



**Australian Government**

**Australian Fisheries Management Authority**

# **Meeting of the Torres Strait Hand Collectables Working Group members**

**7 August 2020, Video conference**

## **Final Meeting Record**

Note all meeting papers and minutes  
are available on the PZJA webpage:

[www.pzja.gov.au](http://www.pzja.gov.au)

# Contents

1	Preliminaries .....	3
1.1	Acknowledgement of Traditional Owners, welcome and apologies .....	3
1.2	Adoption of agenda .....	4
1.3	Declarations of interest.....	4
1.4	Action items from HCWG16 and previous meetings .....	6
1.5	Out of session correspondence .....	6
2	Working Group Updates .....	6
2.1	Industry member update .....	6
3	Catch and effort Summary .....	6
4	Preliminary results of the Beche-de-mer stock survey .....	7
5	Future Black teatfish opening .....	15
6	Date and venue for next meeting .....	17
	Attachment A – Adopted Agenda .....	20

# 1 Preliminaries

## 1.1 Acknowledgement of Traditional Owners, welcome and apologies

1. Quinten Hirakawa opened the meeting in prayer around 9:20 am.
2. The Chair welcomed attendees to the meeting via video conference. The Chair acknowledged the Traditional Owners of the land on which the various members were located and paid respect to Elders past, present and future.
3. Attendees at the Working Group are detailed in **Table 1** below. The position of Traditional Inhabitant Member for Maluialgal is currently vacant.
4. The Chair welcome the Scientific member, Steven Purcell, to his first meeting of the HCWG.
5. The AFMA Member advised that this meeting did not meet the requirements for quorum under PZJA Fisheries Management Paper 1, due to the absence of three traditional inhabitant members. As a result any recommendations and advice from the meeting will be of individual working group members as opposed to advice of the Hand Collectables Working Group (HCWG).
6. Apologies received are detailed in the **Table 2** below.

**Table 1. List of attendees at the meeting of HCWG members**

Members	
Anne Clarke	Chair
Tim Skewes	Scientific member
Michael Passi	Traditional Inhabitant member, Kemer Kemer Meriam
Maluwap Nona	Traditional Inhabitant member, Gudumalulgal
Selina Stoute	Australian Fisheries Management Authority (AFMA) member
Mark Anderson	Torres Strait Regional Authority (TSRA) member
Steven Purcell	Scientific Member
Nick Boucher	Queensland Department of Agriculture and Fisheries
Executive Officer	
Danait Ghebregabhier	HCWG Executive Officer, AFMA
Observers	
Maluwap Nona	Malu Lamar (Torres Strait Islanders) Corporation RNTBC
Yen Loban	TSRA Fisheries Portfolio Board Member
Nicole Murphy	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Eva Plaganyi-Lloyd	CSIRO
John Jones*	Compliance Manager, AFMA
Ian Butler	Australian Bureau of Agricultural and Resource Economics and Sciences, Department of Agriculture, Water and the Environment

Keith Brightman	TSRA
Quinten Hirakawa	TSRA

\* John Jones attended the preliminaries of the meeting and then left to remain on standby to re-join the meeting as required. That is when advice was required on compliance related matters. Mr Jones however was not recalled to the meeting.

**Table 2. List of apologies for the meeting of HCWG members.**

Apologies	
Anthony Salam	Traditional Inhabitant Member - Kaiwalagal
Patrick Bonner	Traditional Inhabitant Member - Kulkagal
Ian Liviko	PNG National Fisheries Authority (NFA) Invited Participant

## 1.2 Adoption of agenda

7. Given the video conferencing format of the meeting and in order to allow adequate time for the presentation of the preliminary survey results and consideration of a future black teatfish reopening, Working Group members:
  - a. accepted the traditional inhabitant member recommendation to bring forward Agenda Item 4 - the Preliminary survey results and Agenda Item 5 - Future black teatfish reopening
  - b. agreed, as recommended by the Chair, to take the following agenda items as read:
    - i. Agenda item 1.4 - Action items from previous meetings
    - ii. Agenda item 1.5 - Out of session correspondence
    - iii. Agenda item 2.3.1 – Government, native title and scientific updates
8. However, with regards to Agenda Item 2 – Working Group updates, the Chair noted that it would be valuable for industry to provide a general update together with an update on any impacts that COVID-19 related restrictions and impacts may have had on their fishing operations

## 1.3 Declarations of interest

9. The Chair advised members and observers, that having regard for the video conferencing format and potential for technology issues, members and observers were invited to update the register of interest provided in the agenda paper by exception and that members would not be asked to leave the meeting. Declared interests are detailed in **Table 3** below. No members objected to this process.
10. Table 3. Declared interests from each attendee.

Name	Position	Declaration of interest
<b>Members</b>		
Anne Clarke	Chair	Previously contracted with Regional Development Australia Far North Queensland and Torres Strait No pecuniary interests or otherwise.
Tim Skewes	Scientific Member	CSIRO/Independent Consultant.

Name	Position	Declaration of interest
		<p>Current co-investigator on TSSAC project 'measuring non-commercial fishing in the Torres Strait'.</p> <p>Current co-investigator on TSRA funded project 'Stock survey of Torres Strait Beche-de-mer species'.</p> <p>Previous principal scientist for Torres Strait Scientific Advisory Committee (TSSAC) project to develop a harvest strategy for the TSBDMF.</p> <p>Previous CSIRO researcher for TSSAC project investigating traditional take of finfish in Torres Strait.</p>
Steve Purcell	Scientific Member	Has interest in invertebrate fishery research has previously worked in the assessment of sea cucumber fisheries in the Pacific and New Caledonia, and on restocking/sea-ranching research; no pecuniary interests or otherwise.
Michael Passi	Traditional Inhabitant Member Kemer Kemer Meriam	TIB licence holder
Maluwap Nona	Traditional Inhabitant Member, Gudumalulgal	TIB licence holder; Chairperson of Malu Lamar; Director of MDW Fisheries Association on Mer; Traditional Inhabitant Member on TSSAC.
Selina Stoute	AFMA Member	Employed by AFMA, no pecuniary interests or otherwise
Mark Anderson	Torres Strait Regional Authority (TSRA) Member	Employed by TSRA, no pecuniary interests as an individual, TSRA holds fishing licences on behalf of traditional inhabitants.
Nick Boucher	QDAF Member	Employed by Queensland Government Managing the East Coast Sea Cucumber Fishery. Previously worked with the TSRA on Torres Strait Fisheries – no pecuniary interests or otherwise
Danait Ghebrezgabhier	Executive Officer, AFMA	Employed by AFMA, no pecuniary interests or otherwise
<b>Permanent Observers</b>		
Yen Loban	TSRA Board, Fisheries Portfolio Member	TIB licence holder; TSRA Board Member for Ngurupai
<b>Casual Observers</b>		
Eva Plaganyi-Lloyd	CSIRO	
Nicole Murphy	CSIRO	
Ian Butler	Australian Bureau of Agriculture and Resource Economics (ABARES)	Employed by ABARES, DAWE, no pecuniary interests or otherwise
Keith Brightman	TSRA officer	Employed by TSRA, no pecuniary interests or otherwise
Quinten Hirakawa	TSRA officer	

## 1.4 Action items from HCWG16 and previous meetings

11. All updates on the status of action items arising from previous HCWG meetings were taken as read and were not explicitly discussed (**Table 4**).
12. The Working Group noted the final meeting record for HCWG 16, which was finalised out of session and published on 3 April 2020.

## 1.5 Out of session correspondence

13. All out of session correspondence on Working Group matters since HCWG16 was taken as read and not explicitly discussed.

# 2 Working Group Updates

---

## 2.1 Industry member update

14. Both Traditional Inhabitant Members, advised members that rough weather over the past few weeks has made it challenging to go fishing but the stocks in the fishing grounds appear to be healthy. The member has had discussion with other full time TIB operators on ramping up fishing operations once the weather improves.
15. COVID-19 related restrictions have given the members a chance to discuss and reflect on various issues in the fishery with other traditional inhabitant members on the HCWG and other operators in the community. This has given them an insight into how to do business in the community, including management arrangements for the reopening of black teatfish.

# 3 Catch and effort Summary

---

16. Working Group members noted the Executive Officer's update on Beche-de-mer (BDM) catches for the 2020 fishing season (as at 24 July 2020) noting that under AFMA's Information Disclosure Policy, data on reported catch within a season can only be provided for species that have been reported as being caught by five or more operators.
  - a. A bit over 14 tonnes of BDM had been reported as being caught across 14 different species. A total of 20 different licenced TIB fishers have landed BDM to a total of eight different licenced fish receivers.
17. Industry members agreed that the catch summary is a fair representation of catches for the 2020 fishing season to date.
18. The issue about different product forms being weighed by fishers or fish receivers was questioned because the catch weights in gutted-weight equivalents will be in error unless the appropriate conversion ratios are used according to each product form. Incorrect reporting of product form in this fishery will probably result in underestimation of the overall catch, so this is an important issue to get right.
19. The AFMA Member clarified that BDM is required to be weighed at the point of landing to a licence fish receiver. Landed product can be processed and agreed conversion ratios for various processing methods are used to convert all reported catch to a standard weight (wet gutted). Where species specific conversion ratios are not available, the most conservative

conversion factor calculated for other species from that same processing method is applied. The reported catch data provided in the summaries is converted weight.

## 4 Preliminary results of the Beche-de-mer stock survey

---

20. The Scientific member and co-investigator for the project, Mr Tim Skewes, presented the preliminary results of the Beche-de-mer underwater dive surveys undertaken in eastern Torres Strait between November 2019-January 2020 as part of the TSRA funded and CSIRO led project 'Stock survey of Torres Strait Beche-de-mer species' (AFMA Project No. 2019/0826). As well as assessing the distribution and stock status of beche-de-mer species in the Torres Strait, the survey also undertook some exploration and mapping of deep water habitats to help inform better environmental management and ground truth reef mapping from previous projects.
21. A total of 297 sites, in 6 zones and a range of strata (equivalent to reef habitat areas) in East Torres Strait were surveyed, most of which had also been done in the 2002-2009 surveys. 53 new deep water sites were surveyed to investigate potential deep water population species such as white teatfish. The deep water surveys covered 20m-50m depths and a TSRA camera system recorded underwater footage during 10 minute drifts of transects (40m – 675m long). The outputs of the survey include relative average densities for species by zones and strata, comparative density over time, and standing stock estimates for the stock. The results for the Barrier and GNEC zone are excluded from the comparative density estimates as they were not surveyed during all previous surveys, however they are still used in the 2019/20 standing stock estimate. The project also carried out detailed sampling of sea cucumbers and habitats on Ugar reefs to support a potential reseeded project there, the results of which were also tabled at the meeting but not discussed.

### **PART 1 – Preliminary survey results**

22. The preliminary results presented here were produced for consideration by the Working Group members to facilitate decisions related to the reopening of the BTF fishery, and as a “first pass” assessment of the sustainability of currently targeted species. The full analysis and recommendations will be contained in the Final report due end December 2020. The preliminary results of the survey are summarised below:
  - a. **Black teatfish (*Holothuria whitmaei*)**
    - i. Black teatfish density across all zones and strata surveyed averaged 7.4 per hectare (Ha) – with the average density in the reef-top buffer strata, its preferred habitat, of about 12 per Ha. None were seen in the deep water strata (>20m). The Barrier and Don Cay zones had the highest average density of black teatfish (>17/Ha) which is well above the 12.5/Ha indicative healthy density for Black teatfish from a FAO global review. The higher densities observed at these sites are consistent with industry's reports of observations.
    - ii. The Darnley, Great North East Channel (GNEC) zones had the lowest density of black teatfish as expected but the results of this survey show a decrease from previous surveys. The results of the Seven Reefs zone on the other hand show an increase in density from previous surveys.
    - iii. The 2019/20 4-zone density is only slightly less than the 2009 density which was considered to have recovered to close to B<sub>0</sub> levels. Together with the very high density observed in the Barrier and Don Cay zones, especially in the preferred reef top buffer strata, in 2019/20 and the similarity of the density in these areas to closed population

densities in the GBR, this indicates that the black teatfish population is currently in a healthy state.

- iv. The conservative stock estimate for black teatfish was 817.8t (gutted weight), this being the lower 90<sup>th</sup> percentile of the estimated biomass of 1,238t (gutted weight) to account for the uncertainty in the estimate due to natural variation in densities and the extrapolation of the survey results to produce the biomass estimate.
- v. The length frequency data showed the presence of some of the largest Black teatfish recorded however there was a slightly lower relative proportion of legal size animals compared to 2009 and the average size was slightly smaller than that measured in 2009, but larger than other surveys. Members noted the advice from one of scientific members that this could be a sign of shrinking of larger individuals and/or the presence of new recruitment to the fishery (hence a greater proportion of smaller animals are present).
- vi. Additional work is required to advise on carrying capacity and the limit reference point for this species.

**b. White teatfish (*H. fuscogilva*)**

- i. The survey results indicates that the deep water strata (20 m - 50 m) (where sampled) in 2019/20 had the highest densities of white teatfish of any strata, with an average density of 15 per Ha. This high density was consistent in all zones sampled. They were also noted in high density on the reef top in the Barrier and Don Cay zones, especially on the deeper reef top habitats. Don Cay had the higher overall density of any zone at over 10 per Ha.
- ii. White teatfish average (stratified) density in east Torres Strait reef zones was very variable over the years. Don Cay zone again had the highest density of White teatfish in the east Torres Strait area, and the Barrier zone had the highest ever observed.
- iii. The highest overall (4-zone) average stratified average for white teatfish (shallow reefs only) observed was in 2002 at 2.5 per Ha. While the 2019/20 estimate of 1.83 per Ha was not as high as 2002, the observed density coupled with the substantial population in deeper water that is likely unfished, indicates that the white teatfish population was still in a healthy state.
- iv. The preliminary fishery biomass population estimate (lower 90<sup>th</sup> percentile as gutted weight) for white teatfish in 2019/20 was 543 t, with almost half of that found in the deep water strata, but none found beyond 36m (deep water strata area is assumed to be the same as the reef edge area – more analysis will be required to better estimate the area of this habitat). The highest density occurs between the depths of 20m-36m and the species seems to prefer sandy-bottom habitat.
- v. Density estimates in deep water far surpassed density in shallow water. Delineating deep water habitat will be challenging to come up with a biomass estimate given their depth.
- vi. Currently the area of the deep water strata is assumed to be the same as the reef slope area. This is likely to be an underestimate therefore this will result in an underestimation of the stock.
- vii. Additional work is required to advise on carrying capacity and the limit reference point for this species.

**c. Prickly teatfish (*Thelenota ananas*)**

- i. The survey results indicates that the highest density was in the Barrier edge strata, and this was true overall as well, with the reef edge having an average density of 16 per Ha.



There were few prickly teatfish seen in deep water (>20 m). The Barrier zone also had the highest overall density at 18 per Ha.

- ii. Overall (4-zone) density was the lowest ever observed for prickly teatfish at 1.5 per Ha, being only 63% of the 2005 estimate, and continues a downward trend for this species since 2005.
- iii. The Cumberland zone, which has a large area and is an important habitat for this species, had a relatively low density, especially when compared to the Barrier zone, where high levels of fishing are unlikely.
- iv. The preliminary fishery biomass population estimate (lower 90<sup>th</sup> percentile as gutted weight) for prickly teatfish in 2019/20 is 375t.
- v. The low prickly redfish densities observed at Darnley were not surprising and seemed consistent with fishers' observations to that effect. It was noted that the Darnley fishing grounds are usually better known for their curryfish assemblages.
- vi. Juvenile/small sea cucumbers were not observed.
- vii. The level of depletion observed is expected given the level of fishing on the species and the TAC has been reduced previously in response to industry's concerns that under reporting may be occurring in the fishery.
- viii. Industry members further confirmed that sustainability of the species was a concern for them and they have been rotating between the key fishing grounds using traditional knowledge and understanding on a 3-4 month basis and have seen the benefit in the recovery of the larger individuals.
- ix. The scientific member Tim Skewes commented that the 3-4 month cycle rotational strategy is most likely allowing larger animals from other areas of the reef to move in.
- x. The scientific member Steven Purcell added that the variation in density may also be due to the species' daily cryptic (hiding/burrowing) and semi-aggregation behaviour, which may in turn be influencing the abundance estimates.
- xi. The scientific members and industry members agreed that further opportunities should be pursued to enable science to inform industry's rotational strategies and traditional ecological knowledge to help inform future scientific stock surveys especially with regards to juvenile/settlement areas.

**d. Curryfish (common) (*Stichopus herrmanni*)**

- i. The survey results indicates that the highest common curryfish density was on the reef top buffer strata, particularly in the Darnley zone, at 38 per Ha. They were also seen on the reef edge and, to a lesser extent, on the reef top strata. Some were even observed in the deep water strata, but in low densities. The Darnley zone had the highest overall density. Cumberland and Don Cay zones also had significant densities of common curryfish.
- ii. Zone and overall survey density over survey years for this species was quite variable. Overall the density was lower than in 2009, and similar to 2002, however, there was not a great variation in density over time.
- iii. The preliminary fishery biomass population estimate (lower 90<sup>th</sup> percentile as gutted weight) for common Curryfish in 2019/20 was 632t. Note that deep water strata area is assumed to be the same as the reef edge area. More analysis will be required to better estimate the area of this habitat.
- iv. Provisional harvest strategy limits do not seem to have been breached, however as per prickly teatfish, the declines in density from previous surveys, while not unexpected given the level of fishing effort on them, need to be investigated further to ensure that the stock remains sustainable.

- v. Species specific identification can be challenging for curryfish species and a dedicated project on collecting morphological info and understanding habitat preference for Curryfish species is a priority.

**e. Curryfish (*S. vastus*)**

- i. The survey results indicates density increased significantly since the 2009 survey. Industry confirmed that they do come across a lot more *S. vastus* while fishing although none of the traditional inhabitant members on the HCWG target *S. vastus* specifically – they are usually just included in the curryfish catch.
- ii. We were not able to produce a preliminary fishery biomass estimate at this stage due to the extreme patchiness of this species. more analysis will be done for the final report.
- iii. Acknowledged that species identification is key and more work needs to be done to standardise naming of Curryfish species.
- iv. Industry commented that curry fish processing can be fiddly and requires careful handling and a lot of patience. Some industry members are working on best processing methods and have worked out a way to dry the product. If successful, dry curryfish can fetch up to \$155/kg (dried) compared to \$28/kg (wet)
- v. The Traditional Inhabitant Member, Gudumalulgal requested that full time TIB operators be invited to participate at HCWG meetings to share their expertise in the industry.
- vi. AFMA Member confirmed that it strongly supports additional industry expertise being made available to the HCWG as required.

**f. Surf redfish (*Actintopyga mauritiana*)**

- i. The survey observed low densities of this species most likely due to its cryptic behaviour during daytime. A dedicated surf redfish survey on the wave-exposed reef crests is likely required to search for individuals.
- ii. This is currently a closed species and current abundance is not sufficient to warrant re-opening the fishery.
- iii. The scientific member Steven Purcell remarked that the low abundance for this species was a concern.

**g. Deepwater redfish (*A. echinites*)**

- i. This species has gone through a significant decline due to extensive fishing effort but seems to have recovered.
- ii. It has a very patchy distribution and this makes it hard to survey.
- iii. The preliminary fishery biomass population in 2019/20 is 70t.

**h. Hairy blackfish (*A. miliaris*)**

- i. Similar to Deepwater redfish, this species is also hard to survey due to its patchy distribution. Previous surveys have found a couple of high density patches but none were seen in this survey.
- ii. It is hard to determine whether the density trends are due to patchiness in distribution or to fishing.
- iii. The preliminary fishery biomass population in 2019/20 is 10t.

**i. Greenfish (*S. chloronotus*)**

- i. Greenfish is not a heavily fished species but populations tend to be variable over time and space, making them challenging to survey.
- ii. They can be one of the most abundant sea cucumber species in the Torres Strait – they were extremely abundant during the 2009 survey.

iii. The preliminary fishery biomass population in 2019/20 is 706t.

23. The scientific member Tim Skewes advised that none of the preliminary results appears to raise immediate sustainability concerns that need to be addressed as a matter of urgency prior to the project being finalised in December 2020 and before the start of the 2021 fishing season.
24. Having considered the results and advice from the scientific member, Working Group members agreed to consider the finalised survey results and their implications for future management arrangements across all species (noting black teatfish results are being considered in detail at this meeting) in the Beche-de-mer Fishery at their meeting in early 2021.
25. With agreement from the project team and traditional inhabitant members at the meeting, the AFMA Member advised that AFMA would make arrangements for further discussions between industry and the project team to inform the further work required to interpret the current survey results across all species. In consultation with participants, these meetings would likely be organised for the coming months.
26. The scientific member Tim Skewes also advised that future scientific stock surveys could benefit from Industry input with regards to future areas to be surveyed given that some specific areas that have high densities and/or specific length compositions have been observed by fishers for some species.
27. Working Group members thanked the Scientific member and the rest of the project team for their work on the project to date and noted that the next project progress update is due in October, with the project due to be completed in December 2020.

## **Part 2 - Black teatfish stock status**

28. Following the presentation of the survey results, the Scientific Member Tim Skewes provided additional information and clarification on the status of black teatfish stock in the Torres Strait and interpretation of the survey results in the context of the harvest strategy HS, the current gaps in the knowledge and comparison with management strategies used by other jurisdictions.
29. Default values of  $B_{TARG}$  and  $B_{LIM}$  in the Commonwealth Harvest Strategy Guidelines are 48%  $B_0$  for  $B_{TARG}$  and 20%  $B_0$  for  $B_{LIM}$ . However, there is broad recognition that these reference levels may be too low for sea cucumbers. The Torres Strait Beche-de-mer Fishery Harvest Strategy has a conservative proxy value of  $B_{LIM}$  of 40% $B_0$ . It is envisaged that these reference levels, including values of  $B_{TARG}$ , will be developed as more data become available. The scientific member Tim Skewes agreed to provide members with supporting resources on harvest strategy reference levels.
30. When drawing comparisons with other surveys, such as the ones undertaken for the Great Barrier Reef, unbiased comparisons between locations are difficult as sea cucumber density varies across reef habitats and in relation to distance from terrigenous influence (across shelf)—and likely several other lesser known gradients. Comparison depends on a clear delineation of the surveyed habitats and historical surveys in Torres Strait have been carried out using the same sample design and survey approach. The current report is showing better confidence in the biomass estimate and this is a sign that future surveys should replicate the sampling protocol for comparability. The results of the surveys are also consistent with industry's reports that stock abundance has increased for certain species.
31. It is hard to compare between various density reference points used in Australia and globally due to how habitat is defined in the various studies, however, by comparing density estimates in similar habitats between regions, it appears that black teatfish density in Torres Strait compares favourably to other regions, including closed areas on the GBR, indicating that black

teatfish densities in the Torres Strait are in a reasonable state. This inference is supported by comparisons with densities in other reports across all habitats and within the species preferred habitats.

### **PART 3 – modelling analyses**

32. Dr Eva Plaganyi presented the results of supplementary modelling analyses that built on the survey results for the Black teatfish stock in the Torres Strait. The biomass dynamic model uses the total 4-zone average biomass reported in the survey results and reported catch data to explore the changes over time to the biomass and productivity of the black teatfish population and see which life history parameters are consistent with the trends in the data. Whilst acknowledging there are limited data and large uncertainties, this type of analysis can help inform on sustainable fishing levels. This level of information cannot be obtained from a stock survey which is a static measure of the standing stock biomass at a given point in time.
33. The model is simple due to the limited information that is currently available for the fishery (i.e., relatively few values in the survey time series (5)) but provides a useful first step in exploring a range of alternative harvest scenarios with different levels of precautions added to support decision making. The fact that there is some contrast in the time series (a decline followed by a recovery) however provides some confidence to use the data to estimate productivity. Consistent with the BDM HS's tiered approach, the model incorporates precaution to deal with the level of uncertainty of the data for the fishery.
34. Key precautions when fitting to the 2019/20 survey estimate is to use the lower 90th percentile estimate and for models where the total biomass is estimated, the models estimate a lower biomass estimate and apply fairly conservative estimates of the growth rate parameter  $r$  so as not to over-estimate the productivity of the stock (especially given recruitment is sometimes sporadic in this species). Although a number of alternative sensitivities were considered, the model base-case doubled the starting 1995 survey estimate based on consideration of reasons why this estimate may be an under-estimate. The exact correction factor isn't known, but this assumption results in a steeper declining trend in survey indices in the early years (catches were also doubled) which also adds to the precaution applied. The model will get more refined and improved as more data become available.
35. As well as standing stock biomass estimates derived from surveys and catch data, the model uses a combination of the intrinsic growth rate ( $r$ ) and the carrying capacity ( $K$ ) parameters to obtain an estimate of productivity and replacement yield in the fishery (that is more robust than either parameter on its own) and hence a relatively robust estimate of Maximum Sustainable Yield (MSY) (assuming a Schaefer logistic growth model). The biomass estimate from the 1995 survey was doubled to provide an estimate of the carrying capacity of the stock. This was considered to be an appropriate starting point as the fishery was in its initial phases and the stock survey at the time is likely to have underestimated the biomass of the stock, relative to any other period in the surveyed history of the fishery.
36. The base-case model estimates the stock is currently at around two-thirds (67%) of  $K$ , and even though this is uncertain, all models suggest considerable stock recovery (well above BLIM), and hence it is reasonable to suggest MSY could be used as the sustainable replacement yield to inform decisions on a sustainable TAC.
37. Given the data inputs and the conservative parameter settings applied, the base case model was used to forward project the biomass trajectory under different exploitation levels, with 15t TAC and 30t TAC presented. The results suggest that 20-21 tonnes (MSY) may be a sustainable catch level for the trial reopening of the black teatfish fishery. This estimate is slightly higher than the 15t default opening TAC recommended by the BDM HS agreed in 2019.

The model projections suggest that a constant annual TAC of 30t would not be sustainable and would lead to a consistent decline in the biomass of the stock after the first year of fishing.

38. There was concern expressed by the TSRA Member that the base-case model (Model 4) did not accurately match the abundance estimates from the stock survey (the survey estimate is 818 tonnes for 2019/20 whereas the model estimate is around 300 tonnes). This was because the base-case model was selected as the base-case based on formal model selection methods which provides the best fit (with fewest associated parameters) to all of the observed data, including surveys from previous years and reported removals, and thus most plausible explanation of the trend in the data that the model are fitted to. Models are not reality but simplified depictions that help the understanding of some of the properties of complex systems.
39. Dr Plaganyi explained that in addition to the base-case model, a number of additional model versions were run and results of some of these presented in the accompanying report and at the meeting, including versions that fixed the biomass at higher levels more similar or identical to the 2019/20 survey biomass estimate. Across all model versions tried, the MSY estimate was roughly in the range 17-28t (with 22t estimates for the version identically matching the survey biomass level) and hence the MSY estimate of 21t was considered relatively robust.
40. In this instance, the biomass dynamic model uses conservative assumptions to provide assurance that the stock is at a healthy place and uses the different pieces of information that are available for the fishery to explain how the productivity of the stock will respond to different levels of exploitation. That is, it provides information on how stock levels might change over time (the trend in biomass: constant, increasing, declining).
41. This level of information cannot be obtained from a stock survey alone which is a static measure of the standing stock biomass at a given point in time and does not take into account the level of susceptibility of the stock to fishing. Furthermore, the base case model could be considered as representing the fished areas only, as opposed to the entire region (which the survey results are extrapolated to). Poor catch reporting can underestimate stock productivity. This is because a decline in stock biomass may be attributed to low catches and hence associated low productivity of the stock, whereas if the catches were actually higher, this means the stock productivity must have been higher.
42. The following additional data would help refine model analyses in the future:
- Available biomass would be a better index to use when managing a recovering stock because it accounts for the lag effect in recruitment to the fishery, especially if they are a slow growing species, to give them a chance to reproduce.
  - Additional data– (catch per species, effort (e.g., data on hours spent fishing per day and number of fishers for each reported catch), catch per unit effort, spatial footprint (approximate areas or reefs fished by each fisher for each reported catch) and species composition) or better certainty in catch data will help to refine and substantially improve modelling results, and assess the accuracy of the current productivity estimate.
  - spatial aspects need to be accounted for in the modelling to reconcile the absolute biomass estimates with the trends in the survey data. Data loggers/tracking devices could be used to quantify spatial footprint and dive times etc
  - Sub-samples of catches could be sampled by fishers/individuals to collect data such as size measurements
43. A TSRA observer acknowledged the value of the modelling work but argued that it was full of uncertainty and as such should not be used to inform the discussion on setting a trial reopening TAC for black teatfish. The TSRA officer alleged that the supplementary modelling work was prepared in secrecy and outside of the scope of the project contract and without any consultation with traditional owners. He further alleged the purpose of undertaking this work was not explained adequately.

44. The AFMA Member advised that it took exception to the accusation made by the TSRA officer that the supplementary work was undertaken in secrecy and implication that AFMA and the project team have not been transparent. The information was not purposefully held back and a copy of the report was shared with the TSRA as soon as it became available. The project team has worked hard to undertake the analysis in time for the meeting. The purpose of the analysis is to support members in developing advice, including traditional inhabitant members. The modelling is not intended to replace data but simply add further lines of evidence for the working group to consider. This meeting provides an opportunity for members to understand and review the information with the project team.
45. Dr Plaganyi advised that there was nothing sinister about the additional work and expressed regret at the misunderstanding that this has caused. Dr Plaganyi outlined that the project team had gone through a considerable amount of effort to upskill to be able to use additional tools to provide insight into the application of the HS using a bootstrapping approach that was previously applied in this fishery but requires time to implement, in the midst of the disruption that the current COVID climate has caused for everyone. The intention of the additional work was to provide as strong a scientific basis as possible to inform the Working Group and industry's consideration of the survey results in light of a future reopening of black teatfish.
46. The Scientific member Steve Purcell advised that in his view the report is very well put together particularly give the time constraints. The survey is of high quality and the modelling advances the analysis. The member understood why some members find it confusing that the model biomass estimates do not match with the survey estimates of biomass. The modelling unlike the survey, incorporates all catch data and potential stock recovery rates. The survey results unlike the modelling also incorporates areas that are not necessarily fished.
47. The Scientific member, Tim Skewes, further advised members that the modelling uses all available information and gives an indication of the potential susceptibility of the species to fishing. It tries to explain why the population dropped so much historically noting catch was very much a likely driver of that decline. This involves a lot of work and it is unfair to say it was done in secret.
48. The TSRA Fisheries Portfolio Board member suggested that the Working Group members proceed to discussing the opening of the fishery based on the advice of the initial modelling work that a trial TAC level of 20-21t is considered sustainable. The Board member further suggested that the modelling be revisited following an initial opening to assess whether higher catch levels are possible for black teatfish in the fishery, following the collection of good quality fishing data.
49. AFMA Member noted that through the development of the HS industry had made clear their preference to rebuild a fishery for this stock cautiously over time and that the collection of data was a long-term commitment. Periodic surveys alone will not resolve uncertainties, good quality catch and effort data is required
50. The TSRA observer withdrew his allegation of the supplementary work being undertaken in secrecy and that it is not a reflection of the science rather an expression of frustration at not having being able to access the supplementary information earlier.
51. To conclude her presentation Dr Plaganyi outlined further research opportunities in exploring the potential uses of a revised and updated MSE (incorporating multispecies spatial operating model):
- Could model all key species, with age structure and spatial component and bound the range of uncertainties
  - A tool to more comprehensively evaluate the risks of different TAC alternatives
  - A tool to validate the new Harvest Strategy (HS) and help implement rules such as how best to use indicators to adjust TACs e.g. size measurements used to inform on age structure and hence available biomass

- Can explore how adding data reduces uncertainty and hence consequences for management recommendations
- More broadly can contribute to aspirational development of an integrated ecosystem model that incorporates climate change

## 5 Future Black teatfish opening

---

### Recommending a TAC based on information presented at the meeting

52. In recognition that new information (the modelling and estimates of available biomass) had been tabled at the meeting and circulated only a few days before the meeting, the AFMA member sought advice from members on whether or not they would like additional time to consider the information, including at a future HCWG meeting. The AFMA member noted that a further meeting of the HCWG could be convened.
53. Both traditional inhabitants together with the TSRA Board Fisheries Portfolio member advised they did not want further time. They supported using the information available and noted industry's commitment and understanding on the need to improve data for the fishery overtime.

### Is the stock above the limit reference point?

54. Working Group members agreed that, all available information indicates that the stock is above the limit reference point, thus satisfying the first condition of *Section 2.11.4 Re-opening Decision Rule* of the TSBDM HS.

### Recommending a TAC based on harvesting an agreed proportion of the estimated standing stock biomass for 2019/20

55. Working Group members discussed the merits of recommending a TAC based on a percentage (e.g., 10%) of the standing stock biomass estimate (available biomass or total) versus a modelling approach to recommending a starting black teatfish TAC to the PZJA. The Scientific Member Tim Skewes advised working group members that he considers the modelling approach to be more reliable and expressed his preference to use this as a basis for decision making, including setting catch limits, along with other lines of evidence. The 5-10% rules of thumb are derived from existing literature to inform exploitation levels for sea cucumbers in the absence of other data and analysis for a given fishery. A 5 % exploitation rate is intended to provide a conservative harvest limit taking into account the slow growth rate and susceptibility to depletion of sea cucumber species generally. It is hard to estimate an upper exploitation limit for these species and 10% was therefore identified as a rule of thumb for the maximum level of take that a healthy sea cucumber stock could sustain.
56. The scientific member, Steve Purcell, advised that 5% exploitation level is of limited application to black teatfish as populations have still been depleted at this level of fishing—the East Coast fishery being a well-studied example. Importantly, rules of thumb do not abrogate the need to collect good fishery data to inform the management and decision making in a fishery. Rules of thumb are based on observations that may be thought of as precautionary but can sometimes be misleading as they may not always account for change in productivity due to changes in recruitment.

### Member advice on a reopening TAC

57. Working Group members proceeded to individually recommend a trial opening TAC that they consider to be demonstrably conservative as per Condition 4 of the Reopening decision rule of the BDM HS.

58. None of the Working Group members recommended applying the rule of thumb approach described above.
59. **AFMA Member supported a recommended trial opening TAC of 20t** based on the conservative model outputs.
60. **Traditional Inhabitant Member Gudumalulgal** recommended a TAC of 20t noting that 21t would still be considered sustainable but the 1t would provide a buffer should the TAC be exceeded. The member also recommended an April 2021 re-opening to allow enough time for the engagement of individual TIB operators to get their perspectives on the arrangements for the reopening.
61. **Traditional Inhabitant Member Kemer Kemer Meriam** – reiterated his agreement with Traditional Inhabitant Member, Gudumalulgal with regards to recommending a 20t TAC level. The member also reiterated that it is important to undertake consultation with full time fishers on all the elements of a black teatfish trial reopening, including presentation of the scientific basis for the recommended TAC and the additional catch reporting requirements that would in place.
62. **The TSRA Member recommended** a TAC of 21t, relying on the provisions in the HS to provide the 5% buffer should catches exceed the set Trial TAC. The member further confirmed that the TSRA Board have supported for the TSRA Fisheries section to undertake community visits, given the stakeholder workshop could not proceed due to COVID-19 restrictions.
63. *Traditional Inhabitant Member, Gudumalulgal left the meeting at 3pm to pay respects to an elder that has passed away at Badu.*
64. **The Scientific Member Steven Purcell recommended** the more conservative 15t Trial TAC for the reopening as the rate that can be demonstrated by the science as being more sustainable especially in light of the CITES Appendix II Listing for black teatfish coming into effect at the end of August. The member noted that the model indicates that 20t would be a sustainable and is based on a precautionary biomass estimate. However this is the maximum sustainable yield (MSY) level that can be taken without impeding the sustainability of the stock and if exceeded runs the risk of having to close the fishery in the future. Whereas a 15t TAC would lower that risk and would support the sustainable redevelopment of the fishery as more CPUE data becomes available to support setting higher TACs in future years. The present lack of data from fishers about fishing effort and areas being fished for each reported catch leaves too much uncertainty (i.e., no way to monitor) about how the stock of black teatfish will respond over subsequent years of re-opening the fishery.
65. **The QDAF Member recommended** a 15t Trial TAC, which is consistent with Table 3. 'TAC Recommendations' which is referred to under the Reopening Decision Rule in the Torres Strait Beche-de-mer Fishery Harvest Strategy. QDAF would support higher TACs in the fishery in the future, if the scientific data supports it and the TAC is not exceeded during the trial openings. QDAF recommended the 15t amount to be consistent with the harvest strategy, because previous trial black teatfish openings have reached or exceeded the TAC quickly and as black teatfish is now a CITES Listed species there can be flow on effects in other jurisdictions when TACs are exceeded.
66. **The Scientific Member Tim Skewes recommended** a trial TAC of 20t as a conservative MSY estimate based on a conservative stock biomass estimate, noting that 21t would still be considered sustainable but the 1t would provide a buffer should the TAC be exceeded. The member stated that he is comfortable that this is a precautionary and justifiable catch limit that balances precaution with the livelihood considerations for Torres Strait Islanders. The member further commented that the current information adequately justifies this level of take from a



CITES Listing perspective also and that other considerations need to be progressed in the fishery such as managing the level of effort and minimising product wastage during processing which this meeting has not touched on.

67. The Permanent observer on the Working Group, Yen Loban, TSRA Fisheries Portfolio Board Member, supported the recommendations of the Traditional Inhabitant Member, Gudumalulgal and the Traditional Inhabitant Member Kemer Kemer Meriam on their recommended TAC of 20 tonnes and the need to undertake community visits prior to the trial reopening, including a presentation of the science that has informed the recommended TAC.
68. Given Working Group members' recommendations and the view expressed to aim for a black teatfish trial opening in April 2021, the AFMA member advised that AFMA will engage with the traditional inhabitant members that have not had a chance to participate in the discussion today to get their views on the recommended TAC levels. AFMA would advise the HCWG on the process for doing so.

## 6 Date and venue for next meeting

---

69. The HCWG noted that a tentative date for the next meeting of the HCWG during the week beginning 5 October had been proposed by AFMA, the format of the meeting will depend on the COVID-19 situation at the time. The need for this meeting was contingent in part on advice from members at this meeting on whether or not any management responses to the preliminary stock survey outcomes (for example advice on BDM TACs limits for the 2021 season) need to be considered. Based on advice from members under agenda item 4, this discussion can be held next year.
70. Other items noted by AFMA requiring advice this year include:
- Research priorities for 2022-23; and
  - Legislative instrument amendments.
71. The Working Group noted that AFMA would liaise with members on a suitable process to progress these items (out of session or in-session in a meeting).
72. The Chair concluded the meeting of the HCWG at approximately 3:30pm
73. Quinten Hirakawa closed the meeting with a prayer.

**Table 4. Status of actions arising from previous HCWG meetings.**

#	Meeting	Action item	Responsibility	Status
1	HCWG 15 (1-2 August 2019)	TSRA and AFMA to develop a discussion paper outlining suggested management arrangements, based on HCWG discussions for pursuing the use of hookah to fish for white teatfish, for further consultation with communities and consideration by the HCWG and the PZJA.	TSRA AFMA	<b>Ongoing.</b> The TSRA supported PZJA Traditional Inhabitant members to undertake cluster consultations in late 2019 which sought feedback from communities on the use of hookah to fish for white teatfish. An overview of the consultations outcomes was considered at HCWG 16. The HCWG recommended Malu Lamar discuss the review of the hookah prohibition at the stakeholder workshop with the view to developing management recommendations (see <b>Action 6</b> below).
2	HCWG 15 (1-2 August 2019)	AFMA to arrange a half/full day future management priorities workshop in conjunction with the next Hand Collectables Working Group meeting.	AFMA	<b>Ongoing.</b> AFMA was unable to arrange the workshop in conjunction with HCWG16 as the focus of that meeting was to seek firm advice on black teatfish for a 2020 opening. Options, including timing and means, for a future workshop will continue to be explored in consultation with members having regard for Covid 19 response measures.
3	HCWG 16 (21 February 2020)	Malu Lamar to make recommendations to AFMA and TSRA on an as needs basis to establish an MOU to assist in improved data collection in the Fishery.	Malu Lamar	<b>Ongoing.</b> While no formal MOU has been developed, a suite of parallel activities have since taken place including a full round of community visits focussed on Fish Receiver System education and awareness, and more recently PZJA traditional inhabitant member cluster consultations. AFMA also continues to work with individual operators to improve data collection.  The TSRA is also working with Malu Lamar to agree a service level MOU that may include programs aimed at improving reporting.  At the HCWG16 meeting, the Malu Lamar Chairperson expressed preference to maintain an ongoing action item on the

#	Meeting	Action item	Responsibility	Status
				development of the MOU to ensure it remains an option if needed.
4	HCWG 16 (21 February 2020)	Malu Lamar to take the lead in convening a stakeholder workshop to further discuss and agree on cultural lore and industry agreements with respect to fishing for black teatfish and report outcomes to the HCWG.	Malu Lamar (supported by TSRA)	<b>Ongoing.</b> The stakeholder workshop was initially planned to take place on 7-8 April but had to be postponed due to the COVID-19 emergency and resulting restrictions. A further workshop was scheduled for the 4-5 August, however it is no longer proceeding. TSRA advise that a series of meetings in communities may now be pursued.
5	HCWG 16 (21 February 2020)	AFMA explore media opportunities such as radio to widely communicate the additional management and reporting requirements for a black teatfish re-opening.	AFMA	<b>In progress.</b> To date, AFMA has identified a number of media avenues to communicate the additional management and reporting requirements for a black teatfish re-opening. These include radio interviews, newspaper adverts, and digital notice boards throughout the region as well as the PZJA website and AFMA's social media platforms.
6	HCWG 16 (21 February 2020)	Malu Lamar to discuss the review of the hookah prohibition at the stakeholder workshop with a view to developing management recommendations.	Malu Lamar (supported by TSRA)	<b>Ongoing.</b> The stakeholder workshop was initially planned to take place on 7-8 April but had to be postponed due to the COVID-19 emergency and resulting restrictions. A further workshop was scheduled for the 4-5 August, however it is no longer proceeding. TSRA advise that a series of meetings in communities may now be pursued.

## Attachment A – Adopted Agenda

### MEETING OF THE PZJA TORRES STRAIT HAND COLLECTABLES WORKING GROUP MEMBERS

7 August 2020 (9:00 am – 3:00 pm)

Teleconference

**DRAFT AGENDA**

The meeting will open at 9:00am on 7 August 2020.

#### **AGENDA ITEM 1                      PRELIMINARIES**

##### **1.1      Acknowledgement of Traditional Owners, welcome and apologies**

The Chair will welcome HCWG members, permanent observers, and casual observers to the meeting of Torres Strait Hand Collectables Working Group members.

##### **1.2      Adoption of agenda**

The working group is invited to consider and adopt the draft agenda.

##### **1.3      Declarations of interest**

Working group members are invited to declare any real or potential conflicts of interests to the group and determine whether a member may or may not be present during discussion of or decisions made on the matter which is the subject of the conflict.

##### **1.4      Action items from previous meetings**

The working group will note the status of action items arising from previous HCWG meetings.

##### **1.5      Out of session correspondence**

The working group will note any out of session correspondence on HCWG matters since the previous meeting.

#### **AGENDA ITEM 2                      WORKING GROUP UPDATES**

The Working Group will note updates from members and observers on matters relevant to Torres Strait Hand Collectable fisheries.

##### **2.1      Industry members**

##### **2.2      Scientific members**

##### **2.3      Government Agencies**

**2.2.1      Australian Fisheries Management Authority (AFMA) – Management**

**2.2.2      Australian Fisheries Management Authority (AFMA) – Compliance**

**2.2.3      Torres Strait Regional Authority (TSRA)**

## 2.2.4 Queensland Department of Agriculture and Fisheries (QDAF)

### 2.3 Native Title

### 2.4 Papua New Guinea National Fisheries Authority

## AGENDA ITEM 3 CATCH AND EFFORT SUMMARY

- 3.1 The working group will note a summary of reported catch in the Beche-de-mer Fishery for the 2020 fishing season to date.

## AGENDA ITEM 4 PRELIMINARY RESULTS OF THE BECHE-DE-MER STOCK SURVEY

- 4.1 The Working Group will consider the preliminary results of the eastern Torres Strait stock survey of Beche-de-mer species that took place in November 2019 and January 2020.

## AGENDA ITEM 5 FUTURE BLACK TEATFISH OPENING

- 5.1 In consideration of the preliminary stock survey results, and guidance under the Beche-de-mer Harvest Strategy, the Working Group will provide advice to the PZJA on an appropriate TAC and relevant management arrangements required for a possible future black teatfish opening.

**Expected Outcome:** The Working Group will **provide advice to the PZJA** on a suitable time and appropriate management arrangements, including a recommended total allowable catch, required to conduct a black teatfish opening in accordance with the decision rule in the BDM harvest strategy for re-opening a closed species.

## AGENDA ITEM 6 OTHER BUSINESS

### 6.1 Other Business

The Working Group is invited to nominate any other business for discussion.

### 6.2 Date and venue for next meeting

The Working Group will consider a date and venue for HCWG17.

## CLOSE OF MEETING



**Australian Government**

**Australian Fisheries Management Authority**

# PZJA Hand Collectables Working Group 17

7 August 2020

Video/teleconference





## Agenda item 1.1

- **Acknowledgement of Traditional Owners and Prayer**
- **Welcome**
- **Apologies:**
  - Mr Tony Salam, Traditional Inhabitant Member - Kaiwalagal
  - Mr Patrick Bonner, Traditional Inhabitant Member – Kulkalgal
  - Ian Liviko, Permanent Observer - PNG NFA
  - Other?





# Video conference instructions

## Please:

- ✓ mute your microphones when not speaking to minimise feedback.
- ✓ participate via online video conference if you can.
- ✓ email your mobile number to [Danait.Ghebrezgabhier@afma.com](mailto:Danait.Ghebrezgabhier@afma.com) if you are having trouble joining the meeting.
- ✓ Put your phones on silent!





## Agenda items to be taken as read

- Agenda item 1.2 - Adoption of Agenda
  - Suggestion to bring forward Agenda items 4 and 5 to allow adequate discussion time.
- Agenda item 1.4 – Action items from previous meetings and final record from HCWG16.
- Agenda item 1.5 – out of session correspondence



# Agenda item 1.3 Declaration of interest

## PZJA Fisheries Management Paper 1

### Role of Hand Collectables Working Group

Working Groups (WG) have been established to **provide advice** on particular matters relevant to individual fisheries to the Protected Zone Joint Authority. The task of a WG is to **discuss, negotiate and debate issues** relevant to individual fisheries.



# PZJA Fisheries Management Paper 1

## Terms of Reference

1. To **provide a forum for the discussion of matters** relevant to the management of Torres Strait fisheries and to act as a medium for the flow of information between all stakeholders;
2. To provide advice and make recommendations to the PZJA with respect to:
  - i. the management of the fishery;
  - ii. the development of fishery management plans;
  - iii. ongoing measures required to manage the fishery in accordance with the provisions of management plans; and
  - iv. amendments to management plans as required;
3. To **provide advice and make recommendations to the PZJA** on research priorities and projects for the fishery. MACs and WGs are to ensure that processes are in place for industry and other interested stakeholders to receive advice from researchers in a form that will be easily understood by the audience;
4. To establish sub-committees as required ensuring that the range of management issues is given proper attention;
5. To liaise with PZJA Agency staff and provide assistance as necessary to ensure approved management measures are implemented; and
6. To undertake additional functions on behalf of the PZJA as determined by the Authority.





# PZJA Fisheries Management Paper 1

## Disclosure of Interests (Agenda item 1.3)

- Types of interest
  - There may be a conflict of interest where a member:
    - ☐ has a material personal interest, including a direct or indirect financial or economic interest, in a matter being considered, or about to be considered, by the MAC, SAC, WG or RAG; and
    - ☐ the interest could conflict with the proper performance of the member's duties in relation to the consideration of the matter.
- Declaring an interest
  - When a WG member recognises that a real or potential conflict of interest exists, the conflict must be disclosed as soon as possible to other members.
- Dealing with interests
  - Where it is determined that a direct conflict of interest exists, the WG may allow the member to continue to participate in the discussions relating to the matter but not in any decision making process.



## Agenda item 2 – Working Group Updates

- Verbal updates from Working Group members and observers
- Written AFMA management update on the progress of the non- detriment finding assessment of black and white teatfish prior to the CITES Appendix II listing of the species coming into effect on 28 August 2020.



## Agenda item 3 – Catch and Effort Summary

Species	Catch (t) (24 July 2020)	2020 season TAC (t)
Prickly redfish	10	15
Hairy blackfish	1.1	5
Basket species	1.4	50
<b>Total</b>	<b>~14*</b>	<b>190</b>

\*the total includes reported catches of other target species. Under AFMA's Information Disclosure Policy, catches by 5 operators or less cannot be published within a fishing season to protect the confidentiality of individual operators.

See also:

**Attachment 3a** – 2020 season AFMA catch watch report

**Attachment 3b** – 2019 season catch and effort summary





## Agenda item 4 – Preliminary survey results

- HCWG Scientific member and CSIRO to provide presentation.
- Working Group to discuss any preliminary survey results that raise sustainability concerns and need to be addressed urgently for the 2021 fishing season.



## Agenda item 5 - Future black teatfish opening

Beche-de-mer Harvest Strategy, Section 2.11.4 Re-opening Decision Rule (pg. 34)

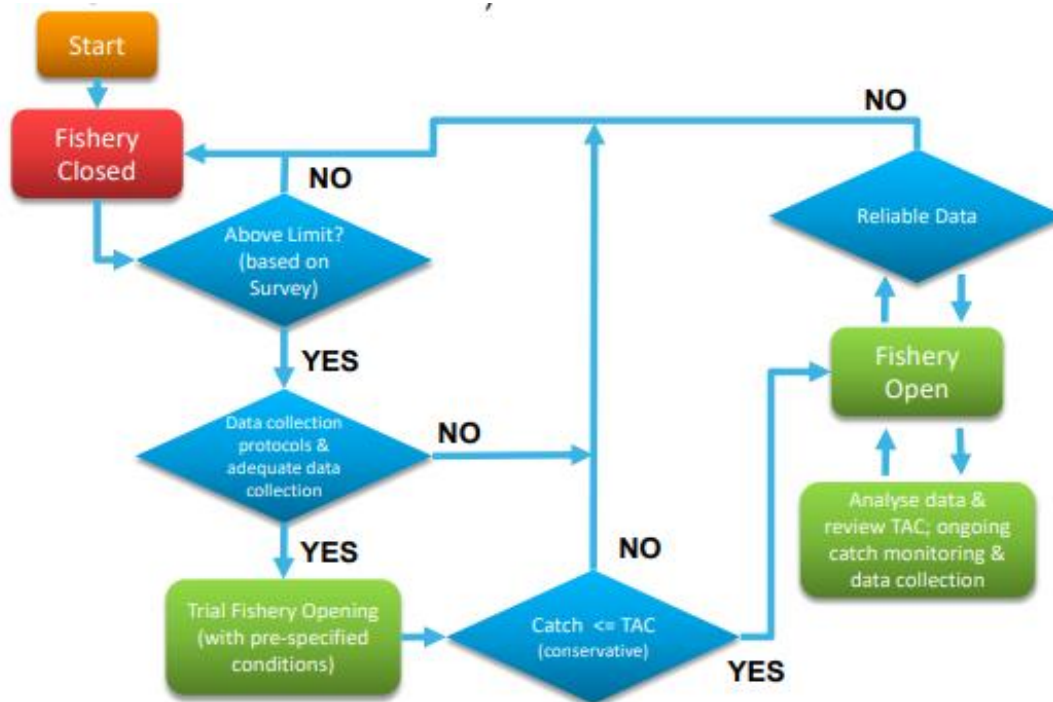


Figure 6. Flowchart summarising process for re-opening a closed fishery





## **Agenda item 5 - Future black teatfish opening – HCWG16 advice**

### **Condition 1 – Using all available information, is the stock above a limit reference point level?**

- the Working Group agreed that all available evidence indicates that the stock is likely above the reference point (the default limit in the BDM Harvest strategy, BLIM, being 40% of B0).
- All available information includes:
  - the preliminary survey results
  - outcomes of the 2009 survey, and
  - the limited recorded fishing effort on black teatfish since its closure in 2003 (two openings 2014 and 2015)



## **Agenda item 5 - Future black teatfish opening – HCWG16 advice (cont...)**

### **Condition 2 - Are monitoring and management adequate?**

- The Working Group:
  - was supportive of the improvements to reporting and general management of the fishery to date.
  - noted that the ability to obtain accurate and timely catch and effort data was essential under the BDM Harvest Strategy to redeveloping the fishery on an ongoing basis.
  - noted the harvest strategy recommends that:
    - a) if a trial TAC is exceeded by more than 5% the fishery should be automatically paused for the following year; and
    - b) if data collection during the Trial opening was not conducted satisfactorily, then the fishery should be closed again and the re-opening rule process applied again.



## Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)

**Condition 3. If conditions 1 and 2 are met then a conditional trial opening is possible subject to the following conditions:**

- **Accurate daily catch and effort** reporting is required
- A **precautionary trigger limit** may be set to temporarily pause fishing while catch records are collated to ensure that overfishing does not inadvertently occur.
- An **effective warning system** needs to be put in place to ensure everyone stops and waits while approaching the trial TAC to allow all catch reported data to be entered and processed.
- Further conditions may also be considered, including limitations on which species can be harvested in conjunction with a re-opened species, or with a particular gear (e.g. hookah).
- Appropriate **seasonal date?**
- **Consideration** should also be given to **cultural laws and community agreements** with respect to who can fish where.





## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### ***3.1 Accurate catch and effort reporting is required***

- The Working Group members were supportive of the additional reporting requirements that were previously discussed, these being the daily reporting of catch by licenced fish receivers to AFMA.
- It was noted that operators would need to ensure that they land catches in areas with telecommunications reception.
- Whilst this may place operational constraints on some fishers, on balance the need for daily reporting was considered by the Working Group to be a priority.



## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### ***3.2 Setting a precautionary trigger limit***

- The Working Group agreed that setting a precautionary catch trigger limit as a stop-go mechanism to allow for compilation of catch data within season may not be feasible given the expected very short time period that black teatfish fishing would be open for under a conservative TAC.
- The 2015 opening lasted eight days.



## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### ***3.3 An effective warning system required to alert fishers as catches approach the TAC***

- The Working Group noted AFMA's advice that it would collate catches and provide daily reports to operators on how catches are tracking against the TAC throughout the black teatfish fishing season.
- Catch updates would be circulated via SMS, email and the PZJA website.





## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### ***3.4 Consider the need for any further condition, including limitations on which species can be harvested in conjunction with a re-opened species, or with particular gear***

- On balance the Working Group did not recommend any further conditions. The additional conditions briefly discussed were considered at this time to be unnecessary, complex and/or not supported by current PZJA licencing policy.



## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### ***3.5 Trial fishing dates to coincide with fishing dates for other species to spread the effort***

- The Working Group was mindful that the fishing period needs to be long enough to provide operators with ample opportunity to fish in favourable weather and tides so as not to compromise safety.





## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### ***3.6 Cultural laws and community agreements***

- Based on recommendations from cluster meetings as per HCWG 15 outcomes.
- Traditional Inhabitant members reiterated that agreed cultural lore and community agreements could be used to support additional voluntary reporting requirements and oversight as to who can fish where (see discussion under accurate catch and effort reporting).



## **Agenda item 5 - Future Black teatfish opening – HCWG16 advice (cont...)**

### **Condition 4. Set a demonstrable conservative TAC with reference to default values.**

- The Working Group recommended adhering to the harvest strategy default trial opening TAC of 15 t for black teatfish (see Table 3 of the harvest strategy).
- As part of its deliberations, the Working Group considered the Scientific member's advice that while a 40 t TAC would still be considered sustainable, it should be viewed as aspirational at this stage given the preliminary nature of the assessment and it does not completely remove the risk of TAC overshoot.
- The collection of high quality spatial catch and effort data during the trial opening will allow for greater confidence to set higher TACs in future seasons.



## **Agenda item 5 - Future Black teatfish opening – HCWG17 advice?**

### **Condition 4. Trial opening TAC**

- Needs to be set at a demonstrably conservative level
- Current fishery biomass estimate =
- Current sustainable catch estimate =
- Recommend a conservative opening catch limit:
  - Uncertainty in the assessment
  - Risk of overshoot
  - Higher future TACs through collection of high quality spatial catch and effort data
  - Demonstration of careful stewardship for CITES Appendix II Listing of black and white teatfish





# Agenda item 5 - Future Black teatfish opening

## Post trial opening (pg. 35 of BDM HS)

5. If the Trial TAC is exceeded by more than 5%, then the fishery is automatically paused (i.e. no fishing allowed) for the following year.
6. If data collection during the Trial opening was not conducted satisfactorily, then the fishery is closed again and the re-opening decision rule process can commence again.
7. If the TAC wasn't exceeded and reliable data were collected, these data need to be analysed to review the TAC and potential for the fishery to stay open in future, or be reopened periodically after a pre-specified interval.
8. An ongoing condition of the fishery remaining open is that reliable data collection continues, and preferably includes additional data such as CPUE, spatial footprint and size composition (see Multiple Indicator Rule).



## Agenda item 6.2 – Date and venue for next meeting

Proposed Date	Key Business
Week beginning 5 October 2020	HCWG 18 (if required) <ul style="list-style-type: none"><li>- Management responses to preliminary stock survey outcomes – for example advice on BDM total allowable catch (TAC) limits for 2021 season.</li><li>- Research priorities for 2022-23 (can be progressed OOS).</li><li>- Legislative instrument amendments.</li></ul>
Week beginning 5 April 2021	Future management priorities workshop <ul style="list-style-type: none"><li>- Including longer term strategic discussions on the use of hookah in the BDM Fishery.</li></ul>
Week beginning 5 April 2021	HCWG 19 <ul style="list-style-type: none"><li>- Final outcomes of BDM stock survey results</li><li>- Overview of black teatfish opening (TBC)</li><li>- Outcomes of Malu Lamar BDM workshop (TBC)</li><li>- Outcome of the application for WTO renewal</li><li>- Final catch and effort summary of 2020</li></ul>





# Torres Strait sea cucumber (Beche-de-mer ) survey 2019/20

Research for sustainable use

Nicole Murphy, Tim Skewes, Kinam Salee, Steve Edgar, Eva Plaganyi

August 2020

CSIRO OCEANS & ATMOSPHERE  
[www.csiro.au](http://www.csiro.au)



Australian Government  
Australian Fisheries Management Authority



Australian Government



TSRA  
[www.tsra.gov.au](http://www.tsra.gov.au)



# Survey objectives

## Sea cucumber

Stock size, density trends and size for:

- Current target species (high priority)
  - White teatfish (high priority)
  - Prickly redfish (high priority)
  - Curryfish (medium priority)
- Closed or reopening species:
  - Black teatfish (high priority)
  - Surf redfish (medium priority)
- Other species (low priority)
- Deeper water populations:
  - White teatfish (high priority)
  - Burrowing blackfish (low priority)
  - Other species (medium priority)

# Outcomes

## Sea cucumbers

- Better management for a sustainable future
  - Through the newly developed Beche-de-mer Harvest Strategy
- Potential fishery expansion and reopening of closed fisheries
  - Reopen – Black teatfish, Surf redfish
  - Expansion – White teatfish
- Check sustainability
  - Prickly redfish, Curryfish (3 species)
- Better modelling of the population dynamics of sea cucumbers
- Information for CITES non-detriment finding



# Other objectives and outcomes

## **Habitat monitoring**

- Habitat trends and mapping
  - Seagrass, coral
  - Crown of thorns starfish
  - Clams, other species
- Better environmental management
- Climate change adaptation

## **Ugar reef mapping**

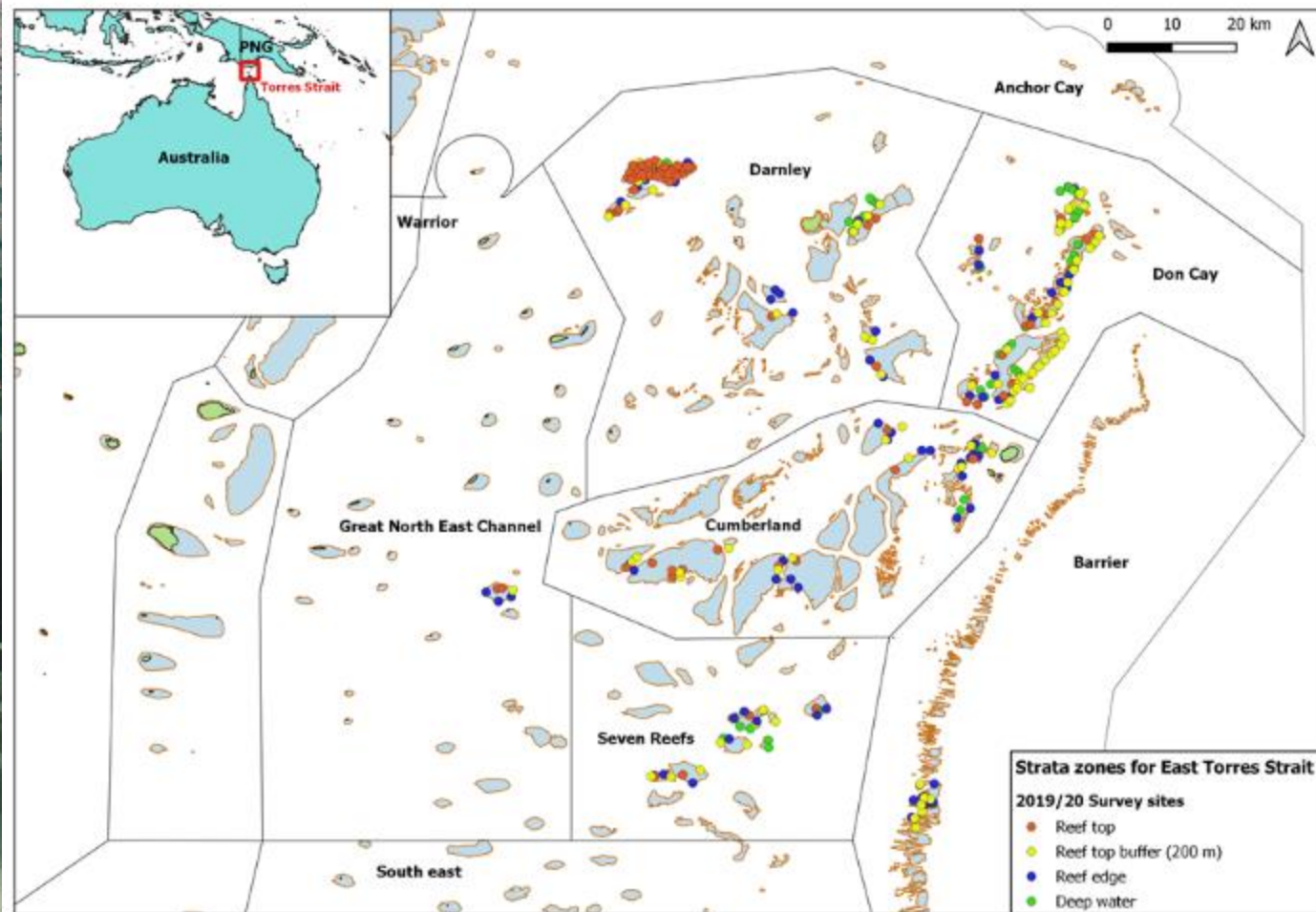
- Fine scale habitat and species mapping
- Potential reef re-seeding and sea ranching project

## **General reef mapping**

- Reef mapping ground truthing (of new NERP reef map)
- Better understanding of reef area and structure in Torres Strait

# Survey sites

Year	Zones	Top	Buffer	Edge	Deep	Total
1995/96	14	1089	164	365	0	1618
2002	6	136	139	159	0	434
2005	5	35	52	40	0	127
2009	5	33	25	45	0	103
2019/20	6	88	86	70	53	297



# Survey methods



- Sampling methods used in all previous surveys
- Transects – snorkel or scuba
- 40m – 100 m transects
- Sites based on 3 strata – reef top, reef top buffer (200 m), reef edge
- Counted and collected sea cucumbers
- Measured length and weight
- Recorded habitat and other biota
- Deepwater sites

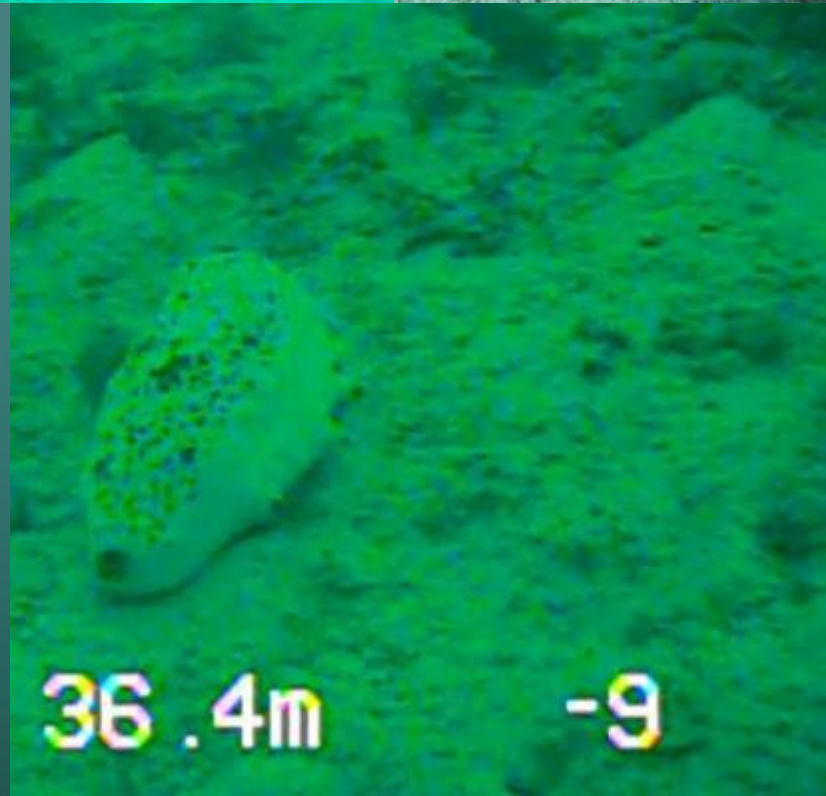


# Deep water survey

- 20 m - 50 m deep, 10 min drifts
- TSRA camera system – Thanks!
- Deepest White teatfish 37 m
- Confident quantified habitat



Thanks also Madeina! (David)



36.4m

-9

# Ugar survey

- Sea cucumber survey and reef mapping of Ugar and Campbell Reefs
- Results provided to community

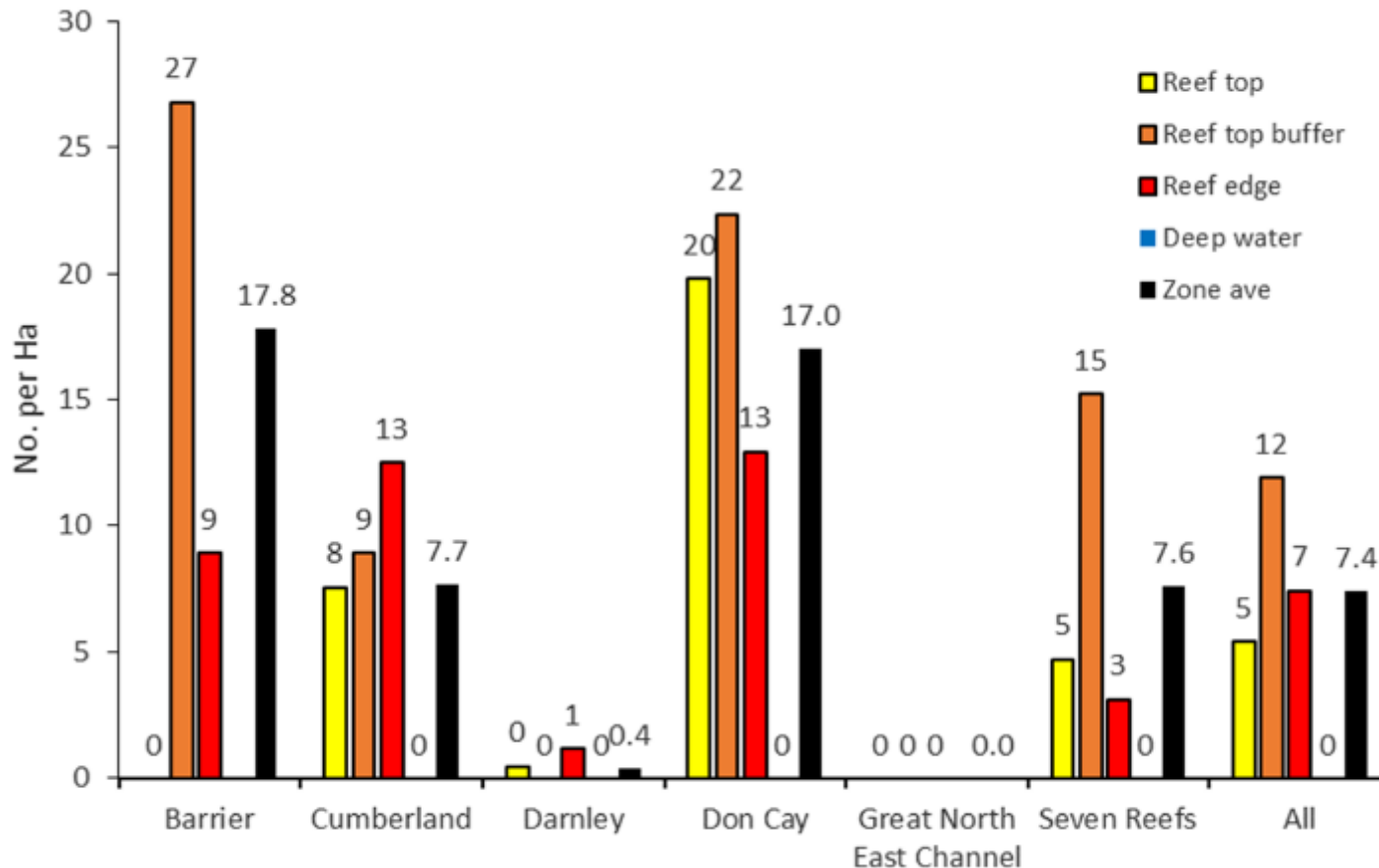




# Analyses (all species)

## Stratified density

- Estimates of mean density for *Black teatfish* – transect counts based on zones and reef strata

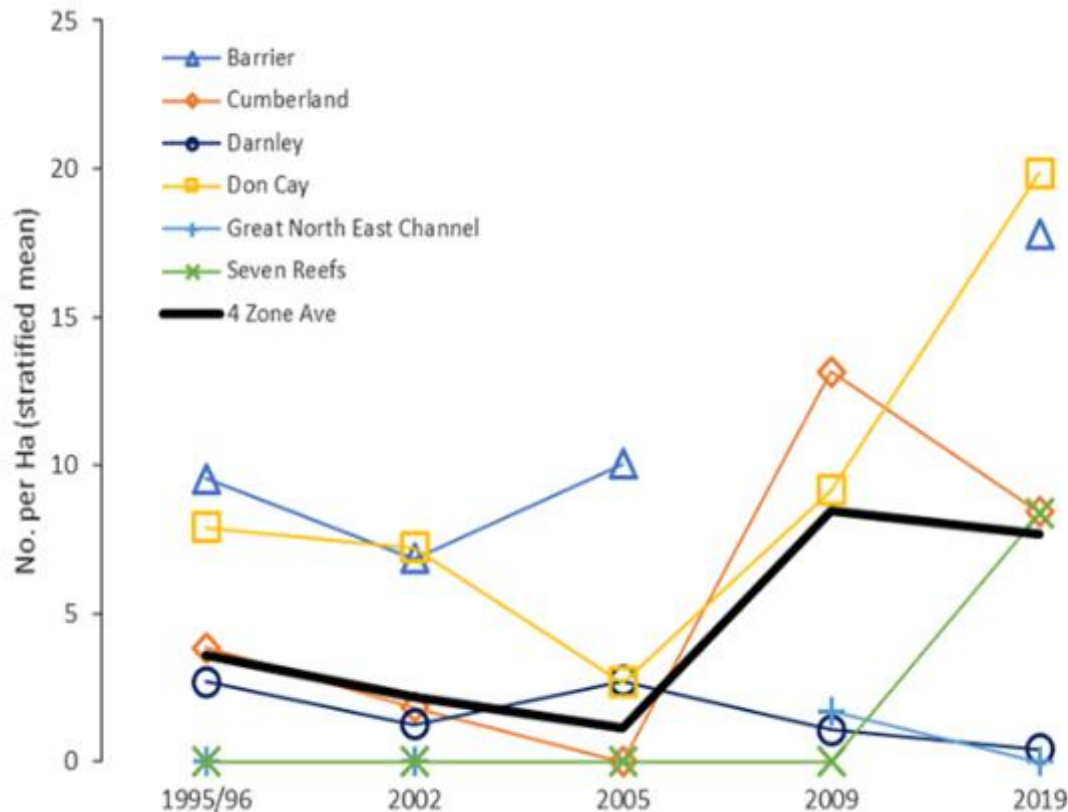




# Analyses

## Stratified density

- Density trends for *Black teatfish* – comparing sites within zone and strata between survey years
- Cumberland, Darnley, Don Cay and Great North East Channel



# Analyses

## Standing stock



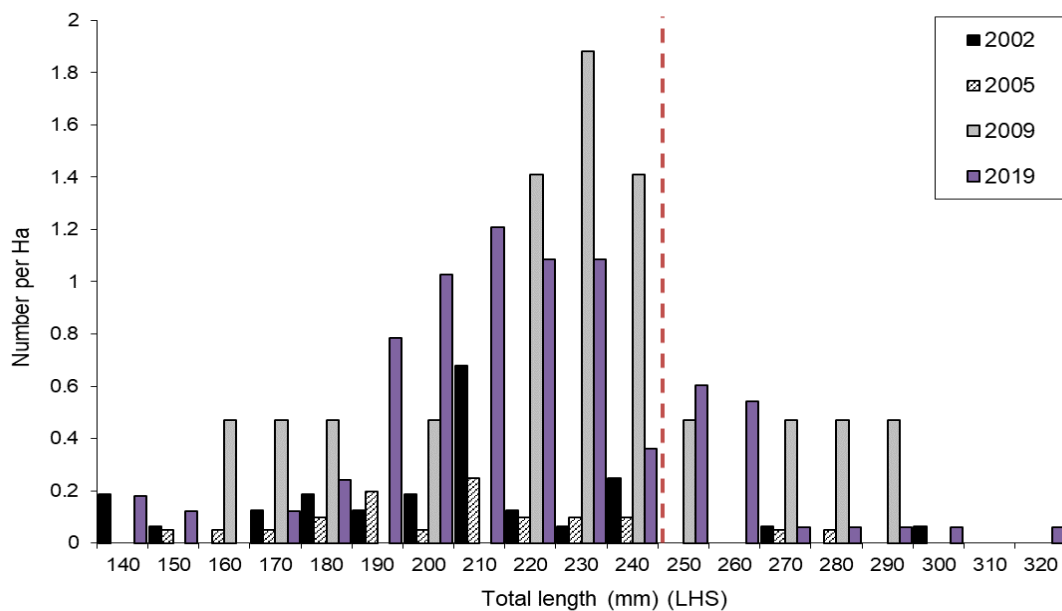
- Stock estimate – sea cucumber density, reef area, average weight, size frequency data, confidence intervals and current conversion ratios
- Estimated biomass of *Black teatfish* in east Torres Strait in 2019/20 was 1,238 t (gutted weight)
- Mirror-match bootstrapping (pg 6 report) – 90 % certain of being greater than the value estimated
- Bootstrapped lower 90th percentile of the stock estimate was 817.8 t
- Conservative stock estimate – requirement of the Harvest Strategy

Zone	Sites	Area (Ha)	Number	Wt (live)	Wt (gutted)
Barrier	15	16204.07	288273	470.5	318.5
Cumberland	50	48986.23	412235	672.8	455.5
Darnley	89	30840.24	16534	27.0	18.3
Don Cay	104	14603.07	282963	461.8	312.7
GNE Channel	6	14472.55	0	0	0
Seven Reefs	33	13743.27	120489	196.7	133.1
Eastern Torres Strait	297	138849.42	1120493	1828.8	1238.1

# Analyses

## Length

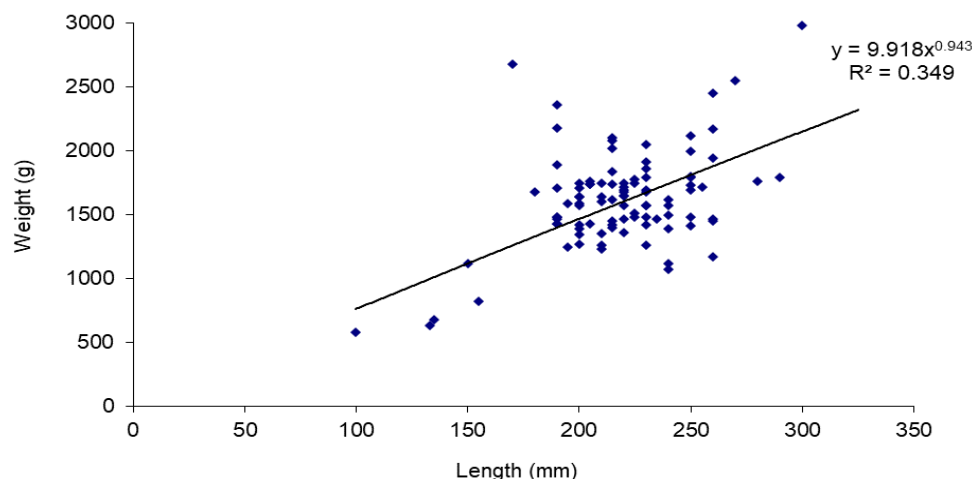
- Length frequency (survey): 100 mm – 325 mm
- Some of the largest *Black teatfish* recorded
- Average size 219 mm, slightly smaller than 2009, but larger than other surveys
- Slightly lower proportion of legal size animals compared to 2009
- Size at maturity: 220 - 260 mm



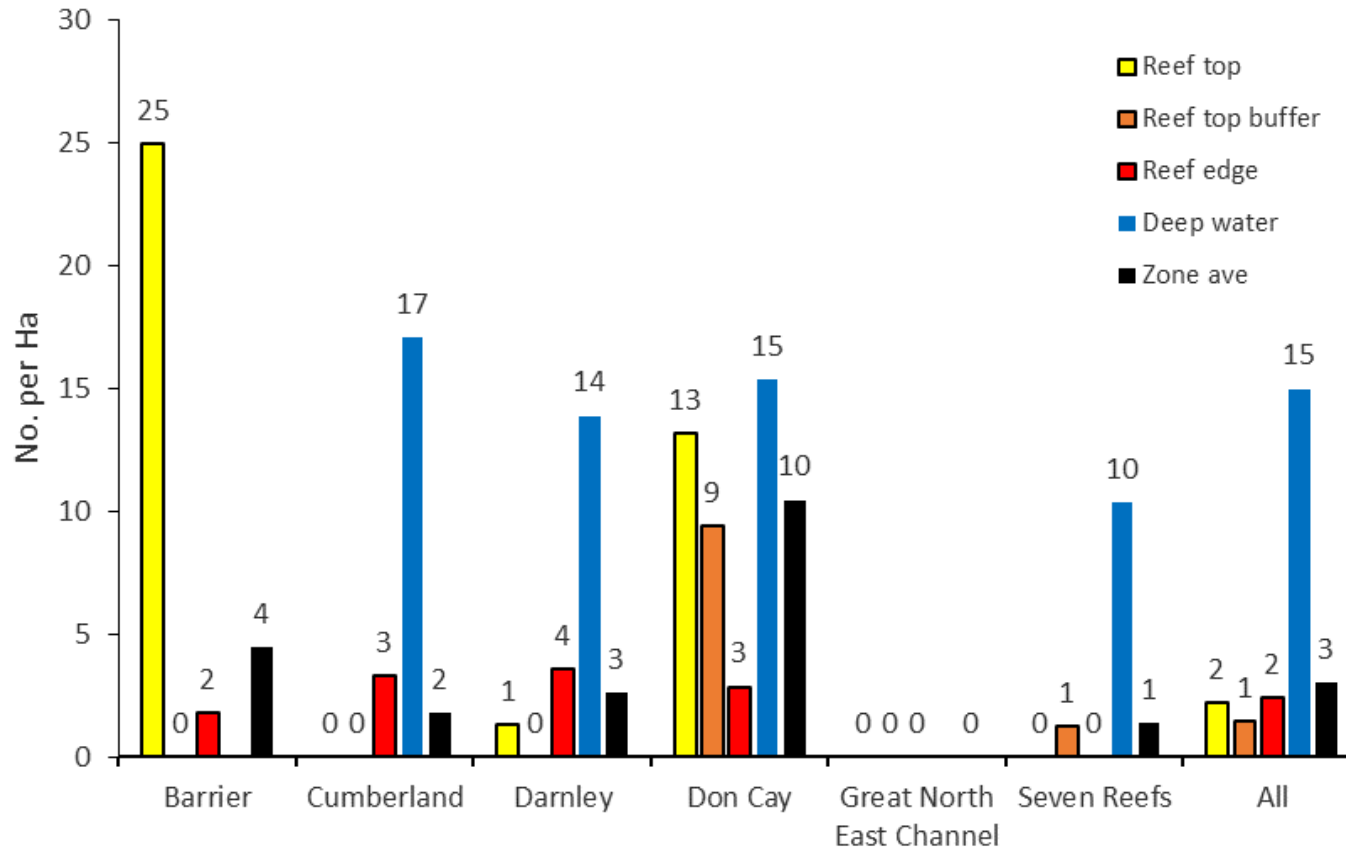
# Analyses

## Weight

- Weight range for *Black teatfish* (survey): 580 – 2980 g
- Average weight: 1632 g
- Comparison - GBR survey (2015) average weight 1820 g and weight range 500 – 2900 g (Knuckey and Koopman, 2016)
- Weight range comparable, average weight for Torres Strait lower



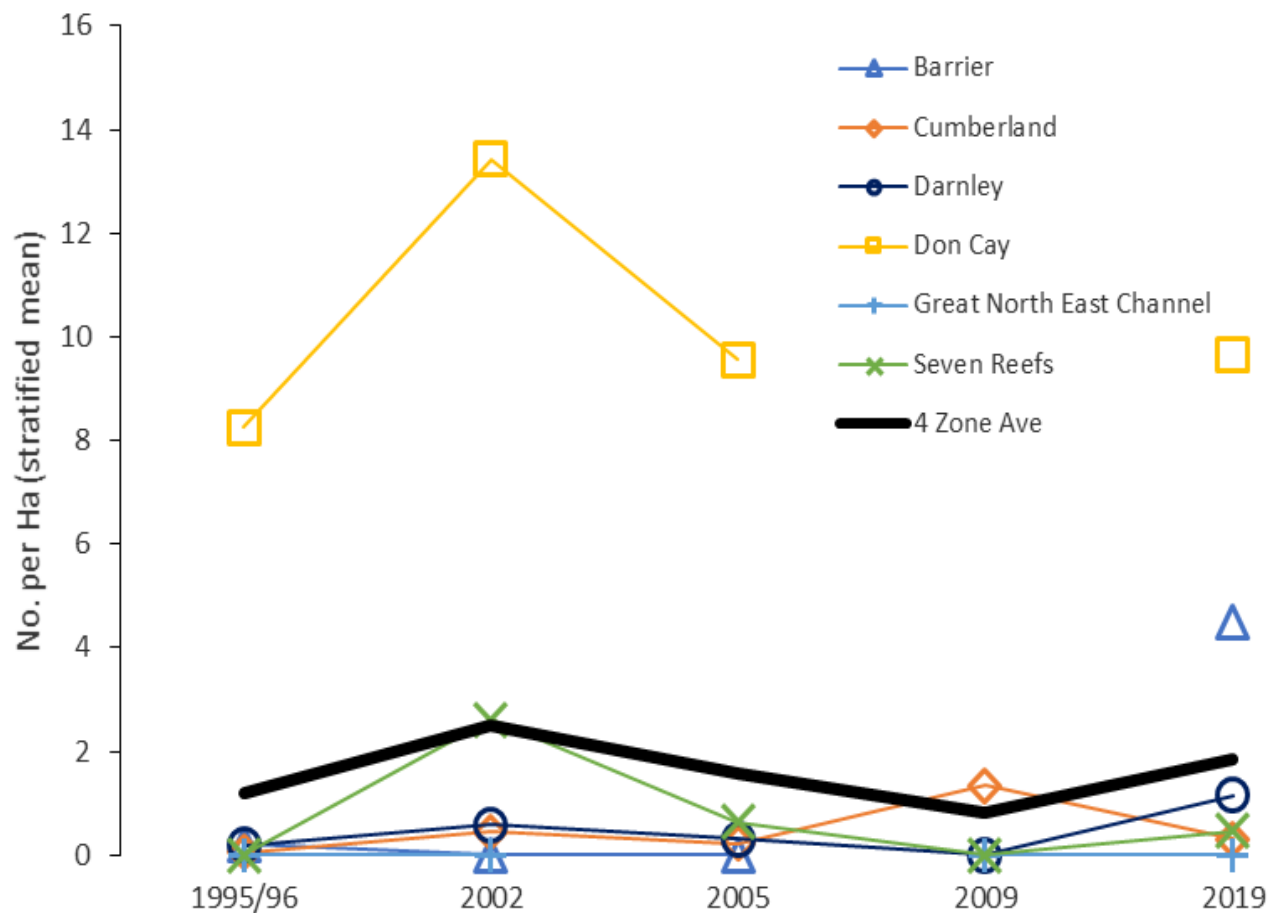
# White teatfish



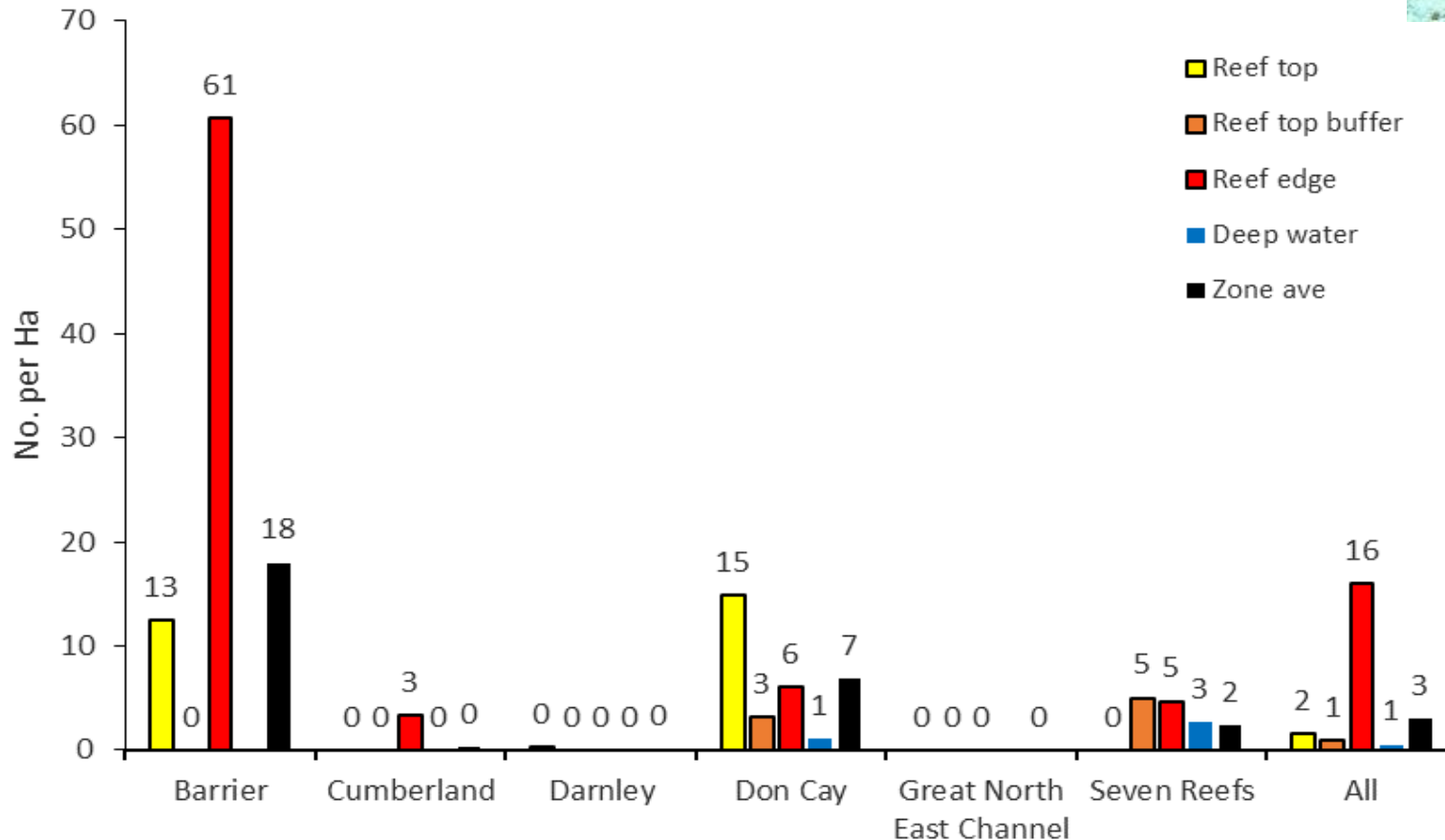
Biomass 543 t (gutted weight)



# White teatfish

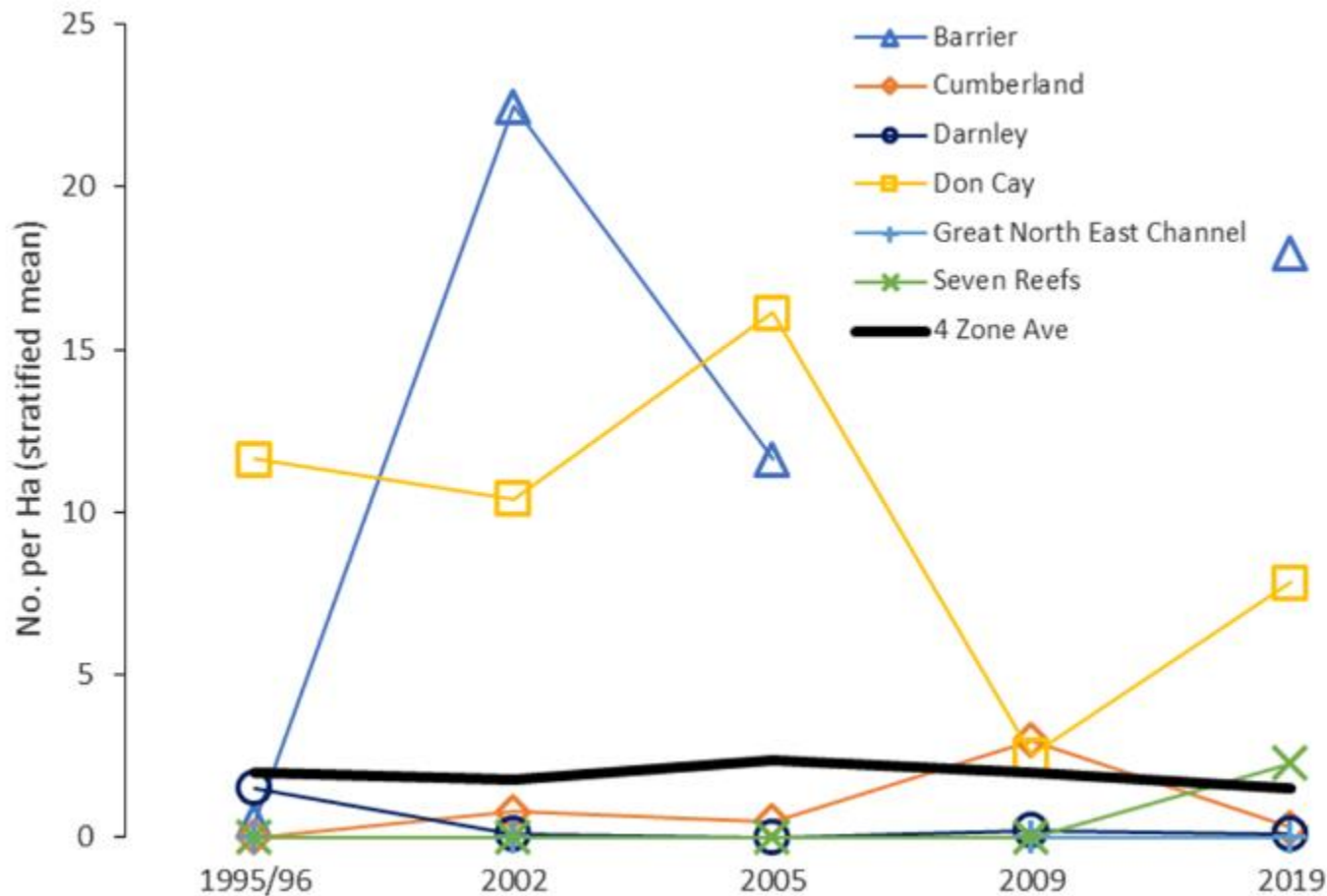


# Prickly redfish

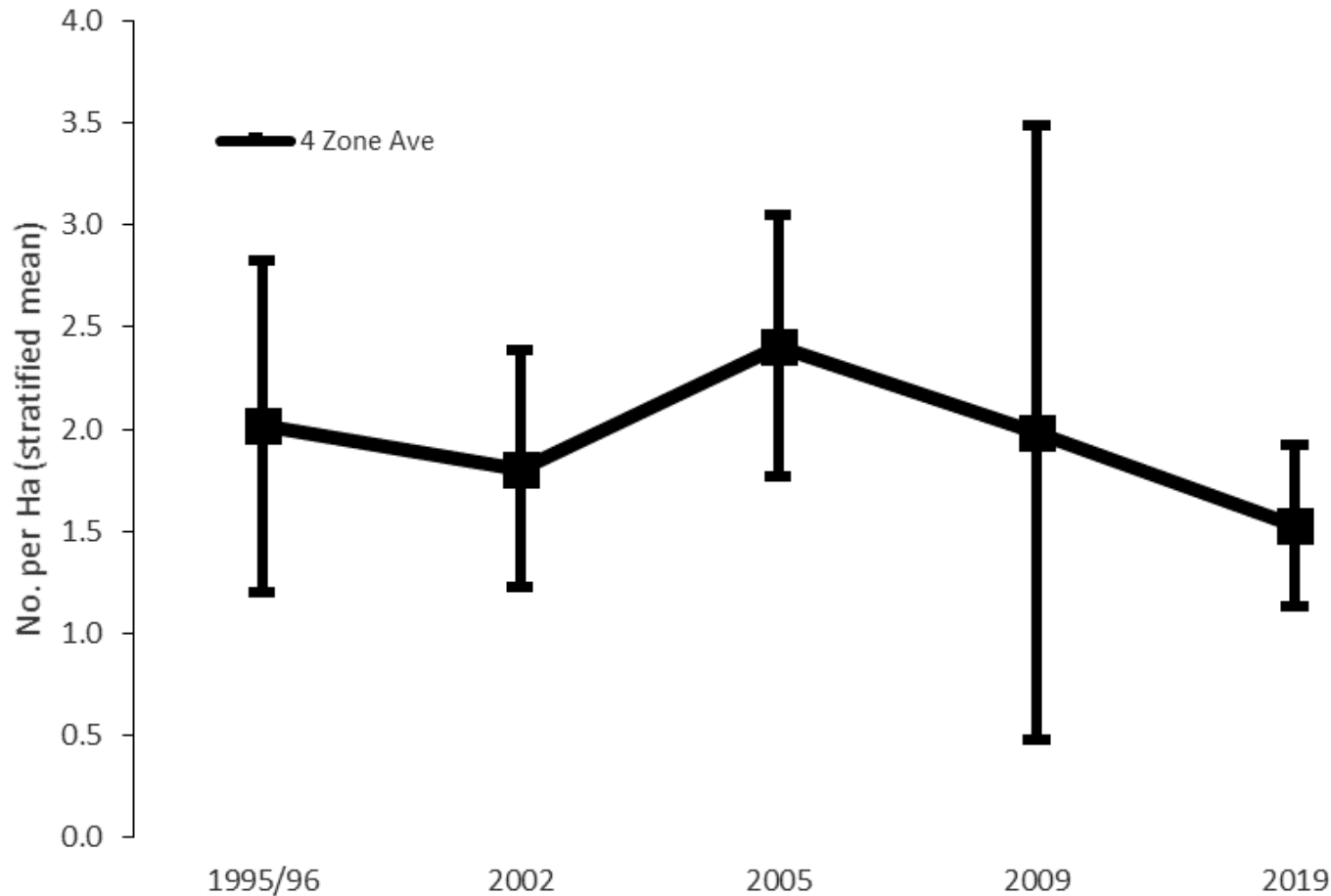


Fishery biomass estimate = 375 t

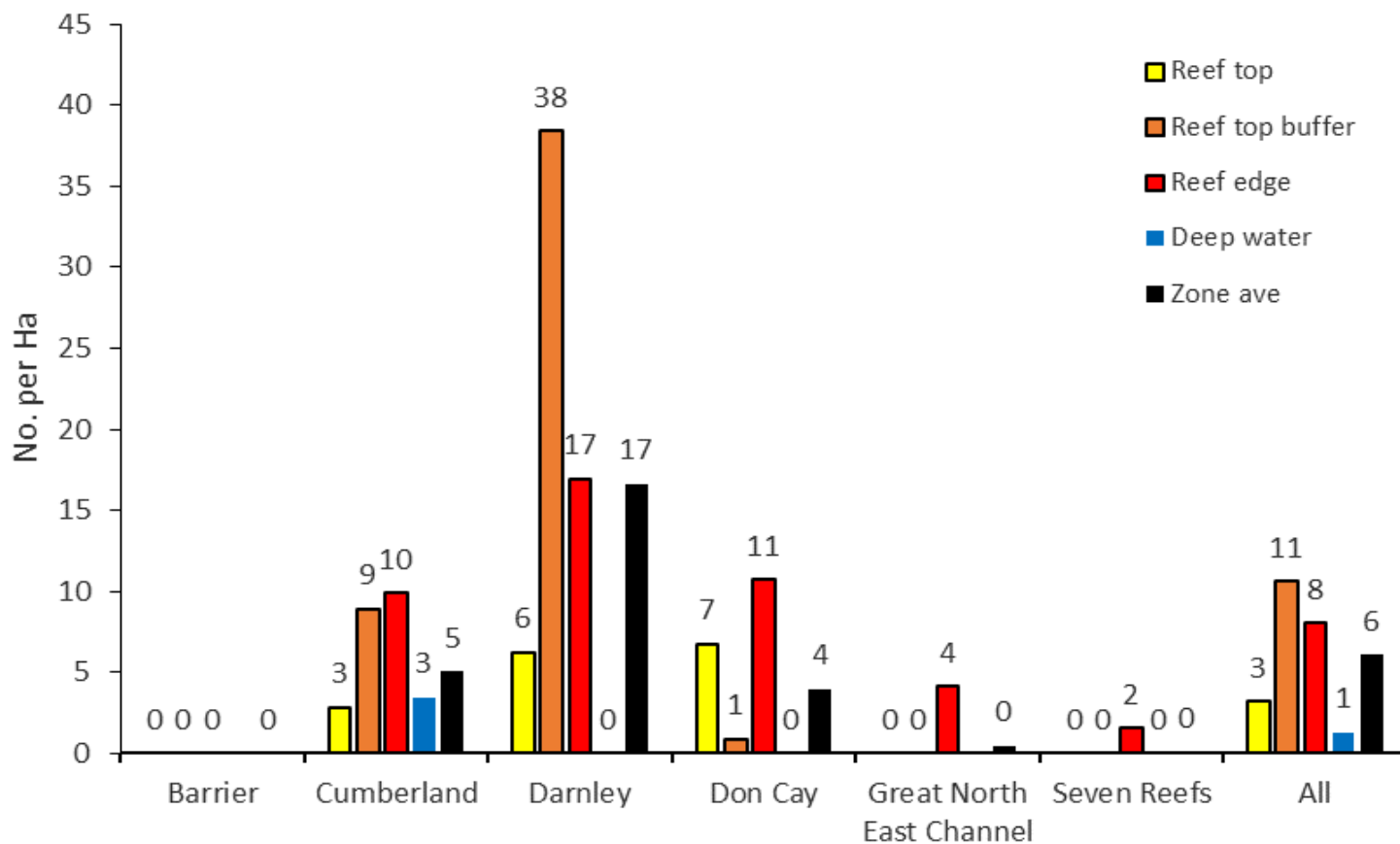
# Prickly redfish



# Prickly redfish



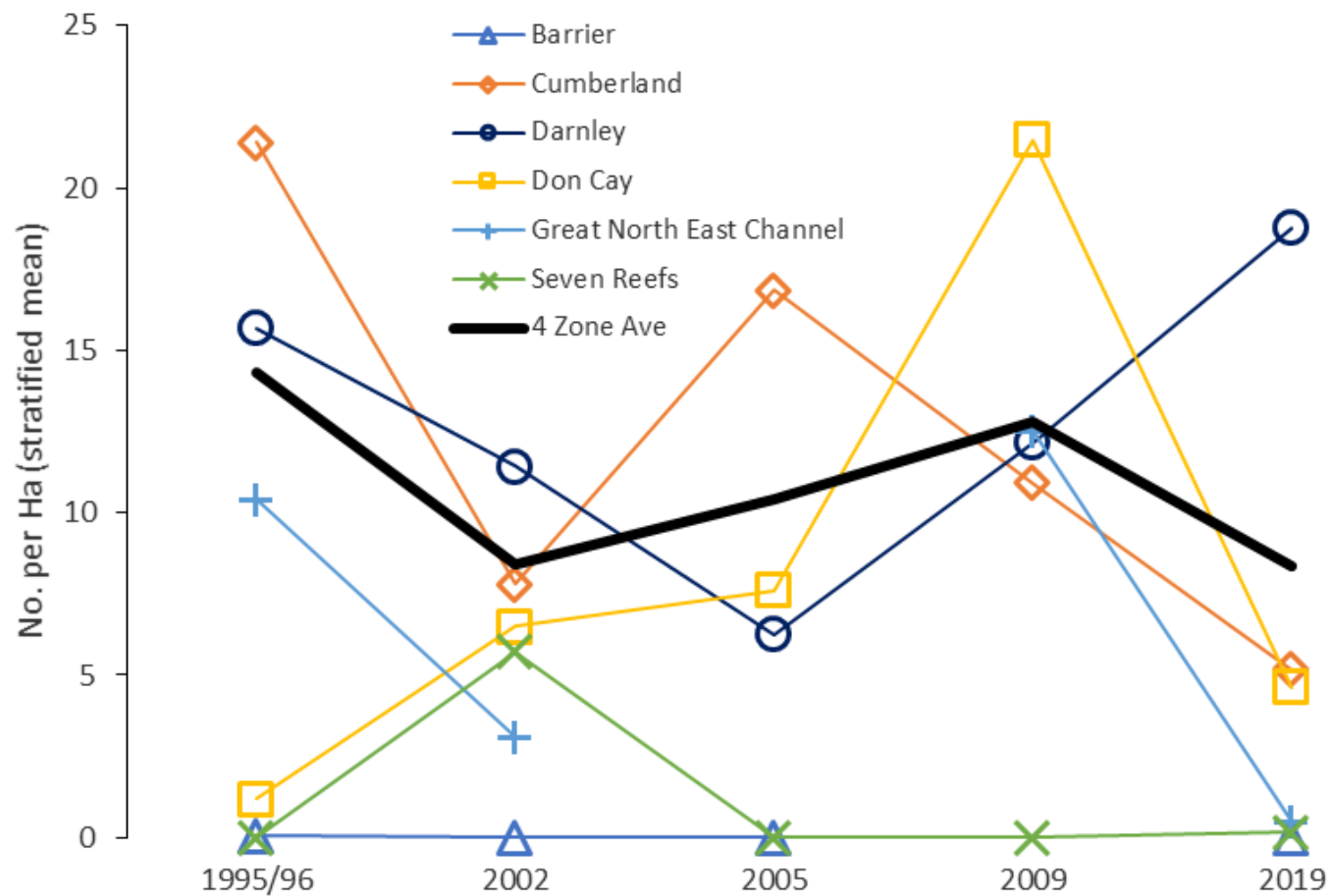
# Curryfish (common)



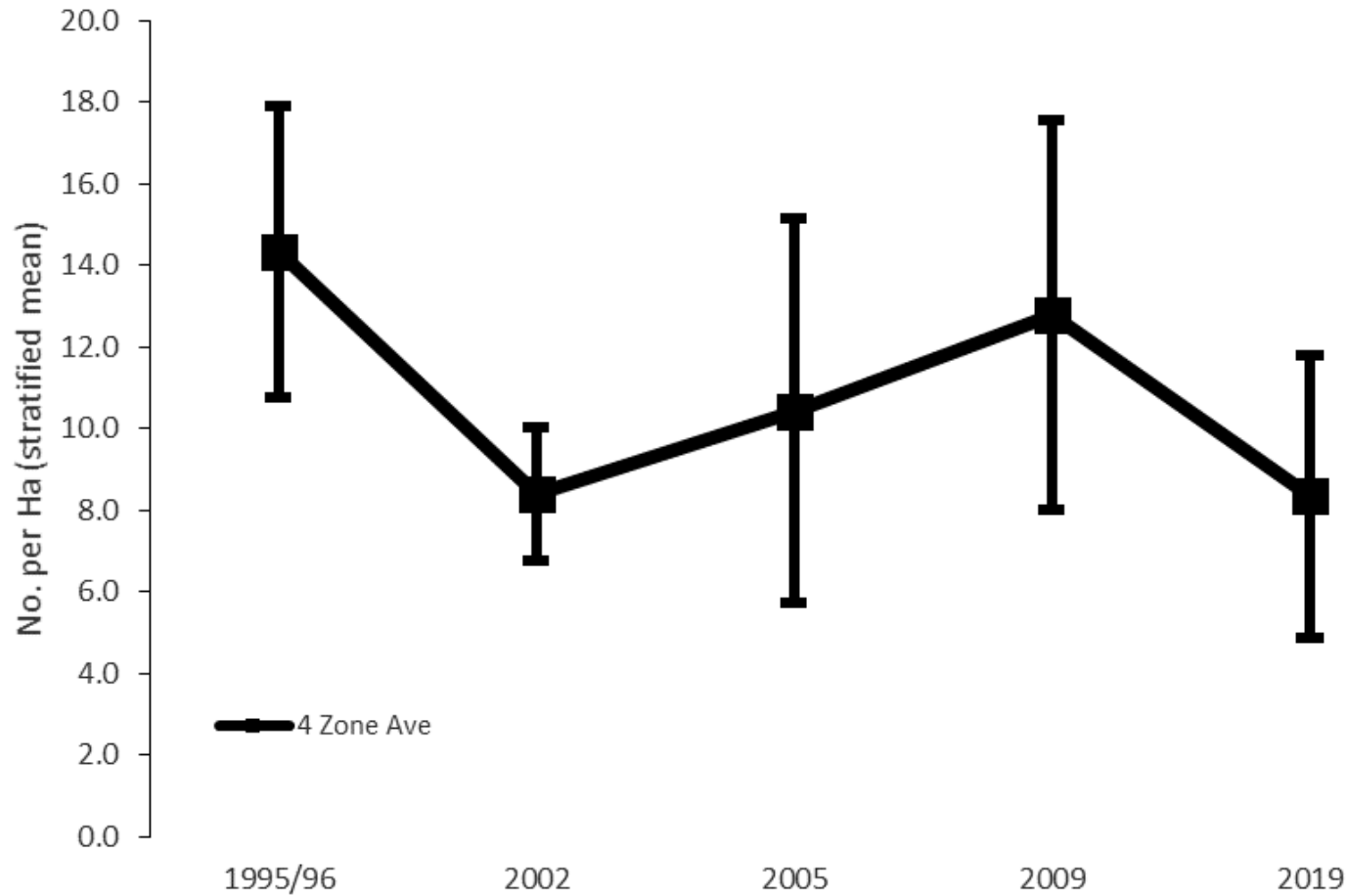
Fishery biomass estimate = 632 t



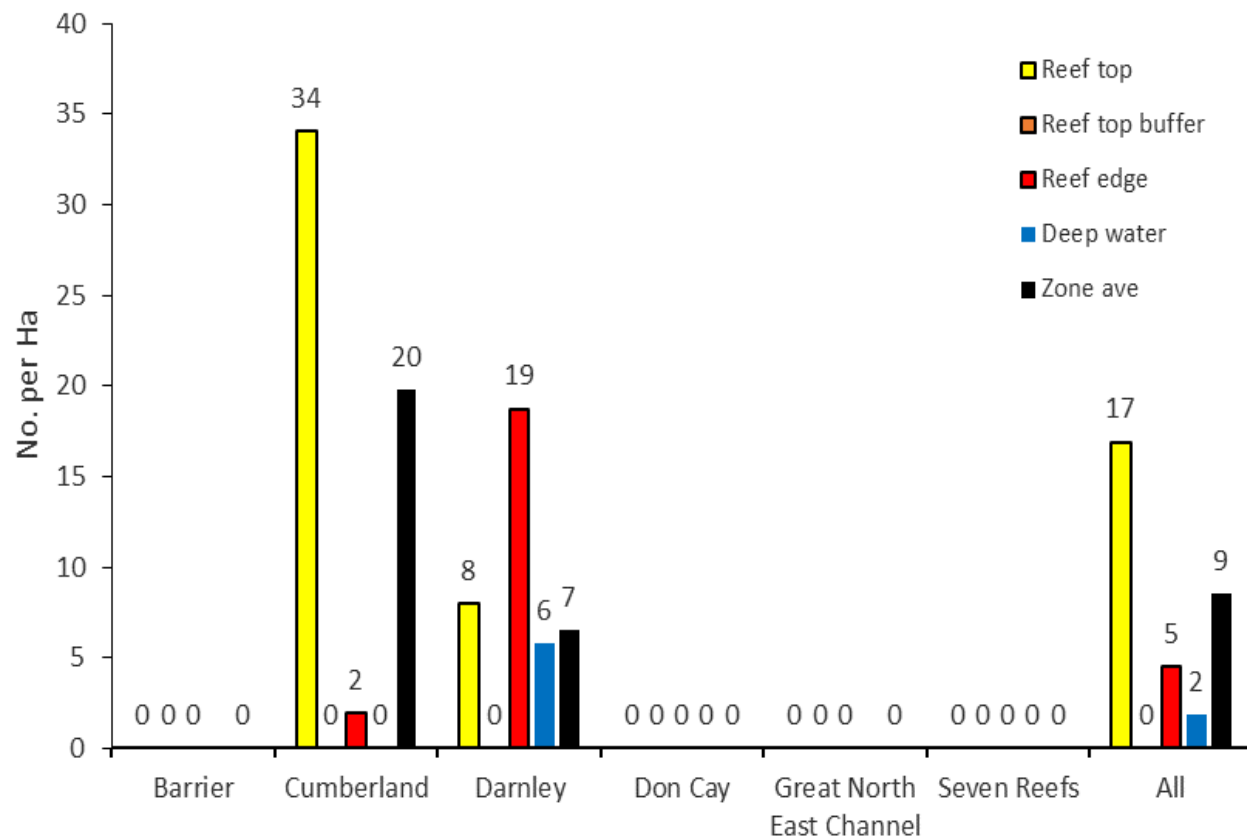
# Curryfish (common)



# Curryfish (common)

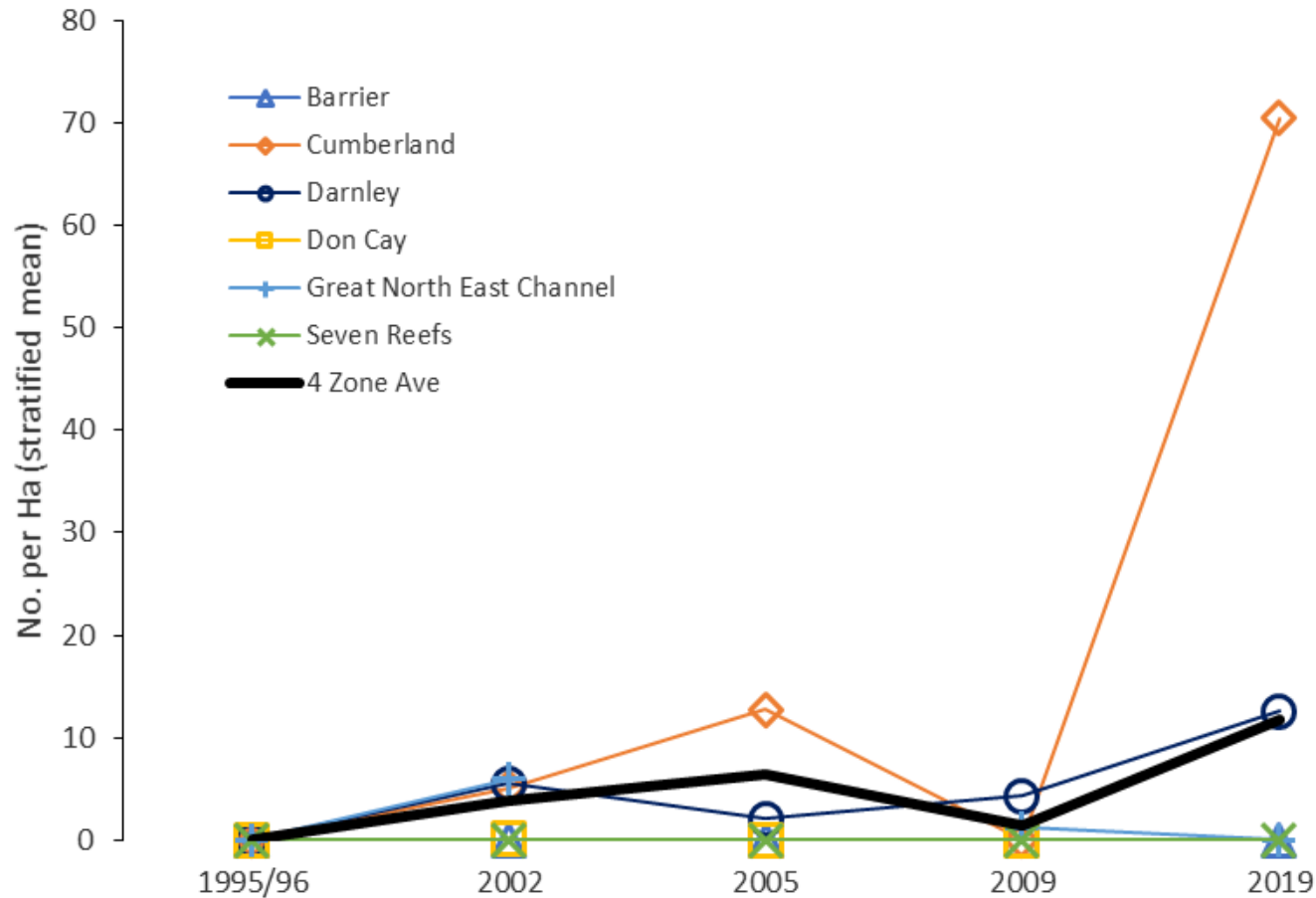


# Curryfish (vastus)

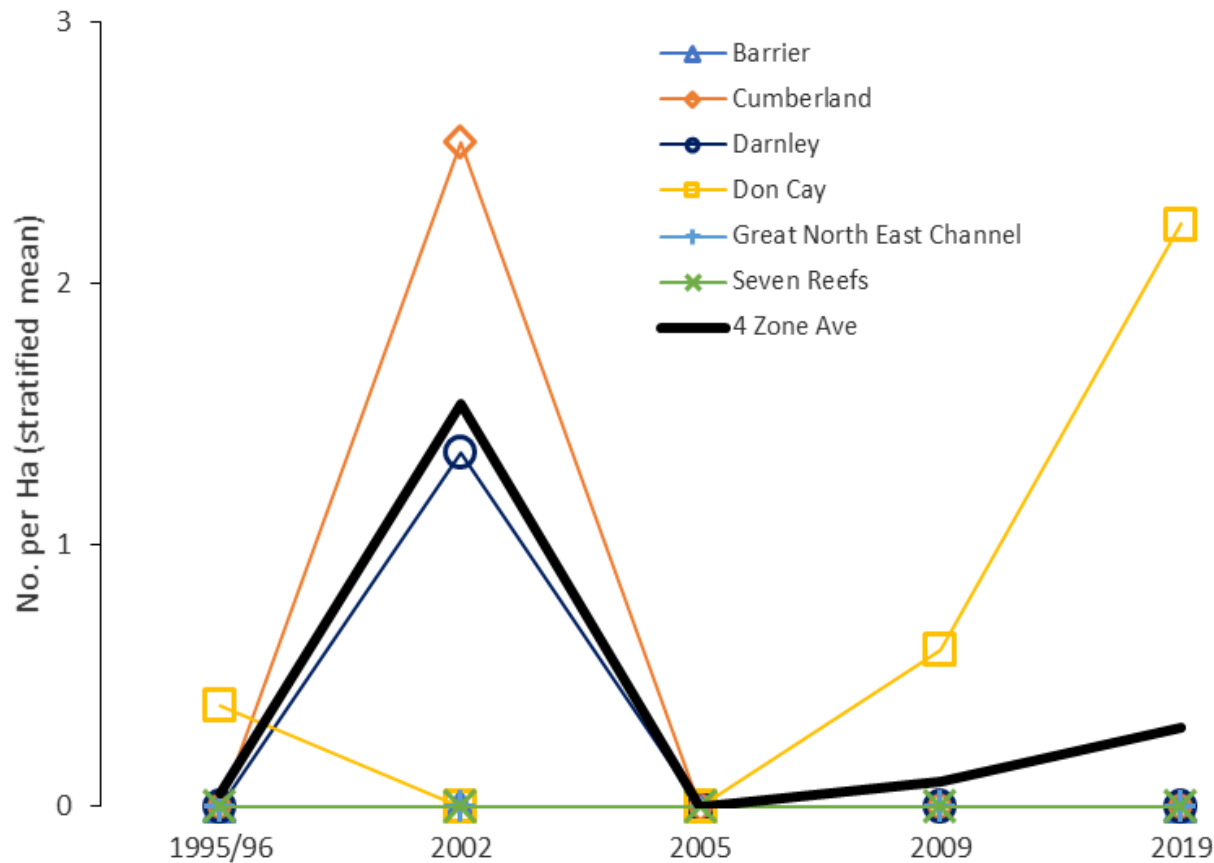


Fishery biomass estimate = 1,110 t (landed wet gutted)

# Curryfish (vastus)



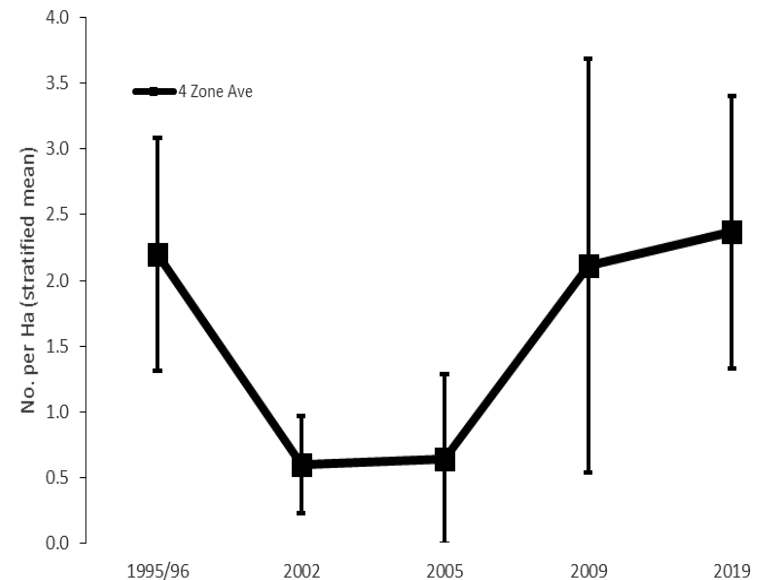
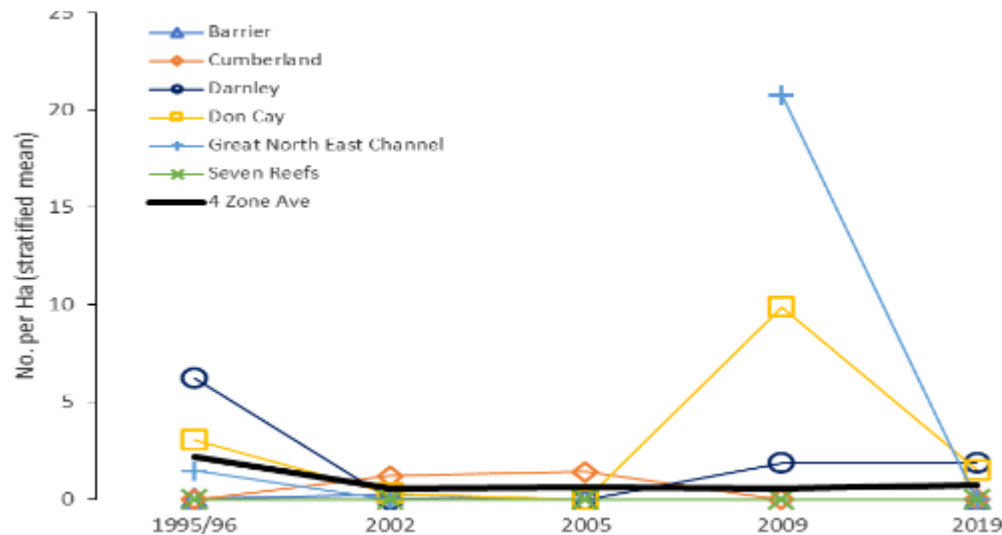
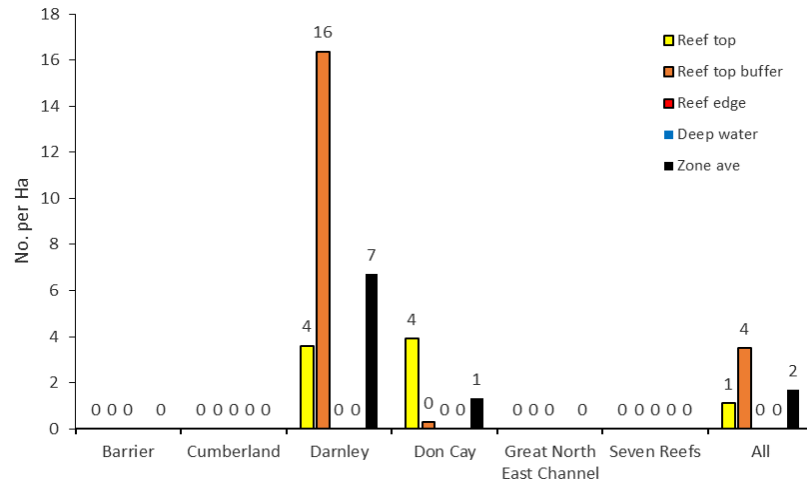
# Surf redfish



Fishery biomass estimate = 13 t

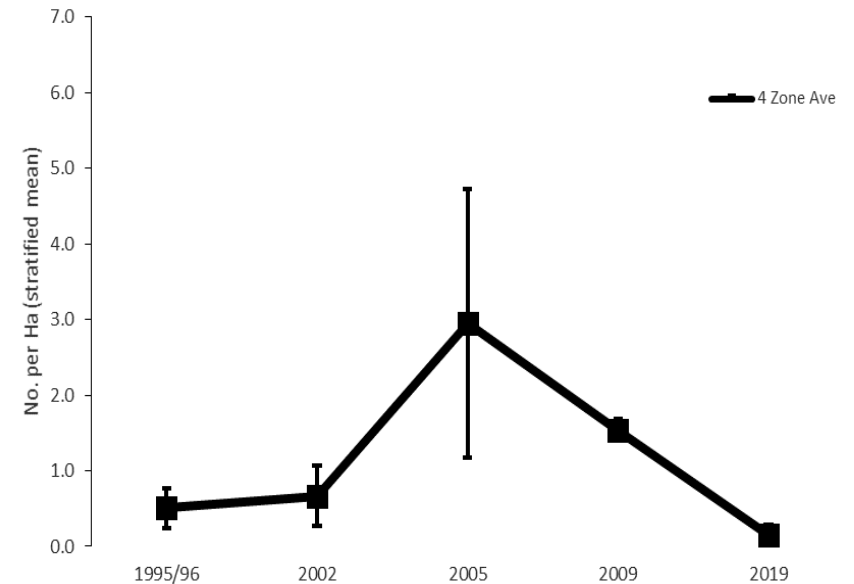
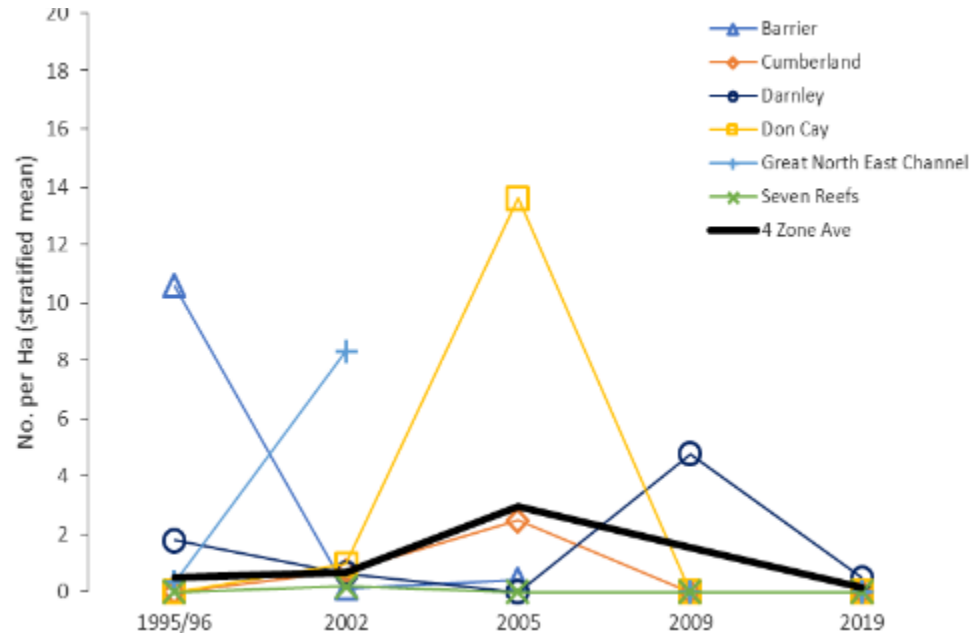
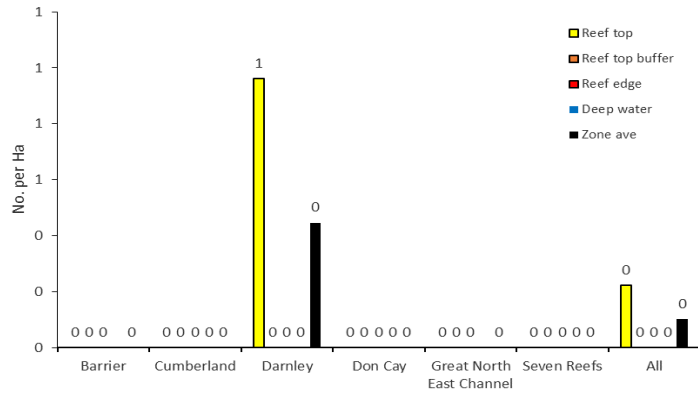


# Deepwater redfish



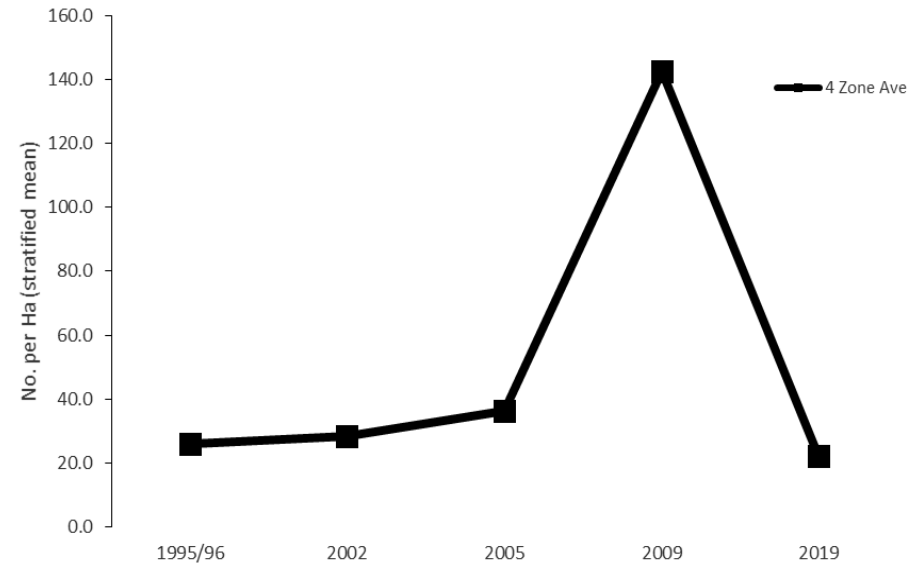
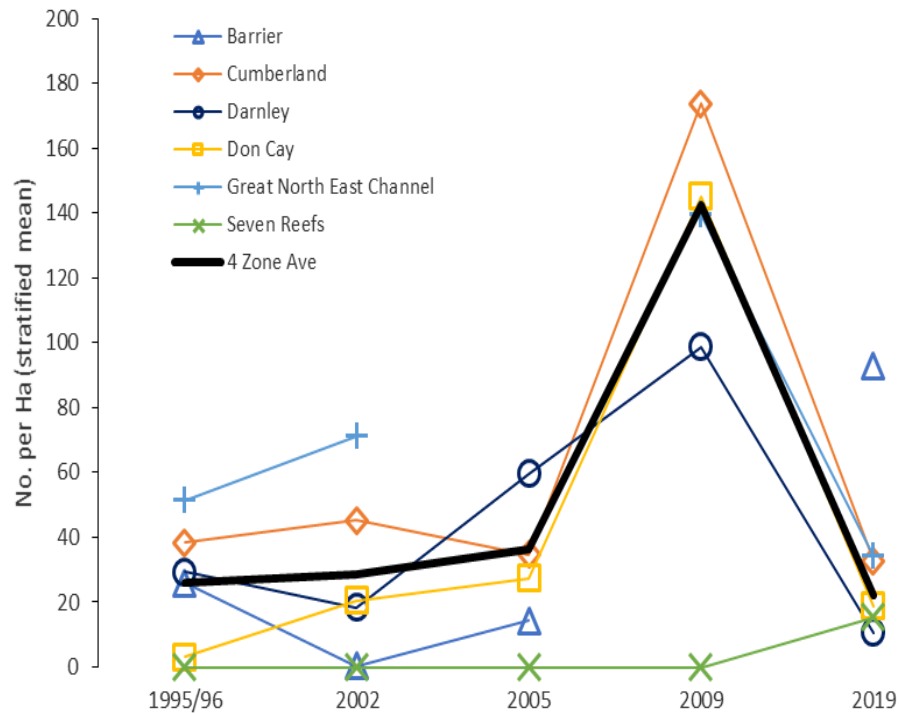
Fishery biomass estimate = 70 t

# Hairy blackfish



Fishery biomass estimate = 10 t

# Greenfish



Fishery biomass estimate = 706 t



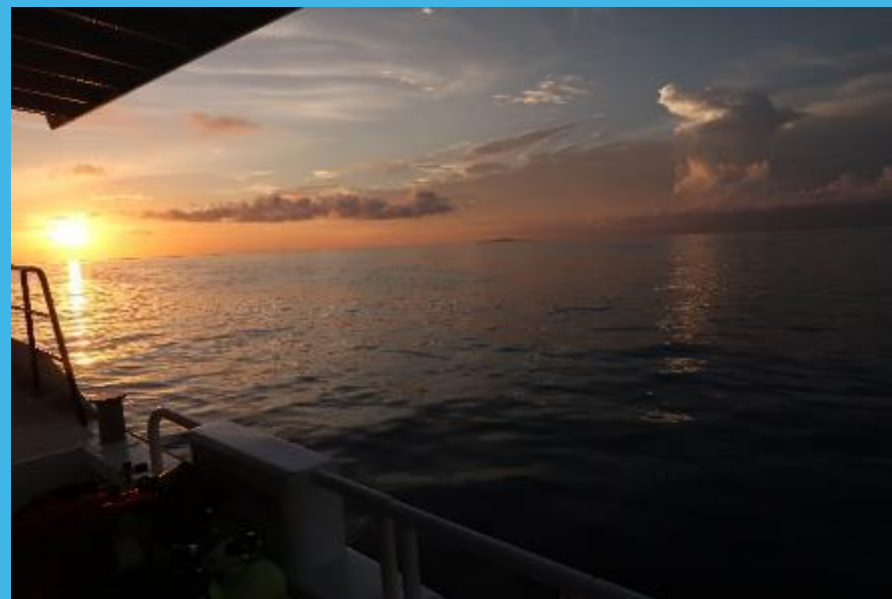
# Thank you

CSIRO OCEANS & ATMOSPHERE

Nicole Murphy (P.I.)  
Brisbane, Australia

Éva Pláganyi  
Tim Skewes

t +61 7 3833 5948  
e [nicole.murphy@csiro.au](mailto:nicole.murphy@csiro.au)  
w [www.csiro.au](http://www.csiro.au)



CSIRO OCEANS & ATMOSPHERE  
[www.csiro.au](http://www.csiro.au)







# Torres Strait sea cucumber (Beche-de-mer ) survey 2019/20

## Black teatfish stock status

Nicole Murphy, Tim Skewes, Kinam Salee, Steve Edgar, Eva Plaganyi

February 2020

CSIRO OCEANS & ATMOSPHERE  
[www.csiro.au](http://www.csiro.au)



Australian Government  
Australian Fisheries Management Authority



Australian Government



TSRA  
[www.tsra.gov.au](http://www.tsra.gov.au)





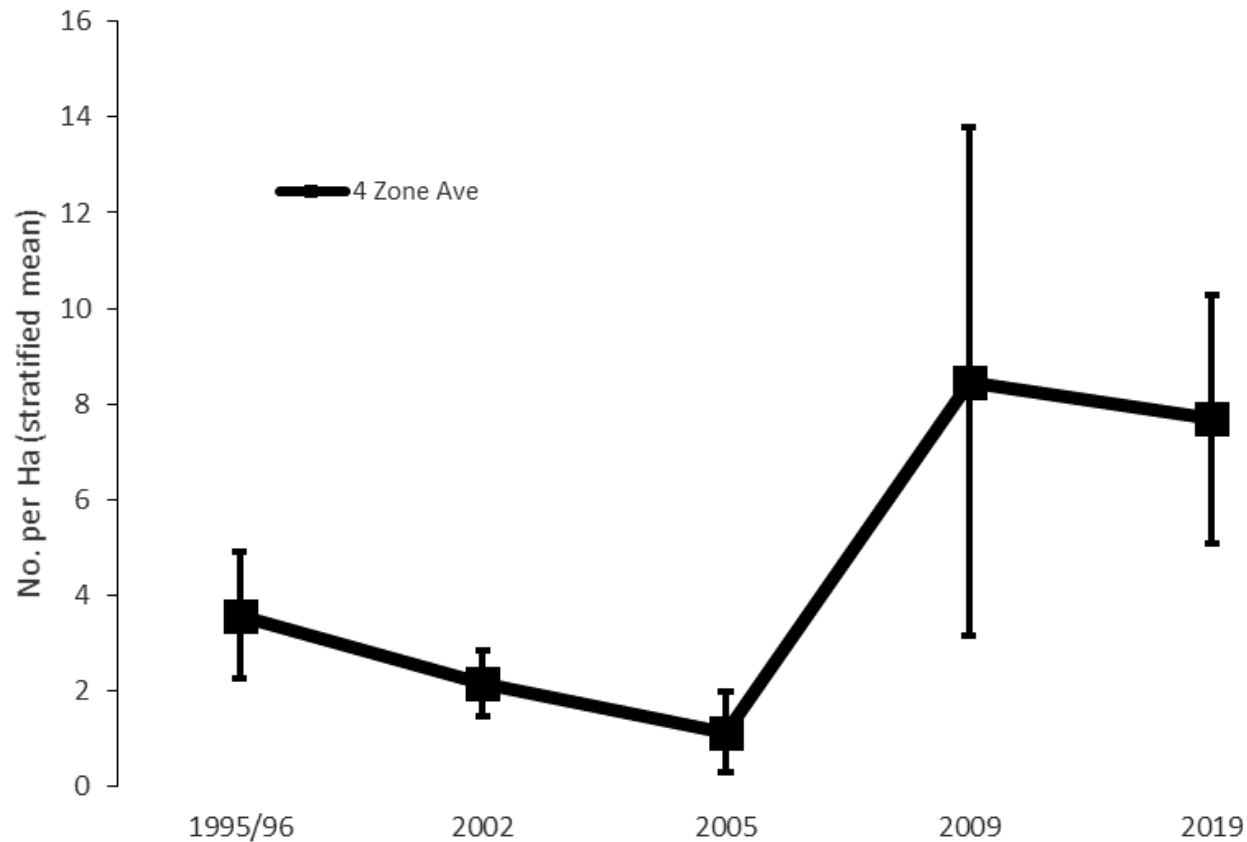
# Black teatfish stock status

- Usually relative to virgin (before fishing) density/biomass ( $B_0$  or  $K$ )
  - related to the ecological system carrying capacity
  - can be difficult when species have variable recruitment or patchy distribution between fishery habitat areas.
- Fisheries depend on increases in productivity as populations are reduced by fishing
  - maximum productivity at  $B_{MSY}$
  - maximum economic yield at  $B_{MEY}$
- Depletion to lower levels can eventually lead to recruitment impairment

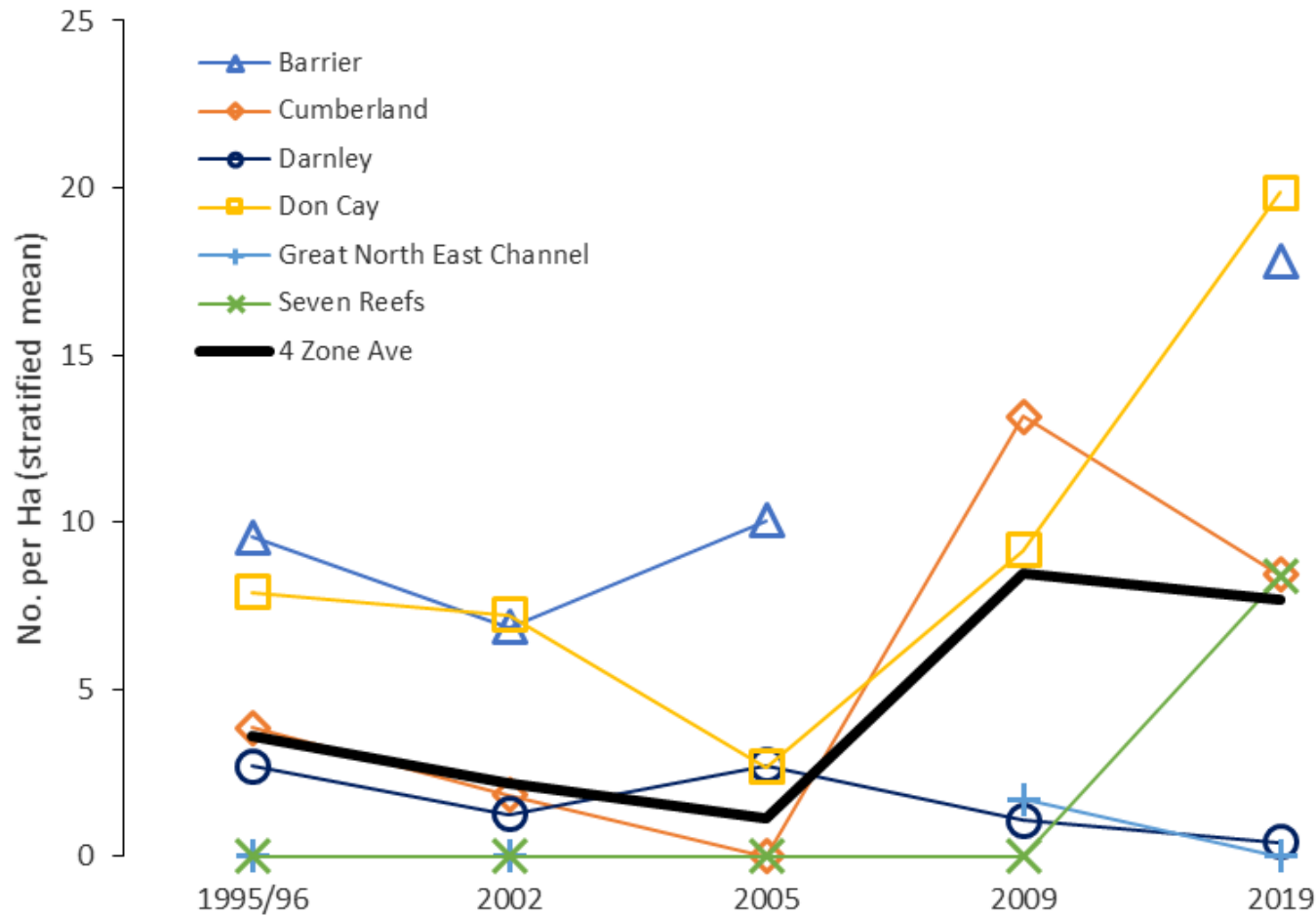
# Black teatfish stock status

- Unfortunately “reference” levels not well understood
  - BTARG – target biomass reference level – where we want the population to be based on BMEY
  - BLIM – the limit reference biomass level – where the danger of recruitment failure is unacceptably high
- Default values of BTARG and BLIM in the Commonwealth Harvest Strategy Guidelines are 48%B<sub>0</sub> for BTARG and 20%B<sub>0</sub> for BLIM
  - There is broad recognition that these reference levels may be too low for sea cucumbers
- The Torres Strait Beche-de-mer Fishery Harvest Strategy has a conservative proxy value of BLIM of 40%B<sub>0</sub>.
- It is envisaged that values of BTARG will be developed as more data becomes available.

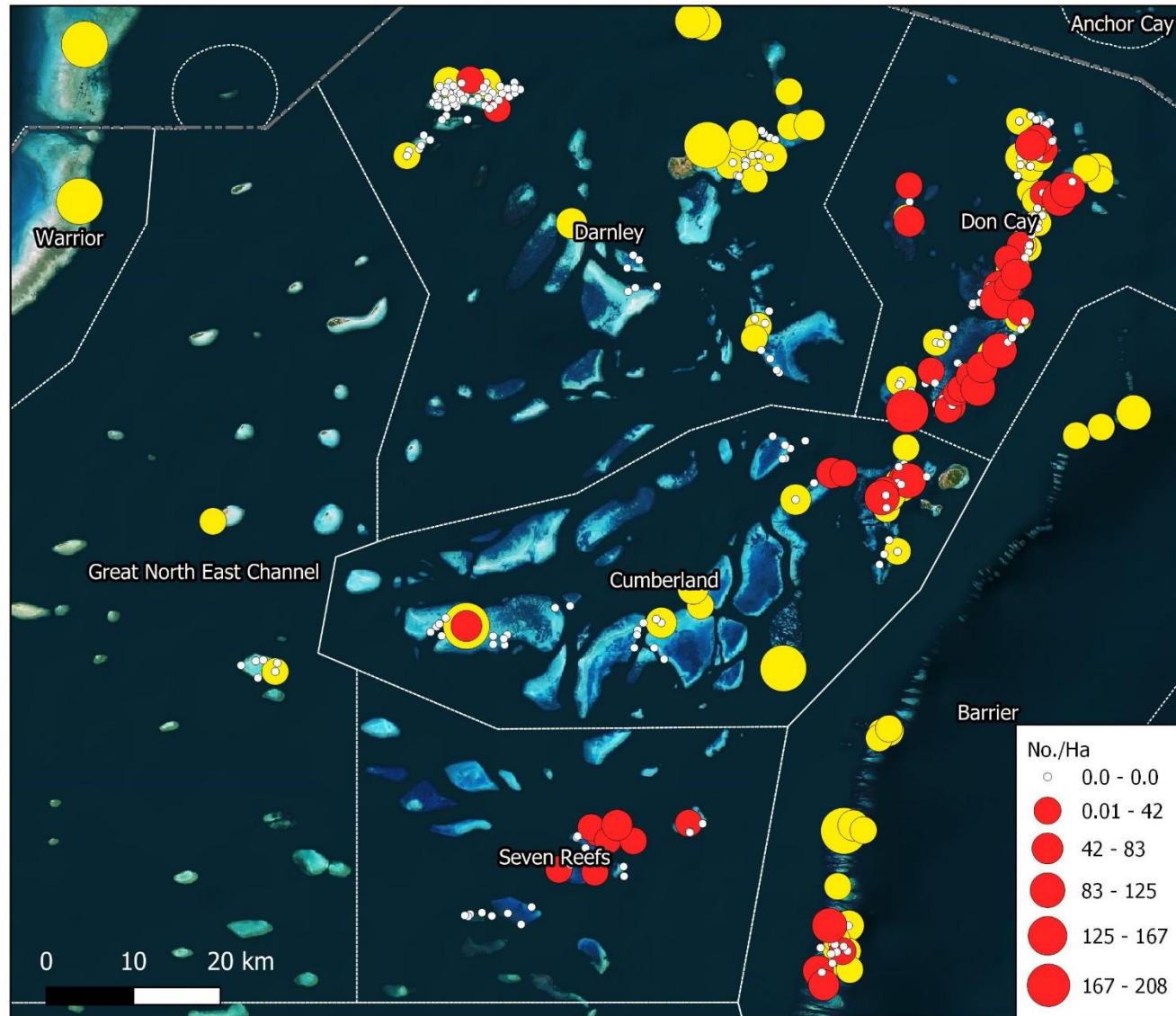
# Black teatfish stock status



# Black teatfish stock status



# Black teatfish site density





# Comparisons with other surveys

- Unbiased comparisons between locations is difficult
- Sea cucumber density varies across reef habitats and in relation to distance from terrigenous influence (across shelf)—and likely several other lesser known gradients
- Comparison depends on a clear delineation of the surveyed habitats
- Historic surveys in Torre Strait have been carried out using the same sample design and survey approach
- Sometimes survey delineations are poorly defined

# GBR Black teatfish

## 1999

- “Area of the fishery” (12-19° S—Princess Charlotte Bay to Lucinda)
- Focused on the “main habitat for Black teatfish” on reef flat with <40%
- Density on ‘closed reefs’ was **20.97** per Ha
- Density on ‘open reefs’ was **5.01** per Ha
- The fishery was closed in 1999
- The biomass estimate for the “fishery area” was **5,585** t.

(Benzie and Uthicke, 2003; Uthicke and Benzie, 2000)

# GBR Black teatfish

## 2015

- Similar area (14-19° S—Cape Melville to Lucinda) as the 1999 survey
- Focused on the 200 m reef edge buffer on the weather (SE facing) side of reefs > 1km<sup>2</sup>
- Mid-shelf reefs
  - 13.5** per Ha (closed reefs) and **12.5** per Ha (open reefs)
- Barrier reefs
  - 27.0** per Ha (closed reefs) and **23.6** per Ha (open reefs)
- Population deemed to have recovered to >70% B<sub>0</sub>
- The biomass estimate for the surveyed area was **379** t.
- The fishery was opened in 2019 with a 30 t TAC

(Knuckey and Koopman, 2016; Koopman and Knuckey, 2020)

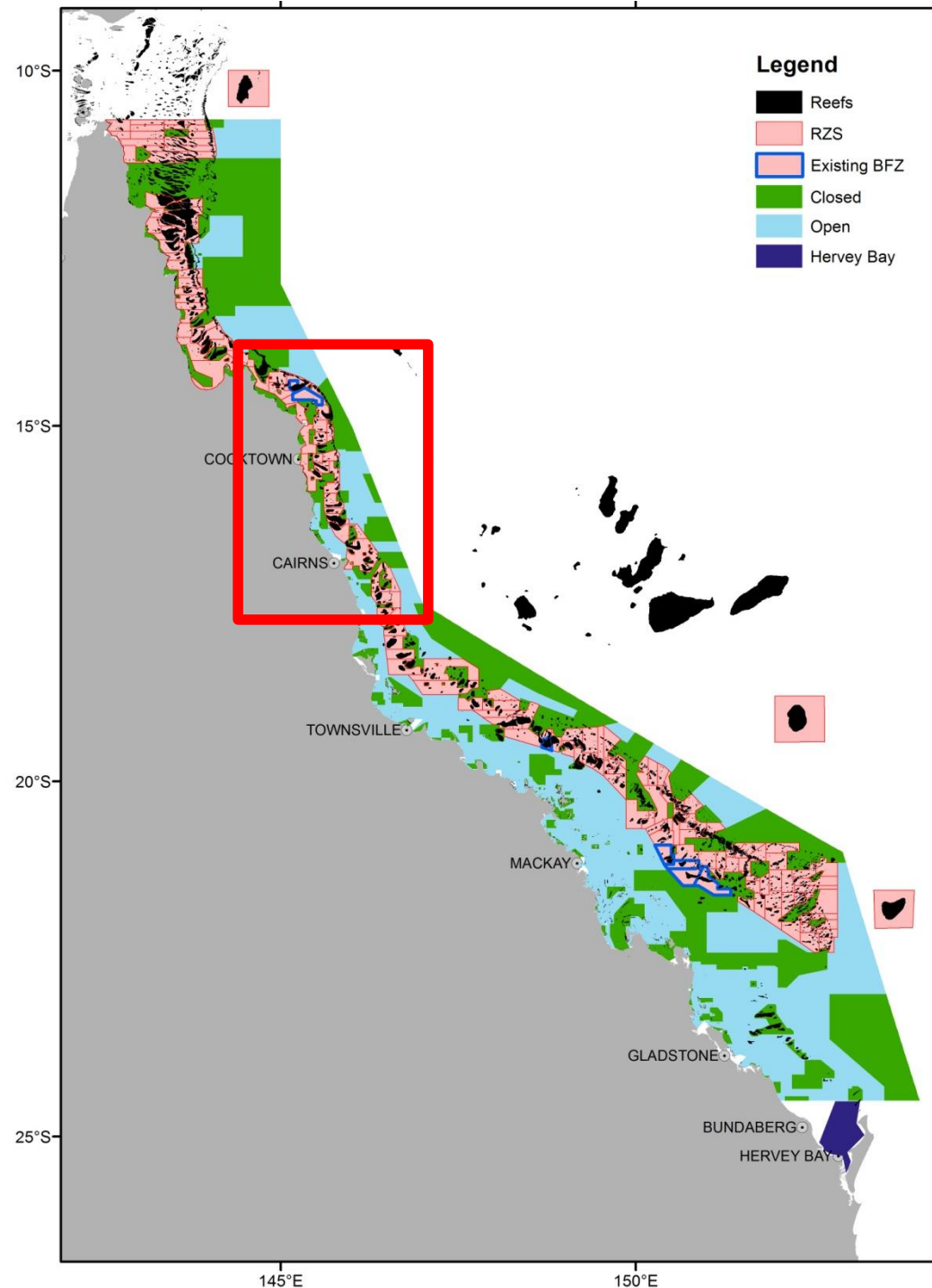
# Qld E.C Fishery (GBR)

Total reef area 26,373 km<sup>2</sup>  
Total “dry reef” area 6,363 km<sup>2</sup>

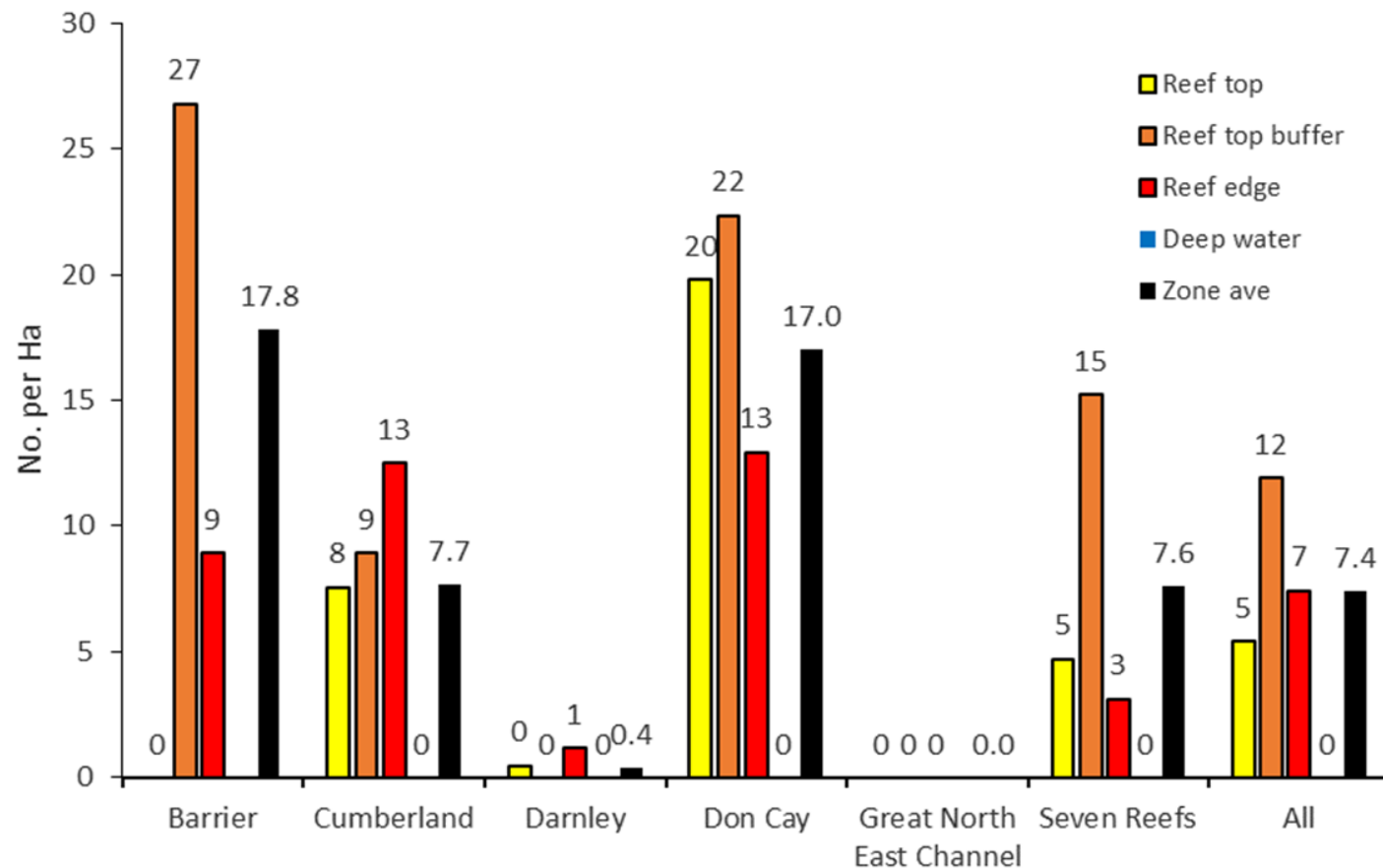
1999 survey area 2,242 km<sup>2</sup>  
2015 survey area 184 km<sup>2</sup>

Closed to fishing 36%

Torres Strait  
Reef area 2,426 km<sup>2</sup>  
(9.2%)

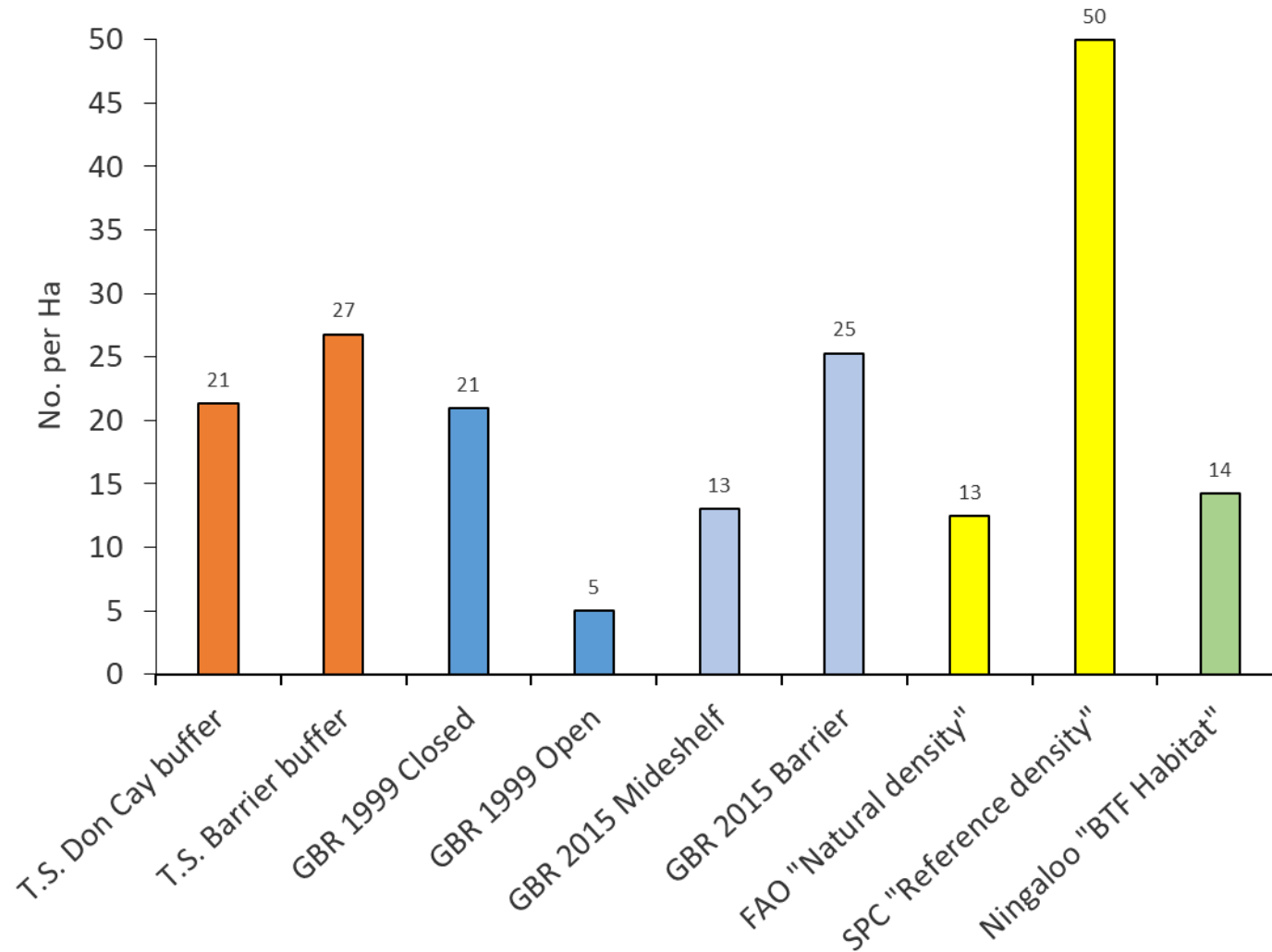


# Comparisons to Torres Strait

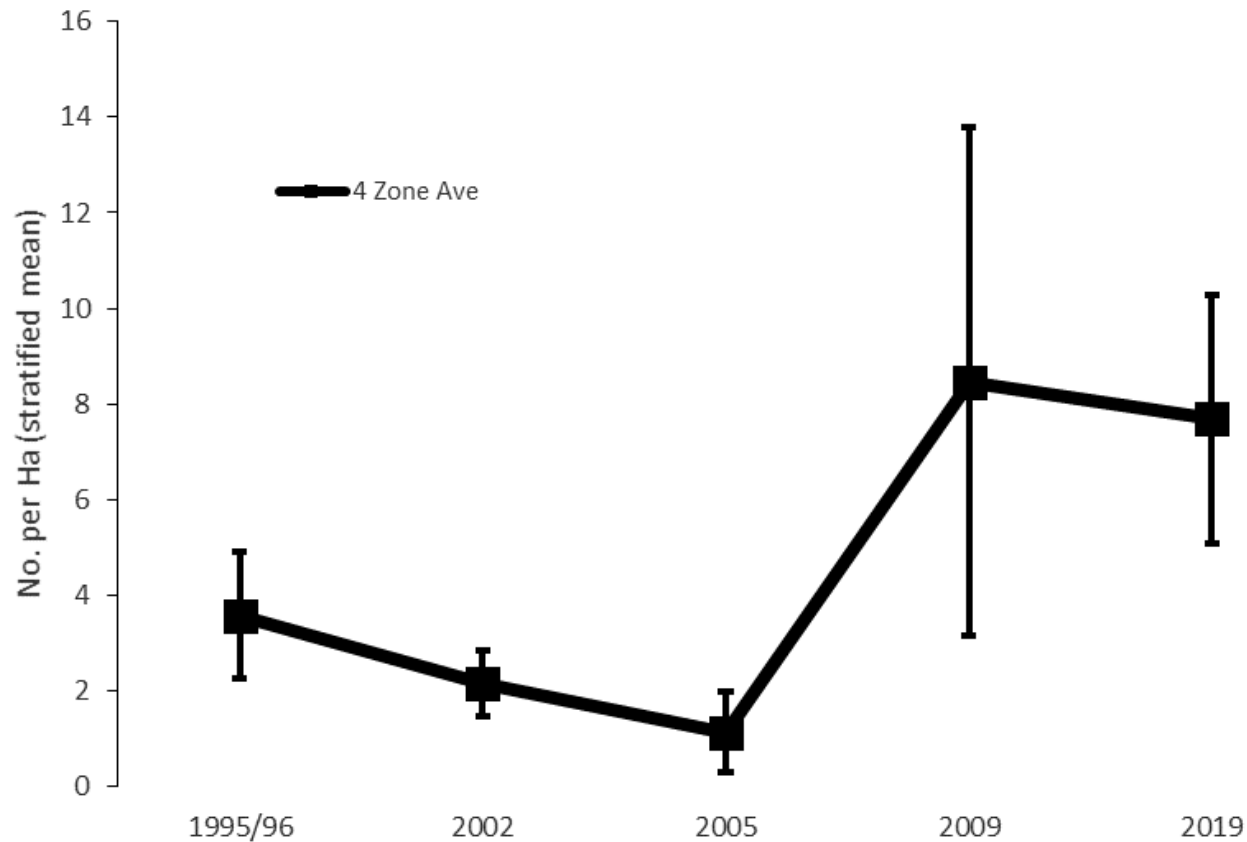




# Black teatfish stock status



# Black teatfish stock status



# Thank you

**CSIRO OCEANS & ATMOSPHERE**

Tim Skewes

t

e [timskewes@internode.on.net](mailto:timskewes@internode.on.net)

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

**CSIRO OCEANS & ATMOSPHERE**

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





# Torres Strait sea cucumber (Beche-de-mer ) survey 2019/20: modelling analyses

Éva Plagányi, Nicole Murphy, Tim Skewes, Kinam Salee, Steve Edgar

August 2020

CSIRO OCEANS & ATMOSPHERE  
[www.csiro.au](http://www.csiro.au)



Australian Government  
Australian Fisheries Management Authority



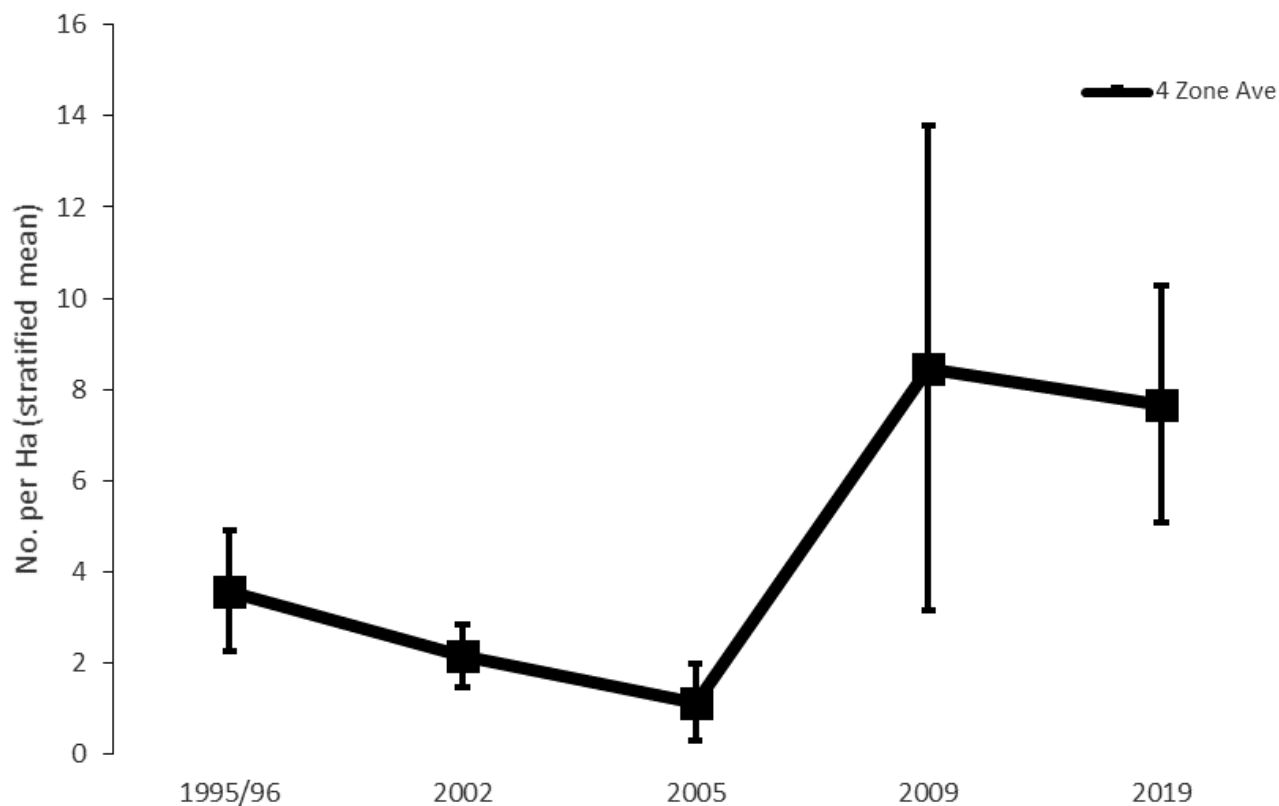
Australian Government



TSRA  
[www.tsra.gov.au](http://www.tsra.gov.au)



## East Torres Strait (4 zone) (bottom) average (stratified) density (No. per Ha) for all reef strata for Black teatfish (*H. whitmaei*) from five surveys





# Why Modelling?

- Objective way to explore the population dynamics and to see which life history parameters are consistent with the trends in the data
- Provides a dynamic (i.e. changing over time) picture of a species and hence informs on not just standing biomass but also what the likely productivity (i.e. turnover rate) is to help inform on sustainable fishing levels
- Formal model selection methods (eg likelihood ratio test, AIC criterion) can be used to select the most parsimonious model, i.e. the model which most reasonably explains the data without adding an unnecessarily large number of parameters that can't be estimated reliably

# Model limitations

- As with any model, model outputs are only as good as the data that are used (GIGO – Garbage In = Garbage Out) hence results assume the data are reasonably reliable or sensitivities can be tested
- There are relatively few values in the BTF time series (i.e. 5 survey points) hence there is limited information to inform a model, but the fact that there is some contrast in the time series (i.e. a downward trend followed by a recovery) is key to being able to estimate productivity
- Biomass dynamic models such as used here are simple models that use lumped biomass but are a useful first step (ideally alternative formulations should be considered in future, such as the age-structured models with associated uncertainties used in the previous MSE\* project)

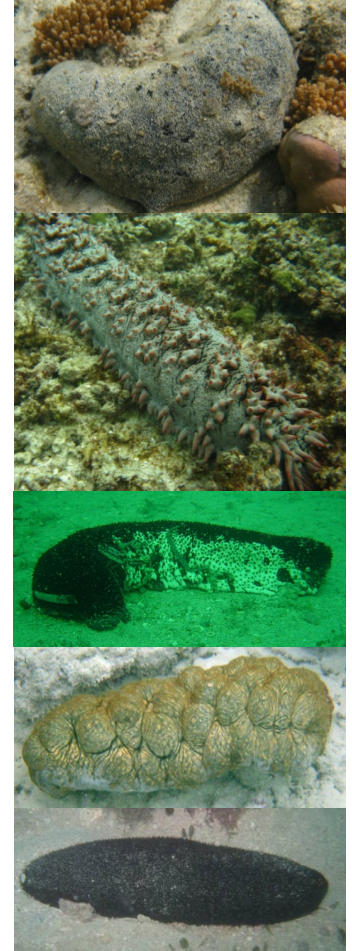
\*MSE: Management Strategy Evaluation

# How does the modelling relate to the new Harvest Strategy (HS)

- The modelling is used to corroborate or shed additional light on analyses of the survey data to provide insights into stock status and sustainable yield
- Consistent with the HS philosophy of using a precautionary starting TAC to re-open a fishery, the modelling can explore a range of alternative scenarios with different levels of precaution added
- Consistent with the HS philosophy of being able to improve and refine management advice as more data become available, models will also be able to refine and improve their estimates as more data become available

# Reminder: How does it work for different stocks with more or less information and data

- If we have less data then assessments need to be simpler and the harvest strategy needs to be more precautionary eg the aim might be to maintain catch rates at historical levels
- With better information and data for a stock, a stock assessment model that uses all the information can be used
- But stock assessments also differ – can be high quality vs more uncertainty in stock assessment:
  - when more certain can approach more robustly
  - but when less certain about stock status then need to be more precautionary as you have less certainty about stock status



# Total Biomass vs Available biomass

- The biomass of a fishery that is “available” to be caught is calculated as the biomass above the MLS (minimum legal size)
- If possible, this is the best quantity to use to calculate the sustainable yield, and is the biomass measure used in age-structured and size-structured fisheries models such as for TRL
- The biomass dynamics model used here can only consider total biomass but more complicated models can refine this
- Available biomass is a better measure than total biomass for stocks that are recovering because it takes into account the lag time for recovery to occur and hence for sufficient animals to grow larger than the MLS and be available to the fishery. If the age-structure is skewed towards incoming recruits, total biomass can overestimate the sustainable yield.



# Pella-Tomlinson equation

$$N_{t+1} = N_t + r N_t \left( 1 - \left( \frac{N_t}{K} \right)^\mu \right) - C_t$$

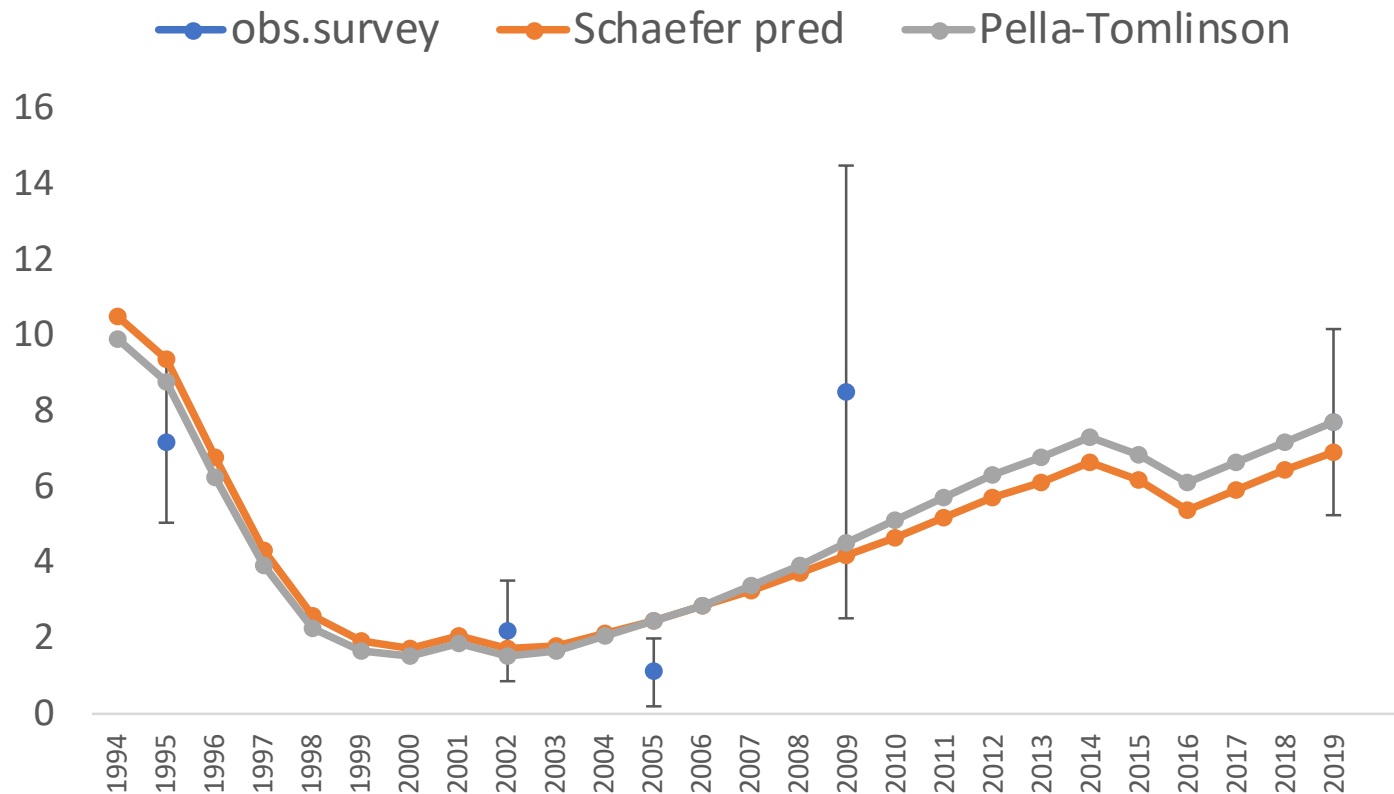
Diagram illustrating the Pella-Tomlinson equation with parameter annotations:

- $N_{t+1}$ : Total biomass of BTF per year (indicated by a blue arrow pointing to the variable)
- $r$ : Intrinsic growth rate (indicated by a blue arrow pointing to the variable)
- $K$ : Carrying capacity (pristine biomass) (indicated by a blue arrow pointing to the variable)
- $\mu$ : Shape parameter (indicated by a blue arrow pointing to the variable)
- $C_t$ : Total annual catch (indicated by a blue arrow pointing to the variable)

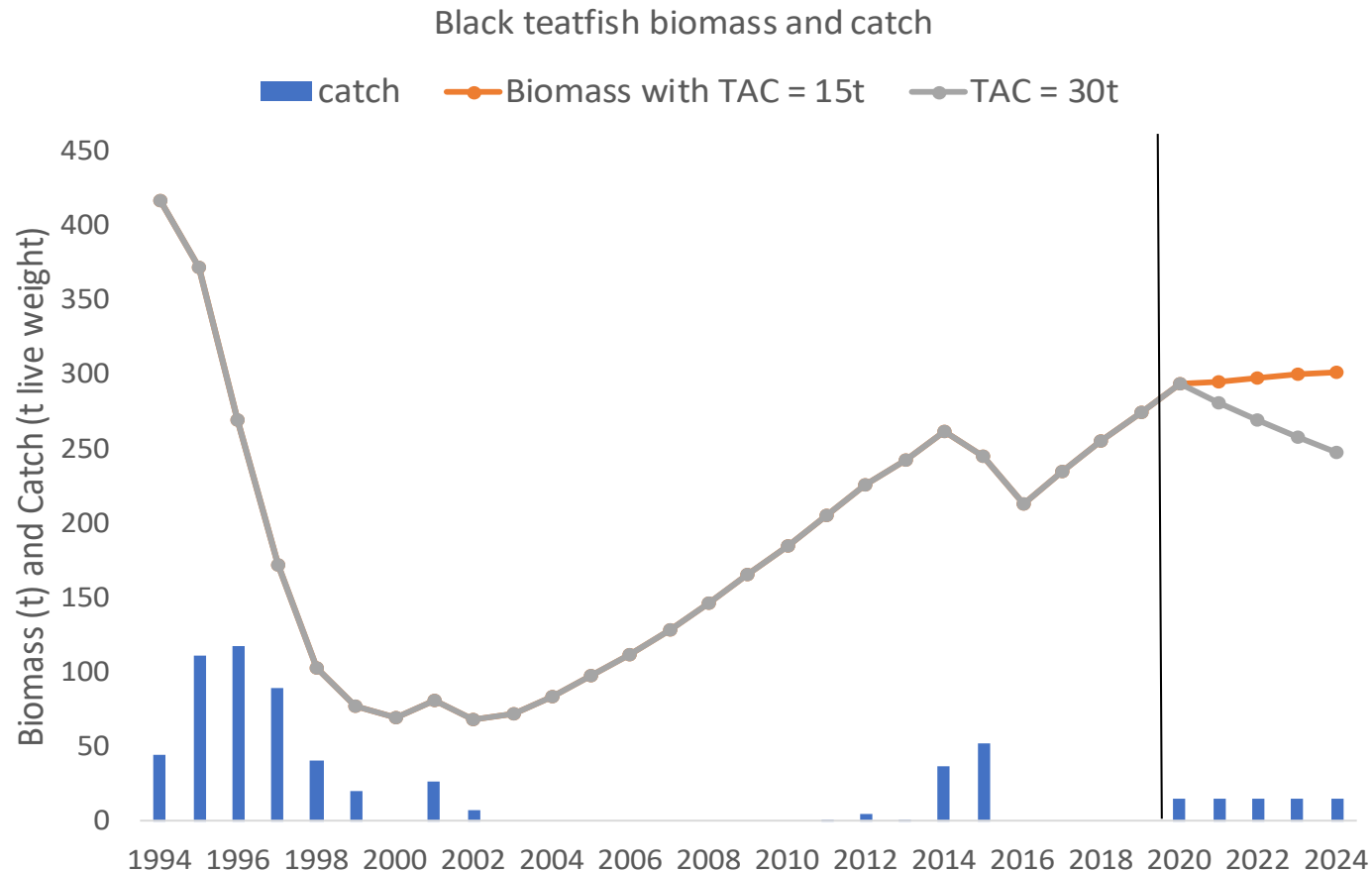
- Lumped biomass model
- Assumes growth is density-dependent
- The combination of  $r$  and  $K$  is more robust than these parameters on their own and informs on sustainable/replacement yield
- Implemented in ADMB

# Model fit to survey data

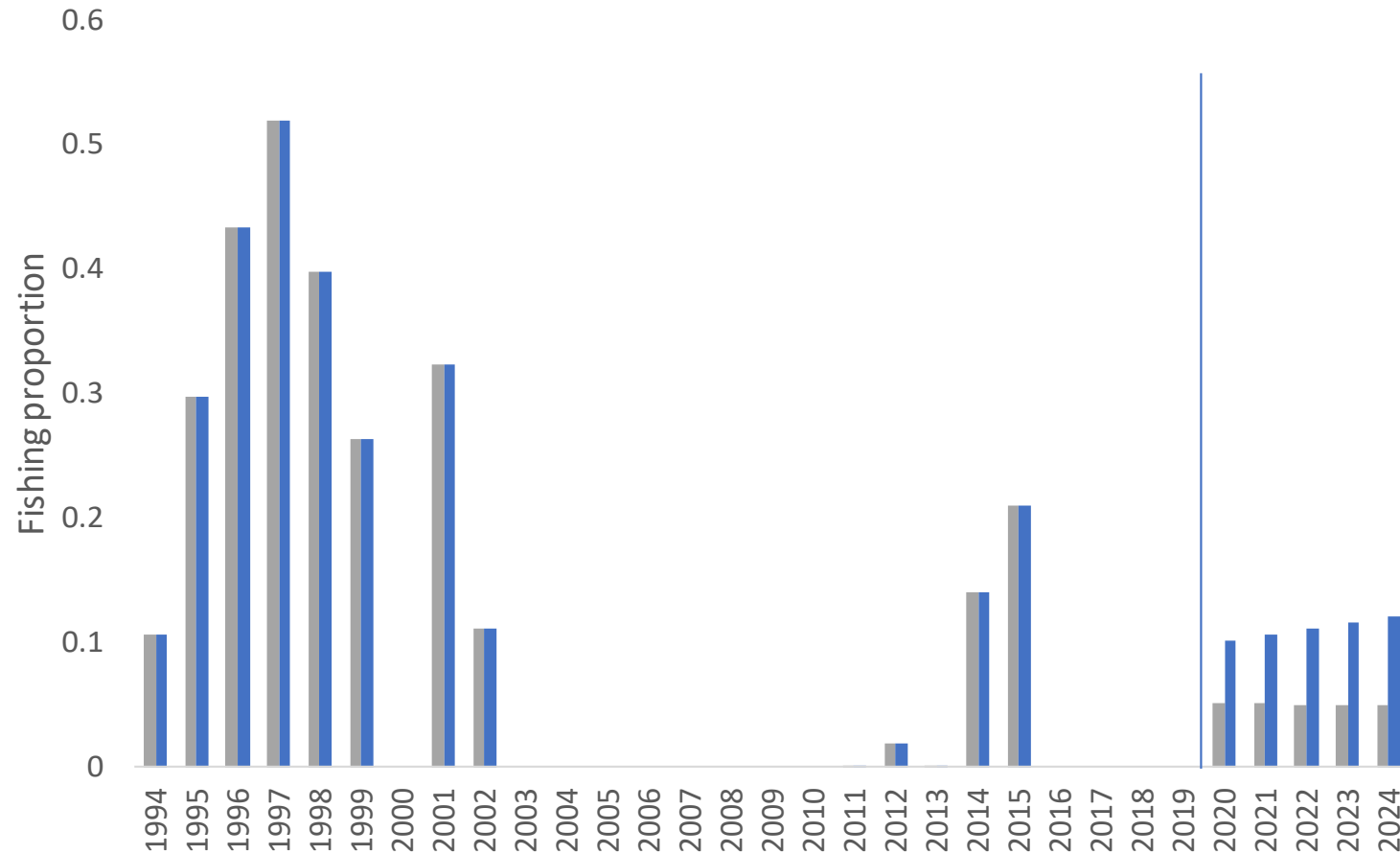
Model fit to survey data :  $r=0.2$ ; double surv(95)



# Base-case model estimated biomass trajectory and forward projection

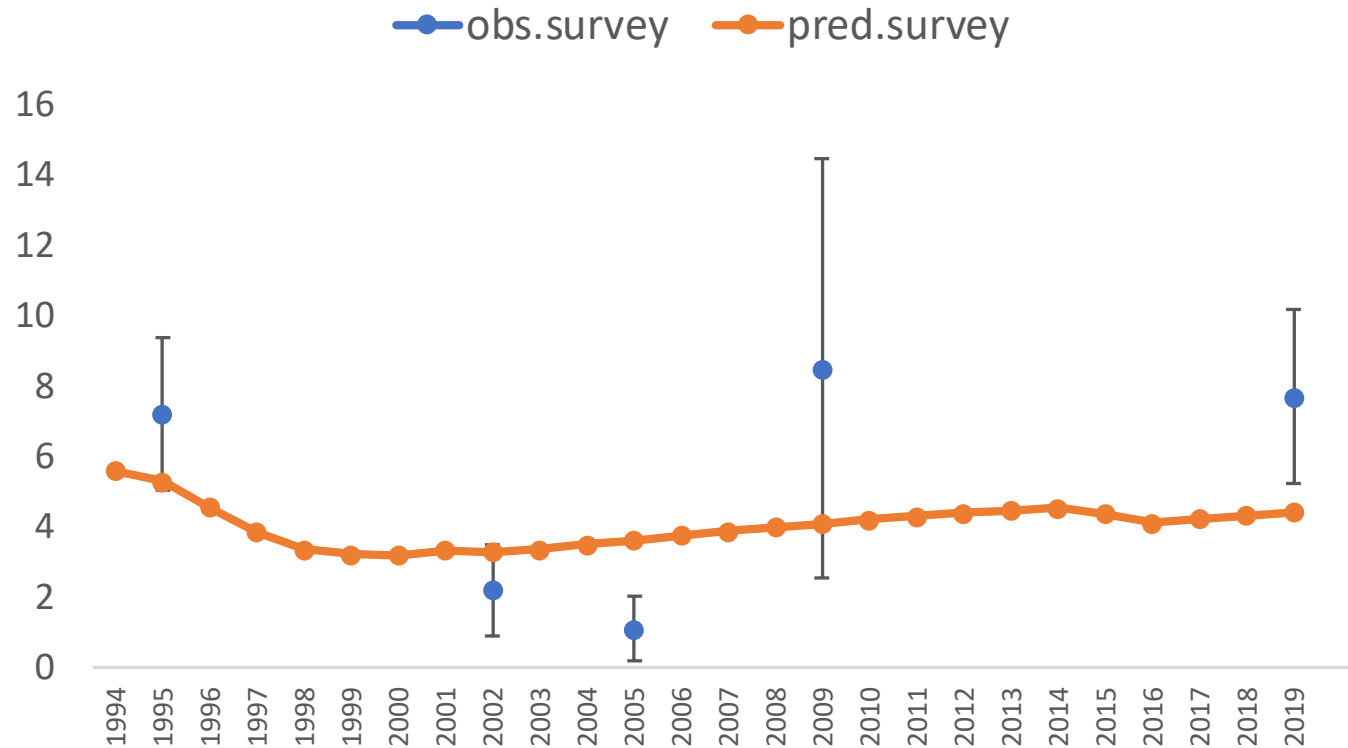


# Base-case fishing proportion estimates



# Fix K – poor model fit

Model fit to survey data :  $r=0.1$ ; fix  $K = 818$  t





# Model Results Summary

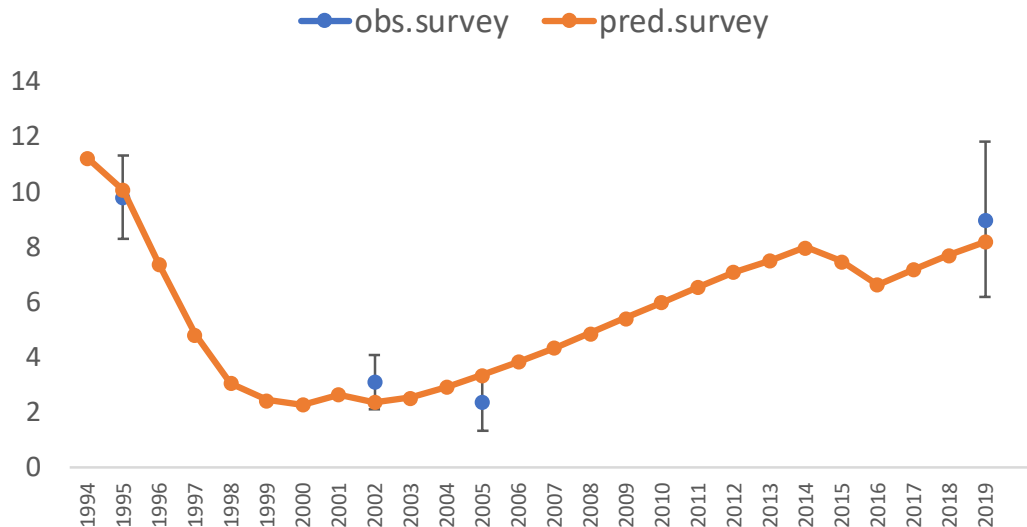
	Description	No.pars	r & [STDEV]	K (t) & [STDEV]	q	-lnL	AIC
Model 1	S; fix r	1	0.15	490.7 [67]	0.014	-2.336	-2.672
Model 2	double surv(95)	1	0.15	450.0 [257]	0.0233	-3.552	-5.104
Model 3	S; fix r	1	0.1	600.9 [172]	0.01	-1.605	-1.21
Model 4	S; fix r; dbl	1	0.2	416.6 [150]	0.025	-4.442	-6.884
Model 5	S; est r,K	2	0.29 [0.13]	391.8 [60]	0.017	-3.173	-2.346
Model 6	S; est r,K; dbl	2	0.25 [0.08]	396 [35]	0.025	-4.665	-5.33
Model 7	P; est r,K,mu; dbl; mu=3.5	3	0.25 (0.08]	396 [35]	0.025	-4.665	-3.33
Model 8	Fix K, est r	1	0.097 [0.08]	820.6	0.0068	-1.23	-0.46

# Model Results Summary: MSY

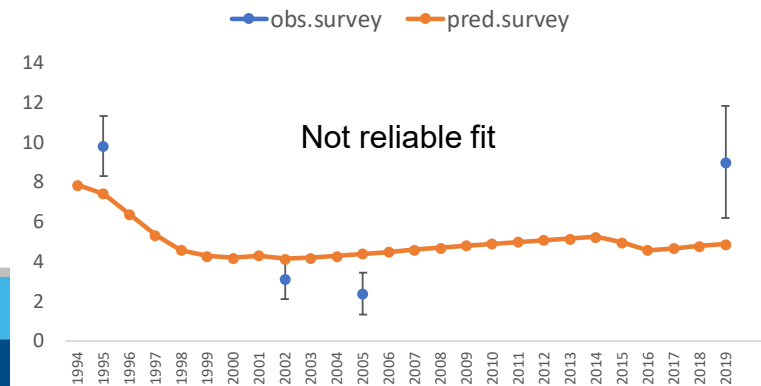
	Description	MSY (t)	BMSY (t)	B(2019) (t)	B2019/BMSY
Model 1	S; fix r	18.5	245.4	336.9	1.37
Model 2	double surv(95)	16.9	225	242.3	1.08
Model 3	S; fix r	15	300.5	385.7	1.28
Model 4	S; fix r; dbl	20.8	208.3	274.7	1.31
Model 5	S; est r,K	28.5	195.8	344.3	1.75
Model 6	S; est r,K; dbl	24.6	197.8	308.2	1.56
Model 7	P; est r,K,mu; dbl; mu=3.5	49.7	257.4	308.2	1.19
Model 8	Fix K, est r	19.9	410.2	647.8	1.57

# Use survey series that includes outer barrier (less variable as less fishing there, but no data for 2009)

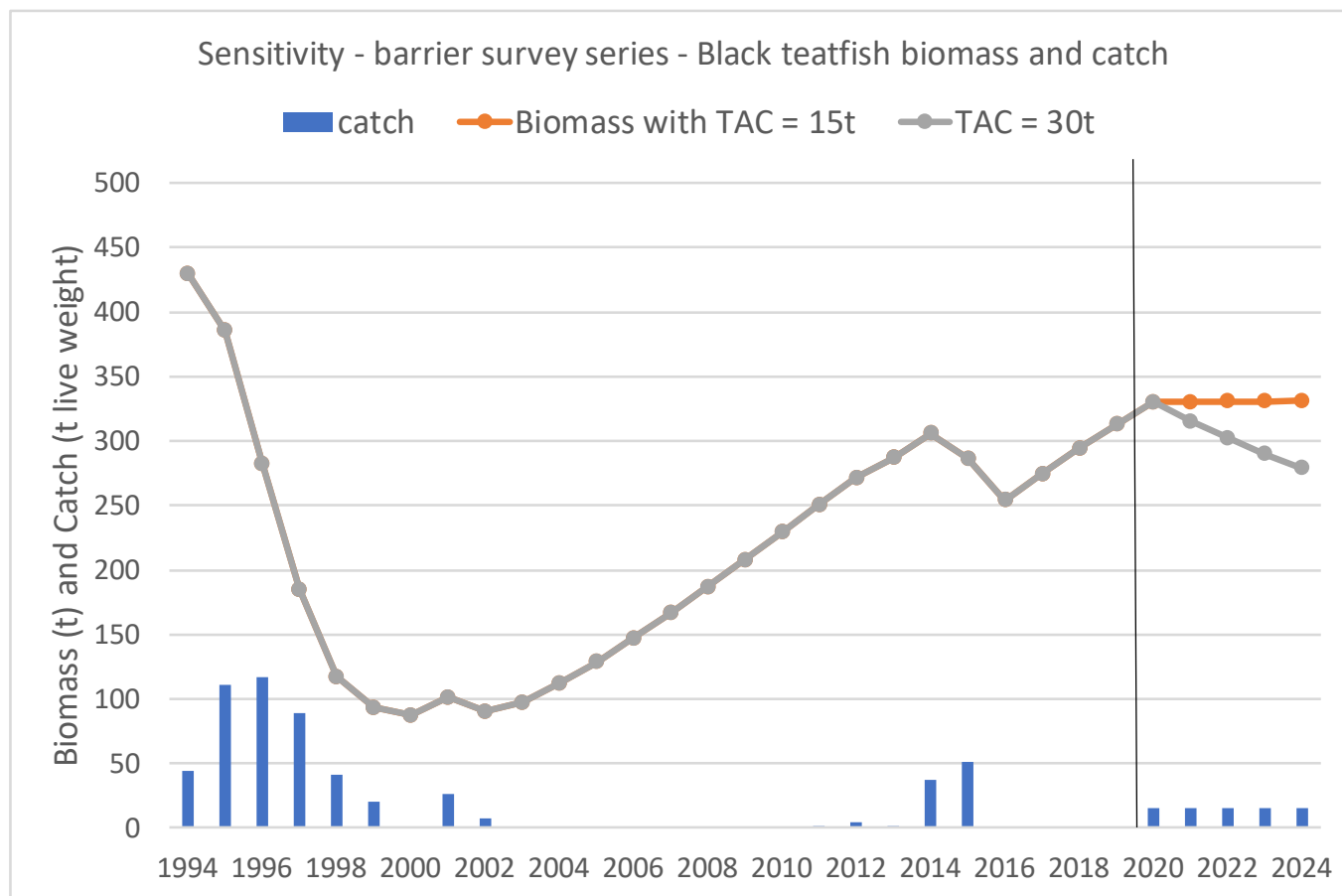
Model fit to "barrier" survey data :  $r = \text{fix } 0.2$ ;  $K = 430 \text{ t}$   
[STD 87];  $\text{MSY} = 21.5 \text{ t}$



Model fit to "barrier" survey data :  $r = 0.05$  (STD 0.18 - can't estimate);  $K = 821 \text{ t}$ ;  $\text{MSY} = 11 \text{ t}$



# Use survey series that includes outer barrier (less variable as less fishing there, but no data for 2009)



F = 0.05

F = 0.1

# Summary

- Across most model versions, projections suggested that a constant annual TAC of 30t may not be sustainable, whereas a TAC of 20 t (and hence 15 t) was sustainable across all model versions run.
- The base-case model estimate of MSY was 21 t, which is slightly higher than the 15 t precautionary TAC that is currently recommended by the Harvest Strategy.
- As more data become available, it will be possible to refine and substantially improve modelling results.
- It wasn't possible to reconcile the absolute biomass estimates with the trends in the survey data, suggesting eg that spatial aspects need to be accounted for in the modelling

# Future research – potential uses of revised and updated MSE (incorporating multispecies spatial operating model)

- Could model all key species, with age structure and spatial component and bound the range of uncertainties
- A tool to more comprehensively evaluate the risks of different TAC alternatives
- A tool to validate the new Harvest Strategy (HS) and help implement rules such as how best to use indicators to adjust TACs e.g. size measurements used to inform on age structure and hence available biomass
- Can explore how adding data reduces uncertainty and hence consequences for management recommendations
- More broadly can contribute to aspirational development of an integrated ecosystem model that incorporates climate change



# Previous MSE modelling results

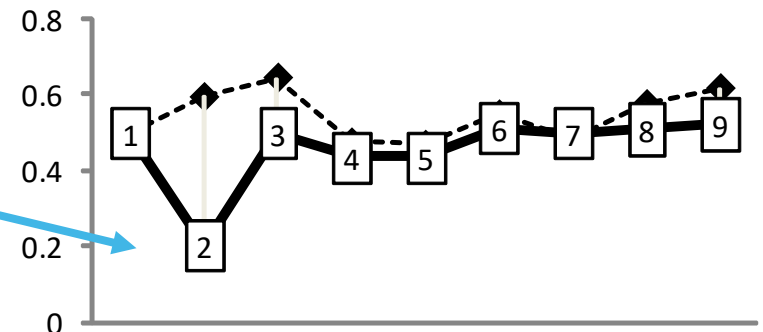
Key	Species
1	<i>Holothuria scabra</i>
2	<i>Holothuria whitmaei</i>
3	<i>Actinopyga Mauritiana</i>
4	<i>Holothuria fuscogilva</i>
5	<i>Thelenota ananus</i>
6	<i>Actinopyga echinites</i>
7	<i>Actinopyga miliaris</i>
8	<i>Bohadschia argus</i>
9	<i>Trochus niloticus</i>

Plaganyi et al 2011.  
Evaluating management  
strategies for data-poor  
bêche de mer species in  
Torres Strait RUSS project  
report

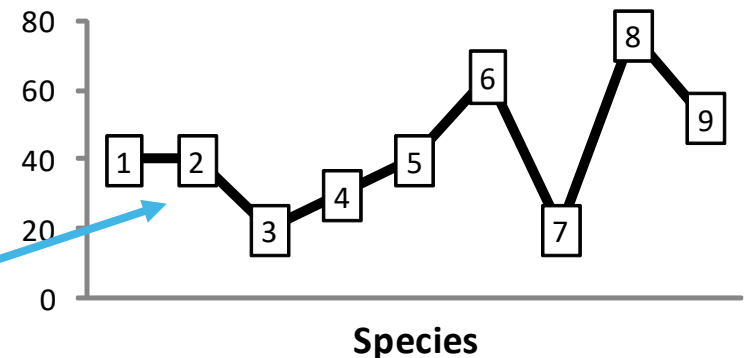
BTF

40t

Risk of falling below Blim



Average Catch (t)



# What data would help refine analyses?

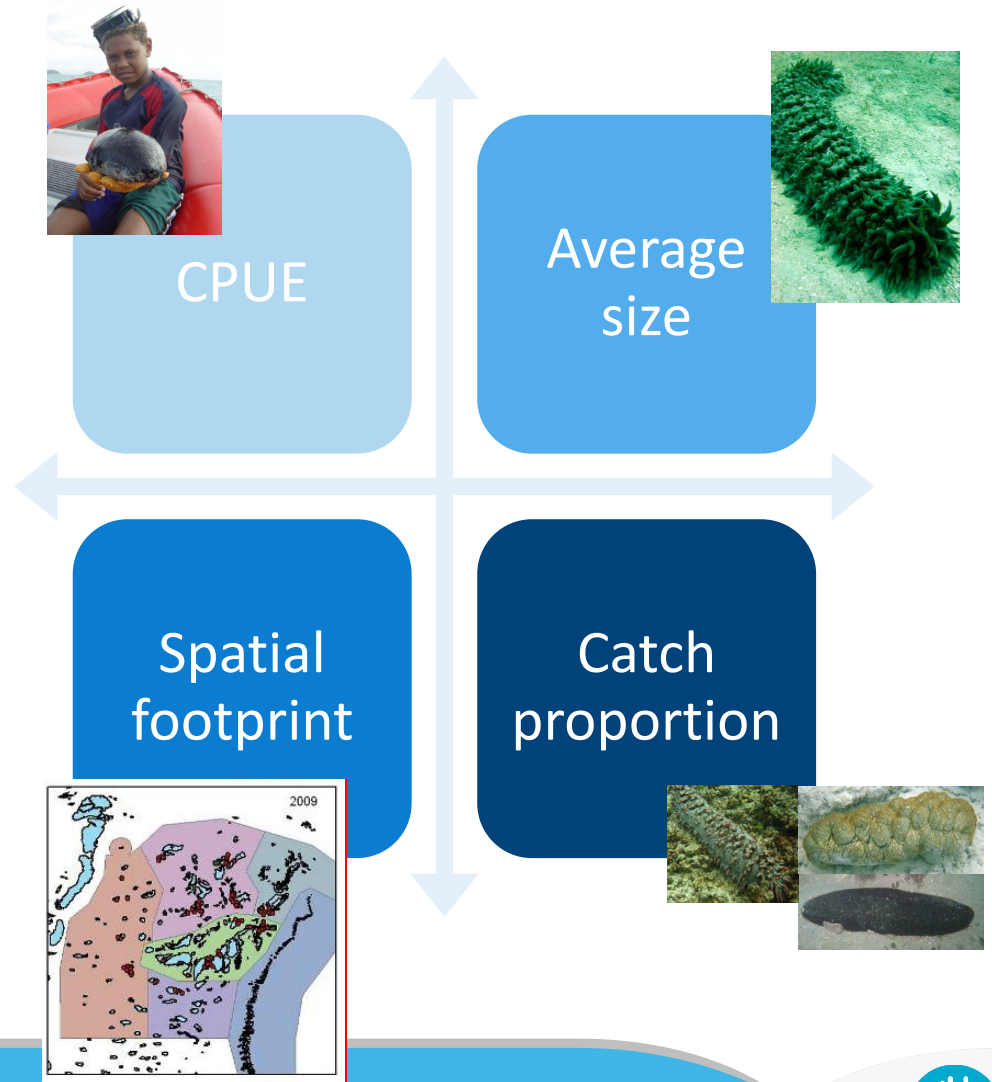
## Primary Indicators

- Catch per species
  - Effort
  - CPUE (Catch Per Unit Effort)
  - Spatial footprint
  - Species composition
- 
- Sub-samples of catches could be sampled eg by fishers/individuals to collect data size measurements
  - Loggers could be used to quantify spatial footprint and dive times etc



# Multiple Indicator Decision Rule

- Use CPUE plus at least 1 other (out of possible 3) indicators
- Calculate average trend in these combined indicators
- If positive, then increase in TAC could be considered (& conversely if negative)
- Set upper catch limit allowed (need survey to increase beyond this)



# Thank you

CSIRO Oceans and Atmosphere  
Nicole Murphy (P.I.)  
Tim Skewes

Éva Pláganyi  
Principal Research Scientist  
Brisbane, Australia

t +61 7 3833 5955  
e [eva.plaganyi-lloyd@csiro.au](mailto:eva.plaganyi-lloyd@csiro.au)  
w [www.csiro.au](http://www.csiro.au)

