21Coral Sea Zone Hook Trial Annual Review
Discussion Paper
Small Working Group meeting # 4

15 February 2023

Meeting Objectives

1. For the Working Group to **consider**:
    a. an update to be provided by members in-session on recreational and commercial fishing effort trends in the Coral Sea Zone (CSZ); and
    b. results of the two-year CSZ Hook Trial compared to the baseline period (2015-2019) as detailed in this paper.
2. Having considered (1) above, for the Working Group to **provide advice** on the key outcomes of the two-year CSZ Hook Trial.
3. For the Working Group to **provide advice** on whether the CSZ Hook Trial should continue in its current form (retain working group and trial arrangements) for the next two seasons (2023 and 2024) whilst the Tropical Tuna RAG and Tropical Tuna MAC evaluate the trial outcomes and consider any next steps in assessing the industry proposal and developing future management options if applicable.

Trial overview

Need

In March 2020 AFMA received an industry request to vary the current longline boat SFR conditions in the CSZ of the ETBF to remove the hook limit per longline shot except between September to February west of longitude 148^0E. The current maximum limit is 500 hooks (h) per shot, at all times. Industry advise 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 advise marlin do not feed at night and are therefore less susceptible to being caught; or
- deep setting (>200m) for albacore, yellowfin and bigeye. In their submission industry highlighted that research has shown that less marlin interactions occur when setting deeper than 75 meters.

Objective of current 500 maximum 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 set up in the mid-1980s (and extended in area in 1991) to reduce longline fishing impacts on marlin availability to the Queensland game fishery 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.

Purpose

In considering the industry proposal TTRAG and TTMAC[1] considered whether the proposal would, if implemented, impact on black and/or blue marlin stock sustainability and potential impact/risks to non-target species, including protected species, given available Ecological Risk Assessment, stock status and catch per unit effort and protected species interactions (**Attachment B**).

TTRAG advised at its meeting on 12-13 October 2020 (meeting 30) that a trial of the proposal would be the best way to assess the gather additional information to help better assess the potential implications of the proposal were it to be implemented on a more permanent basis in future. TTRAG also noted that there is temporal variability in fishing conditions in the area and therefore any trial should be for at least two years and designed with appropriate parameters that are both precautionary and allow for the collection of key data that is needed.

At its meeting in October 2020 (meeting 24), TTMAC recommended that a two-year trial, with sufficient safeguards to ensure Blue and Black Marlin interactions are managed be implemented from early 2021.

Trial arrangements

In line with recommendations from TTMAC (meeting 24) the current working group was formed to determine the exact specifications of the trial. The WG has met three times[2] to both agree the trial arrangements and monitor progress. To date the WG has annually reviewed 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 limit per longline shot.
    - a maximum of 1200 hooks per day may be set in the area of the CSZ east of longitude 148^0E, regardless of the number of longline sets undertaken.
    - a maximum 1200 hooks[3] per day may be set between the period of 1 March and 31 August in the area of the CSZ west of longitude 148^0E, regardless of the number of longline sets undertaken.
    - no more than 500 hooks per longline may be set in the area of the CSZ west of longitude 148^0E between September to February.

[1] TTAMC 22, TTMAC 24, TTMAC 25, TTRAG 27, TTRAG 30

[2] 19 November 2020, 23 June 2021, 3 February 2022

[3] 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.

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[4].

3. Two-tier marlin catch trigger for fishing in the area west of longitude 148^0E during the period 1 March to 31 August.

   Rules

   Within a trial year, if the number of marlin interactions recorded in the area west of longitude 148^0E 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 to be 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 trial (2021)		Year two of trial (2022)
	Blue Marlin	Black Marlin	Marlin (blue and black combined)
First Tier	34	65	99
Second Tier	45	86	131

   Note the tier levels were calculated based on the seasonal average of marlin interactions recorded from March to August between 2016-2019 west of longitude 1480E. Tier one is twice the four-year (2015-2019) average whilst Tier 2 is 75 % of 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 20kg) will be collected during the trial, facilitated through the new e-log software and verified through e-monitoring.

[4] Working Group meeting # 3, 3 February 2022

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^{0}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^{0}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^{0}E	796	319	197
# of sets east of 148^{0}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^{0}E	Not applicable	89	34
# of >500h sets east of 148^{0}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**

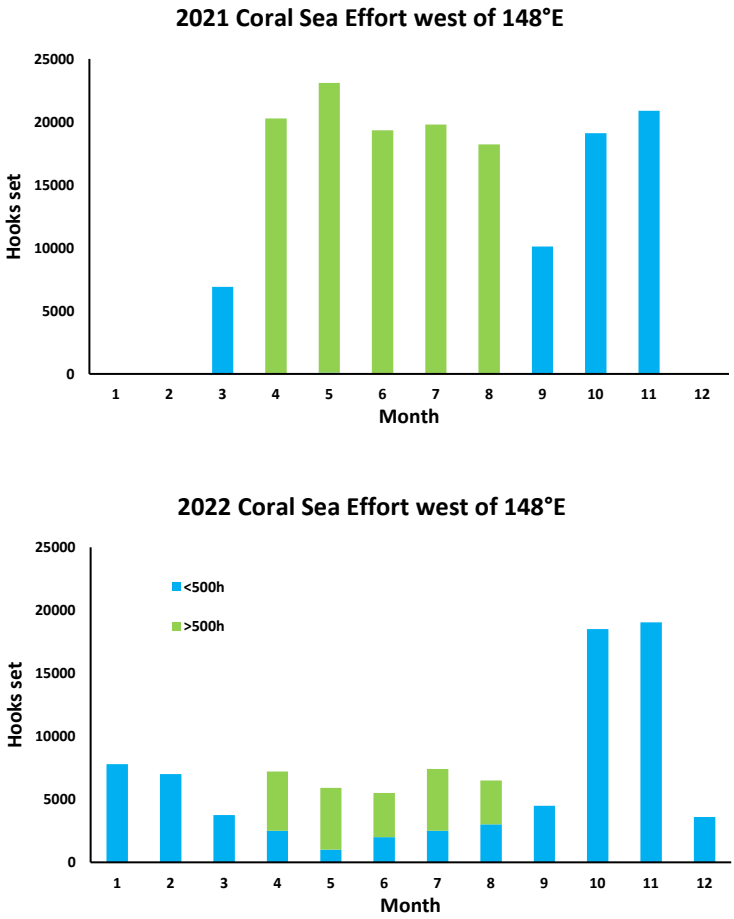


Figure 1. Total monthly hooks set west 148^0E each month during the trial years (2021 and 2022). Shots less than (blue bars) and greater than 500h (green bars) are shown.

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 148^0E (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%

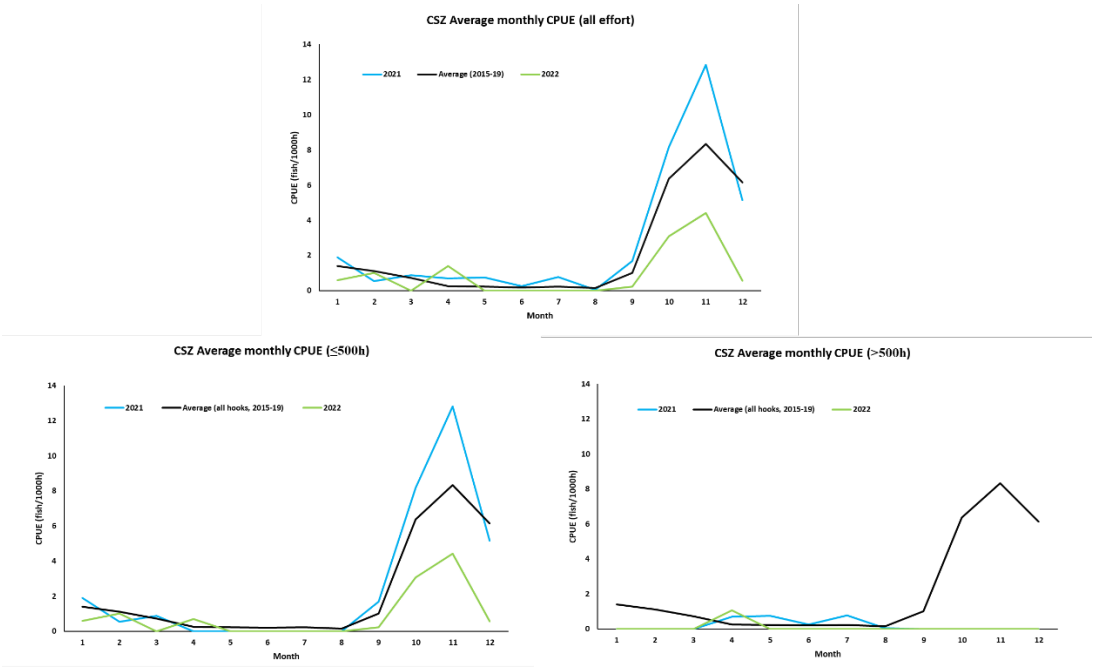
Table 4. Combined marlin interactions recorded on sets with less than or greater 500h, east and west of 148^0E annually during the CSZ trial.

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

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 yeas 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			
	Alive	Dead	UnK	Alive	Dead	UnK	Alive	Dead	UnK	Total
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[5] '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
Total	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[6]. 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.

[5] Trial commenced 1 March 2021

[6] 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.

Attachment A

Trial Proposal letter from operators

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 theCoral 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 maintaineconomic 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 oflongitude 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 usto amend the 500-hook condition.

This issue will be considered at the next Tropical Tuna Management Committee meeting scheduledfor 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,

Attachment B

TTRAG27 (June 2020) CSZ Outcomes

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

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

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

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

Potential implications for black and blue marlin and protected species

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

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

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

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

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

- It is difficult to predict potential impacts without having explored a range of scenarios of possible effort and catch changes and their impacts on total mortality of both species. Mortality estimates should potentially include consideration of at haul mortality and condition (including set time

impacts on this), during set cryptic mortality (e.g. depredation by false killer whales potentially increasing with increased set times), and post release mortality. They should also account for spatial and temporal differences in catches and catch rates from historic data and different effort scenarios from increasing effort by current active CSZ vessels (3) to all CSZ licenses (11) being actively used in the CSZ. It was noted CPUE for black marlin is highest in the CSZ so effort increases would have larger impacts on total ETBF black marlin catches, than relative to blue marlin impacts.

- Scenarios could consider impacts of variations on the current proposal – for example, expanding the hook limit period to include January and February, which have similar CPUE to already proposed month of September.
- Consideration of whether the ERA should be rerun for these species under the above scenarios.
- The proportional change of increased effort could be higher for black marlin as CSZ CPUEs and proportion ETBF catches in CSZ are higher for this species.
- Localised depletions may be a concern that requires consideration, including with respect to charter/recreational strike rates.
- It is important to consider annual variability in monthly catch proportions not just the average over multiple years (e.g. up to 50% of blue marlin catch is outside proposal area/months in some years).
- Any amended arrangement should be upon agreement of both sectors and implementation should potentially be done in a stepwise manner with monitoring/assessment of impacts (on commercial catch/mortality levels and potentially charter strike rates) pre and post implementation.

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

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

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

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

- **Seabirds** – The AFMA paper noted that the area of the proposal is north of the main seabird interaction area and it is therefore unlikely that there would be significant increase in seabird interactions as a result of fishing effort increasing by vessels already fishing in the area. It is possible that if fishing effort shifted from further south to the CSZ, a lowering of total interactions with seabirds in the ETBF could result. However, proper examination of relevant data and information should be undertaken to examine these assumptions. A scientific member noted scientific surveys in the mid-1990s that supported the very low level of seabird interaction in that region.
- **Sea turtles** – The AFMA paper noted it is uncertain if an increase in fishing effort by current CSZ vessels or from shifting of effort by other vessels into the CSZ could lead to an increase in turtle interactions, and therefore increased the risk to local sea turtle populations. As such, this could be considered further through examination of spatial and seasonal trends in interactions rates of sea turtles (where possible by species) through the ETBF relative to the CSZ, and considerations of implications for interaction levels

under different plausible CSZ future fishing effort levels. A scientific member noted that leatherback hotspots are further south than the CSZ but areas of relatively high green turtle interaction do occur in the CSZ and that longline fishing method factors (e.g. lightsticks and fishing depth) may be influential.

- **Marine mammals** – The AFMA paper noted that by comparison to seabirds and sea turtles, marine mammal interactions are relatively rare throughout the ETBF, so AFMA does not expect the proposal to impact on marine mammal populations. However, this should be examined through available data summaries and presentation to TTRAG/TTMAC regarding relative interaction rates inside and outside the CSZ, as per the sea turtles analysis recommended above.

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

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

Further information, data or scientific research needed

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

1. For black and blue marlin and protected species (particularly sea turtles), an analysis of the range of potential changes in likely catches and mortalities that might occur as a result of a range of potential and likely changes in fishing effort in the CSZ. This should take into account the most up to date and relevant information on:
    - at haul life status (condition and mortality),
    - post release mortality,
    - potential cryptic mortality (e.g. depredation impacts, if possible),
    - the potential implications of extended soak time (due to more hooks per set) on both of the above,
    - a range of effort change scenarios, from no change, to current active CSZ vessel increases, to increased numbers of CSZ licensed vessels operating (up to 11), and
    - consideration of both potential individual season and average season effects.
2. Extension of the above analyses to provide information on how estimates might change under a range of modified proposals/arrangements – for example – extending the hook limitation period to include January and February. TTMAC could assist in identifying the scenarios to explore. Extension could potentially include analysis of potential ecological risk under the proposal via ERA Level 2 tools.
3. For black and blue marlin – consideration of the need for information pre- and post- implementation of any new arrangements to assess the impacts of the arrangements on charter vessel strike rates in the CSZ (including potential localised depletions).

4. Further information from industry on how the proposal might improve economic efficiency for ETBF fishing operations in the CSZ.
5. TTRAG should also consider what monitoring would be required to assess the impacts of any revised arrangements upon marlin and protected species.

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

TTRAG 30 October 2020 CSZ Outcomes

Coral Sea proposal - indicators and data review

Under this item, the RAG discussed the industry proposal to restrict the 500 hook limit condition on longline fishing in the Coral Sea Zone (CSZ) to the area west of 148^{o}E during the period of 1 September to 31 December each year.

The RAG noted the background to the proposal where:

- Currently, AFMA requires operators must only fish 500 hooks or less per shot. This condition was implemented to reduce soak time and increase Black and Blue marlin survivability at haul and post release.
- At TTRAG 27, AFMA provided maps of the area of the CSZ and the distribution of where Black and Blue Marlin have previously been caught, as well as catch by month for each of the species that showed the bulk for both species is between October and December.
- TTRAG 27 information provided to the RAG also showed that the CSZ catch of Blue Marlinis a relative low proportion of the total ETBF where as CSZ Black Marlin is a relatively high proportion of the total ETBF catch. It was further noted in the AFMA summary that the ERA outcomes for both species resulted in them being low risk.
- In TTRAG's analysis of the proposal, the RAG suggested that for Black and Blue marlin and protected species (particularly sea turtles), an analysis of the range of potential changes in likely catches and mortalities that might occur from potential changes in fishingeffort in the CSZ under the proposal should be done. The RAG suggested a number of factors (such as life status of interactions, post release mortality, and a range of effort scenarios) be included in the analysis.
- TTMAC22 supported the TTRAG27 proposal for further analysis to support development of advice on this matter, with that advice to be then provided to TTMAC to support its further consideration of the industry proposal.

The RAG was asked to consider and discuss a subsequent analysis (provided at Agenda item 4.1a) on how varying fishing effort scenarios may impact the level of interactions with Black and Blue marlin in the CSZ. The RAG noted that not all the factors they suggested be considered at TTRAG27 were able to be included in the analyses.

For the purposes of the analyses presented, the level of future potential fishing effort in the CSZ, under the industry proposal (and variations upon that) was considered to be a product of:

- The number of boats
- The number of months in which 500 hook rule does not apply
- The number of hooks set per shot (in months when the 500 hook limit does not apply)
- The number of sets per day
- The number of days fished per month

The analysis examined three potential variations in each of three of these factors only, being:

- Number of boats fishing:
    - 3 (status quo),
    - 7 (mid-range) and
    - 11 (all CSZ Boat SFRs utilised)
- Number of months (in which the 500 hooks limit does not apply):
    - 4 months (May-Aug)
    - 6 months (Mar-Aug)
    - 8 months (Jan-Aug)

Note –the industry proposal is for 8 month application when the 500 hook limit does not apply, TTRAG noted that variations (extensions) on this should be explored to cover extended periods of high CPUE for blue marlin in particular. Hence consideration of 4 and 6 months.

- Number of hooks per set:
    - 1200 (intended hooks/set by industry proponent)
    - 1500 (mid-range)
    - 1800 (ETBF average – Campbell 2020)

The key results and conclusions include the following:

- Overall, the key drivers of significant change in the relative levels of likely longline interactions with black and blue marlin is increasing the number of vessels and increasing numbers of hooks per set. Increasing the number of months of application of the 500 hookrule has a lesser impact on minimising increases in interactions that might occur under theproposal. This is particularly so for black marlin, due to the months of high CPUE for that species occurring mainly within the core 4 month period in which the 500 hook limit is proposed to apply. This is somewhat less the case for blue marlin.

- If the core industry proposal (8 months with no hook limit, fishing 1200 hooks per set1 or per day) is applied, for only three vessels that have historically fished the area, the analysis estimates a potential increase by 8% in annual black marlin interactions and by 18% for blue marlin interactions, relative to the baseline. The increase is due predominantly to the higher estimated fishing effort per day fished per vessel (1200 hooks versus ~750 hooks/day previously on average). For blue marlin, the increase is higher due to relatively higher CPUEs outside the September-December period in which the 500 hook limit applies. These estimated increases drop to 1% (black marlin) and 5% (blue marlin), if the 500 hook limit is removed for only 4 months (May-August).

- If the above scenario is modified to include all 11 vessels fishing at the same monthly effort levels (1200 hooks/set and 8 months with no hook limit) then the estimated interactions increase by 63% (black marlin) and 136% (blue marlin).

- These increases are by 100% (black marlin) and 218% (blue marlin) if hooks per set increased to the ETBF average of 1800hooks (and 11 vessels). This is effectively the "worst case" scenario of those examined.

- However, for that scenario (11 vessels and 1800 hooks/set) the increase is only by 11% (~84 fish) for black marlin, and 59% (186 fish) for blue marlin, if the period without 500 hooklimit is restricted to four months.

In considering the outcomes of the analysis, the key points discussed by the TTRAG were that:

- Scaling each of the factors (number of boats, hooks set and months fished) gives a varying result in the percentage increase of interactions for both blue and black marlin.
- There is interannual variability in the average catch rates in blue and black marlin however the analysis has used the average CPUE per month (across 5 years for each month) so the resulting figures should be interpreted within that context.

- While the analysis focuses on the CSZ, changes to spatial effort (e.g. translocation of effort) generally may influence the number of interactions in the ETBF as a whole (i.e. effort shifting to the CSZ may reduce interactions elsewhere in the fishery).

- It is difficult to predict whether all 11 boats that are licensed to fish in the CSZ would increase their effort if current restrictions were to change, and overall, there is not enough information to predict what the likely impact would be if the 500 hook restriction is lifted on apermanent basis.

In addition, the recreational member noted that the recreational fishery may see value in quantifying their current strike rate as a baseline if they choose to explore whether there are effects on recreational catches resulting from the proposal in the future (assuming the proposal is endorsed).

TTRAG Recommendation:

The RAG agreed that a trial of the proposal would be the best way to assess the gather additional information to help better assess the potential implications of the proposal were it to be implemented on a more permanent basis in future. The trial should aim to collect key data on factors that remain uncertain, and the trial should be designed by considering:

- The specific circumstances that would result in the cessation of the trial (e.g. if interactionlevels were considered to have significantly increased beyond was is deemed acceptable).
- The number of boats that would be permitted to participate in the trial (e.g. all boatslicensed to fish in the CSZ or a subset of those)
- Whether there is an upper limit for the number of hooks that can be set during the trial andwhich months the current 500 hook limit would continue to apply.
- The type of data collection and monitoring that would accompany the trial (e.g. increasedreview of electronic monitoring, observer coverage, additional data fields collected etc.)
- The length of the trial (where the RAG noted too short time frame may not result

inenough information to assess the outcomes).

- What is achievable under a trial, and what a successful trial looks like.

It was agreed that the RAG's recommendation of proceeding with a trial be presented to TTMAC, and if endorsed, a sub-group be formed to design the trial with appropriate parameters that are both precautionary and allow for the collection of key data that is needed to look at some of the uncertain factors that have been identified.

TTMAC 24 – October 2020 CSZ Outcomes

1. Under this agenda item, TTMAC discussed the industry proposal to restrict the 500 hook limit condition on longline fishing in the Coral Sea Zone (CSZ) to the area west of 148^{o}E during the period of 1 September to 31 December each year.

2. TTMAC noted that it had previously considered the proposal at TTMAC 22, where it was agreed to seek additional advice from TTRAG. AFMA and TTRAG have since provided additional analysis and advice on the potential implications of the proposal to the MAC.

3. The AFMA member explained all fishing effort in the Coral Sea Zone in recent years has been conducted by the three boats owned by the Lamason's, a company which maintains very good relations with local game fishers and charter owners.

4. TTRAG advice concluded that a trial of the proposal would be the best way to assess the gather additional information to help better assess the potential implications of the proposal were it to be implemented on a more permanent basis in future. TTRAG also noted that there is temporal variability in fishing conditions in the area and therefore any trial should be for at least two years and designed with appropriate parameters that are both precautionary and allow for the collection of key data that is needed.

5. Subsequent to the TTRAG meeting, AFMA arranged a meeting between Rowan Lamason, David Ellis, Grahame Williams and Ian Bladin to consider the options. This meeting also supported a two year trial with suitable hook limits of around 1,200 to 1,500 per shot), time limits (the trial west of 148 could only use more hooks between either January-August or April- August) and interaction limits with blue and black marlin (which will depend on the time period chosen).

6. Participants at the meeting reported to the MAC that a high degree of co-operation characterised the meeting and also made suggestions regarding suitable candidates for scientific members to sit on the proposed Small Working Group for the Coral Sea Zone hook trial. Suggestions included: Dr Julian Pepperrell, Dr Rob Campbell or other CSIRO scientist.

7. TTMAC agreed that a two-year trial, with sufficient safeguards to ensure Blue and Black Marlin interactions are managed be implemented from early 2021; and

8. To form a small working group to determine the exact specifications of the trial.

Action item 2: Coral Sea Zone hook proposal

2.1 TTMAC agreed that a two-year trial, with sufficient safeguards to ensure Blue and Black Marlin interactions are managed be implemented from early 2021; and

2.2 To form a small working group to determine the exact specifications of the trial.

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 **1,250 hooks** 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^{o}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 **life status and size data** 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 (≤500h 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

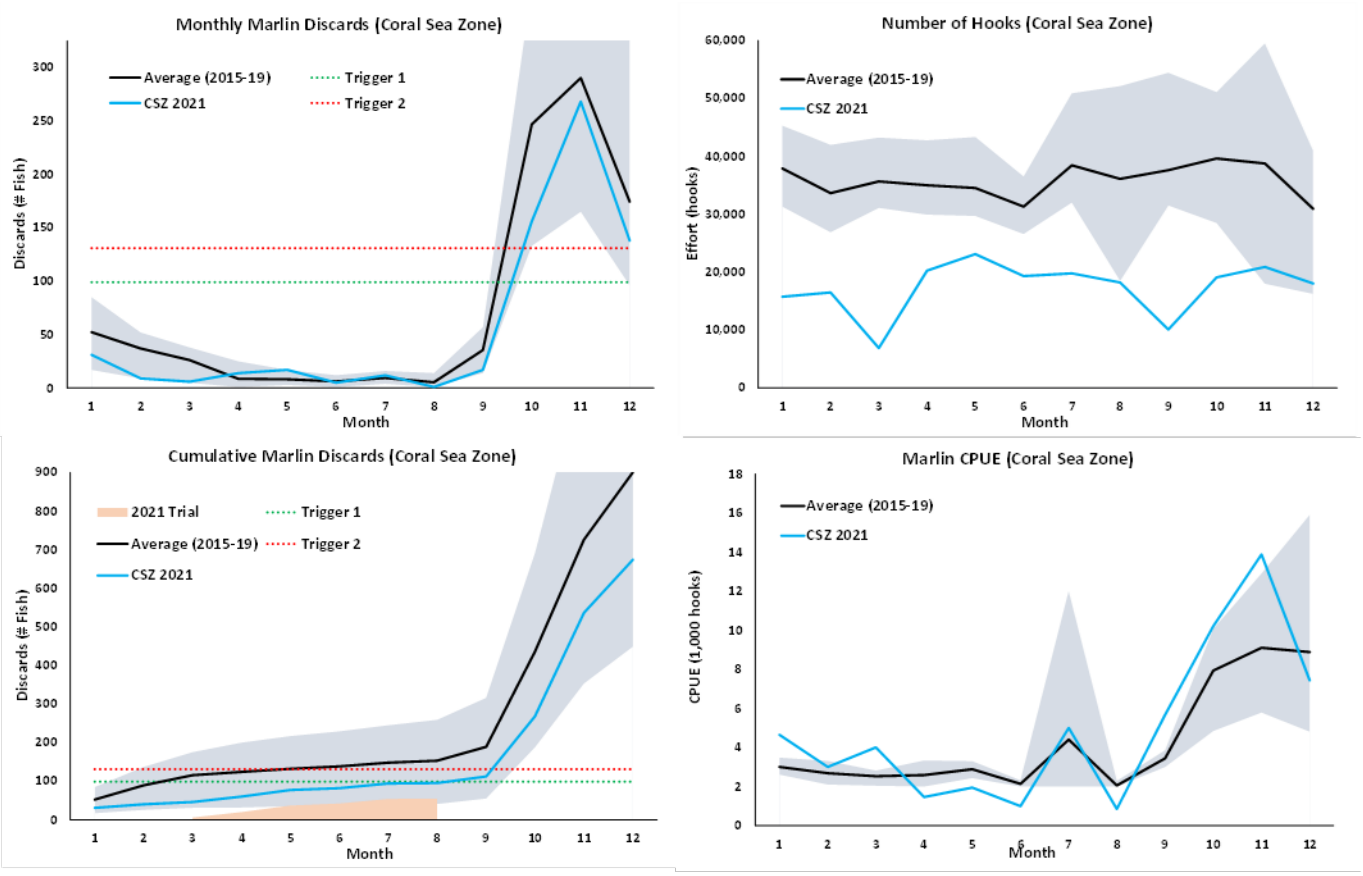
Attachment A: REQUEST FOR FURTHER INFORMATION

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 the 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 <=500hooks 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 <=500hooks 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.

Vessel 1	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	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
Annual	**82**	**133**	**64,040**	**85**	**85**	**100,610**	**218**	**164,650**	**985**

Vessel 2	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	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
Annual	**23**	**41**	**19,850**				**41**	**19,850**	**863**

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.

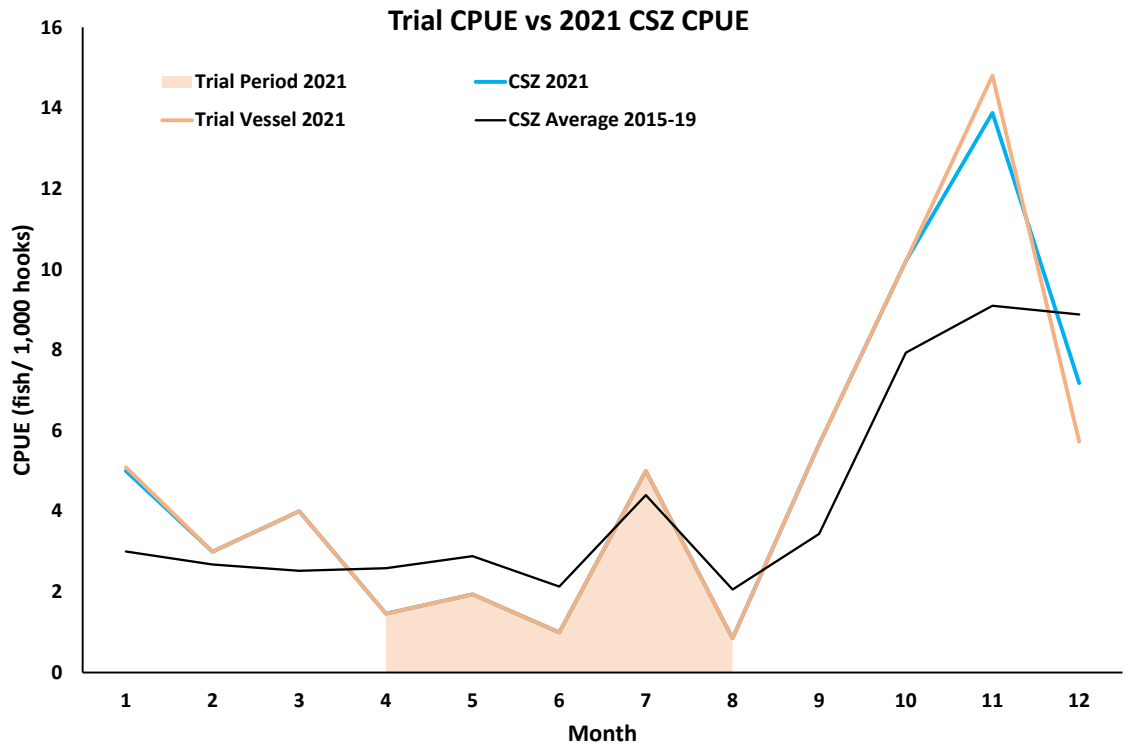
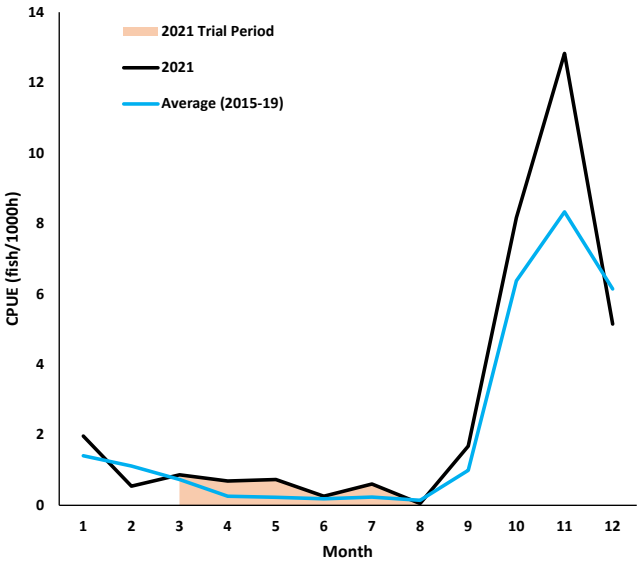
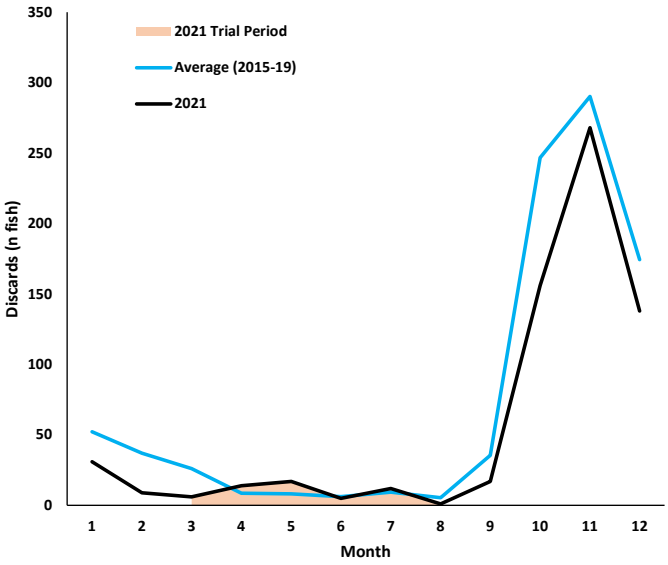


Figure 2. Recalculation of combined marlin CPUE incorporating all effort in the CSZF (not just those hooks from shots that saw interactions) results in slightly lower CPUE for marlin than previously shown, and flattens the peak previously seen in July.

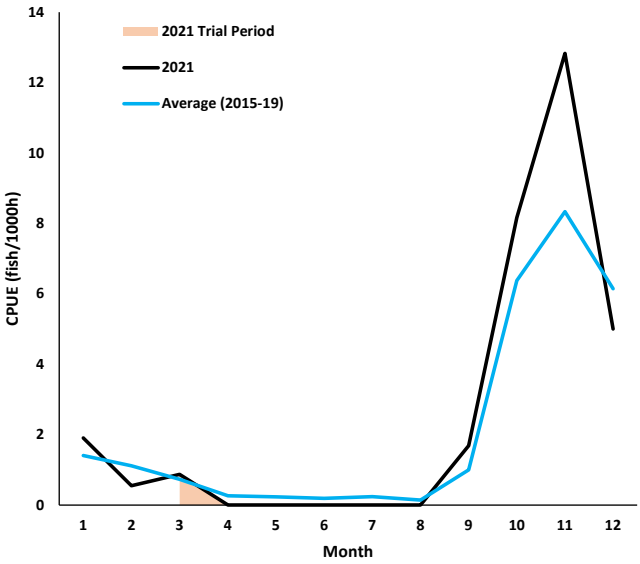
Average CSZ CPUE vs 2021 CSZ CPUE (all vessels)



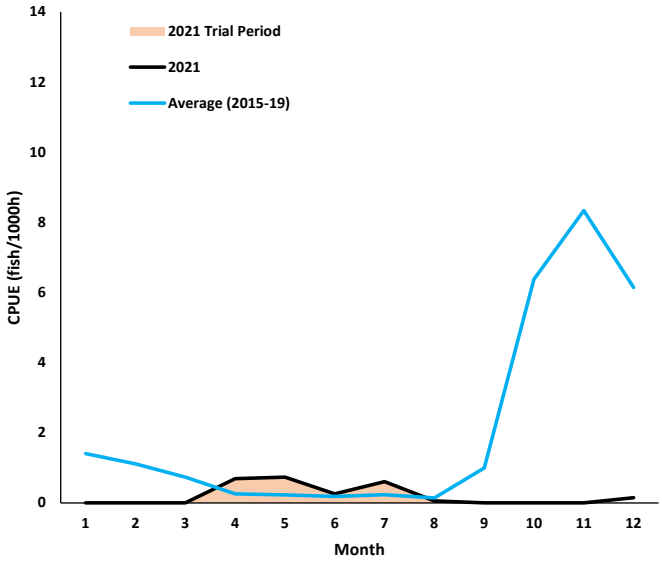
Average CSZ discards vs 2021 CSZ discards (all vessels)



Average CSZ CPUE vs 2021 CSZ CPUE (≤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.

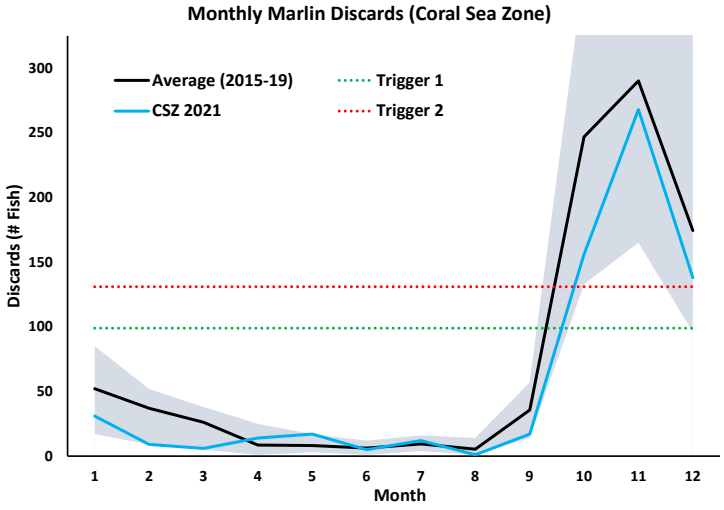
	2015	2016	2017	2018	2019	2021	Mean
Jan	0.54	0.84	1.14	1.92	2.60	1.97	**1.50**
Feb	0.38	0.90	1.05	1.71	1.55	0.55	**1.02**
Mar	0.15	0.88	1.19	0.64	0.81	0.87	**0.76**
Apr	0.12	0.82	0.18	0.03	0.15	0.69	**0.33**
May	0.22	0.45	0.18	0.20	0.10	0.74	**0.32**
Jun	0.29	0.33	0.14	0.15	0.04	0.26	**0.20**
Jul	0.23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

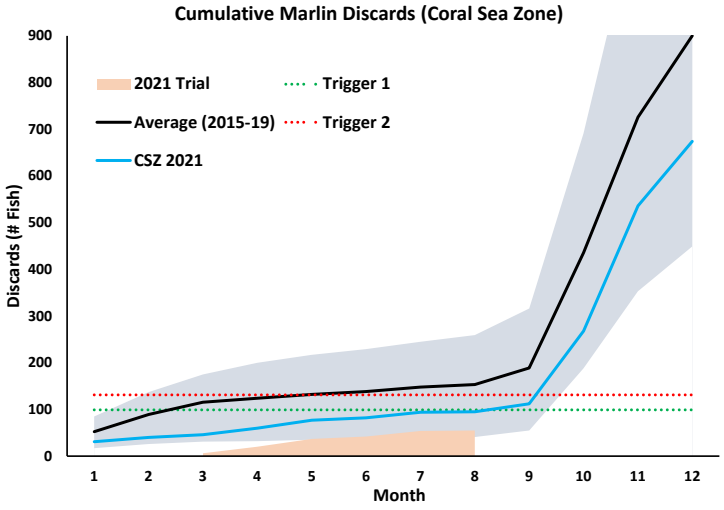
3. **Effort, monthly & cumulative discards**

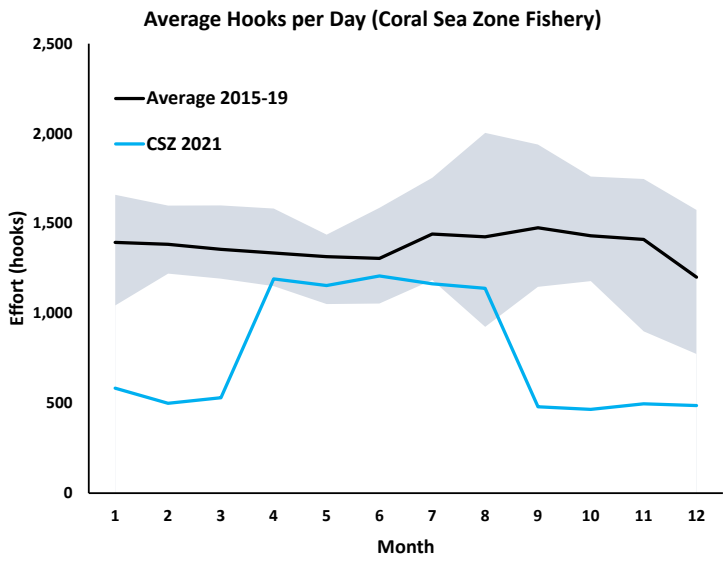
East of 148°E. 2 shots of 1200h each were undertaken in April east of 148°E.
No discards (no interactions, reflected in industry's report that trips were generally short to meet supply chain limitations).

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.







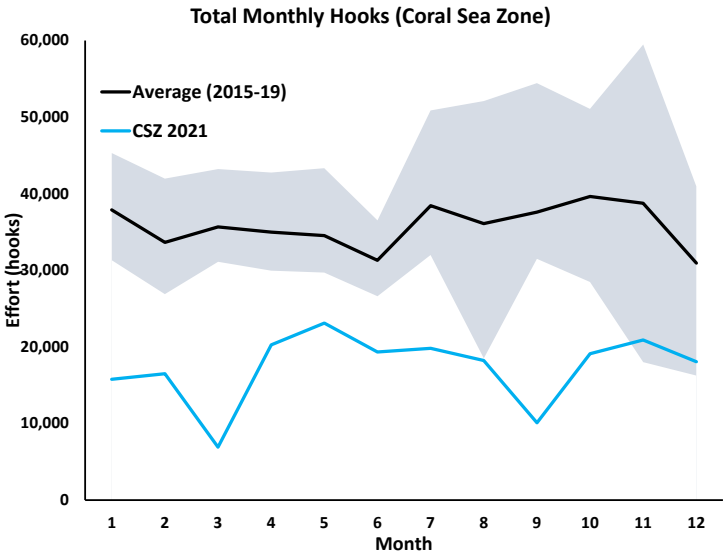
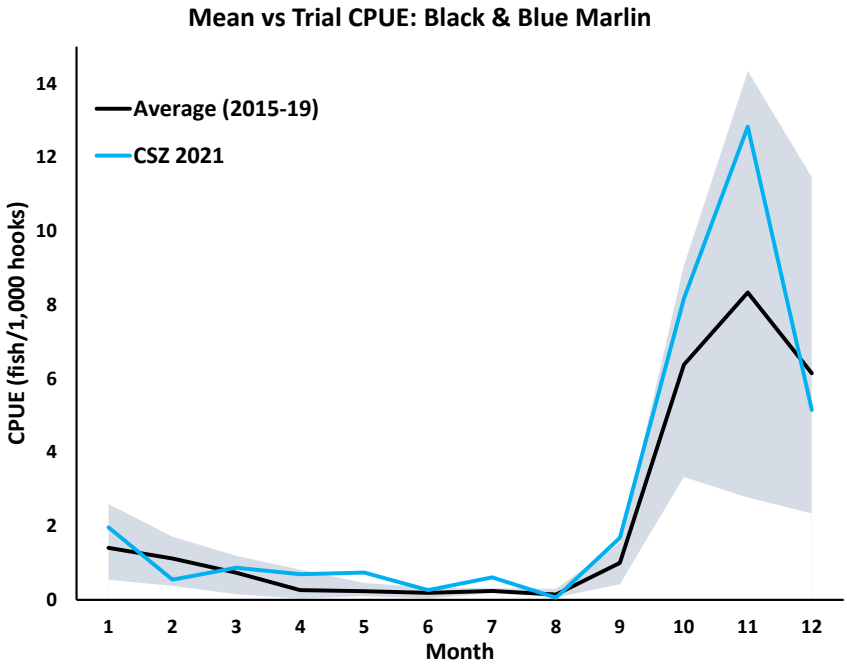


Figure 3. Effort, monthly and cumulative discards.



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 <=500hooks 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 <=500hooks 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 ≤500 h and >500h to explore differences in life status outcomes. While shots of >500h 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 ≤500h likely correlates with increasing CPUE seen in November.

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

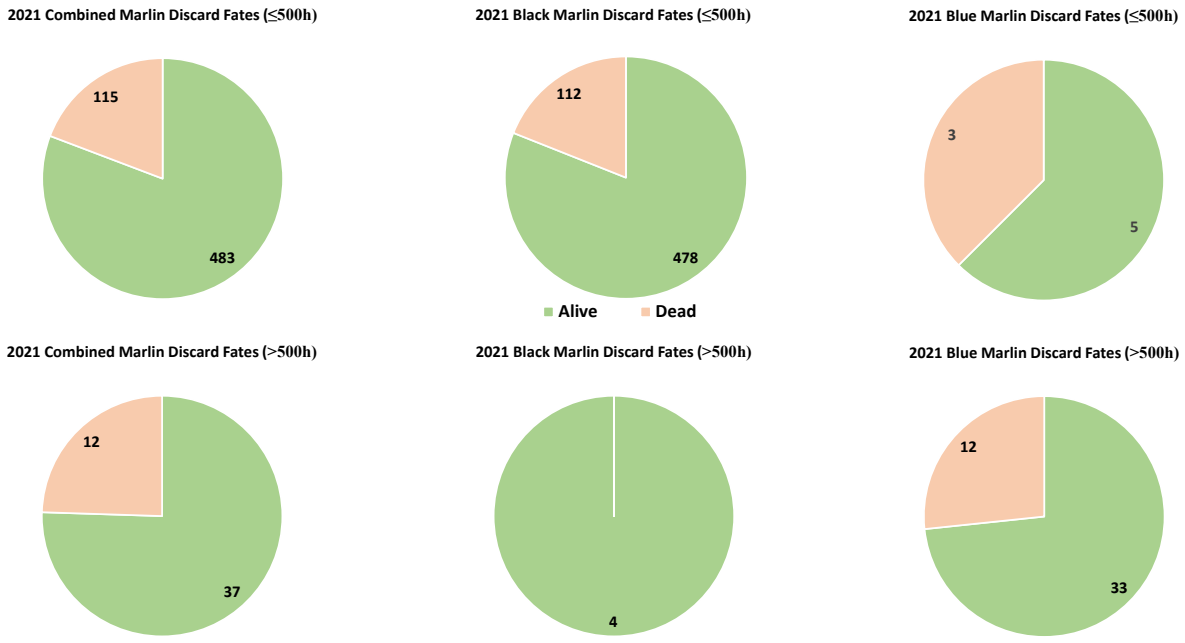


Table 3. Discard fates of blue, black, and combined blue and black marlin in the Coral Sea Zone. For 2021, the figures provided are available for trial – present, and whole year (in parentheses).

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

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