

# **40<sup>th</sup> Meeting of the Tropical Tuna Resource Assessment Group (TTRAG)**

**FINAL RECORD**

**TTRAG 40**

**19-21 March 2024**

## TROPICAL TUNA RESOURCE ASSESSMENT GROUP (TTRAG)

**Chair:** Dr Cathy Dichmont

**Date:** 19-21 March 2024

**Meeting:** 40

**Venue:** Surfair Conference and Events, Marcoola Beach and video conference.

**Attendance:** All members attended the meeting venue, except those identified otherwise below.

Members	Invited Participants	Observers
Dr Cathy Dichmont, Chair	Mr Terry Romaro* <sup>^</sup> , Industry	Ms Laura Tremblay – Boyer <sup>^</sup> , CSIRO
Mr Robert Curtotti, Economic Member		Dr Miriana Sporcic* <sup>1</sup> , CSIRO
Mr Pavo Walker* <sup>2</sup> , Industry Member		Mr Phil Ravanello, Industry
Mr Gary Heilmann, Industry Member		Dr Don Bromhead, ABARES
Dr Julian Pepperell <sup>3</sup> , Recreational Fisheries Member		Ms Lisa Walton* <sup>4</sup> , Researcher
Dr Ashley Williams <sup>^</sup> , Scientific Member		Mr Rowan Lamason* <sup>5</sup> , Industry
Dr Ian Knuckey <sup>^</sup> , Scientific Member		Mr Robbie Wood* <sup>6</sup> , AFMA
Dr Rich Hillary, Scientific Member		Ms Selina Stoute, AFMA
Dr Lara Ainley, AFMA Member		
Ms Elissa Mastroianni, Executive Officer		

### Apologies:

Dr James Larcombe, Scientific Member

Mr David Ellis, Industry Invited Participant

\*Attended online via MS Teams.

<sup>^</sup> Absent on 21 March, Agenda Item 7 onwards.

<sup>1</sup> Attended for Agenda Item 6 only.

<sup>2</sup> Attended from Agenda Item 3.1 onwards.

<sup>3</sup> Absent on 19 March, attended from Agenda Item 3.2 onwards.

<sup>4</sup> Attended for Agenda Items 6 and 8 only.

<sup>5</sup> Attended for Agenda Item 7 only.

<sup>6</sup> Attended for Agenda Item 6 only.

## 1 Preliminaries

### 1.1 Welcome and apologies

The fortieth meeting of the Tropical Tuna Resource Assessment Group (TTRAG40) was opened at 09:05am on 19 March 2024 by the Chair, Dr Cathy Dichmont. The Chair welcomed members and observers to the meeting and:

- a) made an Acknowledgement of Country;
- b) noted the following apologies for the meeting:
  - Dr James Larcombe, Scientific Member
  - Mr David Ellis, a regular industry invited participant
- c) advised members the meeting would be recorded to assist with the preparation of the meeting record. The recording will be deleted once the record is finalised.

### 1.2 Declaration of interests

The RAG noted the standing declaration of interests and members provided updates as necessary following the last TTRAG meeting. The updated declarations of interest are at **Attachment 1**.

The RAG agreed that scientific member Ian Knuckey, industry member Pavo Walker and industry observer Rowan Lamason held potential conflicts of interest with *Agenda Item 8 – Coral Sea Hook Trial*. Other industry participants, without Coral Sea Permits, were not considered to have a conflict.

Conflicted members were asked to leave the room while the RAG considered the nature of the conflict and appropriate action to be taken when the agenda item is discussed. The remaining RAG members agreed that these meeting participants should contribute to the discussion of this item but would be excluded from any final recommendation. Conflicted members returned to the meeting and were informed of the RAG's agreed position.

There were no other conflicts identified for other agenda items.

### 1.3 Adoption of agenda

The RAG adopted the draft agenda with no amendments (**Attachment 2**). The order of agenda items was revisited throughout the meeting to meet the availability of invited presenters.

### 1.4 Actions arising from previous meetings

The RAG noted the current status of action items from previous meetings and noted that completed items will be removed. The status of actions arising, including RAG advice on ongoing items, can be found at **Attachment 3**.

Scientific member Dr Ian Knuckey provided some additional detail on Action Item 7. He noted that the Ships Of Opportunity (SOOP) project has been extended to include additional sensors and that, long-term, the project may become part of the Integrated Marine Observing System (IMOS) ongoing oceanographic monitoring and data collection program. The RAG also noted a brief presentation on the results of this project and congratulated Dr Knuckey and the project participants on its success.

### 1.5 Out of session correspondence

The RAG noted the out of session correspondence between TTRAG 39 and TTRAG40 as detailed in Table 1, below

**Table 1.** Correspondence provided to TTRAG members since TTRAG 39.

Date	Description
21 December 2023	Project proposal for RAG recommended power analysis work on the Coral Sea Zone Hook Trial with comments sought by 12 Jan. Several comments received, but no consensus agreement reached by the RAG on whether to proceed with the project.
17 January 2024	Introduction of the new TTRAG EO and advertisement for MAC member applications.
19 January 2024	Opportunity to provide further comment on the swordfish CKMR research proposal to be provided to the ARC.
23 January 2024	Update to RAG members on the Australian Fisheries Management Authority (AFMA) Draft Climate Risk Framework and associated trial. Letter from the acting CEO to MAC and RAG chairs and a copy of the Draft Framework provided as attachments to the email.
23 January 2024	Placeholder invitation for TTRAG40.
25 January 2024	Scoping email for TTRAG40 location. Members preference sought for Brisbane or Mooloolaba location.
19 February 2024	TTRAG40 dates and venue confirmation. Draft agenda V1 circulated to members.
23 February 2024	TTRAG40 draft agenda V2 circulated to members.

## 2 Member updates

### 2.1 Industry, recreational fishing, and scientific member update

The RAG noted the following verbal update from the recreational fishing member:

- The black marlin heavy tackle season off Cairns seems to be a fairly good season this year.
- Recruitment for juvenile marlin, which has been known to come in peaks and troughs, appears to have been poor this year. 0+ juvenile marlin did not occur from southern Queensland (QLD) to New South Wales (NSW) as they normally would, but 1+ and 2+ classes were present in quite good numbers.
- Striped marlin have had a strong season this year, although distribution patterns were unusual which may be related to unusual water temperatures.
- Blue marlin catch numbers appear to be down, but dolphinfish appear to be up.
- As in previous years, there are not many small school yellowfin tuna on the shelf from southern QLD to southern NSW, noting however, there are some patches of bigger fish in NSW.
- Catch rates of blue, black, and striped marlin during a recent game fishing competition off Western Australia (WA) seem good, as do sailfish numbers. Blue marlin are also biting off Geraldton and Perth, which does not happen often.
- Several research projects relating to recreational fishing are underway:
  - a current project is looking into long-term fishery performance from personal logbooks/diaries to analyse for future projections.
  - a Fisheries Research and Development Corporation (FRDC) project is assessing novel data sources (potentially including social media) for billfish and tuna species.

In addition to a written update provided by Tuna Australia, the RAG noted the following updates from industry members:

- Water temperatures have been high across the fishery, both off the south coast of NSW and Mooloolaba, and tied to poor fishing conditions for tuna. Fishing is always worse early in the year, but this year seems particularly poor.

- One boat fishing off the west coast reported fairly good catch and market conditions, although a weaker Yen is providing some challenges.
- Industry confirmed the 2023 season saw increased catches of pacific bluefin, but it's uncertain if high numbers will continue this year.

The RAG noted the following update from scientific members:

- The Commonwealth Scientific and Industrial Research Organisation (CSIRO) are attending the Pacific Community (SPC) pre-assessment workshop next week which will look at updating the assessments for striped marlin and albacore tuna.
- SPC have requested that CSIRO provide the striped marlin catch per unit effort (CPUE) index as an input for the assessment. A presentation on the CPUE standardisation adopted by TTRAG38<sup>7</sup> in July 2023 will be given to the Pre-assessment workshop led by SPC in New Caledonia, March 2024, together with a quarterly index and an estimate of uncertainty.
- Indian Ocean Tuna Commission (IOTC) are progressing towards adopting management plans for swordfish and skipjack tuna in 2024. Several meetings relating to management strategy evaluation (MSE) scenarios and management plans have been held to date, and additional technical work will be done by the MSE Taskforce in advance of the IOTC meeting in May 2024.
- It is likely CSIRO will be involved in informing total allowable catches (TACs) for bigeye tuna this year for IOTC. The adopted bigeye tuna management plan set a 2-year TAC, which is due to be run again this year to set TACs for 2025, 2026, and 2027.
- CSIRO are looking to do some detailed species identification work for pacific bluefin tuna. Data suggests this species is recovering faster than expected, noting New Zealand also saw increased numbers last season.

## 2.2 AFMA Management and international meetings update

The RAG noted the AFMA management update, in particular:

- Lara Ainley is now acting as the tropical tuna manager while Kate Martin is on extended leave. Elissa Mastroianni has joined the tropical tuna team and will also hold the TTRAG Executive Officer role.
- Outcomes of the 29<sup>th</sup> Tropical Tuna Management Advisory Committee (TTMAC29) meeting on 23 October 2023, included total allowable commercial catch (TACC) advice provided to the AFMA Commission.
- Outcomes of the AFMA Commission's November 2023 meeting, included determined TACCs for the Eastern Tuna and Billfish Fishery (ETBF) and Western Tuna and Billfish Fishery (WTBF).
- Seabirds management arrangements remain a priority focus for AFMA. Reviews are underway on both the Seabird Threat Abatement Plan (TAP) and the Western and Central Pacific Fisheries Commission (WCPFC) Seabird Conservation Management Measure.
- The Threatened Species Scientific Committee (TSSC) are seeking comment on the Threatened Species Scientific recommendation to delist Southern Bluefin Tuna as conservation dependent under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

<sup>7</sup> See [TTRAG38](#) meeting record.

### 3 Swordfish Harvest Strategy

#### 3.1 Modified Swordfish Harvest Strategy

The modified harvest strategy for swordfish was originally implemented to account for extreme undercatch situations and avoid unnecessarily reducing the RBCC. It was tested assuming the extreme undercatch ended in 2024. The RAG noted the presentation from CSIRO (**Attachment 4**) on the results of further testing to determine whether the modified harvest strategy for swordfish may continue to be applied should the extreme undercatch extend beyond 2024 for an additional two years. This would be an interim approach while the review of the Swordfish Harvest Strategy proceeds (see Agenda Item 3.2). The analysis was required as extreme undercatch of swordfish is expected to continue.

The RAG reflected on the lessons learnt in developing and applying this modification, and the way that it can be incorporated into the new swordfish harvest strategy (see Agenda Item 3.2) so that extreme undercatch no longer needs to be considered an exceptional circumstance. This is especially relevant given it appears that undercatch (for reasons other than overfishing) is likely to be an ongoing feature of the fishery for some time.

The RAG agreed that the modified harvest strategy approach still meets the CPUE objectives of the harvest strategy when extended through to 2025 and 2026; and will not negatively impact the stock spawning biomass. The RAG also agreed that high levels of undercatch still present in the fishery are likely being driven by shifting and ongoing market and economic factors, rather than indicating poor stock abundance. Therefore, the RAG **recommended** applying the modified harvest strategy approach when setting the swordfish RBCC for 2025.

#### 3.2 Harvest Strategy Review

The RAG considered a submission from Tuna Australia which proposed, rather than following a harvest strategy, setting swordfish TACCs at WCPFC TAC levels, and in line with the indicators and ‘whole of government position’ approach used for yellowfin, bigeye and albacore. The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) observer clarified that the domestic fishery still meets the Commonwealth Harvest Strategy Policy (CHSP) requirements for a harvest strategy within our region of WCPFC, but that within our region (as across the rest of the WCPFC area) Australia is pursuing better management of international catches to complement our domestic approach. For this reason, Australia is advocating for strengthening the swordfish conservation management measure (CMM) in WCPFC. Scientific members acknowledged that nuances and weaknesses in the tagging data exist, but the RAG agreed it still provides compelling evidence of a separate regional subpopulation west of approximately 165°E. The RAG further acknowledged that international catches can have an impact on the stock, but as long as Australia’s proportional catch shares remain high in the region, AFMA must implement appropriate management of the stock.

The Chair reminded the RAG that their previous position is to manage the interconnectedness of the swordfish stocks through MSE testing. Likewise, the choice of using a CPUE tuning target as opposed to a stock spawning biomass (SSB) one addresses the interplay with international catch and management. Both points are being considered as part of the harvest strategy review.

The RAG noted a presentation from CSIRO (**Attachment 5**) outlining possible priority analyses and candidate directions to explore for MSE testing. The RAG discussed the possible analyses and candidate directions and agreed to the list of options for MSE testing identified in Table 2.

**Table 2. Agreed options for MSE testing**

Harvest Strategy Component	Options for MSE testing
Operating Model – general	<ul style="list-style-type: none"> <li>- Update OM to include latest catch and effort data available</li> <li>- Compare predictions from updated OM against 2021 assessment</li> </ul>
Operating model (Base case)	<ul style="list-style-type: none"> <li>- Assume single spawning stock</li> <li>- Change zero migration to updated asymmetric movement parameters from Patterson et al. (2021)</li> <li>- 3 steepness options (0.65, 0.8, 0.95)</li> <li>- M-at-age vector from the diagnostic case of the (2021/2025) WCPFC assessment</li> <li>- Exclude distant water fishery with high catches in far northeast of the assessment area</li> <li>- Retain modified feature of current HS to allow a response to future undercatch</li> </ul>
Operating model (Reference grid)	<ul style="list-style-type: none"> <li>- 3 TACC schedules: <ul style="list-style-type: none"> <li>o every year</li> <li>o every 3 years (constant annual TACC)</li> <li>o every 5 years (constant annual TACC)</li> </ul> </li> <li>- Undercatch scenarios based on mean undercatch from 2013-23 (but remove covid year)</li> <li>- Increase/decrease AU catch share relative to other fleets (CSIRO to explore different levels using WCPFC data as a guide)</li> <li>- Group other fleets by target/bycatch in adjacent high seas to the ETBF (use selectivities for grouping)</li> <li>- 2 tuning criteria: <ul style="list-style-type: none"> <li>o ETBF sub-adult CPUE</li> <li>o SSB relative depletion in Region 1 (for base case run only)</li> </ul> </li> </ul>
Robustness grid	<ul style="list-style-type: none"> <li>- Permanent low recruitment (lowest of a moving 5-year average) (regime shift)</li> <li>- Lower M-at-age compared to 2021 assessment</li> <li>- Assume separate spawning stocks in each region</li> <li>- Low levels of undercatch (~15%) – i.e. similar to pre-covid levels</li> <li>- Implementation scenarios where undercatch is incorrectly projected for the next year</li> <li>- High movement rates between R1 and R2</li> <li>- Higher increase of DWFN catch</li> <li>- Include DWFN fleets in far northeast</li> </ul>
Harvest Control Rule	<ul style="list-style-type: none"> <li>- Consider a narrower buffer width (for longer term TACC setting). CSIRO to explore different widths</li> <li>- Consider 3, 4 and 5-year average of recent CPUE for HCR input</li> </ul>
RBCC setting	<ul style="list-style-type: none"> <li>- Status quo maximum changes to TACC (10%)</li> <li>- Test asymmetric TACC change e.g. max 10% down and max 11.1% up for annual TACC setting.</li> <li>- Multi year TACC should be annually constant</li> <li>- Evaluate setting a TACC relative to a tuned TACC (in addition to the current HS that uses the previous year TACC to set the new TACC)</li> </ul>

Harvest Strategy Component	Options for MSE testing
Tuning objective	<ul style="list-style-type: none"> <li>- Depletion B<sub>40</sub> or B<sub>48</sub></li> <li>- CPUE-based <ul style="list-style-type: none"> <li>o Use the sub-adults index</li> <li>o Move away from current 2012-2015 average CPUE. For example, could use an average CPUE over a long period or a multiplier (determined from tuning to B<sub>48</sub>) of long-term average (1998-present). CSIRO to explore difference reference periods.</li> </ul> </li> <li>- Projection period – tune to achieve objective on average over the 2035-2040 period</li> </ul>

The RAG acknowledged the significance of the harvest strategy review for the future of the fishery and the importance of following and considering the outcomes of this work as it progresses.

#### Action Item

CSIRO to provide advice on the prioritisation of options from Table 2 for MSE testing and coordinate with AFMA to develop a workplan and timelines for this work.

RAG to provide advice on the prioritised list/options, timeline and workplan out of session.

## 4 ETBF CPUE Standardisation Refinement

The RAG considered ongoing work to develop the ETBF standardised CPUE indices with two key areas of focus: spatial approaches and use of the metiers approach<sup>8</sup>.

### Spatial approaches

The RAG noted a presentation from CSIRO on different spatial approaches and noted:

- There is spatial variation in the distribution of fish, fishing effort/practices, and fleet dynamics across the ETBF. Without accounting for these differences, nominal CPUE can vary through time when fishing operations shift to different areas not accounted for in the CPUE index. This makes it difficult to determine whether changes in nominal CPUE reflect changing stock abundance or shifts in the distribution of fishing effort and/or strategies.
- The current agreed approach is to decide on a fixed 'core zone' (based on catch) to account for differences in fishing and to resolve this issue. However, fishing patterns have changed since these areas were selected (using data up to 2015 for swordfish and up to 2007 for tuna species). For example, the areas used for albacore deep setting are not included in the core zone for broadbill swordfish so a switch in targeting to albacore over swordfish during Covid years will not be captured by the CPUE standardisation.
- An alternative approach considers a continual spatial covariate to capture the evolving effort patterns over the fishing areas for the time period for which the indices are developed.
- This alternative approach is considered to be best practice and has been used in WCPFC for several years. It also means that the spatial domain is analyst-independent (because the analyst is not choosing which fixed areas to include).

<sup>8</sup> See meeting minutes for [TTRAG37](#) and [TTRAG38](#) for detail on previous work.



The RAG agreed that this alternative spatial approach to treat space in a continuous way would be an improvement on the current approach. However, the RAG noted these are considerations for ongoing development work, and the current CPUE standardisation methods ([TTRAG38](#)) can still be used in this year's TACC setting process.

Balanced against other priorities in the fishery, the RAG confirmed that the order of priority for testing should be as follows:

1. the swordfish harvest strategy review MSE simulation work.
2. ongoing development and improvement of the ETBF CPUE standardisation method, including the proposed spatial approach.
3. revisit and update the EBTF simulation model to better account for space, if time and priorities permit in future.

### **Metier approach**

The RAG noted the updated information on the metiers approach, as provided by CSIRO, and the value of this work in detecting and monitoring changes in fishing strategy. The RAG considered that there was still uncertainty on how much instability would be introduced into the CPUE model by including a metier approach. As such, the RAG supported trialling the inclusion of metiers (to represent fishing strategy) in this year's indicator report to see if it is informative.

## **5 Indicator Approach Review**

### **5.1 'Pulse' events**

The RAG noted the presentation from CSIRO (**Attachment 6**) on identifying pulse events using cumulative catch across the fishing season, specifically:

- the pulse events work focuses on yellowfin tuna as this is the species previously identified by industry as having displayed pulses in the past.
- pulse event years are distinct in hindsight, as cumulative catch per day (and month) in pulse event years display a different trend to those in non-pulse event years. Because of this difference, there is the possibility of comparing real time cumulative catch to past trends as the season progresses. However, it takes at least 100 days (approximately) for the trend to be distinguishable from non-pulse event years and uncertainty can remain with in-season detection especially earlier in the fishing year. Rapid increases in catches could also occur for other reasons (e.g. be market driven)
- if monitoring throughout the season, with the intention of implementing some in-season change to management, an appropriate temporal resolution for monitoring would be important (e.g. days, weeks, or months).

The RAG supported the principle of increasing flexibility for industry and agreed that there is no further scientific advice for them to offer at this time. AFMA will consider management options and arrangements relating to pulse events and request additional scientific advice from the RAG as needed.

### **5.2 Frequency of undertaking a full review of all indicators**

The RAG recalled their intent to move toward setting a 3-year TACC for the tropical tunas (yellowfin, bigeye and albacore).

The RAG noted that it is AFMA management's aim to have this implemented in 2025. In effect, this means that if the AFMA Commission agree to this approach, 3-year TACCs will need to be determined, and advice provided, in 2024. As such, it is expected that all indicators for all species will be reviewed and a report compiled and presented to the AFMA Commission in 2024, and every three years thereafter. In the interim years, the RAG will review a reduced set of indicators and confirm whether anything has changed in the fishery which would change their previous advice.

The RAG noted the presentation from CSIRO (**Attachment 7**) which outlined current analyses used to compile the annual indicator report and their benefits/uses; the timing of WCPFC species stock assessments; and a potential approach to reviewing indicators over a 3-year TACC setting cycle. Benefits of the 3-year cycle include administrative efficiencies and allowing the flexibility for innovation, progress and development of other strategic work of the fishery.

The RAG supported setting 3-year TACCs for four of the five species that TTRAG provide advice on (yellowfin tuna, bigeye tuna, albacore tuna and striped marlin). Standardised CPUE should be reviewed annually for striped marlin (given the stock status and Australia's proportion of catch for this species) but is not necessary for the tropical tuna species. For swordfish, the RAG agreed to maintain an annually determined TACC and noted that a potential 3-year setting is an option to be MSE tested under the review of the swordfish harvest strategy (see Agenda Item 3.2). A summary of the fishery indicators and their agreed review frequency is detailed in Table 3 below.

**Table 3. Agreed approach to 3-year TACC setting**

Indicator	3-year review for RBCC setting (TACC setting year)	Annual Review (interim years)
Catch	Yes	Yes
Effort	Yes	Yes
Size	Yes	Yes
Nominal CPUE	Yes	Yes
Standardised CPUE	Yes	For swordfish and marlin
Stock structure	Yes	No
Stock status	Yes	When available
Economic conditions index	Yes	Yes
Fishing strategy (metiers)	Yes *	No

\*as a trial, see Agenda Item 4

## 6 Ecological Risk Assessment (ERA) Preliminary Results

The RAG noted the presentation from CSIRO on the updated ERA for the ETBF, in particular:

- Changes between the previous (2019) and the current draft ERA include new data inputs and a change to the way susceptibility scores are calculated (making these calculations more mathematically correct and more precautionary).
- Byproduct and bycatch were the only ecological components not eliminated following the Level 1 analysis.
- Level 2 analysis and the residual risk analyses resulted in 8 high risk species (6 turtles and 2 cetaceans).

The RAG noted that the ERA process followed the precautionary principle, so in the absence of information a more conservative approach was used. Some key knowledge gaps were identified for the 8 high risk species, including trophic levels, stock status/population trend, post-release survivability, and unknown species identification in logbooks.

The RAG noted that additional information may be sought that could contribute to the ERA and resolve some key knowledge gaps on the trophic levels of turtles. The New Zealand marine mammal stock assessment was updated last year and may also be useful in providing some additional information for the two high risk cetacean species.

The RAG emphasised the importance of ensuring confidence in the robustness of the species risk classifications, high or otherwise, given the key role the ERA and ecological risk management (ERM) framework occupies in AFMA's management approach and the scope of work and decisions that are supported by the ERA outcomes.

The RAG acknowledged the work of CSIRO in providing the draft ERA results and agreed to review the results again following further work and additional information and go through the in-depth and likely iterative process to assess these risks.

**Action Item**

AFMA to coordinate the provision of additional information (from ABARES, members, and other sources) to contribute to the ERA.

TTRAG Executive Officer to investigate options for holding a teleconference meeting to allow the RAG to consider any additional information and further discuss draft ERA results.

## **7 Coral Sea Zone Hook Trial**

The RAG were provided an update of the most recent results from the Coral Sea Zone Hook Trial from AFMA (details available at **Attachment 8**) and discussed:

- Key results included 554 total marlin interactions, 3 active vessels, 261,420 total hooks, and 429 total sets.
- The results were broadly similar to previous years, in terms of effort and interaction levels, and as in previous years none of the blue and black marlin trigger levels had been exceeded.
- a clarification around sizes from an industry observer, who acknowledged difficulty in accurately estimating sizes given fishers endeavour to get marlin off the line quickly.
- the trial has been running since 2021 and will end on 31 December 2024 (after 4 years).
- Part of the aim of the trial was to address concerns from the recreational sector, noting that the restriction on blue and black marlin is a sectoral allocation issue (rather than an ecological one).
- the low absolute number of marlin interactions (37 fish) indicate a low risk to the stocks of those species and were not a cause for concern for any RAG member or fishing sector.
- The power analysis which the RAG previously recommended<sup>9</sup> was ultimately not supported for funding. The additional year of data (2023) did not enable the RAG to provide scientific advice in the absence of this power analysis.

<sup>9</sup> [TTRAG38](#), July 2023

- the level of data currently available is still not sufficient to provide robust scientific advice on the impact of the trial.

Industry representatives (members, invited participants and observers) expressed strong positions on the trial from a practical perspective and noted that the cost of the power analysis on the levy base was prohibitive to industry supporting the project for funding. Further, since the absolute numbers of interactions were low and the blue and black marlin triggers had not been exceeded, the industry representatives suggested continuing the trial with the current Coral Sea zone management arrangements in place, without the need for further research. The RAG noted these positions and refocused the discussion on the scientific issues of the trial.

The RAG advised that with the current data available, it was not possible to provide a scientific assessment on the impact of using increased numbers of hooks on marlin interactions. Noting that the power analysis was not supported for funding and the trial is due to end 31 December 2024, the RAG agreed that it is not possible to resolve scientific questions further. The RAG did however note that, although they cannot provide full scientific advice with the current data available, the low absolute numbers of marlin and other protected species interactions were not a cause for concern for any of the members. The RAG noted that the issue is likely an allocation one between the recreational and commercial sectors (who have a positive and open relationship in the Coral Sea Zone), and it would be up to AFMA and TTMAC to consider the future management of the Coral Sea zone.

## **8 USC Presentation on Hook Sink Rate Trials**

The RAG noted a presentation from PhD candidate and Tuna Australia employee Ms Lisa Walton on hook sink rate trials. In particular:

- Time depth recorders were attached to gear to measure and record sink rates.
- Novel treatments were trialled to assess their suitability for use. Factors assessed included sink rate performance, practicality, functionality and safety considerations. Initial results suggest no significant improvements in sink rates observed, and several safety and practicality issues identified.
- The trials also looked at improving sink rates of standard industry branchlines by using environmental factors and boat level controls. Improved sink rates were observed when setting across the current with slack gear, confirming it is possible to manipulate sink rates without adding extra weight to the line.
- Tuna Australia will continue investigating these environmental/boat effects through an extension to a current FRDC project.

The RAG noted the value in being able to use gear currently available in industry to get better results for seabird interaction mitigation and thanked Ms Walton for her presentation.

## **9 TTRAG Priorities and Meeting Schedule**

The RAG agreed to the priorities for future meetings as identified in Table 5 below.

**Table 5. Priorities agreed to at TTRAG 40 for upcoming meetings.**

Date	Meeting	Priorities
July 2024	TTRAG 41	Review indicators for all species with the view to setting 3 year TACCs for tunas (provided the AFMA Commission support this approach). RAG to agree to the TACC in principle, with OOS review of WCPF and economic information.
		Seabird interaction review
		Presentation from the University of Sunshine Coast – FRDC project – honours student depredation toothed whale interactions.
		Presentation from the recreational fishing sector TTMAC members on the objectives and operational environment regarding recreational fishing sectors for striped marlin.
March 2025	TTRAG42	Review current and future data needs:  EM/Logbook congruence study recommendations, reviews (CPUE standardisation), risk assessments (ERA) and future harvest strategies, the data needs in additional fields for e-log i.e. whale depredation, seabird mitigation requirements, WCPFC recommended fields, economic survey missing fields and programs for collecting that data should be reviewed.
Proposed intersessional meetings		Teleconference to be convened in late June or early July to consider ERA results and residual risk scores in further detail.
		AFMA coordinate a small working group out of session to determine to scope improving our understanding of eddie oceanography through temperature depth recorders to assist in further defining fishing strategies. However, this is a lower priority given the success of the SOOP project. A collaborative research group (including UNSW and USC) may meet in June and AFMA/other members may wish to be involved.
		AFMA and Tuna Australia to convene a climate adaptation stakeholder workshop
		Electronic Monitoring workshop – identifying enhancement to electronic monitoring and ‘e’ related data needs.
		Swordfish harvest strategy and indicator review (TBA by RAG and Project team)

The RAG noted that CSIRO and AFMA would determine a timeline for consideration of the various elements of the swordfish harvest strategy work and provide this to the RAG out of session.

The RAG agreed that dates for TTRAG 41 would be confirmed out of session.

## 10 Other Business

There was no other business identified for the meeting. The meeting was closed by the Chair at 11:20am on 21 March 2024.

## Attachment 1 – Updated Declarations of Interest

**Table 1. TTRAG member, invited participants and observer’s declarations of interests.**

Position	Membership	Declared Interests
<b>Dr Cathy Dichmont</b>	Chair	Has a consulting company but has no pecuniary interests in the tuna fisheries. Is the current Commonwealth Research Advisory Committee (ComRAC) chair.
<b>Dr Lara Ainley</b>	AFMA Member	Employee of AFMA, which includes a salary. Manager of the tropical tuna fisheries. No pecuniary interest in tropical tuna fisheries.
<b>Ms Selina Stoute</b>	AFMA, Senior Manager, Tuna and International Fisheries	Employee of AFMA, which includes a salary. Is the Senior Manager of the Tuna and International section. No pecuniary interest in tropical tuna fisheries.
<b>Ms Elissa Mastroianni</b>	Executive Officer	Employee of AFMA, which includes a salary. Senior Management Officer in the tropical tuna fisheries team. No pecuniary interest in tropical tuna fisheries.
<b>Mr Robert Curtotti</b>	Economics Member	Employee of ABARES, involved in fisheries economic research related to the Eastern Tuna and Billfish Fishery. Has no pecuniary interest in the Australian tropical tuna fisheries.
<b>Dr James Larcombe</b>	Scientific member	Apology
<b>Dr Ashley Williams</b>	Scientific Member	Employee of CSIRO, no pecuniary interest in Australian tropical tuna fisheries. Is the PI for the project on <i>Data Management, Assessment and implementation of Harvest Strategy for Australia's Tropical Tuna and Billfish Fisheries</i> .
<b>Dr Rich Hillary</b>	Scientific Member	Employee of CSIRO, no pecuniary interest in Australian tropical tuna fisheries. Is the Co-investigator for the Scientific advice management of Tropical Tuna and Billfish Fisheries project Declared an interest in Agenda item 5 and was excluded from formalising any recommendations.
<b>Dr Julian Pepperell</b>	Scientific Member	Independent fisheries research consultant and representative of the recreational fishing sector. Is involved in projects including monitoring and research on pelagic fish landed at game fishing tournaments, analysis of gamefish tagging data and assessing current data and alternate data collection methods relating to recreational catches of tropical tuna and billfishes.
<b>Dr Ian Knuckey</b>	Scientific Member	Has a consulting company with interests in electronic reporting in the tuna fisheries and is a member on several other AFMA Committees. Has previously worked on a project on FADs in Tasmania and work relating to the Commonwealth resource sharing framework. Is working on a recreational and indigenous capacity building project with DAWE.
<b>Mr Gary Heilmann</b>	Industry Member	Director of a processing company, no longer holds ETBF boat or quota SFRs.
<b>Mr Pavo Walker</b>	Industry Member	Owner of several ETBF boat SFRs and holds a Coral Sea permit and minor line permit.
<b>Mr David Ellis</b>	Industry Invited Participant	Apology
<b>Mr Phil Ravanella</b>	Industry Invited Participant	Program Manager of industry association Tuna Australia which includes a salary paid by industry. Attending to provide industry update on behalf of David Ellis, Tuna Australia.
<b>Mr Terry Romaro</b>	Industry Invited Participant	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

Position	Membership	Declared Interests
		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 SFR holder. Director of a company who owns a fish processing facility in Port Lincoln, and a Director of Tuna Australia.
<b>Ms Laura Tremblay Boyer</b>	Scientific Invited Participant	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>Dr Don Bromhead</b>	Observer, ABARES	Employee of ABARES, No pecuniary interest in tropical tuna fisheries.
<b>Ms Miriana Sporcic</b>	Invited Participant, CSIRO	Employee of CSIRO, no pecuniary interest in Australian tropical tuna fisheries.
<b>Ms Lisa Walton</b>	Observer, researcher	Employee of Tuna Australia.

## Attachment 2 – Adopted Agenda

**Tropical Tuna Resource Assessment Group Meeting 40** **19-21 March 2024**

Surfair Conference & Events Centre, Marcoola Beach, QLD

Tuesday 19 March – Thursday 21 March 2024

Day 1. Tuesday 0900 – 1700 hrs

Day 2. Wednesday 0900 – 1630 hrs

Day 3. Thursday 0900 – 1200hrs

DAY 1		
9:00-9:45	<b>1. Preliminaries</b> 1.1 Welcome and apologies 1.2 Declaration of interests 1.3 Adoption of agenda 1.4 Actions arising from previous meetings 1.5 Out of session correspondence	AFMA/Chair
9:45-10:30	<b>2. Member updates</b> 2.1 Industry, recreational fishing and scientific member update 2.2 AFMA Management and International meeting outcomes update	Members
10:30-11:00	<b>MORNING TEA</b>	
11:00-12:00	<b>3. Swordfish Harvest Strategy</b> 3.1 Modified Swordfish Harvest Strategy	CSIRO
12:00-13:00	<b>LUNCH</b>	
13:00-15:00	3.2 Harvest Strategy Review	AFMA
15:00-15:30	<b>AFTERNOON TEA</b>	
15:30-17:00	3.2 continued	AFMA
DAY 2		
9:00-10:30	<b>4. ETBF CPUE Standardisation Refinement</b> The RAG will be asked to consider results on the following approaches: i. Continued work on implementation of metiers approach ii. Move from area-based approach to explicit spatial approach iii. Inclusion of oceanography covariates In addition, the RAG will be asked to assess the priority of the following research area: iv. Prioritising simulation test of CPUE standardisation	Laura Tremblay-Boyer
10:30-11:00	<b>MORNING TEA</b>	
11:00-12:00	<b>5. Indicator Approach Review</b> 5.1 'Pulse' events – Literature review and consideration	Laura Tremblay-Boyer
12:00-13:00	<b>LUNCH</b>	
13:00-14:00	5.2 Frequency of undertaking a full review of all indicators	AFMA/CSIRO
14:00-14:30	<b>AFTERNOON TEA</b>	
14:30-16:30	<b>6. Ecological Risk Assessment (ERA) Preliminary Results</b> The RAG will be invited to consider the results of the ETBF preliminary ERA results.	Miriana Sporic
DAY 3		
9:00-10:00	<b>7. Coral Sea Zone Hook Trial</b> Consider options for the future of the Coral Sea Hook Trial and associated power analysis.	AFMA
10:00-10:30	<b>8. USC Presentation on Hook Sink Rate Trials</b> Consider results and provide advice on future research.	Lisa Walton
10:30-11:00	<b>MORNING TEA</b>	
11:00-11:30	<b>9. TTRAG Priorities and Meeting Schedule</b> The RAG will be asked to provide advice on key priorities for the short to medium term, and agree on a date for the next meeting.	AFMA
11:30-12:00	<b>10. Other Business</b> Members will be invited to raise any other business agreed by the Chair.	Chair



### Attachment 3 – Updated Action Items

**Table 1. Actions Items as at TTRAG 40**

Number	Action	Meeting Raised	Responsibility	Status at TTRAG 40 (March 2024)
1.	ABARES to pursue options to take account of SBT in the catch figures and calculations of GVP and NER for the ETBF and include SBT in future ETBF economic indicators for TTRAG considerations.	TTRAG 33	ABARES / Economics Member	<b>COMPLETE:</b> Update provided by Economics Member Robert Curtotti at TTRAG 39.
2.	AFMA to investigate, if possible, whether bait changes have been experienced by NZ and the Spanish.	TTRAG 33	AFMA	<b>IN PROGRESS:</b> AFMA emailed the NZ Ministry of Primary Industries on 20 September 2023 and are awaiting a response.
3.	TTRAG to be provided an update in the new year on the Management Procedure for big eye tuna.	TTRAG 35	ABARES/AFMA	<b>NOT YET ACTIONED:</b> AFMA has not been able to present Management Procedure for bigeye tuna, due to competing timeframes for agenda items. AFMA is aiming to present the action item in 2024.
4.	ABARES to examine congruence between logbook and CDR data in the ETBF over time to determine if there is a need to alter the calculation of CPUE to ensure a consistent factor for GVP calculations.	TTRAG 36	ABARES / Economics Member	<b>COMPLETE:</b> Update provided by Economics Member Robert Curtotti at TTRAG 39.
5.	AFMA to outsource analysis of the Coral Sea hook trial data and present findings to the TTRAG mid-2024	TTRAG 38	AFMA	<b>IN PROGRESS:</b> AFMA contacted Ian Knuckey for indicative costings (which amount to \$37,000) who has confirmed his capacity to undertake analysis and present results to TTRAG 41 in July. To be discussed further under Agenda Item 7.
6.	AFMA to coordinate a small working group out of session to determine to scope improving our understanding of eddie oceanography through temperature depth recorders to assist in further defining fishing strategies and whether temperature and depth recorders projects can concurrently run or remain separate.	TTRAG 38	AFMA	<b>IN PROGRESS:</b> Was assessed as part of the 2024/25 annual research cycle. However, AFMA was unable to coordinate a small working group prior to AFMA research committee meeting timings. This will remain a priority for the RAG as part of 2025/26 annual research cycle.
7.	AFMA and CSIRO to explore options on the frequency of undertaking a full review of all indicators to move to 3 yearly consideration of all indicators (includes CPUE standardisation for all species).	TTRAG 38	AFMA/CSIRO	<b>IN PROGRESS:</b> to be discussed under Agenda Item 5.

Number	Action	Meeting Raised	Responsibility	Status at TTRAG 40 (March 2024)
8.	AFMA and Project team to explore options to recognise a YFT pulse event and possible HCR that could apply in response. Noting most likely indicator will be cumulative catch within season.	TTRAG 38	AFMA/CSIRO	<b>IN PROGRESS:</b> to be discussed under Agenda Item 5.1.
9.	AFMA to invite Ian Bladin and Grahame Williams to provide recommendations on recreational sector objectives of targeting striped marlin.	TTRAG 38	AFMA	<b>IN PROGRESS:</b> Recreational members were not available to present at TTRAG40. The invitation has been extended to attend TTRAG41 in July 2024.
10.	CSIRO to develop possible 'break out rules' for each of species of yellowfin tuna, bigeye tuna, albacore and striped marlin in the ETBF and WTBF for RAG consideration.	TTRAG 38	CSIRO	<b>NOT YET ACTIONED:</b> to be presented at TTRAG 41 in July 2024.

**Table 2. Action Items relating to CPUE as of TTRAG 40**

Number	Item	Meeting Raised	Responsibility	Status at TTRAG 40 (March 2024)
1.	The RAG recommended using revised data each year and accepting minor changes for the catch summary tables. Any change greater than 1% will be flagged and brought to the attention of the RAG for discussion and advice.	TTRAG 38	CSIRO	<b>NOT YET ACTIONED</b>
2.	<p>TTRAG discuss and provide advice at its meeting in March 2024, on priority need to undertake simulation testing of the CPUE standardisation.</p> <p>The RAG identified the following four CPUE refinement priorities: Priority refinement (1-3), further discussion needed for priority 4 simulation testing of CPUE.</p> <ol style="list-style-type: none"> <li>1. Continue the implementation of metiers approach</li> <li>2. Move from area-based approach to explicit spatial approach</li> <li>3. Improve inclusion of oceanography covariates eg. Eddies</li> <li>4. Simulation test of the CPUE standardisation-To be discussed in March TTRAG during research gaps.</li> </ol>	TTRAG 38	CSIRO, TTRAG	<b>NOT YET ACTIONED:</b> To be discussed under Agenda item 4.

Number	Item	Meeting Raised	Responsibility	Status at TTRAG 40 (March 2024)
3.	Tuna Australia and CSIRO to investigate potential erroneous logbook reporting regarding 45 hooks between floats. Tuna Australia to follow up with operator if error is identified.	TTRAG 38	CSIRO, Tuna Australia	<b>ONGOING:</b> Tuna Australia contacted all ETBF operators regarding 45 hooks per basket. However, have not received any responses to the query. AFMA identify boat is recording 45 hooks between floats into e-logs and liaise with Tuna Australia, if required.
4.	CSIRO will look to explore potential changes in fishing practices (particularly with the start of set location) associated with the introduction of Marine Parks, and determine potential implications for CPUE standardisations.	TTRAG 23	CSIRO	<b>ONGOING:</b> At TTRAG 37 (March meeting 2023), the RAG agreed to keep this as an ongoing action item, due to work being undertaken with CPUE standardisation and noted this agenda item may inform future data priorities.
5.	TTRAG to consider development of Time Temperature Depth Recorder (TDR) based research and/or data collection in the ETBF to better understand and account for (in CPUE analyses) the relationship between fishing strategies (including vessel log speed, shooter speed and dropper lengths etc) and fishing depth.	TTRAG 23	CSIRO, Ian Knuckey, AFMA	<b>ONGOING:</b> At TTRAG 37 (March meeting 2023), the RAG agreed to keep this as an ongoing action item, due to work being undertaken with CPUE standardisation and noted this agenda item may inform future data priorities.
6.	AFMA to examine VMS data to check and verify sets reported on logbooks as having mainline lengths greater than 100km.	TTRAG 24	CSIRO, AFMA	<b>ONGOING:</b> At TTRAG 37 (March meeting 2023), CSIRO presented distributions of variables used in the CPUE standardisation to identify appropriate thresholds for outliers/erroneous entries.
7.	TTRAG 29 discussed how e-logs may allow better collection of gear information through the ability to prepopulate fields that do not regularly change, and the need for the fleet to form good reporting habits at the start of the elog transition relating to additional potential fields, specifically, those required by WCPFC logbooks and ROP, fields relevant to collecting data on depredation, and shape of mainline set.	TTRAG 29	CSIRO, AFMA	<b>ONGOING:</b> At TTRAG 37 (March meeting 2023), the RAG agreed to keep this as an ongoing action item, due to work being undertaken with CPUE standardisation and noted this agenda item may inform future data priorities.
8.	AFMA to work with Tuna Australia to develop operationally feasible options to capture discard sizes for swordfish. i.e. (E-log comment section, tick box for fish between 10-20kg, head only, small, medium or large).	TTRAG 34	AFMA/Tuna Australia	<b>ONGOING:</b> AFMA sought advice from the RAG, the RAG agreed to keep this as an ongoing action item, due to work currently being undertaken with CPUE standardisation and noted this agenda may inform future data priorities.

## Attachment 4 – Presentation pertaining to Agenda Item 3.1



Australia's National Science Agency

# Evaluation of the extension of the modified swordfish harvest strategy to 2026

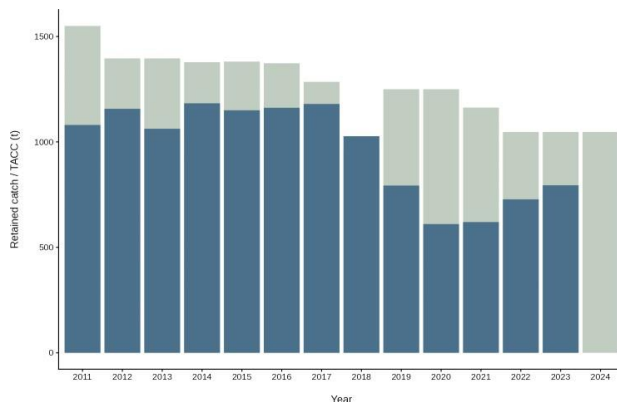
Working paper to TTRAG 40, Marcoola Beach, March 19th to 21st

Laura Tremblay-Boyer, **Rich Hillary** and Ashley Williams



## The modified harvest strategy

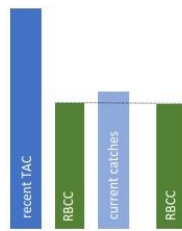
- Harvest strategy for broadbill swordfish adopted in 2020
- Significant undercatch over COVID especially agreed by TTRAG/MAC to be exceptional circumstances



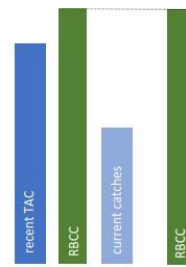
- Hillary 2022 tested a modified HS where the RBCC accounts for the amount of undercatch
- The test assumed that the undercatch period ceased in 2024



#### Unchanged RBCC

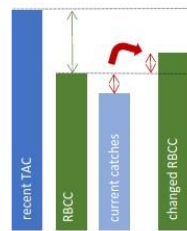


If the  $RBCC < \text{current catches}$ , the RBCC stays unchanged

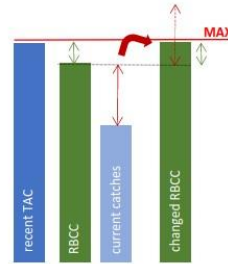


If the  $RBCC > \text{recent TAC}$ , the RBCC stays unchanged

#### Changed RBCC



If the  $RBCC < \text{recent TAC}$  BUT greater than current catches, the **predicted undercatch** is added to the RBCC...



... up to a maximum value of the recent TAC

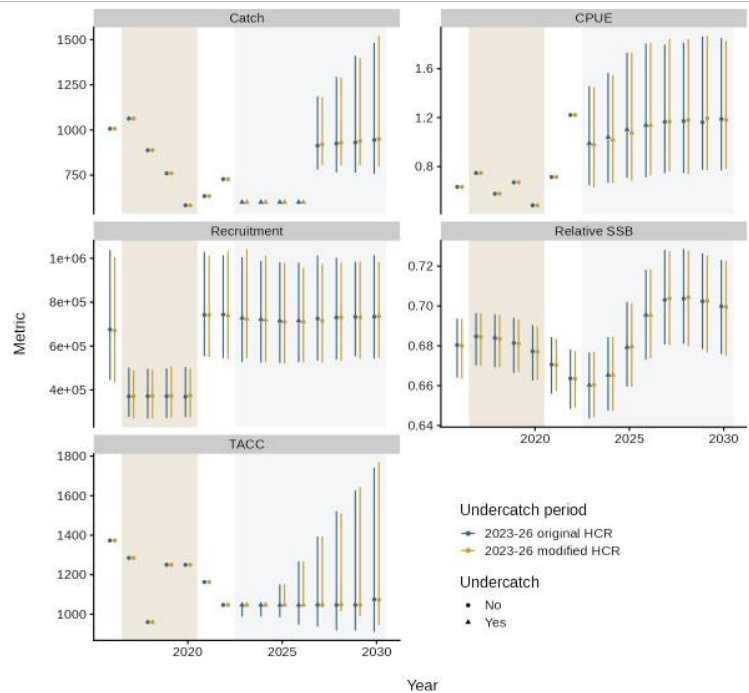


## Extension to undercatch period when testing the modified harvest strategy

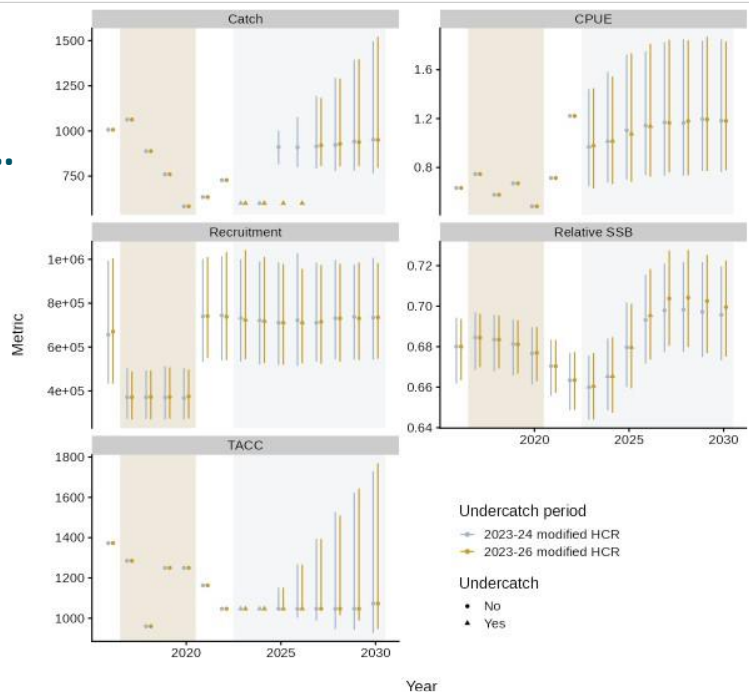
- Unclear as to whether undercatch will persist in 2024 and beyond, so TTRAG requested an update to the modified HS test
- Follows Hillary (2022) but [undercatch period extends to 2026](#)
- Projections start in 2023 (we have catch, CPUE and TAC records up to 2022) and end in 2030
- Used reference case operating model with three steepness values
- Low recruitment period maintained from 2017 to 2020
- Tested performance against tuning objective (2012-15 CPUE)
- Compared:
  - i. Original vs. modified under updated projection settings
  - ii. Modified with undercatch ending in 2024 vs. modified with undercatch ending in 2026



## Original vs. modified HS Undercatch 2023 to 2026



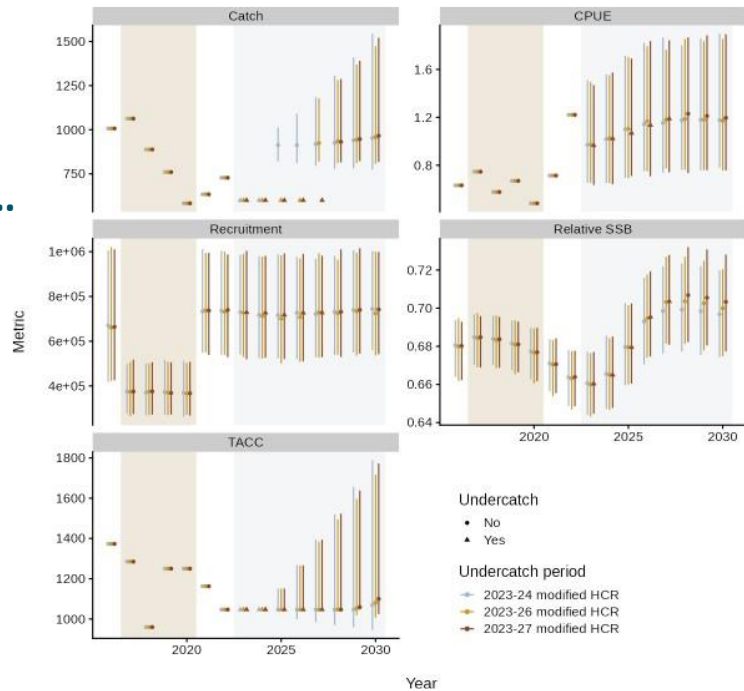
## Modified with undercatch... ... ending in 2024 vs. ending in 2026





## Bonus Modified with undercatch...

... ending in 2024  
vs. ending in 2026  
vs. ending in 2027



## Summary

- Modified harvest strategy is robust to an extension of the undercatch period to 2026 [27]
- TACC levels remain stable or increasing during the undercatch period and management objectives are still met
- Stock still needs to be monitored for signals of low recruitment

## Attachment 5 – Presentation pertaining to Agenda Item 3.2



Australia's National Science Agency

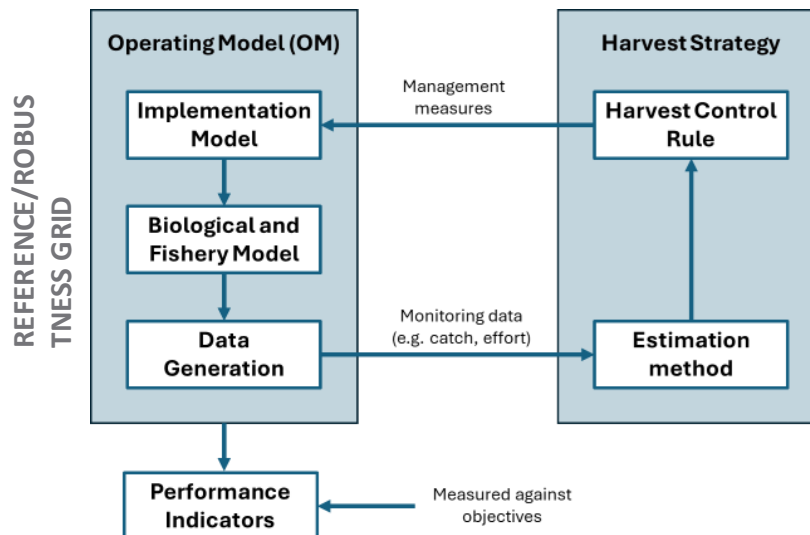
# Options for the updated Management Strategy Evaluation for broadbill swordfish

Presentation to TTRAG 40, Marcoola Beach, March 19th to 21st

Laura Tremblay-Boyer, Rich Hillary and Ashley Williams



## Components of Harvest Strategy







## Factors to consider in updating MSE

- Type of operating model (e.g. spatial structure, relationship to WCPFC SWO stock assessment, etc.)
- Uncertainty scenarios [a.k.a. reference and robustness grids]
- Type and shape of harvest control rule
- Tuning objective (including timeframe)
- Trade-off between areas to focus on in terms of resources



## Operating model structure

General 2020 approach:

- Simplify (annual cycle) and "fix" (spatial recruitment, stock structure) issues and fit to same data as stock assessment

Option 1 (the minimum but realistic option)

- At the minimum, update to latest data available
- Compare predictions against more recent SWO assessment (2021)
- Revisit movement parameters given Patterson et al. 2021 (but not necessarily spatial structure)
- [include map of region structure]

Option 2 (complete overhaul but resource intensive)

- Don't try to replicate assessment, fit to key data and use status priors to constrain population dynamics conditioned on key hypotheses (done for IOTC Albacore)



## 2020 tuning criteria

1. CPUE tuning: by 2035 (15 years from the first TAC decision) attain the mean sub-adult CPUE, measured between 2012–2015 (and also  $\pm 20\%$  of this value)
2. SSB depletion tuning: by 2035 (15 years from the first TAC decision) attain SSB depletion levels of 38%, 48% and 58%

Current objective is to achieve the sub-adult CPUE over 2012 to 2015 period

- Pros: easy to tune HCR and interpret results, concrete, visible outcome for industry
- Cons: aiming for higher levels in what appears to be cyclical CPUE means we are often below the objective (implying TAC reductions)
- Cons: relative levels of CPUE target period might change compared to baseline series depending on the standardisation method



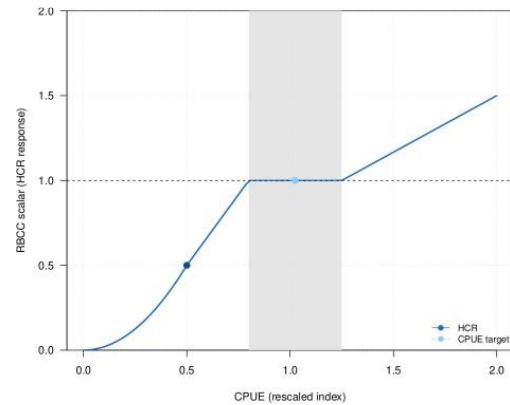
## Alternative tuning criteria

- Retaining CPUE, but could set multiplier compared to long-term trend (e.g. 1.5 times long-term average)
- Foregoing CPUE:
  - mean size? (but might need to standardise?)
  - relative abundance (SSB depletion---hard since we don't control all regional catches)?
- Timeframe to achieve objective: Is 2035 still ok?



## The Harvest Control Rule

- Width of the buffer? (currently 0.8 to 1.2)
- General shape and functionality
- Moving 4 years average of recent CPUE [4 years?]
- Other thoughts or concerns?



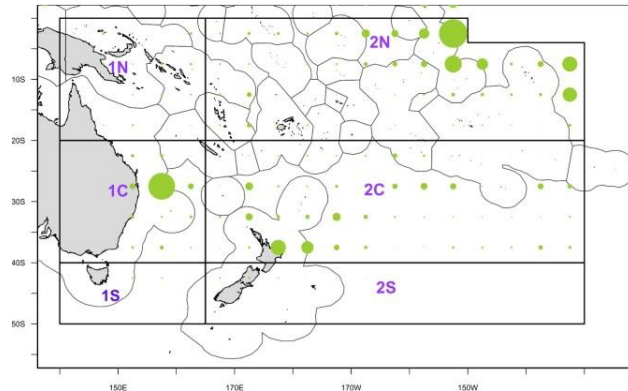
## Setting the RBCC

- Delta maximum change (asymmetric so that reductions can be fully reversed)
  - Schedule: previously looked at 1, 2 and 3 years – suggest move to 3 use MSE to test it
  - RBCC change:
    - Currently changes  $TAC[y]$  to  $TAC[y+1]$  - interacts negatively with cyclical abundance trends
    - Alternatives such as having  $TAC[y+1] = ("Long\ term"\ TAC) * \text{change due to HCR response}$
- This can avoid long low TAC runs (but negative feature is that it can be slower to react to strong signals)



## 2020 reference grid: 'base' case

- Single spawning stock
- Zero migration across both regions
- 3 steepness options (0.65, 0.8, 0.95)
- M-at-age vector from the diagnostic case per the WCPFC assessment
- No DW2N fishery included



## 2020 reference grid

- 2 fishery options:
  - i) remove the DW fleet in the North of region 2
  - ii) include all 13 fisheries
- 2 tuning criteria:
  - i) ETBF CPUE
  - ii) SSB relative depletion
- 2 TAC schedules:
  - i) every year
  - ii) every 3 years



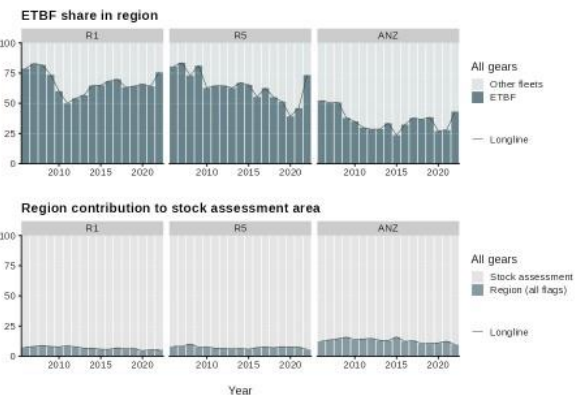
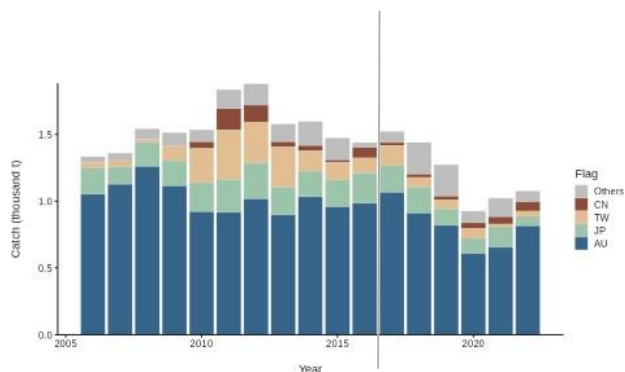
## 2020 robustness grid

- 5% and 10% symmetric migration
- Low (50%) mean future recruitment for 5 years
- Lower M-at-age compared to 2021 assessment
- Separate spawning stocks in each region
- Change in migration to 10% after 5 years
- Fractional change (half or double) in EU fishing pressure in each region



## Catch scenarios

- 2020 MSE DWFNs: a fractional change [0.5/2] in EU fishing pressure in each region
- Thoughts on more realistic scenarios?

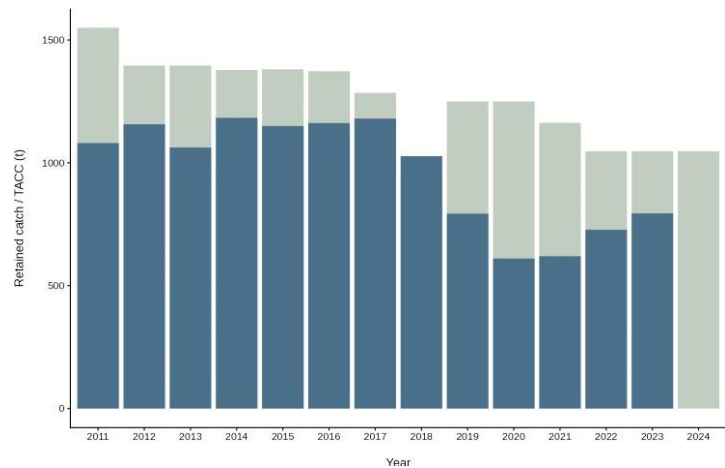


Annual catch of broadbill wordfish (in thousand tons) by country in Region 1. Countries contributing to less than 2.5% of the total catch are grouped into the "Others" category.



## ETBF undercatch scenarios

- 2020 MSE assumed ~15% undercatch from TTAC --- retained catch to TACC levels have been between 70% to 90% (prior to undercatch period)
- Projected catch time-series could include randomly placed periods of "severe" undercatch lasting for (e.g.) [2] to [6] continuous years (is this worth it? could be tricky) (note: having exceptional circumstances triggered is also useful)
- Uncertain how continued implementation of modified HS might respond to future periods of recruitment failure



## Movement

- 2020 MSE: 3 movement scenarios
- At the minimum, we can update to recent movement parameters from Patterson et al. (2021)

Table 4. Estimated quarterly transfer rates from the 2 region CTHMM.

Estimate	Value	CI
Pr(Region 1 → Region 2)	0.028	0.007–0.072
Pr(Region 2 → Region 1)	0.047	0.0061–0.15

Annual movement probabilities  
 reg 1 --> 2 = 0.10  
 reg 2 --> 1 = 0.17

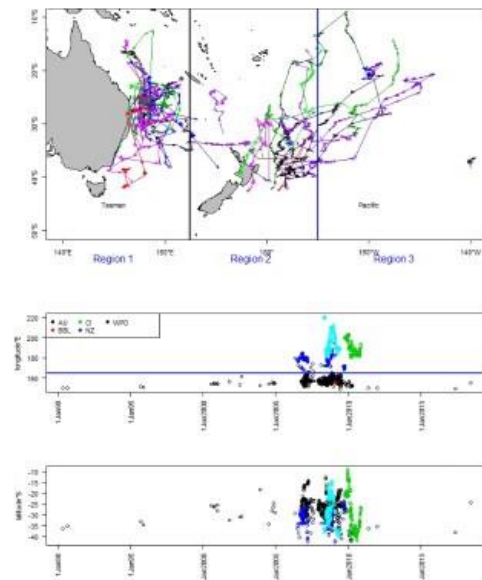


Figure 1 (top) movements from PSAT and conventional tags and spatial zones considered in the analysis. The 2-region model zones are denoted above the plot in black and the 3-region model zones are below the plot in blue. (middle) estimated longitude by time coloured by release region (bottom) estimated latitude by time coloured by release region.



## Climate change

- Low recruitment and change in migration tests in previous MSE were [obliquely] related to this
- There are a few ways we can look at climate change, e.g. changing movement rates? recruitment failures?
- Any obligations to climate from management perspective?

FRDC project 2016-059 Table A-2

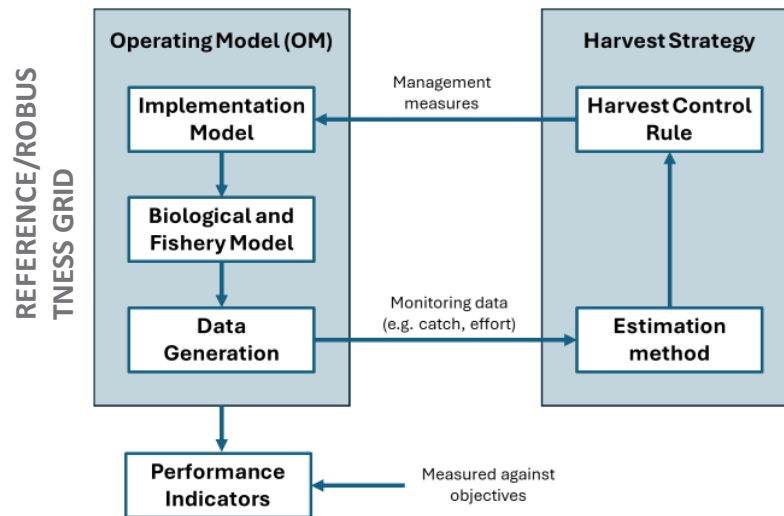
ETBF

Broadbill Swordfish		▼ 5-60%		Larger drops in some areas due to food web changes; strongest declines at the northern extent.
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<https://www.frdc.com.au/sites/default/files/product%2016-Appendix3ClimateSensitivityRating.pdf>



## Summary





**Thank you!**

**Please be in touch with any thoughts...**

**Contact:**

[laura.tremblayboyer@csiro.au](mailto:laura.tremblayboyer@csiro.au)

[rich.hillary@csiro.au](mailto:rich.hillary@csiro.au)

[ashley.williams@csiro.au](mailto:ashley.williams@csiro.au)

Australia's National Science Agency



## Monitoring catch pulses in the ETBF: overview

Laura TremblayBoyer

Presentation to TTRAG 40—20 March 2024

Environment  
[www.csiro.au](http://www.csiro.au)



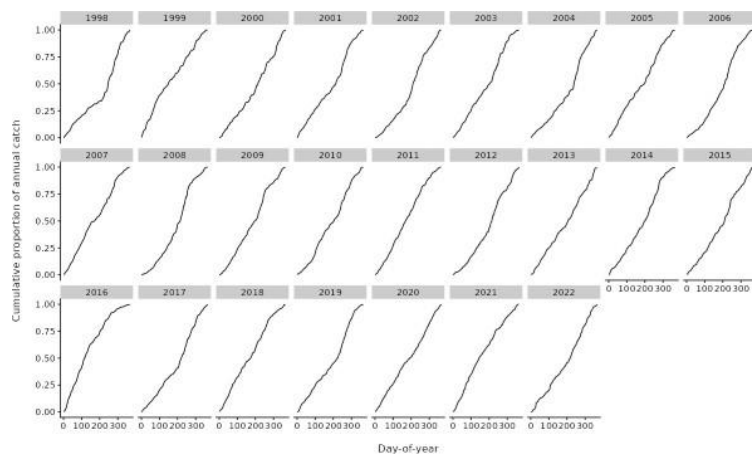
### Catch pulses

- . Occur occasionally for some species (yellowfin tuna most notably, striped marlin recently)
- . Concern for industry with regards to TACC management, can become limiting towards end of financial years
- . Flexibility sought during 'pulse' years

ETBF catch pulses: Slide 2 of 10



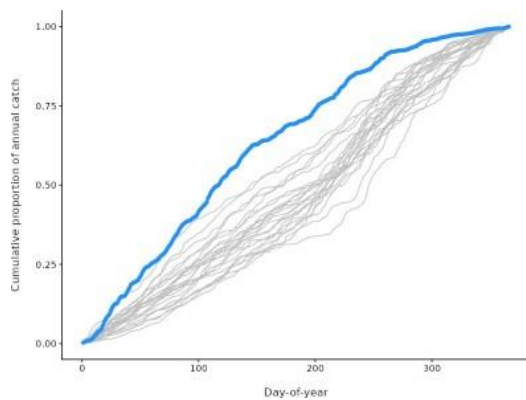
## Cumulative catch by day for yellowfin tuna



ETBF catch pulses: Slide 3 of [10](#)



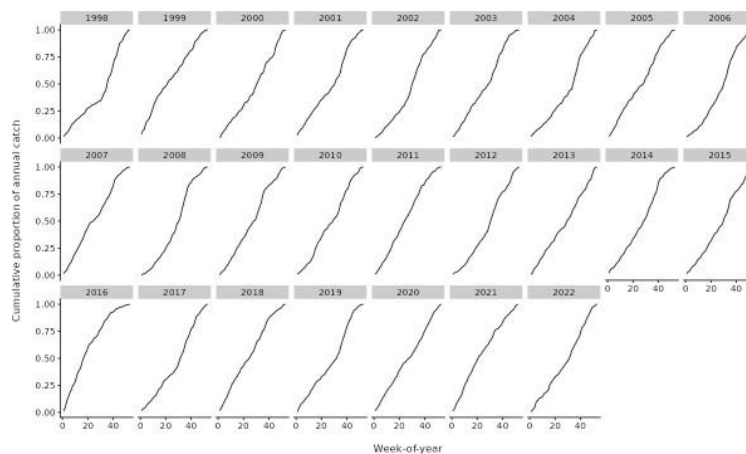
## Cumulative catch by day for yellowfin tuna



ETBF catch pulses: Slide 4 of [10](#)



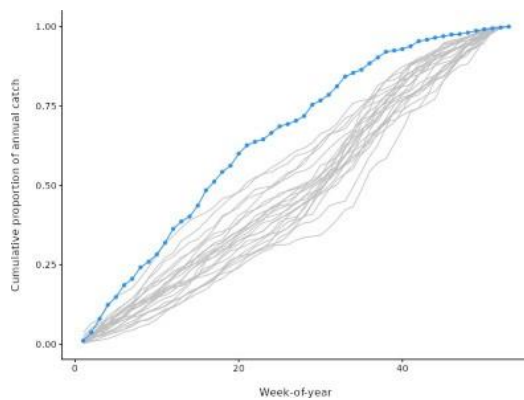
## Cumulative catch by day for yellowfin tuna



ETBF catch pulses: Slide 5 of [10](#)



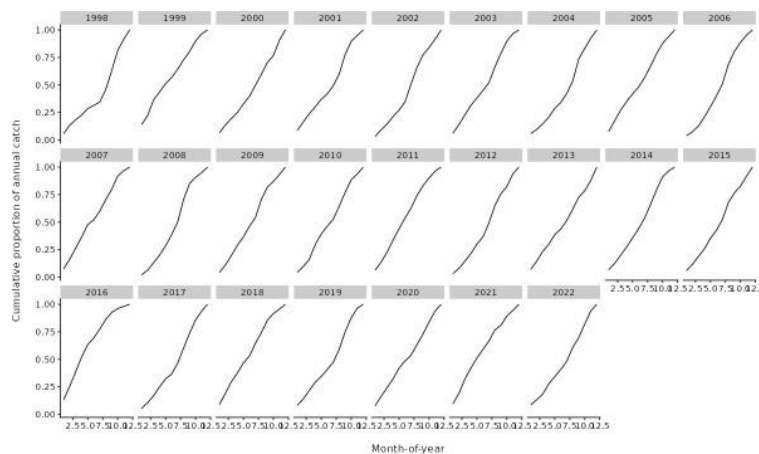
## Cumulative catch by day for yellowfin tuna



ETBF catch pulses: Slide 6 of [10](#)



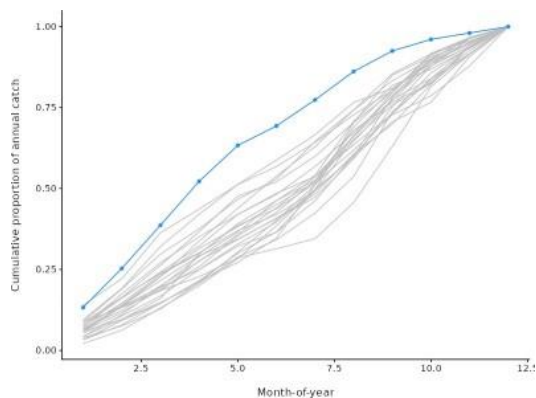
## Cumulative catch by day for yellowfin tuna



ETBF catch pulses: Slide 7 of 10



## Cumulative catch by day for yellowfin tuna



ETBF catch pulses: Slide 8 of 10



## Summary

- . Pulse years distinct in hindsight
- . But need to detect in real-time
- . Could compare cumulative catch to past trends, but need appropriate temporal resolution

ETBF catch pulses: Slide 9 of [10](#)



## Thank You

CSIRO Environment

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## Attachment 7 – Presentation pertaining to Agenda Item 5.2



Australia's National Science Agency

### TTRAG indicators for target species

Presentation to TTRAG 40, Marcoola Beach, March 19th to 21st

Ashley Williams, Laura Tremblay-Boyer and Rich Hillary



### Considerations

- Desire to move to a 3year cycle for formal review of indicators to set RBCCs
- Which indicators are required for this frequency of RBCC setting?
- Which indicators should still be examined by TTRAG annually?
- Are there any current indicators that are not useful/required?
- Are there any new indicators we should be looking at?



## Target species

- Yellowfin tuna
- Bigeye tuna
- South Pacific albacore
- Broadbill swordfish –Harvest strategy
- Striped marlin– Harvest strategy



## Current indicators

- Catch
- Effort
- Size
- CPUE (nominal and standardised)
- Stock status
- *Economic conditions index*



## Catch

Current analyses:

- Spatial and temporal trends
- Relative to other regions/fleets
- Discards

Useful for:

- Indicate potential changes in availability/targeting
- Identify potential errors in data



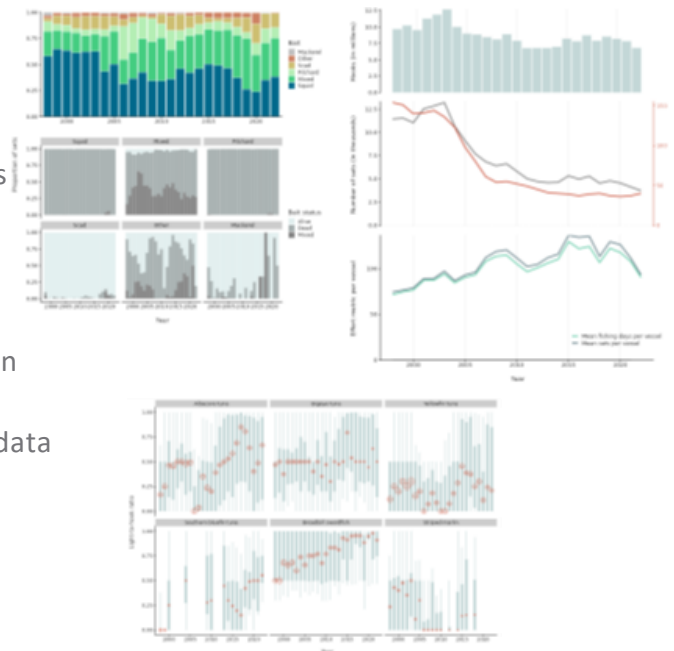
## Effort

Current analyses:

- Spatial and temporal trends
- Bait and gear type

Useful for:

- Indicate potential changes in fleet/targeting/strategies
- Identify potential errors in data







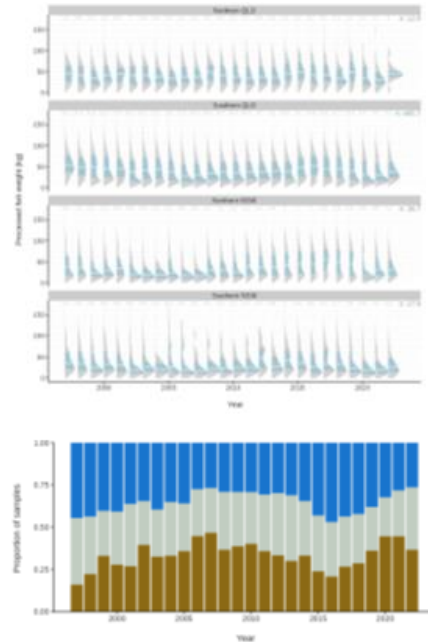
## Size

Current analyses:

- Size frequency and size class
- Spatial and temporal trends

Useful for:

- Indicate potential changes in targeting
- Indicate patterns in recruitment



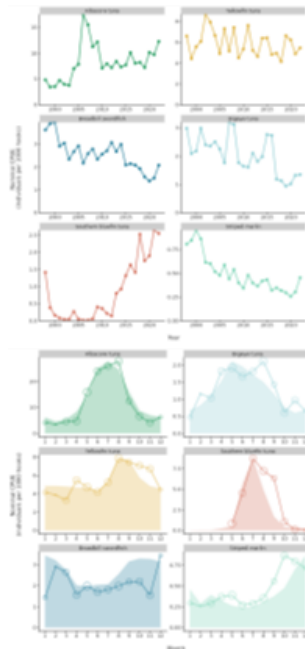
## Nominal CPUE

Current analyses:

- Temporal trends (annual, seasonal)

Useful for:

- General trends in catch rates
- Not indicative of abundance trends





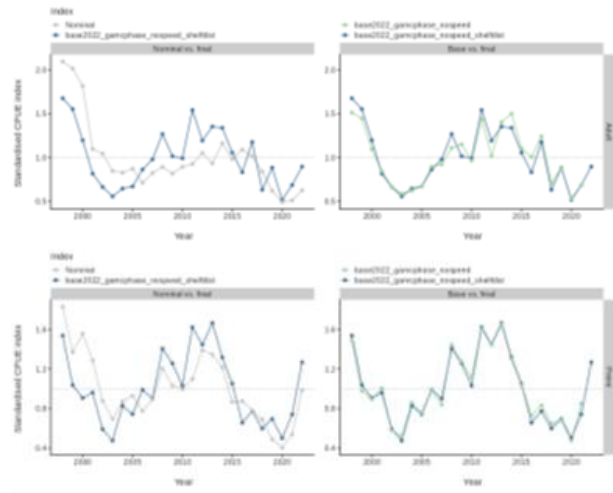
## Standardised CPUE

Current analyses:

- Temporal trends
- Size class trends

Useful for:

- Indicative of relative abundance
- Indicate patterns in recruitment



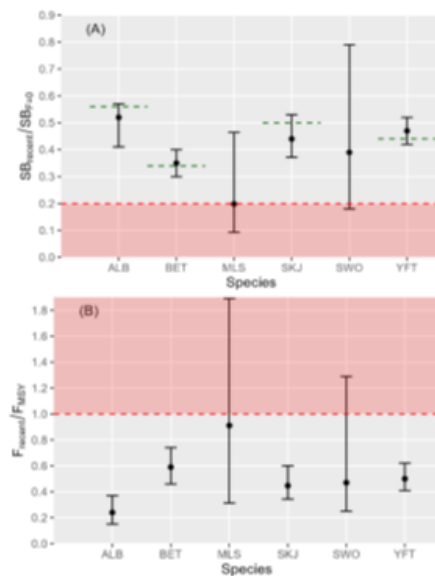
## Stock status

Current analyses:

- Summarise results from WCPFC assessments
  - Stock depletion
  - Fishing mortality

Useful for:

- Stock-wide view of stock status and fishing pressure relative to reference points





## WCPFC Stock assessment schedule

Species	Recent assessment	Frequency	Next assessment
ALB	2021	3y	2024
BET	2023	3y	2026
YFT	2023	3y	2026
SWO	2021	4y	2025
STM	2019	5y	2024



## Current approach

Indicator	Annual review by TTRAG
Catch	Yes
Effort	Yes
Size	Yes
Nominal CPUE	Yes
Standardised CPUE	Yes
Stock structure	Yes
Stock status	Yes
Economic conditions index	Yes



Reported to  
Commission  
annually



## Potential approach for 3-year RBCC setting

Indicator	Annual review by TTRAG
Catch	Yes
Effort	Yes
Size	Yes
Nominal CPUE	Yes
Standardised CPUE	No*
Stock structure	No
Stock status	No
Economic conditions index	?
Others?	

\*Except perhaps SWO & STM



## Potential approach for 3-year RBCC setting

Indicator	Annual review by TTRAG	3-year for RBCC setting
Catch	Yes	Yes
Effort	Yes	Yes
Size	Yes	Yes
Nominal CPUE	Yes	Yes
Standardised CPUE	SWO & MLS	Yes
Stock structure	No	Yes
Stock status	Yes (when available)	Yes
Economic conditions index	Yes	Yes
Others? Metiers		



Thank you

Australia's National Science Agency

## Coral Sea Zone Hook Trial Annual Review Discussion Paper March 2024

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### Trial overview

#### Need

In March 2020 the Australian Fisheries Management Authority (AFMA) received an industry request to vary the current longline boat Statutory Fishing Rights (SFR) conditions in the Coral Sea Zone (CSZ) of the Eastern Tuna and Billfish Fishery (ETBF) to remove the hook limit per longline shot except between September to February west of longitude 148°E. The current maximum limit is 500 hooks (h) per shot, at all times. CSZ SFR holders advised that these changes would improve the cost effectiveness and efficiency of their operations whilst maintaining measures to minimise interactions with blue and black marlin (the industry proposal is at **Attachment A**).

Industry advised that under the proposed changes they would be able to optimise the timing of effort when fish are feeding rather than setting two shots per day. Industry expects these changes should also minimise interactions with marlin. Depending on the moon phase, the changes include:

- setting all their effort at night when targeting bigeye, yellowfin and broadbill. Through their experience industry advised marlin do not feed at night and are therefore less susceptible to being caught; or
- deep setting (> 200 m) for albacore, yellowfin and bigeye. In their submission industry highlighted that research has shown that less marlin interactions occur when setting deeper than 75 m.

#### Objective of current conditions; maximum 500 hook limit

The ETBF contains a specific management zone, the Coral Sea Zone (CSZ – historically, referred to as “Area E” until 2005) that was first established in the mid-1980s (and later extended in size in 1991) to reduce longline fishing impacts on marlin availability to Queensland game fishing in that area. This was implemented alongside a ban on retaining black and blue marlin in the ETBF, for the same purpose. The maximum 500 hook limit per shot condition was implemented in the mid 1990’s to reduce soak time and increase black and blue marlin survivability at haul and post release.

#### Trial arrangements

In line with recommendations from TTMAC (October 2020) the current working group (WG) was formed to determine the arrangements for the trial. The WG has met four times<sup>1</sup> to both agree on the trial arrangements and monitor progress. To date, the WG annually reviews data trends in marlin interaction rates, marlin discard fates, total shots and total hooks set during the trial. The WG has compared results from the trial against an agreed baseline period of 2015-2019.

The trial arrangements are:

1. Hook limits per day and per longline set:

<sup>1</sup> 19 November 2020, 23 June 2021, 3 February 2022, 15 February 2023

- a maximum of 1,250 hooks per day may be set in the area of the CSZ east of longitude 148°E, regardless of the number of longline sets undertaken.
- a maximum 1,250 hooks<sup>2</sup> per day may be set between the period of 1 March and 31 August in the area of the CSZ west of longitude 148°E, regardless of the number of longline sets undertaken.
- a maximum of 500 hooks per longline may be set in the area of the CSZ west of longitude 148°E between 1 September and 28/29 February.

## 2. Number of sets per day.

In year one of the trial, a maximum of one set per day was applied if shooting more than 500 hooks. In year two of the trial this restriction was removed<sup>3</sup> and no further changes have been made as we enter the 4<sup>th</sup> year of the trial.

## 3. Two-tier catch triggers for marlin for fishing in the area west of longitude 148°E during the period 1 March to 31 August. The triggers do not apply otherwise.

### Rules

During the trial, between 1 March and 31 August when the hook limit is increased to 1,250 in the area west of longitude 148°E, if the number of marlin interactions recorded in the area reach the:

- first tier, AFMA will convene the working group (within two weeks of the trigger being reached) to review available data.
- second tier, the trial is terminated and the conditions in the fishery be reverted to standard arrangements (ie, reinstate the maximum 500 hook limit per longline shot).

### Tier levels

	Year one of the trial (2021)		Subsequent years of the trial (2022, 2023 and 2024)
	Blue Marlin (Interactions)	Black Marlin (interactions)	Marlin interactions (blue and black combined)
First Tier	34	65	99
Second Tier	45	86	131

<sup>2</sup> The agreed hook limit has been recorded as 1,200 and 1,250 in different WG meeting outcomes. The WG agreed at its first meeting (19 November 2020) that the limit of 1,200 hooks, with an additional 50 hook buffer, would be appropriate given the boats intending to fish during the trial are currently equipped to set a maximum of 1,200 hooks. Please note that the trial conditions imposed to the Coral Sea Boat Statutory Fishing Rights conditions have applied a 1,200 hook limit.

<sup>3</sup> Working Group meeting # 3, 3 February 2022

Note the tier levels were calculated based on the seasonal average of marlin interactions recorded from March to August during the baseline period (between 2015 and 2019) west of longitude 148°E. the first tier is 75 % of the average of the four-year (2015-2019) average whilst the second tier is twice the average.

4. All boats operating in the trial must comply with the ETBF e-monitoring requirements. AFMA will continue to monitor e-monitoring audit rates for reporting accuracy.
5. Life status and size data (less than or greater than 20 kg) will be collected during the trial, facilitated through the new e-log software and verified through e-monitoring.

## Trial Results

### Effort reported during the trial compared to the baseline period (2015-2019)

In total, the number of active vessels in the CSZ during the trial was two in 2021 and three in both 2022 and 2023; and is comparable to the average number of active vessels in the CSZ per year during the baseline period. Total hooks and total sets deployed during the trial were approximately 2-4 times less than that deployed annually during the baseline period. Consistent with the baseline period most sets were deployed west of 148°E during the trial (**Table 1**).

One vessel set longlines with > 500 hooks during years one and two of the trial (2021 & 2022) and three vessels set longlines with > 500 hooks during the third year of the trial, 2023.

Where the trial arrangements allow for the use of more than 500 hooks (west of 148°E during March to August and east of 148°E), the number of sets with more than 500 hooks ranged from 89 to 139 across the three years of the trial and represented approximately 70% of total sets in these areas, despite an overall reduction in effort and the majority of sets occurring outside of these areas where the maximum hook limit remains at 500 (ie, in the area west of 148°E during September to February; **Table 1**).

Where the trial arrangements allow for the use of more than 500 hooks, the majority of sets were in the area west of 148°E between March and August. There was limited effort in the area east of 148°E during the trial period (**Table 1**).

**Table 1.** Vessel numbers, total hooks and total sets recorded during the baseline period (2015-2019) and during the trial (2021-2023). Total sets per area (west of 148°E during September to February and March to August, and east of 148°E) with the total sets where the number of hooks was greater than 500 presented in brackets recorded during the baseline period (2015-2019) and during the trial (2021-2023).

Year	Baseline average (2015-2019)	2021	2022	2023
Active vessels in CSZ	3	2	3	3
Total hooks	427,703	218,400	103,022	261,420
Total sets	867	322	214	429



Total sets west of 148°E between September and February	398	218	149	222
Total sets west of 148°E between March and August (sets > 500 hooks)	398	102 (87)	63 (34)	162 (102)
Total sets east of 148°E (sets > 500 hooks)	71	2 (2)	2 (1)	45 (37)

Where the trial arrangements allow for the use of more than 500 hooks, in the first year of the trial (2021) most sets with > 500 hooks had 1,200 or more hooks (noting the limit at 1,250 hooks). In contrast, in the second year of the trial (2022) sets with > 500 hooks had no more than 700 hooks deployed; and in the third year of the trial (2023) most sets with > 500 hooks deployed up to 1,000 hooks (**Table 2**).

**Table 2.** Comparison of number of hooks per set recorded in the CSZ during each year of the trial (2021-2023).

Number of hooks	≤500	550	600	700	800	850	900	990	1,000
2021	233			1	1	1	4		1
2022	179		11	24					
2023	290	3	8	51	1		8	1	46
Number of hooks	1,050	1,100	1,150	1,175	1,180	1,200	1,210	1,250	Total
2021	1	8		6		26	1	39	322
2022									214
2023		5	15		1				429

### Total marlin interactions reported during the trial compared to the baseline period (2015-2019)

The total number marlin interactions (blue and black marlin combined) recorded during each year of the trial was 680 for 2021, 169 for 2022 and 554 for 2023, and represented a 1.4, 5.6 and 1.7 times (respectively) reduction compared to the baseline period where the average annual number of marlin interactions recorded was 939 (**Table 3**). Overall, there were more marlin interactions where there was a great number of sets (ie, in the area west of 148°E during September to February).

Where the trial arrangements allow for the use of more than 500 hooks (west of 148°E during March to August and east of 148°E), the total number of marlin interactions was 62, 10 and 41 in each of the trial years. The majority of interactions occurred on sets with > 500 hooks during the first year of the trial and represented approximately 87% of interactions recorded in those areas (**Table 3**). During the second and third years of the trial, the number of interactions on sets with > 500 hooks decreased to 50% and 59% of total sets in those areas, respectively.

The two-tiered trigger limits apply when fishing west of 148°E during March to August. The total number of marlin interactions recorded during this period were 60 in 2021, 10 in 2022 and 25 in 2023 and did not reach the tier-one trigger in any year of the trial. Of these interactions, 90%, 50% and 32% (respectively in each year of the trial) occurred on sets with > 500 hooks.

**Table 3.** Total marlin interactions (combined) recorded during the baseline period (2015-2019) and during the trial (2021-2023). Total interactions per area (west of 148°E during September to February and March to August, and east of 148°E) with the total interactions where the number of hooks set was greater than 500 presented in brackets recorded during the baseline period (2015-2019) and during the trial (2021-2023).

Year	Baseline average (2015-2019)	2021	2022	2023
Total interactions	939	680	169	554
Total interactions west of 148°E between September and February	827	618	159	513
Total interactions west of 148°E between March and August (interactions on sets > 500 hooks)	68	60 (54)	10 (5)	25 (8)
Total interactions east of 148°E (interactions on sets > 500 hooks)	45	2 (2)	0	16 (16)

### Marlin discard fates reported during the trial compared to the baseline period (2015-2019)

The recorded discard fates for all marlin interactions reported for sets with up to 500 hooks and for sets with more than 500 hooks during the baseline period and trial are shown in **Table 4**.

During the baseline period on sets with up to 500 hooks, 56% of marlin discarded were reported alive, compared to 17% reported dead and a high number of discards reported as “unknown”. Compared to the baseline period, the proportion of marlin discards reported alive on sets with up to 500 hooks increased during the trial representing 81%, 61% and 88% across each trial year respectively (**Table 4**).

Where the trial arrangements allow for the use of more than 500 hooks (west of 148°E during March to August and east of 148°E), on sets with more than 500 hooks, the proportion of discards reported alive was consistent with those on sets with up to 500 hooks representing 79%, 80% and 38% across each trial year respectively. In each case, there were more discards reported alive than dead (**Table 4**). A notable exception is the discard fates of marlin recorded on sets with more than 500 hooks during 2023, where 38% were recorded alive and 63% recorded dead.

**Table 4.** Total marlin interactions (combined) by discard fate (alive, dead or unknown) recorded during the baseline period (2015-2019) and during the trial (2021-2023) for sets with up to 500 hooks and for sets with more than 500 hooks.

Year	Baseline average (2015-2019)	2021	2022	2023
Total interactions on sets ≤ 500 hooks	914	624	164	530
Alive	509 (56%)	504 (81%)	100 (61%)	468 (88%)
Dead	154 (17%)	116 (19%)	63 (38%)	62 (12%)
Unknown	314	4	1	0
Total interactions on sets > 500 hooks		56	5	24
Alive		44 (79%)	4 (80%)	9 (38%)
Dead		12 (21%)	1 (20%)	15 (63%)
Unknown		0	0	0

## Size class information

Between 2021 and 2023, a total of 1,403 interactions were reported. However, 150 interactions, representing 10.6%, lacked discard weight information. The recorded sizes ranged from 1 kg to 4,000 kg (**Table 5**). Notably, the current recreational fishing world records for black marlin and Pacific blue marlin are 717.61 kg and 636 kg, respectively. Consequently, data points exceeding 800 kg were excluded, resulting in the removal of 523 interactions. This refinement leaves us with 880 usable data points, accounting for 63% of the original 1,403 interactions during the 2021-23 period. It is important to acknowledge the challenge of ensuring the reliability of the cleaned subset of data we are currently analysing due to the inconsistency in reporting weights across the total sample size.

**Table 5.** Total interactions by weight class of blue and black marlin caught during trial period (2021, 2022 and 2023).

Discarded Marlin Size Class (kg)	1-20	20-40	40-60	60-80	80- 100	100- 120	120- 140	140- 160	160- 180	
Black Marlin	3	3	15	12	24	24	6	44	15	
Blue Marlin	32	15	22	13	34	0	2	18	3	
Total Marlin	35	18	37	25	58	24	8	62	18	
Discarded Marlin Size Class (kg)	180- 200	200- 220	220- 240	240- 260	260- 280	280- 300	340- 360	380- 400	400- 420	
Black Marlin	83	12	3	13	6	92	17	97	8	
Blue Marlin	20	0	0	0	0	30	0	4	0	
Total Marlin	103	12	3	13	6	122	17	101	8	
Discarded Marlin Size Class (kg)	420- 440	440- 460	460- 480	480- 500	540- 560	580- 600	640- 660	680- 700	720- 740	TOTAL
Black Marlin	4	5	8	63	5	89	11	16	6	684
Blue Marlin	0	0	0	0	0	3	0	0	0	196
Total Marlin	4	5	8	63	5	92	11	16	6	880

## Next steps

The [Working Group \(WG\)](#) and [TTRAG 37 \(March 2023\)](#) supported AFMA'S proposal to continue the trial throughout 2023 and 2024. It was noted by both WG and TTRAG 37 that the trial has safeguards in place to minimise impacts on blue and black marlin (catch based management triggers, together with an annual stakeholder review process).

During 2023, a scientific subgroup of the WG met twice<sup>4</sup> to discuss an appropriate sampling design to determine the impacts of increasing the CSZ hook limit on interactions with marlin and other protected species (in particular turtles) and recommended that a project be established to ensure that the trial collects the data critical to form a decision at its conclusion.

A key aspect of the trial review will be to assess whether the data collected further informs us on the likely risks with changing the hook limit (noting the purpose of the original hook limit) and whether the

<sup>4</sup> [Meeting one](#) and [meeting two](#).

information currently available is sufficient to support a management decision to change or retain arrangements and/or collect more data.

At its July meeting ([meeting 38](#)) the RAG supported a small tactical project be funded as part of the annual research priorities (noting this will be through the levy base) to analyse the trial data and determine what, if any, further sampling is necessary to detect any impacts of marlin and protected species. The analysis was also expected to assist the RAG to determine the sampling size (via power analysis) to detect the level of confidence and detect the level of change in mortality on blue and black marlin and protected species in the CSZ.

A call for research to undertake the project was sent in October 2023. A proposal for the project was received and distributed to the RAG for consideration in December 2023. While the project received some support, it did not gain consensus support from TTRAG. Industry representatives held concerns about the potential output of the work and the funding required from the Eastern Tuna and Billfish Fishery levy base.

AFMA Management is not supportive of continuing the trial without completing the work recommended by the RAG in July 2023. That is, to analyse the trial data and determine what, if any, further sampling is necessary to detect any impacts changed arrangements

## Attachment A

### Trial Proposal letter from operators

Seeter PTY LTD

T/A Great Barrier Reef Tuna

Dear President of Cairns Professional Game Fishing Association,

### RE: Management conditions for Historic Area E of the Coral Sea

I am writing you this letter seeking your support to amend the management conditions outside the dates for the Far North Queensland black marlin heavy tackle season within the Historic Area E of the Coral Seas within the Eastern Tuna and Billfish Fishery.

During the mid 1990's a fishing condition was placed on longline fishing vessels restricting the maximum allowable hooks to 500 per set. This condition was implemented to maximise Blue and Black Marlin survival should they become hooked, especially when they aggregate near the ribbonreefs north of Cairns to spawn.

We have been fishing this area since 1991, and currently have 3 vessels that are restricted to using 500 hooks per shot. However, the fishery has changed significantly since this condition was introduced. Our access to fishing areas has been reduced, and costs are ever increasing. To maintain economic viability and achieve greater efficiency, while maintaining ecological sustainability for the marlin fishery we wish to review the 500 hook condition.

To review the 500-hook condition we examined our logbook catch data verified by AFMA for the past 5-years. The data demonstrated that the majority of our marlin catches occurs to the west of longitude 148°, with peak catches during the months from September to December (Black marlin 87.4%, Blue marlin 72.5%)

### Our Proposal

We propose to have the 500-hook condition amended to reflect that

*A maximum of 500 hooks per shot be maintained west of longitude 148° in Historic Area E from 1 September to 31 December. Outside of this temporal and spatial condition there will be no specification of the number of hooks than can be used in this area of the ETBF.*

*We also recommend that any ETBF vessel fishing Area E must have a permit in keeping with the current regulations of a limited entry fishery with no new issuing of permits.*

This will ensure the intent of the 500-hook condition to maintain ecological sustainability is maintained, while improving the economic efficiency of our fishing operations

We request that with your knowledge and time spent in the Marlin Fishery that you can support us to amend the 500-hook condition.

This issue will be considered at the next Tropical Tuna Management Committee meeting scheduled for late March, 2020, and I would sincerely appreciate it if you could send them a letter of support by 14 March 2020 (Draft letter template attached). I am also more than happy to discuss this proposal at your convenience.

Any questions please don't hesitate to ask

Kind regards,

Rowan Lamason

DRAFT

## WG Meeting #1 Outcomes

Issue	Discussion	Decision
Hook Size Limits	The group noted that 7 of the total 12 CSZ Statutory Fishing Rights (SFRs) belong to company that has requested the trial with other operators unlikely to participate. In good faith, the company will only operator 3 boats, and not utilise their remaining 4 SFRs during the trial. A limit of 1250 hooks per day (including a 50 hook buffer) would be appropriate given the 3 boats are currently equipped to set a maximum of 1,200 hooks	It was agreed to limit the trial to a maximum of <b>1,250 hooks</b> set and one set per day
Time Period	The group noted that there would be a 2 year trial period with the above hook limit. Fishing west of 148°E will be restricted to certain months within the trial. Given the high numbers of marlin are present in the CSZ during October to December, and the migration of marlin during September, these months were excluded from the trial. The recreational sector noted significant concerns in allowing the trial to occur during January and February. A cautioned approach commencing the first of the trail in March 2021 and running through to August 2021 was adopted to allow for a review of data prior to deciding the time period for the second year of the trial.	It was agreed the first year of the two year trial would occur between the months of March to August in 2021, with a review of the data arising from year one to inform the time period for year two.
Marlin Limits to cease the trial	It was agreed there would be benefit in adopting a two tier marlin catch limit; with a mid-point that triggers a review of the trial but does not cease trial, and an upper limit that ceases the trial if reached. The two tier limit would apply to cumulative marlin catch for the duration of the trial. The two tier marlin catch limit should be based on the average marlin catch over the last four years. The upper threshold (second tier) being twice the four year average, and the lower (first tier) being 75% of the upper threshold.	A two-tier marlin catch limit will apply during the trial. If the first tier is reached, this would trigger AFMA convening this small working group (within two weeks of the limit being reached) to review available data. If the second tier is reached, the trial would be suspended and boats would revert to setting 500 hooks.
Additional data requirements	The group noted that operators would be required to provide life status information on a fish by fish basis through the e-log software for all fishing activity. It was recommended that size categories should capture juvenile fish that are “less than 20kg” or adult fish “over 20kg”, to gain a better understanding on interactions.	All boats operating in the trial must comply with the ETBF e-monitoring requirements. AFMA will continue to monitor e-monitoring audit rates for reporting accuracy.  It was agreed that <b>life status and size data</b> would be collected during the trial, facilitated through the new e-log software and verified through e-monitoring.

## WG Meeting #2 Outcomes

1. If requested, further marlin ID resources will be provided to Industry.
2. Tier 1 and 2 Marlin interaction which were originally broken down into Black and Blue Marlin species, are to be combined as follows:

	Marlin (Blue and Black)
First Tier	99
Second Tier	131

**Table 1 (revised 23/06/21) two-tier marlin catch limit to apply during CSZ hook trial**

3. The operator must still attempt to identify marlin by species. That is, all requirements regarding identification and recording of species, as in the original trial outline, still apply. This will continue to include recording of all interactions with protected species and the recording of species, life status and weight estimation for each individual interaction with marlin.
4. With regard to the counting of marlin interactions when fishing with 500 hooks, group members affirmed their understanding that these should be included in the trigger number. Noting some concerns from industry around the validity of this in the trial, the committee agreed that each marlin interaction within the trial period would be counted but additional information would be included, such as number of hooks for the shot.
5. AFMA will provide data on: catch rate of marlin (combined blue and black) per 1000 hooks, by month, to establish a nominal catch rate (2015 to now) as part of analysis of the trial. This is to be provided for the next meeting of the group.
6. AFMA is to provide further breakdown of life status of individual marlin interactions, including historical data (data supplied appeared to have multiple fish against a single life status and it wasn't clear how this was grouped) for next meeting of the group.
7. The trial will continue, with the combined trigger and AFMA will continue to monitor marlin interactions.
8. AFMA will convene another meeting of this group if the combined 99 marlin interaction trigger is reached before August. If this does not occur, the next meeting of the group will be at the end of 2021 leg of the CSZ hook trial in August 2021.



## WG Meeting #3 Outcomes

1. The trial is to continue in 2022 and AFMA will continue to monitor marlin interactions.
2. The trial period for fishing west of 148°E will remain between 1 March and August 31 2022, with shots limited to a maximum of 500h outside of these months.
3. Amend permit condition to allow a cumulative maximum of 1250h per day regardless of number of longline sets undertaken east of 148°E year round, and west of 148 between 1 March and 31 August.
4. Tier 1 and 2 Marlin interaction triggers will remain as the combined limits set on 23 June 2021 as follows:

	Marlin (Blue and Black)
First Tier	99
Second Tier	131

**Table 1. Two-tier marlin catch limit to apply during CSZ hook trial**

5. Operators must continue to attempt to identify marlin by species. That is, all requirements regarding identification and recording of species, as in the original trial outline, still apply. This will continue to include recording of all interactions with protected species and the recording of species, life status and weight estimation for each individual interaction with marlin.
6. As discussed in June 2021, all marlin interactions across the CSZ during 2022 will be included in the trigger number.
7. AFMA will provide data on whole fishery shot characteristics and marlin fates by shot type ( $\leq 500$ h or greater than 500h) as described in **Attachment A**.
8. AFMA provided supplementary requested data **Attachment B**.
9. AFMA will convene another meeting of this group if the combined 99 marlin interaction trigger is reached.

Following discussion and agreement on the trial, the group heard from J Pepperell on his efforts seeking funding for a project aiming to update a prior study on black marlin catch rates in the Great Barrier Reef (GBR) area, which he had completed with Rob Campbell in the early 2000s. The group heard that an application to the GBR Foundation, which had already received partial funding from the Cairns Professional Game Fishing Association and the Queensland Game Fishing Association (\$25k of \$71k sought), was unsuccessful. The group agreed that updating this study with another 20 years of data would be valuable and noted that while AFMA is not well placed to provide funding due the nature of the research and AFMA research funding focus, an application to the FRDC is worth pursuing.

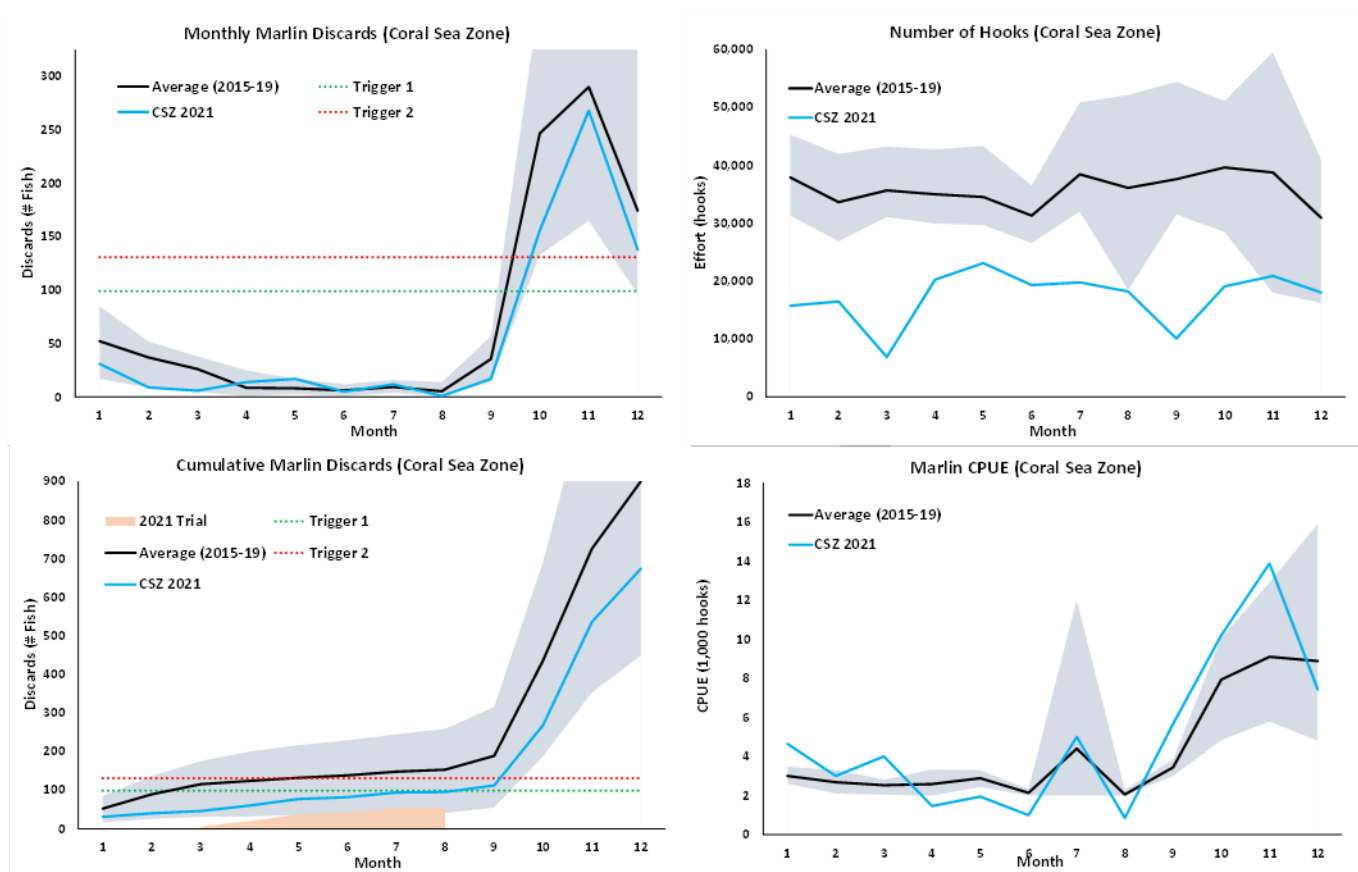
Fiona Hill thanked the Small Working Group for its continued commitment to working through the trial, and the meeting concluded at 12:54pm

## Attachment A: REQUEST FOR FURTHER INFORMATION

1. As there were two vessels operating during the year, it would be good to provide details for both vessels in a table such as that shown below. Providing the number of days that each type of shot was deployed allows one to calculate the mean number of hooks deployed per day (based on previous analyses this was around 800 hooks, as often more than one set of up to 500 hooks were deployed on any day). Also, providing the data for the extra months would also indicate whether effort has changed during the 'out-of-trial' period.

Vessel #	Shots with <=500 Hooks			Shots with >500 Hooks			All shots	
Month	N. Days	N. Shots	Total Hooks	N. Days	N. Shots	Total Hooks	N. Shots	Total Hooks
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								

2. In Figure 1, the blue lines in both graphs represent average CPUE in the Coral Sea Zone for combined black and blue marlin discards, by month, during 2021. We understood that this average was for calculated over all vessels. In the figure on the right, the average CPUE is also shown just for the trial vessel – brown line. It was queried as to why the blue line (both vessels) and the brown line (trial vessel only) were the same for all months except the last two. It would seem highly unlikely that both vessels had exactly the same average CPUE for most months. Seems that some understanding is missing here.
3. In Figure 2 (labelled Figure 3) we understand that these data are for all (both) vessels that fished in the CSZ in 2021 (i.e. not just the trial vessel) – is that correct? It would be useful to show figures similar to this figure but for the data i) east of 148E and ii) west of 148E (as the 1250 hook limit applies to all months in the eastern sector and based on some data reviewed by the working group last June it appeared that most marlin were caught west of 148E).



4. In Table 3 and Figure 3 again we understand these data are for all (both) vessels that fished in the CSZ in 2021 (i.e. not just the trial vessel) – is that correct? As a main focus is on billfish survivability, it would be useful to compare life-status for shots using  $\leq 500$  hooks and those using  $> 500$  hooks. As such, could you provide tables and figures similar to Table 3 and Figure 3 but stratified by shots deploying  $\leq 500$  hooks and those deploying  $> 500$  hooks.

Meeting participants were reminded that the data, and all documents provided for discussion are **commercial-in-confidence** and must not be shared outside the meeting under any circumstances.

## Attachment B: SUPPLEMENTARY DATA

### 1. 2021 vessel level effort summary

**Table 1.** Vessel effort for the two active vessels in the CSZF in 2021, from the commencement of the hook trial on 1 March 2021.

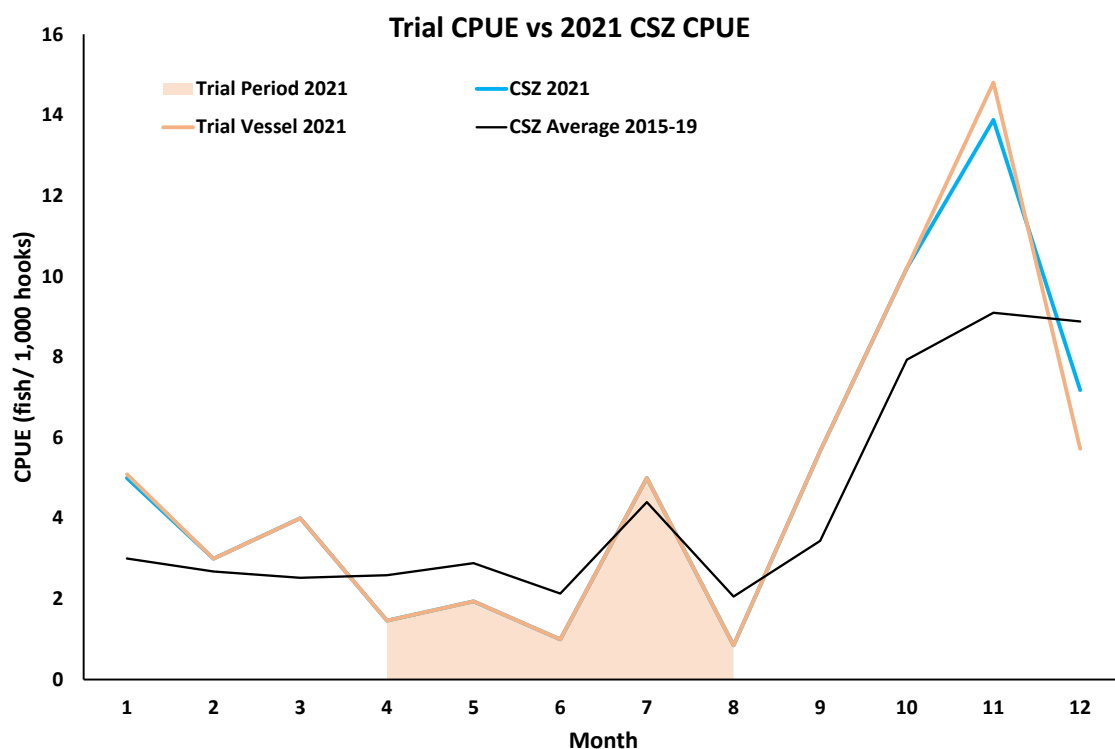
<b>Vessel 1</b>	Shots with ≤500 hooks			Shots with >500 hooks			All shots		
<b>Month</b>	N. days	N. shots	Total hooks	N. days	N. shots	Total hooks	N. shots	Total hooks	μ daily hooks
March	5	6	3,000				6	3,000	600
April				17	17	20,260	17	20,260	1,191
May	1	1	100	19	19	23,000	20	23,100	1,155
June				16	16	19,325	16	19,325	1207
July				17	17	19,800	17	19,800	1,165
August				16	16	18,225	16	18,225	1139
September	13	21	10,100				21	10,100	778
October	23	41	19,100				41	19,100	830
November	20	34	16,940				34	16,940	847
December	20	30	14,800				30	14,800	740
<b>Annual</b>	<b>82</b>	<b>133</b>	<b>64,040</b>	<b>85</b>	<b>85</b>	<b>100,610</b>	<b>218</b>	<b>164,650</b>	<b>985</b>

<b>Vessel 2</b>	Shots with ≤500 hooks			Shots with >500 hooks			All shots		
<b>Month</b>	N. days	N. shots	Total hooks	N. days	N. shots	Total hooks	N. shots	Total hooks	μ daily hooks
March	5	8	3,900				8	3,900	780
April									
May									
June									
July									
August									
September									
October									
November	5	8	3,950				8	3,950	790
December	13	25	12,000				25	12,000	923
<b>Annual</b>	<b>23</b>	<b>41</b>	<b>19,850</b>				<b>41</b>	<b>19,850</b>	<b>863</b>

2. In **Figure 1**, the blue lines in both graphs represent average CPUE in the Coral Sea Zone for combined black and blue marlin discards, by month, during 2021. We understood that this average was for calculated over all vessels. In the figure on the right, the average CPUE is also shown just for the trial vessel – brown line. It was queried as to why the blue line (both vessels) and the brown line (trial vessel only) were the same for all months except the last two. It would seem highly unlikely that both vessels had exactly the same average CPUE for most months. Seems that some understanding is missing here.

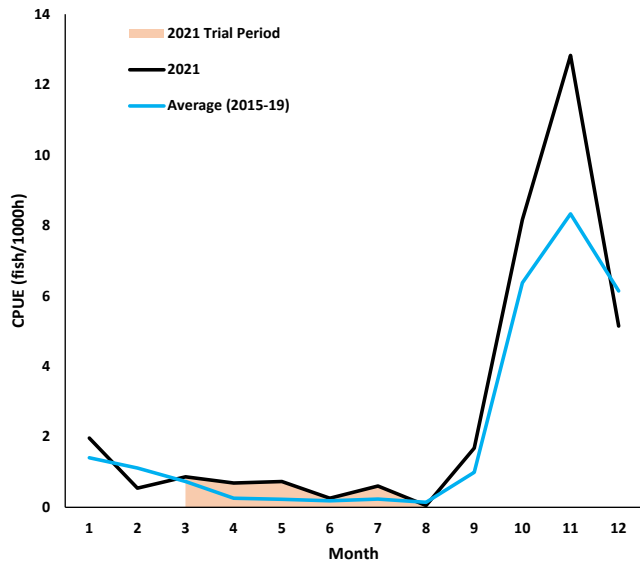
**AFMA response:** (Table 1) above illustrates that the second vessel active in the fishery only fished during March (56% of total fishery effort), November (19% of total fishery effort) and December (45% of total fishery effort). For this reason, the CPUE for the coral sea fishery, and the CPUE for the trial vessel are virtually identical until later in the year, though some divergence between the lines can also be seen in January. Nominal CPUE has also been recalculated in (Table 2) below.

**Figure 1.** Average CPUE in the Coral Sea Zone for combined black and blue marlin discards, by month, for the period 2015-2021, and 2021, showing the trial vessel, trail period relative to the 2021 CSZ CPUE.

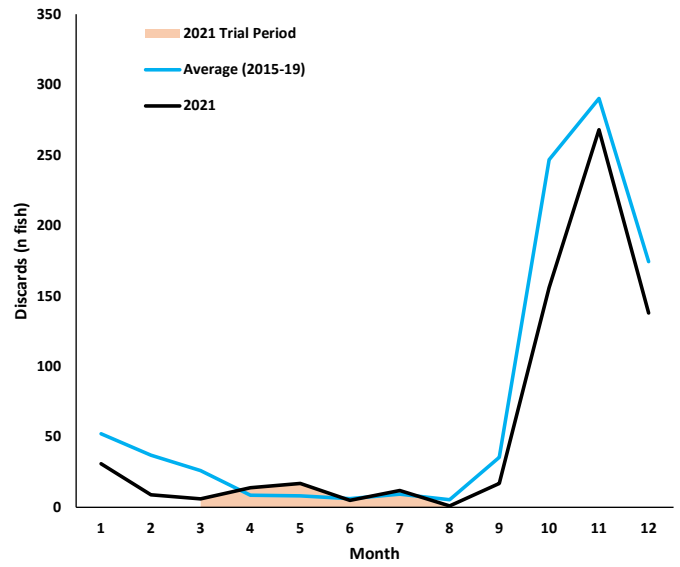


**Figure 2.** Recalculation of combined marlin CPUE incorporating all effort in the CSZF (not just those hooks from shots that saw interactions) results in slightly lower CPUE for marlin than previously shown, and flattens the peak previously seen in July.

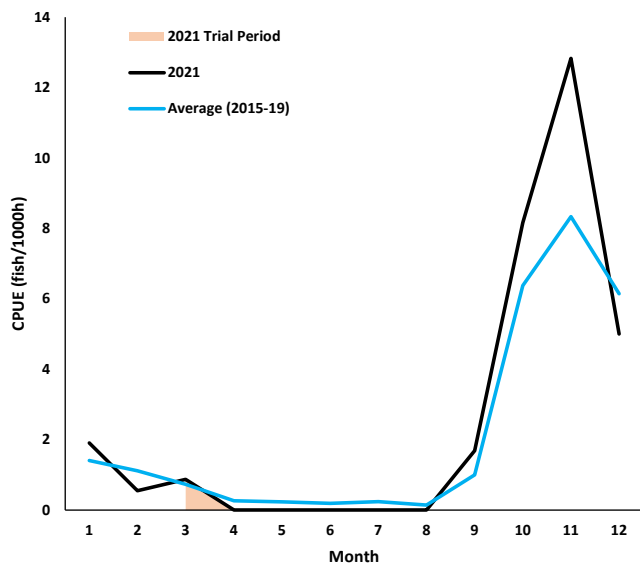
Average CSZ CPUE vs 2021 CSZ CPUE (all vessels)



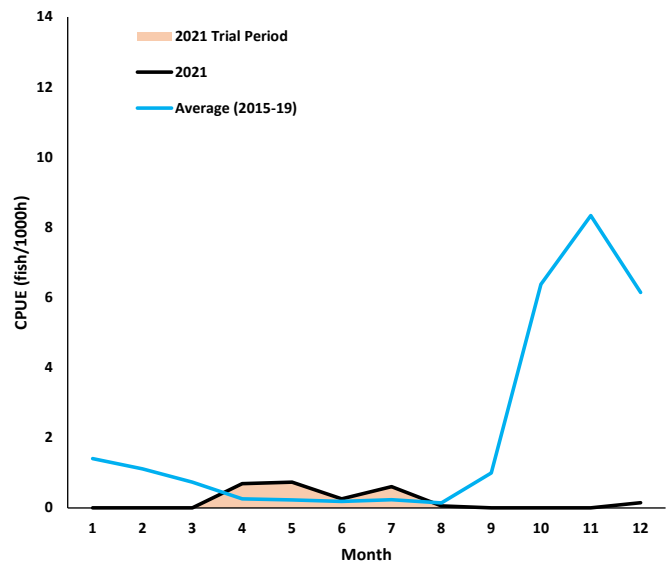
Average CSZ discards vs 2021 CSZ discards (all vessels)



Average CSZ CPUE vs 2021 CSZ CPUE ( $\leq 500h$ )



Average CSZ CPUE vs 2021 CSZ CPUE ( $>500h$ )



Interaction rates increase at the end of the year, with a peak CPUE of 12.83 seen in November 2021 (**Table 2**), which falls within the historical range for this month (max of 14.34 in 2018). This peak is associated with shots of <500h, and a fishery average of 818.5 hooks per day in that month.

**Table 2.** Recalculated monthly combined marlin CPUE in the CSZ from 2015-2021, and an indicated mean annual nominal catch rate for the period.

	2015	2016	2017	2018	2019	2021	Mean
<b>Jan</b>	0.54	0.84	1.14	1.92	2.60	1.97	<b>1.50</b>
<b>Feb</b>	0.38	0.90	1.05	1.71	1.55	0.55	<b>1.02</b>
<b>Mar</b>	0.15	0.88	1.19	0.64	0.81	0.87	<b>0.76</b>
<b>Apr</b>	0.12	0.82	0.18	0.03	0.15	0.69	<b>0.33</b>
<b>May</b>	0.22	0.45	0.18	0.20	0.10	0.74	<b>0.32</b>
<b>Jun</b>	0.29	0.33	0.14	0.15	0.04	0.26	<b>0.20</b>
<b>Jul</b>	0.23	0.24	0.31	0.18	0.22	0.61	<b>0.30</b>
<b>Aug</b>	0.09	0.10	0.30	0.07	0.16	0.05	<b>0.13</b>
<b>Sep</b>	1.54	0.42	1.48	0.44	1.11	1.68	<b>1.11</b>
<b>Oct</b>	9.06	3.33	7.34	3.76	8.39	8.17	<b>6.67</b>
<b>Nov</b>	9.09	2.77	6.31	9.17	14.34	12.83	<b>9.08</b>
<b>Dec</b>	11.46	2.34	3.05	7.82	6.06	5.15	<b>5.98</b>
<b>Mean</b>	<b>2.76</b>	<b>1.12</b>	<b>1.89</b>	<b>2.17</b>	<b>2.96</b>	<b>2.80</b>	<b>2.28</b>

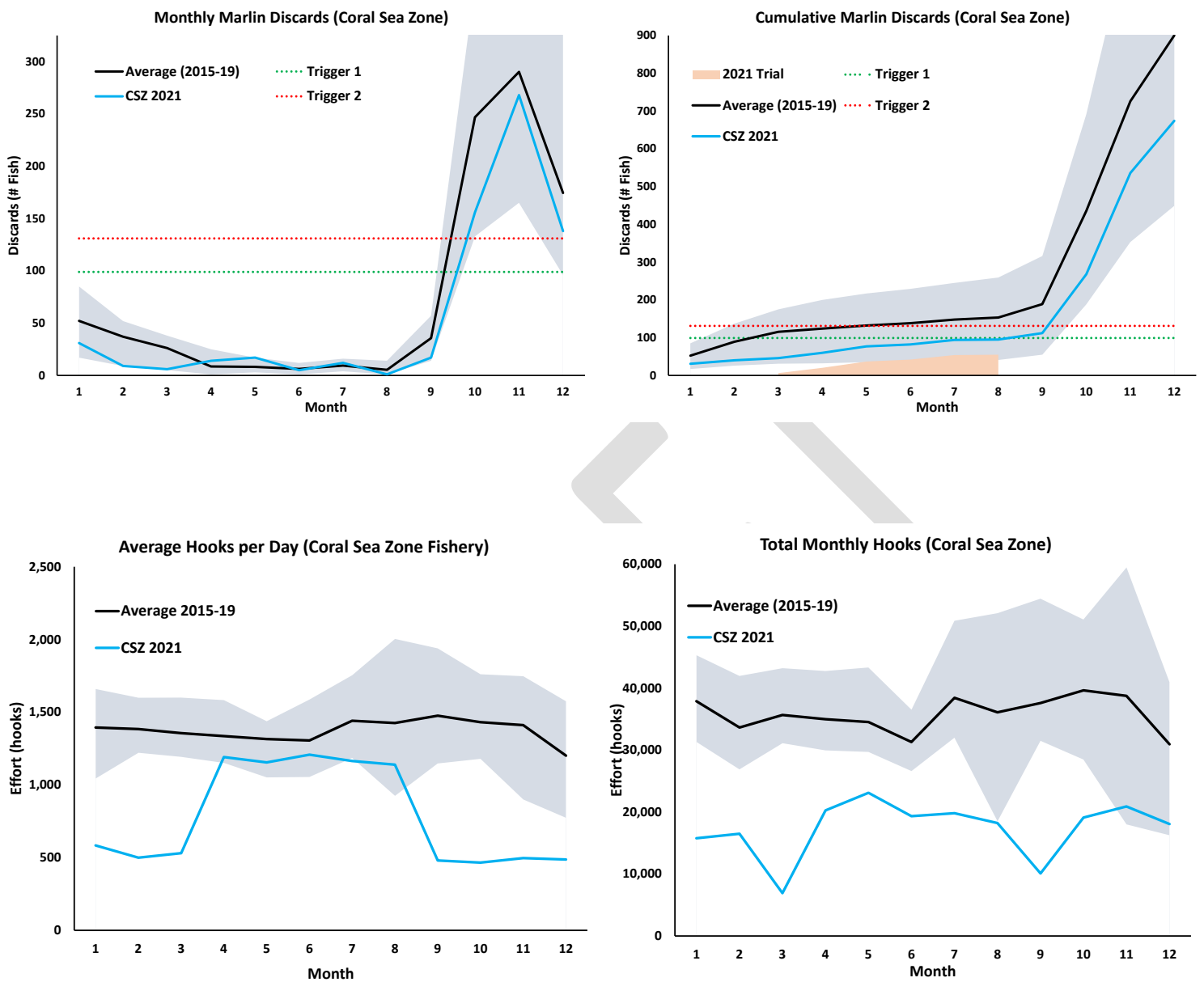
### 3. Effort, monthly & cumulative discards

**East of 148°E.** 2 shots of 1200h each were undertaken in April east of 148°E.

No discards (no interactions, reflected in industry's report that trips were generally short to meet supply chain limitations).

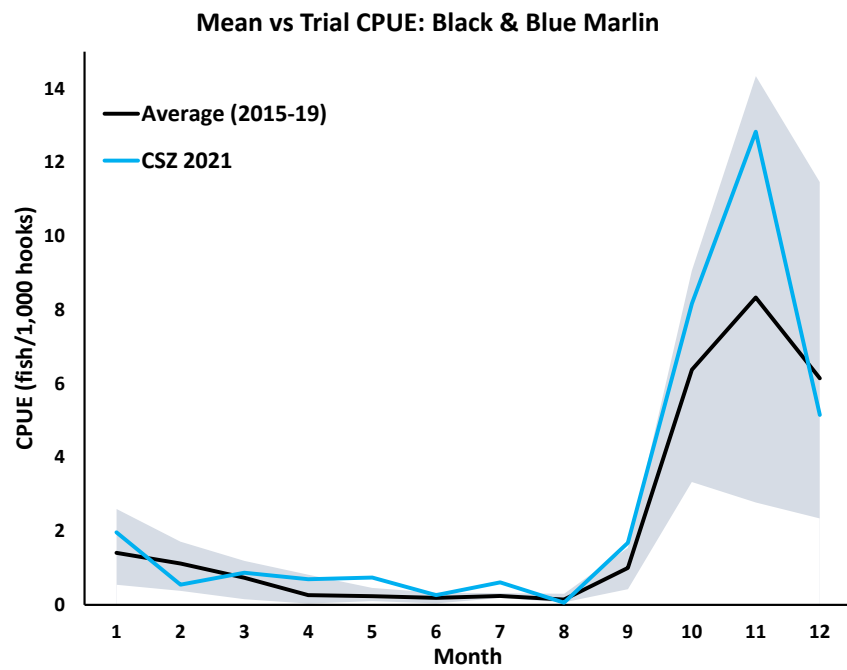
**West of 148°E. Figure 3 below.** 2021 total discards by month (black and blue marlin), monthly effort (total hooks), cumulative discards (including discrete 2021 trial period values), and CPUE (black and blue marlin, fish/1,000h) shown in comparison to 2015-19 averages (black line). Also shown are the values bounded by the minimum and maximum values recorded between 2015-19 (shaded area).

**Figure 3.** Effort, monthly and cumulative discards.





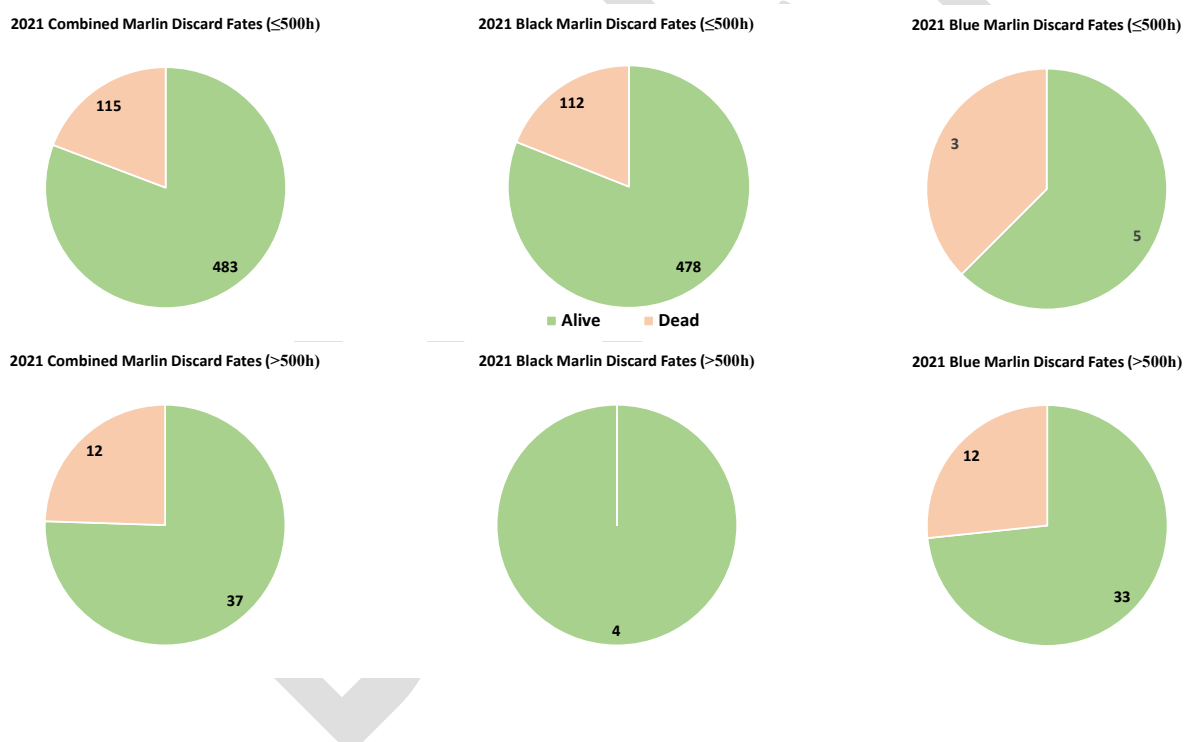
**Figure 3.** Effort, monthly and cumulative discards.



4. In Table 3 and Figure 3 again we understand these data are for all (both) vessels that fished in the CSZ in 2021 (i.e. not just the trial vessel) – is that correct? As a main focus is on billfish survivability, it would be useful to compare life-status for shots using  $\leq 500$  hooks and those using  $>500$  hooks. As such, could you provide tables and figures similar to Table 3 and Figure 3 but stratified by shots deploying  $\leq 500$  hooks and those deploying  $>500$  hooks.

**AFMA Response:** Figure 4 and Tables 3 & 4 below illustrate discard fates of blue, black and blue and black marlin caught on sets with  $\leq 500$  h and  $>500$ h to explore differences in life status outcomes. While shots of  $>500$ h had proportionally greater dead discards, the number of marlin interactions on these shots was low. The greater incidence of dead discards seen in shots of  $\leq 500$ h likely correlates with increasing CPUE seen in November.

**Figure 4.** Discard fates of blue, black and blue and black marlin caught on sets with  $\leq 500$  h and  $>500$ h to explore differences in life status outcomes 2021.



**Table 3.** Discard fates of blue, black, and combined blue and black marlin in the Coral Sea Zone. For 2021, the figures provided are available for trial – present, and whole year (in parentheses).

	Blue Marlin			Black Marlin			Combined Marlin			Total
	Alive	Dead	UnK	Alive	Dead	UnK	Alive	Dead	UnK	
<b>Mar-Dec '21</b>	37 (49)	15 (16)		473 (493)	109 (112)		510	124		634 (674)
-										
<b>2019</b>	105	26	13	768	244	14	873	270	27	1170
<b>2018</b>	25	29	31	344	85	85	369	114	116	599
<b>2017</b>	107	26	180	200	83	365	307	109	545	961
<b>2016</b>	111	30	135	47	10	283	158	40	418	616
<b>2015</b>	437	100		458	160		895	260		1155
<b>μ 2015-19</b>	157	42.2	89.75	363.4	116.4	186.75	520.4	158.6	276.5	955.5

**Table 4.** Discard fates of blue, black and combined blue and black marlin in the Coral Sea Zone in 2021. Note that figures vary slightly from that provided in Table 3, indicating an update to submitted logbook data since February 2022.

<b>2021</b>	<b>Blue Marlin</b>	<b>Black Marlin</b>	<b>Combined Marlin</b>
<b>≤ 500h</b>			
Alive	5	478	483
Dead	3	112	115
<b>&gt;500h</b>			
Alive	33	4	37
Dead	12	0	12
<b>All hooks</b>			
Alive	38	482	520
Dead	15	112	127

## Working Group #4 Outcomes

### Trial Results

#### Effort reported during the trial compared to the baseline period

In total, three vessels fished in the CSZ in 2022 compared with only two in 2021. During the baseline period an average of three vessels fished in the CSZ (**Table 1**). Total sets and hooks deployed during trial period were significantly lower than the baseline period average (**Table 1**). Consistent with the baseline period most sets were deployed west of 148°E during the trial (**Table 1**).

Two vessels set longlines with >500h during year one of the trial (2021) with only one vessel doing so in year two (2022) (**Table 1**). The total number of longline sets with > 500h varied from 91 in 2021 to 36 in 2022 (**Table 1**). This represents 39.4% and 22.5% percent of all shots set in the CSZ in 2021 and 2022 respectively (**Table 1**).

Of the total number of sets with >500h, 89 were set in the area west of longitude 148°E and 34 were set east of longitude 148°E (**Table 1**). In year one of the trial (2021) most >500h shots, had 1200 or more hooks (no more than 1250). In contrast, in year two (2022) most >500h shots had no more than 700h (**Table 2**).

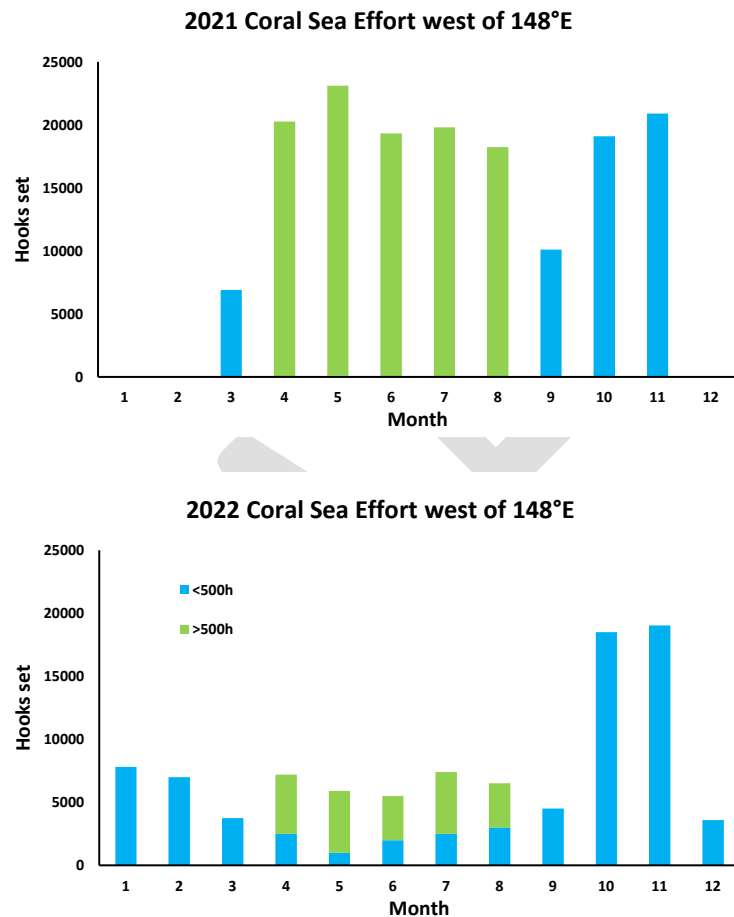
The monthly distribution of total hooks set west 148°E during the trial is shown in **Figure 1**. In year one of the trial, all hooks set between April and August were on longlines with greater than 500h. In contrast hooks set per shot varied from less than 500h to greater than 500h during those months in year 2 of the trial (**Figure 1**).

**Table 1.** Vessel numbers, hooks, total sets and sets with greater than 500h recorded during the baseline (2015-2019) and trial periods (2021 and 2022) in the CSZ.

	Baseline period annual average	2021 (total n)	2022 (total n)
Vessels fished	3	2	3
Hooks	427703	221160	102947
Total sets	867	322	200
# of sets west of 148°E	796	319	197
# of sets east of 148°E	71	3	3
# of vessels that set shots with >500h	Not applicable	2	1
Total # sets with >500h	Not applicable	91	36
% of sets >500h	Not applicable	39.4%	22.5%
# of >500h sets west of 148°E	Not applicable	89	34
# of >500h sets east of 148°E	Not applicable	2	2

**Table 2.** Comparison of number of hooks per set recorded in the CSZ during the trial period (2021 and 2022).

	≤500	600	700	800	850	900	1000	1050	1100	1175	1200	1210	1250	Total
2021	231	-	1	1	1	4	3	1	8	6	26	1	39	322
2022	164	11	23	-	-	-	-	-	-	-	2	-	-	200



**Figure 1.** Total monthly hooks set west 148°E each month during the trial years (2021 and 2022). Shots less than (blue bars) and greater than 500h (green bars) are shown.

### Total marlin interactions reported during the trial compared to the baseline period.

The total number marlin interactions (blue and black marlin combined) recorded during the trial was 641 for 2021 and 168 for 2022. During the baseline period the average annual number of interactions recorded in the CSZ was 955.5 (**Table 3**). The number of marlin interactions recorded on sets with greater than 500h during the trial period, was 55 for 2021 and 5 for 2022 (**Table 3**). This represents 8.6% and 2.9% percent of all interactions for 2021 and 2022 respectively (**Table 3**).

Of the total interactions that occurred when fishing west of 148°E (March to August), 54 were recorded during 2021 and 5 during 2022 (**Table 4**). This means that the tier one trigger (99 marlin for

fishing in the area west of longitude 148 degrees east during the period 1 March to 31 August was not reached in either of the trial years.

**Table 3.** Marlin interactions recorded during the baseline (2015-2019) and trial periods (2021 and 2022) in the CSZ.

	Baseline period annual average	2021 (total n)	2022 (total n)
Total interactions	955.5	641	168
Interactions <500h	Not applicable	585	163
% interactions on sets <500h	100%	91%	97%
Interactions on sets >500h	Not applicable	55	5
% Interactions on sets >500h	Not applicable	8.6%	2.9%

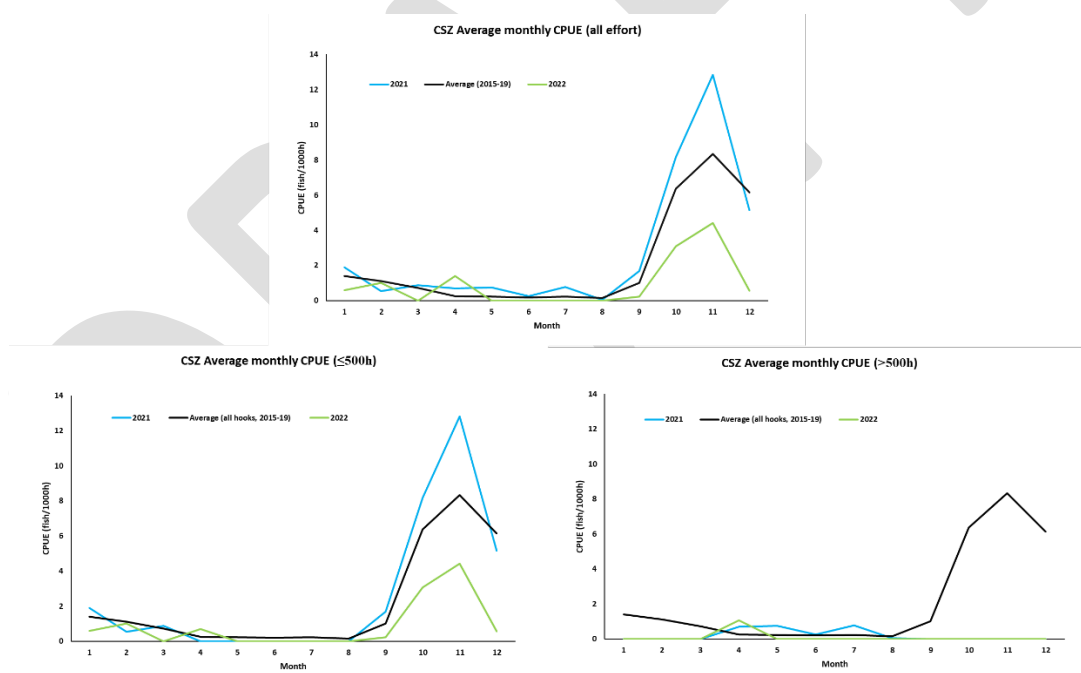
**Table 4.** Combined marlin interactions recorded on sets with less than or greater 500h, east and west of 148°E annually during the CSZ trial.

	2021		Total	2022		Total
	Sets with <500h	Sets with >500h		Sets with <500h	Sets with >500h	
West of 148°E	585	54	639	163	5	168
East of 148°E	0	1	1	0	0	
<b>Total</b>	<b>640</b>			<b>168</b>		<b>168</b>

## Marlin interaction rates reported during the trial compared to the baseline period (marlin interactions per 1000h)

The average monthly marlin interactions recorded per 1 000h (blue and black marlin combined) remained around the baseline average between January and August during the trial (**Figure 1**). During the trial years the average monthly marlin interactions were higher than baseline between October to December in 2021 but lower than baseline for the same months in 2022 (**Figure 1**).

**Figure 2.** Average nominal marlin CPUE (marlin interaction per 1000h) for the CSZ during the baseline period (2015-2019) compared to the averages for trial period (2021 and 2022) for: a) all shots; b) shots with hooks less than 500h; c) shots with more than 500h.



## Marlin discards fates reported during the trial compared to the baseline period

The recorded discard fates for all marlin interactions reported in the CSZ during the baseline and trial periods are shown in **Table 5**. During the baseline period on average, 54.4% of marlin discarded were reportedly alive. Compared to the baseline period, the relative proportion of marlin discards reported alive was higher with 80.6% and 61.9% of total marlin discards being record as alive in 2021 and 2022 respectively. Further during the trial years, the relative proportion of marlin discards reported alive was higher on sets with greater than 500h compared with sets with less than 500h (**Table 5**). The proportion of unknown fates for marlin discards were significantly lower during the trial compared to the baseline period (**Table 5**).

**Table 5.** Discard fates of blue marlin, black marlin, and combined marlin (blue and black marlin) caught in the CSZ during the baseline (2015-2019) and trial periods (2021 and 2022). Unk = Unknown.

	Blue Marlin			Black Marlin			Combined Marlin			Total
	Alive	Dead	UnK	Alive	Dead	UnK	Alive	Dead	UnK	
Baseline average	157	42.2	89.75	363.4	116.4	186.75	520.4 (54.4%)	158.6	276.5	955.5
Mar-Dec <sup>5</sup> '21	43	15	0	473	109	0	516 (80.6%)	124	0	640
2022	32	37	1	72	26	0	104 (61.9%)	63	1	168

**Table 6.** Discard fates of blue marlin, black marlin, and combined marlin (blue and black marlin) caught on sets with less than and greater than 500h during trial period (2021 and 2022). Totals (n) are without brackets and proportions are given within bracket.

	2021		2022	
	Sets with <500h	Sets with >500h	Sets with <500h	Sets with >500h
Alive	516 (82%)	43 (95.5%)	100 (61.3%)	4 (80%)
Dead	112 (18%)	2 (4.4%)	62 (38%)	1 (20%)
Unknown	0	0	1 (0.6%)	0
<b>Total</b>	628	45	163	5

## Size class information

At the first meeting of this WG, it was agreed that in addition to life status, size data would also be recorded to aid the WG to explore impact levels on juvenile fish. Whilst fishers have provided comments on other observations such as depredation by sharks and whales, size data is yet to be provided<sup>6</sup>. In addition to working with fishers to encourage size reporting, AFMA will investigate options to amend the e-log pro-forma to assist fishers report size information. Amending an e-log however can take up to 6 months.

<sup>5</sup> Trial commenced 1 March 2021

<sup>6</sup> At the CSZ Hook Trial Working Group meeting #4, AFMA advised that size class data, used to measure interactions with either juvenile or adult marlin, had been submitted by fishers during the trial however in error, AFMA had not extracted the data in its latest data query. AFMA advised that a summary of the size class data would be provided to Working Group members out of session.



## Next steps

The intended two-year trial period has concluded. It is necessary for the Tropical Tuna RAG and MAC to consider the outcomes of the trial. This will be undertaken throughout 2023 and possibly into 2024 (if appropriate, two years allows time to develop and consult on any management options). Subject to advice from the WG, AFMA recommends that the trial continue in its current form (retain working group and arrangements) during this time (2023 and 2024) on the basis that:

- extending the trial, it will allow ongoing data collection; and
- the trial has safeguards in place to minimise impacts on marlin (catch based management triggers, together with an annual stakeholder review process).

A key aspect of the trial review will be to assess whether the data collected further informs us on the likely risks with changing the hook limit (noting the original purpose of the hook limit) and whether the information now available is sufficient to support a management decision to change or retain arrangements and/or collect more data. As part of the review, the following should be examined:

- a) the potential for the management arrangements adopted in the trial which combined input and output measures, to achieve the same objective as the current hook limit; and
- b) as far as possible, risks associated with changing the hook limit compared with those that might be associated with a general increase in overall effort. This will assist in identifying management needs once the efficacy of existing management arrangements in the fishery including the AFMA's Ecological Risk Assessment/Ecological Risk Management framework, and bycatch/TEP arrangements are taken into account.