Australian Government
Australian Fisheries Management Authority

Tropical Tuna and Billfish Fisheries Resource Assessment Group (TTRAG) 27

Minutes

17 June 2020

Video Conference

1 Welcome and Apologies

The Chair, Dr Cathy Dichmont, welcomed members to the meeting, opening the meeting at 2.50pm. The following participants were present at the meeting:

Present	
Dr Cathy Dichmont	Chair
Dr Don Bromhead	AFMA member
Dr Rich Hillary	Scientific member, CSIRO
Mr Gary Heilmann	Industry member
Mr Pavo Walker	Industry member
Dr Julian Pepperell	Recreational fishing member
Dr Ian Knuckey	Scientific member
Dr Rob Campbell	Scientific member, CSIRO
Mr James Larcombe	Scientific member, ABARES
Mr David Mobsby	Economics member
Invited Participants	
Mr Terry Romaro	Industry invited participant (July meetings)
Mr David Ellis	Industry representative invited participant, TTRAG and TTMAC
Executive Officer	
Ms Darci Wallis	TTRAG Executive Officer

Apologies were received from Mr Paul Williams prior to the meeting.

2 Declaration of Interest

The Chair asked all participants present at the meeting to declare any conflict of interest with the agenda items. Each participant with a declared conflict of interest was asked to leave the teleconference while the remaining members discussed their individual claims.

Member/participant	Declared Interests
Dr Cathy Dichmont (Chair)	Has a consulting company, but has no pecuniary interests in the tuna fisheries. *No conflict of interest declared.*
Dr Don Bromhead	Employee of AFMA, which includes a salary. Is the Manager of the tropical tuna fisheries. No pecuniary interest in tropical tuna fisheries. *No conflict of interest declared.*
Ms Darci Wallis	Employee of AFMA, which includes a salary. Executive Officer for TTRAG, but has no pecuniary interest in Australian tropical tuna fisheries. *No conflict of interest declared.*
Mr David Ellis	David is CEO for Tuna Australia, and is the managing director of a Fisheries and Aquaculture consultancy company. *Declared an interest in Agenda item 3.*
Mr Gary Heilmann	Industry member, director of a processing company, no longer holds ETBF boat or quota SFRs. *Declared an interest in Agenda item 3.*

Dr Rich Hillary	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. *No conflict of interest declared.*
Dr James Larcombe	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. *No conflict of interest declared.*
Dr Robert Campbell	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: "*Data management, provision of fishery indicators and implementation of the harvest strategies for Australia's tropical tuna fisheries*". *No conflict of interest declared.*
Dr Ian Knuckey	Has a consulting company with interests in electronic monitoring in the tuna fisheries, and is a member on several other AFMA Committees. *No conflict of interest declared.*
Mr David Mobsby	Employee of ABARES, involved in fisheries research, as it relates to TTRAG primarily through the economic survey of the Eastern Tuna and Billfish Fishery. Has no pecuniary interest in the Australian Tropical Tuna Fisheries. *No conflict of interest declared.*
Dr Julian Pepperell	Independent fisheries consultant and representative of the recreational fishing sector. Is currently undertaking research into gamefishing. Is involved in projects including the monitoring of fish landed at game fishing tournaments and pop-up satellite tagging on juvenile Black Marlin. *No conflict of interest declared.*
Mr Pavo Walker	Owns several ETBF boat SFRs, and ETBF quota SFRs for all species. Holds a Coral Sea permit and minor line permit. *Declared an interest in Agenda item 3.*
Mr Terry Romaro	Director of a company that owns Eastern Tuna and Billfish Fishery (ETBF) boat statutory fishing rights (SFRs), minor line SFRs, ETBF longline SFRs, Western Tuna and Billfish Fishery (WTBF) boat SFRs, WTBF longline SFRs, Western Skipjack Tuna Fishery (WSTF) purse seine permit, Small Pelagic Fishery (SPF) purse seine, mid-water trawl SFRs, and SPF quota SFRs. Shareholder of a company that owns shares in a proposal to fish with foreign longliners in the WTBF. Industry member on Southern Bluefin Tuna (SBT) and Tropical Tuna MAC , Invited participant for TTRAG, and industry representative at the Commission for the Conservation of SBT (CCSBT) & IOTC. Invited participant for squidRAG and squid concession holder. Director of a company who owns a fish processing facility in Port Lincoln. *Declared an interest in Agenda item 3.*

In all cases where a member, invited participant or observer declared a conflict of interest, the participant left the teleconference. The remaining members unanimously agreed they were permitted to participate in the item of discussion, noting the expertise of the individuals and benefits of these members contributing to discussions.

3 ETBF Harvest Strategy

3.1 Questions/clarifications to Dr Hilary

TTRAG noted the two key technical papers and two associated 'key questions' papers developed by CSIRO as part of the ETBF Harvest Strategy Development project:

- **Conditioning of the Broadbill Swordfish Operating Models,**
- **Management Strategy Evaluation of the Broadbill Swordfish ETBF harvest strategies,**
- **Summary of advice requested given Operating Model paper, and**
- **Summary of advice requested given MSE paper.**

TTRAG also noted the following documents provided by AFMA:

- ***Summary of key questions raised – OM and MSE work***: A summary of the key questions from the written feedback from members, and
- **Small Working Group Meeting Summary**: Compiled advice from the two small working group (SWG) meetings on 29 April and 21 May 2020.

TTRAG considered the responses provided by Dr Hillary and other TTRAG members to the key questions from Dr Hillary to the TTRAG and then TTRAG requests for further clarifications. A summary of the responses and discussion is provided under each question below.
The summary discussion and advice below is a combination of the written feedback provided by members and the discussions held at the TTRAG meeting. A paper which compiles the final TTRAG advice and recommendations to TTMAC, including the outcomes and advice of small working group (SWG) meetings, the June 16 TTRAG27 teleconference and written responses to the above papers submitted by TTRAG members is available at **Attachment A**.

Swordfish Operating Model

OM Question 1 – Use of Data
We have used the same data as the WCPFC stock assessments but, given our change of structure to an annual time-step not quarterly, we use weighted average (or summed in the case of catch numbers) data for a given year. For the size and weight frequency we used the relative sample size in a given quarter as the weighting; for the CPUE we used the relative effort as the weighting.
Are TTRAG comfortable with how we constructed the data in this fashion, given the rationale for moving from a quarterly to an annual time-step?

TTRAG noted the following responses and clarifications:

- In response to a question regarding how seasonality is included within the annual time step data, Dr Hillary clarified that there are no seasonal parameters, all the data has been aggregated to annual with only a seasonal adjustment for when the catch was taken. This allows for the inclusion of seasonal variation within the annual data without the use of a complicated season model.
- Dr Hillary confirmed how the quarterly CPUE indices were aggregated, with only the non-ETBF fleets weighted by effort, these weightings are not applied to the ETBF indices.
- TTRAG noted that the above clarifications responded to the question of whether the model should be rerun with annual indices, which wasn't required as the indices were annual.
- Industry expressed ongoing concern about how international fishing catches adjacent to our EEZ impact the TAC setting for the Australian quota.
- Dr Campbell advised that the SPC would need to confirm where the AU_1 length data comes from for Swordfish.

Action Item 1: Dr Campbell to contact Peter Williams at SPC to confirm the source of the AU_1 length data

Based on the clarifications provided by CSIRO and the advice of the SWG, **TTRAG supported the above 'best practice' data aggregation and weighting processes applied to the OMs.**

OM Question 2 – Model Structure

The four main changes to the model structure, relative to the WCPFC assessment were:

1. Moving from a quarterly to an annual time-step in the fishery and population dynamics to reduce both intra-annual noise in the data and unnecessary complexity in the population and fishery models
2. Parameterising the movement directly in terms of transition probabilities between regions, not translated diffusion coefficients given region sizes
3. Developing a spatiotemporally correlated (log-Gaussian process) recruitment deviation model and estimating the parameters thereof
4. Not estimating time-dependent catchability for fleets without usable CPUE series and effort deviation parameters for all fisheries to reduce by an order of magnitude the number of parameters we estimate (unnecessarily for our purposes)

Are TTRAG comfortable with, and clear on, the changes we have made in constructing the population and fishery models for the revised OMs?

A number of TTRAG members questioned the drivers of the very significant differences in depletion and the apparently higher productivity/resilience of the OM "Stocks" compared to those statistics from the regional assessment.

TTRAG noted the following responses and clarifications:

- While it is difficult to specify in each scenario the exact reason for the difference in the depletion estimates, Dr Hillary outlined that the two main drivers behind the above differences are how the data is weighted and different formulations and assumptions for recruitment.
- TTRAG noted that WCPFC assessment pre-weights the data, whereas this OM iteratively weights the data based on how well it fits the information in the model. The WCPFC assessment divides the stock across two regions/areas where recruitment is considered quasi-independent and weighting of data within the model is predefined. Predefining the weighting infers a level of stability that you don't get if you adaptively estimate what the precision of each data set should be. The OMs allow for spatial and temporal variation in recruitment. Both the methods used in the OMs are now considered to be best practice.
- While it would be expected that the WCPFC assessment would show more sensitive to natural mortality that the OMs, these OMs did show a similar sensitivity to the other WCPFC models, demonstrating the OMs still performed well.
- In response to a query as to whether similar settings to the WCPFC model could be applied in this OM to get a closer comparison, Dr Hillary advised that it would difficult to fix the parameters to get a similar recruitment model in the assessment as it's not clear exactly what SPC did in the model.

TTRAG noted that, even if the OMs were under-estimating the level of depletion which could result in an overly optimistic assessment in the performance of the harvest strategy to the actual limit reference point, a number of more pessimistic scenarios than the reference case (higher migration levels, inclusion of all fisheries and low recruitment) were tested and the OM still performed reasonably well.

On the basis of the rationale provided by CSIRO and the advice of the SWG, **TTRAG supported the changes (relative to the regional assessment model) made to the construction of the population and fishery models within the revised OM.**

OM Question 3 - Scenarios
We have explored the OM scenarios outlined in the out of session phone meeting (January 2020) and outlined the key steepness and natural mortality scenarios either adopted or omitted from the previous WCPFC grid set.
Do the TTRAG think there needs to be additional scenarios, or meaningful modifications to the current set, run for the next phase of the MSE work?

TTRAG considered the range of scenarios presented, noting the following points:

- There were only two M scenarios run even though the wording in paper could be interpreted as three. Dr Knuckey asked whether there was the need to run the three steepness scenarios within the OM. Dr Hillary confirmed that this provides some consistency with the uncertainty grids used in WCPFC and, given the model run times, can be undertaken if requested.
- That the low recruitment scenario only lowered recruitment for a five year period and whether this may provide a more optimistic outlook. TTMAC discussed the need for an additional scenario with a longer period of low recruitment to test the harvest strategy response if recruitment does not return to the long-term average. TTRAG agreed this scenario should only include the last 20 years of recruitment (from the mid-90s).

Action Item 2: AFMA to liaise with Dr Hillary and Dr Campbell as to whether the additional longer low recruitment scenario is feasible and advise TTRAG.

TTRAG agreed that the above suite of OMs cover the range of scenarios needed to test the robustness of the harvest strategy, with one additional scenario recommended:

- To test a scenario by which recruitment continues forward at the recent level, which is below the long-term average.

OM Question 4 - Overall
We have outlined from the beginning that this is *not* an alternative stock assessment of Swordfish in the wider South West Pacific region; it is a process to generate representative and useful OMs to explore the performance of the candidate revised harvest strategies for Broadbill Swordfish.
Do the TTRAG feel that we have accomplished this task and that, subject to requested changes, these OMs can be used in the MSE work?

Overall TTRAG supported the use of the OMs in the MSE, noting the following points:

- That due to the differences in the model structures, it would not be possible to apply the exact parameters from the WCPFC assessment within the OM to compare the outputs, although one scenario (MigDiag) mimicked the WCPFC assessment as closely as possible.
- That questions would likely be asked regarding the difference between the regional assessment and this OM. Based on this, TTRAG agreed that a strong justification for the different approach taken and the reasons for the different depletion estimates would be required. TTRAG also agreed that reference would also need to be made to how a particular CPUE target equates to a particular biomass level and how the harvest strategy

can achieve the requirements of the Commonwealth Harvest Strategy Policy (CHSP) and the Marine Stewardship Council (MSC).

- Due to the differences in the depletion and that the OMs used methods that are currently considered to be 'best practice', the lessons learned from the work completed by CSIRO should be communicated to SPC assessment team to help them improve the 2021 WCPFC assessment.

Action Item 3: Dr Bromhead, Dr Hillary, Dr Larcombe, Dr Campbell and Mr Ellis to develop text out of session outlining the reasons for differences in the assessment outcomes and circulate to TTRAG for approval.

On balance and taking into account both the identified improvements made in the OM (relative to the regional assessment), and the fact that the candidate harvest strategy performed acceptably even under the very pessimistic scenarios that were tested, **TTRAG recommend:**

- **That the suite of OMs developed are appropriate and sufficient to test the robustness of the candidate harvest strategy against the CHSP requirements and ETBF fishery objectives, specifically to avoid the LRP (more than 90% of the time) and achieve the CPUE based TRP.**
- **That CSIRO pass on learnings/improvements from the OM development process to the SPC regional assessment team to assist in the updating of that assessment in 2021.**

Swordfish Management Strategy Evaluation

Due to time constraints, only the key questions were explicitly addressed. TTRAG agreed that responses to all the questions should be compiled into a document for consideration by the RAG. This would allow for members to see the responses to the questions to provide further clarity that were unable to be addressed at the meeting.

Action Item 4: AFMA to compile responses to the questions posed by TTRAG members in the written feedback.

MSE Question 1 – Clarity of HS Structure

We have been through the general structure of the HS (data used, harvest control rule (HCR) *etc.*) a number of times.
Does the TTRAG have any remaining questions about what goes into the HS and how the RBCC would be calculated by the HCR?

TTRAG noted the HCR structure that has previously been considered, with the following key points discussed:

- In the current MSE analyses (3.1b) both 1 and 3-year TAC cycles were explored with a maximum TAC change of 10% and 27% respectively, with no minimum change limitation. The results of these are discussed in subsequent sections.
- A buffer is included within the HCR to build inertia in the system to avoid large interannual fluctuations in the total allowable catch (TAC), and provide stability and certainty for industry planning, when the sCPUE index is close to the target.
- While the harvest control rule (HCR) contains a target reference point it does not require an explicit limit reference point (LRP), rather a trigger threshold. Further advice may be required from ABARES or the Department to ensure consistency with the CHSP.
- The "beta" distribution (in relation to the TAC Catch estimation) varies between 0 and 1, using the historical ratio of catch taken to TAC set which has always been less than one

(i.e. TAC has never been fully caught). The implementation model is then conditioned on the historical data and then that is used to simulate what that fraction would be in the future.

- There are limitations for a CPUE tuned harvest strategy by altering only the ETBF catch. It would be difficult within the proposed model to quickly reduce the stock to a specific depletion level considering the limits applied by the maximum change rules and possible multi-year TACs. However, TTRAG agreed that in the case that TACs were set higher than the current effort levels could conceivably catch it would inherently be more precautionary as a lower catch volume was being taken.

In line with the previous advice provided by TTRAG on the harvest strategy structure, TTRAG members endorsed the general form of the HCR including the key index input (sCPUE), the use of a buffer zone and threshold and calculation of the RBCC.

MSE Question 2 - Implementation model

- Within the MSE paper we outlined the specifics of the implementation model - specifically how we go about calculating the degree to which the actual catch taken is always less than the TAC to some degree.

Does the TTRAG understand and approve of the implementation model used in the MSE work?

In considering the SWG meeting report on this issue, TTRAG27 noted:

- The catch data used for the implementation model was from 2013-2018, as the catch from 2019 was significantly lower than previous years.
- The additional scenario which included the 2019 catch considered at the second meeting of the SWG, had minimal impacts on the outputs of the harvest strategy and was not recommended for inclusion in the final implementation model.
- The starting point in the implementation model is based on the current TAC, not the most recent catches.

On the basis of the points above, TTRAG approved the use of the proposed implementation model in the MSE, including the exclusion of the 2019 which differs significantly from previous years.

MSE Question 3 - MSE runs undertaken

The out-of-session phone meeting set out the main runs the TTRAG thought should be done, and in the paper we have added some additional runs of possible future scenarios.
Does the TTRAG see a need for additional runs and are the runs we undertook both clear and relevant?

TTRAG noted the scenarios undertaken and agreed that those undertaken were clear and relevant.

Overall, while TTRAG 27 requested one additional scenario (to test ongoing low recruitment using the recent 20 year average) it otherwise agreed that the current suite of MSE scenarios developed by CSIRO are sufficient to test the robustness of the harvest strategy.

MSE Question 4 - Tuning interpretation

In the paper we outlined what we call the strict tuning principle that is usually invoked when one controls all the fishing pressure (via catch or effort). For the ETBF we clearly do not control all the fishing pressure (more like around 25% for the single stock case) and we suggest a more relaxed (approximate) tuning definition so that the confidence intervals (in the CPUE tuning case both observed target and simulated) overlap sufficiently.

Does the TTRAG understand and approve of the more relaxed tuning interpretation given the realities of how much control we have to move the mature biomass via changing only the ETBF catch?

TTRAG considered the application of tuning principle, noting the following comments/questions:

- There may need to be clarification for TTMAC why we believe the HS can be effective if the HS is unable to control biomass (and CPUE is related to biomass) as implied by this question from CSIRO?

Overall, TTRAG members supported:

- ***The tuning interpretation used in the MSE which reflects the amount of control ETBF catches have on the mature biomass.***
- ***The use of CPUE to tune the harvest strategy, due the level of difficulty in tuning using SSB. The SWG noted that tuning to CPUE may be more meaningful from an economic perspective, allowing consideration of the trade-offs between trip level CPUE and season level TACCs.***

MSE Question 5 - Summary statistics

Depending on their familiarity with previous MSE work, and those kinds of summary statistics used across a range of examples, there might be either unfamiliar things in the work or missing statistics members might find useful.

Are there are additional (or modified) summary statistics TTRAG members would like to see in the MSE work?

Noting the suggestions from the SWG, TTRAG suggested the following minor changes to the summary statistics:

- A performance statistic to measure performance against falling below the LRP is included as this has potential implications for both Marine Stewardship Council certification and the CHSP requirements.
- Absolute true CPUE (unstandardised) is included in the summary statistics
- Noting the value in the time periods tested in the plots (current, 2035 after tuning and 2040) and considering the overall comfort with the harvest strategy performance at the end of the tuning period, it may be valuable moving forward to consider the short, medium and long term set of numbers within a 20 year projection period (e.g. 5, 10 and 20 years).
- The axis labels ‘Statistic’ should be on the middle of the group, not on the white line and should be larger.
- There should also be some horizontal reference lines for targets and limits (for depletion).

With the inclusion of the above suggestions, TTRAG supported the summary statistics included in the MSE.

MSE Question 6 - General results overview

6.1

When tuning the future (centred around 2035) ETBF CPUE to be *approximately* tuned to the 2011–2016 observed mean CPUE, the broad-scale performance of the HS was generally fairly good. Across a range of plausible robustness trials SSB depletion levels by the tuning (2035) and final (2040) years are between 45–75% but overwhelmingly between the 60–70% range. In terms of average TACs they are almost between 1,250–1,800t and were only lower for explicitly negative robustness scenarios. Average changes in TAC were around the 50–200t level (irrespective of the TAC schedule).

Does the TTRAG feel they have enough results for this look at the performance of an initial reference HS tuning?

In line with the advice from the SWG, TTRAG agreed that with all the scenarios considered at both meetings, there was sufficient information to look at the performance of the tuning options.

6.2

There are moderate but noticeable differences between the "reference" 3-year TAC schedule and the annual TAC scenario explored.

Does TTRAG feel they have enough information with the 2 possible cycles (and their differing maximum change percentages) explored to make a choice on this fundamental HS control parameter?

Noting the results of the 1 and 3-year TAC scenarios, TTRAG discussed the following points:

- That these were only triggered in some of the more extreme scenarios (20% reduction in CPUE target) where the model is trying to make greater changes to the reach the target.
- Overall, the mean TAC under the annual cycle scenario is higher than the three year cycle, due to the TAC moving upwards annually in response to improving recruitment and higher CPUE rather than changing the TAC every three years (even though the maximum change is lower under the annual scenario).
- That while recent CPUE has been below average, a number of scenarios demonstrate improving recruitment (back to average levels) which maintains the stock at or above the target. The low recruitment scenarios did test the ability to bring the stock back up to target levels.
- There isn't a large difference in the performance of either a one or three year TAC cycle, although from a technical perspective the three year TAC schedule performs slightly better than the one year TAC schedule as its less likely to be following 'noise' in the CPUE Index.

TTRAG considered the need for the maximum change requirement and whether any additional scenarios should be completed without this requirement. Following advice from industry that its inclusion is necessary to minimise changes in the TAC and that some of the more pessimistic scenarios do test similar issues, **TTRAG agreed no additional scenarios regarding maximum change were required.**

Noting the above points, TTRAG supported the advice of the SWG that a decision on which TAC setting cycle to use in the harvest strategy should be made by the Tropical Tuna Management Advisory Committee (TTMAC).

6.3

With the four tuning options we explored (three CPUE tunings and one 60% SSB depletion tuning option) this resulted in quite a wide range of possible future performances for these candidate harvest strategies.

Does the TTRAG see enough differences in performance in the tunings explored to make some judgements on preferable tuning options?

Noting the four tuning options presented, TTRAG discussed the following key points:

- Overall the harvest strategy performed fairly well across the different scenarios tested, with sufficient scenarios presented to consider the performance of the tuning options.
- The work presented to date presents the opportunity to identify a harvest strategy and there is sufficient information in the MSE work conducted to date to inform TTMAC decision on TAC schedule and CPUE tunings (targets).

Considering the discussion above, TTRAG recommended that:

- **The Harvest Strategy should be tuned with a CPUE index rather than SSB due to the difficulties in tuning to SSB, and the greater relevance of a CPUE target to economic returns to the fishery.**
- **In relation to choosing a CPUE target, the third CPUE tuning scenario (20% CPUE decrease) should not be considered further due to its poor performance within the MSE, its undesirable HCR features (e.g. a steep TAC decline as CPUE reduced below the buffer zone – see Figure 2 above) and its likely impact to further reduce trip CPUEs and subsequently trip level profitability.**

MSE Question 7 - Summary

We have tried to explore the key scenarios outlined in the out of-session phone meeting and add in some additional plausible robustness scenarios that we would want a harvest strategy to be robust to. The overarching final question is general but very important:

Do the TTRAG see either a particular HS, or the seeds of a future modified HS, within the suite presented in the paper and, if not, where do we need to go from here?

TTRAG agreed that the work provides suitable options for a HS, and supported the SWG recommendation that the following key decisions should be deferred to TTMAC:

- **The exceptional circumstances and**
- **Meta-rules to build into the harvest strategy.**
- **Whether to adopt a one vs. three-year TAC schedule**
- **What HCR CPUE targets to adopt.**

3.2 Review of TTRAG Advice and next steps

AFMA confirmed the next steps to process the harvest strategy:

- AFMA will circulate the minutes and a RAG advice paper for comment as soon as possible, with comments requested within a few days to allow this advice to be finalised in time for TTMAC.
- TTMAC will consider then consider the TTRAG advice recommendations via video conference, currently scheduled for 3 July 2020.

4 Coral Sea Zone Proposal

TTRAG members considered a background information paper from AFMA (**4.1 – ETBF Coral Sea Proposal**) and the associated industry proposal (**4.1b – Coral Sea Proposal Attachment A**) to restrict the 500 hook limit to areas within the Coral Sea Zone (CSZ) west of 148ºE during the period of 1 September to 31 December, the area and months that the majority of black and blue marlin longline interactions occur in.

AFMA requested that TTRAG members provide written responses/advice on the following questions:

1. Do you consider the proposal would, if implemented:
    a. significantly impact on Black and/or blue marlin stock sustainability, or
    b. have implications for populations of other non-target species including protected species.
2. For both, why or why not? If yes, what variations to the proposal could be considered to mitigate those impacts?
3. Is there further scientific/research information or data that you can identify that might further assist AFMA and TTMACs consideration of the proposal.

Written response submissions were received from four scientific members, the AFMA member, the economic member, and two industry invited participants. Submissions were not received from TTRAG industry members. Substantive discussion was not held on this agenda item due to time constraints.

The following summarises key issues and points raised by TTRAG member and invited participants written submissions.

Potential implications for black and blue marlin and protected species

In relation to **question 1a** on the implications of the proposal for black and blue marlin stock sustainability, TTRAG members noted the information provided in the cover paper including the following:

- **For blue marlin** - The blue marlin stock is considered to be pan-Pacific and stock status is considered to be healthy on the latest assessment, noting the data assessed was to 2014. The ETBF ERA (using data to 2015) indicated the stock to be at low risk from the ETBF, while NSW tournament data suggests a relatively stable if not recently higher local abundance. There is relatively little relevant (i.e. longline study based) post release survival information.
- **For black marlin** - There are likely two stocks in the Pacific, however the stock status for the stock which the ETBF interacts with is unknown. The ETBF ERA (using data to 2015) indicated the stock to be at low risk from the ETBF, while NSW tournament data suggests a relatively stable if not recently higher local abundance.

Significant further information pertaining to black and blue marlin catches and catch rates and life status in the CSZ were provided by two scientific members in their submissions, including drawing on scientific longline surveys in the 1990s. In particularly they noted:

- Historically under the 500 hook per shot limit, some vessels have set multiple shots per day (e.g. 2 or 3) and in recent times the average hooks per day per boat is ~800.
- Evidence for increasing mortality of black marlin upon hauling as sets (i.e. soak time) become longer. For example - increasing from 10% to 44% mortality with set times increasing from less than 200 minutes to 1000 minutes.

More generally, the following points were raised by one or more TTRAG members:

- It is difficult to predict potential impacts without having explored a range of scenarios of possible effort and catch changes and their impacts on total mortality of both species. Mortality estimates should potentially include consideration of at haul mortality and condition (including set time impacts on this), during set cryptic mortality (e.g. depredation by false killer whales potentially increasing with increased set times), and post release mortality. They should also account for spatial and temporal differences in catches and catch rates from historic data and different effort scenarios from increasing effort by current active CSZ vessels (3) to all CSZ licenses (11) being actively used in the CSZ. It was noted CPUE for black marlin is highest in the CSZ so effort increases would have larger impacts on total ETBF black marlin catches, than relative to blue marlin impacts.
- Scenarios could consider impacts of variations on the current proposal – for example, expanding the hook limit period to include January and February, which have similar CPUE to already proposed month of September.
- Consideration of whether the ERA should be rerun for these species under the above scenarios.
- The proportional change of increased effort could be higher for black marlin as CSZ CPUEs and proportion ETBF catches in CSZ are higher for this species.
- Localised depletions may be a concern that requires consideration, including with respect to charter/recreational strike rates.
- It is important to consider annual variability in monthly catch proportions not just the average over multiple years (e.g. up to 50% of blue marlin catch is outside proposal area/months in some years).
- Any amended arrangement should be upon agreement of both sectors and implementation should potentially be done in a stepwise manner with monitoring/assessment of impacts (on commercial catch/mortality levels and potentially charter strike rates) pre and post implementation.

One scientific member felt future RAG consideration should include a history of the current arrangements for context (as provided to TTMAC), examine the uncertainty and potential overestimation of post release survival estimates associated with the one study of longline released blue marlin (Kerstetter et al 2003) and raised two questions:

- Will the southeast CSZ still be subject to year round 500 hook limit?
- Will the arrangement be 500 hooks/day or per shot?

An industry invited participant raised concerns over the use of input and output controls in the CSZ and the negative economic impacts upon industry of the current arrangements, stating that this should be considered in the Commonwealth Resource Sharing arrangements.

For Protected species, members noted a range of issues to consider including:

- **Seabirds** – The AFMA paper noted that the area of the proposal is north of the main seabird interaction area and it is therefore unlikely that there would be significant increase in seabird interactions as a result of fishing effort increasing by vessels already fishing in the area. It is possible that if fishing effort shifted from further south to the CSZ, a lowering of total interactions with seabirds in the ETBF could result. However, proper examination of relevant data and information should be undertaken to examine these assumptions. A scientific member noted scientific surveys in the mid-1990s that supported the very low level of seabird interaction in that region.
- **Sea turtles** – The AFMA paper noted it is uncertain if an increase in fishing effort by current CSZ vessels or from shifting of effort by other vessels into the CSZ could lead to an increase in turtle interactions, and therefore increased the risk to local sea turtle populations. As such, this could be considered further through examination of spatial and seasonal trends in interactions rates of sea turtles (where possible by species) through the ETBF relative to the CSZ, and considerations of implications for interaction levels under different plausible CSZ future fishing effort levels. A scientific member noted that leatherback hotspots are further south than the CSZ but areas of relatively high green turtle interaction do occur in the CSZ and that longline fishing method factors (e.g. lightsticks and fishing depth) may be influential.
- **Marine mammals** – The AFMA paper noted that by comparison to seabirds and sea turtles, marine mammal interactions are relatively rare throughout the ETBF, so AFMA does not expect the proposal to impact on marine mammal populations. However, this should be examined through available data summaries and presentation to TTRAG/TTMAC regarding relative interaction rates inside and outside the CSZ, as per the sea turtles analysis recommended above.

An industry invited participant submitted that non-target species sustainability implications are already addressed through the combination of Seabird TAP, bycatch strategy, ecological risk assessment, trip limits, trigger limits, bycatch mitigation strategies, by-catch handling policy, EM and e-log books. He stated that the proposal is consistent with the intent of the 500 hook limit, would introduce cost efficiency for industry and effort may decrease in future as operations are optimised.

In general, through written submissions, industry invited participants were supportive of the proposal, and two scientific members provided some additional useful information to inform consideration of the key questions, but a number of members also raised concerns that other information would be required to be considered by TTRAG before final advice could be provided to TTMAC. In addition, a member asked if the questions needed to be broadened to consider the implications of the proposal upon recreational fishery catch rates (a separate question to that of stock sustainability). This latter question might be best considered by TTMAC.

Further information, data or scientific research needed

The specific data and information that was identified by TTRAG members to further consider this issue at the next TTRAG meeting TTRAG was:

1. For black and blue marlin and protected species (particularly sea turtles), an analysis of the range of potential changes in likely catches and mortalities that might occur as a result of a range of potential and likely changes in fishing effort in the CSZ. This should take into account the most up to date and relevant information on:
    - at haul life status (condition and mortality),
    - post release mortality,
    - potential cryptic mortality (e.g. depredation impacts, if possible),

- the potential implications of extended soak time (due to more hooks per set) on both of the above,
- a range of effort change scenarios, from no change, to current active CSZ vessel increases, to increased numbers of CSZ licensed vessels operating (up to 11), and
- consideration of both potential individual season and average season effects.

2. Extension of the above analyses to provide information on how estimates might change under a range of modified proposals/arrangements – for example – extending the hook limitation period to include January and February. TTMAC could assist in identifying the scenarios to explore. Extension could potentially include analysis of potential ecological risk under the proposal via ERA Level 2 tools.
3. For black and blue marlin – consideration of the need for information pre- and post-implementation of any new arrangements to assess the impacts of the arrangements on charter vessel strike rates in the CSZ (including potential localised depletions).
4. Further information from industry on how the proposal might improve economic efficiency for ETBF fishing operations in the CSZ.
5. TTRAG should also consider what monitoring would be required to assess the impacts of any revised arrangements upon marlin and protected species.

In conclusion TTRAG agreed that this information should be compiled through collaboration between AFMA and relevant TTRAG members where required, as a priority in time for the next TTRAG meeting in July, with that meeting to develop and provide its advice on the above questions to TTMAC.

Action Item 5: AFMA with assistance from TTRAG members to undertake and coordinate compilation of relevant data and analyses identified by TTRAG 27 for presentation to TTRAG28 to assist its development of advice relating to the implications of industries Coral Sea Zone proposal for black and blue marlin and protected species.

TTRAG recommended on the basis of written submissions that the TTMAC consideration and decision on the proposal is delayed until the identified data and information had been consider by TTRAG at its next meeting. TTRAG would then develop relevant advice against the above questions.

5 ETBF Stock Structure Project

TTRAG members noted the draft final report of the ETBF Stock Structure Project and that the written comments provided by members had been provided to CSIRO.

Overall TTRAG supported the draft final ETBF Stock Structure Project report, noting the following key points:

- The results of the study are consistent with assumptions of mixed stocks of yellowfin tuna, bigeye tuna and albacore, noting the limited number of sites that were sampled. However, this does not necessarily mean there aren't differences among these regions (or among other regions), just that the power of the study was not able to reveal such differences if they did exist. This was largely due to difficulties in obtaining ideal samples, and to some extent on the quality of the samples that were obtained.
- That while two years of samples were available from Australia and New Zealand, it was unfortunate not to get Cooks samples.
- Noting the contamination within a number of the samples of the study, the development of actual protocols for this kind of sampling to assist with sample collection at recreational

fishing events, by observers on commercial vessels or from fish markets would be beneficial.

- A presentation to TTRAG was requested on the final results of the study, noting that this would be after the final Swordfish results are available.
- Whether there is a need to get broader scale stock structure for Swordfish and other species. While some work has been completed in this space within WCPFC, it would be useful to see this included in the final report.
- The need for further work is still a bit unclear, with the final Swordfish results possibly providing further clarity on whether this study clearly defines the stock structure.

6 Meeting Close

AFMA advised that the next TTRAG meeting will be held in July/August, pending CSIRO availability of the work presented annually to mid-year meeting, with the date to be confirmed.

Action Item 6: AFMA to confirm the date and style (face to face or remotely) of the next meeting out of session.

The Chair closed the meeting at 5.05pm and thanked members for their attendance, with the Chair and members thanking Dr Hillary specifically for his excellent work on the harvest strategy.