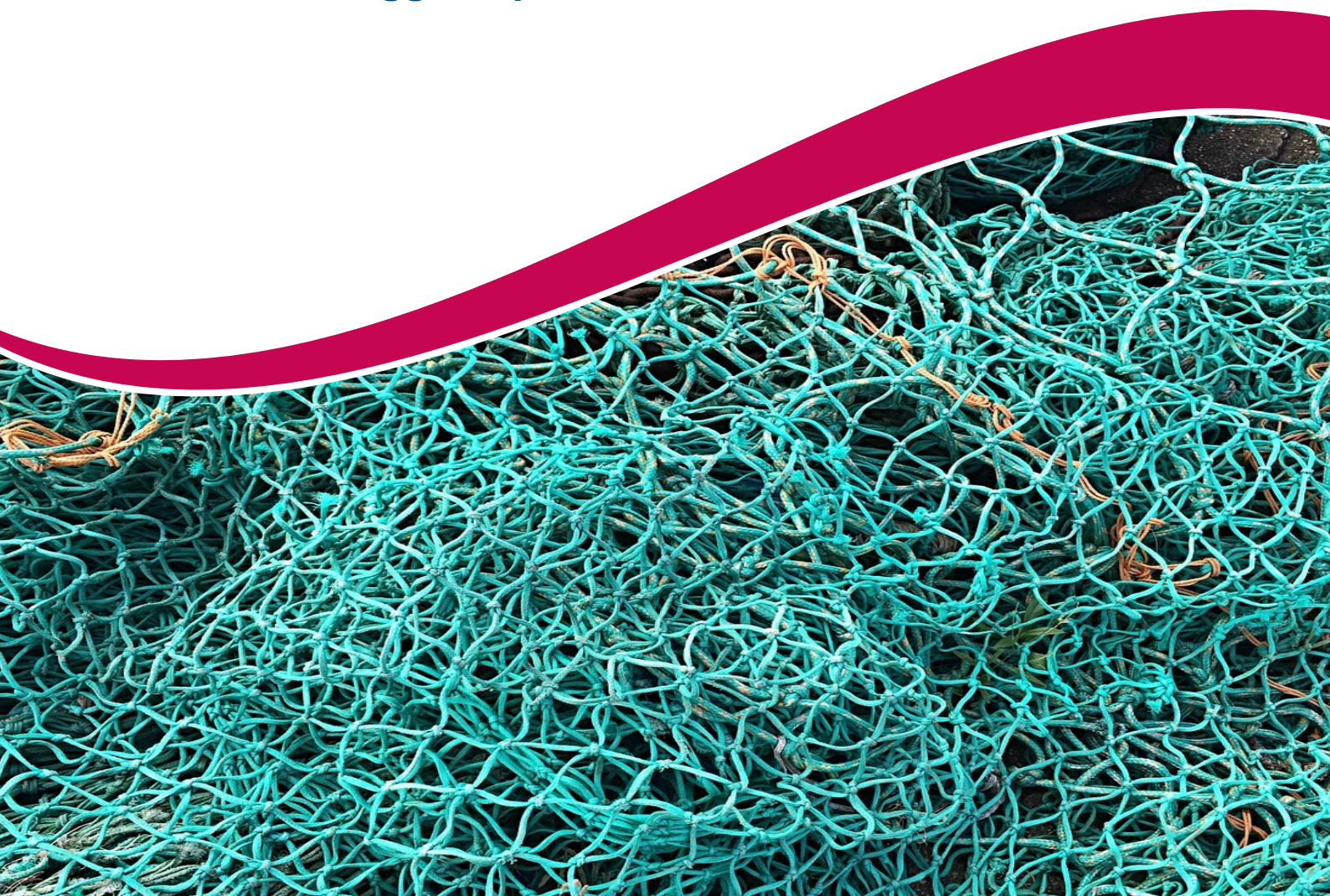**Australian Government**

Australian Fisheries Management Authority

Coral Sea Fishery

2017-18 Trigger report

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Logbook catch and effort data for the Coral Sea Fishery (CSF) has been assessed in accordance with the trigger limits detailed in harvest strategies for each respective CSF fishing sector. There was no effort in the Lobster and Trochus sector in 2017-18 and this sector has not been reviewed against the triggers.

Line, Trap and Trawl Sector

The Line, Trap and Trawl (LT&T) sector of the CSF landed 63,644 kg of fish during the 2017-18 fishing year (1 July- 30 June). All of the catch was from hook methods, and there was no fishing using trawl or trap methods.

Catch and effort data for the past three fishing years is outlined in Table 1 below.

Table 1 Catch and effort for the LT&T sub-fisheries over the past three seasons

	Total Catch (kg)			Total Effort Line= hooks	trap= lifts	trawl= hours
	2015-16	2016-17	2017-18	2015-16	2016-17	2017-18
Line	28,628	49,781	63,135	169,070	147,204	504,116
Trap	-	-	-	-	-	-
Trawl	-	-	-	-	-	-
Combined	28,628	49,781	63, 644	169,070	147,204	385,616

Of the 66 species caught in 2017-18, only 26 species had total catches greater than 100 kg and of these only five were greater than one tonne. For the last three season the top four species caught have remained the same. The top ten species by volume for the last three season are listed in table 2.

Table 2 The top ten caught species by volume for LT&T for 2015-16, 2016-17 and 2017-18

2015-16		2016-17		2017-18	
species	kg	Species	Kg	Species	Kg
flame snapper	28,628	flame snapper	25,066	flame snapper	41,182
ruby snapper	8,897	rosy snapper	12,197	rosy snapper	6,410
bar rockcod	4,806	ruby snapper	2,524	bar rockcod	3,936
rosy snapper	1,553	bar rockcod	2,118	ruby snapper	3,223
ray's bream	1,201	amberjack	1,241	ornate jobfish	1,102

amberjack	1,081	rusty jobfish	1,103	long tail rubies/snapper	963
snapper	940	paddletail seabream	679	amberjack	665
saddleback snapper	709	temperate basses & rockcods	598	sea perch	474
alfonsino	358	ornate jobfish	369	paddletail seabream	451
comet grouper	348	sharks (mixed)	363	ghostsharks	433

The Australian Bureau of Agriculture and Resource Economics and Sciences' (ABARES) 'Reducing Uncertainty in Stock Status' (RUSS) project (ABARES 2015), produced estimates of maximum sustainable yield (MSY) for a number of scalefish assemblages in the CSF. The MSY estimates for deep sea assemblages were updated in April 2017, these estimates are referred to throughout this report.

These estimates were based on estimated values for natural mortality, unfished biomass and various exploitation constants. Unfished biomass is based on estimates of suitable habitat and fish density. The values are dependent on the composition of the catch at the time and are considered to be conservative and reflect lack of available research information specific to the Coral Sea (ABARES 2015).

In previous reports, exploitation constants of 0.3 and 0.7 have been used to refer to the lower and upper MSY estimates. It has since been agreed the MSY estimate will be based on the 0.3 constant.

The Triggers

The LT&T Harvest Strategy details various trigger limits and management responses. A Level 1 response requires an analysis to determine why observed changes are occurring and determine the risk to the species or stock. A Level 2 response requires fishing for the species to cease for the following season until the risk to the species or stock is shown to be low, either through further analyses or management responses.

Overarching catch trigger

   i.   *Must be less than total highest catches across the main species caught to date*

At the Coral Sea Fishery panel meeting 21 September 2016 it was agreed that an average catch of over 1,000 kg over a five year period is a suitable threshold for species to be considered a 'main

species' and is consistent with the 1,000 kg threshold applied to other triggers in the harvest strategy.

There were four mains species caught in the 2017-18 season; flame snapper, rosy snapper, ruby snapper and bar rockcod. Flame snapper was the only main species to trigger a level 1 response in this report with 41,182 kg caught in the 2017-18. The total highest catch was previously 28,628 kg in the 2015-16 season. Flame snapper will be discussed in more detail later in this report.

  i. *Overarching Level 1 trigger for total fishery catch: 450 t*

  ii. *Overarching Level 2 trigger for total fishery catch:1000 t*

Total catch for the LT&T sector for 2017-18 was 63,135 kg which is below both the Level 1 and Level 2 trigger value.

Species- specific triggers (high risk/ vulnerable AND key species)

There was one reported interaction with a minke whale in 2017-18. It was reported as 'hooked, entangled or caught' in a set auto-longline. There was an AFMA observer on board and it was cut free and reported as alive and vigorous. This was the first interaction with TEP species in the CSF since 2011-12 season.

Whitetip reef shark

  i. *Level 1: 2.5 t (1/6 historical high catch)*

  ii. *Level 2: 5 t (1/3 historical high catch)*

There was 538 kg of whitetip reef shark reported on the catch disposal records (CDR) from the LT&T sector in the 2017-18 season which is below the level 1 and 2 triggers. No catch of whitetip reef shark was reported in the logbooks. AFMA will investigate the discrepancy between logbook and CDR reported catches of whitetip reef sharks.

Grey reef shark

  i. Level 1: 13 t (1/2 historical high catch)

  ii. Level 2: 26 t (historical high catch)

No grey reef sharks were caught in the LT&T sector in the 2017-18 season.

Triggers pertaining to changes in catch proportion

  i. *If the relative catch proportion of any species changes by >30% from its historical average AND the catch of this species is greater than 1t, invoke a level 1 response for the relevant species. If this is accompanied by an ≥50% overall decline in the CPUE over the last three years, invoke a Level 2 response*

Three species met the Level 1 trigger for the 2017-18 season; flame snapper, ruby snapper and ornate jobfish. The total catch and proportion of total catch for the species which met the Level 1 trigger for the 2017-18 season are detailed in table 3.

Table 3 LT&T species that met the Level 1 trigger for 2017-18 pertaining to changes in catch proportion

	2017-18 catch (kg)	Proportion of catch	Historic average proportion
flame snapper	41,182	64.70%	36.95%
ruby snapper	3,223	5.06%	10.08%
ornate jobfish	1,100	1.73%	0.72%

Catches of ornate jobfish have historically been low, and the 2017-18 season was the first time catches exceeded 1,000 kg. There has been an increase in ornate jobfish catch over the past four seasons and this is reflected in the increase in catch proportion. While there is no MSY estimate for ornate jobfish, total catch across the fishery is low and the risk to the stock is likely low.

Flame snapper met the criteria for a level 1 trigger in 2017-18 season with a total catch of 41,182 kg, representing a 42 per cent increase in catch proportion from the historic average. While catches of flame snapper are below the historical high, they represent a high proportion of the total catch. The increase in catch was driven by an increase in automatic longline effort in the fishery which target this species.

Recent catches of flame snapper are higher than the MSY estimate of 16,000 kg. The uncertainty around MSY estimates has been discussed earlier in this report, however AFMA responded to the increase in recent catches by collecting biological samples during observed auto-longline trips in 2017-18. This information can be used in future assessments to obtain a better understanding of stock size and status.

Ruby snapper met the criteria for trigger Level 1 in the 2017-18 season due to a 50 per cent decline in catch proportion from the historical average of 10.08 per cent. Ruby snapper makes up a relatively small proportion of the total catch and the decrease in proportion was largely driven by the increase in catch of flame snapper. Species with relatively low catches are particularly susceptible to changes in catch proportion and this will be considered when updates to trigger analyses are implemented in a revised harvest strategy.

The Level 2 trigger was also met due to a 54 per cent decline in CPUE between the 2015-16 and 2017-18 fishing season. There was also a decrease in catch from 8,897 kg in 2015-16 to 3,223 kg in 2017-18.

In line with a level two response, AFMA sought advice from ABARES regarding the risk to the ruby snapper stock in the CSF. While the estimates of MSY for deep scalefish assemblages are uncertain due to lack of information, they are also inherently conservative. Recent catches of ruby snapper are below the estimated MSY of 15.8 t. The CPUE analysis in this report is rudimentary

and simply considers total catch relative to the number of hooks. Fishing is normally targeted on aggregating reef-associated species and the CPUE analysis should be treated with some caution.

ABARES recommended monitoring fishing effort and catches of ruby snapper in future seasons and suggested a more quantitative CPUE analysis should be considered if catches increase.

> ii. *If the relative proportion of any species in the catch declines inter-annual by 10% or greater over 3 consecutive years, invoke a Level 1 response. If this accompanied by ≥50% overall decline in CPUE over the last 3 years, invoke a Level 2 response*

Ruby snapper invoked a Level 2 response as discussed above.

Triggers pertaining to spatial changes

For the purposes of this report, 'hillgrids' are used to represent areas fished. Each hillgrid is a square, approximately 15 nautical miles wide. Fishing effort typically occurs in only a proportion of each hillgrid and so the analysis is spatially broad.

If the following changes occur invoke a Level 1 response to determine why, with the added option of imposing spatial management measures, such a closures or move-on provisions:

> i. *The percentage of areas fished increased by ≥40% (fishery expansion), OR*

> ii. *The percentage of areas fished decreases by ≥40% (fishery contraction), OR*

The total number of hillgrids fished over the last three seasons is summarised in Table 4 and the change in areas fished are relative to the year prior.

Table 4 Summary of areas fished in the LT&T sector for the past three seasons

	2015-16		2016-17			2017-18		
	Areas fished (cells)	Areas fished (km^2)	Areas fished (cells)	Areas fished (km^2)	Change in area fished	Areas fished (cells)	Areas fished (km^2)	Change in area fished
Dropline/Longline	33	25443	15	11565	55% Decrease	24	18504	60% increase

A level 1 trigger was met in 2017-18 due to a 60 per cent increase in the number of hillgrids fished in 2017-18 from 2016-17. This follows a 55 per cent decrease in the number of hillgrids fished from 2015-16 to 2016-17 and illustrates the relatively low and variable spatial effort which makes it particularly sensitive to this trigger on a year by year basis. A more suitable indicator is the number of hillgrids fished compared to a longer-term average, which is what trigger (iv) measures.

Triggers pertaining to the spatial extant of the fishery will be reviewed in light of zoning changes under the Coral Sea Marine Reserve Management Plan 2018.

iii.   If ≥40% of the total catch is taken from a single area (fishery contraction/ undue fishing pressure on one area) OR

iv.   If ≥40% of once- exploited areas are no longer fished

Of the 63,644 kg caught in the LT&T section in 2017-18 the highest contribution from a single area was 23,113 kg or 36.31 per cent, which means this trigger was not met.

The 'once exploited areas' are taken to be the 'total number of individual areas fished over the past three years' for the purpose of assessing this trigger. Of the 43 areas which were once exploited, 14 of those were exploited in 2017-18 which means that 67 per cent of once-exploited areas were not fished in 2017-18. There were ten areas fished in the 2017-18 season which had not been fished in the previous three season.

This has triggered a Level 1 response. This trigger was intended to pick up recent decreases in the areas fished within the Coral Sea, however it does not account for shifts in effort. By only assessing the area of catch over the past three seasons it limits the ability to assess long term trends in the areas fished within the Coral Sea.

There are only four areas which have been exploited each year over the past four fishing seasons. Table 5 details what percentage of the total catch for the LT&T sector was caught in each of these areas for the past three seasons and 2017-18 season.

Table 5 Percent of the LT&T total catch caught in the 4 areas which were fished 2014-15, 2015-16, 2016-17 and in 2017-18 fishing seasons.

Area No.	Hillgrid	2014-15	2015-16	2016-17	2017-18
14	421520714	21.24%	26.68%	3.94%	32.11%
12	421520732	58.03%	16.88%	44.46%	36.31%
9	421521112	7.50%	1.39%	16.32%	8.66%
2	421522114	4.86%	1.68%	0.30%	0.025%
	Total	91.6%	46.64%	65.03%	77.12%

In the 2017-18 season, 68 per cent of the total catch was caught in area 14 and 12, which are on the same reef. The total catch from these two areas was 43, 552 t. Of this, 3 t was flame snapper. While this is above the lower and median estimate of MSY for this species across the fishery, it is below upper estimate (37.4 t). Biological samples are being collected from this area as part of the AFMA observer program to inform a stock assessment and develop a better understanding of a sustainable catch from this area. In the meantime, AFMA will continue to monitor catches from this area, and may consider catch limits to ensure catches remain sustainable.

> *v.*   *If any of the above triggers are accompanied by a ≥50% overall decline in CPUE over the last three years, invoke a Level 2 response*

This trigger was not reached in the 2017-18 season.

Triggers pertaining to CPUE

The 2017-18 catch is the highest of the past three seasons and was 13 t more than in 2016-17.There was also an increase in the number of hooks in the line sector, with 360,000 hooks set in 2017-18 compared to 139,000 in 2016-17..

A basic comparison of effort/ catch suggests that overall CPUE has increased, however, CPUE is not standardised and in this fishery effort is targeted on aggregating reef-associated species, making the indicator difficult to assess.

Table 6 details the catch, effort and CPUE for the LT&T for fishing years 2013-14 to 2017-18

Table 6 Logbook catch, effort and CPUE for line, trawl and trap methods for fishing years 2013-14 to 2017-18. There has been no fishing in the trawl or trap sectors in the past 5 seasons.

Fishing year	Dropline hooks [1]	Catch (Kg whole weight)	CPUE (total catch/total effort)
2013-14	16,400	3,891	0.23
2014-15	2,800	395	0.14
2015-16	11,070	25,179	2.27
2016-17	8,304	4,690	0.56
2017-18	25,355	4,514	0.03
Fishing year	Longline hooks	Catch (Kg whole weight)	CPUE (total catch/total effort)
2013-14	54,000	5,083	0.09
2014-15	62,500	9,846	0.15

[1] Hook numbers for dropline are calculated by multiplying the number of lines lifts by the average number of hooks per line.

2015-16	158,000	26,436	0.16
2016-17	138,900	24,465	0.17
2017-18	360,261	43,656	0.12

> i. If CPUE for any species shows a decline over the last 3 years, but without any of the above indicators being triggered, a Level 1 response shall be invoked if the decline is less than or equal to 50%, and a Level 2 response shall be invoked if the decline is greater than 50%

The range of fishing methods in the LT&T sector means each gear type must be assessed separately. CPUE has been calculated using the total weight landed relative to the number of hooks set for demersal longline and dropline methods combined.

Species which have been exclusively reported as being caught using the fishing method handline (mechanised) have been excluded from this report due to the number of hooks used not being available. This has also been considered when assessing the species where the catch was partially caught by handline (mechanised).

Table 7 CPUE of species which exceeded Level 1 and Level 2 in 2017-18

Species	2017/18 Catch (kg)	10 year Historical Average Catch (kg)	Highest historical Catch	2015-16 CPUE	2016-17 CPUE	2017-18 CPUE	L1 decline CPUE (last 3 yrs)	L2 >50% decline CPUE (last 3 yrs)
bar rockcod	3,936	2,404	9,862	0.028	0.014	0.010	TRUE	TRUE
amberjack	665	803	2,970	0.006	0.008	0.002	TRUE	TRUE
fish (mixed)	346	315	3,648	0.001	0.002	0.001	TRUE	FALSE
comet grouper	254	107	1,723	0.002	0.002	0.001	TRUE	TRUE
saddleback snapper	249	187	709	0.004	0.002	0.001	TRUE	TRUE
rusty jobfish	247	474	6,331	0.002	0.007	0.001	TRUE	TRUE
blue-eye trevalla	128	601	6,000	0.002	0.002	0.000	TRUE	TRUE

mozambique seabream	124	122	2,505	0.002	0.001	0.000	TRUE	TRUE
ray's bream	71	128	1,201	0.007	0.000	0.000	TRUE	TRUE
goldband snappers	69	38	8,015	0.001	0.000	0.000	TRUE	TRUE
red emperor	65	256	40,455	0.001	0.000	0.000	TRUE	TRUE
oblique-banded snapper	39	35	119	0.000	0.001	0.000	TRUE	TRUE
alfonsino	14	276	69,672	0.002	0.000	0.000	TRUE	TRUE
red squirrelfish	10	28	256	0.000	0.000	0.000	TRUE	TRUE
gemfish	2	43	13,391	0.000	0.000	0.000	TRUE	TRUE

These triggers are only considered for species that have not met any other triggers in the harvest strategy. Of the 66 species caught in 2017-18, CPUE has decreased by more than 30 per cent over the past three seasons for one species, and more than 50 per cent for 14 species.

Of these species, bar rockcod was the only species to have a catch over 1,000 kg with 3,936 kg caught. The minimum MSY estimates were not exceeded for any of these species.

The appropriateness of CPUE- based triggers was also discussed at the September 2016 panel meeting. Highly variable catch composition, relatively low catch rates and spatial distribution of effort mean that these triggers are overly sensitive. The difficulty in assessing CPUE trends for species groups such as 'mixed fish' and 'trevallas and scads' further complicates the trigger review.

Considering the above, AFMA will continue to monitor the total catch of these species over time and will review the appropriateness of CPUE based triggers.

Discussion

Eighteen of the 66 species caught in 2017-18 activated at least one trigger. Of those, only five had catches greater than 500 kg.

The appropriateness of the LT&T harvest strategy triggers is currently under review and following the recommendations from the 2016 panel meeting AFMA anticipates that the triggers will be replaced with the following:

- The 450t (Level 1) and 1000t (Level 2) total catch triggers to be replaced by three separate species assemblages triggers for deep water scalefish, reef associated scalefish and shark

assemblages. The triggers will be based on the outcomes of the 2015 ABARES RUSS project.

- Implement species-specific triggers for key commercial fish species based on MSY estimated from the RUSS project. A key commercial species is any species with a 5-year average catch of more than 1000 kg.

- CPUE and effort (area) based triggers will be removed and incorporated into Level 1 and Level 2 analyses, when catch triggers are reached.

Aquarium

For the 2017-18 season, 36,678 individual fish were harvested in the aquarium sector. This is an increase on the previous two seasons.

The Triggers

The Hand Collection Sector: Aquarium Harvest Strategy details various triggers pertaining to catch and effort. Five main functional groups with the highest historical catch have been specified in order to monitor catch; angelfish, damselfish, gobies, surgeonfish and wrasse. The triggers below have been developed to encapsulate the dynamics of the fishery, which if triggered lead to analyses and possible management responses until the risk has been mitigated or analysed further.

Triggers pertaining to effort

i.   *Has 200 or more fishing days been logged for the financial year?*

There was a total of 116 days fished in 2017-18

Triggers pertaining to catch

i.   *Have 40,000 or more individuals been logged for the financial year?*

There was a total of 36,678 individuals collected in 2017-18

ii.   *Has 20t or more of live rock been logged for the financial year?*

There was 5.9 t of live rock collected in 2017-18

iii.   *If 40 t of live rock is taken in a single season then cease fishing for live rock*

Not applicable

iv.   *If the above trigger has not been reached within 3 years, an assessment of the sustainable take of live rock must be undertaken within the next 3 years*

This trigger was intended to pick up a potential decrease in the catch per unit effort for live rock. The take of live rock is largely market driven, and the low level of harvest is reflective of a market demand. AFMA considers the harvest of live rock for the 2017-18 is sustainable.

Triggers pertaining to catch proportion

> i.   *If a significant change in the relative proportion of the catch of a functional group occurs and no other trigger has been reached and the number of specimens is >500 then do Level 1 assessment*

In 2017-18, the proportion of catch for all of the functional groups was within the 5 year average.

Humphead Maori wrasse monitoring

Aquarium sector fishing permit holders are authorised to take a total of 50 specimens during the season (25 per concession holder). Operators are required to record the number of specimens taken per trip, their size and latitude/longitude information in the 'comments' section of their logbook. Fisheries Queensland provides logbook service for the aquarium sector of the CSF.

Fisheries Queensland provide scanned copies of those logbooks to AFMA when they are submitted, and AFMA keeps a record of Maori wrasse catches.

17 Humphead Maori wrasse were taken by the CSF Aquarium Sector in 2016-17 but no more than 7 individuals were taken from any one reef. 1 Humphead Maori wrasse was taken during the 2017-18 season.

Discussion

The triggers in the harvest strategy for the aquarium sector are currently being reviewed and will focus on the sustainable harvest for key commercial family groups, live rock, corals and Maori wrasse, rather than triggers based on proportions. The focus will be on ensuring a sustainable level of harvest across the fishery and at individual reefs.

Hand Collection (Sea Cucumbers)

The Hand collection (sea cucumbers) was active for 5 days in the 2017-18 season. A total catch of 1016 kg was taken over 38 dive hours.

The Triggers

The trigger limits for the Sea Cucumber sector as a TAC/ trigger limit for each of the main species, any combination of greenfish and lollyfish, any other single species, and all species of the order Aspidochirotida. Table 8 details the catch for the past three seasons and the trigger limits. None of the trigger limits were met in the 2017-18 season.

Table 9 Assessment of Hand Collection Sector: Sea Cucumber CDR catches against the Harvest Strategy catch limits for years 2015-16 to 2017-18

Common Name	Species	Total Allowable Catch (TAC)/ trigger limit (t)	2015-16	2016-17	2017-18
Main Species					
Black teatfish	*Holothuria whitmaei*	1	0	0.08	0.06
White teatfish	*Holothuria fuscogilva*	4	0	2.4	0.58
Sand fish	*Holothuria scabra*	1	0	0	0
Prickly redfish	*Thelenota ananas*	20	0	0.32	0.33
Surf red fish	*Actinopyga mauritiana*	10	0	0	0.04
Other species					
Any combination of greenfish and lollyfish	Greenfish- *Stichopus chloronotus* Lollyfish- *Holothuria atra*	10 tonnes (any combination of greenfish and lollyfish)	0	0	0
Any other single species		5 tonnes per species	0	0	0.008

Total species for the sector						
All species of the Order Aspidochirotida		0	150 tonnes (TAC for all species in the sector)	0	0	0

Reference

ABARES, 2015. Reducing uncertainty in fisheries stock status. Research by the Australian Bureau of Agricultural and Resource Economics and Sciences