of the recreational fishing sector. Is currently undertaking research into game fishing. Is involved in projects including the monitoring of fish landed at game fishing tournaments and pop-up satellite tagging on juvenile Black Marlin. <i>Declared a conflict of interest in Agenda item 5.</i>
<b>Ms Natalie Rivero</b>	Employee of AFMA, which includes a salary. Is the Executive Officer for the TTRAG, but has no pecuniary interest in Australian tropical tuna fisheries. <i>No conflict of interest declared.</i>
<b>Professor John Tisdell</b>	Employee at the University of Tasmania and is a scientific member of the Great Australian Bight Resource Assessment Group (GABRAG). Has no pecuniary interest in tropical tuna fisheries. <i>Declared a conflict of interest in Agenda item 5.</i>

*Mr Pavo Walker	Owns several ETBF boat SFRs, and ETBF quota SFRs for all species. Holds a Coral Sea permit and minor line permit. <i>Declared an interest in Agenda items 3 and 5.</i>
Mr Paul Williams	Director of a company that holds an ETBF boat SFR, ETBF quota SFRs, and holds a Commonwealth fish receiver's permit. <i>Declared an interest in Agenda items 3 and 5.</i>

\* Did not attend the meeting.

5. In all cases where a member or participant declared a conflict of interest, the remaining members unanimously agreed they were permitted to participate in the item of discussion. It was decided that the expertise of the members and invited participants present at the meeting was critical for comprehensive discussion of the agenda items, further noting that no final decisions were being made at the meeting.

### 1.3 Adoption of Agenda

6. The Chair proposed a number of changes to the draft agenda as follows:
  - That the WTBF agenda items (3.6 and 5.6) be grouped together and placed after all ETBF items to ensure continuity in the discussion
  - That the update on the harvest strategy (4.1) be moved to immediately prior to agenda item 3.
7. The agenda was endorsed by the RAG and the final amended agenda is provided in Appendix 1.

### 1.4 Acceptance of minutes

8. The minutes from the TTRAG 18 meeting held on 11 – 12 July 2017 were circulated out of session to the RAG on 18 August 2017.
9. Comments were received by Dr Miriana Sporcic and the suggested changes were incorporated into the draft.
10. The RAG agreed to allow an additional week for participants to submit comments to AFMA on the draft minutes. The minutes will be accepted out of session.

### 1.5 Actions arising

11. The RAG discussed the action items arising from TTRAG 18 and ongoing action items from previous RAG meetings and commented on the progress on each item (Table 1).
12. A summary of actions arising from this meeting are summarised in Appendix 2.
13. The Chair suggested that the list of action items be split into those that are standing items and are ongoing, with regular meeting updates, to be separated from those that are shorter term actions to be addressed.

**ACTION ITEM 1** – AFMA to split action items into two categories; standing items that require regular meeting updates, and actionable actions to be addressed in the short term.

**Table 1. Status of actions arising from previous TTRAG meetings.**

	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
1	ETBF Management Arrangements spreadsheet: TTRAG members to each review their area of expertise and add relevant management arrangements to the existing table also including management arrangements in the WTBF. Separate sheets suggested for economic factors and recreational fishing.	TTRAG 14	TTRAG	ONGOING: The update of this spreadsheet will be completed routinely (as a standing agenda item for the July meeting each year).	Noted
2	Estimating Recreational Catch: AFMA to contact NSW fisheries for the charter boat logbook data. Dr Julian Pepperell with contact Daniel Ghosn to see what recreational club data she can provide.	TTRAG 14	AFMA/Dr Julian Pepperell	ONGOING: At the TTRAG 18 meeting it was noted that the recreational club data has been digitized and is ready for use and that Dr Campbell was yet to receive the NSW charter boat data received by AFMA. AFMA has since provided Dr Campbell with this data.	Dr Julian Pepperell requested a copy of the data. Dr Campbell questioned what kind of analysis the RAG would prefer. TTRAG agreed that a simple summary would be useful. Dr Campbell will present at the next TTRAG.
3	5 year research plan: Dr Julian Pepperell to prepare a recreational fishing proposal to be included in the 5 year research plan and circulate to TTRAG out of session.	TTRAG 14	Dr Julian Pepperell	ONGOING: At the TTRAG 18, the RAG requested that an update on the progress of the proposal be given at the August RAG meeting.	Noted
4	AFMA and CSIRO to prepare a paper that includes information from the harvest	TTRAG 15	AFMA/CSIRO	ONGOING: This item was discussed under agenda item	Noted

	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
	strategy, stock status information, the CSIRO MSE analysis and connectivity review assess sustainability issues in implementing inshore and offshore quota zones for swordfish.			5.4 at TTRAG 18. It was agreed that a Swordfish research proposal be progressed after the RAG considers the Swordfish depletion analysis under Agenda item 3.4	
5	AFMA will provide economic data from ABARES to include in the RBCC advice in future.	TTRAG 16	AFMA	ONGOING. Economic data was discussed by the RAG at TTRAG 18 under agenda item 2.5. An update from the TTRAG economic working group will be given under agenda item 2.3	Noted
6	AFMA to send management arrangements booklet out to TTRAG members in future	TTRAG 17	AFMA	ONGOING: Management Arrangement booklets are sent to industry at the beginning of the fishing season and TTRAG members will be added to the distribution list	Noted
7	AFMA to present Catchwatch reports as cumulative plots showing catch per month over current and preceding years.	TTRAG 17	AFMA	ONGOING: It was clarified at TTRAG 18 that what was requested was a plot of similar time point within the fishing season compared over a number of years. AFMA has an updated catchwatch report that will be	Noted



	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
				presented under agenda item 2.2	
8	AFMA to follow up on whether a review will be conducted to determine if the TAP aligns with the ACAP guidelines and if so who will be undertaking the review.	TTRAG 17	AFMA	ONGOING: AFMA will provide a verbal update on the review conducted by AFMA's bycatch team.	AFMA will present a summary of the outcomes at the next RAG meeting.
9	AFMA member to seek clarification from the ERA TWG on their advice regarding bypassing the species component at the SICA stage.	TTRAG 17	AFMA	IN PROGRESS: This has been passed onto the AFMA ERA team who have indicated it will be raised at the next ERA TWG. Managers of fisheries undertaking ERAs have also been informed of the issue.	AFMA ETBF management team to follow this up again with AFMA ERA team. TTRAG noted there has been a staffing change within the ERA team.
10	AFMA to follow up internally on how to best provide EM data to Dr Robert Campbell.	TTRAG 17	AFMA	ONGOING: AFMA will be working with Dr Campbell on this out of session.	AFMA has been working internally to establish a link between the logbook and EM data. Once CSIRO gains access to the data, TTRAG will review the use of EM data in scientific research and advice provision processes as part of the development of a Data Strategy within the ETBF FMS

	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
11	Dr Robert Campbell to follow up with Simon Hoyle if there is value and if it is practical to conduct the two-stage process for models not tested under Group-A	TTRAG 17	Dr Robert Campbell	ONGOING: This is a longer term issue that will be addressed before the first TTRAG meeting of 2018	Noted
12	Dr Julian Pepperell to follow up with Dr Karen Evans regarding recreational fishing contacts that may provide useful for sample collection.	TTRAG 17	Dr Julian Pepperell	COMPLETE: Dr Pepperell has been in touch with charter operators/contacts in NZ and they are getting Dr Evans samples.	AFMA to follow up with Dr Sam Williams regarding additional access to samples
13	All RAG members to contact any relevant researchers/contacts who may have (or are able to collect) samples relevant to the project and contact Karen directly.	TTRAG 17	TTRAG	ONGOING: Status to be discussed by TTRAG. Dr Evans also attended WCPFC SC in August and has arranged for further sample collections through relevant areas of the Pacific	AFMA to provide the RAG with Karen Evans contact details.
14	AFMA to follow up on the NSW charter boat data received and provide to Dr Robert Campbell	TTRAG 18	AFMA	COMPLETE: See Action item 2	Noted
15	Dr Sean Tracey to provide Dr Karen Evans with Swordfish samples for the genetics project.	TTRAG 18	Dr Sean Tracey	ONGOING: Dr Tracey has informed AFMA he will be undertaking a sample stock take and contacting Dr Evans early September.	Noted
16	AFMA to follow up with staff that attended IOTC if discussions on Swordfish took place at the IOTC meeting	TTRAG 18	AFMA	COMPLETE: AFMA confirmed that no Swordfish discussions took place at the last IOTC meeting.	Noted

	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
17	The RAG sub-committee explore options available to the RAG for collecting economic information and prepare a paper for RAG and MAC consideration.	TTRAG 18	Tuna Australia, AFMA, ABARES, Professor John Tisdell	ONGOING: The RAG sub-committee will give a verbal update under Agenda item 2.3.	Noted
18	AFMA to provide a summary to the ERA team on the discussion by the RAG and the agreed approach to assessing species under the SAFE methodology.	TTRAG 18		COMPLETE: The TTRAG 18 minutes were circulated to the CSIRO ERA team on 18 August 2017.	Noted
19	Dr Robert Campbell to add the nominal CPUE to the first and last stepwise influence plots for comparison	TTRAG 18	Dr Robert Campbell	ONGOING: Dr Campbell will next present the CPUE standardisations at TTRAG 21 in July 2018.	Noted
20	The AFMA member contact AFMA staff attending the ComRAC meeting to suggest TTRAG be the steering the committee for the oceanography research project	TTRAG 18	AFMA	COMPLETE: The suggestion that TTRAG be the steering committee was raised at the ComRAC meeting.	Complete. CSIRO agree to hold steering meetings with TTRAG and include as sub-set of TTRAG members on steering committee.
21	AFMA to clarify the FRDC contract provisions around intellectual property	TTRAG 18	AFMA	ONGOING: AFMA has sent a request to FRDC on this issue and is awaiting reply.	The AFMA Research team has indicated that FRDC can make arrangements in the contract to allow external countries to gain access to the data models. The RAG noted that this

	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
					is critical to the success of the project. AFMA will provide another update at the next TTRAG meeting.
22	Dr Robert Campbell to redo Swordfish depletion analysis using update CPUE standardisations and prepare a paper for the RAG to discuss.	TTRAG 18	Dr Robert Campbell	COMPLETE: Dr Campbell has completed the analysis and it will be discussed under Agenda item 3.4	Noted
23	AFMA to contact Dr Karen Evans to determine when results from the Swordfish genetics project will be available for the RAG to consider	TTRAG 18	AFMA	COMPLETE: To be discussed under agenda item 6.	Noted – Discussed further under item 6.1
24	The Swordfish research proposal agenda item to the progressed out of session.	TTRAG 18	Dr Robert Campbell, Tuna Australia and AFMA	See Action item 4.	Noted – discussed under item 6.1
25	AFMA to follow up on the exact date the trip limit for mahi mahi was removed and add it to the significant events spreadsheet	TTRAG 18	AFMA	ONGOING – AFMA was unable to determine from historical records if and when a trip limit on mahi mahi was in place in the ETBF. Further advice to be sought from TTRAG	Gary Heilmann recalled the limit being removed in 2002, noting that it was an amendment to the OCS arrangements. AFMA to confirm and report back on details.

	Action	Meeting raised	Responsibility	Status	Comments from TTRAG 19
26	Dr Julian Pepperell to update the recreational sector significant events and add to the document out of session	TTRAG 18	Dr Julian Pepperell	ONGOING: Dr Pepperell to provide an update.	Dr Pepperell indicated this will be completed by the next meeting.

## 1.6 Out of session correspondence

14. The RAG noted the out of session correspondence between the TTRAG 18 and TTRAG 19 meeting described in Agenda item 1.6 with no further correspondence added to the list.

## 2 Review of fishery performance

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### 2.1 Current catches and effort in the domestic fishery

15. The scientific, industry and recreational members of the RAG gave an update of the catches in the fishery since the last RAG meeting in July.
16. One industry member acknowledged that the year is running as normal relative to long term trends but fairly poor compared to recent good years. Yellowfin catches have declined this August. He added that there has been a recent increase in small yellowfin (20-30kg) on the continental shelf, at the base of the Coral Sea and as far down as Coffs Harbour. Bigeye tuna fishing is considered to be poor, with around half the catch this year compared to last.
17. Swordfish is still patchy, and striped marlin catches which often correlate with the yellowfin catches, are down. Albacore catch has been very strong, which is unusual to what is normally expected. The latest poor conditions are very reminiscent of the conditions from 2004, noting the similar drop in catches and catch rates from that time, following a period of much higher catches. The mild La Nina that has been experienced hasn't induced the same rainfall as would normally be expected following extreme El Nino like that experienced in 2015, noting that there tends to be good fishing immediately following El Nino conditions.
18. Other industry members agreed with those comments and noted that the yellowfin tuna has been moving wider. Catches have been good in recent weeks and are expected to improve in the coming months before declining again heading into the summer months. Fishing deeper in the Coral Sea, has helped with improving catch rates in the warmer months.
19. The Tuna Australia industry representative provided a brief update on behalf of other members of the Tuna Australia not present. He noted that in Cairns, yellowfin catches have been improving with good size and flesh colour. Broadbill swordfish have also been appearing in good numbers, albacore catches have been prolific. In the mid-north, yellowfin catches have been steadily improving and following the recent lunar phase, catches have been extremely good. Swordfish have appeared in good numbers in 'the paddock' and albacore is also prolific. Reports around the central area (Coffs Harbour/Nelson Bay), yellowfin catches are good, and bigeye tuna are fetching high prices in Japan. Further south from Ulladulla to Bermagui, most operators are fishing for Southern Bluefin Tuna (SBT). Catches have been variable due to the weather and the currents are not as obvious. Prices for SBT have been very good and some uncaught quota still remains.
20. The current zone proposal under the Commonwealth Marine Reserve (CMR) Network draft plan is welcomed by industry, however there are some concerns around 'no take' areas of the Great Barrier Reef boundary extension on the Southwest corner of the Coral Sea CMR, Norfolk Island, Derwent Hunter and Bull's pyramid in the Temperate East CMR. Industry is also seeking practical prosecution guidelines due to 'drift and distance'. The Tuna Australia industry representative added that there needs to be clarity around the process of 'gear class approvals' to fish in a CMR by the Director of National Parks. If there are any concerns regarding conservation values in the future and a gear type not being approved, there needs to be a

government department agreement assessment process involving the Department of the Environment and AFMA. It is very important the current zoning proposal is approved during the current government term of office as industry is becoming frustrated with the lack of certainty in the process.

21. The association is trying to finalise issues with foreign labour, noting that it accounts for approximately 50 per cent of the industry workforce. Tuna Australia have been working with the Department of Immigration on issues regarding the removal of certain positions (Master Fisher, Ships Master, Engineer and Officer) as part of the changes to the 457 Visa and these will be included in the Fishing Industry Labour Agreement and signed off by the minister in the coming weeks.
22. Discussions are continuing with political parties regarding the utilization of latent fishing effort in the WTBF with a Japanese joint venture.
23. The catch recording and reporting project with AFMA is progressing. Tuna Australia will start looking to industry members to undertake trials on real time reporting. The FV's Samurai and Gracie P will be the first vessels to trial the project.
24. Following the reports from industry, the recreational member gave an update on the recreational fishing sector stating that there has been some yellowfin tuna are being caught off the coast of NSW, including out wide. Some fishers off Sydney have been very successful catching swordfish using squid drop baits. Fishing methods and technology are being widely shared across the recreational industry. There has been a very good juvenile recruitment of black marlin off the coast of Cairns, indicating that a good cohort of six month old fish are moving through. A very large (220kg gutted) bluefin tuna was recently caught off the coast of Bermagui. It was undetermined whether it was a southern Bluefin or a Pacific Bluefin. Industry noted that the identification of Bluefin tuna can be based on the time of year that the fish is caught and the condition of the fish.
25. The Chair thanked the scientific, industry and recreational members for their updates and closed the agenda item.

## 2.2 AFMA Catchwatch reports

26. AFMA presented the RAG with the latest catchwatch report noting that the descriptions made by industry on peak yellowfin catches in the month of August are reflected in the catch disposal records (CDR) by month plots from the catchwatch data.
27. AFMA verbally provided the latest catchwatch data for the RAG to consider how the latest cumulative catches are tracking against the historic data. The RAG noted that striped marlin was tracking very low compared to past years, and considered this may be due to limited targeting.
28. AFMA reminded the RAG that the latest catchwatch figures are likely to be a bit higher than indicated given that the most recent month's data is likely to be incomplete, and may not capture recent increases in yellowfin catches.

## 2.3 Update on the TTRAG Economic Working Group

29. A verbal update was provided by the AFMA member on the economic working group that was formed at TTRAG 18 to discuss the need for and best use of economic data that is currently available for the ETBF.
30. Although the small group has not met since its inception, the RAG noted that the policy section at AFMA has been collating some economic data that the small working group will consider when they meet. The data includes some Sydney Fish Market (SFM) data, as well as economic data presented at the WCPFC SC, which incorporates foreign fish market prices.
31. AFMA reminded the RAG that the SFM economic data presented is strictly confidential and is not to be distributed outside the group.
32. The ABARES scientific member reminded the RAG that the source of the economic price data needs to be interpreted with caution, as the foreign export price versus a price through the Sydney Fish Market are different.
33. An industry member noted that in NSW, a lot of locally sold product is being sold directly to retailers and bypassing the wholesale market.
34. Industry suggested that the upcoming transition to a calendar year season, with a short ten month season, may have an economic impact on the fishery. There may be less quota available for the period when the majority of quota is caught.

## 2.4 Update on the 13<sup>th</sup> Regular Session of the WCPFC Scientific Committee

35. The ABARES scientific member provided a verbal update on the 13th regular session of the Western and Central Pacific Scientific Committee held in Rarotonga, Cook Islands on 9 – 17 August 2017.
36. Key items noted were the updated stock assessments for bigeye tuna, yellowfin tuna, southwest Pacific swordfish, porbeagle and bigeye thresher shark species. The SC13 adopted a new approach for determining stock status by using a full grid of all the plausible models instead of the traditional approach of selecting a base case model for the provision of management advice. There is further work for the SC to develop an approach to undertake weighting of the grid uncertainty axes and for producing appropriate plot and outputs that use the full grid.

### Bigeye tuna

37. The bigeye assessment included some significant changes including to the regional structure and growth inputs, compared to those used in the 2014 assessment. A weighted grid approach was applied to better capture the uncertainty around the assessment with all weightings equal except for the growth input where the old growth models were down weighted (25 per cent).
38. The growth assumption was by far the most influential factor on the outcomes of the assessment, noting that the key difference between the old growth and the new growth curves is that the maximum length is lower in the new growth model. The new growth curve was questioned by some countries for having fewer big fish samples. Some new scientific research



is being undertaken to confirm the growth models, and if the SC can agree on this input, the assessment will again be run in 2018, effectively removing the current uncertainty around growth from the 2017 assessment.

39. The median recent spawning biomass ( $SB_{\text{recent}}/SBF=0$ ) was 0.32 with a probable range of 0.15 to 0.41 (80% probability interval). There was a roughly 16% probability that the recent spawning biomass had breached the adopted LRP.
40. The median recent fishing mortality ( $F_{\text{recent}}/F_{\text{MSY}}$ ) was 0.83 with a probable range of 0.61 to 1.31. There was a roughly 23% probability that the recent fishing mortality was above  $F_{\text{MSY}}$ .
41. Industry questioned the date of the otolith samples collected and cautioned against collecting age samples from only one point in time as it may not be representative of how growth patterns may have changed over time.
42. Dr Campbell noted that none of the runs using the new growth model fell below the agreed limit reference point 20%SBF=0. Noting the broad range of results, overall, the updated assessment provided a more optimistic stock status compared with the 2014 assessment and stock status is now expressed in terms of likelihood.

## Yellowfin tuna

43. The updated yellowfin assessment utilized a full grid of 48 models, with no weighting, to provide stock status advice. The assessments results indicated that the stock is more depleted compared with the 2014 assessment, with less uncertainty and a roughly 8 per cent probability that the recent spawning biomass had breached the adopted limit reference point, and approximately 4 per cent probability that the recent fishing mortality was above  $F_{\text{msy}}$ .
44. An industry member expressed concerned with the more pessimistic biomass calculation, when the stock was deemed to be not experiencing overfishing. The ABARES scientific member reminded the RAG that the reference point of  $F_{\text{recent}}/F_{\text{msy}}$  is still being used due to requirements under the UN Fish Stocks Agreement. AFMA added that without a target reference point, it could be considered that the biomass estimate is not in a concerning position, provided it is above the limit reference point.

## Swordfish

45. The updated swordfish assessment in 2017 incorporated new growth and maturity research that resolved the previous key uncertainty in the assessment around conflicting growth models. The new assessment used a complete unweighted grid with a more pessimistic outcome compared with the 2013 assessment. The median recent spawning biomass ( $SB_{\text{recent}}/SBF=0$ ) was 0.35 with a probable range of 0.29 to 0.43. This indicated there was a very low probability that the recent spawning biomass had breached the adopted limit reference point (so stock not overfished). The median recent fishing mortality ( $F_{\text{recent}}/F_{\text{msy}}$ ) was 0.86 with a probable range of 0.51 to 1.23. This indicated there was approximately a 32% probability that the recent fishing mortality was above  $F_{\text{msy}}$  (i.e. 32% probability of overfishing).
46. The RAG noted that swordfish does not yet have a limit or target reference point within the WCPFC.

47. Noting the model sensitivity to the dispersion rate between the east and west regions of the southwest Pacific, the recreational member questioned if Australia would favour a lower dispersion rate, with TTRAG noting that this will be determined by the genetic study that is underway.

### **Bigeye thresher shark**

48. The new assessment in 2017 encompassed the entire Pacific Ocean, and used a new 'risk assessment' approach that provides annual fishing mortality estimates but not direct estimates of biomass depletion. The fishing mortality reference points are the same as for the Ecological Risk Assessment SAFE method.
49. Fishing mortality is relatively high overall, particularly in the equatorial region. Under the most plausible scenario, accounting for some post-capture survival (of 30-70%), the median sustainability risk for the 2000-2014 period ranged between:  
20% below to 60% above the reference point  $0.5r$  ( $F_{msm}$ ),  
50% below to 10% above the reference point  $0.75r$  ( $F_{lim}$ ), and  
60% to 20% below the reference point  $r$  ( $F_{crash}$ )  
This roughly equates to a 'medium risk' under the Australian ERA framework, however when considering the uncertainty, the risk may escalate to 'high'.

### **Porbeagle shark**

50. The new assessment in 2017 encompassed the entire southern hemisphere range of the species and uses the same 'risk assessment' methodology to provide estimates of annual fishing mortality.
51. Fishing mortality was estimated to have been relatively low in all areas and years with a very high, or high probability of being below the three reference points for fishing mortality ( $F_{msm}$ ,  $F_{lim}$  or  $F_{crash}$ ). This roughly equates to 'low risk' under the Australian ERA methodology.

### **Management Issues**

52. The RAG noted that some progress had been made at the SC on the harvest strategy framework workplan including the submission of a paper for agreeing to a target reference point for South Pacific Albacore. The paper examined some trade-offs and implications for a range of target reference points for South Pacific Albacore. Other issues discussed including developing performance indicators for management strategy evaluation and an operating model for skipjack tuna.
53. The ABARES scientific member acknowledged that swordfish is not included in the Harvest Strategy Framework, noting however that the results of the genetic study could be a useful catalyst for the inclusion of swordfish in the framework. Dr Campbell added that given there will be updated assessment in 2018 for striped marlin, and the current research on swordfish, it may be an ideal time to push for the development of a limit reference point for those species.

## Ecosystem and Bycatch

54. SC13 developed safe release guidelines for manta and mobulid species.
55. High bycatch rates of seabirds were reported by some countries fishing in waters south of 30° South in 2016. The SC expressed concern over this data as there is a significant level of fishing effort occurring around that latitude that does not have observer coverage.
56. Additional work on sea turtles was also conducted, examining alternative gear configurations on the sea turtle mortality in longline fisheries, looking at the effects of large circle hooks, fish bait and hook position, as well as set depth.
57. The AFMA member added that the United States of America (USA) are likely to advocate for a new conservation management measure (CMM) on sea turtles in the coming years to try and achieve more turtle mitigation in deepset longline fisheries. Australia has requested that the USA keep Australia informed with the developments of their proposal.

## Update on the Tropical Tuna Conservation and Management Measure (TTCMM) workshop

58. The AFMA member provided an update on the outcomes of the Tropical Tuna Conservation Management Measure workshop held in Honolulu in August 2017.
59. The intention of the workshop was to continue the development of tropical tuna CMM for bigeye, yellowfin and skipjack tuna, including target reference points and acceptable levels of risk for breaching limit reference points.
60. The existing CMM is focused largely on the conservation of bigeye tuna, which was previously considered as experiencing overfishing, and being overfished. The previous iteration of the CMM aimed to reduce the fishing mortality of bigeye tuna by 30 per cent and while it did not achieve that, it did manage to maintain the stock at a stable level. Had the measure not been in place, the bigeye tuna stock would have likely declined further towards or below the limit reference point, reiterating the importance of maintaining and continually developing the tropical tuna CMM.
61. The workshop allowed country members a mechanism to provide suggestions on how the CMM should be revised. AFMA noted there are essentially two polarized views on the issue. One being Forum Fisheries Agency (FFA) member countries (including Parties to the Nauru Agreement (PNA)) pushing for zone based management, while at the other extreme are some non-FFA countries preferring flag based management. Then there are positions that sit in between these. The meeting served to allow discussion of each countries position but there was relatively little progress in resolving some of the key differences in those positions.

## WCPFC Data Summary for key tuna species

62. Dr Campbell provided a brief overview of the tuna fisheries data in the WCPFC, which was presented at SC13.
63. The RAG noted the following key points on each species:

64. The total catch of tuna in the WCPFC Convention Area was 2,717,850 mt, the second highest on record and nearly 120,000 mt below the previous record catch in 2014. This equates to 56 per cent of the global tuna catch.
65. The provisional catch of yellowfin tuna in the WCPFC Convention Area in 2016 was 643,611 mt (a record). This catch was a 12 per cent increase over 2015 (and a 9 per cent increase over 2014), a 13 per cent increase over the previous five year 2011-15 average (569,056 mt), and a 17 per cent increase over the average since 2000 (548,665 mt). The provisional longline catch in 2016 (84,376 mt, the 20th highest on record) was a 15 per cent decrease on 2015 and a 6 per cent decrease on the previous five year 2011-15 average (89,853 mt).
66. The provisional catch of bigeye tuna in the WCPFC Convention Area in 2016 was 146,465 mt, the 12th highest on record. This was an 8 per cent increase over 2015 (a 5 per cent decrease over 2014), a 2 per cent decrease over the previous five year 2011-15 average (148,871 mt), and similar to the average since 2000 (146,709 mt). The record catch was 180,393 mt in 2004. The provisional longline catch in 2016 (57,813 mt, the 12th highest on record), was a 9 per cent decrease on 2015 and a 12 per cent decrease on the previous five year 2011-15 average (65,587 mt).
67. The provisional total catch of albacore tuna in the south Pacific in 2016 was 68,601 mt, the 8th highest on record (the record being 87,895 mt in 2010). This was a 16 per cent decrease over 2015 and a 15 per cent decrease over the previous five year 2011-15 average (81,557 mt). The provisional longline catch in 2016 (66,230 mt and the 8th highest on record) was down 16 per cent on 2015 and down 14 per cent on the 2011-15 average but similar to the 2000-15 average (66,412 mt).

The RAG agreed to discuss Agenda Item 4.1 ahead of Agenda Item 3.

## **3 Harvest strategy for the 2018-19 Season**

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### **3.1 ETBF Harvest Strategy and RBCC calculations for Swordfish and Striped marlin**

#### **Swordfish**

68. Dr Campbell presented a summary of the results of the 2017 assessment and implementation of the harvest strategy to calculate a Recommended Biological Commercial Catch (RBCC) for broadbill swordfish and striped marlin as outlined in Agenda Item Paper 3.1.
69. The key conclusions noted by Dr Campbell were:
- The standardised CPUE indices are calculated for the years 1997 to 2016 based on fitting two variations of a two-step delta/log-gamma general linear model.
  - The standardised CPUE indices are smoothed using a LOESS (locally weighted scatterplot smoother) algorithm.
  - This approach is used to smooth out the high inter-annual variability seen in the CPUE indices for some species.
  - While a number of models are run as sensitivities, the standardised GLM-1 CPUE series LOESS smoothed model is used to determine final RBCC advice.
70. The RAG noted the latest trends in catch and effort:

- The 2016 catch is lower than the catch in 2015.
- The prime size class has the highest proportion of fish in the three (small, prime and large) size classes.
- The small size standardised CPUE (loess smoothed) shows a consistent decline in the small sized fish over the last few years (since the 2008-09 period)
- The prime size standardised CPUE (loess smoothed) shows a consistent decline since the 2010-11 period.

71. The RAG noted the results for swordfish which showed:

72. The LOESS smoothed GLM-1 CPUE-Prime index for 2016 is below the target CPUE (80%CPUE<sub>targ</sub>) and the trend in this index over the previous five years has been decreasing and is projected to decrease over the next five years. The Level-1 multiplier is 90.2%, implying that a decrease in the present TACC should allow the target CPUE to be achieved over the next five years. The rate of change in CPUE-Prime (- 8.2% p.a.) is assessed to be FALLING as it is below the stable range ( $\pm 5\%$ ) while the status of CPUE-Old (0.81) and the proportion- Old (31.4%) are both ABOVE the 40%SPR (spawner-per-recruit) targets respectively. The corresponding Level-4 option "Falling-A" asks whether CPUE-Recruits is declining and given that the rate of change of -7.8% p.a. over the past five years is below the -10% p.a. threshold, the only further adjustment required is the application of the Level-1 multiplier of 0.95. Thus the final RBCC multiplier is 85.7%.

73. Dr Campbell noted that if the HS was applied to the nominal base case model, the total multiplier suggested by the HS would be 79.8%. The higher percentage estimated by the LOESS GLM 1 multiplier demonstrates the CPUE standardisations are accounting for factors impacting the CPUE that are not related to abundance.

74. The AFMA member noted that in terms of the Harvest Strategy Review, the annual change threshold of 10 per cent for the small fish CPUE trend (as an indicator of recruitment) needs to be examined further under the harvest strategy review. The RAG agreed that successive changes of just under 10 per cent could still accumulate to a large impact on harvest strategy outcomes in the longer term.

**ACTION ITEM 2** – AFMA to examine the cumulative impacts of the annual 10 per cent change threshold for the small fish CPUE trend under the Harvest Strategy Review.

75. The AFMA member questioned whether applying the 10 per cent TAC limit rule would impact on the "years to target". Assuming that the five years to target is based on a full TAC reduction calculation (14.3%), what would the effect on years to target be if the TAC reduction was only 10 per cent. The RAG noted that this would depend on the difference between the number the TAC should be and what it is with the limit rule. The RAG acknowledged that the 10 per cent limit rule had rarely been applied to either species.

76. The AFMA member also questioned if the LOESS was MSE tested. The RAG noted it had been retrospectively analysed, but not officially MSE tested.

**Table 2. The Decision-Tree multiplier for each species and the final Harvest Strategy multiplier to be applied to the 2017/18 TACC based on the full application of the harvest strategy. If adopted, the resulting**

RBCC for 2018/19 based on the current TACC for each species is also shown. The catch in the 2016/17 quota year is also shown.

Species	Model (LOWESS)	2016/17 Catch	2017/18 TACC	D-Tree Multiplier	HS Multiplier	2018-19 RBCC
Swordfish	GLM-1	1,065	1,285	85.7%	90.0%	1,157
	GLM-2	1,065	1,285	86.6%	90.0%	1,157

## Striped Marlin

77. The RAG noted the latest trends in catch and effort for striped marlin:

78. The catch and effort has been relatively stable over the last few years. Size classes, mostly prime fish are exhibiting more stable proportions. Small LOESS smoothed sized fish CPUE trends show an increase in the last six years, and prime LOESS smoothed size fish CPUE, although are still below the target reference point, show an increase from 2015. The large LOESS smoothed fish CPUE trend is considered relatively stable.

79. The RAG also noted the results for striped marlin which showed:

80. The LOESS smoothed GLM-1 CPUE-Prime index for 2016 is below the target CPUE (72%CPUE<sub>targ</sub>). However, there is an increasing trend in this index and over the next five years the projected CPUE-Prime is estimated to increase at a rate just below that required to achieve the target CPUE (c.f. Figure STM-3a). As a result, the Level-1 multiplier is 96.9%, implying only a small reduction in the TACC is required if the target CPUE is to be achieved over the next five years. The rate of change in CPUE-Prime is within the stable range (2.7%) while the status of CPUE- Old (0.64) and the proportion- Old (21.9%) are both above their respective 40%SPR (spawner-per-recruit) targets. Given this set of indicators, the corresponding Level-4 option Stable-A implements no additional changes, thus the final TACC multiplier is 96.9%.

**Table 3. The Decision-Tree multiplier for striped marlin and the final Harvest Strategy multiplier to be applied to the 2017/18 TACC based on the full application of the harvest strategy. If adopted, the resulting RBCC for 2018/19 based on the current TACC for each species is also shown. The catch in the 2016/17 quota year is also shown.**

Species	Model (LOWESS)	2016/17 Catch	2017/18 TACC	D-Tree Multiplier	HS Multiplier	2018-19 RBCC
Striped Marlin	GLM-1	257	351	96.9%	96.9%	340
	GLM-2	257	351	97.3%	97.3%	342

81. The RAG noted the figures on page 19 of Agenda Item paper 3.1 showing the relative insensitivity of the resulting LOESS curve for striped marlin to the choice of smoothing parameter, but noted some sensitivity for swordfish with the LOESS curve becoming flatter with the use of higher values of the smoothing parameter.

82. The RAG acknowledged that the decline in the number of strata with few or no observations for swordfish was likely to have been partly influenced by the RAG encouragement for industry to fish wider.

## 3.2 Fishery indicators for the Tropical Tunas

83. Dr Campbell presented the fishery indicators papers for the tropical tuna species within the ETBF and the WCPO.

### Yellowfin tuna

84. The RAG noted the information on yellowfin tuna outlined in agenda item paper 3.2, pages 7 – 23 and discussed the following points:

85. The tagging data from yellowfin tuna provides a clear indication of the west-east movement of tuna between the 10° North and 10° South equatorial band, with few recaptures north or south of that region, suggesting restricted movement of fish outside this equatorial band.

86. The recreational member noted that the New South Wales (NSW) recreational tagging data would be useful to be included in the SPC tagging summary. AFMA agreed and suggested Dr Pepperell get in touch with SPC to discuss this further.

**ACTION ITEM 3** – Dr Pepperell to touch base with SPC staff to discuss the inclusion of NSW recreational tagging data in the SPC tagging database.

87. The AFMA member noted that the tagging data presented in the indicators paper is only inclusive of the conventional tagging data that is input into the model, however it would be useful to visualize the other tagging data from archival or PSAT tags in addition to the mark recapture data.

88. The RAG noted that Region 9 was included in the assessment some years ago as a result of an SPC study which made assumptions about limited mixing rates between yellowfin tuna tagged in the Coral Sea and other regions.

89. The WCPO longline fishery has had a relatively small and stable impact on the depletion of yellowfin tuna, with the majority of the impact coming from associated and un-associated purse seine fishing. Regions 3, 4 and 8 indicated the highest levels of depletion historically.

90. The size class catch composition data shows potential indications of reported small fish in the ETBF being discarded in the most recent years. An industry member made a comment referring to the possible biological preference of different sized fish to different environmental conditions, noting that it appears when the larger fish are present, smaller fish are not, and vice versa.

91. Industry noted that with yellowfin, industry tends to see a mix of age classes, however with bigeye tuna, industry tends to see a stronger catch of more similar age classed fish.

92. The recreational member also noted that the yellowfin tuna that tend to occupy the environment closer to the shelf exhibit shorter sickles while the yellowfin further offshore have longer sickles, despite being a similar range of fish sizes. The RAG discussed uncertainties around whether this may be attributed to varying environmental conditions or indicate fish from different sub-populations. The recreational member noted past research by John Diplock (formerly at the University of New South Wales (UNSW)) investigating the morphological traits of yellowfin tuna versus sickles size and suggested that information may be useful for the FRDC genetics project Karen Evans is working on.

**ACTION ITEM 4** – Karen Evans (CSIRO) to provide an update on the FRDC yellowfin tuna project at the next TTRAG meeting in March 2018.

**ACTION ITEM 5** – Dr Pepperell suggests to Karen Evans that she consider morphological differences in yellowfin tuna sickle size from studies done by Kurt Schaefer and John Diplock in the her genetics project.

93. An industry member questioned if CSIRO could produce a plot that shows the catch and CPUE trends of large sized fish by region. The AFMA member suggested that a contour map of the same data for all sized fish would be useful, but there may be challenges in mapping data that is trip aggregated rather than shot by shot.

**ACTION ITEM 6** – Dr Campbell to attempt to produce a contour map of all sized fish by region using logbook data for the next RAG meeting.

94. Industry noted that the trend of cohort connectivity is not as apparent in yellowfin compared with other species and this needs to be reflected in the management advice.

## Bigeye tuna

95. The RAG noted the information on bigeye tuna outlined in agenda item paper 3.2, pages 24 – 40 and discussed the following points:

96. The genetic data for bigeye tuna indicates that there is a single stock within the Pacific, unlike yellowfin which has an east and west structure.

97. The Tuna Australia industry representative noted with interest that there had been no tags recovered for bigeye tuna in Australia. The RAG acknowledged however, that given the significantly lower fishing effort in the Australian region this is not unexpected.

**ACTION ITEM 7** – Dr Campbell to update the tagging paper and analysis that was presented on tropical tunas a few years ago to tie in with the new oceanographic studies. Timeframe for the work is next couple of years.

98. Industry and recreational members expressed some concern over the validity of the growth curve in the bigeye tuna stock assessment, noting that larger fish have been observed in their industries, compared with what the new growth curve was implying. Dr Campbell noted that the curve maximum is in fact a mean value, not the highest value observed.

## Albacore tuna

99. The RAG noted the information on albacore tuna outlined in agenda item paper 3.2, pages 41 – 52 and discussed the following points:

- The last full stock assessment of the albacore tuna stock within the south Pacific was undertaken in 2015
- The subtropical longline fishery is having the greatest impact on the South Pacific albacore stock biomass; a trend which has increased significantly since the 1990's.



- The preliminary estimated total catch of south Pacific albacore in the WCPFC-Convention Area in 2016 was 58,033mt, which was an 8 per cent decrease from 2015 and a 13 per cent decrease over the 2011-2015 average.
- Total ETBF longline catch of albacore in 2016 was 1,103mt a 16 per cent increase on 2015 catch levels.
- These increases in catch are not related to increases in effort, with effort in 2016 being 5 per cent

100. Industry noted that there has been no shift in targeting, however there has been an actual recent increase in numbers and size of fish. Since 2010, the operational nature of fishing has been reasonably consistent with limited changes in targeting practices and fishing operations.

101. Industry questioned if the warmer water pushing south will result in the larger sized fish usually caught further north to start showing up further south.

102. The Tuna Australia industry representative questioned how the RAG will define the size classes of fish moving forward. Dr Campbell noted that the size class cut off points will be revisited as part of the Harvest Strategy review.

103. Dr Campbell noted that there is no CPUE trend for small sized albacore but there is a decline in the proportion of smaller fish in the catch. He suggested this is unlikely to be driven by quota availability but may be an indication of poor recruitment in recent years.

### 3.3 Annual catches by fleet in the south-west Pacific

104. Dr Campbell presented a summary of the total annual catches of ETBF species within Region 5 as outlined in Agenda Item Paper 3.3.

105. The most notable change in the recent catch data for swordfish is an increased foreign catch in 2016 in Region 5, with potential implications of that catch on the application of the harvest strategy, particularly if the increases were maintained into the future.

**ACTION ITEM 8** – Dr Campbell to obtain updated catch data for Region 5 to provide an update to the RAG in the March 2018 meeting.

106. Industry expressed serious concern over the harvest strategy and whether it should be applied to only the ETBF fleets or to the entire catch and effort of all fleets (domestic and foreign) operating in Region 5, given that the proportion of Australian catch has reduced.

### 3.4 Swordfish depletion analysis

107. Dr Campbell presented the new swordfish depletion analysis paper and the RAG noted the following points:

- The catch of swordfish increased rapidly in the mid-1990s, peaking at 2,832mt in 1999. Over the following three years (2000-2002), the rapid expansion was seen in the catch since 1995 was curtailed, with the total annual catch averaging around 2,415 tonnes during those years.

- Industry observations indicated relatively high catch rates were maintained on the periphery of the fishery, as fishing effort continued to expand offshore, while catch rates in the inshore regions tended to show a relatively consistent pattern of decline.
- While total catches in recent years have also declined, this corresponds to a period of substantial longline effort increase (over 17 per cent).

108. When examining trends in swordfish CPUE, since 2002, the 'Brisbane Grounds' have accounted for approximately half of the entire spatial extent of the ETBF, around two-thirds of the total annual effort and on average, 86 per cent of the annual swordfish catch.
109. Since longline effort peaked in the Brisbane Grounds in 2003, effort has dropped substantially with both the number of hooks deployed and the spatial extend of fishing reaching a minimum in 2013.
110. When considering a 1-degree square analysis, examining the relationship between the average effort and average CPUE across 1-degree squares that have been fished for a given number of years, the more years a square was fished, the more the catch rates declined. This trend was very apparent through till 2006 and after which no new squares were fished. Industry suggested this was also due to the expansion of the fishery ceasing due to the introduction of the competitive TAC. The RAG noted that the number of vessels fishing has fallen from a peak of 127 vessels in 1999 to only 31 in 2016.
111. Industry members again questioned the accuracy of reporting of catch in Region 5 from the foreign vessels. It was suggested that it may be useful to see a similar plot for total fishing effort by fleet over the same time period.
112. When considering trends in a longitudinal analysis, Dr Campbell noted that the pattern of CPUE trends indicated a general increase as you move further eastward offshore
113. The RAG noted that trends in the catch rate data by squares from 2008 onwards indicated that due to reduced fishing effort, in effect the localized depletion had diminished. This was likely because dispersion and recruitment were more in balance with removal rates.
114. The ABARES scientific member added that the RAG needs to consider the stock assessment results and the declining trend in spawning potential which is largely attributed to the significant increase in fishing effort and in the late 90's, in Region 1 in particular. He noted that there is 1) a natural gradation of higher abundance the further offshore you move as well as 2) a potential localized depletion effect inshore that was very clear in the earlier years of the Australian fishery, but was not so evident in the more recent years. Dr Campbell reminded the RAG that the further offshore you move, the higher the dedicated swordfish targeting is.
115. Industry highlighted that that there are environmental factors at play which are influencing the replenishment rates into a particular region. However, the greater concern is that the harvest strategy is only being applied to a very small portion of the catch that is occurring in the broader region 5.
116. The AFMA member affirmed that it is likely to be a combination of factors driving swordfish CPUE and depletion trends, including recruitment as well as environmental factors. It is important for the RAG to try to explain those complexities in the advice to the MAC.

**ACTION ITEM 9** – Dr Campbell to present information on fishing effort and catch rates of the foreign catch within Region 5 to the RAG March 2018 meeting. Drs Bromhead and Campbell to investigate the available information to help the RAG understand the additional foreign catch in Region 5.

### 3.5 Information to be considered in the RBCC advice

117. With respect to the annual Harvest Strategy that will inform the 2018/19 RBCC advice, certain aspects of the completed review work (e.g. issues relating to CPUE) have been incorporated into the 2018-19 Harvest Strategy model. Aspects yet to be completed such as reviewing whether or not the Target Reference Points are appropriately set, will not be reflected in the 2018-19 model.

## 4 Harvest Strategy

### 4.1 Update on Harvest Strategy review

Note that this agenda item was discussed prior to 3.1 in the TTRAG agenda.

118. The AFMA member noted that a significant number of items required out of session development by the scientific members of the RAG. The RAG discussed what they would like reflected in the final advice given the MAC and Commission.

119. AFMA expressed a preference for the paper on target reference point analyses and recommendations to be developed and considered by the RAG out of session ahead of the March 2018 RAG meeting.

**ACTION ITEM 10** – Dr Bromhead to talk to Dr Hillary about timelines for target reference points (TRPs) on swordfish.

### 4.2 Operation of the decision tree in the ETBF Harvest Strategy

120. Dr Campbell presented the results of the analysis regarding the operation of the decision tree within the ETBF Harvest Strategy which examined the ongoing utility of the lower levels of the decision tree in making adjustments to the preliminary RBCC determined at Level 1 of the harvest strategy.

121. The results indicate that of the 16 implementations of the harvest strategy across all four species, the lower levels of the decision tree have led to an adjustment of the preliminary RBCC eleven times since 2011.

122. The RAG concluded that the lower levels of the HS decision tree clearly play an important role in the HS outcomes, despite earlier predictions from MSE testing that those levels might not be influential.

## 5 Stock status advice & Recommended Biological Commercial Catches (RBCC)

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123. Dr Campbell updated the TTRAG RBCC advice document live during the discussions, noting that some elements (e.g. catch statistics etc.) of the document would need to be fact checked and filled in out of session.
124. In drafting the advice, the ETBF catch relative to Region 5 for each target species were considered, as well as the Harvest Strategy results for swordfish and striped marlin, and the tropical tuna indicators based on recent stock assessments and indicators from the ETBF.
125. The RAG agreed that an additional heading on Harvest Strategy Outcomes be included in the advice to the MAC and Commission for swordfish.
126. The RAG agreed to also include an RBCC figure applicable in a ten-month season for each species noting the upcoming transition to a calendar year fishing season in 2018.
127. The TTRAG RBCC and stock status advice for the 2018-19 fishing season is outlined in Error! Reference source not found.. Discussions that took place in drafting the advice are summarised below.

### 5.1 Swordfish – RBCC and stock status advice

128. The RAG discussed the results for the 2018/19 season Harvest Strategy for Swordfish.
129. Out of session, a subgroup consisting of the AFMA member, a scientific member and Tuna Australia drafted RBCC advice to incorporate outcomes from the swordfish HS discussions by the RAG, for the RAG to consider.
130. In determining the RAGs overall confidence in the Harvest Strategy for swordfish, industry expressed that the confidence in the Harvest Strategy should be deemed low. He again expressed concern that the Harvest Strategy is not having the impact it should because it is only addressing the fishing mortality in the ETBF zone and does not adequately address the entire biomass and subsequent non-ETBF fishing mortality of Region 5. He believed the Harvest Strategy does not provide good management advice on the outcomes of the harvest strategy with regards to increased foreign catches, or environmental influences and is not adequately providing advice on how to manage the situation.
131. The Tuna Australia representative supported the sentiments of other industry members and agreed that despite the Harvest Strategy informing us to reduce TACs, those cuts do not help solve the problem of declining CPUEs. The industry representative added that there is too much uncertainty in the data available for the harvest strategy to be effective in providing management advice.
132. The AFMA member was also inclined to suggest 'low', noting a concern that the Harvest Strategy may not be having the impact that it was designed to upon the stock. Specifically, because the TAC has not been caught in the past (typical annual catch is 200-400mt lower than the TACC), past TAC cuts have not impacted on actual fishing mortality, and the current reduction in RBCC may also not impact on ETBF fishing mortality on the local region biomass,

meaning that the declining trend in CPUE (indexing biomass) may not be impacted (arrested) by application of the HS (to date).

133. Two of the scientific members initially suggested a confidence level of medium.
134. The Chair made the point that it is possible to attribute under-caught TACs to the fact that the TAC levels are being set too high. The RAG also acknowledged that part of the under-catch in the TAC is sometimes due to the availability of quota.
135. The Economics member reminded the RAG that the question is not asking whether the Harvest Strategy is having the impact that it should, the question is asking if the Harvest Strategy is providing effective management advice.
136. The ABARES scientific member reminded the RAG that expression of the statement (on confidence in the HS) is asking if the Harvest Strategy is achieving the objectives of the policy and its objectives of achieving a target reference point, and avoiding a limit reference point, as well as ensuring the target reference point is correct.
137. The recreational member suggested that this statement is subjective and there is no rule to aid in quantifying the RAGs level of confidence, when there is a suite of data to inform all of the other management advice.
138. The RAG agreed to a suggested confidence level of 'low-medium' as a compromise position, noting that this is subject to change from year to year depending on the proportion of ETBF catches in Region 5, and acknowledging the most recent decline in the catch proportion in 2016 may or may not be sustained in future.

<p><b>ACTION ITEM 11</b> – The RAG agreed to capture a statement in the MAC report that provides a summary of the condition of the fishery as per the industry updates.</p>
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139. Further, under the heading of Stock Status, an industry member expressed some concern over the SC13 comment regarding the longline only nature of the swordfish fishery being uninformative with regards to recruitment dynamics.
140. The industry members disagreed with this statement, noting that the ETBF small swordfish catch (<20kg DWT) has comprised between 15 and 40 per cent of the annual catch by numbers in the ETBF. The RAG agreed to capture this sentiment in the stock status section of the management advice document.

## 5.2 Striped marlin – RBCC and stock status advice

141. The RAG discussed the 2018/19 season Harvest Strategy results for striped marlin.
142. The RAG debated how best to capture the footnote regarding the differences in logbook and CDR data versus data provided by the WCPFC in terms of the Australian catch proportion calculations within Region 5.
143. The RAG expressed concern over the very small size range of fish that constitute 'prime-sized' fish, recommending that the classification of size classes be reviewed by CSIRO as part

of the HS Review in progress.

144. In describing the confidence of the harvest strategy to provide effective management advice, the RAG agreed to maintain the level at low. This was because although the ETBF catch proportion for Region 5 has increased slightly in 2016, the longer term average proportion has declined over the past five years.

145. The RAG agreed that a note regarding the possible incomplete nature of the 2016 data for Region 5 be included in the management advice indicator tables for each tuna species.

### **5.3 Yellowfin tuna – Stock Status Advice**

146. The RAG discussed the stock status advice for the 2018/19 season for yellowfin tuna.

147. The RAG agreed that given there were no significant changes in key indicators, the management advice for yellowfin tuna was maintained similar to previous years.

### **5.4 Bigeye tuna – Stock Status Advice**

148. The RAG discussed the stock status advice for the 2018-19 season for bigeye tuna.

149. The RAG noted that a large recruitment of small-sized fish seen in 2014 contributed to a strong cohort of prime-sized fish in 2015 and has subsequently been reported as a strong cohort of large-sized fish in 2016.

150. The RAG agreed that given there were no significant changes in key indicators, the management advice for bigeye tuna was maintained similar to previous years.

### **5.5 Albacore tuna – Stock Status Advice**

151. The RAG discussed the stock status advice for the 2018-19 season for albacore tuna. Very little was discussed on albacore tuna, noting that no new assessment had been undertaken in 2017. Acknowledging that an updated assessment is scheduled for 2018, the RAG agreed to maintain similar management advice from previous years.

### **5.6 Western Tuna and Billfish Fishery RBCC and stock status advice**

152. The AFMA member provided a brief summary of the Western Tuna and Billfish Fishery and relevant TACs, noting the following points:

- The WTBF Management Plan requires that a TAC be set each year by 1 February, however over the past three years, the fishery has been managed under a three year TAC due to the small size of the fishery, and very low catch levels. The three year TAC period is set to end at the completion of the current season.
- The existing TACs are not based on a harvest strategy, but are derived from a historic allocation to Australia of 5 per cent of the MSY level for each species, based on the area of Australia's EEZ and stock distributions.

- The level of fishing effort in the WTBF has not changed much in recent years. Until the fishery begins to develop in size, there is very little data to use in a reasonable scientific TAC calculation or the consideration of a harvest strategy approach.
- Australia's catches are a very small proportion of the catch relative to the whole of the Indian Ocean tuna fishery.

153. Given the very small effort of the WTBF fishery, the RAG needs to consider the investments made in both the science and management of the fishery. The ABARES scientific member suggested it would be useful to update the previous analysis CSIRO conducted on the distribution of biomass across the whole of the Indian Ocean using Japanese CPUE data, relative to Australia's EEZ, this time using updated SEAPODYM models.
154. The RAG acknowledged that there is a broader management discussion needed at the MAC regarding the high TACs and the economic and biological implications that may have should the TAC end up being fully caught if the fishery was to expand. The RAG did agree that, if the fishery was to develop and additional catch and effort data became available, that information should be used to consider determining appropriate TACCs with greater confidence.
155. The RAG considered the information provided in the background paper and concluded that it did not have sufficient information (in part due to the low level of effort in the fishery) to determine whether the TACs set in the WTBF were appropriate (from sustainability and economic perspectives), noting however the current low levels of catch in the WTBF are highly unlikely to significantly impact on the status of the stocks in the Indian Ocean.
156. The RAG requested that AFMA maintain an Indian Ocean catchwatch report for the WTBF, including recreational catches and to schedule a brief WTBF update once a year at the July TTRAG meeting.

**ACTION ITEM 12** – AFMA to provide a brief WTBF catchwatch report at each July TTRAG meeting.

## 6 Research

### 6.1 Update on the swordfish research proposal

157. The AFMA member provided a brief update on the swordfish research proposal.
158. Discussions with Dr Karen Evans indicated that at least 75 inshore and 75 offshore tissue samples would be needed to better analyse any potential stock connectivity between inshore and offshore areas.
159. The RAG noted that the project would require more funds to achieve this; including approximately \$15,000 to process the ~ 150 samples, plus additional funds for analysis. If deemed urgent by the RAG, Karen may be able to prioritise the processing of the swordfish samples however it would still be a two year timeframe for processing, analysis and reporting on the data.
160. AFMA noted that the research is very important given the concerns by the RAG regarding the declining swordfish catch rates. However, Karen's broader study is more focused on the

connectivity between the ETBF and the rest of the Pacific, compared with the more localised connectivity between the inshore and offshore zones of Region 5 alone.

161. Industry were concerned with why New Zealand were not included in the WCPFC connectivity project given the close proximity of Australia and New Zealand and the levels of catch in those areas.

**ACTION ITEM 13** – AFMA suggested contacting John Annala from New Zealand Ministry of Primary Industries to see if New Zealand would be interested in supporting the swordfish project and investigate the potential of New Zealand providing some funding.

162. The RAG noted the need to clarify from Karen Evans how many samples are required and from which zones, and to then obtain proper costings from Karen.

**ACTION ITEM 14** – AFMA to follow up with Karen Evans of CSIRO to determine exactly how many swordfish samples would be required from each zone to satisfy an adequate sampling design, for each inshore, offshore and potential western New Zealand. David Ellis to also work with AFMA to assist in sourcing offshore samples and possible funding from the ETBF.

163. The RAG agreed to report back on the action items out of session to then discuss a way forward.

## 6.2 Update on current research projects

164. AFMA provided a verbal update on current research projects in the tropical tuna fisheries. The RAG noted the following points:

- The full proposal for the oceanography project was considered by ComRAC, and approved by the FRDC Board, with some modifications to the budget.
- ComRAC agreed to a preliminary list of research priorities to be considered for potential FRDC funding in October 2017.
- The Annual Research Statements will be considered by the ARC at their 5 October meeting.

## 6.3 Recreational fishing project update

165. The recreational member provided a brief update on the recently funded recreational fishing project.

166. The data agreements and licenses signed are already in place with NSW fisheries for the gamefish tagging data, which includes a 25 year historic data set.

167. The RAG noted that the project is intended to be a one year project, which was initiated in response to an apparent sharp decline in yellowfin tuna catches in recent years.



## 7 Other business

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### 7.1 ETBF catch history – conversion factors

168. Dr Campbell presented agenda item 7.1 on ETBF catch conversion factors. The RAG noted the following key points:
- AFMA uses processed weight CDR data, which is then converted to whole weight
  - These numbers are different from those used by CSIRO and those depicted in other literature.
169. Noting the inconsistencies, Dr Campbell noted there are three options to move forward with in order to have a consistent single set of data to determine catch history;
- a) continue to use the AFMA conversion factors;
  - b) collect more data to recalculate new conversion factors, or
  - c) investigate the literature further for alternate conversion factors.
170. The RAG noted that the origins of the AFMA conversions are unclear and agreed it would be useful to investigate where the factors were derived from. This information can then be used as an initial first step before proceeding to investigate the remaining two options. The RAG noted to be resolved prior to the next season.
171. The RAG agreed that until this issue is resolved, Dr Campbell should use the same conversion factors as he has always been using (Japanese longline data).
172. The RAG agreed to make this agenda item a standing agenda item for the next TTRAG meeting.

**ACTION ITEM 15** – AFMA to investigate where the AFMA conversion factors were originally derived from.

### 7.2 ERA Update

173. AFMA provided a very brief update on the Ecological Risk Assessment process, and noted that final ERA report is still being written.

## 8 Next meeting

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174. The RAG agreed on the following dates for the three TTRAG meetings in 2018:
- TTRAG 1: 26, 27 and 28 March – Mooloolaba
  - TTRAG 2: 16 - 17 July – Mooloolaba
  - TTRAG 3: 18 – 19 September – Mooloolaba (TBC by the Chair)
167. The Chair thanked Dr Rob Campbell for his consistent hard work in the RAG, Ms Rivero for her work in organising the meeting and Ms Langdon for her work as EO. The Chair also thanked Dr Larcombe, Dr Bromhead and Mr Ellis for helping prepare the management advice overnight.
168. The Chair closed the meeting 3.09pm.

## List of Attachments

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Attachment A – 2018-19 RBCC and Stock Status Advice

# Appendix 1: Adopted Agenda

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## Tropical Tuna Resource Assessment Group (TTRAG19)

The Mantra Hotel, Mooloolaba

Tuesday 11 July & Wednesday 12 July 2017

### 1. Preliminaries

- 1.1. Welcome and apologies
- 1.2. Pecuniary interest declarations
- 1.3. Adoption of Agenda
- 1.4. Acceptance of TTRAG 18 minutes
- 1.5. Actions arising/out of session developments
- 1.6. Out of session correspondence

### 2. Review of fishery performance

- 2.1. Current catches and effort in the domestic fishery – verbal updates from scientists, industry and recreational fishing members since last RAG Meeting (July 2017)
- 2.2. AFMA catchwatch report
- 2.3. Update on TTRAG Economic working group
- 2.4. Update on the 13<sup>th</sup> regular session of the Western and Central Pacific Fisheries Commission Scientific Committee (WCPFC SC) meeting

### 4. Harvest Strategy Review

- 4.1. Update on Harvest Strategy (including update on review)
- 4.2. Operation of the decision tree in the ETBF Harvest Strategy

### 3. Harvest Strategy for the 2018/19 season

- 3.1. ETBF Harvest Strategy and RBCC calculations for Swordfish and Striped Marlin
- 3.2. Fishery indicators for the tropical tunas
- 3.3. Annual catch by fleet in the south-west Pacific
- 3.4. Swordfish depletion analysis
- 3.5. Information to be considered in RBCC advice

### 5. Stock Status Advice and Recommended Biological Commercial Catches (RBCC) - FOR THE ETBF

- 5.1. Swordfish – RBCC and Stock Status Advice
- 5.2. Striped Marlin – RBCC and Stock Status Advice
- 5.3. Yellowfin Tuna – Stock Status Advice
- 5.4. Bigeye Tuna – Stock Status Advice
- 5.5. Albacore Tuna – Stock Status Advice

### Stock Status Advice and Recommended Biological Commercial Catches (RBCC) - FOR THE WTBF

5.6 WTBF TACCs and RBCC advice

## **6. Research**

6.1 Update on the Swordfish Research Proposal

6.2 Update of current research projects

6.3 Recreational fishing project update

## **7. Other business**

7.1 ETBF catch history: conversion factors

7.2 ERA update

## **8. Date and venue for next meeting**

## Appendix 2: Actions arising from TTRAG19

	Action	Responsibility
1	AFMA to split action items into two categories; standing items that require regular meeting updates, and actionable actions to be addressed in the short term.	AFMA
2	AFMA to examine the cumulative impacts of the annual 10 per cent change threshold for the small fish CPUE trend under the Harvest Strategy Review.	AFMA
3	Dr Pepperell to touch base with SPC staff to discuss the inclusion of NSW recreational tagging data in the SPC tagging database.	Dr Pepperell
4	Karen Evans (CSIRO) to provide an update on the FRDC yellowfin tuna project by the next TTRAG meeting in March 2018.	Karen Evans
5	Dr Pepperell to talk to Karen Evans to consider morphological differences in yellowfin tuna sickle size from studies done by Schaefer and Diplok in the oceanography project.	Dr Pepperell Karen Evans
6	Dr Campbell to produce a contour map of all sized fish by region using logbook data for the next RAG meeting.	Dr Campbell
7	Dr Campbell to update the tagging paper and analysis that was presented on bigeye tuna a few years ago to tie in with the new oceanographic studies.	Dr Campbell
8	Dr Campbell to obtain updated catch data for Region 5 to provide an update to the RAG in the March 2018 meeting.	Dr Campbell
9	Dr Campbell to present information on fishing effort and catch rates of the foreign catch within Region 5 to the RAG March 2018 meeting. Mr Bromhead and Dr Campbell to investigate the available information to help the RAG understand the additional foreign catch in Region 5.	Dr Campbell
10	Mr Bromhead to talk to Rich Hillary about timelines for target reference points (TRPs) on swordfish.	Mr Bromhead Dr Hilary
11	The RAG agreed to capture a statement in the MAC report that provides a summary of the condition of the fishery as per the industry updates.	TTRAG
12	AFMA to provide a brief WTBF catchwatch report at each July TTRAG meeting.	AFMA

13	AFMA suggested contacting John Annala from New Zealand Ministry of Primary Industries to see if New Zealand would be interested in supporting the swordfish project and investigate the potential of New Zealand providing some funding.	AFMA
14	AFMA to follow up with Karen Evans of CSIRO to determine exactly how many swordfish samples would be required from each zone to satisfy an adequate sampling design, for each inshore, offshore and potential western New Zealand. David Ellis to also work with AFMA to assist in sourcing offshore samples and possible funding from the ETBF.	AFMA Karen Evans David Ellis
15	AFMA to investigate where the AFMA conversion factors were originally derived from.	AFMA

### TTRAG Advice for the Eastern Tuna and Billfish Fishery in the 2018/19 Season

August 2017

#### Overview

##### *Eastern Tuna and Billfish Fishery (ETBF)*

TTRAG is providing RBCC advice using the Harvest Strategy with caveats for both SWO and STM. For YFT, BET and ALB, TTRAG is providing stock status advice based on fishery indicators.

In providing this advice, TTRAG took into consideration the information about the ETBF catch relative to the catch of other fleets in Region 5. The proportion of the ETBF catch in Region 5 (south of 10°S and west of 170°E as shown in Figure 1) is different for each species – SWO (56%), STM (63%), YFT (12%), BET (39%), and ALB (10%) in 2016 respectively. (TTRAG noted that the catch estimates in Region 5 for 2016 are provisional). If the estimated catch (assuming a 20% mortality for tagged and released fish) of the recreational sectors in Australia and New Zealand is included then the proportion of the ETBF catch in Region 5 for striped marlin is 51%.

For YFT, BET and ALB the proportion of the ETBF catch is not high enough to allow the harvest strategy to function and hence the objectives of the Harvest Strategy Policy will not be achieved. TTRAG has provided a range of fishery indicators based on the most recent stock assessments, catches in Region 5 and a suite of indicators from the ETBF.

TTRAG applied the HS and identified a RBCC for SWO, however, has reduced the level of confidence with the current harvest strategy for the provision of effective management advice for the ETBF from high to low-medium. This change was due to the lower proportion of the ETBF catch to the total catch in Region 5 in 2016 (56%) and uncertainty in regard to the TRP in the current harvest strategy. If changes made to catches for SWO in the ETBF are offset by increases in the catches by other commercial and recreational fleets, then these changes need to be taken into consideration.

TTRAG applied the HS and identified a RBCC for STM, but had low confidence in the use of the harvest strategy for the provision of effective management advice for STM. More recent MSE testing of the HS indicates a continual decline in management effectiveness as the ETBF catch as a proportion of the Region 5 total declines.

TTRAG noted that the 2018/19 will be a 10 month season, and the RBCC for this shorter season has also been included in the following advice. For this purpose, TTRAG used the methodology outlined in the paper: “*Determination of a Transitional TACC in the ETBF due to changes in the dates of the Fishing Season*” (Campbell 2017).

TTRAG noted that there has been a substantive increase in the catch of SBT over recent years (>500t in 2015 and 2016). However, the outcome of the CPUE standardisation and the RBCC results were not sensitive to a re-analysis where all sets catching at least one SBT had been removed from the data used in the standardisation analyses.

TTRAG noted a significant increase in the Region 5 catch attributed to the longline fishery in the Solomon Islands during 2014 and 2015 (with the catch of the three tuna species by this fleet being between 40-50% of the total Region 5 catch in 2015), but noted a zero catch for this fleet in 2016. However, TTRAG also noted that the data for 2016 may be incomplete.

#### *Western Tuna and Billfish Fishery (WTBF)*

TTRAG noted that there are currently only 2 active boats in the fishery. Based on the information available TTRAG cannot determine whether the TACCs set in the WTBF are appropriate. The current low levels of catch in the WTBF (see Table below) are highly unlikely to threaten the status of the respective stocks in the Indian Ocean.

Quota species	Current TACCs	Current MSY Est.	Current TACC as % of MSY	IOTC Status	WTBF Average Catch 2011-2015	IOTC Average Catch 2011-2015
Bigeye tuna	2,000t	104,101t	1.92%	Not overfished No overfishing	110t	101,515t
Yellowfin tuna	5,000t	422,000t	1.18%	Overfished Overfishing	38t	390,185t
Broadbill Swordfish	3,000t	39,400t	7.61%	Not overfished No overfishing	224t	31,900t
Striped marlin	125t	5,220t	2.39%	Overfished Overfishing	1.4t	4,481t



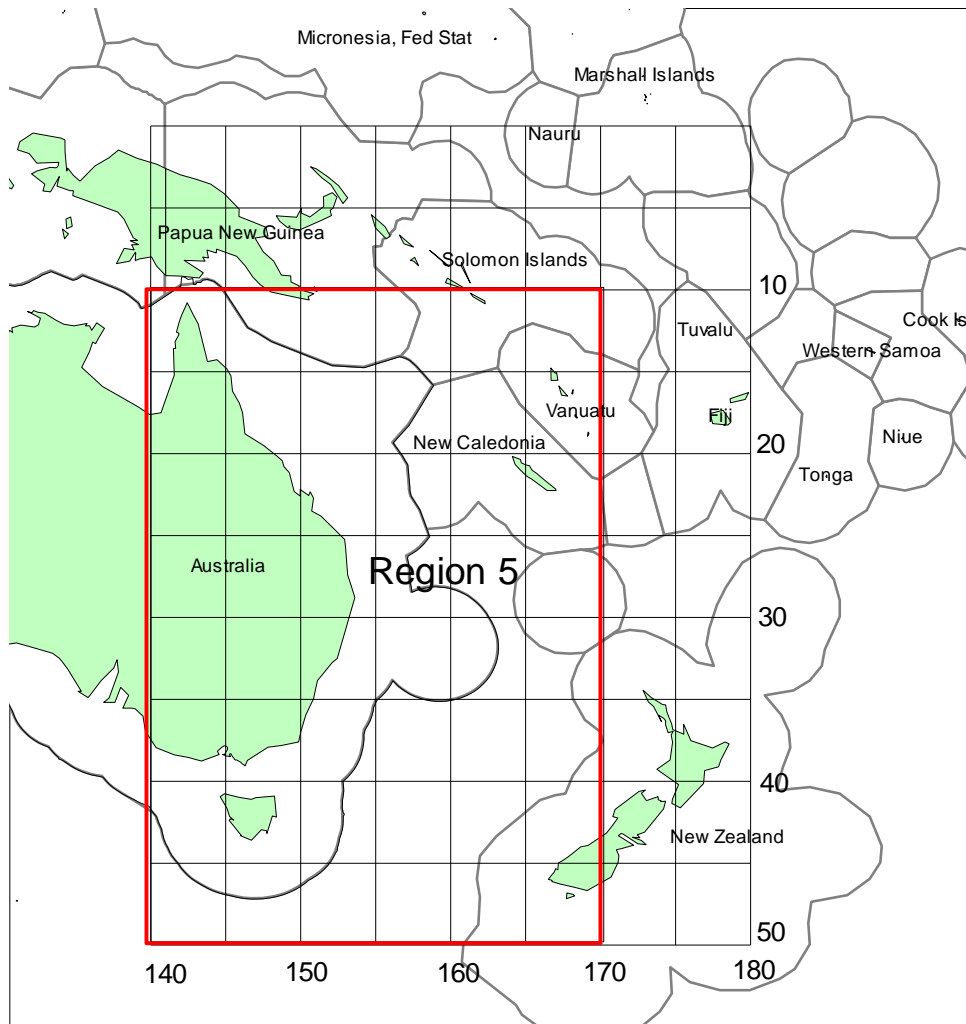


Figure 1. Map of the southwest Pacific Ocean showing the area known as Region 5 used in the provision of management advice.

## Broadbill Swordfish (SWO)

- Current TACC: 1,285t
- ETBF catch in 2016/17 quota year (CDR based): 1,066t (13% lower than the 1,230t catch in 2015/16 quota year)
- 2016 catch<sup>1</sup> in WCPFC Statistical Area south of the equator: 8,117t (provisional, 10% lower than the 9,060t catch in 2015, and 14% lower than the average over the previous decade).
- 2016 catch in Region 5 (south of 10°S and west of 170°E): 1,770t (provisional). The ETBF catch was 56% of this total and has averaged 64% over the past 5 years (based on logbook<sup>2</sup> data supplied by SPC).
- **Level of confidence with the current harvest strategy for the provision of effective management advice for the ETBF: Low-Medium.**
- The RBCC outcome from the harvest strategy for a 12 month season is 1,157t (-10%).
- The RBCC outcome from the harvest strategy for a 10 month season is 960t.

1. Based on data supplied by the WCPFC Science Service Provider.
2. Catch weights recorded on logbooks usually consistently under-estimate actual catch weights. Hence CDR (Catch Disposal Record) weights, which are based on fish receiver weights, will be higher than logbook weights. While the true difference remains uncertain a difference of around 15% is not uncommon.

### *Harvest Strategy Outcomes*

TTRAG noted that:

- the reduction in RBCC from the Harvest Strategy (to return the CPUE to its TRP in 5 years) was 14.3%, but that the HS “maximum change” rule applies to restrict this to 10%.
- the reduced RBCC is the result of a decline (over 4 years) in the CPUE of prime-sized fish and a longer term decline (8 years) in the CPUE of small-sized fish (which is interpreted to indicate a decline in recruitment). These trends may result in a decline in the CPUE of the large-sized fish in future years.

TTRAG also noted there had been a significant decline in the LOWESS-smoothed standardised CPUE for prime sized Broadbill Swordfish between 1997 and 2003, followed by a recovery to 2008 after a reduction in catch and effort and the subsequent application of a 1,400t catch limit in 2006 (c.f. Figure SWO-1b). TTRAG further noted that this CPUE indicator for prime-sized Broadbill Swordfish was stable between 2008 and 2013 but has since decreased and in 2016 was below the target CPUE (~80% CPUE<sub>target</sub>). The standardised-CPUE for large-sized Broadbill Swordfish (>68 kg DWT) has been stable since 2008; however the standardised-CPUE for small-sized Broadbill Swordfish (< 20kg DWT) has been decreasing since 2008 and is currently at a historical low (since 1997, c.f. Figure SWO-1a).

Based on the average processed weight of Broadbill Swordfish and the number of fish recorded in logbooks from 1997 to 2005 and CDR weights since 2006, the average annual Broadbill Swordfish catch during the period 1997 to 2016 was 1,774t. The smallest catch over this period was 1,062t (in 2013) and the highest 3,075t (in 1999). The average CDR catch between 2006 and 2008, a period of rebuilding of the resource, was 1,322t. The average CDR catch over the previous 5 years (2011-15) has been 1,126t.

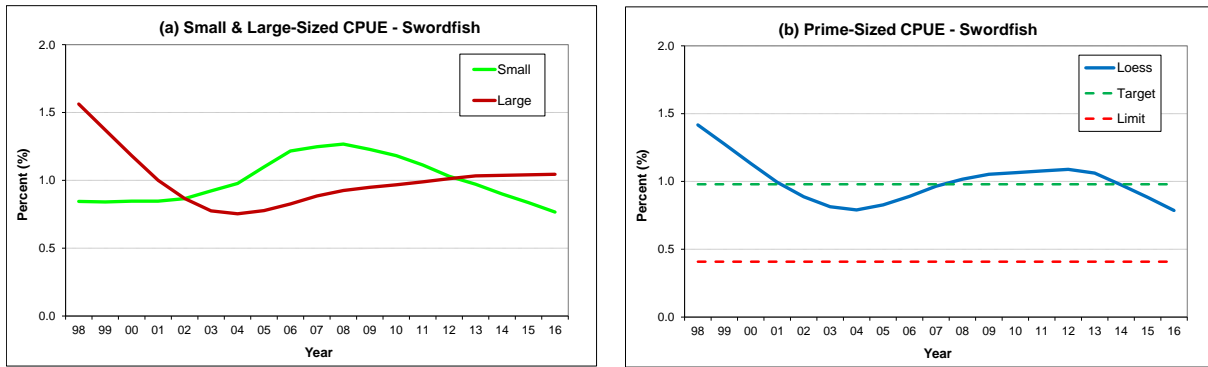


Figure SWO-1. LOWESS-smoothed standardised CPUE for (a) small-sized and large-sized and (b) prime-sized Broadbill Swordfish (scaled so that the mean of the each index over the period shown is 1). The target and limit CPUE reference values are also shown for prime-sized fish.

### *Applicability of harvest strategy*

TTRAG recognised the scientific advice that there is a separate south-western Pacific swordfish stock and Australia continues to be a major player in the fishery targeting that stock. Further, that the results from Management Strategy Evaluation indicate that management actions by Australia have the potential to impact on the status of the stock.

However, there are a number of factors which impact upon confidence in the application of the HS:

- The declining CPUE has occurred during a period (2011–2016) in which the actual catch from the fishery has been consistently and significantly lower (between 18-30%) than the TACC.
- However, TTRAG also notes findings that indicate that the TRP for swordfish in the HS may be mis-specified and currently too high. For example:
  - 1) the relationship between the CPUE and the spawning-stock biomass (SSB) is not linear,
  - 2) the suite of revised TRP CPUEs calculated were lower than the previous target established in 2013, and
  - 3) the results indicated that the TRP is dependent of the CPUE series used and the number of years over which the analysis is conducted, and using a longer time series appeared to improve the results.

While TTRAG-17 outlined a process to review the current ETBF harvest strategy, the RAG also noted that this review would not be completed in time for the setting of the 2018/19 season TACC.

TTRAG noted that the declining CPUEs are most likely not solely the result of the impact of the Australian fishery. These declines may be explained by:

- a) environmental impacts on recruitment (this is likely, due to the sequential nature of the CPUE declines by size class), and/or
- b) environmental impacts on distribution of the fish relative to the fishing grounds, though the decline in prime fish CPUE in 2015/16 coincident with the strong El Nino is not observed in the large fish (this is the subject of a recently funded research project), and/or
- c) other sources of catch mortality causing depletion of the locally available stock. Total non-ETBF catch levels in Region 5 adjacent to Australia's EEZ have been relatively steady prior to a large increase (25%) in 2016 (which led to a decrease in the proportion taken by the ETBF to 56%). The potential for mis-reporting by foreign fleets has been raised as a concern by some TTRAG members.

TTRAG noted evidence of a persistent gradient of increasing swordfish relative abundance with distance from the Australian mainland, with highest abundance occurring beyond 160°E. In addition to this, TTRAG noted the strong evidence for localised depletion of swordfish in areas closest to mainland Australia through the period 1998-2006 when catch and effort levels were at their highest. However, while fishing effort has been concentrated in more inshore areas (west of 162°E) since about 2008, with lower catch and effort levels during this period, there is no clear evidence for a localised depletion effect during this more recent period. As such localised depletion does not explain the recent declines observed in catch rates.

Noting the consistent and challenging spatial issues that arise for the ETBF, TTRAG reiterated the importance of:

- gaining a better understanding of swordfish stock structure and the connectivity of the ETBF with Region 5 and beyond, and the need for TTRAG’s involvement in the current FRDC genetics and oceanographic projects to ensure this research continues to be aligned with the needs of the fishery,
- the need for a more explicit consideration of these issues in the future design of the harvest strategy and management of the fishery.

### ETBF catch proportions

South-west Pacific scenario: In 2016 the ETBF catch was 56% of the total catch within Region 5 (c.f. Figure SWO-2).

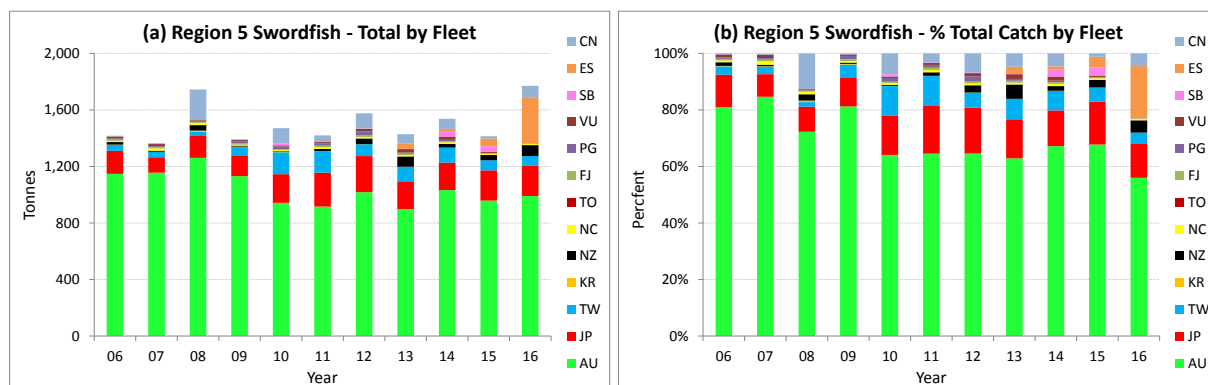


Figure SWO-2. (a) Total annual catch of Broadbill Swordfish by fleet within Region 5, and (b) the percentage of the total annual catch of Broadbill Swordfish by fleet within Region 5.

The proportion of the ETBF catch compared with the total catch in both Region 5 and the broader south-west Pacific in recent years highlights that the harvest strategy for Broadbill Swordfish should be effective in achieving the objectives of the Commonwealth Harvest Strategy Policy. The TTRAG can provide advice on the RBCC under the harvest strategy with caveats. However, TRAG noted that the proportion of the ETBF catch in Region 5 has changed from around 80% between 2006 and 2009 to 64% over the past 5 years (2012-2016). Although TTRAG noted that the proportion taken by the ETBF was 68% in 2015, it declined to 56% in 2016. If a decreasing trend continues then this could negate the future ability of the HS to effectively manage total fishing mortality in Region 5, particularly if changes made to catches in the ETBF are offset by increases in the catches by other fleets.

### *Stock structure*

The results of genetic studies support a separate south-western Pacific stock of Broadbill Swordfish. TTRAG therefore considered that Broadbill Swordfish is a single stock within the south-west Pacific. Over the past 5 years (2012-2016) the ETBF catch as a proportion of the total catch in the WCPFC Statistical Area south of the equator has averaged 10.3%.

### *Stock status*

Last assessment: 2017

Overfished: Highly Unlikely

Overfishing: Unlikely

TTRAG noted that the last stock assessment for south-west Pacific Broadbill Swordfish was undertaken in 2017 and reviewed by the WCPFC Scientific Committee meeting (SC13) held in August 2017. The assessment incorporated data to the end of 2015. The stock assessment was based on a structural uncertainty grid comprising 72 models. The major uncertainty related to growth and maturity noted in the previous assessment has now been resolved due to the results of new research which were presented to and endorsed by SC12.

SC13 considered all options within the four axes of uncertainty for steepness, size data, diffusion rate and natural mortality to be equally likely and the resulting uncertainty grid was used to characterize stock status.

SC13 noted that the central tendency of relative recent spawning biomass was ( $S_{Brecent}/S_{BF=0}$ ) = 0.35 with a probable range of 0.29 to 0.43 (80% probability interval). The central tendency of relative recent fishing mortality was ( $F_{recent}/F_{msy}$ ) = 0.86 with an 80% probability interval of 0.51 to 1.23. While this suggested that there was likely a buffer between recent fishing mortality and  $F_{msy}$  it also showed that there was some probability that recent fishing mortality was above  $F_{msy}$ . SC13 noted that there was a roughly 32% probability (23 out of 72 models) that the recent fishing mortality was above  $F_{msy}$ . Fishing mortality rate increased notably from the mid-1990s in both model regions, on maturing aged (4-6) fish in particular.

Across all models in the uncertainty grid the spawning biomass declines steeply between the late 1990s and 2010 but since then the rate of decline has been less. Those declines are found in both model regions, but are higher in the eastern Region 2 (equator to 50°S, 165°E to 130°W).

SC13 noted that in comparison with the bigeye and yellowfin assessments, evidence for an increase in recent recruitment for southwest Pacific swordfish was not found in either the CPUE time series or estimates of recruitment. SC13 noted that the longline only nature of the fishery catching mainly larger, older swordfish, is not strongly informative with regards to recruitment dynamics. (However, TTRAG noted that since 1997 small swordfish, <20kg DWT, have comprised between 15-40% of the annual catch by numbers in the ETBF).

Next assessment: 2022

### *Management advice from the WCPFC-Scientific Committee*

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 SBmsy level, noting that the Commission has yet to adopted a 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). SC13 noted that there has been an increase in fishing mortality notably from the mid-1990s, and that the biomass relative to unfished levels is estimated to have declined rapidly during the period late-1990s to 2010 followed by a more gradual but continued decline after 2010.

Consistent with its previous advice (from SC9), SC13 recommended that the Commission consider developing appropriate management measures for the area north of 20°S to the equator which is not covered by CMM 2009-03, noting that:

- recent catches between the equator and 20°S continue to represent the largest component of the catch in Region 2 (equator to 50°S, 165°E to 130°W) and represent half the total catches from the stock, and,
- 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 (Region 1).

SC13 also recommended that current restrictions on catches south of 20°S also be maintained.

### *State catches*

Negligible based on advice from industry members.

### *Recreational catches*

Currently very small. A small recreational fishery has recently developed off eastern Tasmania and has expanded to Victoria and NSW.

### *Whole of government position*

Not available.

### *Status of stock in relation to the Commonwealth Harvest Strategy Policy (CHSP)*

The 2017 SWO assessment indicates that spawning stock biomass in the region west of 165°E (ETBF and surrounding area) in 2015 was ~43% of unfished levels (below the 48% that is advocated by the CHSP).

## Striped Marlin (STM)

- Current TACC: 351t
- ETBF catch in 2016/17 quota year (CDR based): 257t (19% lower than the 319t catch in 2015/16 quota year).
- 2016 catch<sup>1</sup> in WCPFC statistical area south of the equator: 1,202t (provisional, 22% lower than the 1,543t catch in 2015, and 29% lower than average over the previous decade).
- 2016 commercial catch in Region 5 (south of 10°S and west of 170°E): 363t (provisional). The ETBF catch was 63% of this total and has averaged 55% over the past 5 years (based on logbook<sup>2</sup> data supplied by SPC). When the estimated catch (assuming a 20% mortality for tagged and released fish) of the recreational sectors in Australia and New Zealand is included, the proportion of the ETBF catch in Region 5 for striped marlin is 51% in 2016 (and has averaged 45% over the past 5 years).
- **Level of confidence with the current harvest strategy for the provision of effective management advice for the ETBF: Low**
- The RBCC outcome from the harvest strategy for a 12 month season is 340t (-3.1%).
- The RBCC outcome from the harvest strategy for a 10 month season is 301t.

1. Based on data supplied by the WCPFC Science Service Provider.
2. Catch weights recorded on logbooks usually consistently under-estimate actual catch weights. Hence CDR (Catch Disposal Record) weights, which are based on fish receiver weights, will be higher than logbook weights. While the true difference remains uncertain a difference of around 15% is not uncommon.

### *Applicability of harvest strategy*

TTRAG was uncertain on the use of the domestic harvest strategy to recommend a Striped Marlin RBCC, based on:

- i) The ETBF catch as a proportion of the total Region 5 commercial catch in Region 5 has averaged 55% over the past 5 years (2012-16).
- ii) When the estimated catch (assuming a 20% mortality for tagged and released fish) of the recreational sectors in Australia and New Zealand (~16% of the Region 5 catch in 2014) is added to the total commercial catch in Region 5 then the proportion of the total catch of striped marlin in Region 5 taken by the ETBF has averaged 45% over the last 5 years.
- iii) MSE testing (Hillary et al, 2017) suggests that at recent ETBF (and non-ETBF) catch levels, the harvest strategy will likely be effective in moving the fishery towards the target CPUE level, providing RBCCs for the ETBF are adopted.
- iv) TTRAG noted that, in effect, the HS aims to steer the population to a level that can sustain an aggregate Maximum Economic Yield (MEY) for the regional fishery. Without a regional mechanism/agreement for catch sharing, the HS reduces regional overfishing by prescribing unilateral catch reductions to the ETBF only, thus preventing the fishery from meeting domestic economic objectives. The HS should maintain the population near the level that can sustain regional MEY, as long as the non-ETBF catch remains below MEY. However, as non-ETBF catches approach MEY, the HS will prescribe domestic catch levels that will approach zero.

TTRAG noted that the LOWESS-smoothed standardised CPUE for prime-sized Striped Marlin declined over the period 2000-05, increased slightly until 2009 before again declining slightly but since 2012 has been increasing, though still remains below the CPUE target (being 72% CPUE<sub>targ</sub> in 2016, c.f. Figure STM-1b). There was a significant decline in the CPUE of small-sized Striped Marlin (<54 kg DWT) between 1998 and 2010 but this index has increased significantly over the past 5 years (c.f. Figure STM-1a). The CPUE of large-sized Striped Marlin (>74 kg DWT) declined

over the period 1998-2005, increased slightly until 2010, then declined again but has been stable since 2013 (c.f. Figure STM-1a).

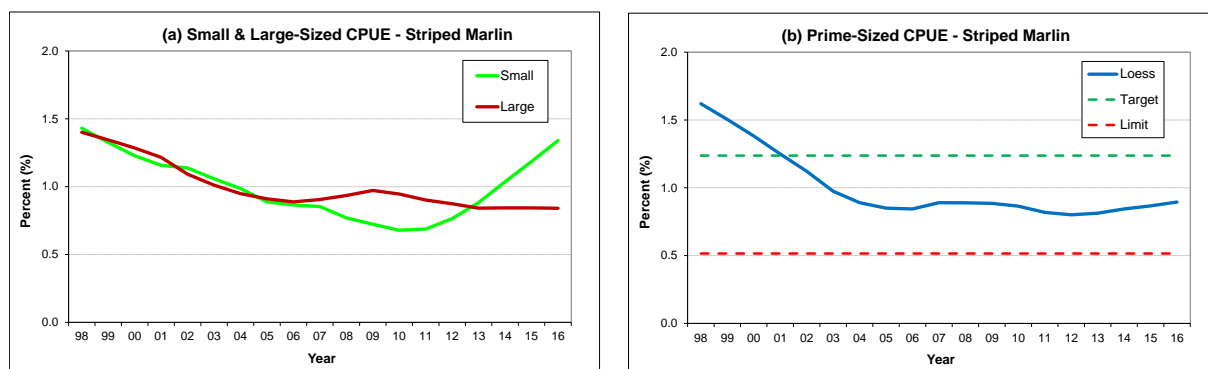


Figure STM-1. LOWESS-smoothed standardised CPUE for (a) small-sized and large-sized and (b) prime-sized Striped Marlin (scaled so that the mean of the each index over the period shown is 1). The target and limit CPUE reference values are also shown for prime-sized fish.

Based on the average processed weight of Striped Marlin and the number of fish recorded in logbooks for the period 1997-2005 and CDR recorded total catch weights since 2006, the average annual catch of Striped Marlin during the period 1997 to 2016 was 484t. The minimum catch over this period was 251t (in 2013) and the maximum was 936t (in 2001).

### ETBF catch proportions

South-west Pacific scenario: In 2016 the ETBF catch was 63% of the total commercial catch within Region 5, and 51% if one includes the estimated mortalities from the Australian and New Zealand recreational sectors (c.f. Figure STM-2). Over the past 5 years (2012-16) these proportions have averaged 55% and 45% respectively.

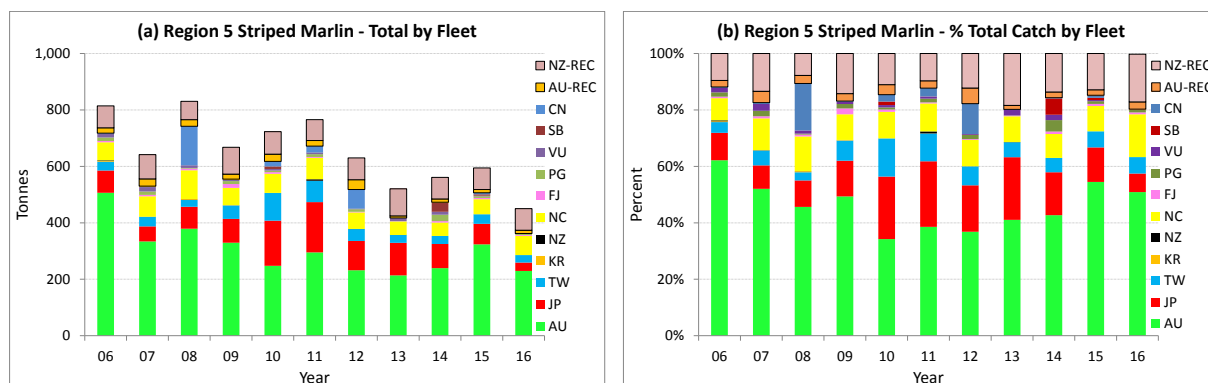


Figure STM-2. (a) Total annual catch of STM by fleet within Region 5, and (b) the percentage of the total annual catch of STM by fleet within Region 5 (including Australian and New Zealand recreational sectors).



### *Stock structure*

The results of genetic studies support a separate south-western Pacific stock of Striped Marlin. TTRAG therefore considered that Striped Marlin is a single stock within the south-west Pacific. Over the past 5 years the ETBF catch as a proportion of the total catch in the WCPFC Statistical Area south of the equator has averaged 17% (and 16% if the recreational catches in Australia and New Zealand are included in the total catch).

### *Stock status*

Last assessment: 2012

Overfished: Uncertain

Overfishing: No

TTRAG noted that the last stock assessment for Southwest Pacific Striped Marlin was undertaken in 2012.

The base case assessment model selected by SC8 (2012) indicates  $SB_{current}/SB_{F=0}=0.34$  and  $SB_{current}/SB_{MSY}=0.87$  (where *current* refers to the period 2007-2010). The range across the six sensitivity models selected by SC8 was 0.32-0.44 and 0.67-1.14 respectively (with the latter being greater than 1 for only one of the models). Therefore, SW Pacific striped marlin may be in an overfished state. The base case model also indicates  $F_{current}/F_{MSY}=0.81$  with a range across the seven models considered of 0.51–1.21 (being greater than 1 for only one of the models). This indicates that overfishing is unlikely occurring for SW Pacific striped marlin.

SC8 also noted that recent catches are close to MSY, and that recent fishing mortality is slightly below  $F_{MSY}$ , and that recent spawning biomass is slightly below  $SB_{MSY}$ . The recent catch increase is driven in part by increases in catch in the northern area of the stock that is not subject to the current WCPFC CMM (Conservation Management Measure) for this stock.

Next assessment: 2018

### *Management advice from the WCPFC-Scientific Committee*

The 2017 WCPFC Scientific Committee meeting (SC13) noted that no updated assessment or management advice has been provided since SC8. Therefore, the advice from SC8 should be maintained, pending a new assessment or other new information.

The 2012 WCPFC Scientific Committee meeting (SC8) recommended measures to reduce overall catch of this stock, through the expansion of the geographical scope of CMM 2006-04 to cover the distribution range of this stock. SC8 also recommended that in designing such a measure the Commission may need to consider the historic trends in the fishery, including the catch declines in the traditional central and southern areas and the recent catch increases in the northern areas. SC8 recognised that Striped Marlin is often caught as a non-target species. SC8 therefore recommended that data analyses be conducted to identify areas of high catch concentration that could be subject to targeted management.

### *State catches*

Negligible, based on advice from industry members.

### *Recreational catches*

Unknown, but 567 fish reported tagged in 2014. This is a decline on the ~1100 fish tagged per year in Australia over the previous four years. In New Zealand, about 800-1000 fish are tagged per year. Post-release mortality is uncertain but has been assumed to be 20%. Information on recreational catches since 2014 was not available.

There is probably a substantial landed catch by non-club recreational fishers. The Australian club landed catches are about 100 fish per year.

### *Whole of government position*

Not available.

### *Status of stock in relation to the Commonwealth Harvest Strategy Policy (CHSP)*

If the CHSP interpretation to stock status is applied to the southwest Pacific Striped Marlin stock, the average spawning biomass between 2007 and 2010 is depleted to ~34% of the biomass that would exist in the absence of fishing (based on the base case model selected by SC8).

## Yellowfin Tuna (YFT)

- Current TACC: 2,400t
- ETBF catch in 2016/17 quota year (CDR based): 1,497t (37% lower than the 2,366t catch in 2015/16 quota year).
- 2016 catch<sup>1</sup> in the WCPFC Statistical Area: 650,479t (provisional, highest on record and 12% higher than the 581,792t catch in 2015, and 15% higher than average over the past decade).
- 2016 catch in Region 5 (south of 10°S and west of 170°E) of the WCPFC stock assessment: 12,635t (provisional). The ETBF catch was 12% of this total and has averaged 12.5% over the past 5 years (based on logbook<sup>2</sup> data supplied by SPC).
- In response to the AFMA Commission's request to not provide RBCC advice based on the HS, TTRAG is providing stock status advice based on fishery indicators.

1. Based on data supplied by the WCPFC Science Service Provider.
2. Catch weights recorded on logbooks usually consistently under-estimate actual catch weights. Hence CDR (Catch Disposal Record) weights, which are based on fish receiver weights, will be higher than logbook weights. While the true difference remains uncertain a difference of around 15% is not uncommon.

### Indicators

A summary of the main indicators is found in the table below.

Indicator	Comment
Stock	Considered a single stock in the Western and Central Pacific Ocean (WCPO) – connectivity between ETBF and equatorial regions uncertain but may be small. Over the period 2012-2016 the ETBF catch as a proportion of the total catch in the WCPO has averaged 0.30%.
WCPO <sup>1</sup> Stock Assessment	<p>Last assessment: 2017<sup>2</sup>.</p> <p>Overfished<sup>3</sup>: Highly Unlikely</p> <p>Overfishing<sup>4</sup>: Highly Unlikely</p> <p>SC13 endorsed the use of the assessment model uncertainty grid to characterize stock status. The consensus weighting considered all options within five axes of uncertainty for steepness, tagging dispersion, tag mixing, size frequency (with two levels), and regional structure to be equally likely.</p> <p>The median values of relative recent spawning biomass (2012-2015) (<math>SB_{\text{recent}}/SB_{F=0}</math>) and relative recent fishing mortality (<math>F_{\text{recent}}/F_{\text{msy}}</math>) over the uncertainty grid were used to measure the central tendency of stock status. The values of the upper 90th and lower 10th percentiles of the empirical distributions of relative spawning biomass and relative fishing mortality from the uncertainty grid were used to characterize the probable range of stock status.</p> <p>The median estimate of recent spawning biomass was (<math>SB_{\text{recent}}/SB_{F=0}</math>) = 0.33 with a probable range of 0.20 to 0.41 (80% probability interval), and there was a roughly 8% probability (4 out of 48 models) that the recent spawning biomass</p>

	<p>had breached the adopted LRP, i.e. <math>\text{Prob}(\text{SB}_{\text{recent}}/\text{SB}_{\text{F=0}} &lt; 0.2) = 0.08</math>. Therefore, the spawning biomass is highly likely above the biomass LRP.</p> <p>The median estimate of recent fishing mortality was <math>(\text{F}_{\text{recent}}/\text{F}_{\text{msy}}) = 0.74</math> with a probable range of 0.62 to 0.97 (80% probability interval), and there was a roughly 4% probability (2 out of 48 models) the recent fishing mortality was above <math>\text{F}_{\text{msy}}</math>, i.e. <math>\text{Prob}(\text{F}_{\text{recent}}/\text{F}_{\text{msy}} &gt; 1) = 0.04</math>. Therefore, recent F is highly likely below <math>\text{F}_{\text{msy}}</math>.</p> <p>Next assessment: 2020.</p>	
Indicator	5-Year Trend	Comment
Region 5 Catch	Stable 2012 to 2014, then increase to 2015 and 2016.	<p>Relatively stable from 2012 to 2014 then an increase (28%) in 2015. The catch in 2016 was 2.5% higher than the 2011-15 average.</p> <p>TTRAG noted a significant catch attributed to the longline fishery in the Solomon Islands in 2014 and 2015 (being ~40% of the total Region 5 catch).</p>
ETBF Proportion of Region 5 Catch	Variable – ranging from 10-15%.	<p>Stable (11% to 10% of total catch respectively) followed by an increase to 15% in 2014 and 2015 then decrease to 12% in 2016 (noting that the 2016 data for Region 5 may be incomplete). Average of 12.5% over the past 5 years.</p> <p>For the longline component, increase between 2012 and 2013 (from 13% to 19%), then decrease to 16% in 2014 and 2015 then increase to 25% in 2016. Average of 18% over the past 5 years.</p>
Region 5 depletion	54.1% $\text{B}_{\text{F=0}}$ 44.1% $\text{SB}_{\text{F=0}}$	Averaged over the period 2011-2014 and based on the mean over the 48 models in the structural uncertainty grid retained for management advice based on the 2017 WCPO assessment (with equal weight to the divisors of 20 and 50 for the weighting on the size-composition data) though this regional estimate is not considered to be reliable.
ETBF Catch	Successive increases then decline.	Three successive increases of 7%, 26% and 29% from 2012 to 2015 to a catch of 2,177t (similar to catch in 2011), followed by a 19% decrease in 2016. Average of 1,645t over the past 5 years.

ETBF Standardised CPUE	2016 similar to average over last 5 years for all size-class	High inter-annual variability. CPUE of small-sized fish in 2016 is 13% above the mean over the previous 5 years (2011-15), CPUE of prime-sized fish is 26% lower, while CPUE of large-sized fish is 29% higher.  CPUE of small-sized fish over the past 5-years (2012-16) is 14% below the mean over all years since 2000, CPUE of prime-sized fish is 7% lower, while CPUE of large-sized fish is 29% higher.
ETBF Weights	Stable	The mean and lower 5 <sup>th</sup> and upper 95 <sup>th</sup> percentiles of the processed weight distribution show slightly increasing trends over the past decade.
State Catches	Negligible	Assumed to be very small.
Recreational Catches	Unknown	About 500 fish tagged per year, though in the past two years less than 100 fish have been tagged per year. Total catch remains unknown.
Status of stock in relation to the CHSP		If the CHSP interpretation to stock status is applied to the yellowfin tuna stock within the WCPO, the spawning biomass in 2012-2015 is estimated to be depleted to ~33% $SB_{F=0}$ .

1. The WCPO area is slightly smaller than the WCPFC convention area as it excludes the overlap area in the Eastern Pacific Ocean south of the equator and east of 150°W.
2. The assessment covers the years 1952-2015.
3. The WCPFC has adopted the indicator  $SB_{\text{recent}}/SB_{F=0} = 0.2$  as a Limit Reference Point for YFT where in the latest assessment  $SB_{\text{recent}}$  refers to the mean annual spawning biomass over the period 2012-15 and  $SB_{F=0}$  is the estimated average annual spawning biomass over the period 2006-15 in the absence of fishing. No Target Reference Point has yet been adopted for YFT.
4. The indicator  $F_{\text{recent}}/F_{\text{MSY}}$  is used to estimate fishing pressure on the stock where in the latest assessment  $F_{\text{recent}}$  is the mean fishing mortality over the period 2012-15 and  $F_{\text{MSY}}$  is the fishing mortality at Maximum Sustainable Yield (MSY).

#### *Management advice from the WCPFC-Scientific Committee*

The 2017 WCPFC Scientific Committee meeting (SC13) noted that based on the uncertainty grid the spawning biomass is highly likely above the biomass LRP and recent F is highly likely below  $F_{\text{MSY}}$ , and therefore noting the level of uncertainties in the current assessment it appears that the stock is not experiencing overfishing (96% probability) and it appears that the stock is not in an overfished condition (92% probability).

Based on the diagnostic case, both juvenile and adult fishing mortality show a steady increase since the 1970s. Adult fishing mortality has increased continuously over most of the time series, while juvenile fishing mortality has stabilized since the late 1990s at a level similar to that now estimated for adult yellowfin.

SC13 reiterated its previous advice from SC10 that WCPFC could consider measures to reduce fishing mortality from fisheries that take juveniles, with the goal to increase to maximum fishery yields and reduce any further impacts on the spawning potential for this stock in the tropical regions.

SC13 also reiterated its previous advice from SC10 that measures should be implemented to maintain current spawning biomass levels until the Commission can agree on an appropriate target reference point (TRP).

*Whole of government position*

Not available.

## Bigeye Tuna (BET)

- Current TACC: 1,056t
- ETBF catch in 2016/17 quota year (CDR based): 834t (4% higher than the 799t catch in 2015/16 quota year).
- 2016 catch<sup>1</sup> in WCPFC Statistical Area: 152,805t (provisional, the 12<sup>th</sup> highest on record and 8% higher than the 141,193t catch in 2015, and was similar to the average over the past decade).
- 2016 catch in Region 5 (south of 10°S and west of 170°E): 1,926t (provisional). The ETBF catch was 39% of this total and has averaged 27% over the past 5 years (based on logbook<sup>2</sup> data supplied by SPC).
- In response to the AFMA Commission's request to not provide RBCC advice based on the HS, TTRAG is providing stock status advice based on fishery indicators.

1. Based on data supplied by the WCPFC Science Service Provider.
2. Catch weights recorded on logbooks usually consistently under-estimate actual catch weights. Hence CDR (Catch Disposal Record) weights, which are based on fish receiver weights, will be higher than logbook weights. While the true difference remains uncertain a difference of around 15% is not uncommon.

### Indicators

A summary of the main indicators is found in the table below.

Indicator	Comment
Stock	Considered a single stock in the Pacific Ocean – connectivity between ETBF and equatorial regions uncertain but may be small. Over the period 2011-2015 the ETBF catch as a proportion of the total catch in the WCPO has averaged 0.36%.
WCPO <sup>1</sup> Stock Assessment	<p>Last assessment: 2017<sup>2</sup>.</p> <p>Overfished<sup>3</sup>: Unlikely</p> <p>Overfishing<sup>4</sup>: Highly Unlikely</p> <p>SC13 endorsed the use of the assessment model uncertainty grid to characterize stock status. The consensus weighting considered all options within four axes of uncertainty for steepness, tagging dispersion, size frequency, and regional structure to be equally likely, while the two growth options (new versus old) were given respective weightings of 3:1.</p> <p>The median values of relative recent spawning biomass (2012-2015) (<math>SB_{\text{recent}}/SB_{F=0}</math>) and relative recent fishing mortality (<math>F_{\text{recent}}/F_{\text{msy}}</math>) over the uncertainty grid were used to measure the central tendency of stock status. The values of the upper 90th and lower 10th percentiles of the empirical distributions of relative spawning biomass and relative fishing mortality from the uncertainty grid were used to characterize the probable range of stock status.</p> <p>The median estimate of recent spawning biomass was <math>(SB_{\text{recent}}/SB_{F=0}) = 0.32</math> with a probable range of 0.15 to 0.41 (80% probability interval), and</p>

	<p>there was a roughly 16% probability (23 out of 144 models) that the recent spawning biomass had breached the adopted LRP, i.e. <math>\text{Prob}(\text{SB}_{\text{recent}}/\text{SB}_{F=0} &lt; 0.2) = 0.16</math>. Therefore, the spawning biomass is likely above the biomass LRP.</p> <p>The median estimate of recent fishing mortality was <math>(F_{\text{recent}}/F_{\text{msy}}) = 0.83</math> with a probable range of 0.61 to 1.31 (80% probability interval), and there was a roughly 23% probability (33 out of 144 models) the recent fishing mortality was above <math>F_{\text{msy}}</math>, i.e. <math>\text{Prob}(F_{\text{recent}}/F_{\text{msy}} &gt; 1) = 0.23</math>. Therefore, recent <math>F</math> is likely below <math>F_{\text{msy}}</math>.</p> <p>Next assessment: 2020.</p>	
Indicator	5-Year Trend	Comment
Region 5 Catch	Initial decline then increase since 2013	<p>Decrease (30%) in catch between 2011 and 2012, and further decrease (1%) to 2013, then increase (18%) to 2014 and further increase (3%) to 2015. Catch in 2015 was 3.9% higher than the 2011-15 average.</p> <p>TTRAG noted a significant increase in the catch attributed to the longline fishery in the Solomon Islands in 2014 and 2015 (being ~40% of the total Region 5 catch in 2015).</p>
ETBF Proportion of Region 5 Catch	Decrease followed by increase	<p>Initial decrease (26% to 18%) from 2012 to 2014 followed by an increase to 29% in 2015 and to 39% in 2016 (noting that the 2016 data for Region 5 may be incomplete). Average of 27% over the past 5 years.</p> <p>For the longline component, initial decrease (27% to 20%) from 2012 to 2014 followed by an increase to 30% in 2015 and to 45% in 2016. Average of 29% over the past 5 years</p>
Region 5 depletion	51.1% $B_{F=0}$ 41.4% $SB_{F=0}$	Averaged over the period 2011-2014 and based on the mean over the 72 models in the structural uncertainty grid retained for management advice based on the 2017 WCPO assessment (where the models using the new growth function are given three times the weighting of the models using the old growth function) though this regional estimate is not considered to be reliable.
ETBF Catch	Initial decline in 2013, then increases in	Over past 5 years catch decreased (11%) between 2012 and 2013, remained stable in 2013 and 2014, then increased strongly (60%) in 2015 and increased again



	2015 and 2016	(11%) in 2016. Catch averaged 638t per year over the past 5 years.
ETBF Standardised CPUE	Variable. In 2016 decreased for Small and Prime-sized fish; increased for Large	<p>High inter-annual variability.</p> <p>CPUE of small-sized fish in 2016 is 37% below the mean over the previous 5 years (2011-15), CPUE of prime-sized fish is 29% higher, while CPUE of large-sized fish is 37% lower.</p> <p>CPUE of small-sized fish over the past 5-years (2011-15) is 23% below the mean since 2000, while the CPUE of prime-sized and large-sized fish are similar.</p> <p>A large recruitment of small-sized fish noted in 2014 contributed to a strong cohort of prime-sized fish in 2015 and has subsequently been reported as a strong cohort of large-sized fish in 2016. Similar patterns of a strong cohort moving through the fishery have been noted in the past.</p>
ETBF Weights	Variable	The mean and lower 5 <sup>th</sup> percentile of the processed weight distribution display no long term trends, while the upper 95 <sup>th</sup> percentile displays a decline since 2011
State Catches	Negligible	Assumed to be very small.
Recreational Catches	Unknown	Likely to be extremely low with less than 10 fish tagged per year over the past few years.
Status of stock in relation to the CHSP		<p>If the CHSP interpretation to stock status is applied to the bigeye tuna stock within the WCPO, the spawning biomass in 2012-2015 is estimated to be depleted to ~32% <math>SB_{F=0}</math>.</p> <p>Within Region 5 the spawning biomass is estimated to be depleted to ~41% <math>SB_{F=0}</math> though this regional estimate is not considered to be reliable.</p>

1. The WCPO area is slightly smaller than the WCPFC convention area as it excludes the overlap area in the Eastern Pacific Ocean south of the equator and east of 150°W.
2. The assessment covers the years 1952-2015.
3. The WCPFC has adopted the indicator  $SB_{recent}/SB_{F=0} = 0.2$  as a Limit Reference Point for BET where in the latest assessment  $SB_{recent}$  refers to the mean annual spawning biomass over the period 2012-15 and  $SB_{F=0}$  is the estimated average annual spawning biomass over the period 2006-15 in the absence of fishing. No Target Reference Point has yet been adopted for BET.
4. The indicator  $F_{recent}/F_{MSY}$  is used to estimate fishing pressure on the stock where in the latest assessment  $F_{recent}$  is the mean fishing mortality over the period 2012-15 and  $F_{MSY}$  is the fishing mortality at Maximum Sustainable Yield (MSY).

### *Management advice from the WCPFC-Scientific Committee*

Based on the uncertainty grid adopted by the 2017 WCPFC Scientific Committee (SC13), the WCPO BET spawning biomass is likely above the biomass LRP and recent F is likely below  $F_{msy}$ , and therefore noting the level of uncertainties in the current assessment it appears that the stock is not experiencing overfishing (77% probability) and it appears that the stock is not in an overfished condition (84% probability).

Although SC13 considered that the new assessment is a significant improvement in relation to the previous one, SC13 advised that the amount of uncertainty in the stock status results for the 2017 assessment is higher than for the previous assessment due to the inclusion of new information on BET growth and regional structures.

SC13 also noted that levels of fishing mortality and depletion differ between regions, and that fishery impact was higher in the tropical region (Regions 3, 4, 7 and 8 in the stock assessment model), with particularly high fishing mortality on juvenile bigeye tuna in these regions. SC13 therefore recommends that WCPFC14 could continue to consider measures to reduce fishing mortality from fisheries that take juveniles, with the goal to increase bigeye fishery yields and reduce any further impacts on the spawning potential for this stock in the tropical regions.

Based on these results, SC13 recommended as a precautionary approach that the fishing mortality on bigeye tuna stock should not be increased from current level to maintain current or increased spawning biomass until the Commission can agree on an appropriate target reference point (TRP).

### *Whole of government position*

Not available.

## Albacore Tuna (ALB)

- Current TACC: 2,500t
- ETBF catch in 2016/17 quota year (CDR based): 1080t (10% higher than 982t catch in 2015/16 quota year).
- 2016 catch<sup>1</sup> in South Pacific: 68,601t (provisional; eighth highest on record and 16% lower than the 81729t catch in 2015, and 10% lower than the average over the past decade).
- 2015 catch in Region 5 (south of 10°S and west of 170°E): 8,413t (provisional). The ETBF catch was 10% of this total and has averaged 4.9% over the past 5 years (based on logbook<sup>2</sup> data supplied by SPC).
- In response to the AFMA Commission's request to not provide RBCC advice based on the HS, TTRAG is providing stock status advice based on fishery indicators.

1. Based on data supplied by the WCPFC Science Service Provider.
2. Catch weights recorded on logbooks usually consistently under-estimate actual catch weights. Hence CDR (Catch Disposal Record) weights, which are based on fish receiver weights, will be higher than logbook weights. While the true difference remains uncertain a difference of around 15% is not uncommon.

### Indicators

A summary of the main indicators is found in the table below.

Indicator	Comment	
Stock	Considered single stock in the south Pacific. Over the period 2011-2015 the ETBF catch as a proportion of the total catch in the south Pacific has averaged 1.6%.	
South Pacific (SP) Stock Assessment	<p>Last assessment: 2015<sup>1</sup>.</p> <p>Overfished<sup>2</sup>: No</p> <p>Overfishing<sup>3</sup>: No</p> <p>The base case assessment model selected by SC11 (taken as the reference model) indicates <math>SB_{latest}/SB_{F=0} = 0.40</math> (with 90% confidence limits of 0.30-0.60) and <math>SB_{latest}/SB_{MSY} = 2.86</math> (with 90% confidence limits of 1.75-7.03). Therefore, SP albacore tuna was not considered to be in an overfished state.</p> <p>The base case assessment model selected by SC11 indicates <math>F_{recent}/F_{MSY} = 0.39</math> (with the 90% confidence limits being 0.13-0.62). Therefore, overfishing was not considered to be occurring for SP albacore tuna.</p> <p>Next assessment: 2018.</p>	
Indicator	5 Year Trend	Comment

Region 5 Catch	Increasing with a substantive decline in 2015	Increases (8% and 3%) each year between 2012 and 2014 (to 20,166t) followed by large decreases (32% and 40%) each year from 2014 to 2016 to a catch low of 8,413t in 2016, being 47% below the 2012-16 average.  TTRAG noted a significant catch attributed to the longline fishery in the Solomon Islands in 2014 and 2015 (being 39% and 44% of the total Region 5 catch respectively).
ETBF Proportion of Region 5 Catch	Variable	From 3.1% and 3.2% of total catch in 2012 and 2013 respectively to a low of 2.8% in 2014, followed by an increase to 5.3% of the total catch in 2015 and 10.2% in 2016 (noting that the 2016 data for Region 5 may be incomplete). Average of 4.9% over the past 5 years.  Similar for the longline component, averaging 5.0% over the past 5 years.
South Pacific Stock depletion	40% $SB_{F=0}$	For 2013 based on the 2015 assessment.
ETBF Catch	Variable then large increases.	Initial increase (9%) from 2012 to 2013 followed by a 5% decline in 2014. A large increase (29%) in 2015 followed by a 16% increase in 2016 to 1,101t. Average catch of 854t per year over the past five years.
ETBF Standardised CPUE	Stable then increase	CPUE of all-sized fish in 2016 25% above the average over the previous 5 years. CPUE of all-sized fish over the past 5-years 12% above the mean since 2000.
ETBF Weights	Slight increase	The mean and lower 5 <sup>th</sup> and upper 95 <sup>th</sup> percentiles of the processed weight distribution show variable but slightly increasing trends over the past five years.
State catches	Negligible	Assumed to be very small.
Recreational catches	Unknown	About 100-150 fish were reported tagged in 2015 and 2016. This is considerably lower than the 1200 per year reported tagged in the previous few years.
Status of stock in relation to the CHSP		If the CHSP interpretation to stock status is applied to the albacore tuna stock within the WCPO, the stock in 2013 is estimated to be depleted to ~40% $SB_{F=0}$ .

1. The assessment covers the period from July 1960 to June 2011.
2. The WCPFC has adopted the indicator  $SB_{latest}/SB_{F=0} = 0.2$  as a Limit Reference Point for ALB where in the latest assessment  $SB_{latest}$  refers to the mean annual spawning biomass in 2013 and  $SB_{F=0}$  is the

estimated average annual spawning biomass over the period 2002- 2011 in the absence of fishing. No Target Reference Point has yet been adopted for ALB.

3. The indicator  $F_{\text{recent}}/F_{\text{MSY}}$  is used to estimate fishing pressure on the stock where in the latest assessment  $F_{\text{recent}}$  is the mean fishing mortality over the period 2009- 2012 and  $F_{\text{MSY}}$  is the fishing mortality at Maximum Sustainable Yield (MSY).

### *Management advice from the WCPFC-Scientific Committee*

Pending a new assessment in 2018, the 2017 WCPFC Scientific Committee meeting (SC13) recalled its previous advice from SC11 and SC12 that longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained, especially for longline catches of adult albacore. SC13 also recommended that this advice be taken into consideration when the TRP for South Pacific albacore is discussed at WCPFC14.

In its management advice to the Western Central Pacific Fisheries Commission (WCPFC) SC11 noted the following:

- The South Pacific albacore spawning stock is currently above both the level that will support the MSY and the adopted spawning biomass limit reference point, and overfishing is not occurring ( $F$  less than  $F_{\text{MSY}}$ ).
- While overfishing is not occurring, further increases in effort will yield little or no increase in long-term catches and result in further reduced catch rates.
- Decline in abundance of albacore is a key driver in the reduced economic conditions experienced by many PICT (Pacific Island Countries and Territories) domestic longline fleets. Further, reductions in prices are also impacting some distant water fleets.
- For several years, SC has noted that any increases in catch or effort in sub-tropical longline fisheries are likely to lead to declines in catch rates in some regions (10-30°S), especially for longline catches of adult albacore, with associated impacts on vessel profitability.
- Despite the fact that the stock is not overfished and overfishing is not occurring, SC11 reiterates the advice of SC10 recommending that longline fishing mortality and longline catch be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained.

### *Whole of government position*

Not available.