

## **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<sup>0</sup>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:

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<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 (i.e., 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	<b>322</b>
2022									<b>214</b>
2023		5	15		1				<b>429</b>

### 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 (i.e., 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 left 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 currently being analysed 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).

<b>Discarded Marlin Size Class (kg)</b>	<b>1-20</b>	<b>20-40</b>	<b>40-60</b>	<b>60-80</b>	<b>80- 100</b>	<b>100- 120</b>	<b>120- 140</b>	<b>140- 160</b>	<b>160- 180</b>	
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	
<b>Discarded Marlin Size Class (kg)</b>	<b>180- 200</b>	<b>200- 220</b>	<b>220- 240</b>	<b>240- 260</b>	<b>260- 280</b>	<b>280- 300</b>	<b>340- 360</b>	<b>380- 400</b>	<b>400- 420</b>	
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	
<b>Discarded Marlin Size Class (kg)</b>	<b>420- 440</b>	<b>440- 460</b>	<b>460- 480</b>	<b>480- 500</b>	<b>540- 560</b>	<b>580- 600</b>	<b>640- 660</b>	<b>680- 700</b>	<b>720- 740</b>	<b>TOTAL</b>
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 on the likely risks with changing the hook limit (noting the purpose of the original hook limit) and whether the information

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

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

## 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 ( $\leq 500h$  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.

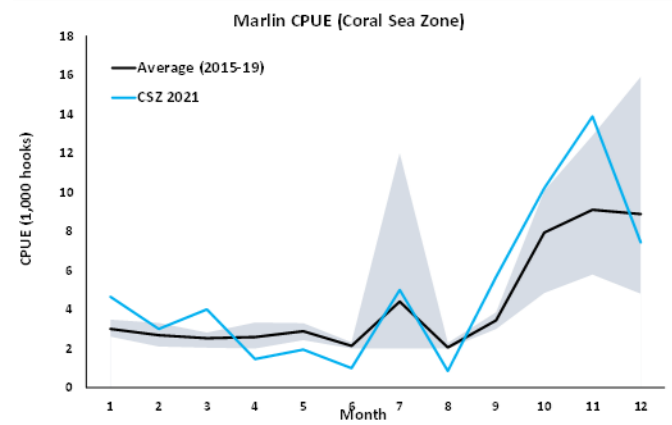
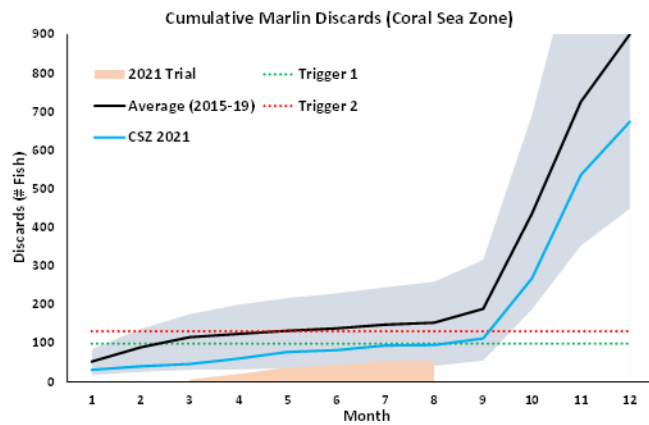
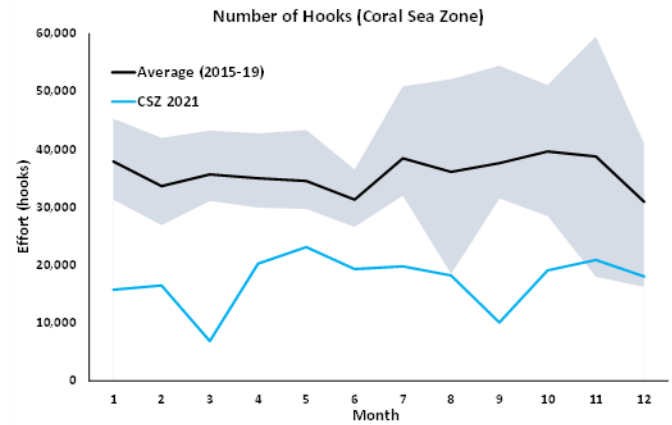
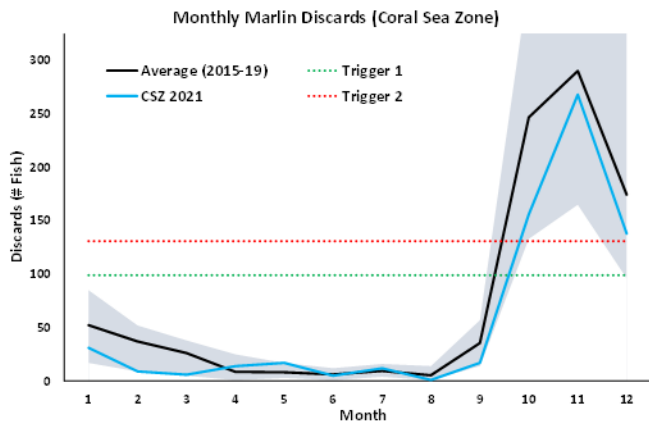
Fiona Hill thanked the Small Working Group for its continued commitment to working through the trial, and the meeting concluded at 12:54pm

**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 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.

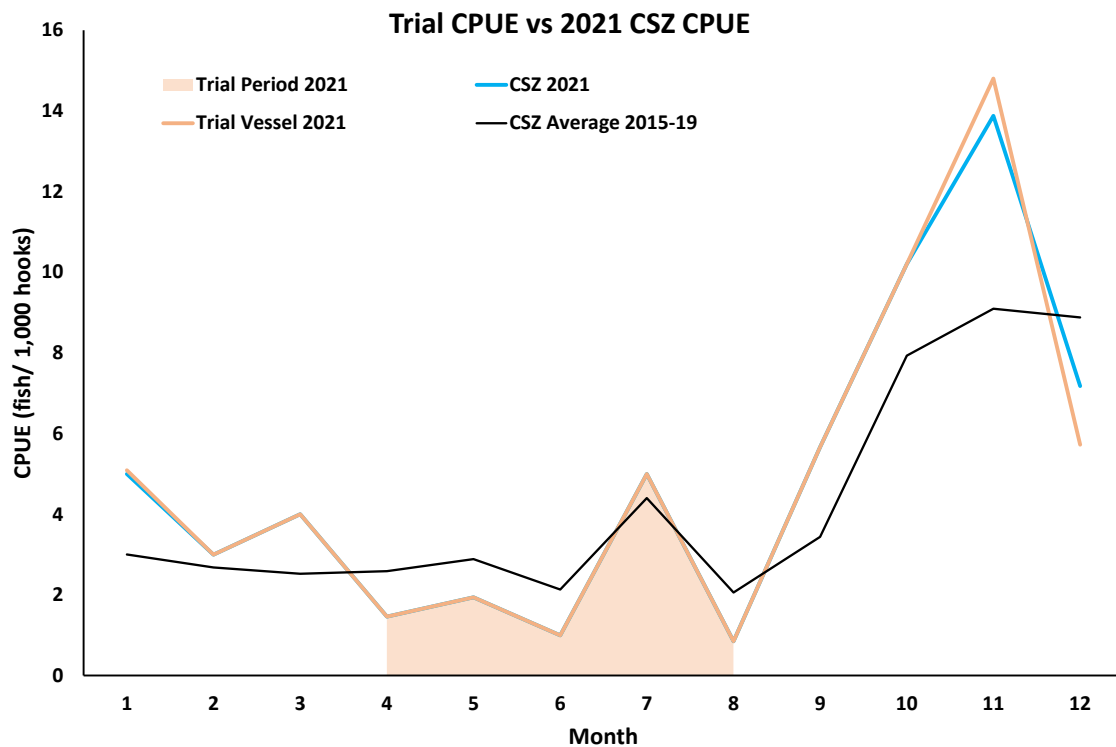
<b>Vessel 1</b>	Shots with ≤500 hooks			Shots with >500 hooks			All shots		
<b>Month</b>	N. days	N. shots	Total hooks	N. days	N. shots	Total hooks	N. shots	Total hooks	μ daily hooks
March	5	6	3,000				6	3,000	600
April				17	17	20,260	17	20,260	1,191
May	1	1	100	19	19	23,000	20	23,100	1,155
June				16	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.

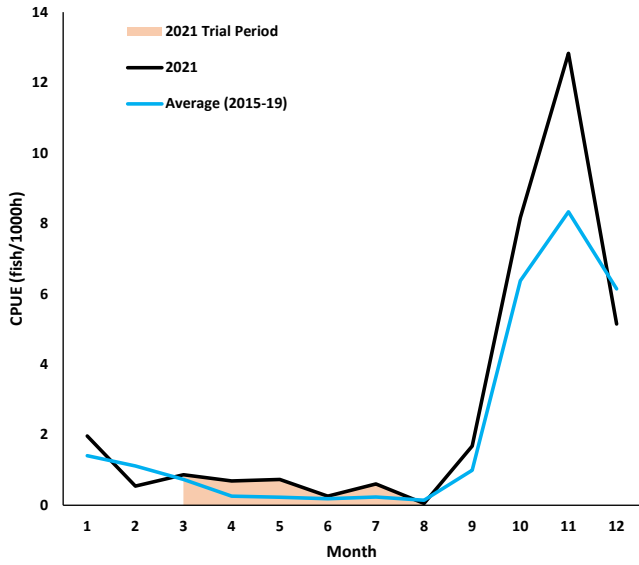
**Figure 1.** Average CPUE in the Coral Sea Zone for combined black and blue marlin discards, by month, for the period 2015-2021, and 2021, showing the trial vessel, trail period relative to the 2021 CSZ CPUE.



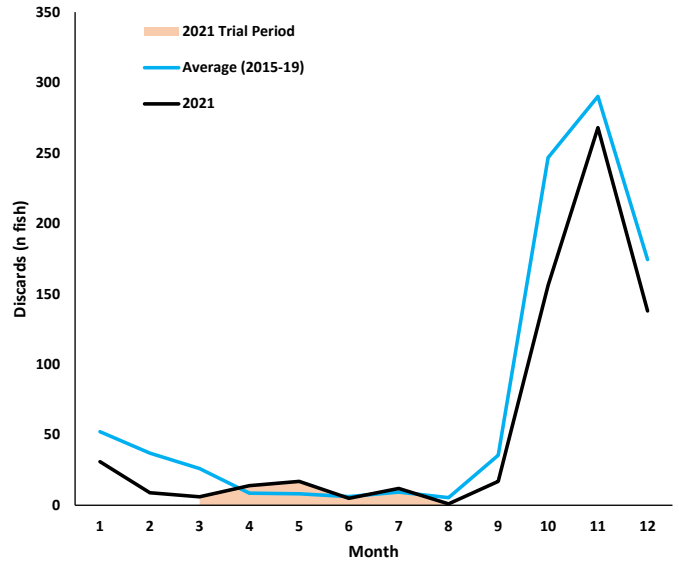
**Figure 2.** Recalculation of combined marlin CPUE incorporating all effort in the CSZF (not just those hooks from shots that saw interactions) results in slightly lower CPUE for marlin than previously shown, and flattens the peak previously seen in July.



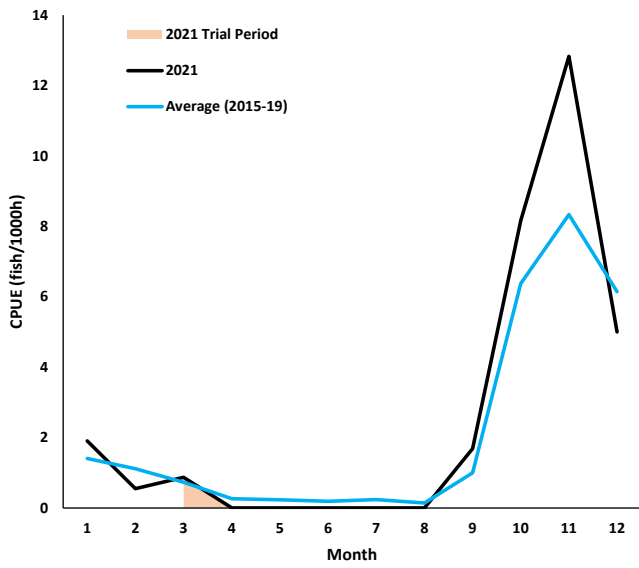
Average CSZ CPUE vs 2021 CSZ CPUE (all vessels)



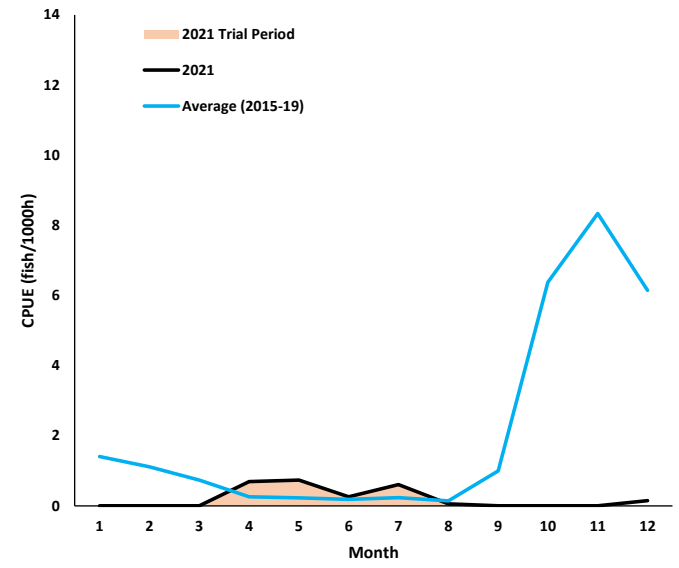
Average CSZ discards vs 2021 CSZ discards (all vessels)



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.

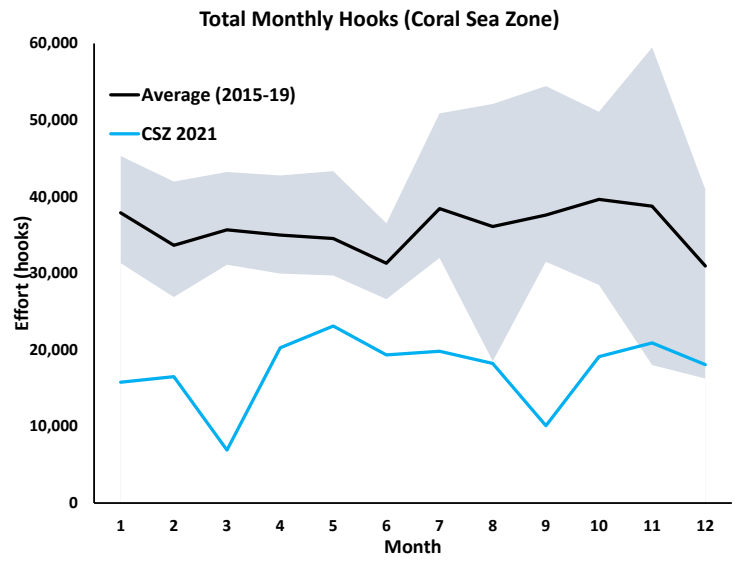
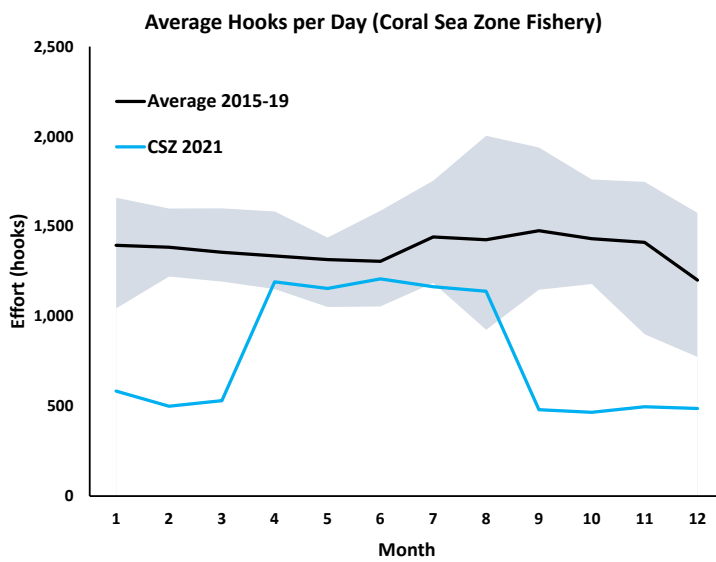
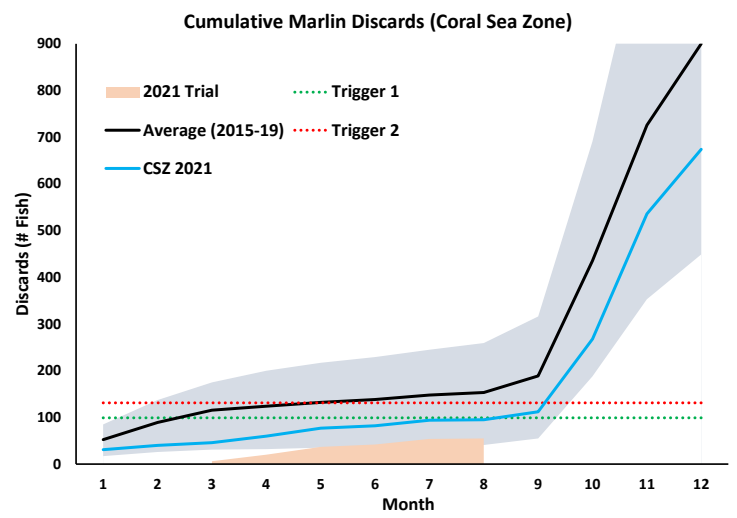
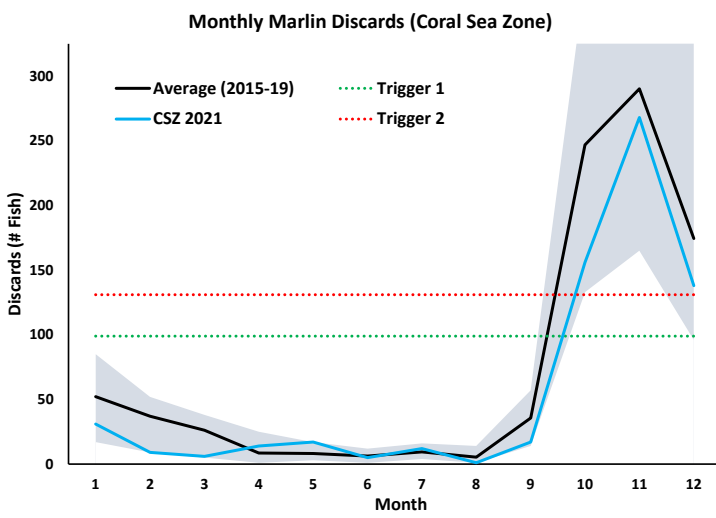
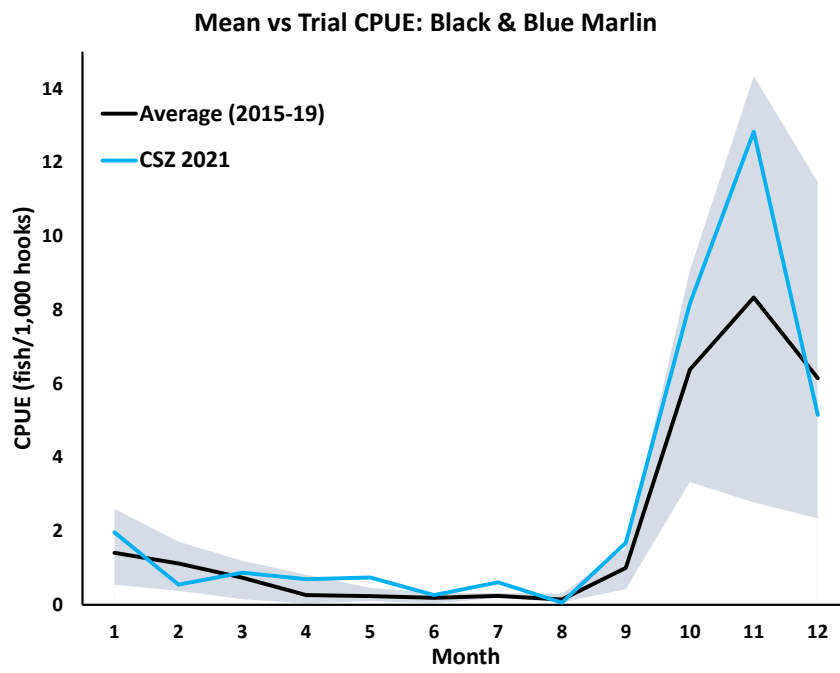


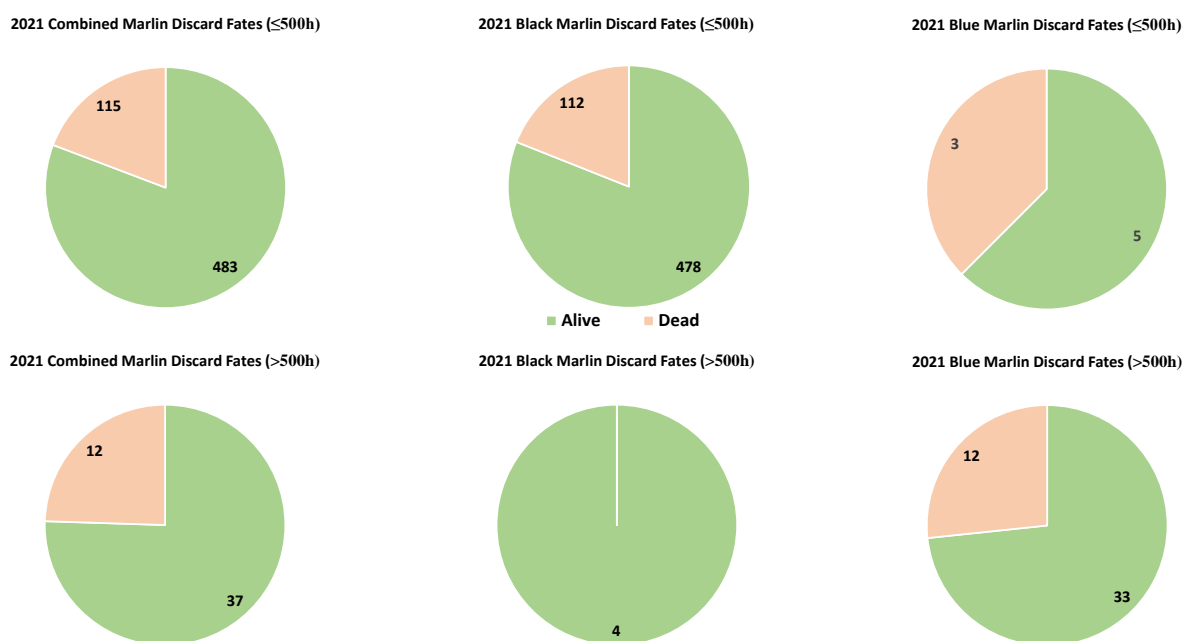
Figure 3. Effort, monthly and cumulative discards.



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	483
Dead		3	115
<b>&gt;500h</b>			
Alive		33	37
Dead		12	12
<b>All hooks</b>			
Alive		38	520
Dead		15	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**).

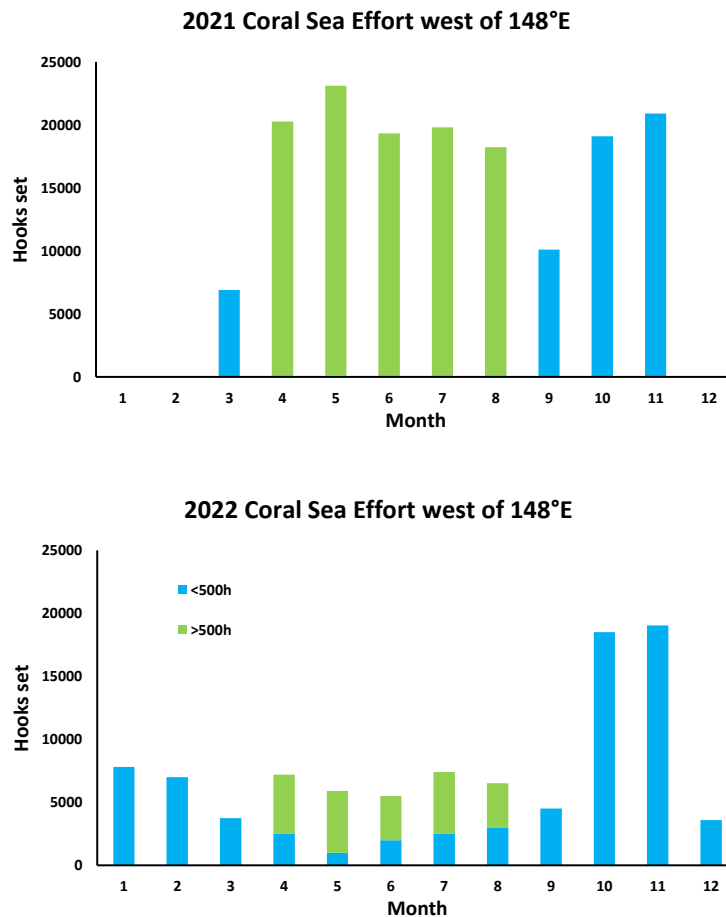
The monthly distribution of total hooks set west 148°E during the trial is shown in **Figure 1**. In year one of the trial, all hooks set between April and August were on longlines with greater than 500h. In contrast hooks set per shot varied from less than 500h to greater than 500h during those months 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	<b>322</b>
2022	164	11	23	-	-	-	-	-	-	-	2	-	-	<b>200</b>



**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%

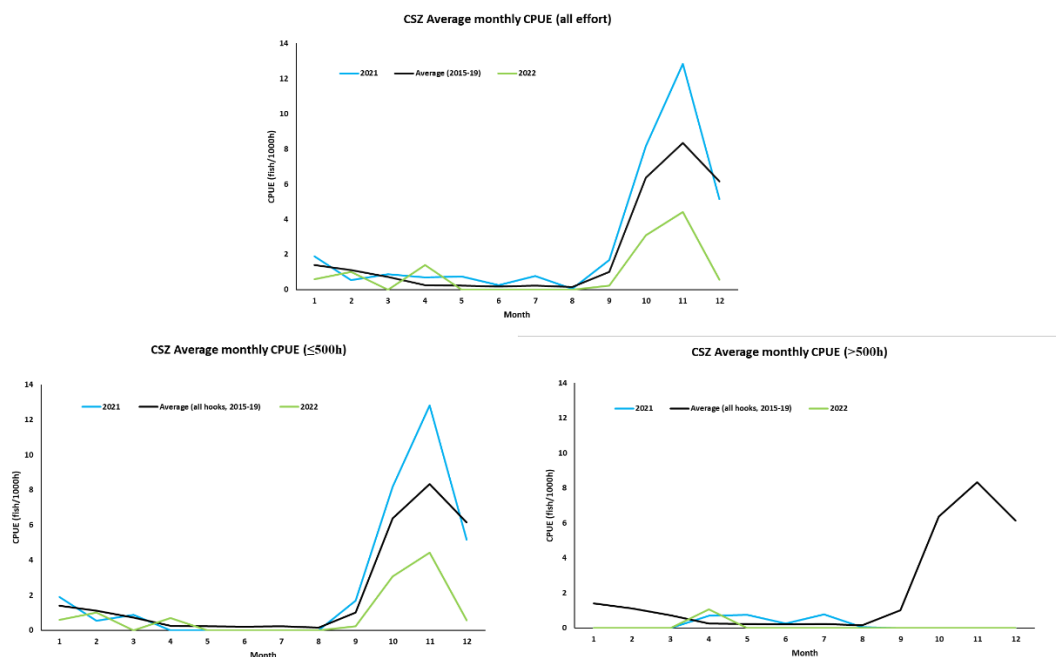
**Table 4.** Combined marlin interactions recorded on sets with less than or greater 500h, east and west of 148°E annually during the CSZ trial.

	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 discard 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 recorded 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.