17th MEETING OF THE HAND COLLECTABLES WORKING GROUP
Meeting Paper Index

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
PRELIMINARIES **Welcome and apologies**	**Agenda Item 1.1** **For NOTING**

RECOMMENDATIONS

1. That the Working Group **NOTE**:
    a. an acknowledgement of Traditional Owners;
    b. the Chair's welcome address;
    c. apologies received from members unable to attend.

2. As of 24 July 2020 no formal apologies have been received however the availability of Mr Tony Salam, the Traditional Inhabitant member for Kaiwalagal, was still to be confirmed.

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
PRELIMINARIES **Adoption of agenda**	**Agenda Item 1.2** **For DECISION**

RECOMMENDATION

1. That the Working Group consider and **ADOPT** the draft agenda.

BACKGROUND

2. A first draft annotated agenda was circulated to members and observers on 6 July 2020.
3. No changes or comments on the draft agenda were received.

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
PRELIMINARIES **Declarations of interest**	**Agenda Item 1.3** **For DECISION**

RECOMMENDATIONS

1. That the Working Group members:
   a. **DECLARE** all real or potential conflicts of interest in Torres Strait hand collectable fisheries at the commencement of the meeting (**Table 1**).
   b. **DETERMINE** whether the member may or may not be present during discussion of or decisions made on the matter which is the subject of the conflict;
   c. **ABIDE** by decisions of the Working Group regarding the management of conflicts of interest.
   d. **NOTE** that the record of the meeting must record the fact of any disclosure, and the determination of the Working Group as to whether the member may or may not be present during discussion of or decisions made on the matter which is the subject of the conflict.

BACKGROUND

2. Consistent with the *Protected Zone Joint Authority (PZJA) Fisheries Management Paper No. 1* (FMP1), which guides the operation and administration of PZJA consultative forums, members are asked to declare any real or potential conflicts of interest.
3. Working Group members are asked to confirm the standing list of declared interests (**Table 1**) is accurate and provide an update to be tabled if it is not.
4. FMP1 recognises that members are appointed to provide input based on their knowledge and expertise and as a consequence, may face potential or direct conflicts of interest. Where a member has a material personal interest in a matter being considered, including a direct or indirect financial or economic interest; the interest could conflict with the proper performance of the member's duties. Of greater concern is the specific conflict created where a member is in a position to derive direct benefit from a recommendation if it is implemented.
5. When a member recognises that a real or potential conflict of interest exists, the conflict must be disclosed as soon as possible. Where this relates to an issue on the agenda of a meeting this can normally wait until that meeting, but where the conflict relates to decisions already made, members must be informed immediately. Conflicts of interest should be dealt with at the start of each meeting. If members become aware of a potential conflict of interest during the meeting, they must immediately disclose the conflict of interest.
6. Where it is determined that a direct conflict of interest exists, the forum may allow the member to continue to participate in the discussions relating to the matter but not in any decision making process. They may also determine that, having made their contribution to the discussions, the member should retire from the meeting for the remainder of discussions on that issue. Declarations of interest, and subsequent decisions by the forum, must be recorded accurately in the meeting minutes.

Table 1. HCWG member and observer Declarations of Interest from most recent meetings.

Note: only declarations of members present are shown.

Name	Position	Declaration of interest
Members		
Anne Clarke	Chair	Board member of the Wet Tropics Management Authority Previously contracted with Regional Development Australia Far North Queensland and Torres Strait No pecuniary interests or otherwise.
Tim Skewes	Scientific Member	CSIRO/Independent Consultant. Current co-investigator on TSSAC project 'measuring non-commercial fishing in the Torres Strait'. Current co-investigator on TSRA funded project 'Stock survey of Torres Strait Beche-de-mer species'. Previous principal scientist for Torres Strait Scientific Advisory Committee (TSSAC) project to develop a harvest strategy for the TSBDMF. Previous CSIRO researcher for TSSAC project investigating traditional take of finfish in Torres Strait.
Steve Purcell	Scientific Member	To be declared.
Michael Passi	Traditional Inhabitant Member Kemer Kemer Meriam	TIB licence holder
Tony Salam	Traditional Inhabitant Member Kaiwalagal	To be declared.
Patrick Bonner	Traditional Inhabitant Member Kulkalgal	TIB licence holder; Chair of Mura Porumalgal Fisheries Corporation
Frank Loban	Traditional Inhabitant Member Maluialgal	TIB licence holder; Traditional Inhabitant Member on TSSAC and Finfish Working Group.
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 – additional interests yet to be declared.
Danait Ghebrezgabhier	Executive Officer, AFMA	Employed by AFMA, no pecuniary interests or otherwise

Permanent Observers		
Yen Loban	TSRA Fisheries Portfolio Member	TIB licence holder; TSRA Board Member for Ngurupai
Ian Liviko	PNG National Fisheries Authority	To be declared.
Casual Observers		
Ian Butler	Australian Bureau of Agriculture and Resource Economics (ABARES)	To be declared.
Keith Brightman	TSRA Fisheries Portfolio Member	Employed by TSRA, no pecuniary interests or otherwise

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
PRELIMINARIES Action items from previous meetings	Agenda Item 1.4 FOR NOTING

RECOMMENDATIONS

1. That the Working Group **NOTE**:
    a. the progress against actions arising from previous meetings, including the 16th meeting of the Hand Collectable Working Group (HCWG15) held on 21 February 2020 (**Attachment 1.4a**).
    b. the meeting record for HCWG16, which was finalised out of session on 3 April 2020 (**Attachment 1.4b**).

BACKGROUND

Actions arising

2. Updates are provided on the status of actions arising from the HCWG16 and previous meetings.

Meeting Record

3. The draft meeting record for HCWG15 was circulated out-of-session to members on 4 March 2020 for comment. Minor comments were received and the record was finalised out of session, emailed to Working Group members on 3 April 2020.

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	**Ongoing.** 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 **Action 6** 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	**Ongoing.** 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	**Ongoing.** 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

#	Meeting	Action item	Responsibility	Status
				the 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)	**Ongoing.** 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	**In progress.** 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)	**Ongoing.** 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.

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Contents

1 Preliminaries

1.1 Acknowledgement of Traditional Owners, welcome and apologies

1. Sereako Stephen opened the meeting in prayer around 9:00 am.
2. The Chair welcomed attendees to the 16th meeting of the Torres Strait Hand Collectables Working Group (HCWG 16) at the Torres Strait Regional Authority (TSRA) Board Room on Thursday Island. The Chair acknowledged the Traditional Owners of the land on which the meeting was held and paid respect to Elders past, present and future.
3. The Chair further acknowledged the role of the HCWG under the PZJA Fisheries Management Paper 1 and reminded members of Working Group of their responsibilities and respectful nature in which to abide by during the two days of meeting.
4. The Chair thanked the TSRA and Traditional Inhabitants for supporting the cultural awareness training held the day before the HCWG meeting. In speaking with other members following the training, the Chair reported that members found the training extremely helpful in building insight into the local culture and the experiences of Torres Strait Islander people. This was considered invaluable in better understanding the aspirations and values of Torres Strait Islander people and how they might relate to fisheries. The Chair thanked all members for their willingness to share their personal advice and experiences
5. Attendees at the Working Group are detailed in **Table 1** below.

Table 1. List of attendees at the HCWG15.

Members	
Anne Clarke	Chair
Tim Skewes	Scientific member
Michael Passi	Traditional Inhabitant member, Kemer Kemer Meriam
Maluwap Nona	Traditional Inhabitant member, Gudumalulgal
Frank Loban	Traditional Inhabitant member, Maluialgal
Patrick Bonner*	Traditional Inhabitant member, Kulkalgal
Tony Salam	Traditional inhabitant member, Kaiwalagal
Selina Stoute	Australian Fisheries Management Authority (AFMA) member
Mark Anderson	Torres Strait Regional Authority (TSRA) member
Danait Ghebrezgabhier	HCWG Executive Officer, AFMA
Casual Observers	
Sereako Stephen	Malu Lamar (torres Strait Islanders) Corporation RNTBC
Keith Brightman	TSRA
Kalya Yamashita	AFMA
Lyndon Peddell**	AFMA, Compliance

* Mr Bonner left the meeting at 0930 and did not return.

** In attendance for agenda items 1,2, 5 and 6.

6. Apologies received are detailed in the **Table 2** below.

Table 2. List of apologies for HCWG15.

Apologies	
Steve Purcell	Scientific Member
Yen Loban	TSRA Fisheries Portfolio Board Member
Ian Liviko	PNG National Fisheries Authority (NFA) Invited Participant
Danielle Stewart	Queensland Department of Agriculture and Fisheries (QDAF) member

1.2 Adoption of agenda

7. The Working Group accepted AFMA's recommendation to discuss agenda item 4 before item 3 and adopted the agenda.

8. The Working Group agreed to break for lunch early noting the Malu lamar representative had a short commitment outside the meeting at 1130. The Working Group wanted to ensure the Malu Lamar representative was included in all business.

1.3 Declarations of interest

9. The Chair advised members and observers, that as provided in PZJA Fisheries Management Paper No. 1 (FMP1), all members of the Working Group must declare all real or potential conflicts of interest in Torres Strait TRL Fishery at the commencement of the meeting. Where it is determined that a direct conflict of interest exists, the Working Group may allow the member to continue to participate in the discussions relating to the matter but may also determine that, having made their contribution to the discussions, the member should retire from the meeting for the remainder of the discussions on that issue.

10. Declarations of interests were provided by each meeting participant. These are detailed in the **Table 3** below.

11. The Working Group followed a process whereby each group of members with similar interests were asked to leave the room to enable the remaining members to:

    a) Freely comment on the declared interests;

    b) Discuss if the interests precluded the members from participating in any discussions; and

    c) Agree on any actions to manage declared conflicts of interests (e.g. the member may be allowed to participate in the discussions relating to the matter but not in the formulation of final advice).

12. The scientific member was also asked to leave the room. The AFMA member noted by way of example, that when discussing potential research projects (for example under agenda item 7 on providing advice on research pre-proposals) scientific members may have real or perceived conflicts of interest. However it is their relevant expertise in fisheries research relevant to the fishery that is highly valued in the development of Working Group advice. Having regard for the declarations made by the Scientific Member and the importance of having relevant scientific expertise, it was agreed that the scientific member be permitted to participate in discussions under all agenda items and the formulation of Working Group recommendations.

13. Those members and observers holding a fishing licence, including the TSRA officers were asked to leave the room. The remaining members agreed that although the excused members may have real or perceived conflicts of interest, their expertise is critical in the development of advice that impacts industries and traditional inhabitants more generally. It was also noted that potential conflicts can arise when specific members or communities from which the members are from are

likely to benefit directly from particular management decisions. In these situations members must be sure to consider the fishery as a whole rather than one particular operator or community over the other. Noting the importance of having traditional inhabitant industry advice and reminding members to act in the best interest of the Fishery at all times, it was agreed that the excused members be permitted to participate in discussions under all agenda items in the formulation of Working Group recommendations.

14. Government members were asked to leave the room. The remaining members noted that TSRA hold a BDM licence in trust on behalf of Traditional Inhabitants but considered the potential risk for a perceived of real conflict of interest to be manageable within the meeting and again recognised the importance of having TSRA contribute to the meeting discussions and advice.

Table 3. Declared interests from each attendee.

Name	Position	Declaration of interest
Anne Clarke	Chair	Board member of the Wet Tropics Management Authority Previously contracted with Regional Development Australia Far North Queensland and Torres Strait No pecuniary interests or otherwise.
Tim Skewes	Scientific Member	CSIRO/Independent Consultant. Previous principal scientist for Torres Strait Scientific Advisory Committee (TSSAC) project to develop a harvest strategy for the TSBDMF. Previous CSIRO researcher for TSSAC project investigating traditional take of finfish in Torres Strait.
Michael Passi	Traditional Inhabitant Member, Kemer Kemer Meriam	TIB licence holder. Has been a member of HCWG for the last 6 years. Has interest in the BDM, Trochus and Pearl Shell Fisheries.
Maluwap Nona	Traditional Inhabitant Member, Gudumalulgal	TIB licence holder, Chairperson of Malu Lamar, Traditional Inhabitant member on TSSAC
Frank Loban	Traditional Inhabitant Member, Maluialgal	TIB licence holder; Traditional Inhabitant Member on TSSAC and Finfish Working Group.
Patrick Bonner	Traditional Inhabitant member, Kulkalgal	Kulkalgal representative , Chair of Mura Porumalgal Fisheries Coproation
Tony Salam	Traditional inhabitant member, Kaiwalagal	TIB licence holder covering all fisheries. Member for kaiwalagal.
Selina Stoute	AFMA Member	Employed by AFMA, no pecuniary interests or otherwise
Mark Anderson	TSRA Member	Employed by TSRA, no pecuniary interests as an individual, TSRA holds fishing licences on behalf of traditional inhabitants.
Danait Ghebrezgabhier	Executive Officer HCWG (AFMA)	Employed by AFMA, no pecuniary interests or otherwise
Sereako Stephen	Casual Observer	TIB licence holder, Director of Malu Lamar and GBK, Chair of the Ugar RNTBC.

Name	Position	Declaration of interest
Keith Brightman	Casual Observer	Employed by TSRA, no pecuniary interests or otherwise
Kayla Yamashita	Casual Observer	Employed by AFMA, no pecuniary interests or otherwise
Lyndon Peddell	Casual Observer	Employed by AFMA, no pecuniary interests or otherwise

1.4 Action items from HCWG15 and previous meetings

15. The Working Group noted the report provided by the Executive Officer on the progress against actions arising from previous meetings, including those that are now complete (Table 4) and noted the following additional comments in relation to some of the action items:

    a. Action Item 4 – As detailed in the agenda paper, while a formal MOU has not been developed AFMA has worked directly with fishers to make significant improvements in reporting. AFMA recommended that this process continue and the action item be removed. AFMA however advised that it remained opened to suggestions from Malu Lamar and stakeholders more generally on improved processes. The TSRA Member advised that TSRA was working with Malu Lamar to agree a service level MOU. The details of the MOU were yet to be worked through however there may be scope to include programs aimed at improving reporting. The Malu Lamar Chairperson expressed preference to maintain the development of the MOU to ensure it remains an option if needed. Having regard for views tabled the Working Group agreed for the following action:

Action item 1.1 - 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.

    b. Action Item 5 – While Mr Frank Loban has expressed interest in presenting at a scientific conference, he called upon the other more senior members of the Working Group to also attend and present. Mr Michael Passi, Mr Simon Naawi and Mr Maluwap Nona to be put forward to the CSIRO and the TSRA as nominees for the opportunity to attend and present on the BDM Harvest Strategy at upcoming scientific conferences. This is in recognition of their extensive effort in the development of the Harvetst Strategy and the level of goodwill placed upon them by their respective communities. The Working Group noted that this is a very exciting opportunity to share the work that has happened in the BDM Fishery to date.

    c. Action item 9 – PZJA Traditional Inhabitants could not attend the last Queensland Sea Cucumber Fishery Working Group meeting due to confidentiality considerations of the agenda items being discussed. However they are supportive of HCWG Traditional Inhabitants attending their future meetings. The status update for the action item will be revised to reflect this sentiment.

16. The Working Group noted the final meeting record for HCWG 15, which was finalised out of session and published on 16 September 2019.

1.5 Out of session correspondence

17. The Working Group noted the correspondence circulated out of session since HCWG15 held on 1-2 August 2019.

2 Working Group Updates

2.1 Industry member update

18. The Working Group noted updates provided by Traditional Inhabitant industry members and observers on the recent performance and strategic issues relating to hand collectable fisheries, including economic trends, affecting the management and development of these fisheries.

19. Traditional Inhabitant members of the PZJA advisory committees recently led community and industry consultations, organised by the TSRA and supported by AFMA, to report on activities related to the PZJA fisheries over the last 12 months and seek input on key issues for the management of the fisheries in the Torres Strait. With regards to the BDM Fishery, Traditional Inhabitant members sought industry and community feedback on the proposed black teatfish trial opening, and the current prohibition on hookah. The key discussions points, feedback and recommendations relevant to the HCWG from the consultations are provided at **Attachment B**.

20. In addition to the attached consultation summary, Traditional Inhabitant members on the HCWG provided the following updates on their respective cluster consultations, strategic issues affecting the management and development of Torres Strait Fisheries and on-water industry updates.

21. The Traditional Inhabitant member for Gudumalulgal led the consultation at Gudumalulgal on 21-14 October 2019 and Kaiwalagal (on behalf of the Traditional Inhabitant member for that cluster) on 21 January 2020 and added that:

- The implementation of the new BDM HS was discussed at the community level and reiterated its value as a tool that will ensure the sustainable management of the resource to build intergenerational wealth.
- Issues relating to the Tropical Rock Lobster and Finfish (re the impacts of the western line closure on the Saibai and Duan communities) Fisheries were also touched on.
- It was recognised that the use of hookah is an issue for the Eastern Nations and would need to be undertaken under Meriam protocols, if the hookah prohibition is removed.
- Fishing has been ok and efforts are being made to encourage other TIB operators to actively participate in the fishery.
- Operators are facing safety risks by traveling long distances with large loads of product and salt or free diving up to 20m for more catch, sometimes in inclement weather. Permitting access to deep water BDM species closer to home (i.e. white teatfish) would alleviate this safety risk and take pressure off the shallow water fishing grounds.
- There is concern that reef walkers may not be adhering to the minimum size limits and may be depleting local resources.
- Reiterated that even within nations one community cannot speak for another with regards to the use of hookah. Harvest for white teatfish using hookah should be permitted on a trial basis to create better income opportunities and as a safer option to how operators are currently fishing for white teatfish in deep waters.

22. The Traditional Inhabitant member for Kemer Kemer Meriam added that:

- The Chinese ban on the live seafood import due to the Coronavirus outbreak has affected the Tropical Rock Lobster industry but not the export of BDM to the Asian market.

- Curryfish catches dropped significantly in the 2019 fishing season as operators on Erub and Masig Islands have been focused on live TRL but efforts may now shift back to sea cucumbers given the Coronavirus impacts.
- There was general lack of support from Ugar for the use of hookah due to sustainability concerns, however, not all on Ugar are opposed the use of hookah.
- Erub supported the recommendations from Mer to use hookah for harvesting white teatfish.
- Industry is pursuing the establishment of processing facilities on Mer.
- It was good to have an AFMA Compliance officer attend the cluster visit and assist with talking to operators about permits and also the catch disposal system to encourage improvement on data collection.

23. The Traditional Inhabitant member for Kemer Kemer Meriam read the summary of consultations for the Kulkalgal cluster on behalf of the Traditional Inhabitant member for that cluster. The Traditional Inhabitant member noted that a lot of the TIB operators' opposition to hookah for white teatfish may also be due to lack of understanding as most fishers on Masig and Poruma Islands have never fished for white teatfish. White teatfish fishing occurs mostly off Mer Island

24. The Traditional Inhabitant member for Kaiwalagal provided the industry update below and deferred to the Traditional Inhabitant member for Gudumalulgal for the update on the cluster consultation as he did not attend the meeting:
    - Coronavirus has affected TRL business. It is a nature of fishing and industry need to weather through it but are positive that the BDM market is still active.
    - He is currently familiarising himself with the ecological and business aspects of the BDM industry with a view to redirecting his effort into the industry, noting that it is currently harder and riskier to target high value BDM species.
25. The Traditional Inhabitant member for Gudumalulgal noted that the interest of operators in this cluster is mainly on TRL due to their distance from the BDM fishing grounds. While willing to listen to BDM and finfish related matters, they indicated they would take advice on the use of hookah from those that actively target the resource.

26. The Traditional Inhabitant member for Maluialgal advised the Working Group that he can only speak on behalf of the fishers that live in his region and not those that live away from the region. He drew the Working Group's attention to the cluster summaries provided, adding that the majority are TRL operators and the eastern grounds are too far away from them to fish. Nevertheless, they were supportive of improved reporting and timely provision of the data to AFMA to inform management.

2.2 Scientific member update

27. The Scientific member advised that he was involved in the stock survey in late 2019 and early 2020 for which he will be presenting the preliminary results under Agenda Item 4. A survey of Warrior Reef was initially included in the project. However, the scientific member was informed during the first leg of the survey that he had been banned from Warrior Reef by Malu Lamar due to a complaint from an Iama Island Traditional Owner regarding an incident that occurred in 2012 – though no formal advice on the grounds for the exclusion has been provided. As it was too late to find a replacement, and given the uncertainty regards the safety of the survey team, the Warrior Reef survey leg was cancelled. The scientific member sought clarity from Working Group members whether they objected to him presenting those results given he was excluded from Warrior Reef.

28. The Traditional Inhabitant member for Gudumalulgal, in his capacity as the Chair of Malu Lamar, advised the Working Group that specific details about the previous incident was not provided when Malu Lamar was called upon to ban the Scientific member from undertaking the Warrior Reef BdM survey. The Chair of Malu Lamar stated the organisation had acted on behalf of the people whose interests it represents to exclude the Scientific Member from the said area to avoid the issue escalating. Malu Lamar is of the view that the issue needs to be resolved by the research team and the CSIRO, AFMA, the Chair of Magani Lagaugal and the relevant individuals from Tudualgal that made the complaint and provide advice back to the Malu Lamar Board. The Malu Lamar Chair and the Malu Lamar Board member Mr Sereako Stephen offered to assist with the resolution of this matter.

29. The AFMA member acknowledged Malu Lamar's position on the matter and commented that it was unfortunate that the Traditional Owner's complaint came in very late and did not provide formal advice on the allegations so that AFMA could better understand the nature of the concerns held by Traditional Owners and as far a possible have them addressed. In the absence of having these concerns raised in detail and in a timely and formal fashion with it, AFMA had no basis on which to formally substantiate and/or investigate the concerns. Having respect for the views of the traditional owners of Iama and Tudu and noting potential safety risks, AFMA and TSRA agreed at the time to discontinue the Sandfish component of the survey. It would not have been appropriate to run the survey with a different group of scientists. CSIRO was commissioned to undertake the research based on an evaluation of their proposal and importantly their demonstrated expertise to deliver such a project. In the absence of formal advice to substantiate the claims, AFMA fully supports the Scientific member and the project team.

30. The concern raised by Traditional Owners was not anticipated by any of the agencies involved as there had been long standing support provided by stakeholders through the HCWG for this research to be undertaken. The HCWG and TSSAC still strongly supported the projectproposal. It was noted that specific to the current research project and prior to the project being funded, comment on the funding proposal was sought from every PBC Chair and relevant fisher association and no concerns or complaints were raised through that consultation process. Concerns were also not raised by traditional owners who attended the PZJA traditional inhabitant member cluster consultation held on Iama on 6 November 2019.

31. The Malu Lamar Chair further commented that matters such as this place Malu Lamar in a difficult position when representing people that operate under two laws and given the angst that still exists amongst individuals regarding past events. He agreed that there needs to be a mechanism and process in place to identify, address and resolve such issues in the future in a timely manner and suggested that a Memorandum of Understanding would provide the framework through which such situations can be mitigated and resolved in the future.

32. The TSRA member reiterated that the TSRA, as the funding body of that project, undertook all formal recognitions and notifications on the scientific activity to communities and relevant bodies. From a process perspective it is very difficult and disempowering to the HCWG for the project to be impacted given the process that was gone through to put the project up on, what seems to be, the view of one individual.

33. Some Traditional Inhabitant members on the Working Group commented that they had not been aware of the issue but understood the need to discontinue the Sandfish component of the

survey due to safety concerns. Following this discussion, the Working Group welcomed the Scientific Member to continue presenting the preliminary survey results.

34. The Chair reiterated that such complaints need to be formalised in writing in a timely fashion in the future as a matter of proper procedure.

2.3 Government updates

2.3.1 AFMA update

35. The Working Group noted the update provided by the AFMA member regarding management issues relevant to Torres Strait hand collectable fisheries as detailed in the Agenda paper, in particular:

    a. The BDM Harvest strategy was adopted by the PZJA at their meeting on 19 November 2019, and came into effect on 1 January 2020 in time for the start of the 2020 fishing season. New TACs for individual and basket species and the conversion ratios were implemented through licence conditions but the old minimum size limits are still in place pending the review of the Fisheries Management Instrument 15 which is currently underway and due to be completed in time for the 2021 fishing season.

    b. The implications for listing commercially fished beche-de-mer species on Appendix II of CITES;

        i. The species may still be traded internationally provided the trade, or a specified level of trade, has been determined to be non-detrimental to the survival of the species in the wild.

        ii. The Department of Agriculture, Water and Environment (formerly the Department of Environment and Energy) is responsible for assessing the sustainability of international trade in Australian species listed on Appendix II and undertakes this assessment based on the information provided to it by the exporting proponent.

        iii. The Commonwealth (AFMA), Queensland, Northern Territory and Western Australia have agreed to support a national approach being funded by the Queensland Sea Cucumber Industry Association (the Association) in seeking a non-detriment finding (NDF) for both black teatfish and white teatfish. Fishwell Consulting has been engaged by the Association to collate all required information for the DoEE's consideration of a non-detriment finding which must be submitted to the Department by early April 2020. AFMA will support the process for the Torres Strait and Coral Sea fisheries.

        iv. Once the take for trade is considered to be sustainable (i.e. a non-detriment finding is approved), trade is generally regulated through permits authorising export of the specimen and exporters will require a permit from the DOEE.

36. The Working Group also noted a range of other AFMA updates relating to:

    a. the latest Fishery Status Reports from the Australian Bureau of Agriculture and Resource Economics (ABARES) were released in September 2019. All BDM species are classified as not being subject to overfishing, with Sandfish being the only species in the Torres Strait that continues to be classified as overfished. The fishing mortality and stock status for two species taken in 2018 remains uncertain mainly due to the lack of more recent survey data

    b. updates on the progression of legislative amendments to the *Torres Strait Fisheries Act 1984* and *Torres Strait Fisheries Regulations 1985*; and

2.3.2 AFMA Compliance update

37. A verbal compliance update was provided by the AFMA Fisheries Officer Mr Lyndon Peddell as follows:

- Current staffing is three Fisheries compliance officers on Thursday Island with further operational support provided from other AFMA officers.
- Adherence with reporting requirements has generally been good. Officers continue to detect and report noncompliance, in most cases these matters have been dealt with through education.
- AFMA has two matters before CDPP for consideration.
- AFMA undertook at sea and aerial surveillance in partnership with Queensland Police based on specific intelligence received on addressing Tropical Rock Lobster stockpiling in the lead up to the TRL fishery opening. Compliance was good and no stockpiling was detected.
- At sea patrols have been conducted with focus on enforcing the hookah closure.
- AFMA is also working with Border Force to utilise their platforms to undertake on-water patrols and surveillance.
- Fisheries Officers have attended some community engagement visits alongside TSRA and Fisheries Management Officers and further assisted community members with compliance related matters.
- Foreign – incursions have been low in the TSPZ, some activity has been detected in the north and Deliverance island areas. No apprehensions have been made but some activities were observed in the calm weather and inclement weather may see this lessen.
- Traditional Inhabitant members requested that they be informed when operators are likely to appear in court so they can be provided with the appropriate legal assistance and representation. Mr Peddell advised that he is not at liberty to discuss details of an ongoing investigation however, each person has the right to engage legal representation.
- Industry members advised that they will be submitting information on illegal fishing activity to AFMA for further investigation.

2.3.3 TSRA Update

38. The Working Group noted the update below provided by the TSRA member:

39. TSRA response to the Corona Virus and impacts on fishers:

- Immediate response has been to offer a loan pause for home and business loan clients affected by the virus
- Coxswain training courses have been put on for fishers that have opted to not continue fishing due to the down turn in the market
- A Seafood trade advisory website has been set up to provide the fishing industry with updates on what is happening at the national level to respond to Coronavirus impacts.
- Considerations include not leasing TSRA held permits to non-traditional fishers to alleviate some of the pressure due to dislocation of effort from one fishery to another.
- Developing a Recovery Action Plan (RAP) to better equip the region to emerge from the impacts
- Working with the State Govt on developing the Grant Guidelines

40. Fisheries Regional Ownership Framework:

- Steering committee continues to work towards the creation of the entity by 1 July
- Summit dates have been locked in for 27 – 29 April at Stadium on TI

41. Warpil – Fishing for our futures

- 60 jobs and 180 trainees over the next two years
- Programme is focussed on the fisheries infrastructure

- Commenced at Erub with Boigu, Saibai and Mer commencing in coming months

42. Torres Strait Marine Safety Programme TSMSP
    - 470 TIB licences
    - 330 to 350 coxswains have been trained
    - 250 TIB fishers traded in fishing
    - 60 TIB vessels currently hold a certificate of operation which is required by AMSA to operate as a commercial fishing vessel. exemption to operate without a coxswain certification expires on 30 June 2020.
    - Industry members noted that recreational operators are opting to get a TIB licence as it is cheaper than getting a recreational one and provides ease of identification and recognition to be able to access areas and this may be inflating the number of actual commercial TIB fishers in the region.

43. Nationally accredited training
    - The TSRA is working with TAFE to develop a Fishing qualification that would be nationally accredited under the AQF

44. TSRA is continuing to work on the enhanced TIB representative model.
    - TSRA wished to acknowledge the work and commitment of the reps
    - All island visits had now been completed with the TIB reps leading the presentation

2.3.4 QDAF Update

45. In the absence of the Fisheries Queensland representative, the Working Group members noted the written update provided on the changes to fishing rules in Queensland that came into effect on 1 September 2019. Of note for the HCWG are the doubling of the recreational boat limit for sea cucumbers and the introduction of no take rules for white teatfish, the requirement for vessel tracking on all commercial vessels and stricter licensing requirements.

2.4 Native Title update

46. The Malu Lamar representative updated the Working Group as follows:

    - Malu Lamar continues to seek full membership status for it and GBK on various fishery advisory groups as the cultural voice of traditional communities and an acknowledgement of Malu Lamar's importance as a stakeholder.
    - With regards to the previous discussion on the outcomes of the cluster consultations, the Malu Lamar representative raised concern that not all TIB operators were represented to contribute to the discussions on the use of hookah to catch white teatfish.

47. The AFMA member acknowledged Malu Lamar's request for membership on the PZJA advisory committees has been a long standing issue. To assist in having Malu lamar's request processed the AFMA member requested that if possible, Malu Lamar formally write to AFMA and in doing so, give guidance on their proposed role on the advisory committees having regard for FMP 1. In particular how Malu Lamar would participate in recommendation making.

48. Malu Lamar welcomed this opportunity and advised that it would seek legal advice on the roles and responsibilities that such membership confers on the organisation and whether a formal Malu Lamar member on a fishery advisory group will be seen to be acting on behalf of the whole of Malu Lamar when it comes to supporting decisions and/or making recommendations.

2.5 PNG National Fisheries Authority update

49. An update was not available due to the unavailability of NFA officers.

3 Catch and effort Summary

50. The Working Group noted the catch summary for the 2019 fishing season for the BDM Fishery provided under Agenda Item 3 and noted the following highlights from the Executive Officer:

- The catch report for the 2019 fishing season has been updated to include more up to date figures as catch disposal recorders have continued to be submitted and entered in the database. As at 18 February 2020, the total reported catch was 36 tonne.
- The summary of changes in key reported metrics from the 2018 to the 2019 fishing seasons has been slightly amended to reflect the significant improvement in the timelines of reporting. Average CDR receipt time in the 2019 season was half that in 2018.
- Species level identification has also improved with no 'unidentified sea cucumbers' reported in 2019.
- Total catch reported has dropped by 46% from 2018, mainly due to the significant drop in curryfish catches. This is consistent with Industry's update that operators known to catch large amounts of curryfish on Darnley and Yorke have shifted their attention to live TRL.
- Catch reports in 2019 have slightly decreased by 7% (20 CDRs)
- Spatial and effort reporting has also improved with 69% of the CDRs submitted reporting the 'Area fished' and 70% reporting the 'Number of days fished'.

51. The AFMA member congratulated industry on their concerted effort within their respective communities to improve reporting in the fishery. AFMA will continue to ascertain the level of participation in the fishery through the number of active licences until such time a more reliable measure is available.

52. The Traditional Inhabitant member for Kemer Kemer Meriam reiterated that reporting by part-time fishers could be improved and noted this as a concern that needs to be addressed. This comment was supported by other industry members and a suggestion was made to find a way to engage part time operators to impress upon them the importance of reporting catch data or come up with a way to limit the amount of catch that they can land without infringing on their right to fish as TIB licence holders.

53. This is also an issue in the TRL fishery and a better approach may be to address the issue across the entire TIB licencing process.

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

54. The Scientific member, 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. Sandfish populations at Warrior Reef were not surveyed as planned due to the banning of a project scientist by the Malu Lamar based on objections raised by Traditional Owners of Iama and Tudu.

55. A total of 297 sites, in 6 zones and a range of strata 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 populations 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 density estimates over time, and estimates of stock size. The results for the Barrier zone are excluded from the comparative density estimates as it was not surveyed every time. It is still used in the stock estimate. The project also carried out detailed sampling of sea cucumbers and habitats on Ugar reefs to support a potential reseeding project there. The

results for the Ugar mapping will be provided once they have been finalised and presented to the community.

56. 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 natural carrying capacity for Black teatfish from a FAO global review. 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.

ii. The preliminary analysis indicates that the virgin population biomass is likely to be at approximately 10/Ha (B_0) for all zones and strata combined, which would place the limit reference level (B_{LIM}) at about 4/Ha (40% B_0). While this is slightly less than the indicative natural carrying capacity for black teatfish of 12.5/Ha, 10/Ha is acceptable for the Torres Strait given the large area of the fishery surveyed, which also includes areas that are not suitable Black teatfish habitat. The 2019/20 survey density estimate was 7.7/Ha, well above the limit reference point.

iii. The 2019/20 density is only slightly less than the 2009 density which was considered to have recovered to close to B_0 levels. Together with the very high density observed in the Barrier zone in 2019/20 (not included in 4 zone average density estimate), this indicates that the black teatfish population is currently in a healthy state.

iv. The fishery biomass for black teatfish was estimated to be 830 t (lower 90th percentile as gutted weight) pending further assessment to finalise the analysis.

b. White teatfish (*Holothuria fuscogilva*)

i. Preliminary analysis of 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 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 90th percentile as gutted weight) for white teatfish in 2019/20 was 668 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. Additional work is required to advise on carrying capacity and the limit reference point for this species

c. Prickly teatfish (*Thelenota ananas*)

i. Preliminary analysis of 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. This trend is concerning and will need to be further investigated through analysis of the size data collected.

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, which likely does not see high levels of fishing.

iv. The preliminary fishery biomass population estimate (lower 90th percentile as gutted weight) for prickly teatfish in 2019/20 is 336 t.

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.

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

i. Preliminary analysis of 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 90th percentile as gutted weight) for common Curryfish in 2019/20 was 509 t. 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.

57. The Scientific Member made a general comment that some deepwater blackfish and redfish species were also observed during the survey.

58. The Scientific member also noted that the reefs in general looks to be in very good condition with high coral cover, minimal to no bleaching and no crown of thorn starfish.

59. The Scientific Member outlined the additional work below that still needs to be carried out to finalise the project as follows:
    - Analyse all data for all species
    - Refine deep water habitat estimates
    - Population modelling

- Analysis outputs suitable for CITES non-detriment
- Habitat analysis (coral, seagrass, CoT, clams)
- Ugar reef mapping for potential re-seeding

60. The Working Group thanked the Scientific member and the rest of the project team for their work on the project to date and for all their effort in making the preliminary results available for the Working Group's consideration so soon after the completion of the last survey.

61. The Working Group further noted that the next project progress update will be provided at the Hand Collectable Working Group's meeting, tentatively in August, with the project due to be completed in December 2020.

5 Future Black teatfish opening

62. The Working Group noted:

    a. that HCWG 15 (1-2 August 2019) recommended a trial opening of black teatfish, contingent on:

        a. the implementation of the beche-de-mer Harvest Strategy and that the strategy has since been agreed by the PZJA (November 2019), and

        b. remaking of the *Fisheries management Instrument No. 15* (FMI No. 15) in 2020. AFMA advised that this process was an ongoing however TAC arrangements for black teatfish could be administered through licence conditions;

    b. outcomes of the HCWG Traditional Inhabitant members community consultations to seek feedback on the proposal to restrict TIB licence holder access to a black teatfish opening through customary protocols and traditional lore (presented under item 2.1);

    c. the preliminary stock survey results for black teatfish from the Torres Strait beche-de-mer species stock survey undertaken in late 2019 (presented under Agenda Item 3);

    d. the overview of catch and effort data for the beche-de-mer fishery during the 2019 season (presented under Agenda Item 4); and

63. The Working Group supported the application the *Torres Strait Bech-de mer Fishery Harvest Strategy November 2019* (the BDM Harvest Strategy) in developing advice on an appropriate TAC and managements arrangements for a future black teatfish opening

Applying the BDM harvest Strategy: Section 2.11.4 Re-opening Decision Rule

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

64. The Scientific member advised that the preliminary outcomes of the recent stock survey (AFMA Project No. 2019/0826) indicate that the black teatfish stock in the TS is very likely above the limit reference point (BLIM) and at a level that can allow the potential opening of the fishery. The Scientific member advised that through further analysis of the survey data, the Working Group will be better placed to advise on upper reference points such as a target reference point within the BDM Harvest Strategy.

65. Noting the preliminary survey outcomes together with: a) outcomes of the 2009 survey, and b) the limited recorded fishing effort on black teatfish since its closure in 2003 (two openings 2014 and 2015) 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).

Condition 2 - Are monitoring and management adequate?

66. The AFMA Member noted that the mandatory fish receiver system that has been in place for the last two years has resulted in substantial improvements in catch and effort reporting. As presented under item 4 the timeliness of reporting along with, species identification and voluntary effort reporting has improved to a relatively high standard.
67. The AFMA member advised that should fishing for black teatfish re-open, the mandatory fish receiver system can be used to require daily reporting of landed catches. Daily reporting would be essential to minimise the risk of over catching the total allowable catch (TAC).

68. The AFMA member further advised that AFMA now having responsibility for domestic compliance is able to undertake targeted compliance activities to support a black teatfish opening.

69. A traditional inhabitant member expressed concern at the catch disposal records being the only source of data for the fishery and would prefer to have had other forms of data inputs to support the re-opening of black teatfish. The AFMA Member advised that the BDM Harvest Strategy is designed to guide management decisions based on available information. This means that management is more precautionary when there is greater uncertainty about the stock and catches. Accordingly a precautionary management approach is recommended to convening a black teatfish opening at this time.

70. Other a traditional inhabitant members advised that Eastern communities had already begun discussions on voluntary measures they would adopt to further reduce the risk of mis-reporting (see detail below under condition 3).

71. The Working Group was supportive of the improvements to reporting and general management of the fishery to date. The Working Group 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. Members noted the harvest strategy recommends that a) if a trial TAC is exceeded by more than 5% then the fishery should be automatically paused for the following year; and b) if data collection during the Trial opening was note conducted satisfactorily, then the fishery should be closed again and the re-opening rule process applied again.

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

Accurate catch and effort reporting is required:

72. 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. AFMA advised that it would make provision for catch disposal records to be submitted electronically (SMS, Email) with hard copies to be forwarded to AFMA through the mail. 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.

73. Traditional inhabitant members advised that fishers in the Eastern communities (Mer, Erub, Ugar and Masig) had commenced discussions about adopting voluntary reporting procedures to further reinforce timely and accurate reporting during a black teatfish opening. For example agreeing to land to a single fish receiver. The Working Group commended industry on taking such initiative. Traditional Inhabitant members however expressed concern that part-time operators or new operators attracted to fish just for black teatfish (the ‘goldrush’ effect) may not adhere to either the daily reporting rules or the additional voluntary measures being developed.
74. The Working Group sought advice from Traditional Inhabitant members on how such agreements could be further developed and agreed by fishers across the region. Traditional Inhabitant members advised that provided the cultural and industry agreements were discussed at the fisher level and didn’t get ‘political’ and fishers from the central and western nations didn’t feel excluded, agreements could be successfully implemented. The Working Group noted advice from the Gudumalulgal Traditional Inhabitant member that the

Gudumalulgal communities had already confirmed that they would respect the culture lore developed by the Meriam people for a black teatfish opening. This includes cultural lore on who can fish where.

75. To assist traditional owners and the BDM industry more broadly to agree on relevant cultural lore and voluntary industry agreements to reinforce timely and accurate catch reporting, the TSRA member offered to fund Malu Lamar to convene a stakeholder workshop. The TSRA member advised that the workshop would be led by Malu Lamar and facilitated by the TSRA in consultation with AFMA.

76. The Working Group welcomed the initiative by Traditional Owners and the industry. The Working Group noted that the proposed initiatives would likely complement the regulatory measures being proposed such as daily reporting.

77. Members noted the importance in future community consultations to continue to emphasise the benefits of improved reporting in ensuring the sustainability of the black teatfish stock for future generations. Improved management and data collection will also inform the development of non-detriment findings (NDF) to allow the continued export of Black and White teatfish once their Appendix II CITES listing comes into effect in August 2020. An NDF for Black and White teatfish would place the Torres Strait BDM Fishery in the unique position of being one of very few fisheries worldwide that is able to export sustainable black and white teatfish.

78. The Working Group also asked that AFMA explore media opportunities such through regional radio to widely communicate the additional management and reporting requirements for a black teatfish re-opening.

Action item 5.1 – 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.

Action item 5.2 – AFMA explore media opportunities such as radio to widely communicate the additional management and reporting requirements for a black teatfish re-opening.

Setting a precautionary trigger limit:

79. 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.

An effective warning system required to alert fishers as catches approach the TAC:

80. AFMA advise 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.

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.

81. The Working Group discussed the need further conditions to support a possible future opening such as;

a. restricting catches to only black teatfish during the opening;
b. imposing trip limits on the amount (number or weight) of black teatfish that can be landed per trip, and/or
c. granting access through a tender process. This would restrict the number of fishers able to fish for black teatfish and generate revenue.

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

Trial fishing dates to coincide with fishing dates for other species to spread the effort:

83. The Working Group noted previous advice from Traditional inhabitant members that future black teatfish openings should coincide with fishing in the Tropical rock lobster (TRL) Fishery. This was to reduce potential management risk of having a 'goldrush' of participants entering the Fishery. However, the Working Group noted that this timing may not be possible for the current year as TRL fishing has slowed down considerably due to the current live import restrictions into China because of Coronavirus.

84. The AFMA member advised that further discussions with industry could take place as part of the proposed Workshop to agree a date for the opening. PZJA agencies would work to get a PZJA decision on having an opening sometime this year prior to the TSRA Board entering caretaker mode late April.

85. With regards to the trial opening dates, 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.

Cultural laws and community agreements:

86. Traditional Inhabitant members reiterated that agreed that 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).

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

87. 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). In making this recommendation, the Working Group discussed whether a larger, but still sustainable, TAC could alleviate some of the risk of the conservative 15 t TAC being overshot as per the 2015 trial opening. One option was to set a 40 t TAC that is a little bit less than the sustainable catch estimate of 5% of the preliminary biomass estimate obtained from the scientific survey. 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 is 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.

Recommendation summary

88. In line with the harvest strategy (section 2.11.4), Working Group recommended a trial fishery reopening for black teatfish subject to a 15 tonne TAC and daily reporting landed catch noting that:

a. based on all available information, including preliminary results from scientific dive surveys in November 2019 and January 2020, that the biomass of black teatfish is likely to be over the limit biomass reference point (BLIM - 40 percent of estimated unfished biomass);

b. monitoring and management arrangements (with daily reporting) are adequate;

   i. a mandatory landed catch reporting system is in place and reporting standards in the BDM Fishery have progressively improved since the system was introduced. This includes voluntary reporting of effort information.

   ii. Fish receivers will be able to submit records to AFMA electronically (SMS, email) during the opening with hard copies to be sent to AFMA in the mail.

   iii. AFMA is now responsible for domestic compliance and is committed to undertake a targeted compliance program to support a future opening.

c. although the preliminary results of the recent scientific survey suggest the stock could sustain a higher TAC, priority was given to ensuring the TAC was demonstrably conservative which is a requirement of the harvest strategy;

The Working Group welcomed the commitment from Malu Lamar, with support from TSRA, to work with fishers to agree voluntary measures to reinforce cultural lore with respect to who can fish where and further ensure accurate daily catch and effort reporting. These arrangements are likely to complement regulatory efforts to reduce the risk of exceeding the TAC.

6 Prohibition of Hookah in the Beche-de-mer Fishery

89. The Working Group noted:
    - that the issue of permitting the use of hookah in the BDM fishery is a long standing issue, with strongly divided views among stakeholders;
    - the views of Torres Strait communities on the use of hookah in the BDM fishery as discussed during PZJA Traditional Inhabitant member cluster consultations (Agenda Item 2.1);
    - that HCWG15 (1-2 August 2019) recommended a discussion paper be developed to explore a longer term strategic approach to using hookah in the BDM fishery.

90. The AFMA member sought the Working Group's agreement on AFMA's proposal to undertake a dedicated, strategic workshop to address the use of hookah in the BDM fishery, which is currently prohibited, in the context of the newly implemented BDM Harvest Strategy. The Workshop would form part of the Future management priorities workshop recommended at the last HCWG meeting.

91. The AFMA member noted some stakeholders have had long held concerns relating to the sustainability and risk of over-exploitation of using the hookah method to collect BDM, some of which have since been mitigated through the implementation of the BDM Harvest strategy and the Fish Receiver System to collect catch data. Outcomes of recent Traditional Inhabitant cluster consultations however indicate that community views on the matter are still varied and stakeholder workshop would enable those views to be better understood and possible management options developed against management objectives and capacity to cost-effectively administer and enforce various options.

92. The Traditional Inhabitant member for Gudumalulgal acknowledged some stakeholders' opposition to fishing with hookah, however, it is important to review the prohibition on hookah in the context of removing barriers to economic opportunities for Torres Strait islander communities. The prohibition on hookah is currently limiting fishing for White teatfish given the species is mostly found in deeper waters and some operators are putting themselves at risk free-diving to depths of up to 30m to fish. He expressed his concern that communities traditionally known to not fish for White teatfish, and are therefore least impacted by this decision, are commenting on behalf of those that rely on the species for their livelihoods. He further reiterated that it is important to consult with full time fishers on their views on the removal of the hookah ban as opposed to those that do not fish on a consistent basis.

93. Other Traditional Inhabitant representatives (MP) agreed/confirmed that some of the stakeholders that expressed their opposition to lifting the hookah ban during the cluster visits do not have much experience working in that fishery and lacked understanding of the hookah fishing method or the impact of the prohibition on the eastern communities that depend on this resource for their livelihoods.

94. The Working Group recommended that this issue be considered in a broader stakeholder workshop and recommended that it form part of the Malu Lamar led workshop process being organised to finalise customary arrangements for the trial opening of black teatfish. This will ensure that there is good representation of communities across the Torres Strait region and provide a good opportunity to:

- share the most recent science on the distribution and status of the white teatfish stock
- address any misinformation that may exist regarding the use of the hookah method
- discuss and perhaps agree on the arrangements that could be implemented through cultural law to complement the regulatory ones in progressing the review of the hookah prohibition.
- discuss possible options for lifting and/or amending the hookah prohibition. The Working Group noted, a number of communities support the use of hookah only for white teatfish and not other species. The Working Group also noted a suggestion from one traditional inhabitant member that a trial be undertaken to test the ability of traditional inhabitant fishers to take the catch using hookah.
- develop strategies to mitigate any of the unintended risks that may arise as a result of lifting the hookah ban.

95. AFMA advised that it would support the strategic stakeholder workshop by providing advice on the administrative and compliance capabilities that currently exist to oversee and manage possible changes to the hookah prohibition.

96. The Working Group reiterated that the perception of conflict of interest needs to be addressed during this process and that all stakeholders across
97. the region is afforded procedural fairness by having an opportunity to present their views.

Action item 6.1 – Malu Lamar to discuss the review of the hookah prohibition at the stakeholder workshop with a view to developing management recommendations.

7 Research

98. The Working Group discussed the research pre-proposal submitted by Nicole Murphy, CSIRO, on 'Determining weight conversion ratios for curryfish species *Stichopus herrmanni* and *S. vastus*', with a view to providing advice for the TSSAC's consideration at its March 2020 meeting. In considering the research application, the Working Group noted that the research application directly addresses a research priority in the Hand Collectable Fisheries Five Year Research Plan. That is to develop weight conversion ratios for the various process forms for curryfish.

99. The Working Group supported the pre-proposal progressing to a full application noting that the proposal:
    - addresses an identified research priority. Having species specific weight conversion ratios will improve the accuracy of total catch data for the fishery. Species specific weight conversion rations would replace the conservative default conversion ratios currently used;
    - is value for money and seeks to engage two Traditional Owners to assist with data collection to provide an understanding of local conditions and processes.

- Broader consultation with traditional owners on the full application will be undertaken through the TSSAC application process.

8 Pearl Shell and trochus fisheries

100. The Working Group noted the update from AFMA on reported fishing activity and licence numbers in the Pearl and Trochus Fisheries as detailed in the agenda paper. No commercial catches have been reported to AFMA through the Fish Receiver System during 2019 with limited activity reported in the Pearl Shell Fishery reported since 1 Dec 2017.

9 Other Business

101. Prompted by concern from a Traditional Inhabitant member that there is insufficient ongoing research in the BDM Fishery, the Working Group discussed strategic research planning for the Fishery. The Traditional Inhabitant member noted that BDM Fishery has the potential for high returns (BDM is sold the capital cities for $350/kg) but there is no ongoing research investment to maintain and expand our understanding of BDM Stocks. The member sought advice on whether the HCWG should recommend more research into the Fishery.

102. The Scientific member advise that the TS BDM Fishery would always be a small fishery compared to the Tropical Rock Lobster Fishery with moderate returns to fishers. The Scientific member agreed however that there are important research areas that need to be addressed for example, where the fishery wants to go, getting better certainty on stocks such as sandfish, understanding the potential for reseeding and how best to maximise value through optimum utilisation of the resource and value adding. The Scientific member noted that further development of a strategic research plan that focuses on maximising the return of benefits to Traditional Inhabitants across Torres Strait Fisheries overall (this is different to trying to maximise the benefits from each fishery) is needed when funding is constrained.

103. The AFMA member advised that AFMA's annual Torres Strait research commitment is around 400k and is part of AFMA's broader government budget which is constrained. In other Commonwealth fisheries, AFMA recovers most research costs from industry. As further investment into the growth of Torres Strait fisheries continues through TSRA's significant investment in fisheries infrastructure and training, the gap in research needed to support fishery expansion and AFMA's funding is likely to grow, highlighting the challenge to attract additional funding outside of AFMA.

104. The TSRA member highlighted the commitment from the Minister for Indigenous Australian's to increase economic and employment opportunities in the region and that this may be an avenue through which some of the research gaps can be addressed.

10 Date and venue for next meeting

105. The HCWG noted the tentative date for the next HCWG is week beginning 3 August to consider the final draft outcomes of the black teatfish survey.

106. The Chair thanked members for their contributions and professional conduct throughout the meeting. The Chair recognised the significance of matters being deliberating by the HCWG on

fisher's livelihoods. The Chair noted the need to have HCWG advice to the PZJA before the TSRA board enters caretaker mode to ensure consideration of a black teatfish opening later this year can be made. The Chair encouraged timely collaboration between Malu Lamar, stakeholders, TSRA and AFMA to ensure the proposed stakeholder workshop is undertaken as soon as possible noting the likely importance of community measures to supporting a successful opening.

107. The Chair again thanked TSRA for convening the cultural awareness training and thanked members for their full participation. Member were to complete the training feedback form for TSRA.

108. Mr Sereako Stephen closed the meeting with a prayer.

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

#	Meeting	Action item	Responsibility	Status
1	HCWG 9 (20-21 June 2016)	AFMA to review the size limits set for the Torres Strait Beche-de-mer Fishery taking into consideration the size limits in place in Queensland and the Commonwealth Coral Sea Fishery.	AFMA	**Complete.** The PZJA agreed to the final Beche-de-mer Harvest Strategy at their meeting on 19 November 2019 which was formally implemented on 1 January 2020. Changes to minimum size limits will not be implemented until the remaking of *Fisheries Management Instrument No. 15* is complete.
2	HCWG 11 (27 June 2017)	Consideration on whether or not changes should be made to the current size limit for Prickly Redfish be undertaken during the Harvest Strategy Workshop noting relevant data will be presented.	AFMA	**Complete.** The PZJA agreed to the final Beche-de-mer Harvest Strategy at their meeting on 19 November 2019 which was formally implemented on 1 January 2020. Changes to minimum size limits will not be implemented until the remaking of *Fisheries Management Instrument No. 15* is complete.
3	Out of Session (July 2018)	The TSRA to assist TIB licence holders to develop a proposal to lift the hookah ban when fishing for white teatfish, to be put up to the PZJA for consideration.	TSRA	**Ongoing (replaced with Action Item 6, below).** 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 will be discussed under **Agenda Item 5.**
4	HCWG 14 (24 October 2018)	Malu Lamar, AFMA and TSRA to meet and discuss a way forward in terms of an MOU/combined strategy to assist in improved data collection and proposed management arrangements in support of a black teatfish opening.	Malu Lamar AFMA TSRA	**Ongoing.** AFMA suggests removing this item from the list of actions. 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. Having regard to clear HCWG advice at this meeting, AFMA will meet with communities to discuss black teatfish arrangements including reporting requirements.
5	HCWG 15 (1-2 August 2019)	Dr Eva Plaganyi to circulate information about upcoming scientific conferences that could serve as opportunities to showcase the Torres Strait BDM HS as a good news story.	Dr Eva Plaganyi	**Complete.** AFMA circulated information on upcoming scientific conferences on behalf of Dr Plaganyi via email on 5 August 2019.

#	Meeting	Action item	Responsibility	Status
6	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	**Ongoing (linked with Action Item 3, above).** 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 will be discussed under **Agenda Item 2.1.** Noting key issues to be discussed under **Agenda Item 6**, AFMA is recommending this action be discussed in more detail at the planned future management priorities workshop.
7	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	**Ongoing.** AFMA was unable to arrange the workshop in conjunction with HCWG16 as the focus of this meeting is to seek firm advice on black teatfish for a 2020 opening. AFMA is still committed to arranging a half day workshop to discuss future management priorities for Torres Strait Hand Collectable Fisheries. A time and date for the workshop is to be discussed under **Agenda Item 10**.
8	HCWG 15 (1-2 August 2019)	AFMA to populate the Hand Collectable Fisheries Five Year Research Plan based on HCWG discussions and circulate back to HCWG members out of session for comment before submitting to the TSSAC for their consideration.	AFMA	**Complete.** AFMA circulated a revised Five Year Research Plan to Working Group members' out-of-session for comment on 16 September 2019. A summary of all comments provided by members out of session was then circulated to members via email on 9 October 2019. The updated Research Plan with incorporated member comments was considered by the TSSAC at their teleconference meeting on 25 November 2019. An update on the TSSAC outcomes will be provided under **Agenda Item 7**.
9	HCWG 15 (1-2 August 2019)	AFMA to investigate the possibility of a HCWG industry member accompanying AFMA staff to the next Queensland Sea Cucumber Fishery Working Group meeting.	AFMA	**Complete.** There has been one Queensland Sea Cucumber Fishery Working Group meeting held since HCWG15 however PZJA Traditional Inhabitants were not permitted to attend. AFMA will continue to liaise with Fisheries Queensland about future Sea Cucumber Fishery Working Group meetings and possible HCWG Traditional Inhabitant member attendance.

Attachment A – Adopted Agenda

16th MEETING OF THE PZJA TORRES STRAIT HAND COLLECTABLES WORKING GROUP

Friday 21 February 2020 (8:30 am – 5:00 pm)

TSRA Boardroom, Thursday Island

DRAFT AGENDA v2

The meeting will open at 8:30 am on Friday 21 February 2020.

AGENDA ITEM 1 PRELIMINARIES

1.1 Acknowledgement of Traditional Owners, welcome and apologies

The Chair will welcome HCWG members and observers to the 16th Torres Strait Hand Collectables Working Group.

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 and observers 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

2.1 Industry members

Industry members and observers will be invited to provide an update on matters relevant to Torres Strait Hand Collectable fisheries, including a report from PZJA Traditional Inhabitant members on their recent cluster consultation meetings.

2.2 Scientific members

Scientific members and observers will be invited to provide an update on matters relevant to Torres Strait Hand Collectable fisheries.

2.3 Government Agencies

The Working Group will note updates from AFMA, TSRA and Fisheries Queensland on matters relevant to Torres Strait Hand Collectable fisheries.

2.4 PNG National Fisheries Authority

The Working Group will note an update from the PNG National Fisheries Authority.

2.5 Native Title

The Working Group will note a verbal update from the Malu Lamar (Torres Strait Islander) Corporation RNTBC.

AGENDA ITEM 3 CATCH AND EFFORT SUMMARY

The Working Group is invited to note a summary of reported catch in the Beche-de-mer Fishery for the 2019 fishing season.

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

The Working Group will consider the preliminary results of eastern Torres Strait stock survey of Beche-de-mer species that took place in (TBC).

AGENDA ITEM 5 FUTURE BLACK TEATFISH OPENING

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.

AGENDA ITEM 6 PROHIBITION ON HOOKAH

The Working Group is invited to consider the outcomes of the PZJA Traditional Inhabitant member cluster consultations and provide advice on a strategic approach to pursuing the development of a proposal to remove the prohibition on hookah in the Beche-de-mer fishery.

AGENDA ITEM 7 RESEARCH

The Working Group is invited to note an update on the current TSSAC research funding cycle for 2020-21.

AGENDA ITEM 8 PEARL SHELL AND TROCHUS FISHERIES

The Working Group is invited to note an update on activities in the Torres Strait Pearl Shell and Trochus fisheries.

AGENDA ITEM 9 OTHER BUSINESS

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

AGENDA ITEM 10 DATE AND VENUE FOR NEXT MEETING

The Working Group will be invited to discuss a suitable date for the next meeting.

The Chair must approve the attendance of all observers at the meeting. Individuals wishing to attend the meeting as an observer must contact AFMA (fisheriesTI@afma.gov.au).

Attachment B – PZJA Traditional Inhabitant Members Cluster Consultations 2019-20

Attached separately.

Summary of Actions Arising from HCWG16

#	Action item	Responsibility
Action item 1.1	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
Action item 5.1	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
Action item 5.2	AFMA explore media opportunities such as radio to widely communicate the additional management and reporting requirements for a black teatfish re-opening.	AFMA
Action item 6.1	Malu Lamar to discuss the review of the hookah prohibition at the stakeholder workshop with a view to developing management recommendations.	Malu Lamar

Summary of HCWG16 Meeting Recommendations

#	Recommendation
1	In line with the harvest strategy (section 2.11.4), Working Group recommended a trial fishery reopening for black teatfish subject to a 15 tonne TAC and daily reporting landed catch noting that: a. based on all available information, including preliminary results from scientific dive surveys in November 2019 and January 2020, that the biomass of black teatfish is likely to be over the limit biomass reference point (BLIM - 40 percent of estimated unfished biomass); b. monitoring and management arrangements (with daily reporting) are adequate; i. a mandatory landed catch reporting system is in place and reporting standards in the BDM Fishery have progressively improved since the system was introduced. This includes voluntary reporting of effort information. ii. Fish receivers will be able to submit records to AFMA electronically (SMS, email) during the opening with hard copies to be sent to AFMA in the mail. iii. AFMA is now responsible for domestic compliance and is committed to undertake a targeted compliance program to support a future opening. c. although the preliminary results of the recent scientific survey suggest the stock could sustain a higher TAC, priority was given to ensuring the TAC was demonstrably conservative which is a requirement of the harvest strategy.
2	The Working Group recommended that this issue [prohibition on hookah] be considered in a broader stakeholder workshop and recommended that it form part of the Malu Lamar led workshop process being organised to finalise customary arrangements for the trial opening of black teatfish.

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
PRELIMINARIES **Out of session correspondence**	**Agenda Item 1.5** **For NOTING**

RECOMMENDATIONS

1. That the Working Group **NOTE** the correspondence circulated out of session since the last meeting held on 21 February 2020.

BACKGROUND

2. The following correspondence was circulated out of session since HCWG16 held on 21 February 2020. Copies of this correspondence can be requested at any time from the HCWG Executive Officer.

Date	Item
4 March 2020	AFMA circulated the draft meeting record for HCWG16 held on 21 February 2020, seeking comments from members.
11 March 2020	AFMA sent a reminder to members regarding the provisions of comments on the draft meeting record for HCWG16 held on 21 February 2020. The comment period was open until 18 March 2020. AFMA circulated, for the information of the HCWG, the initial milestone report for the TSSAC project "Climate variability and change relevant to key fisheries resources in the Torres Strait".
3 April 2020	AFMA circulated the final meeting record of HCWG16.
17 April 2020	AFMA sent an email confirmation for an urgent 17th meeting of the HCWG on 21 April 2020. The purpose of the meeting was to consider the proposed re-opening of the Black teatfish fishery in the COVID-19 emergency related circumstances and a request received to increase the Trial TAC with a view to providing a recommendation for the PZJA's consideration at its meeting of 23 April 2020.
20 April 2020	AFMA sent an email advising members that the urgent 17th meeting of the HCWG was being postponed on the TSRA's request, to allow for the consideration of a more complete CSIRO report on the stock status of Black teatfish in setting a Trial TAC and opening the species for fishing again. As well as to allow the TSRA time to consider options for filling the vacant on the Working Group for a Traditional Inhabitant member for Maluialgal, following Frank Loban's resignation in February.
12 June 2020	AFMA updated members on the key information items for the Torres Strait Beche-de-mer Fishery including: • Fishwell Consulting submitted their report *Information to inform non-detriment findings of Australian fisheries for Black Teatfish and White Teatfish* to the Department of Agriculture, Water and the Environment on 14 May 2020 to inform the non-detriment

	finding assessment for black and white teatfish as part of the CITES Appendix II Listing process. • The postponement of the Curryfish conversion ratio project as CSIRO's workplan and priorities have been directed to other projects due to the COVID emergency
26 June 2020	AFMA emailed all HCWG members seeking availability for a meeting proposed to be held on during the week starting 3 August.
6 July 2020	AFMA emailed all HCWG members proposing 5 August as the meeting date for HCWG17 and seeking comments on the attached draft agenda by 10 July 2020.
15 July 2020	AFMA emailed all HCWG members confirming that the HCWG17 meeting had been moved to 7 August to accommodate the Malu Lamar BDM workshop that was proposed for 4-5 August. A draft agenda was included.
17 July 2020	AFMA emailed members an out-of-session paper seeking their comments and advice on the remaking of the following legislative instruments: a. *Torres Strait Fisheries Logbook Instrument 2015;* and b. *Torres Strait Fisheries Management Instrument No. 7 (Pearl Shell Fishery)* (FMI 7)
20 July 2020	AFMA sent a further email to members seeking their comments and advice on the remaking of *Fisheries Management Instrument No. 6* (FMI 6)
24 July 2020	AFMA circulated the meeting papers for HCWG17, noting that some attachments were still pending.

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
WORKING GROUP UPDATES	Agenda Item 2.1 – 2.4 For NOTING

RECOMMENDATIONS

1. That the Working Group:
   a. **NOTE** any verbal updates provided by members and observers;
   b. **NOTE** that a written Australian Fisheries Management Authority (AFMA) Management update is provided separately under Agenda item 2.2.1.

BACKGROUND

2. Verbal reports will be sought from the following Working Group members and observers under this item:

Agenda Item 2.1 **Industry member updates**

Agenda Item 2.2 **Scientific member updates**

Agenda Item 2.3 **Government Agency updates**

2.2.2 AFMA Compliance

2.2.3 Torres Strait Regional Authority (TSRA)

2.2.4 Queensland Department of Agriculture and Fisheries

Agenda Item 2.3 **Native Title updates**

Agenda Item 2.4 **Papua New Guinea National Fisheries Authority update (**subject to the availability of NFA officers)

3. It is important that the Working Group develops a common understanding of any relevant matters within adjacent jurisdictions and what issues if any, are having the greatest impact on industry and the management of fisheries. Such understanding will ensure proceedings of the Working Group are focused and may more effectively address each issue.

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
WORKING GROUP UPDATES AFMA update (Management)	Agenda Item 2.2.1 FOR NOTING

RECOMMENDATIONS

1. That the Working Group **NOTE** the updates provided by AFMA 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.

KEY ISSUES - Status of non-detriment finding assessment

2. The Commonwealth (AFMA), Queensland, Northern Territory and Western Australia have agreed to support a national approach being funded by the Queensland Sea Cucumber Industry Association (the Association) in seeking a non-detriment finding (NDF) for both black teatfish and white teatfish. Fishwell Consulting was engaged by the Association to collate all required information for the DAWE's consideration of a non-detriment finding (NDF).
3. Once the take for trade is considered to be sustainable (i.e. a positive non-detriment finding), trade is generally regulated through permits issued to exporters by the DAWE authorising export of the species.
4. Fishwell Consulting submitted their report *Information to inform non-detriment findings of Australian fisheries for Black Teatfish and White Teatfish* to the DAWE on 14 May 2020 and a copy of the submission is provided as **Attachment 2.2.1a**.
5. The Department's Wildlife Trade Assessments and Regulations teams is undertaking an assessment of NDF against CITES requirements to determine whether the two species can continue to be exported, including any maximum limits on the tonnage that can be exported that may be applied as conditions of the Fishery's WTO accreditation.
6. AFMA supported the process for the Torres Strait Beche-de-mer and Coral Sea fisheries and expects to be advised of the outcome of the NDF assessment and any additional conditions that may be applied to the WTO in early-mid August 2020.

BACKGROUND – The listing

7. On 25 August 2019, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Conference of the Parties (CoP18) agreed to adopt the proposal to list teatfish black teatfish *H. (Microthele) nobilis*, *H. (Microthele) whitmaei*)) and white teatfish (*Holothuria (Microthele) fuscogilva*, under CITES Appendix II.
8. Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation incompatible with their survival.
9. The proposal, put forward by Seychelles, was adopted with a 12 month implementation delay, meaning the listing will come into effect on 28 August 2020.
10. Species listed on Appendix II of CITES may still be traded internationally provided the trade, or a specified level of trade, has been determined to be non-detrimental to the survival of the species in the wild.

11. The Department of Agriculture, Water and the Environment (DAWE) is responsible for assessing the sustainability of international trade in Australian species listed on Appendix II and undertakes this assessment based on the information provided to it by the exporting proponent.

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
WORKING GROUP UPDATES Catch and Effort Summary	Agenda Item 3 For NOTING

RECOMMENDATIONS

1. That the Working Group **NOTE** the high level report on catch and effort for the 2020 fishing season to date.

BACKGROUND

2. As at 24 July 2020, a bit over 14 tonnes of beche-de-mer (BDM) had been reported as being caught across 14 different species in the BDM Fishery in the 2020 fishing season to date. This includes:
    a. ~10 tonnes of prickly redfish;
    b. 1.1 tonnes of hairy blackfish; and
    c. 1.4 tonnes of basket species.
3. A total of 20 different licenced TIB fishers have landed BDM to a total of eight different licenced fish receivers.
4. A high level AFMA Catchwatch summary is provided as **Attachment 3a** 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.
5. The overview of reported catch and effort for the 2019 fishing season that was considered by the Working Group at their 21 February meeting is also provided as **Attachment 3b**.

Australian Government
Australian Fisheries Management Authority

AFMA CATCHWATCH

A REPORT FROM THE AUSTRALIAN FISHERIES MANAGEMENT AUTHORITY

Notice issued on 24 July 2020

Torres Strait Beche-de-mer Fishery - 2020 Season (1 January 2020 – 31 December 2020)

Species Name	Total Allowable Catch (kg)	Reported Catch (kg) ^	% Total Allowable Catch Caught
Prickly redfish	15,000	9,959.52	66.40%
White teatfish ^	15,000	-	-
Deepwater redfish ^	5,000	-	-
Hairy blackfish	5,000	1,120.16	22.40%
Greenfish ^	40,000	-	-
Curryfish species ^	60,000	-	-
Burrowing blackfish	50,000	1,372.85	2.75%
Brown sandfish			
Deepwater blackfish			
Golden sandfish			
Leopardfish			
Lollyfish			
Grand Total	**190,000**	**14,151.55**	**7.45%**

^ Under AFMA's Information Disclosure Policy, information on reported catch by species cannot be provided at this time to protect the confidentiality of individual operators.
Reported catches are calculated based on catch reported through TDB02 Catch Disposal Records and does not include any unreported catches. All reported catch is converted to wet weight gutted using CSIRO recommended conversion factors. For details on conversion factors for each species please contact AFMA.

2019 SEASON BECHE-DE-MER DATA SUMMARY	Attachment 3b

KEY ISSUES

Beche-de-mer Catch Data

1. As at 18 February 2020, a total of 36 tonnes of beche-de-mer had been reported across 14 different species in the BDM Fishery in the 2019 fishing season.
2. This is a significant reduction (44%) in reported catches from the 2018 fishing season which reported 64.3 tonnes of beche-de-mer.
3. Curryfish was the most caught species, with 13.5 tonnes, followed by prickly redfish (11.8 tonnes), lollyfish (3.9 tonnes) and blackfish (3.7 tonnes).
4. This is a noticeable change in targeted species since 2018, where leopardfish and white teatfish were the two most commonly caught species after curryfish and prickly redfish. A summary of catch by species is provided in **Table 1**.
5. 2019 season catches were reported across 239 Catch Disposal Records (CDRs), from 17 fish receivers and 40 licenced TIB fishers. As summary of licences in the BDM fishery is outlined in **Table 2**.
6. Key improvements to the reported CDR data include:
    a. Species level identification of sea cucumbers with 8% of reported curryfish (13.5 tonnes) were reported as common curryfish (*Stichopus herrmanni*); 2% of curryfish was reported as curryfish vastus (*Stichopus vastus*); and 90% of curryfish was reported as the mixed curryfish basket;
    b. no ‘unidentified sea cucumbers’; and
    c. no reports of prohibited species.

Voluntary Section

Catch by Area

7. Of the 239 CDRs submitted with 2019 season catches, 69% of records (165 CDRs) reported the ‘Area Fished’.
8. By volume of catch, 79% of the total BDM catch was reported as being caught from Areas 11 (Warrior), 12 (Warraber), 14 (Great North East Channel), 16 (Darnley), 17 (Cumberland), 18 (Seven Reefs) or 19 (Don Cay).
9. 21% of the total catch did not include data on ‘Area Fished’.

Catch by trip length (number of days fished)

10. 70% of records (167 CDRs) reported the ‘Number of Days Fished’, which accounted for 88% of the total reported catch volume.
11. Reported trip lengths ranged from 1-21 days, however 37% of the total reported catch was reported on single day trips only.
12. The average reported catch for a single day’s fishing was 114kg.

Number of People Fishing

13. 71% of records (169 CDRs) reported ‘Number of fishers’; with the majority of records (64%) indicating that 4 or less people were fishing on that trip. More specifically, the

majority of catch (14.5 tonnes, or 42% of the total) was reported to have been caught in dinghys with 3 people.

14. A total of 40 different licenced TIB fishers landed catch of Beche-de-mer in 2019. 13 of the same TIB fishers fished in both 2018 and 2019. A total of 25 'new' TIB fishers fished for BDM in 2019 compared with last season, while 19 different fishers who fished in 2018 did not fish in 2019.
15. All reported BDM catch was landed to and reported by 17 different licenced fish receivers in 2019.
16. Ten of these receivers consistently received catch over the past two seasons (since the introduction of the FRS), with an additional 7 'new' fish receivers in 2019.

Processed State

17. BDM catch was reported in 11 different processed states including; boiled, boiled and chilled, boiled and frozen, boiled and salted, chilled, frozen and green, live, salted, salted and frozen, whole weight, and damaged.
18. 33% of total reported catches were recorded as 'boiled and salted', 25% as 'salted' and 22% as 'frozen and green'.
19. There have been significant improvements in the number of CDRs and fishers voluntarily reported damaged product separately.

Timeliness of data submission

20. In the 2019 season, 75% of CDRs were received by AFMA within 24 days. 24 days accounts for the maximum 3 day limited to send the white copy CDR to AFMA after the product is weighed, plus a conservative estimate of time (21 days) needed for CDRs to reach AFMA in the post.
21. This is a considerable improvement on the 2018 fishing season where only 49% of CDRs were considered to have been received 'on time'.
22. The average time between the reported date landed and the date the CDR was received by AFMA has reduced substantially from 52 days in 2018, to 26 days in 2019.
23. A summary of key reporting metrics and status from 2018 and 2019 are summarised in **Table 2. Number of licences in the Beche-de-mer Fishery as at** 7 February 2020.

Number of TIB licences with BDM fishery entries	Number of TVH licences	Fish Receiver licences
168	1 licence held in trust by the TSRA	78

24. Table 3 below.

Table 1. Breakdown of reported BDM catch[1] by species since 2005.

Common name	TAC (t)	2005	2007	2010	2011	2012	2013	2014	2015	2016	2017[2]	2018[3]	2019
Black teatfish	0 (15[4])				75	2,001	138	16,624	23,303				
Prickly redfish	15 (20[5])	5,564	128	146	11,056	1,255	5,888	9,173	28,110	11,211	12,185	14,741	11,765
Sandfish	0			5	31	2,152	26	6				18	
Surf Redfish	0	734					52	1			747		
White teatfish	15	186			3,179	13,924	12,633	16,341	4,200	990		1,774	1,556
Blackfish	80 basket		128		507	73	216	1,960	3,596	1,098	11,118	1,368	3,475
Burrowing blackfish													3
Curryfish – mixed					1,118				6,099	1,085	597	42,392	12,212
Curryfish common													1,093
Curryfish vastus													215
Deepwater redfish				7			5,024	4,229	5,546		160	172	50
Elephant trunkfish					4	28	2		133			190	
Golden sandfish							52	351	55			8	32
Greenfish							1	1	14		63	1,013	271
Stonefish				459							6		
Leopardfish											6,876	2,322	958
Brown sandfish												30	204
Lollyfish													3,997
Unidentified BDM												67	
'Basket total'		**186**	**256**	**466**	**1,629**	**101**	**5,295**	**6,541**	**15,443**	**2,183**	**19,831**	**47,761**	**22,686**
GRAND TOTAL		**6,484**	**256**	**617**	**15,970**	**18,803**	**24,032**	**48,686**	**71,056**	**14,384**	**32,764**	**64,300**	**36,006**

[1] No catch reported in 2006, 2008, 2009
[2] Catch data for 2017 is converted weights where processed form is known (47kg unknown), based on catch reported through tax invoices, HC01, TDB01 and TBD02. Verification was conducted to remove possible duplicates between records.
[3] Data is reported through TDB02 Catch Disposal Records only and converted to wet weight gutted using CSIRO recommended conversion factors.
[4] The 15t TAC was available during 2014 and 2015 only
[5] The 20t TAC was available until the end of 2017.
Yellow highlighted cells indicate an exceeded TAC

Table 2. Number of licences in the Beche-de-mer Fishery as at 7 February 2020.

Number of TIB licences with BDM fishery entries	Number of TVH licences	Fish Receiver licences
168	1 licence held in trust by the TSRA	78

Table 3. Summary of changes in key reporting metrics from 2018 to 2019.

Metric	2018	2019	Change
Number of CDRs submitted	258	239	↓
Total catch reported	64.3 tonnes	36 tonnes	↓ (44%)
No. of species reported	14	14	n/a
% of CDRs reporting Area Fished	84%	69%	↓
% of CDRs reporting Number of Days Fished	77%	70%	↓
% of CDRs reporting Number of Fishers	96%	71%	↓
% of CDRs received by AFMA within 24 days	57%	75%	↑
Average CDR receipt time	52 days	26 days	↓
Number of licenced TIB fishers reporting BDM	34	40	↑
Number of licenced Fish Receivers reporting BDM	13	17	↑

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
Preliminary results of the Torres Strait Beche-de-mer Stock Survey	**Agenda Item 4** **For DISCUSSION & ADVICE**

RECOMMENDATIONS

1. That the Working Group **DISCUSS** and **PROVIDE ADVICE**:

    a. on the preliminary results of the eastern Torres Strait Beche-de-mer stock survey to be presented by the Project Team; and

    b. whether the preliminary results raise any significant management concerns that should be addressed ahead of the 2021 fishing season which commences on 1 January 2021, noting the final report which will include comprehensive interpretation of the results is not due before 15 December 2020.

KEY ISSUES

2. CSIRO conducted underwater dive surveys of beche-de-mer species between 25 November - 5 December 2019, and 10 – 23 January 2020, as part of the project '*Stock survey of Torres Strait Beche-de-mer species'*, (AFMA Project No. 2019/0826), led by CSIRO and funded by the TSRA. The surveys examined:

    a. the eastern Torres Strait fishery with the focus on prickly redfish, curryfish species, black teatfish and surf redfish;

    b. a limited exploration of deep water habitats to extend our knowledge of the full extent of the white teatfish resource in east Torres Strait, and

    c. additional opportunistic habitat surveys of Ugar Island to support a related project involving Traditional Inhabitant Fishers from Ugar and CSIRO researcher Leo Dutra, for the enhancement of beche-de-mer stocks; and

    d. additional habitat surveys of Ugar Island and deep water surveys of white teatfish stocks.

3. To support the HCWG consideration of options for having a black teatfish opening, the Project team, agreed to provide an overview of the preliminary results of the survey to the HCWG meeting on 21 February 2020. This was not a contracted milestone for the project nor a pre-requisite of the HCWG15's (1-2 August 2019) recommendation for the PZJA to consider opening the black teatfish fishery on 1 February 2020. AFMA wishes to acknowledge the additional reporting provided by the Project team.

4. CSIRO has now submitted its milestone report on the preliminary results of the stock survey of sea cucumbers in East Torres Strait (**Attachment 4a – Draft Milestone Report)**) and the results of the Ugar Island sea cucumber survey (**Attachment 4b – Draft Field Survey and results**). These will be presented by the Project team at the meeting.

5. A further report is being prepared by the Project Team focused on the results for black teatfish. This will be provided to members as soon as it is available (**Attachment 4c**).

6. The Working Group is being asked to consider this information and have regard for it when discussing a future reopening of black teatfish and, where relevant, future management priorities.

7. Importantly the Working Group should note that the results remain preliminary with further detailed work to be undertaken by the Project team on the interpretation of the results (see

key deliverables listed below). This further work will be central to guiding advice on potential management responses and future priorities. Noting however that the final report is not due until 15 December 2020 and the 2021 fishing season commences on 1 January 2021, it is prudent, following consideration of the preliminary results, for the HCWG to consider whether there are any critical issues that should be addressed in time for the 2021 fishing season. A further HCWG meeting could be convened later this year to support further consideration of any issues.

BACKGROUND

8. In June 2019, the Torres Strait Scientific Advisory Committee (TSSAC) agreed to endorse the research proposal to undertake a stock survey of Torres Strait beche-de-mer species. The last surveys on east Torres Strait was undertaken in 2009.
9. The project addresses an essential priority in the fishery's Five Year Research Plan which was originally identified by HCWG14 at their meeting on 24 October 2018 on Erub originally aimed at understanding the stock status of sandfish at Warrior Reef.
10. Due to objections raised by Traditional Owners of Iama and Tudu against a particular CSIRO scientist participating in the sandfish Warrior Reef survey, this segment of the survey was not carried out and survey effort was reallocated to eastern areas of the survey. As such, the survey results do not address sandfish abundance on Warrior Reef which has been a longstanding research priority.
11. Dr Nicole Murphy from CSIRO is the Principle Investigator on the project with both Dr Tim Skewes and Dr Eva Plaganyi as co-investigators.
12. The key deliverables from the survey are to:
    a. Produce stock size estimates and distribution data, and assess the fishery status for each population of beche-de-mer in Torres Strait, including the sandfish fishery.
    b. Use survey data to make recommendations on potential fishery expansion (e.g. TACs) and re-opening of closes fisheries.
    c. Map important habitant variables, especially those relevant to fishery production.
    d. Make survey outputs available in a form suitable for us in the Beche-de-mer Harvest Strategy for Torres Strait.
    e. Production of formal final reports and a plain English summary document with special consideration of Traditional Knowledge.
13. A copy of the full research proposal is provided at **Attachment 4d**.
14. The project is funded across the 2019/20 and 2020/21 financial years by the Torres Strait Regional Authority.

Australia's National
Science Agency

Stock survey of sea cucumbers in East Torres Strait

Milestone report – Preliminary results

Nicole Murphy, Eva Plaganyi, Steven Edgar, Kinam Salee and Tim Skewes

July 2020

AFMA Project 2019/0826

Multi-Use Ecosystems

OCEANS & ATMOSPHERE

Citation

Murphy NE, Plaganyi E, Edgar S, Salee K, Skewes T (2020) Stock survey of sea cucumbers in East Torres Strait. Milestone report. July 2020. CSIRO, Australia. 85 pp.

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Figures

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Acknowledgements

This project is funded by Torres Strait Regional Authority (TSRA), the Australian Fisheries Management Authority (AFMA) and The Commonwealth Scientific and Industrial Research Organisation (CSIRO).

Underwater video cameras were kindly provided for use by TSRA.

We would like to thank the Captain and crew of the MV Wild Blue and staff of Rob Benn Holdings for their valuable support and assistance during the survey.

Thank you to Ms Madeina David for valuable assistance during the January 2020 survey.

Thank you to Leo Dutra for comments on the report.

Thank you to all Torres Strait Traditional Owners for regularly hosting us on their land and supporting this research.

Summary

The sea cucumber fishery in Torres Strait (referred to as the Torres Strait Bêche-de-mer Fishery (TSBDMF)) is an important source of income for Torres Strait islanders. The last fishery independent survey of these populations was carried out in 2009 and a stock survey is currently considered the only viable method for determining the size and status of fished sea cucumber populations for Torres Strait. This milestone report outlines project activities up until the end of June 2020 and includes the preliminary results of the sea cucumber surveys of East Torres Strait.

The current survey was conducted using similar methods applied to previous surveys, with the addition of a new method to survey deep water species (drop down cameras). The sea cucumber survey (visiting sites surveyed in previous years) was conducted in November 2019, and a second survey with a focus on deep-water sites, mapping of Ugar reef and additional repeated sites (where possible) was carried out in January 2020. The time between the two surveys allowed for additional planning necessary for trialling the use of drop video cameras, where tides, currents and depths needed to be managed for targeted sampling of White teatfish.

The analyses include an assessment of recruitment from site counts and size frequency data, a technique that has been shown to be viable from previous surveys. Estimates of gross environmental parameters including seagrass and algae species, live coral cover and other biota and substrate (sand, rubble, etc.) collected during the survey, will be used for mapping and monitoring of the environment in general.

Estimates of sea cucumber population size and status will support management decisions and assist in the implementation of the new Torres Strait Bêche-de-mer Harvest Strategy. Additionally, the full extent of the distribution of White teatfish in deeper (>20 m) habitats is currently of interest, in terms of quantifying total stock biomass and evaluating the potential for further development of this fishery.

1 Project

1.1 Sea cucumber survey of East Torres Strait

Sea cucumber fisheries in Australia and the South Pacific have been subject to increased fishing pressure in recent years due to relatively high prices for bêche-de-mer (the dried product) in Asia and the easiness to fish them. Research has shown that many South Pacific sea cucumber fisheries have been over-exploited, with recovery being slow and sporadic (Purcell, 2013).

The sea cucumber fishery in Torres Strait (referred to as the Torres Strait Bêche-de-mer Fishery (TSBDMF) in the remainder of the report) (Figure 1-1), is an important source of income for Torres Strait islanders since it was re-established in the early 1990's. Sandfish (*Holothuria scabra*) on Warrior Reef provided the bulk of the early catches, however, after its closure in 1998 from over-harvesting, the fishery targeted several other species in east Torres Strait (**Error! Reference source not found.**-1). Most sea cucumber populations in Torres Strait are considered to be in good condition. However, in response to declining populations, closure or catch limits have been implemented for several high value fishery species such as Black teatfish (*H. whitmaei*) and Surf redfish (*Actinopyga mauritiana*). Currently, fishing is mainly focused on Prickly redfish (*Thelenota ananas*), White teatfish (*H. fuscogilva*), Deepwater blackfish (mostly *A. palauensis*), Deepwater redfish (*A. echinites*) and of late, Curryfish (*Stichopus herrmanni* and *S. vastus*).

Recently, there has been some evidence of local depletion for Prickly redfish and Curryfish i.e. fishermen reporting decreased catch rates. Therefore, quantifying the sea cucumber populations and assessing the status of important fishery species is a high priority to support adequate management decisions, in the interest of the long-term sustainability of the TSBDMF. There is also a strong desire from some Torres Strait fishers to reopen the Black teatfish fishery and contemporary estimates of population size and status would also support management decisions for this species and assist in the implementation of the new Torres Strait Bêche-de-mer Harvest Strategy. Additionally, the full extent of the distribution of White teatfish in deeper (>20 m) habitats is currently of interest, in terms of quantifying total stock biomass and evaluating the potential for further development of this fishery. For a compilation of sea cucumber species issues – see Appendix A.2.

Fishery-dependent data (Catch Disposal Records) were introduced to the TSBDMF in December 2017. There is still however, limited information available to assess the status of fishery populations, with incomplete catch and effort time series data available prior to 2017. The last fishery independent survey of these populations was carried out in 2009 (Skewes et al., 2010), therefore a stock survey is presently the only viable method for determining the size and status of fished sea cucumber populations for Torres Strait.

This milestone report outlines activities in the project up until the end of June 2020 and includes the preliminary results for the sea cucumber surveys of East Torres Strait.

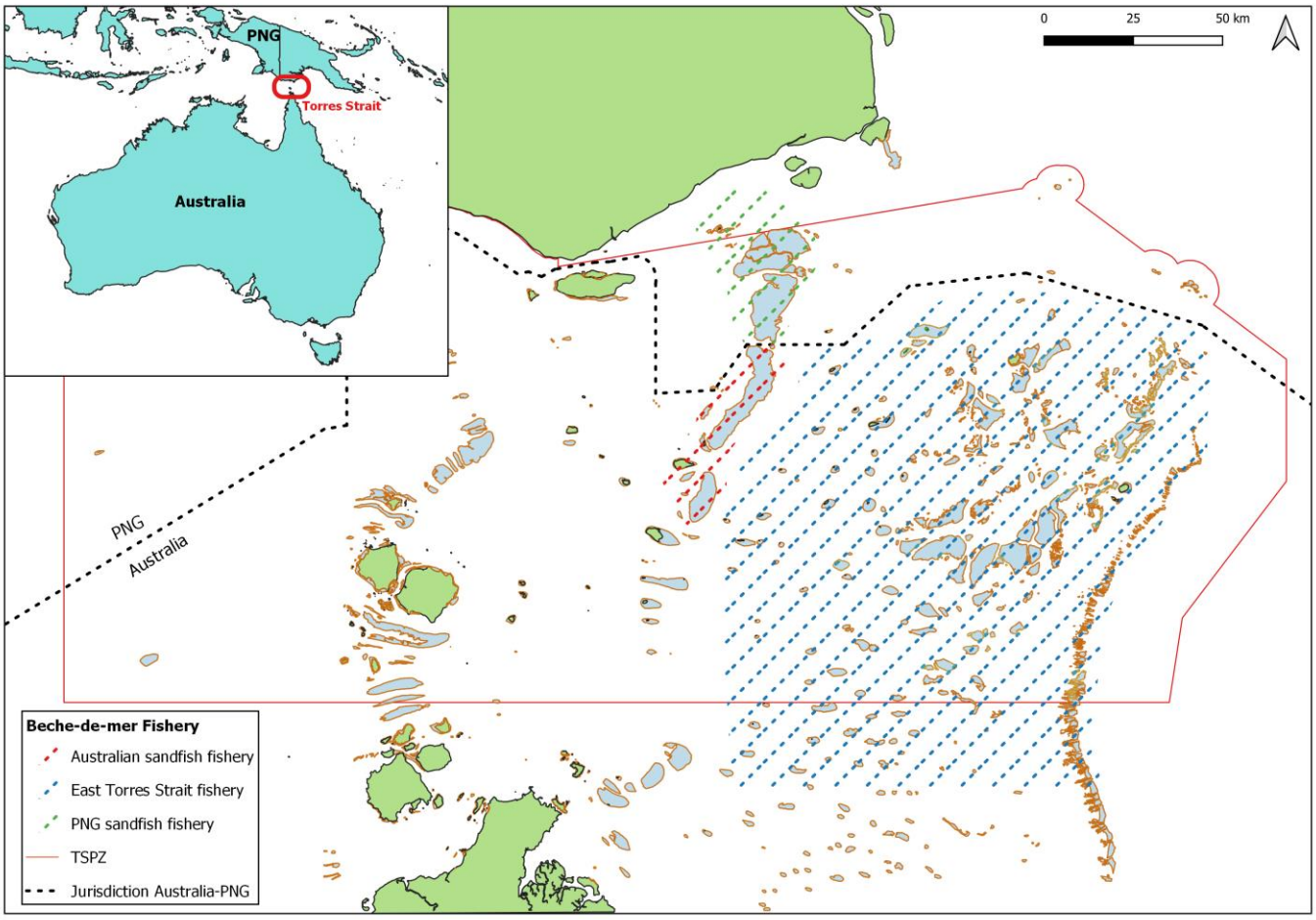

Figure 1-1. Map of Torres Strait showing the approximate location of the three sea cucumber fisheries in Torres Strait.

1.2 Project objectives

1. Survey of the east Torres Strait Bêche-de-mer Fishery with the focus on Prickly redfish, Curryfish species, Black teat fish and Surf redfish.
2. Carry out a preliminary exploration of deeper-water for White teatfish.
3. A survey of Sandfish on Warrior Reef was planned, however this was not possible to undertake and a variation for the January 2020 survey was approved by AFMA and TSRA.
   - Further deep-water surveys to be undertaken and additional activities to include targeting of surf redfish and extra BDM sampling sites.
   - Map reef and quantify habitats of Ugar home reef for possible sea cucumber re-seeding project.

1.3 Deliverables:

1. Produce stock size estimates and distribution data, and assess the fishery status for each population of sea cucumber in Torres Strait.

2. Use survey data to comment on potential for fishery expansion (e.g. TAC's) and reopening of closed fisheries.
3. Map important habitat variables, especially those relevant to fishery production.
4. Survey results will be made available in a form suitable for use in the new Bêche-de-mer Harvest Strategy for Torres Strait.
5. Information from the project will be provided to AFMA, TSRA and Torres Strait Island stakeholders in the form of formal final reports and a plain English summary document. Special consideration will be taken with Traditional Knowledge.

2 Methods

2.1 Community consultation

Feedback was sought on the aims of the survey and its design at targeted pre-consultation and consultation phases for the project. This involved contacting islander representatives, including Community Fisher Groups, Prescribed Body Corporates and Island Councillors, where information about the survey was provided and it was requested that project flyers detailing project information and a request for feedback, be posted on community notice boards (see Appendix A.1). Permission and support for the survey work from communities was sought and questions and feedback were incorporated into survey planning.

The history, status and previous research carried out on the TSBDMF has been communicated to Torres Strait islanders through TSHCWG meetings, and dedicated community workshops in 2019 and several years before, as part of the development of the recently endorsed TSBDM Harvest Strategy. Our understanding is that there is a high level of awareness of the specifics of the fishery eg. locations, species distribution, seasonal abundance and fishery operations among traditional owners, who also have good knowledge of the various levels of stock status. This is evidenced by feedback received from AFMA, in relation to the Fish Receiver community information sessions that were undertaken on a number of Islands.

The project's overall design was ratified by the Torres Strait Hand Collectable Working Group.

2.2 Study area

The TSBDMF is a 16,844 km^2 area of Torres Strait situated at its eastern extreme which includes the Australian side of the Torres Strait Protected Zone east of Warrior Reef (Figure 1-1). It contains about 700 km^2 of shallow reef top habitat, 504 km^2 of shallow reef top buffer habitat and 185 km^2 of reef edge (<20 m deep) habitat (see details in section 2.3), which accounts for about 64 % of all the reefs in Torres Strait (Skewes et al., 1999) (Table 2-1).

Table 2-1. Zone areas of shallow Reef top, Reef top buffer and Reef edge habitat in the East Torres Strait Bêche-de-mer Fishery, representing survey area for each zone.

Zone Area (km^2)	Reef top	Reef top buffer	Reef edge	Non reef	Total
Barrier	26.0	93.4	42.6	3,629.0	3,791.0
Cumberland Passage	309.4	133.7	46.8	1,471.9	1,961.7
Darnley	161.7	107.0	39.7	2,921.2	3,229.6
Don Cay	52.1	69.4	24.5	1,710.9	1,857.0
Great North East Channel	77.0	50.6	17.2	4,304.7	4,449.4
Seven Reefs	73.8	49.9	13.7	1,418.3	1,555.7
Total	700.1	503.9	184.5	15,456.0	16,844.5

2.3 Sample design

To incorporate the large extent of shallow reefs distributed over the fishery area, the area was divided into 7 zones which have been used since 2002, as the basis for the collection of fishery catch data (logbook areas) (Skewes et al. 2004). The zones are based on available catch information, likely Holothurian abundance and physiographic characteristics of the fishery habitats (Figure 2-2). These zones formed the basis for the sample design and stratified analysis.

A marine habitat map that delineated shallow reefs was superimposed on the fishery zones and used as the basis for the survey. Each zone was further divided into three habitat strata; the reef top, the reef top buffer and the reef edge stratum. The reef top buffer being defined as a 200 m wide buffer around the inside of the reef margin. During previous surveys, the reef top buffer was identified as an area likely to contain higher abundance of targeted species, especially Surf redfish and Black teatfish (Skewes et al., 2010).

Past sea cucumber surveys of east Torres Strait have been undertaken in 1995-96 (full scale), 2002 (full scale), 2005 (relative – subset of sites from full scale survey) and 2009 (relative) (Skewes et al., 1999; Skewes et al., 2004; Skewes et al., 2010) (see Appendix A.2). The current survey was conducted using similar methods applied to previous surveys, with the addition of a new method to survey deep water species (drop down cameras). Two of the survey staff - Nicole Murphy and Tim Skewes, have led or participated on all previous sea cucumber surveys.

The timing of the current survey was planned to coincide with the seasonal timing of previous surveys. This was to reduce differences in survey observer rates resulting from changes in sea cucumber burrowing behaviour, caused by seasonal and tidal factors. Based on previous survey dates and project scope and logistics, a sea cucumber survey (visiting sites surveyed in previous years) was conducted in November 2019, and a second survey with a focus on deep-water sites, mapping of Ugar reef and additional repeated sites (where possible) was carried out in January 2020. The time between the two surveys allowed for additional planning necessary for trialling the use of drop video cameras, where tides, currents and depths needed to be managed for targeted sampling of White teatfish.

The analyses include an assessment of recruitment from site counts and size frequency data, a technique that has been shown to be viable from previous surveys. Estimates of gross environmental parameters including seagrass and algae species, live coral cover and other biota and substrate (sand, rubble, etc.) collected during the survey, will be used for mapping and monitoring of the environment in general.

Deep Trekker DTG3 remotely operated vehicle

The TSRA kindly offered for the research team a number of their Remotely Operated Vehicle (ROV) units to trial for surveying deep-water habitats. The DTG3 model proved the most adequate for deployment from the CSIRO 5.0m inflatable Naiad, as well as for handling in conditions of swell, wind and inclement weather. The DTG3 was used as a modified ‘drop camera’ with a cabled tether and towed to collect data in drift transects undertaken from the Naiad for a set time duration. Of note for the DTG3 was the 270 degree of view, and capability to record high quality video (Figure 2-1).

For the deep-water transects (>20m), observations were made in real time e.g. sea cucumbers seen and significant habitat, with depth and time noted and a sampling data sheet completed afterwards. All recorded video was reviewed to verify sea cucumber identification and total number, and habitat information was also updated on site data sheets.

Time was also spent quantifying the DTG3 field of view to determine area estimates needed for subsequent analyses. This was undertaken by placing an object of known length on transect and video captured, with a diver also taking measurements. Photos were used (after review) for comparison and assessment.

Figure 2-1. Deep Trekker DTG3 Remotely Operated Vehicle.

2.4 Historical CSIRO seabed surveys

Mapping and characterisation of key biotic and physical attributes of the Torres Strait ecosystem was undertaken in 2007, where samples of plants, invertebrates and fishes were collected (Pitcher et al., 2007). The database from this survey was interrogated to collate all sea cucumber records, and subsequent images and site descriptions were extracted to support species identification (where not recorded) and species counts.

2.5 Field survey

2.5.1 East Torres Strait survey

The survey team carried out two, 2-week surveys during November 2019 and January 2020. Across the two surveys, 297 sites were visited in East Torres Strait (Table 2-2, Figure 2-2). Repeated measures were undertaken for most of the reef sites, previously surveyed in 2002, 2005 and 2009. Uniquely, in 2019/20, we also successfully surveyed 53 deep-water sites to investigate sea cucumber deep-water species, such as White teatfish.

Table 2-2. Number of survey sites by year, zone and strata.

Year	Zones	Reef top	Reef top buffer	Reef edge	Deep water	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

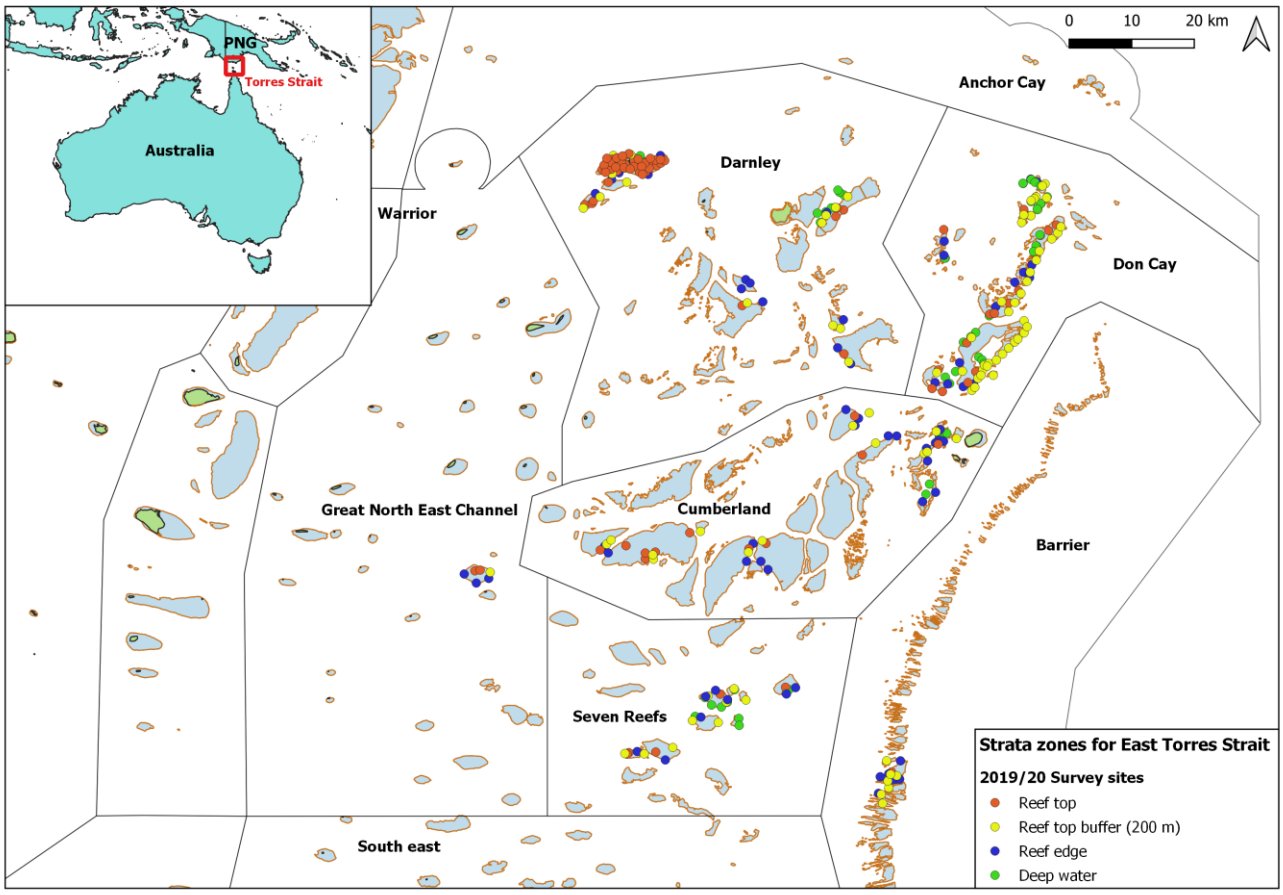

Figure 2-2. Sites visited in 2019/20, by zone and strata.

Survey notes

- Fifth survey of east Torres Strait.
- Number of sites in 2019/20 was the highest since 2002.
- Also included deep water (>20 m) sites for the first time.
- We managed to sample all zones in East Torres Strait.
- Sites were mostly repeated sites that have been visited in previous surveys.
- First time we have been able to investigate deep water populations, particularly for White teatfish (see section 2.3 and below).
- Intensive sampling of Ugar reef to investigate the fine scale habitats and sea cucumber populations (see section 2.6).

2.5.2 Deep-water habitat

The White teatfish survey was exploratory and highly targeted. Data records from previous Torres Strait surveys - including the planned CSIRO seabed mapping review (see section 2.4), as well as advice from fishers and other stakeholders was used to choose sites. Deep-water sites included sites off the shallow reef edge continuing down the reef slope, and in the deeper lagoons of the sunken north easterly reefs.

Survey notes

- We were assisted by TSRA cadet, Ms Madeina David, for part of the cruise. This was very helpful for conducting the survey, particularly in terms of assistance with operation of the DTG3 camera system.
- The camera system was very successful at observing and quantifying sea cucumbers, particularly White teatfish.
- Although we surveyed habitat down to 50 m deep, we did not observe White teatfish deeper than 37 m.
- We are confident we have delimited and quantified the deeper-water White teatfish population.
- Transects were 20 m to 50 m deep.
- Transects were 40 m to 675 m long.
- Transects were undertaken during 10-minute drifts.

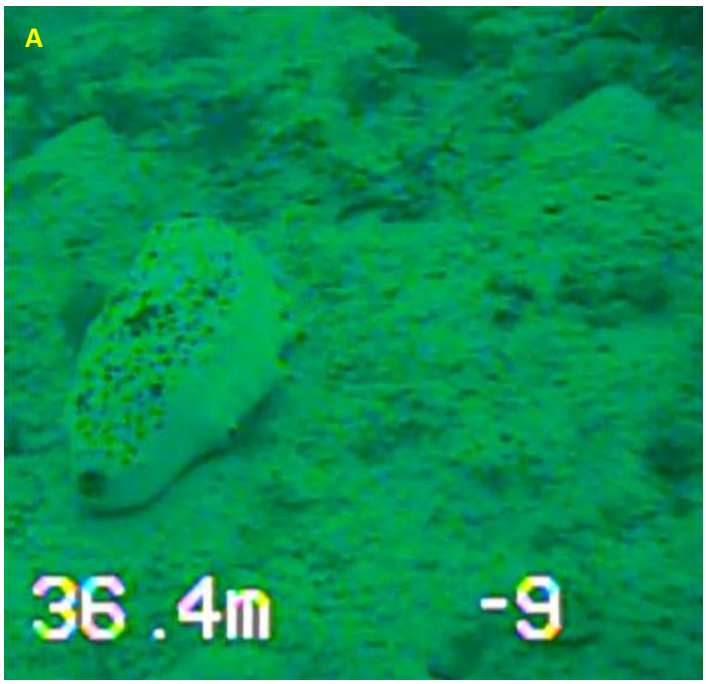

Figure 2-3. Deepwater habitat survey A) White teatfish on video transect B) Undertaking video transect - N. Murphy and M. David C) Deep Trekker DGT3 Remotely Operated Vehicle (underwater view).

2.6 Ugar Island survey

Surveys of Ugar Island and Campbell Reef to map habitats and quantify populations of sea cucumbers and giant clams were undertaken in order to provide information to the community, and for support of a sea cucumber re-seeding proposal currently being developed by Mr Rocky Stephens and CSIRO researcher Leo Dutra. This work will help to improve sea cucumber stocks for the benefit of local communities in Torres Strait.

This survey received approval from Mr Sereako Stephen, Chair of the Ugar RNTBC and Councillor, Mr Rocky Stephen upon survey consultation (see Appendix A.1).

Sixty snorkel and dive transects were undertaken as part of the December 2019 and January 2020 survey. Of the sites sampled, 38 were surveyed in previous years (repeated measures), with 22 new sites that included reef top, reef top buffer and representative reef edge sites to inform on sea cucumber species, distribution and habitat (Figure 2-4).

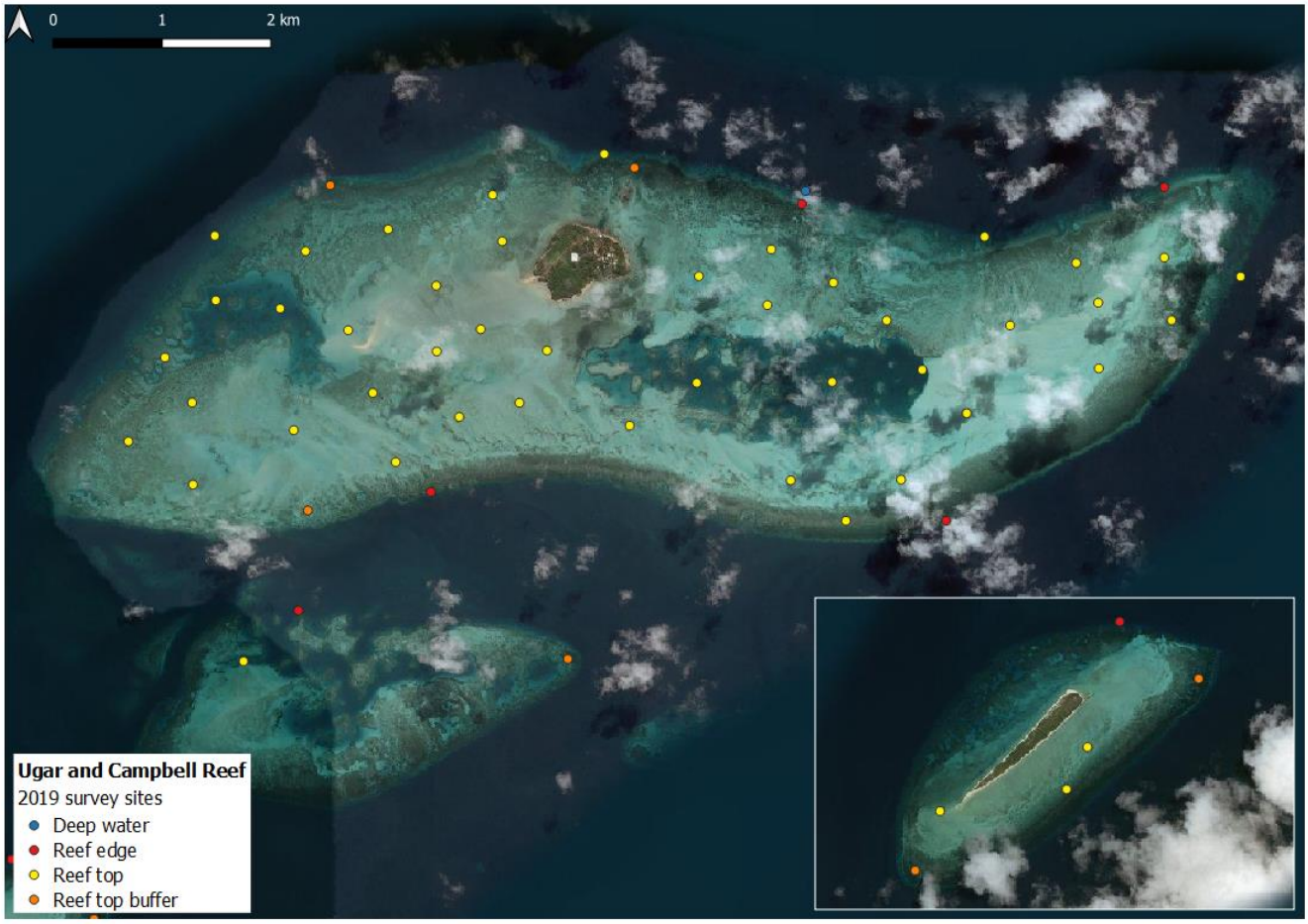

Figure 2-4. Survey sites sampled at Ugar Island and Campbell Reef during 2019/20 survey, Torres Strait.

2.6.1 Ugar survey report

A separate report for the Ugar field survey was produced for provision of results to the community, as part of project consultation and support for the re-seeding proposal (Murphy et al., 2020).

3 Collation of existing data

3.1 Survey data

Data collected in previous surveys (Table 3-1) have been collated and used to determine habitat ranges for sea cucumber species of interest, with physical data gathered providing insights into physical correlates. Together, this information provided guidance for macro and micro scale spatial envelopes for species occurrence.

Table 3-1. Eastern Torres Strait sea cucumber surveys.

Year	Date	Days	Survey type	Sites
1995; 1996	Feb 95, Nov 95, Feb 96	-	Full scale, including western, central & eastern Torres Strait	1519 15m depth
2002	End March/April	14	Full scale, eastern Torres Strait	424 (*two dive teams/2 dinghies) 20m depth
2005	End Jan/Feb	9	Relative, eastern Torres Strait	122 sites, 75 planned (extra assistance from crew) 20m depth
2009	March	10	Relative, eastern Torres Strait (combined trochus; 5 from 6 zones)	113 15m depth

3.2 Historical CSIRO seabed surveys

A total of 352 sea cucumber records were collated from use of towed video, digital cameras, epibenthic sleds and trawls, with the more abundant species distribution mapped. Six sea cucumber records were identified to species and of the species that were mapped, two are of current commercial importance - *Stichopus horrens* (*herrmanni*) and *Holothuria* (*Stichopus*) *ocellata*.

While remaining sea cucumber records were not of high abundance, they may represent species of high commercial importance e.g. White teatfish or knowledge gaps e.g. Deepwater blackfish. Photos and collected specimens exist for these sampling records, which could potentially be identified to species level with additional scrutiny.

The review of these additional data will complete this historical data set and possibly provide updated information on distribution and abundance of more deep-water species, and other relevant ecological information for the present day TSBDMF.

4 Results

4.1 Data analysis

Estimates of mean density (count per hectare) were derived using a stratified analysis of transect counts based on zones (logbook areas) and reef strata (see section 2.3 and Figure 2-2). This takes into account the heterogeneity in the variance of observed counts and is representative of the physical size differences of the varying habitats in the surveys.

For investigating trends in species density, we compared survey sites within zone and strata that were sampled in previous years. For all surveys since 1995, three zones were sampled consistently: Cumberland, Darnley and Don Cay zones. Four zones were consistently sampled in 1995, 2002, 2009 and 2019/20: Cumberland, Darnley, Don Cay and Great North East Channel.

We produced the following outputs from the data analysis:

1. Stratified mean densities and population estimates for 2019/20 for the areas surveyed.
2. Comparative average density data for between year comparisons using four zones that have data for 1995, 2002, 2009, 2019/20 sampling year. This includes the Cumberland, Darnley, Don Cay and Great North East.
3. Length frequency distributions for sea cucumber species.
4. Estimates of standing stock were calculated as the product of estimates of density, reef area and average weight from size frequency data collected during the survey. These data are suitable for calculating standing stock estimates for the surveyed areas, but not for direct comparison between years.

Although the survey was designed as a relative density survey, we produced preliminary estimates (where possible) of population standing stock for the 2019/20 survey zones, which, at 151,324 Ha is over 80% of the total reef area in East Torres Strait.

As fishery catch in Torres Strait is managed as landed (gutted) weight, we converted biomass estimates to landed wet weight (gutted) using current conversion ratios (updated since the 2009 survey; Murphy et al. 2020). The 90th percentile of the mean estimate for distribution (assumes that the real estimate would be 90% certain of being greater than this value), were also used as a conservative stock estimate (where possible).

Catch data from 2017 to 2020 recorded as part of the Fish Receiver System were analysed to view mean catch for species across years fished and Catch per Unit Effort (CPUE) for species for catch, recorded in standard weight (application of conversion ratio). Processing methods used for sea cucumber species were also considered and used to convert to standardised biomass estimates.

4.2 Black teatfish (*H. whitmaei*)

4.2.1 Density

The highest density for Black teatfish (*H. whitmaei*) was the reef top buffer strata, for the Barrier zone, which also had the highest overall average zone density (Table 4-1; Figure 4-1).

Table 4-1. Density (No. per ha) for *H. whitmaei* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	26.8	8.9	-	17.8
Cumberland	7.6	8.9	12.5	0	7.7
Darnley	0.5	0	1.2	0	0.4
Don Cay	19.8	22.4	12.9	0	17
GNE Channel	0	0	0.0	-	0
Seven Reefs	4.7	15.2	3.1	0	7.6
All	5.4	11.9	7.4	0	7.4

*The current deep-water strata area is assumed to be the same as the reef edge area.

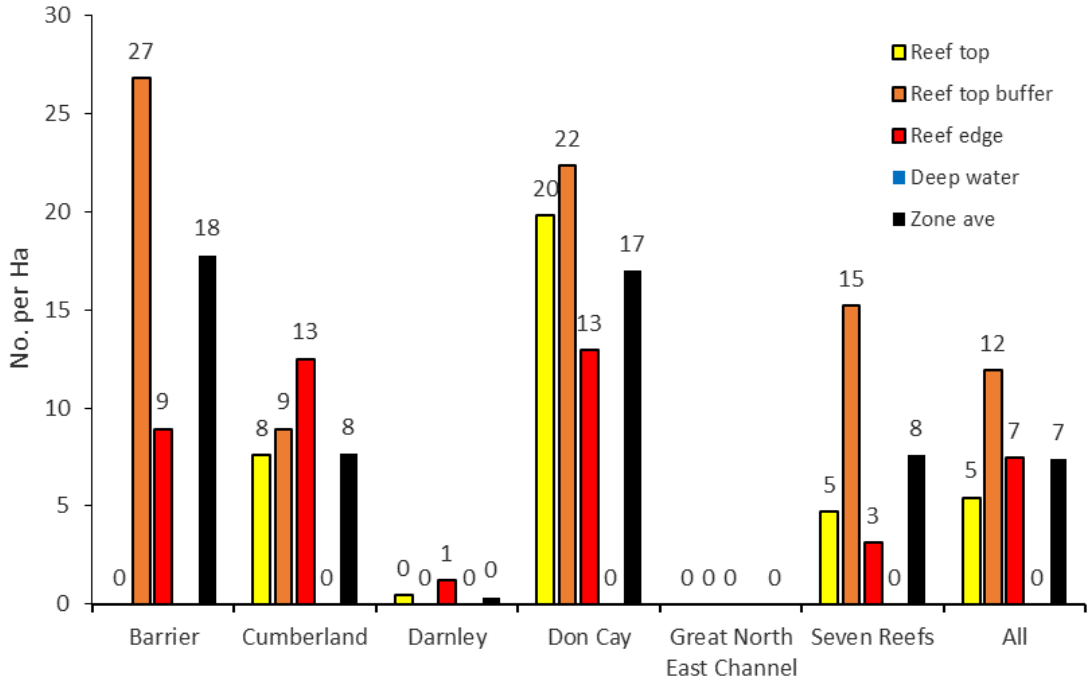

Figure 4-1. Zone and strata average density (No. per Ha) for *H. whitmaei* in 2019/20.

4.2.2 Density trends

The highest zone and survey density for Black teatfish (*H. whitmaei*) was for Don Cay. The overall zone average was similar to the highest levels seen in 2009 (Table 4-2; Figure 4-2).

Table 4-2. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. whitmaei* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	9.6	3.9	2.7	7.9	0	0	3.6
2002	6.8	1.8	1.2	7.2	0	0	2.2
2005	10	0	2.7	2.7	-	0	1.1
2009	-	13.2	1.1	9.1	1.7	0	8.5
2019	17.8	8.4	0.4	19.9	0	8.4	7.7

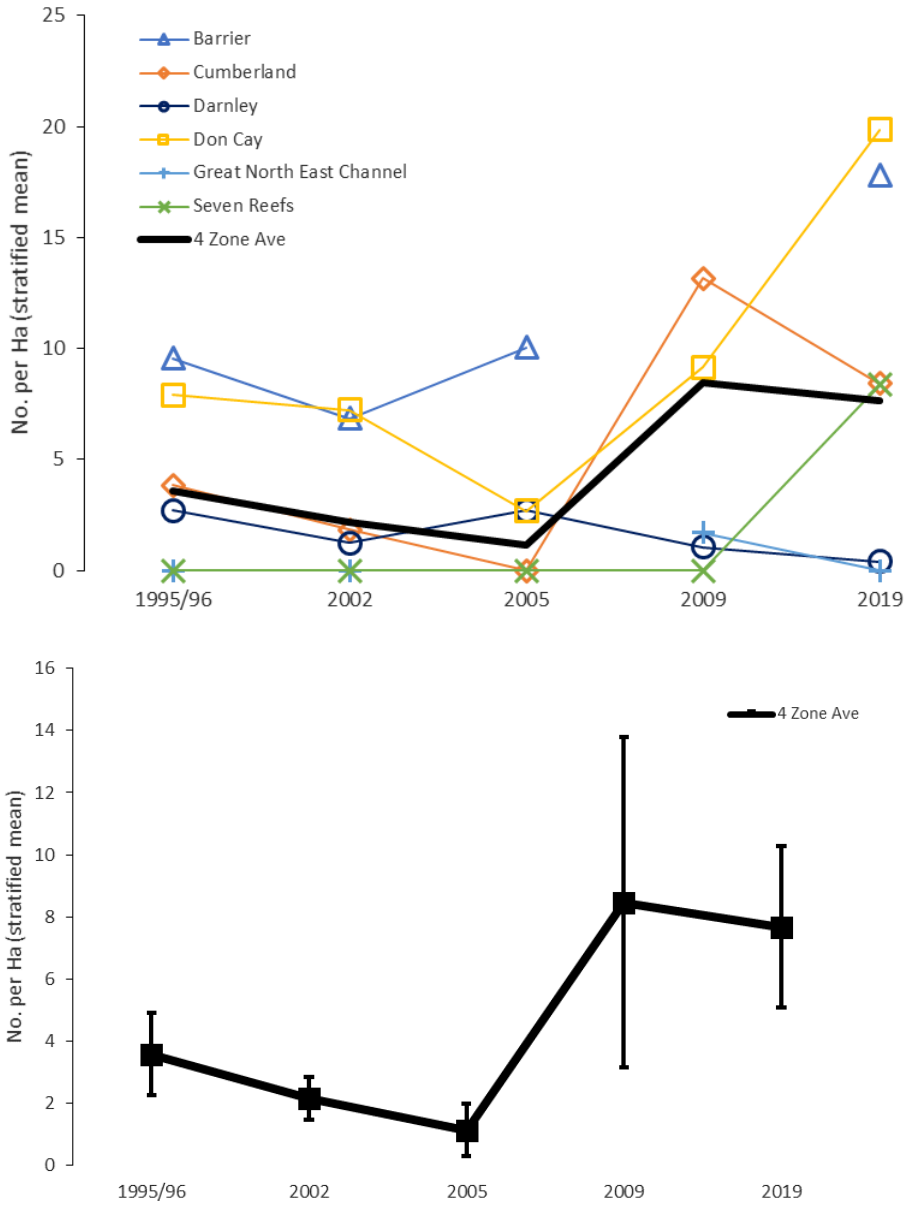

Figure 4-2. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *H. whitmaei* from five surveys (does not include deep water strata).

4.2.3 Population estimates

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Black teatfish (*H. whitmaei*) in 2019/20 is 765t (Table 4-3). (Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-3. Stock estimate for *H. whitmaei*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, *B*) (GNE = Great North East, ETS = East Torres Strait; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16204.1	17.8	118.3	288,273	470.5	318.5	57.5
Cumberland	50	53665.5	7.7	24.4	412,235	672.8	455.5	75.2
Darnley	89	34808.4	0.4	0.1	12,498	20.4	13.8	0.8
Don Cay	104	17055.6	17.0	21.4	290,013	473.3	320.5	208.0
GNE Channel	6	14472.5	0	0	0	0	0	-
Seven Reefs	33	15117.5	7.6	9.8	114,937	187.6	127.0	58.5
ETS	297	151323.6	7.4	4.8	1,117,954	1,824.7	1,235.3	764.9

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.2.4 Length frequency

The average size of *H. whitmaei* was similar to the 2009 survey, with some of the largest Black teatfish also recorded (Figure 4-3).

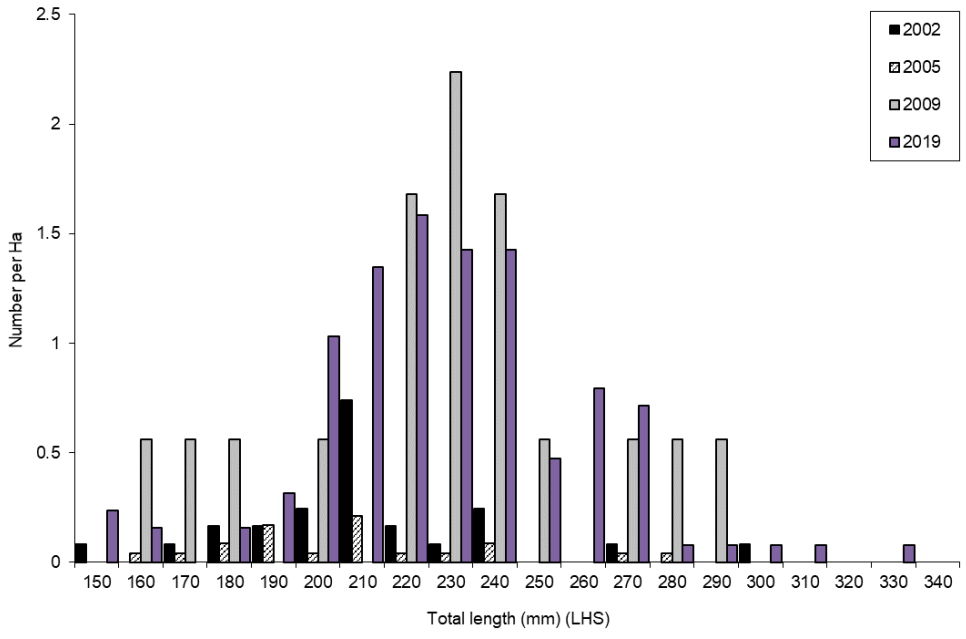

Figure 4-3. Length frequency for *H. whitmaei* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.3 White teatfish (*H. fuscogilva*)

4.3.1 Density

The highest density for White teatfish (*H. fuscogilva*) was for the deep-water strata (20-40 m; where sampled), for Don Cay zone, which also had the highest overall average zone density (Table 4-4; Figure 4-4).

Table 4-4. Density (No. per Ha) for *H. fuscogilva* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	25	0	1.8	-	4.5
Cumberland	0	0	3.3	17.1	1.8
Darnley	1.3	0	3.6	13.9	2.6
Don Cay	13.2	9.4	2.9	15.4	10.5
GNE Channel	0	0	0	-	0
Seven Reefs	0	1.3	0	10.4	1.4
All	2.2	1.4	2.4	15.0	3.0

*The current deep-water strata area is assumed to be the same as the reef edge area.

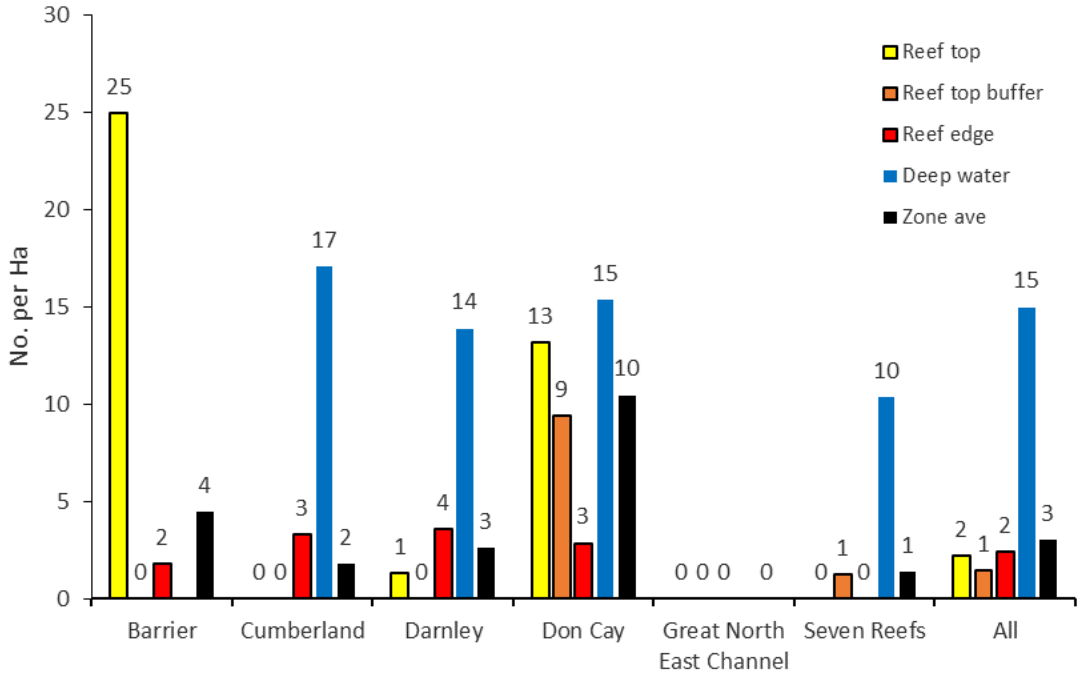

Figure 4-4. Zone and strata average density (No. per Ha) for *H. fuscogilva* in 2019/20.

4.3.2 Density trends

The highest zone and survey density for White teatfish (*H. fuscogilva*) was for Don Cay. The overall zone average was similar to 2005 (

Table 4-5; Figure 4-5).

Table 4-5. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. fuscogilva* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.2	0	0.2	8.2	0	0	1.2
2002	0	0.4	0.6	13.4	0	2.6	2.5
2005	0	0.2	0.3	9.6	-	0.6	1.6
2009	-	1.3	0	0.8	0	0	0.8
2019	4.5	0.3	1.2	9.6	0	0.5	1.8

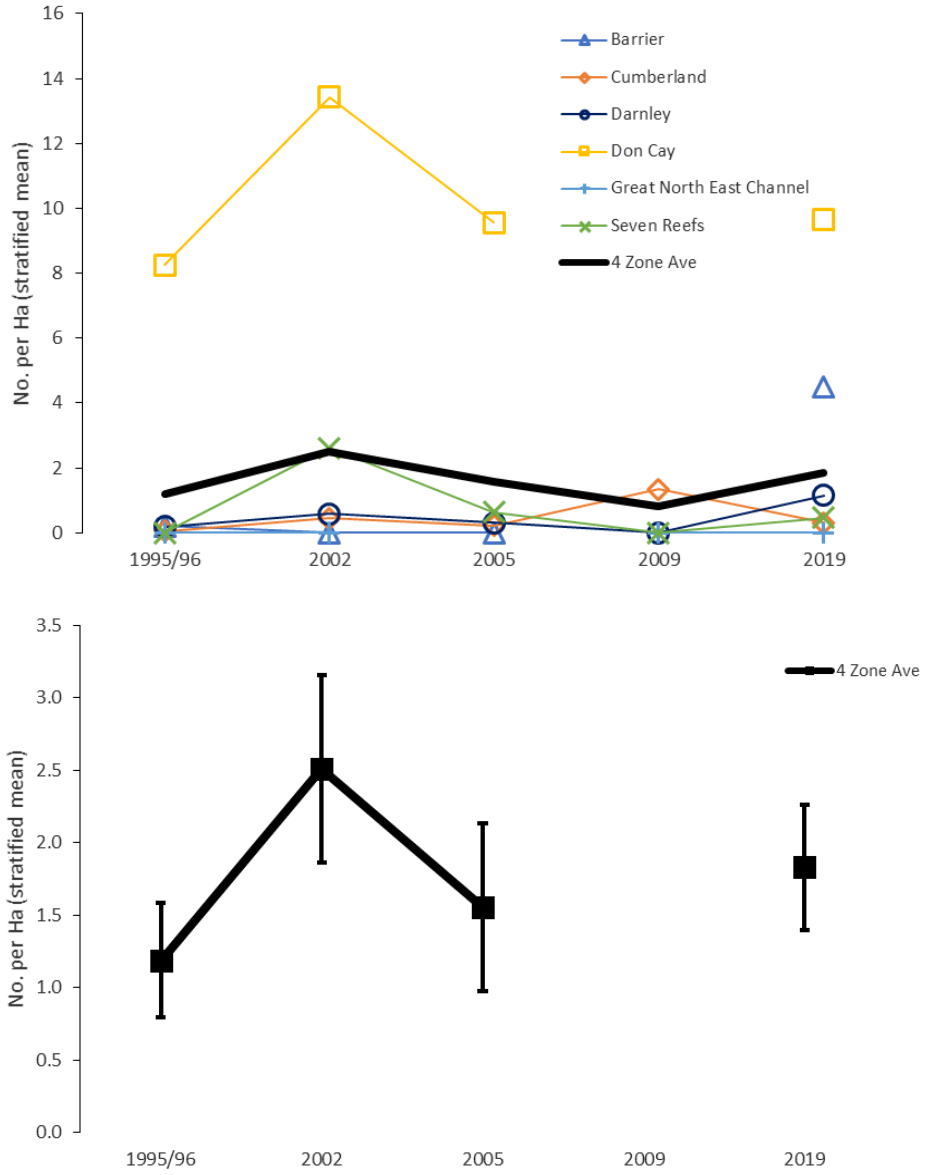

Figure 4-5. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *H. fuscogilva* from five surveys (does not include deep water strata).

4.3.3 Population estimates

Fishery biomass population estimate (lower 90th percentile as gutted weight) for White teatfish (*H. fuscogilva*) in 2019/20 is 543t, with almost half of that found in the deep water strata (Table 4-6).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-6. Stock estimate for *H. fuscogilva*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, *B*) (GNE = Great North East, ETS = East Torres Strait; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16204.1	4.5	0.2	72,604	177.6	111.4	95.7
Cumberland	50	53665.5	1.8	0.3	95,346	233.3	146.3	90.8
Darnley	89	34808.4	2.6	2.8	90,663	221.8	139.1	23.5
Don Cay	104	17055.6	10.5	7.3	178,440	436.6	273.8	182.8
GNE Channel	6	14472.5	0	0	0	0.0	0.0	-
Seven Reefs	33	15117.5	1.4	0.7	20,495	50.1	31.4	6.4
ETS	297	151323.6	3	0.3	457,549	1,119.5	701.9	543.0

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.3.4 Length frequency

Length frequency for White teatfish (*H. fuscogilva*) were comparable to 2009, with larger sizes recorded for 2019/20 (Figure 4-6).

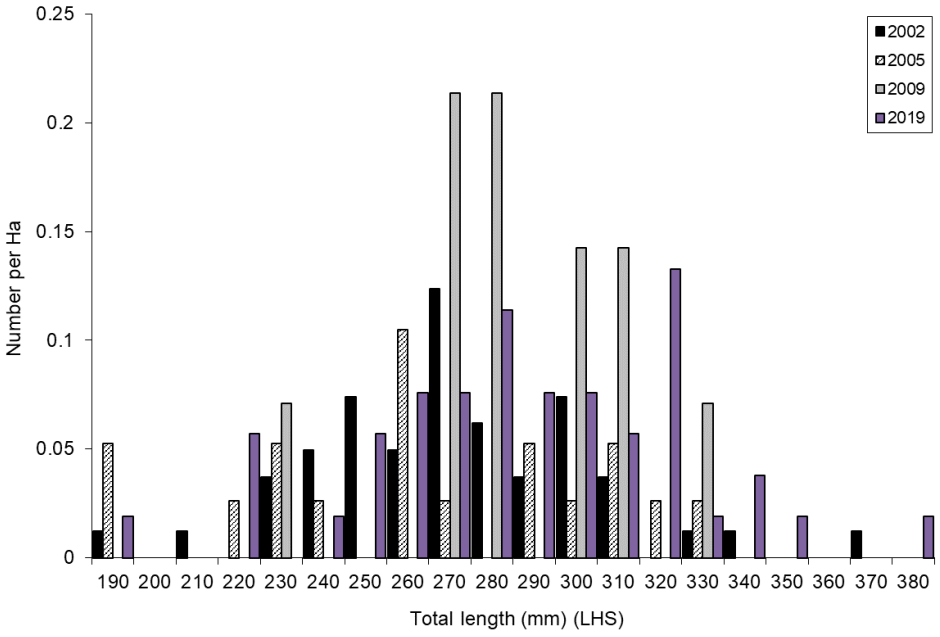

Figure 4-6. Length frequency for *H. fuscogilva* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.4 Prickly redfish (*T. ananas*)

4.4.1 Density

The highest Prickly redfish (*T. ananas*) density was for the reef edge strata, for Barrier zone, which also had the highest overall average zone density (Table 4-7; Figure 4-7).

Table 4-7. Density (No. per Ha) for *T. ananas* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	12.5	0	60.7	-	18.0
Cumberland	0	0	3.3	0	0.3
Darnley	0.2	0	0	0	0.1
Don Cay	14.8	3.2	6.1	1.1	6.9
GNE Channel	0	0	0	-	0
Seven Reefs	0	5.0	4.7	2.7	2.3
All	1.6	0.9	16	0.5	3.1

*The current deep-water strata area is assumed to be the same as the reef edge area.

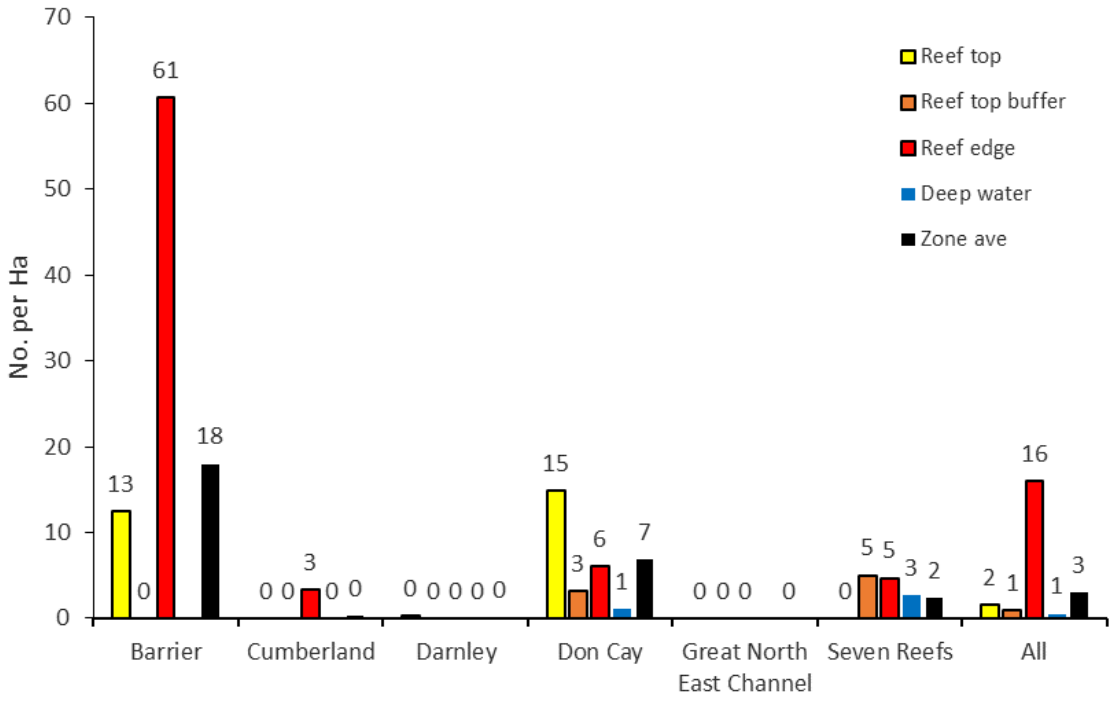

Figure 4-7. Zone and strata average density (No. per Ha) for *T. ananas* in 2019/20.

4.4.2 Density trends

The zone with the highest density for Prickly redfish (*T. ananas*) was for Barrier. The overall average zone density for 2019 was the lowest observed across survey years (

Table 4-8; Figure 4-8).

Table 4-8. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *T. ananas* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.5	0	1.5	11.6	0	0	2.0
2002	22.5	0.8	0.1	10.4	0	0	1.8
2005	11.6	0.5	0	16.1	-	0	2.4
2009	-	3.0	0.2	2.5	0	0	2.0
2019	18	0.3	0.1	7.8	0	2.3	1.5

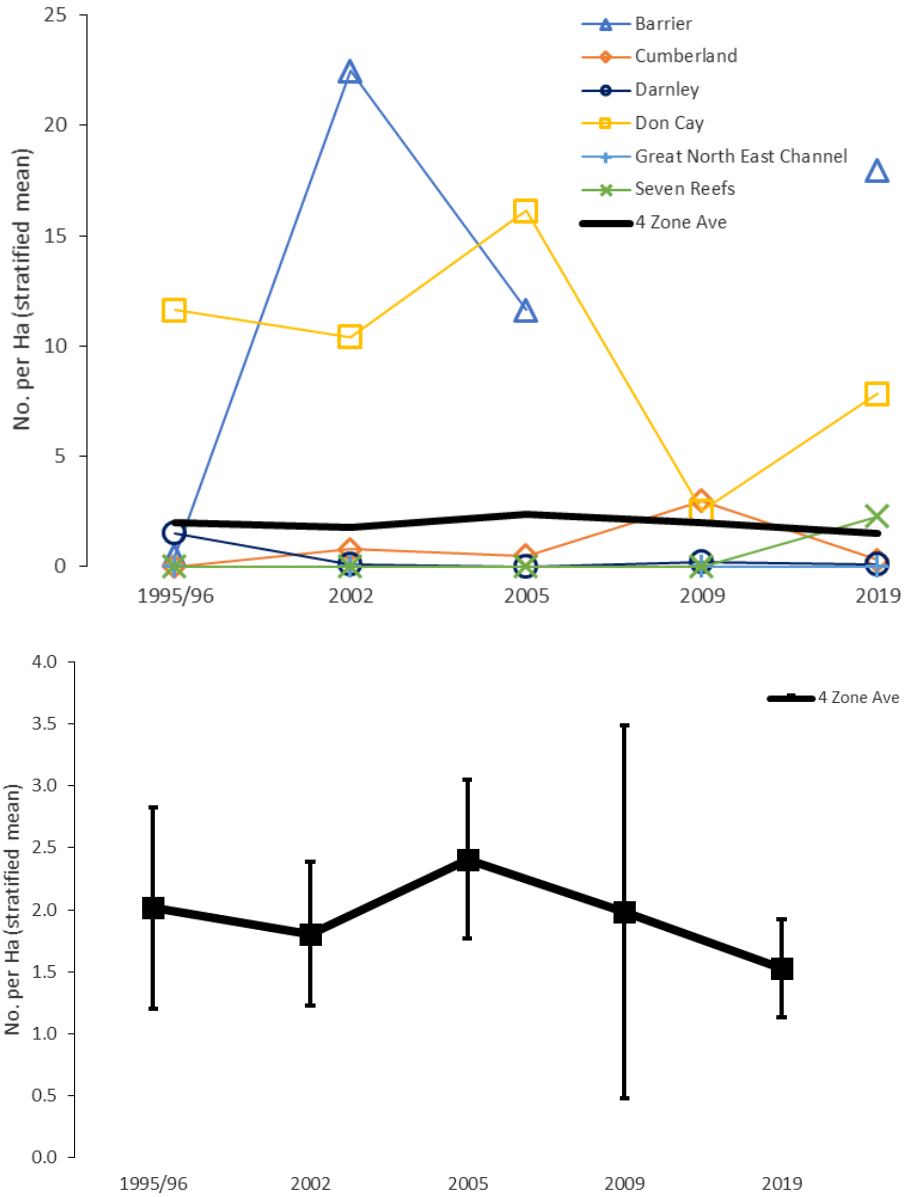

Figure 4-8. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *T. ananas* from five surveys (does not include deep water strata).

4.4.3 Population estimates

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Prickly redfish (*T. ananas*) in 2019/20 is 375t (Table 4-9).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-9. Stock estimate for *T. ananas*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, *B*) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th*B* (t) Wet Wt gutted
Barrier	15	16204.1	18.0	164.5	291,344	860.5	573.9	25.0
Cumberland	50	53665.5	0.3	0.1	15,392	45.5	30.3	-
Darnley	89	34808.4	0.1	0.0	3,887	11.5	7.7	-
Don Cay	104	17055.6	6.9	4.8	117,394	346.7	231.3	136.2
GNE Channel	6	14472.5	0	0	0	0.0	0.0	-
Seven Reefs	33	15117.5	2.3	0.9	35,039	103.5	69.0	31.4
ETS	297	151323.6	3.1	2.0	463,056	1,367.6	912.2	375.1

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.4.4 Length frequency

Length frequency for Prickly redfish (*T. ananas*) was down for number and sizes for the 2019/20 survey (Figure 4-9).

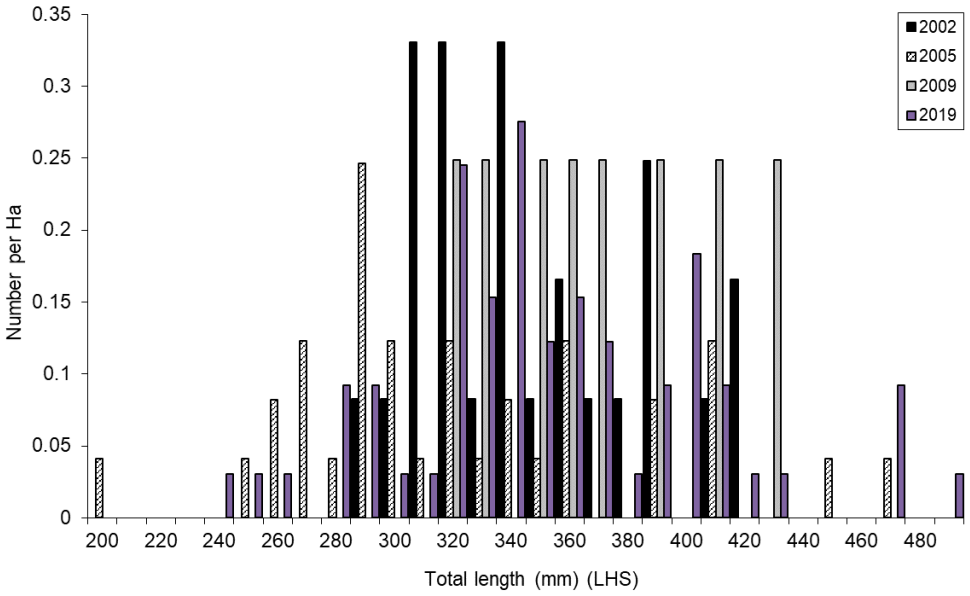

Figure 4-9. Length frequency for *T. ananas* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.5 Curryfish (*S. herrmanni*)

4.5.1 Density

The highest Curryfish (*S. hermmanni*) density was for the reef top buffer strata, for the Darnley zone, which also had the highest overall average zone density (Table 4-10; Figure 4-10).

Table 4-10. Density (No. per Ha) for *S. herrmanni* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	0	0	-	0
Cumberland	2.8	8.9	9.9	3.5	5.0
Darnley	6.3	38.4	17.0	0	16.6
Don Cay	6.8	0.9	10.7	0	4.0
GNE Channel	0	0	4.2	-	0.5
Seven Reefs	0	0	1.6	0	0.1
All	3.2	10.6	8.1	1.3	6.1

*The current deep-water strata area is assumed to be the same as the reef edge area.

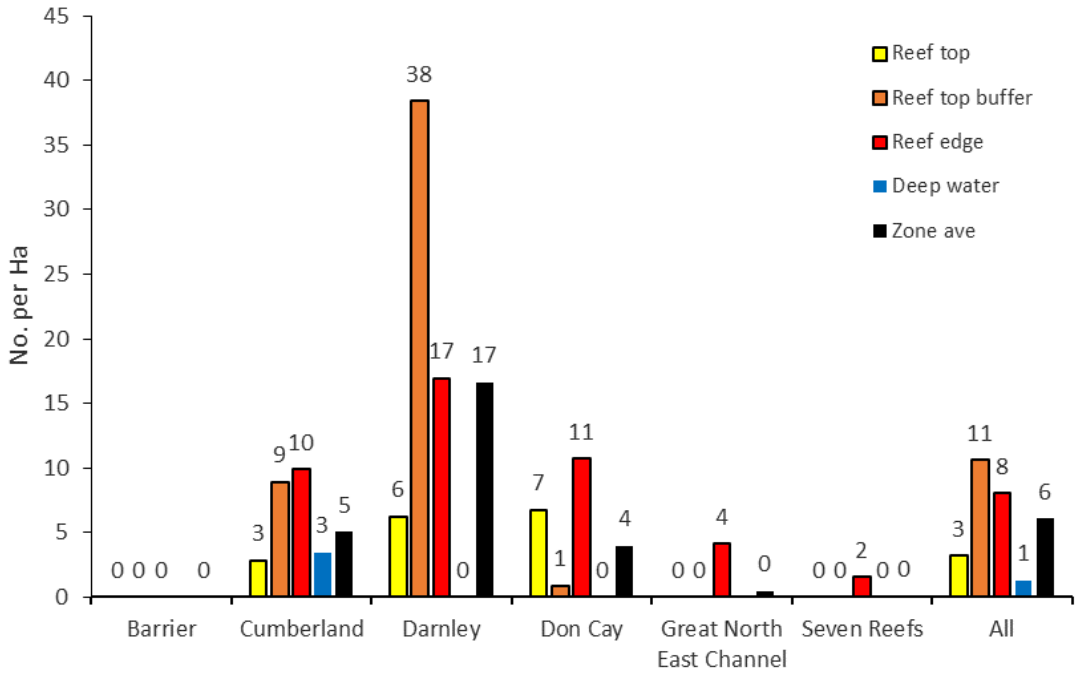

Figure 4-10. Zone and strata average density (No. per Ha) for *S. herrmanni* in 2019/20.

4.5.2 Density trends

The highest zone density for Curryfish (*S. herrmanni*) was for Darnley, which was also the highest density recorded across survey years. However, the overall average zone density was similar to the lowest found in 2002 (

Table 4-11; Figure 4-11).

Table 4-11. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *S. herrmanni* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.1	21.4	15.7	1.2	10.4	0	14.3
2002	0	7.8	11.4	6.5	3.1	5.7	8.4
2005	0	16.9	6.3	7.6	-	0	10.4
2009	-	10.9	12.2	21.5	12.5	0	12.8
2019	0	5.2	18.8	4.6	0.5	0.2	8.4

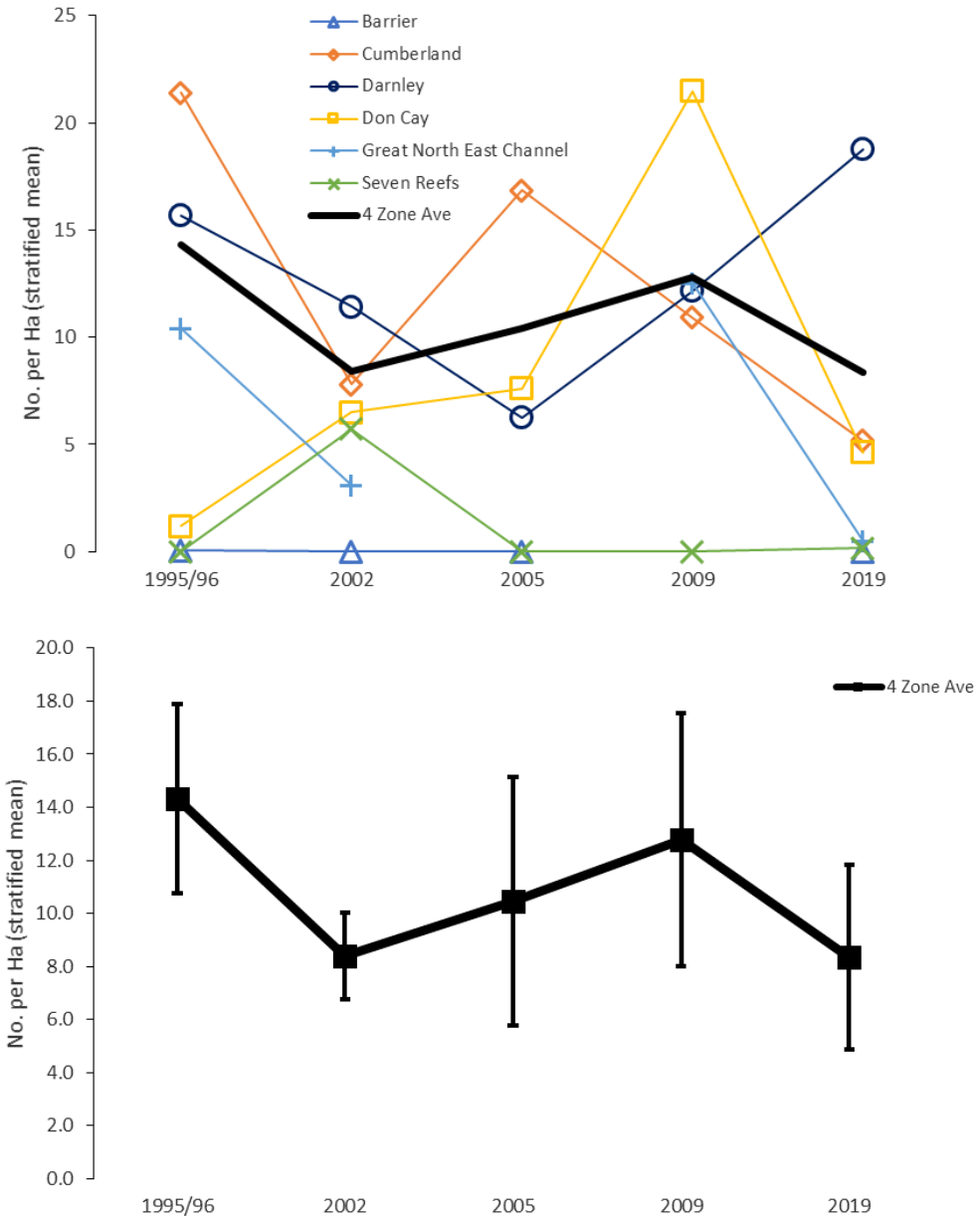

Figure 4-11. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *S. herrmanni* from five surveys (does not include deep water strata).

4.5.3 Population estimates

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Curryfish (*S. herrmanni*) in 2019/20 is 632t (Table 4-12).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-12. Stock estimate for *S. herrmanni*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, *B*) (GNE = Great North East, ETS = East Torres Strait; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	0	0	0	0	0	-
Cumberland	50	53,665.5	5.0	7.9	269,678	590.8	384.6	106.0
Darnley	89	34,808.4	16.6	97.2	579,287	1,269.1	826.2	194.4
Don Cay	104	17,055.6	4.0	3.2	67,856	148.7	96.8	40.3
GNE Channel	6	14,472.5	0.5	0.2	7,149	15.7	10.2	-
Seven Reefs	33	15,117.5	0.1	0	2,147	4.7	3.1	-
ETS	297	151,323.6	6.1	6.2	926,117	2,029.0	1,320.9	632.2

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.5.4 Length frequency

Length frequency for *S. herrmanni* was similar to 2002, with fewer smaller to medium size seen and a number of larger animals recorded (Figure 4-12).

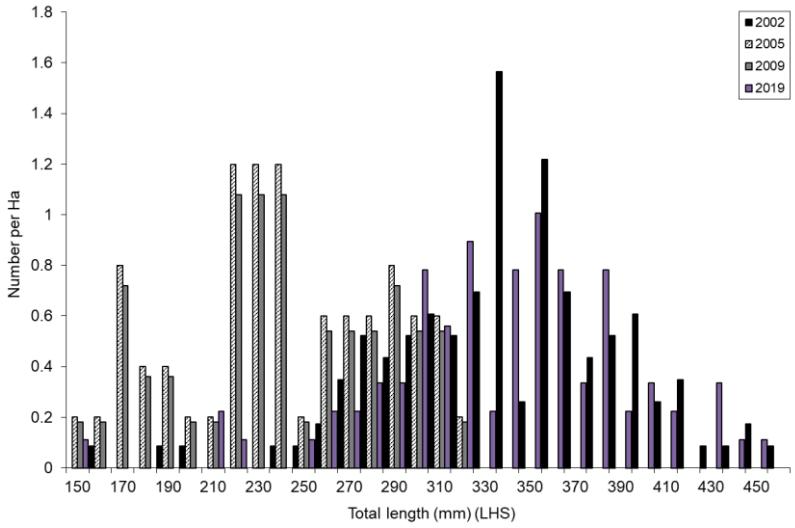

Figure 4-12. Length frequency for *S. herrmanni* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.6 Curryfish (*S. vastus*)

4.6.1 Density

The highest density for Curryfish (*S. vastus*) was for the reef top strata, for the Cumberland zone, which also had the highest overall average density (Table 4-13; Figure 4-13)

Table 4-13. Density (No. per Ha) for *S. vastus* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	0	0	-	0
Cumberland	34.1	0	2	0	19.8
Darnley	8.0	0	18.8	5.8	6.5
Don Cay	0	0	0	0	0
GNE Channel	0	0	0	-	0
Seven Reefs	0	0	0	0	0
All	16.9	0	4.5	1.8	8.5

*The current deep-water strata area is assumed to be the same as the reef edge area.

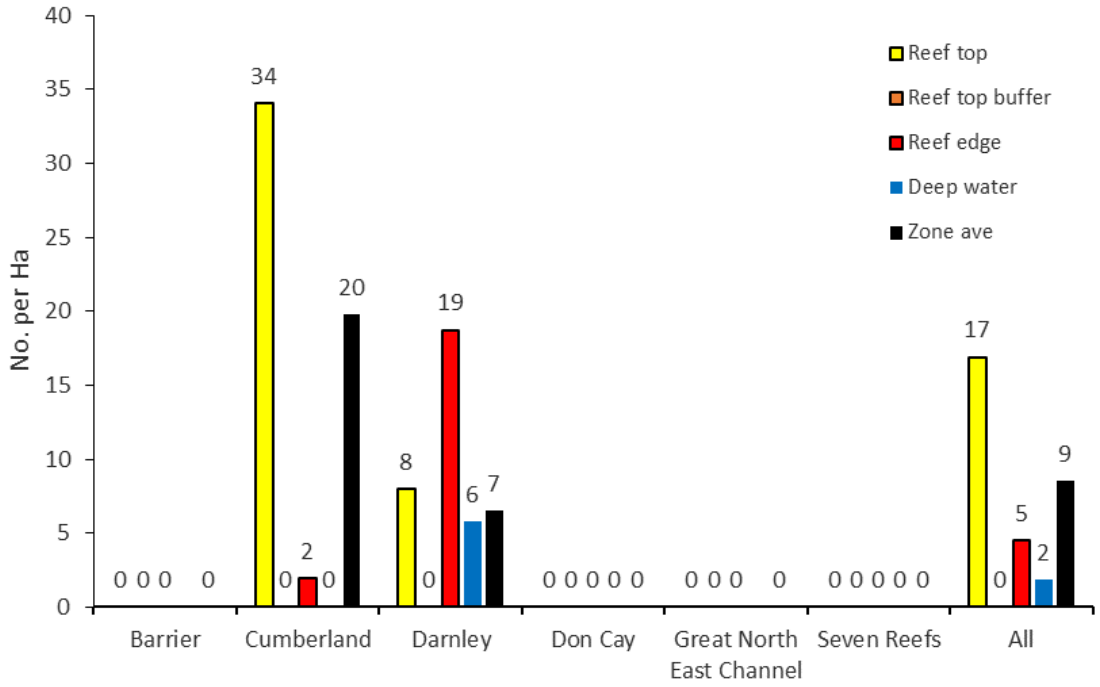

Figure 4-13. Zone and strata average density (No. per ha) for *S. vastus* in 2019/20.

4.6.2 Density trends

The highest zone density for Curryfish (*S. vastus*) was for Cumberland, which also had the highest density recorded across survey years. The highest overall average zone density across survey years was recorded for the 2019 survey (Table 4-14; Figure 4-14).

Table 4-14. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *S. vastus* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0	0	0	0	0	0	0
2002	0	5.1	5.6	0.1	5.9	0	3.9
2005	0	12.7	2.1	0	-	0	6.4
2009	-	0	4.3	0	1.2	0	1.4
2019	0	21.7	6.6	-	0	0	11.72

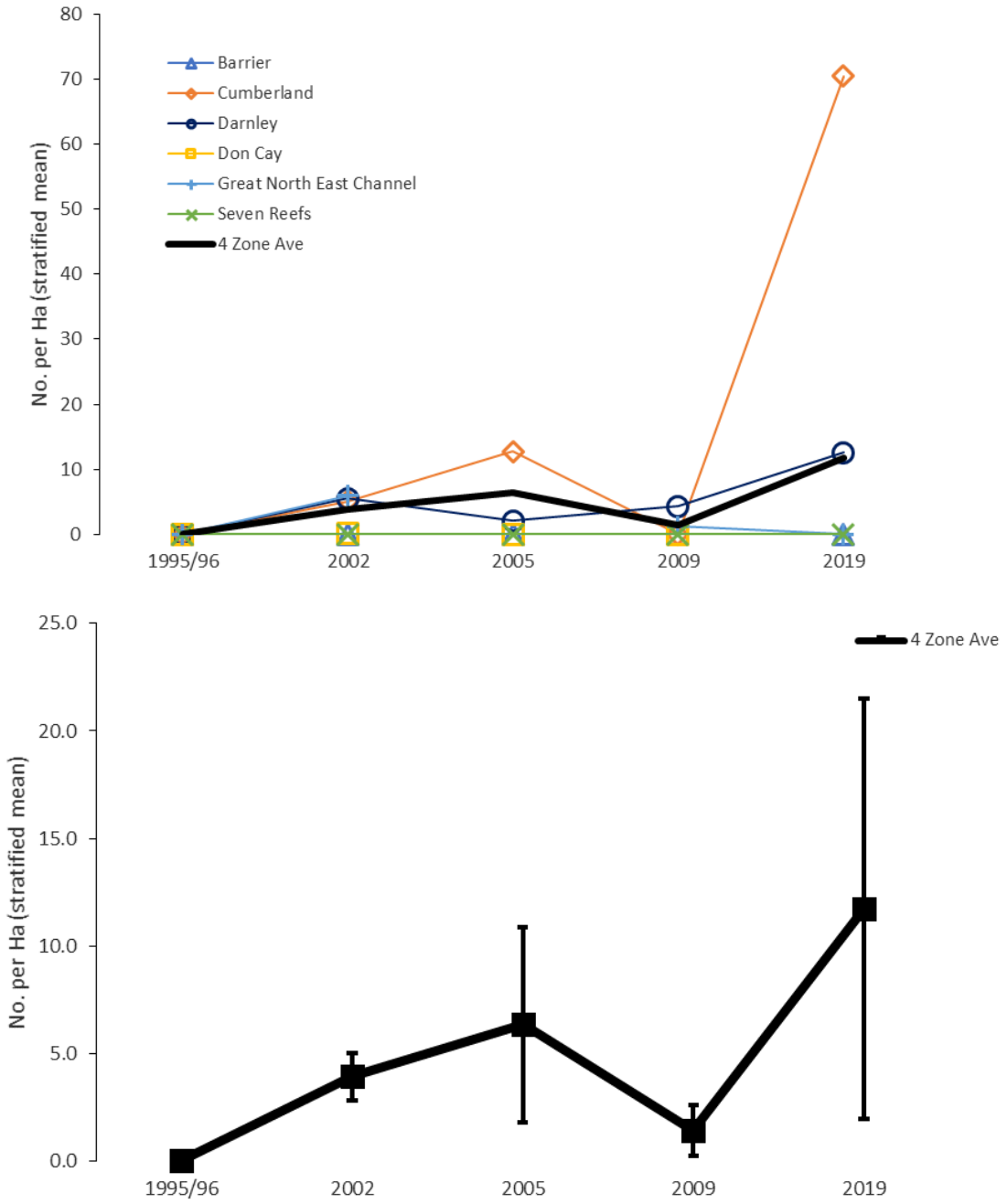

Figure 4-14. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *S. vastus* from five surveys (does not include deep water strata).

4.6.3 Population estimates

Fishery biomass population estimate for landed (wet gutted) weight for Curryfish (*S. vastus*) in 2019/20 is 1,110t (Table 4-15).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-15. Stock estimate for *S. vastus*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	0.0	0.0	0	0	0	-
Cumberland	50	53,665.5	19.8	386.3	1,063,966	1,405.1	914.7	-
Darnley	89	34,808.4	6.5	8.9	226,928	299.7	195.1	79.9
Don Cay	104	17,055.6	0	0	0	0	0	-
GNE Channel	6	14,472.5	0	0	0	0	0	-
Seven Reefs	33	15,117.5	0	0	0	0	0	-
ETS	297	151,323.6	8.5	49.1	1,290,894	1,704.8	1,109.8	-

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.6.4 Length frequency

Size frequency for Curryfish (*S. vastus*) was the lowest for all survey year and size distribution (Figure 4-15).

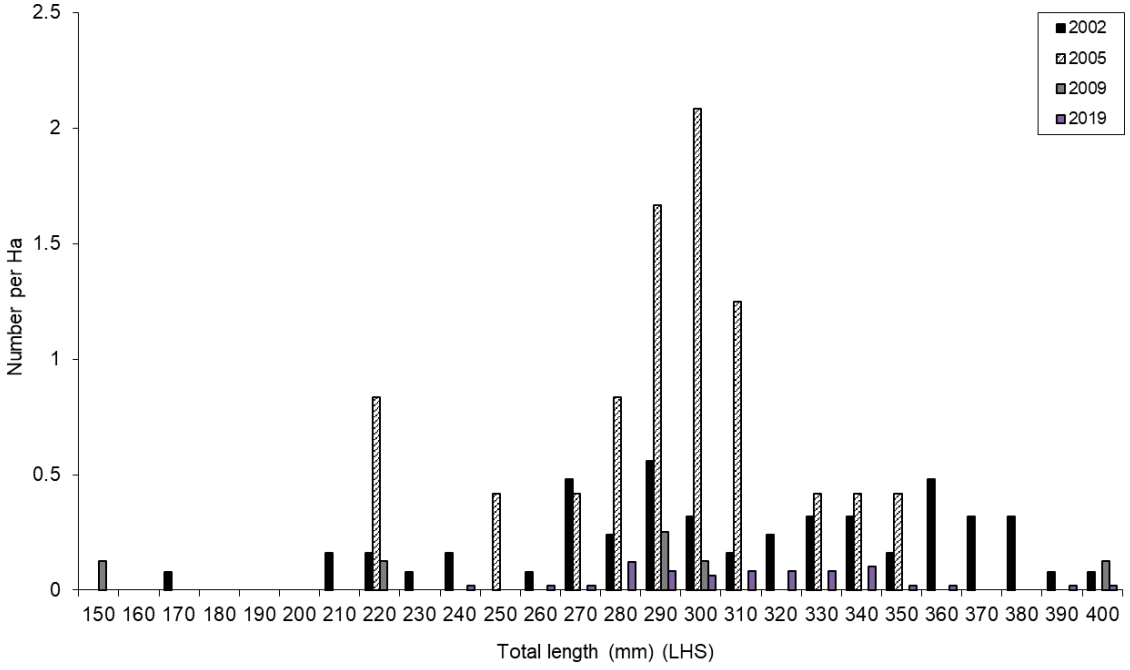

Figure 4-15. Length frequency for *S. vastus* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.7 Surf redfish (*A. mauritiana*)

4.7.1 Density

The highest density for Surf redfish (*A. mauritiana*) was recorded on the reef top strata, for the Don Cay zone, which also had the highest overall average zone density (Table 4-16; Figure 4-16).

Table 4-16. Density (No. per Ha) for *A. mauritiana* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	0	0	-	0
Cumberland	0	0	0	0	0
Darnley	0	0	0	0	0
Don Cay	0.8	4.1	0	0	1.9
GNE Channel	0	0	0	-	0
Seven Reefs	0	0	0	0	0
All	0.1	0.6	0	0	0.2

*The current deep-water strata area is assumed to be the same as the reef edge area.

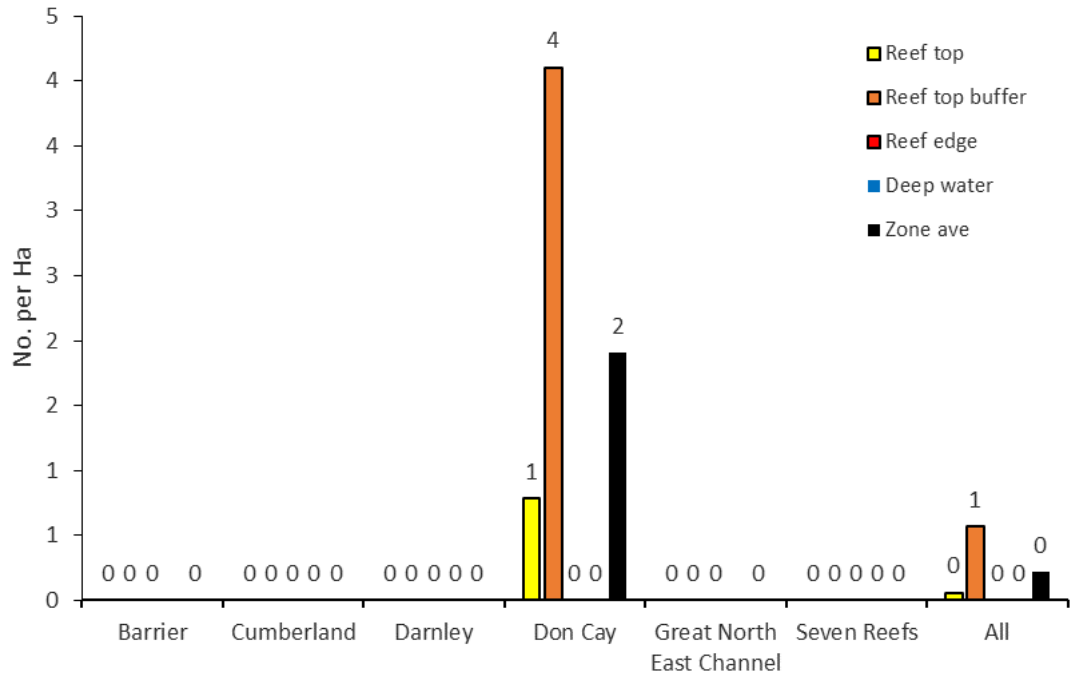

Figure 4-16. Zone and strata average density (No. per Ha) for *A. mauritiana* in 2019/20.

4.7.2 Density trends

The highest zone density for Surf redfish (*A. mauritiana*) was for Don Cay. The overall average zone density was similar to the lowest values for 1995/96 and 2009 (Table 4-17; Figure 4-17).

Table 4-17. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. mauritiana* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0	0	0	0.4	0	0	0.1
2002	0	2.5	1.3	0	0	0	1.5
2005	0	0	0	0	-	0	0
2009	-	0	0	0.6	0	0	0.1
2019	0	0	0	2.2	0	0	0.3

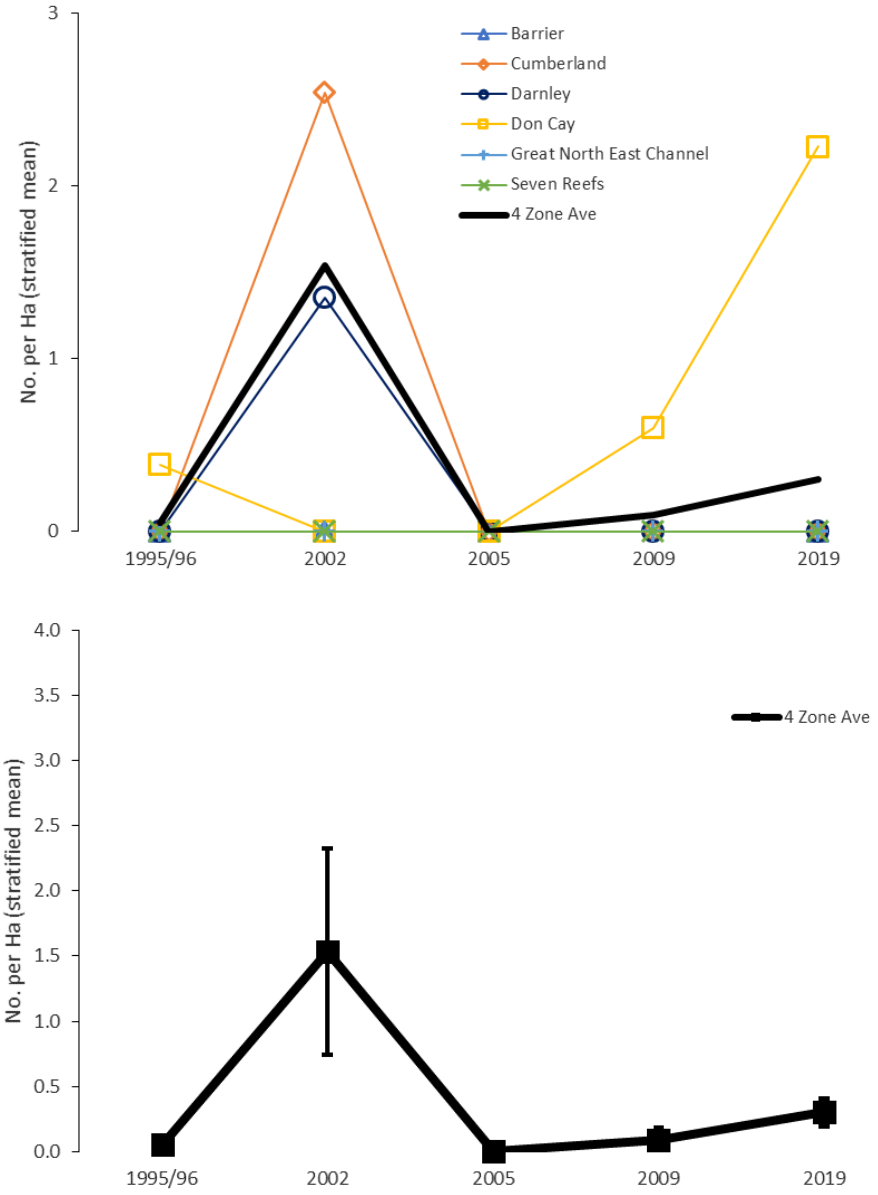

Figure 4-17. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. mauritiana* from five surveys (does not include deep water strata).

4.7.3 Population estimates

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Surf redfish (*A. mauritiana*) in 2019/20 is 13t (Table 4-18).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-18. Stock estimate for A. *mauritiana*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16204.1	0	0	0	0	0	-
Cumberland	50	53665.5	0	0	0	0	0	-
Darnley	89	34808.4	0	0	0	0	0	-
Don Cay	104	17055.6	1.9	0.5	32,542	35.4	24.2	13.0
GNE Channel	6	14472.5	0	0	0	0	0	-
Seven Reefs	33	15117.5	0	0	0	0	0	-
ETS	297	151323.6	0.2	0	32,542	35.4	24.2	13.1

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.7.4 Length frequency

Length frequency for Surf redfish (*A. mauritiana*) was similar in number and size to 2002 (Figure 4-18).

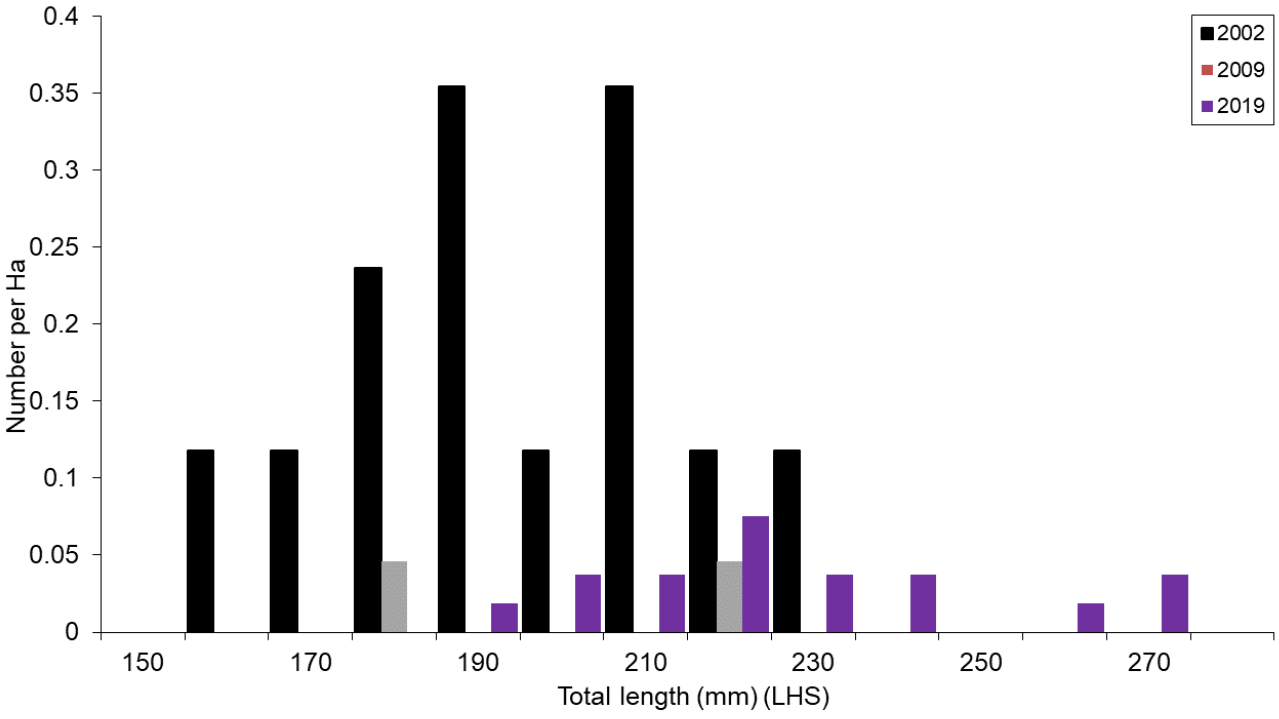

Figure 4-18. Length frequency for *A. mauritiana* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.8 Deepwater redfish (*A. echinites*)

4.8.1 Density

The highest density for Deepwater redfish (*A. echinites*) was for the reef top buffer, for the Darnley zone, which also had the highest overall average zone density (Table 4-19; Figure 4-19).

Table 4-19. Density (No. per ha) for *A. echinites* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	0	0	-	0
Cumberland	0	0	0	0	0
Darnley	3.6	16.4	0	0	6.7
Don Cay	3.9	0.3	0	0	1.3
GNE Channel	0	0	0	-	0
Seven Reefs	0	0	0	0	0
All	1.1	3.5	0	0	1.7

*The current deep-water strata area is assumed to be the same as the reef edge area.

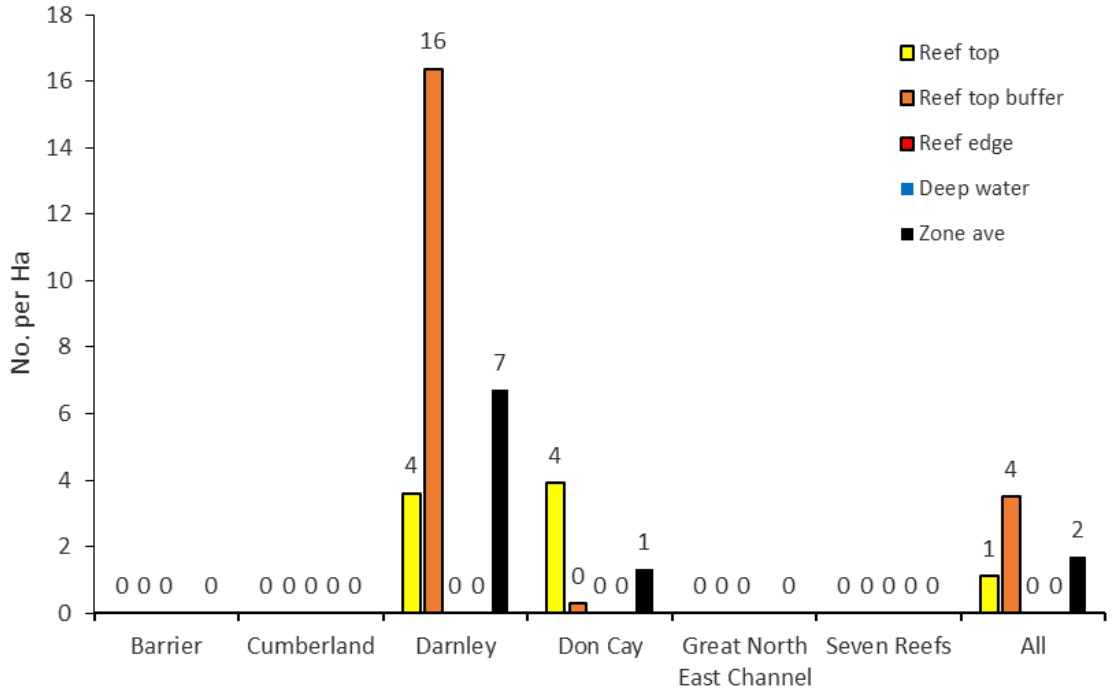

Figure 4-19. Zone and strata average density (No. per ha) for *A. echinites* in 2019/20.

4.8.2 Density trends

The highest zone density for Deepwater redfish (*A. echinites*) was for Darnley, of note was zero found for GNE Channel compared to 2009. The overall average zone density was similar to 2002 to 2009 (Table 4-20; Figure 4-20).

Table 4-20. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. echinites* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.1	0	6.2	3.1	1.5	0	2.2
2002	0.3	1.2	0	0.3	0	0	0.6
2005	0	1.4	0	0	-	0	0.6
2009	-	0	1.9	9.9	20.8	0	2.1
2019	0	0	7.6	1.5	0	0	2.4

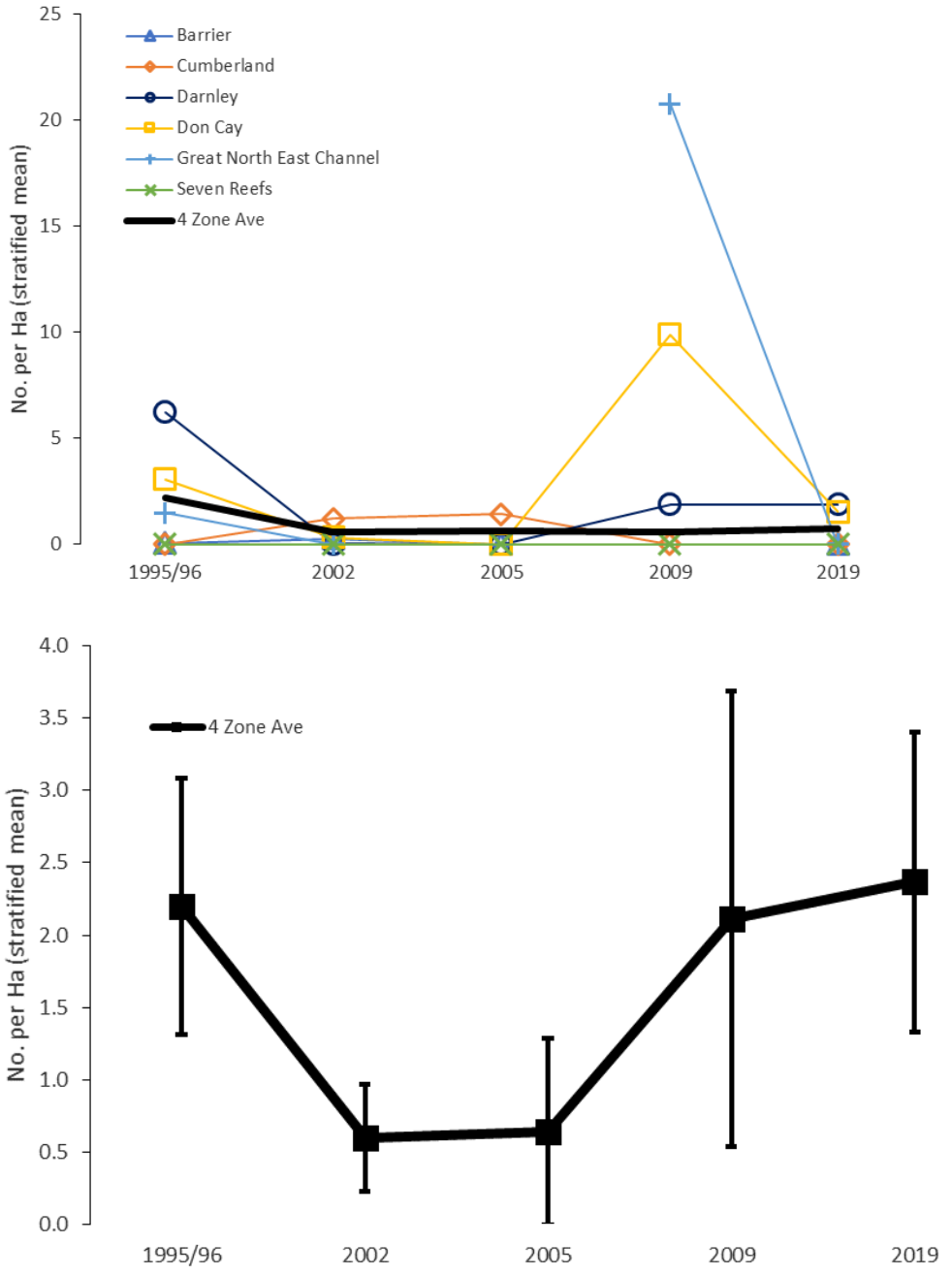

Figure 4-20. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. echinites* from five surveys (does not include deep water strata).

4.8.3 Population estimates

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Deepwater redfish (*A. echinites*) in 2019/20 is 70t (Table 4-21) (Note that deep water strata area is assumed to be the same as the reef edge).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-21. Stock estimate for *A. echinites*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16204.1	0	0	0	0	0	-
Cumberland	50	53665.5	0	0	0	0	0	-
Darnley	89	34808.4	6.7	10.0	233,498	201.1	139.2	54.5
Don Cay	104	17055.6	1.3	1.4	22,481	19.4	13.4	-
GNE Channel	6	14472.5	0	0	0	0	0	-
Seven Reefs	33	15117.5	0	0	0	0	0	-
ETS	297	151323.6	1.7	0.5	255,978	220.5	152.6	66.9

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.8.4 Length frequency

Size frequency for Deepwater redfish (*A. echinites*) were similar in numbers to the 2009 survey, with larger sea cucumbers recorded for 2019/20 (Figure 4-21).

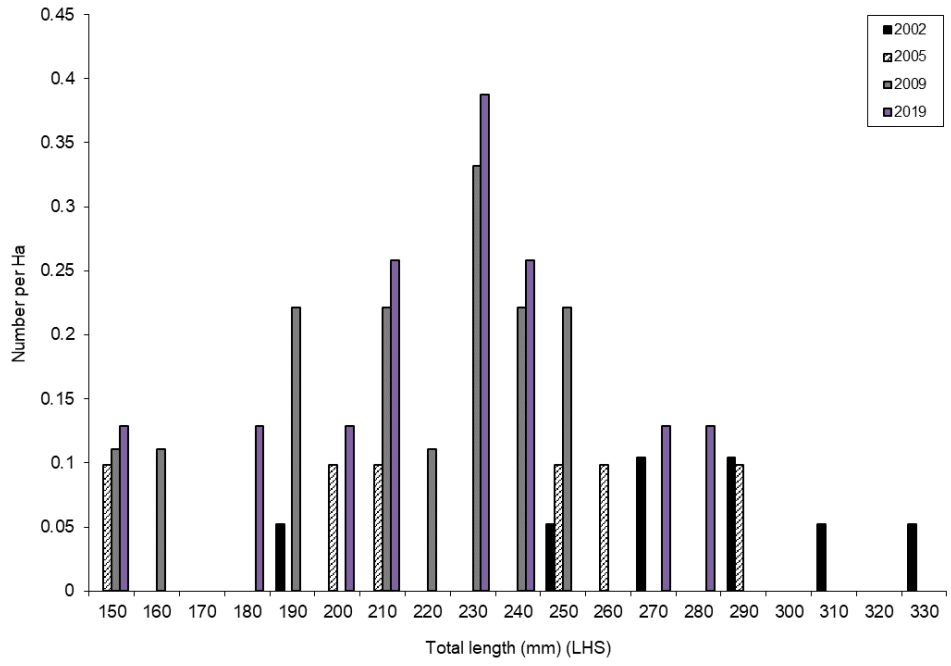

Figure 4-21. Length frequency for A. echinites collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.9 Hairy blackfish (*A. miliaris*)

4.9.1 Density

The highest density for Hairy blackfish (*A. miliaris*) was for the reef top strata, for the Darnley zone, which also had the highest overall zone average. (Table 4-22; Figure 4-22)

Table 4-22. Density (No. per ha) for *A. miliaris* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	0	0	-	0
Cumberland	0	0	0	0	0
Darnley	1.0	0	0	0	0.4
Don Cay	0	0	0	0	0
GNE Channel	0	0	0	-	0
Seven Reefs	0	0	0	0	0
All	0.2	0	0	0	0.1

*The current deep-water strata area is assumed to be the same as the reef edge area.

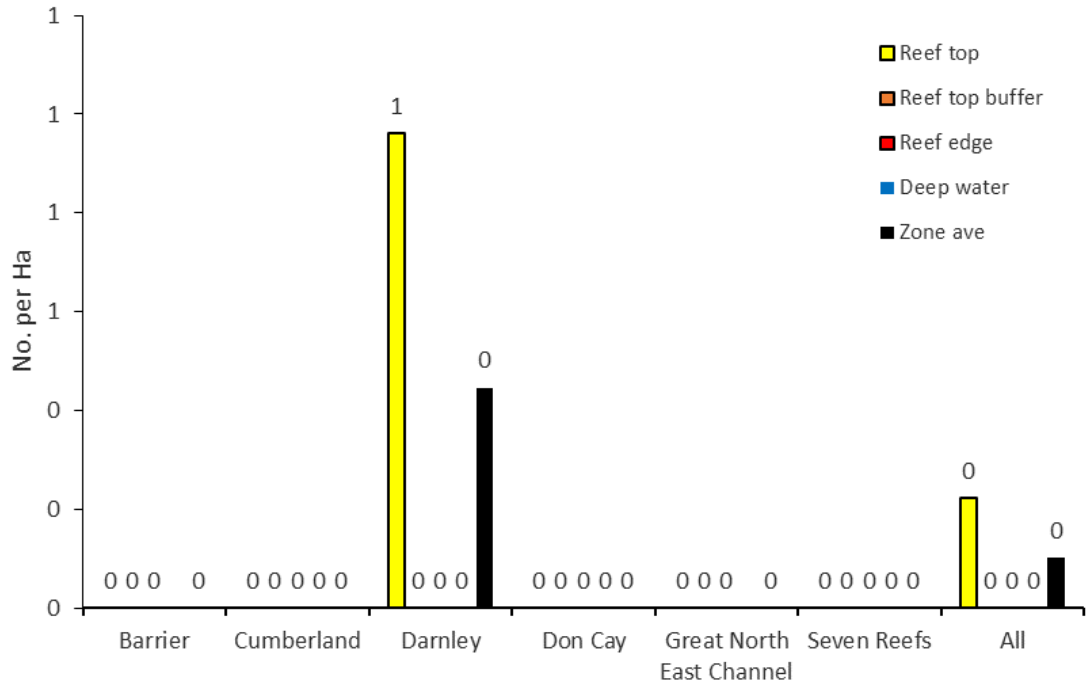

Figure 4-22. Zone and strata average density (No. per ha) for *A. miliaris* in 2019/20.

4.9.2 Density trends

The highest zone density for Hairy blackfish (*A. miliaris*) was for Darnley. The overall average zone density was lowest in 2019 compared to other survey years (Table 4-23; Figure 4-23).

Table 4-23. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. miliaris* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	10.6	0	1.8	0	0.3	0	0.5
2002	0.1	0.7	0.6	1.0	8.3	0.2	0.7
2005	0.4	2.5	0	13.6	-	0	3.0
2009	-	0	4.8	0	0	0	1.5
2019	0	0	0.5	0	0	0	0.1

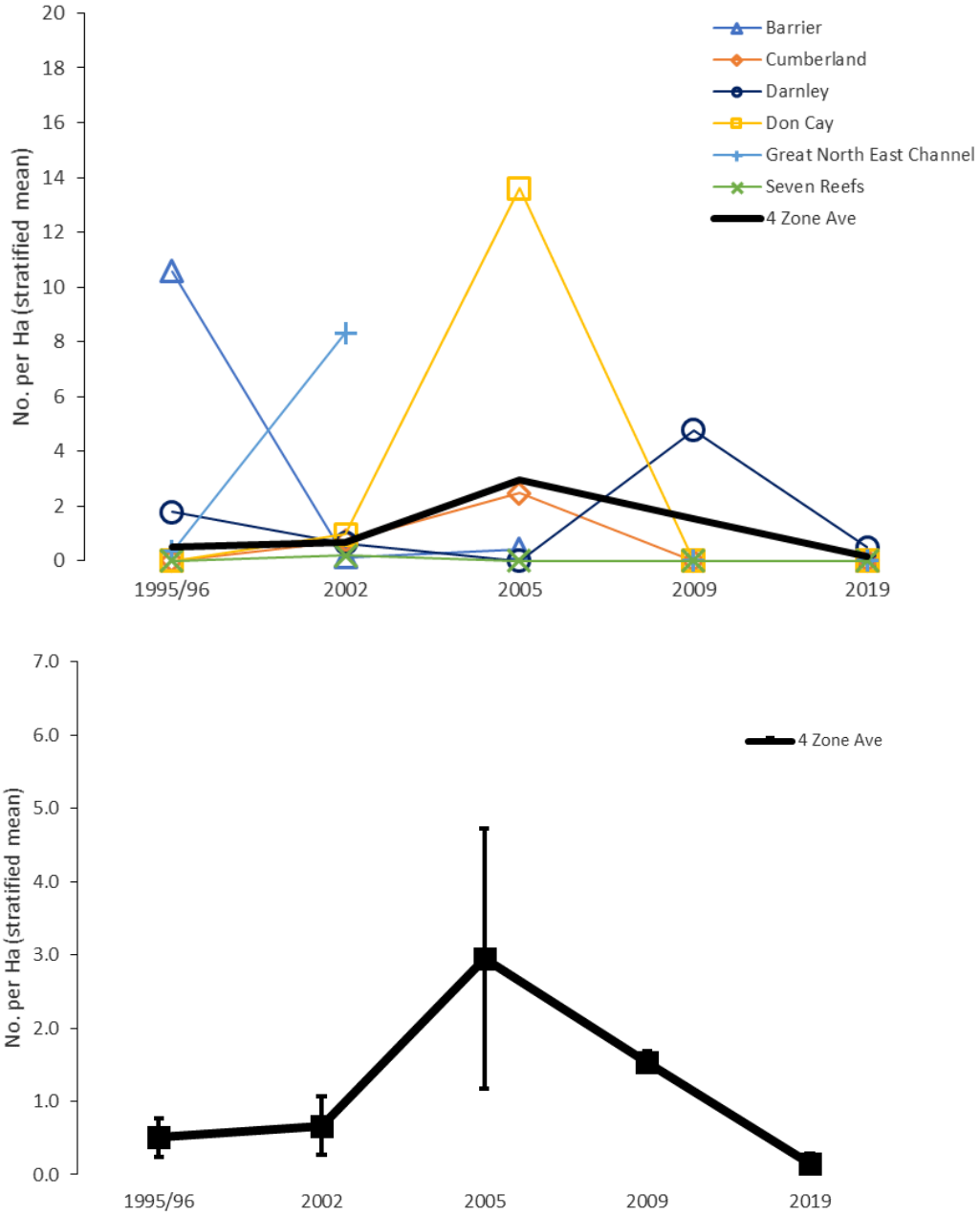

Figure 4-23. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. miliaris* from five surveys (does not include deep water strata).

4.9.3 Population estimate

Fishery biomass population estimate for landed (wet gutted) weight for Hairy blackfish (*A. miliaris*) in 2019/20 is 10t (Table 4-24).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-24. Stock estimate for *A. miliaris*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16204.1	0	0	0	0	0	-
Cumberland	50	53665.5	0	0	0	0	0	-
Darnley	89	34808.4	0.4	0.2	15,547	21.8	10.4	-
Don Cay	104	17055.6	0	0	0	0	0	-
GNE Channel	6	14472.5	0	0	0	0	0	-
Seven Reefs	33	15117.5	0	0	0	0	0	-
ETS	297	151323.6	0.1	0	15,547	21.8	10.4	-

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.9.4 Length frequency

Length frequency numbers for smaller sized Hairy blackfish (*A. milaris*) were low in 2019 compared to previous survey years. Overall numbers were also low compared to the 2009 survey (Figure 4-24).

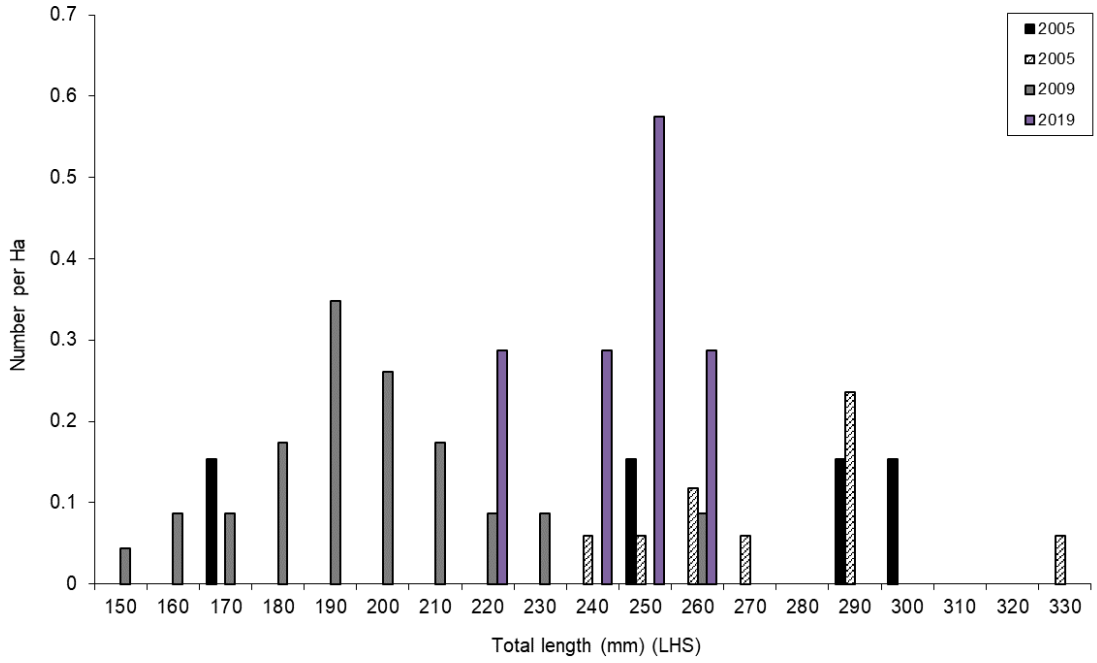

Figure 4-24. Length frequency for *A. miliaris* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.10 Elephant trunkfish (*H. fuscopunctata*)

4.10.1 Density

The highest density for Elephant trunkfish (*H. fuscopunctata*) was for the reef top buffer strata, for the Don Cay zone, which also had the highest overall average zone density (Table 4-25; Figure 4-25).

Table 4-25. Density (No. per ha) for *H. fuscopunctata* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	12.5	0	0	-	2.0
Cumberland	0	0	5.3	3.9	0.8
Darnley	0.2	2.2	2.1	0	1.0
Don Cay	12.5	23.0	12.0	7.6	16.0
GNE Channel	0	0	0	-	0
Seven Reefs	4.0	10.0	6.3	0	5.8
All	1.9	4.6	3.8	3.0	3.1

*The current deep-water strata area is assumed to be the same as the reef edge area.

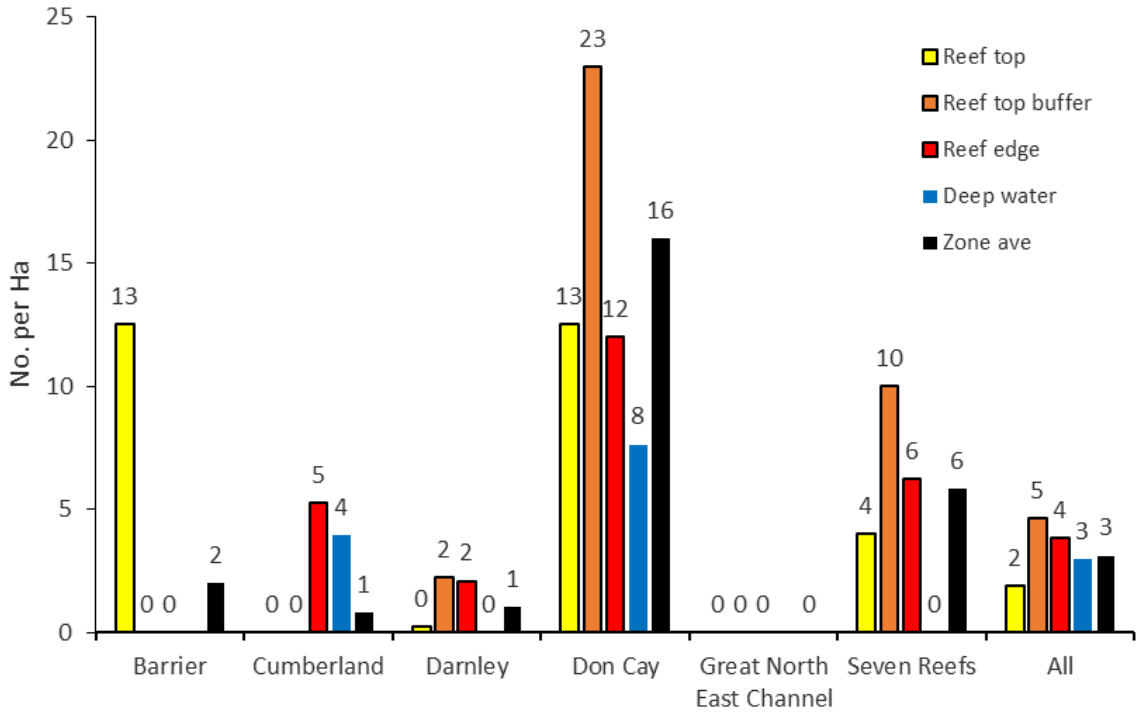

Figure 4-25. Zone and strata average density (No. per ha) for *H. fuscopunctata* in 2019/20.

4.10.2 Density trends

The highest zone density for Elephant trunkfish (*H. fuscopunctata*) was for Don Cay. The overall average zone density was higher in 2019 than the 2009 survey, but less than other survey years (Table 4-26; Figure 4-26).

Table 4-26. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *H. fuscopunctata* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.1	0.2	0	3.6	0	0	0.6
2002	3.1	0.2	0.4	6.5	0	9.1	2.2
2005	1.1	0.8	0	3.0	-	0.6	0.8
2009	-	0.2	0	4.2	0	0	0.7
2019	0.5	0.6	0.5	3.2	0	1.2	1.0

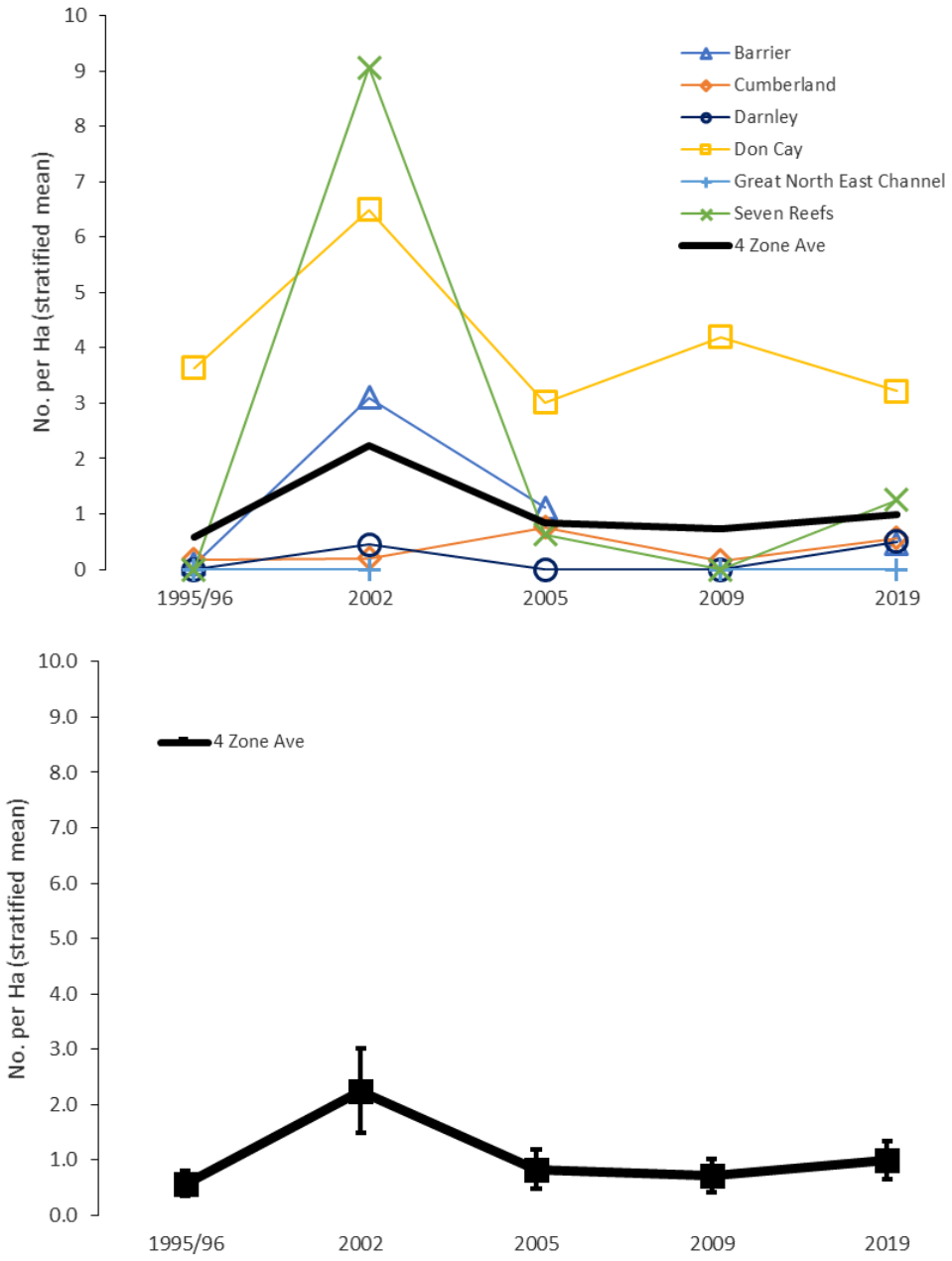

Figure 4-26. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *H. fuscopunctata* from five surveys (does not include deep water strata).

4.10.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Elephant trunkfish (*H. fuscopunctata*) in 2019/20 is 417t (Table 4-27).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-27. Stock estimate for *H. fuscopunctata*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East, Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	2.0	0	32,495	71.3	37.0	37.0
Cumberland	50	53,665.5	0.8	0.2	42,978	94.3	48.9	15.1
Darnley	89	34,808.4	1.0	0.5	36,044	79.1	41.0	4.5
Don Cay	104	17,055.6	16.0	13.0	272,703	598.4	310.6	220.4
GNE Channel	6	14,472.5	0	0	0	0	0	-
Seven Reefs	33	15,117.5	5.8	8.5	87,973	193.0	100.2	34.7
ETS	297	151,323.6	3.1	0.3	472,193	1,036.1	537.8	416.7

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.10.4 Length frequency

Length frequency for Elephant trunkfish (*H. fuscopunctata*) were comparable to previous survey years. A lower number of larger sizes were recorded (Figure 4-27).

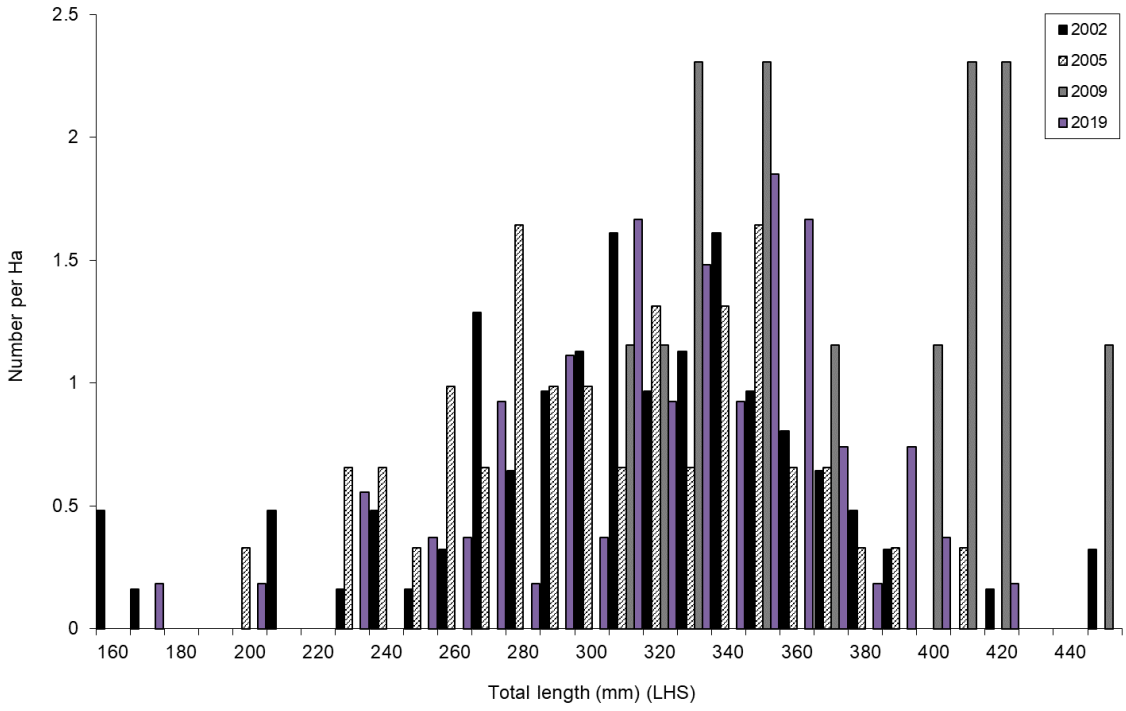

Figure 4-27. Length frequency for *H. fuscopunctata* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.11 Lollyfish (*H. atra*)

4.11.1 Density

The highest density for Lollyfish (*H. atra*) was for the reef top strata, for the Great North East Channel zone, which also had the highest overall average zone density (Table 4-28; Figure 4-28)

Table 4-28. Density (No. per Ha) for *H. atra* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	53.6	25.0	-	37.5
Cumberland	51.1	39.4	9.9	0	40.2
Darnley	48.0	55.1	4.5	0	39.8
Don Cay	59.4	65.9	8.9	5.0	47.0
GNE Channel	1,062.5	250.0	4.2	-	653.1
Seven Reefs	51.7	79.2	54.7	2.7	56.6
All	160.4	74.1	14.9	1.3	100.8

*The current deep-water strata area is assumed to be the same as the reef edge area.

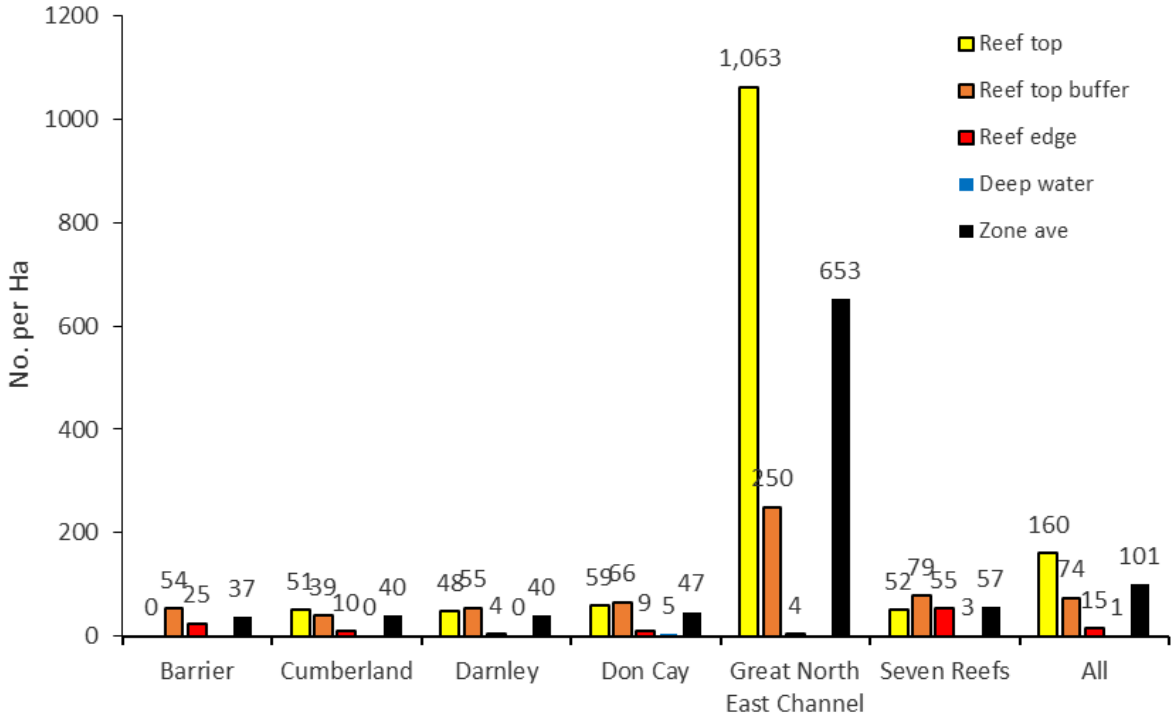

Figure 4-28. Zone and strata average density (No. per ha) for *H. atra* in 2019/20.

4.11.2 Density trends

The highest zone density for Lollyfish (*H. atra*) was for Great North East Channel. The overall average zone density was lower in 2019 than the 2009 survey and similar to other survey years (Table 4-29; Figure 4-29).

Table 4-29. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. atra* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.1	70.6	153.0	30.7	39.1	25.7	79.8
2002	22.7	72.5	26.3	37.0	114.9	47.6	51.4
2005	24.3	53.2	32.6	51.4	-	33.6	44.6
2009	-	123.6	153.0	90.7	123.5	43.8	126.9
2019	37.5	44.0	44.8	54.0	653.1	61.9	47.9

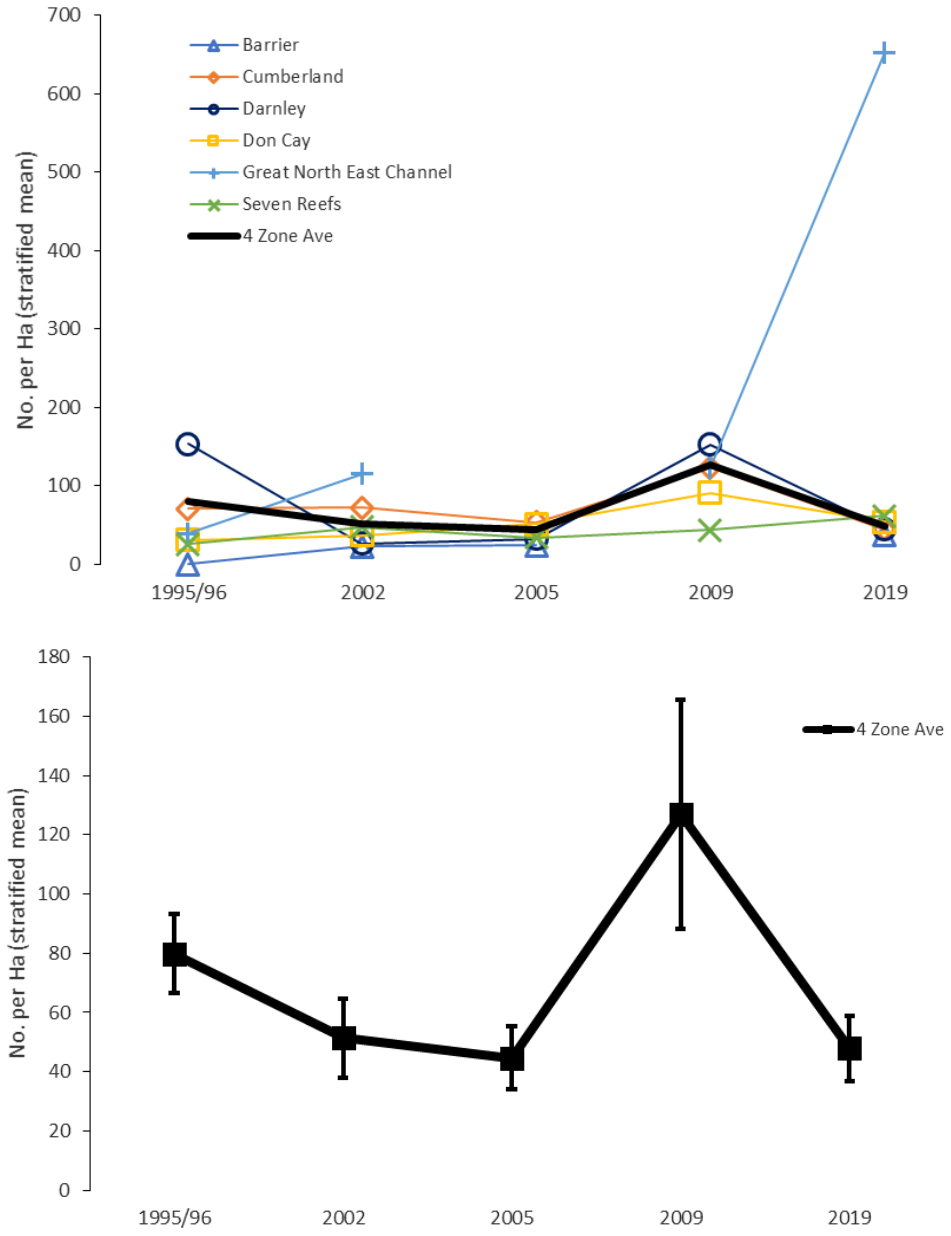

Figure 4-29. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. atra* from five surveys (does not include deep water strata).

4.11.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Lollyfish (*H. atra*) in 2019/20 is 5933t (Table 4-30).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-30. Stock estimate for *H. atra*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	37.5	283.0	606,998	609.3	265.7	105.7
Cumberland	50	53,665.5	40.2	390.1	2,155,440	2,163.7	943.4	340.9
Darnley	89	34,808.4	39.7	152.4	1,382,433	1,387.7	605.1	362.2
Don Cay	104	17,055.6	47.0	85.8	800,805	803.9	350.5	261.3
GNE Channel	6	14,472.5	653.1	1105.9	9,452,392	9,488.7	4,137.1	3,833.8
Seven Reefs	33	15,117.5	56.5	466.6	854,863	858.2	374.2	187.2
ETS	297	151,323.6	100.8	76.2	15,252,931	15,311.6	6,675.9	5,933.1

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.11.4 Length frequency

Length frequency for Lollyfish (*H. atra*) was comparable to previous survey years (Figure 4-30).

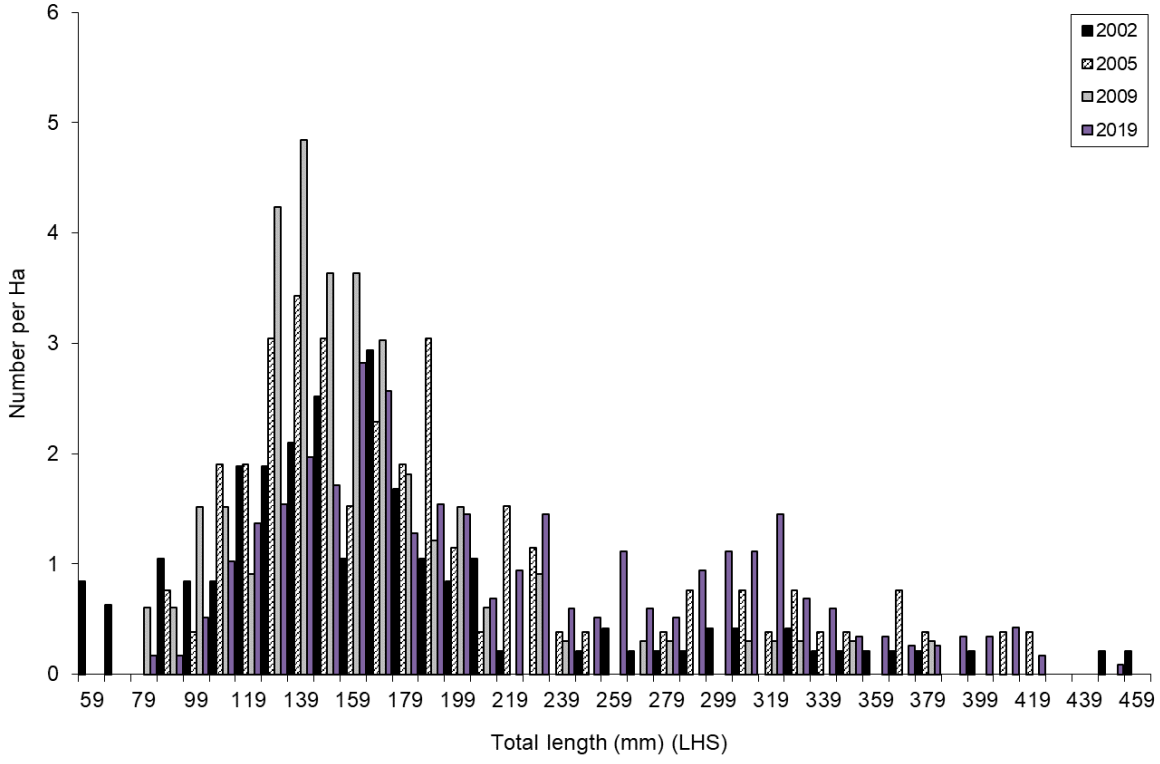

Figure 4-30. Length frequency for *H. atra* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.12 Amberfish (*T. anax*)

4.12.1 Density

The highest density for Amberfish (*T. anax*) was for the deep water strata, for the Don Cay zone, which also had the highest average zone density (Table 4-31; Figure 4-31).

Table 4-31. Density (No. per Ha) for *T. anax* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	0	1.8		0.5
Cumberland	0	0	5.9	7.4	1.2
Darnley	1.0	0	0	0	0.5
Don Cay	7.2	0	4.0	10.3	4.3
GNE Channel	0	0	0		0
Seven Reefs	0	0	12.5	4.1	1.5
All	0.8	0	3.4	5.3	1.2

*The current deep-water strata area is assumed to be the same as the reef edge area.

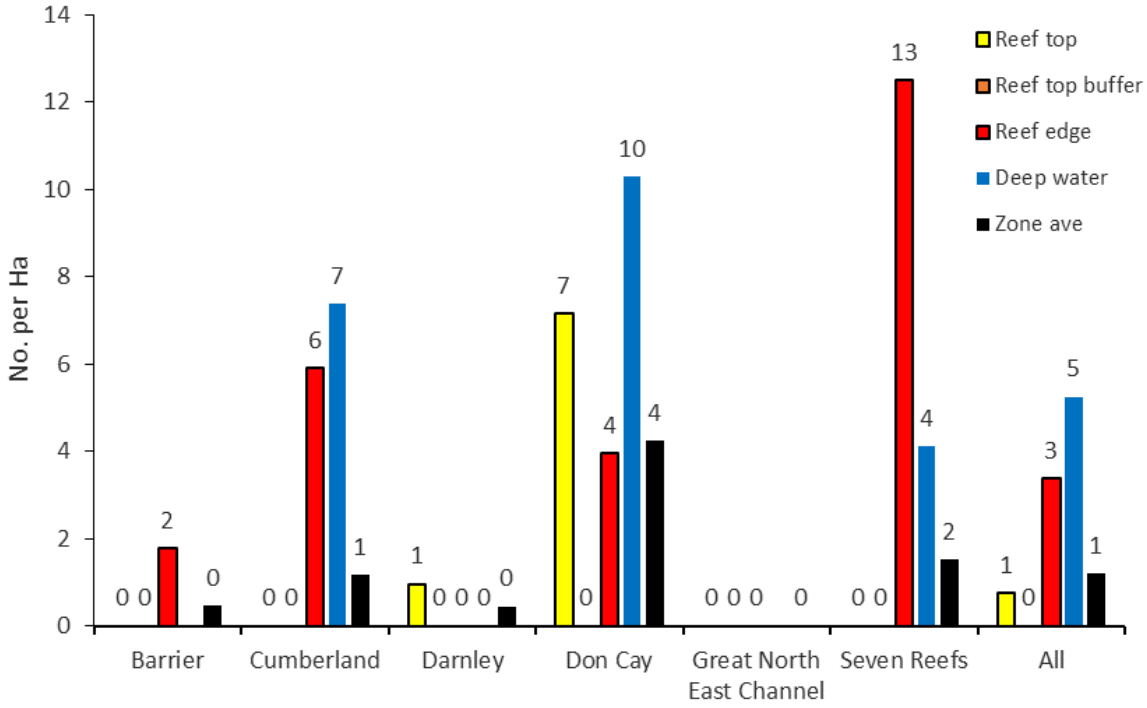

Figure 4-31. Zone and strata average density (No. per ha) for *T. anax* in 2019/20.

4.12.2 Density trends

The highest zone density for Amberfish (*T. anax*) was for Don Cay. The overall average zone density was similar to lower values for other survey years (Table 4-32; Figure 4-32)

Table 4-32. Survey zones and average (stratified) density (No. per Ha) for East Torres Strait (across 4 zones) per reef strata for *T. anax* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.1	0.2	0	3.6	0	0	0.6
2002	3.1	0.2	0.5	6.5	0	9.1	2.3
2005	1.1	0.8	0	3.0	-	0.6	0.8
2009	-	0.2	0	4.2	0	0	0.7
2019	0.5	0.6	0.5	3.2	0	1.3	1.0

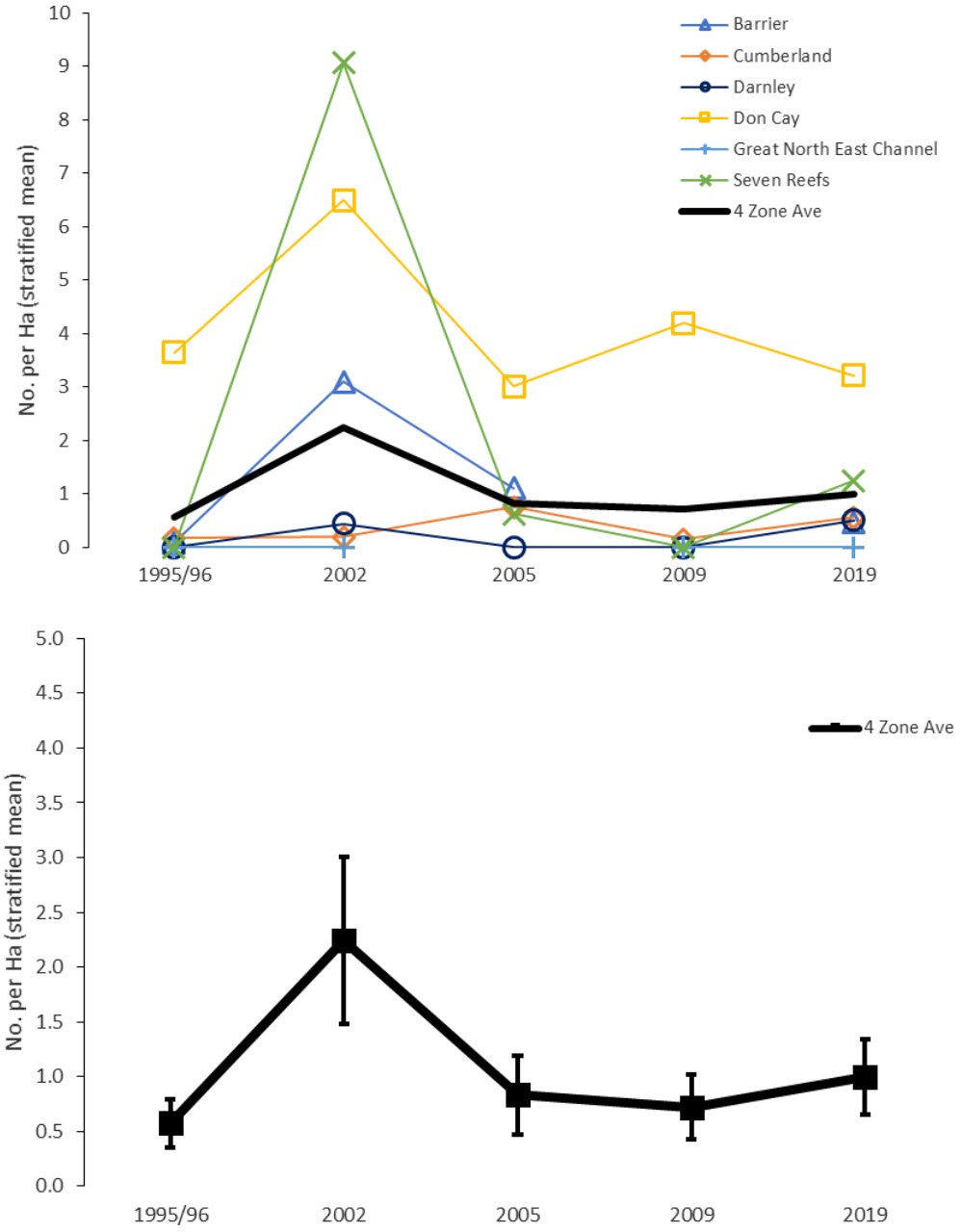

Figure 4-32. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *T. anax* from five surveys (does not include deep water strata).

4.12.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Amberfish (*T. anax*) in 2019/20 is 249t (Table 4-33).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-33. Stock estimate for *T. anax*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	0.5	0.2	7,613	23.3	15.5	-
Cumberland	50	53,665.5	1.2	0.3	62,304	190.3	127.0	55.5
Darnley	89	34,808.4	0.4	0.2	15,547	47.5	31.7	-
Don Cay	104	17,055.6	4.2	3.4	72,289	220.8	147.3	65.0
GNE Channel	6	14,472.5	0	0	0	0	0	-
Seven Reefs	33	15,117.5	1.5	0.4	22,831	69.7	46.5	22.0
ETS	297	151,323.6	1.2	0.1	180,585	551.7	368.0	248.2

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.12.4 Length frequency

Length frequency for Amberfish (*T. anax*) in 2019 was comparable to 2005 with fewer larger measurements recorded (Figure 4-33).

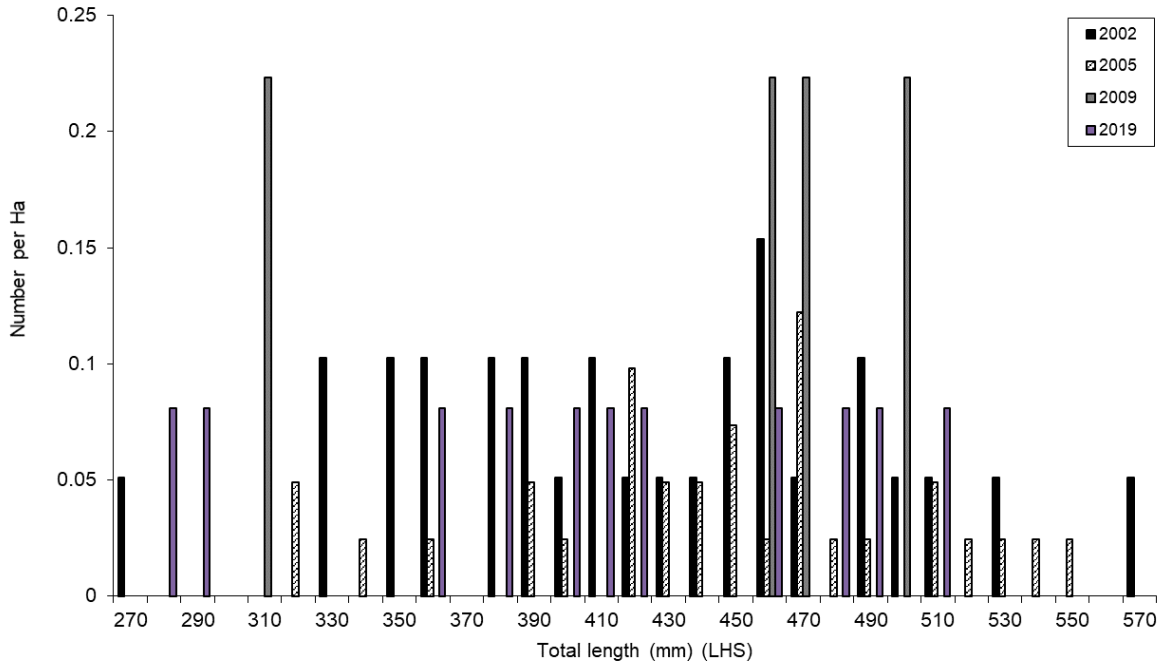

Figure 4-33. Length frequency for *T. anax* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.13 Greenfish (*S. chloronotus*)

4.13.1 Density

The highest density for Greenfish (*S. chloronotus*) was for the reef top buffer strata, for the Barrier zone, which also had the highest overall zone average (Table 4-34; Figure 4-34).

Table 4-34. Density (No. per ha) for *S. chloronotus* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	160.7	0	-	92.7
Cumberland	21.8	69.4	0	0	29.9
Darnley	5.6	22.3	0	0	9.5
Don Cay	12.5	28.2	5.9	0	16.1
GNE Channel	62.5	0	8.3	-	34.2
Seven Reefs	0	41.7	3.1	-	14.0
All	18.8	61.0	1.7	0	29.2

*The current deep-water strata area is assumed to be the same as the reef edge area.

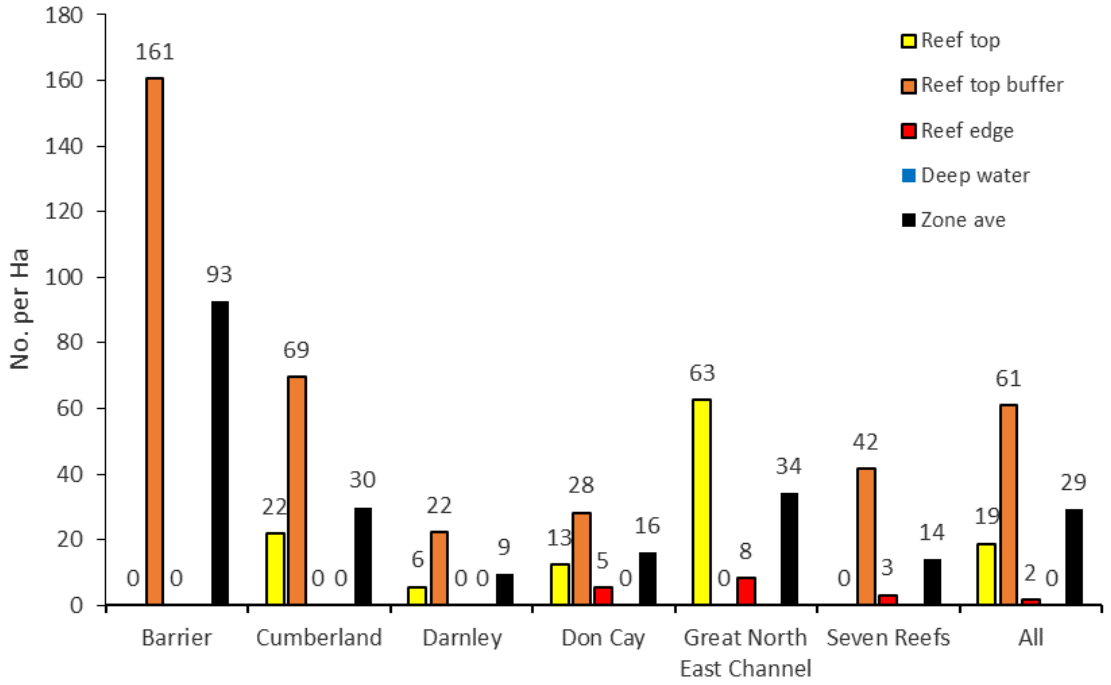

Figure 4-34. Zone and strata average density (No. per ha) for *S. chloronotus* in 2019/20.

4.13.2 Density trends

The highest zone and survey density for Greenfish (*S. chloronotus*) was for Barrier. The overall zone average was lowest compared to other survey years and notably different to 2009 (Table 4-35; Figure 4-35).

Table 4-35. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *S. chloronotus* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	25.8	38.4	29.3	3.0	51.5	0	26.1
2002	0.4	45.3	18.4	20.5	71.4	0	28.5
2005	14.4	34.7	59.8	27.5	-	0	36.5
2009	-	173.7	98.7	145.2	139.6	0	142.7
2019	92.7	32.7	11.0	18.8	34.3	15.4	22.4

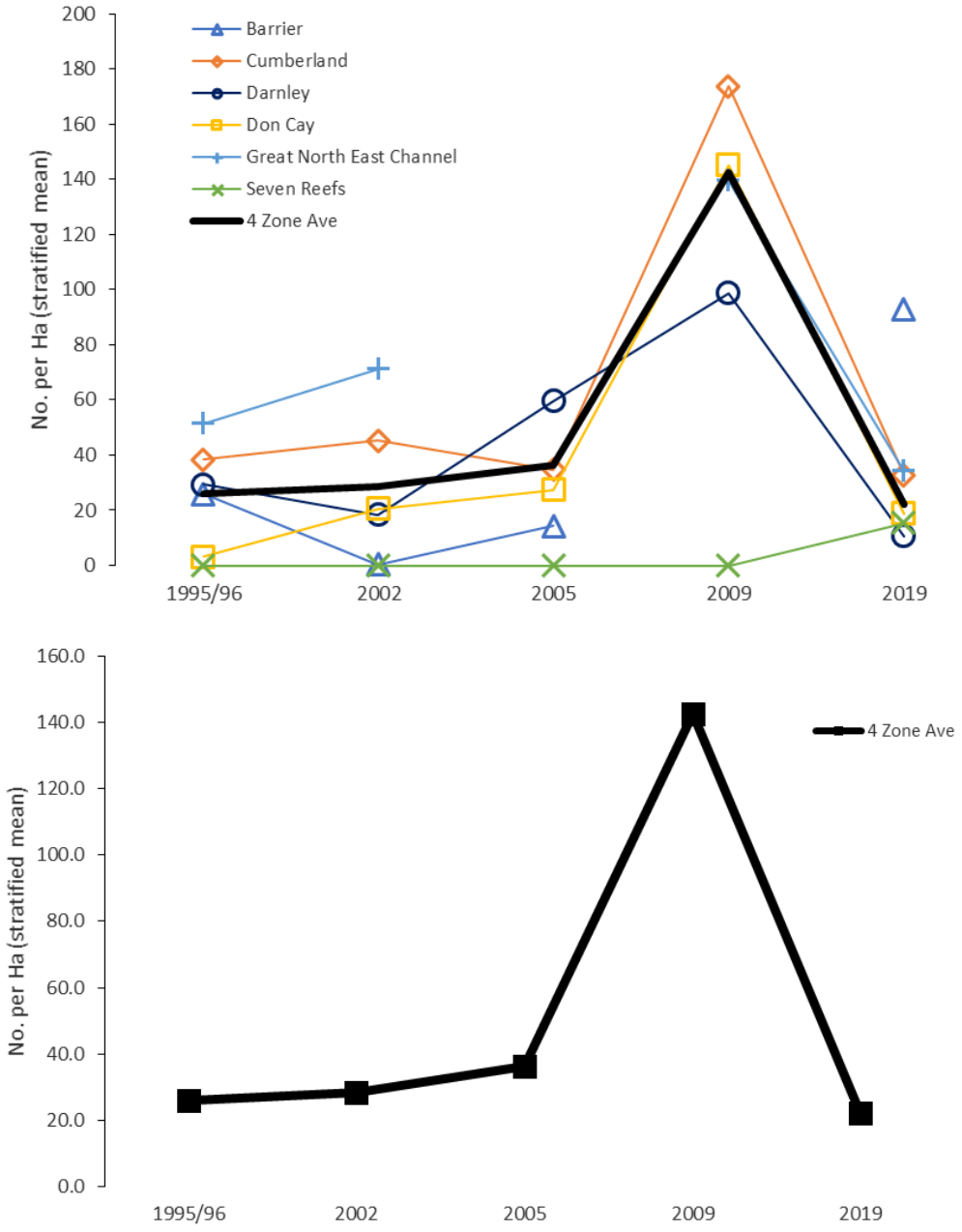

Figure 4-35. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *S. chloronotus* from five surveys (does not include deep water strata).

4.13.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Greenfish (*S. chloronotus*) in 2019/20 is 706t (Table 4-36).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-36. Stock estimate for *S. chloronotus*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	92.6	11.1	1,501,241	545.3	355.0	93.7
Cumberland	50	53,665.5	29.9	1.6	1,602,201	582.0	378.9	222.6
Darnley	89	34,808.4	9.5	0.4	329,595	119.7	77.9	35.1
Don Cay	104	17,055.6	16.1	0.4	274,246	99.6	64.8	43.1
GNE Channel	6	14,472.5	34.2	12.6	495,532	180.0	117.2	-
Seven Reefs	33	15,117.5	14.0	1.4	211,985	77.0	50.1	-
ETS	297	151,323.6	29.2	0.5	4,414,801	1,603.6	1,043.9	706.0

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

Length frequency for Greenfish (*S. chloronotus*) was comparable to previous survey years (Figure 4-36).

4.13.4 Length frequency

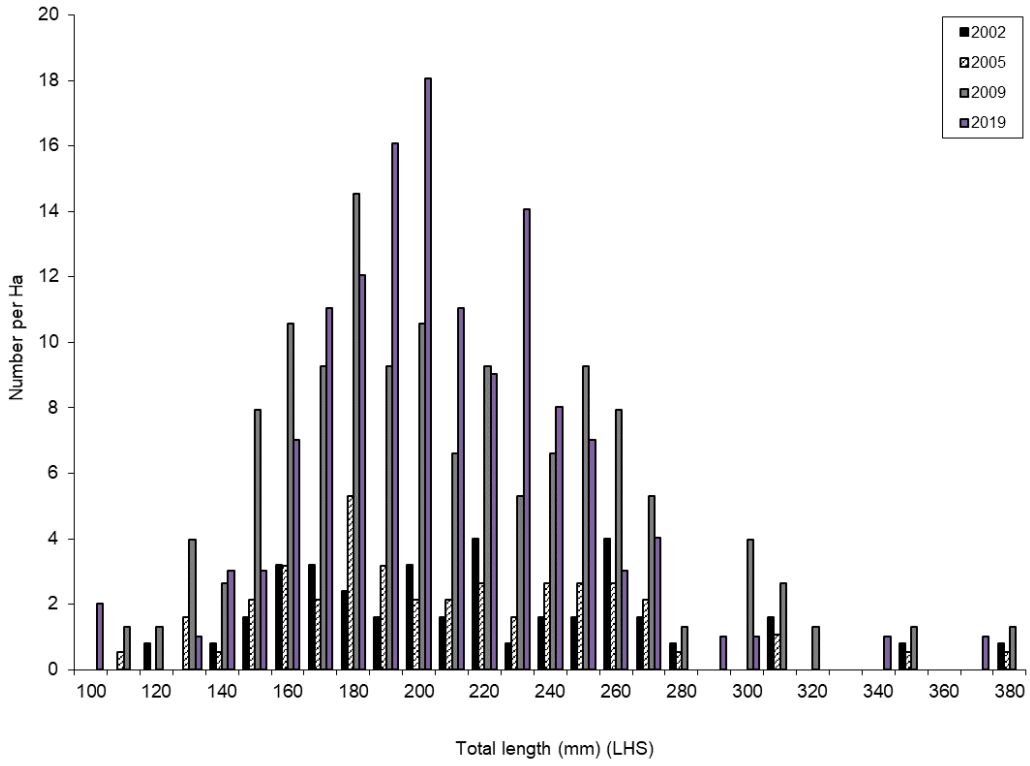

Figure 4-36. Length frequency for *S. chloronotus* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.14 Leopardfish (*B. argus*)

4.14.1 Density

The highest density for Leopardfish (*B. argus*) was for the reef top strata, for the Don Cay zone, which also had the highest overall zone average (Table 4-37; Figure 4-37).

Table 4-37. Density (No. per Ha) for *B. argus* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	12.5	0	25.0	-	8.6
Cumberland	2.8	4.5	8.6	0	3.5
Darnley	2.3	4.5	9.8	0	3.6
Don Cay	58.6	21.5	10.3	0	28.1
GNE Channel	0	0	33.3	-	4.0
Seven Reefs	0	1.3	4.7	0	0.8
All	6.6	5.2	14.9	0	6.6

*The current deep-water strata area is assumed to be the same as the reef edge area.

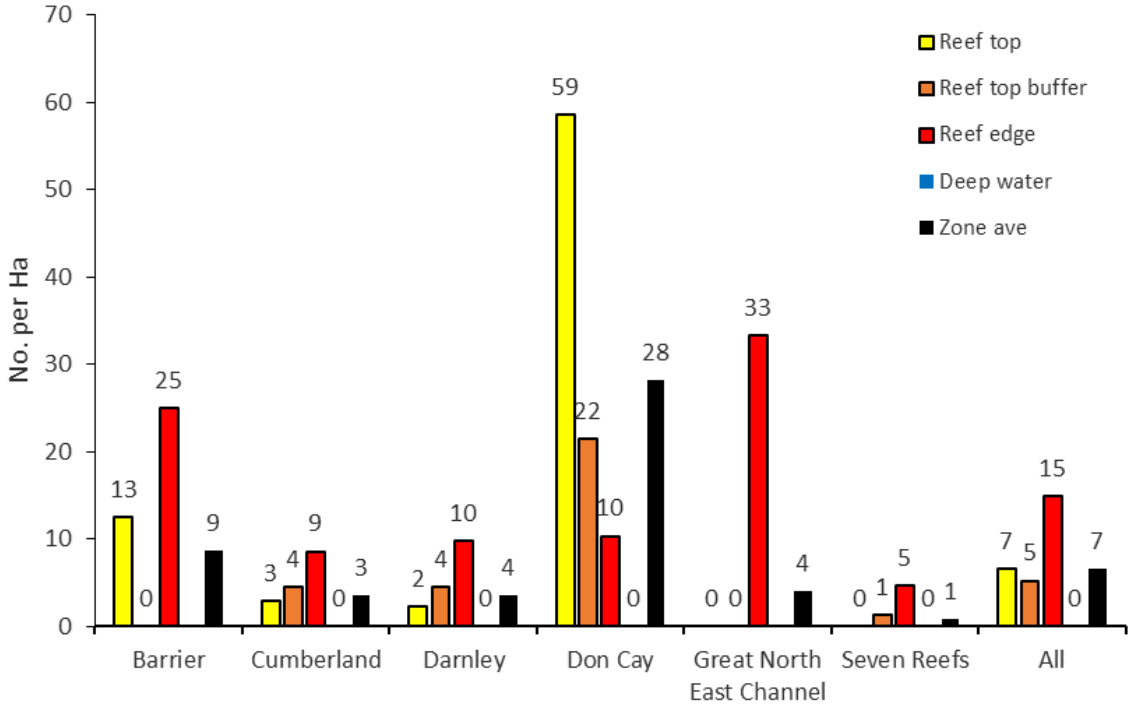

Figure 4-37. Zone and strata average density (No. per Ha) for *B. argus* in 2019/20.

4.14.2 Density trends

The highest zone density for Leopardfish (*B. argus*) was for Great North East Channel. The overall zone average was lower in 2019 than the 2009 survey, and similar to 2005 (Table 4-38; Figure 4-38).

Table 4-38. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *B. argus* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	3.8	3.8	5.0	4.8	21.9	0	3.7
2002	7.7	3.5	6.7	22.2	6.8	0	6.5
2005	10.4	12.8	0.7	21.7	-	0	8.9
2009	-	6.0	22.9	13.4	17.0	43.8	13.1
2019	8.6	3.8	4.0	32.9	34.0	0.9	7.4

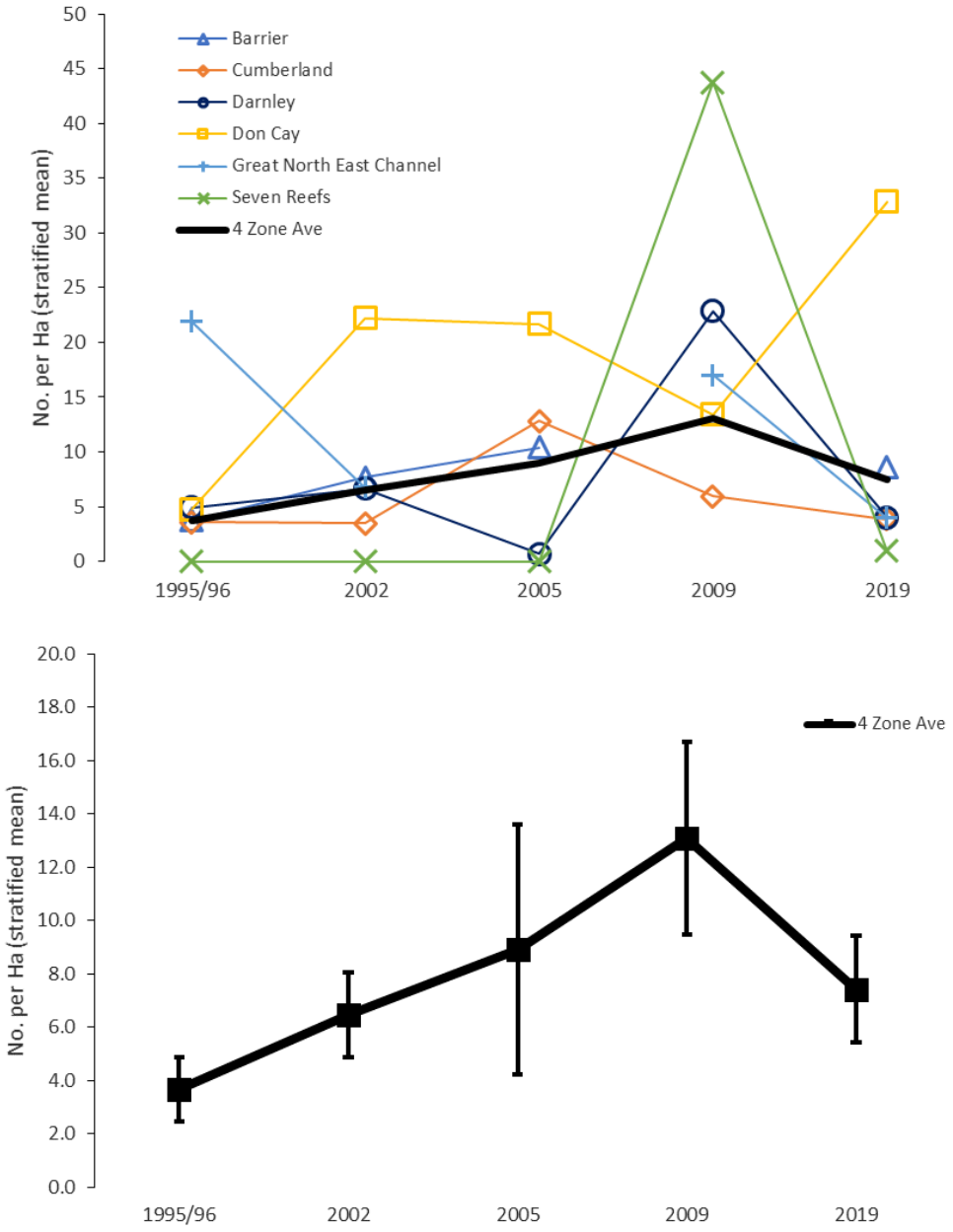

Figure 4-38. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *B. argus* from five surveys (does not include deep water strata).

4.14.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Leopardfish (*B. argus*) in 2019/20 is 522t (Table 4-39).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-39. Stock estimate for *B. argus*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	8.6	10.8	139,080	154.4	102.7	49.9
Cumberland	50	53,665.5	3.5	4.2	187,594	208.2	138.5	33.2
Darnley	89	34,808.4	3.6	2.8	123,678	137.3	91.3	36.0
Don Cay	104	17,055.6	28.1	108.4	480,009	532.8	354.3	185.2
GNE Channel	6	14,472.5	4.0	10.5	57,192	63.5	42.2	-
Seven Reefs	33	15,117.5	0.8	0.3	12,672	14.1	9.4	1.9
ETS	297	151,323.6	6.6	2.3	1,000,226	1,110.3	738.3	522.0

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.14.4 Length frequency

The length frequency for Leopardfish (*B. argus*) was comparable to the 2009 survey year, with lower numbers of larger numbers recorded (Figure 4-39).

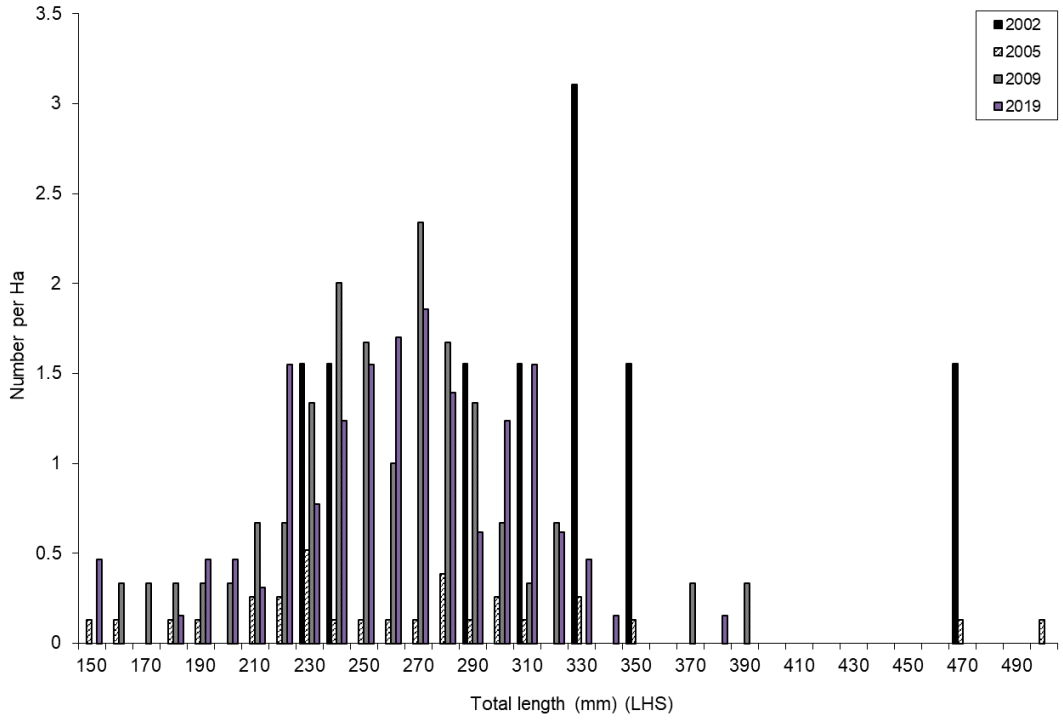

Figure 4-39. Length frequency for *B. argus* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.15 Pinkfish (*H. edulis*)

4.15.1 Density

The highest density for Pinkfish (*H. edulis*) was for the reef edge strata, for the Darnley zone, which also had the highest overall zone average (Table 4-40; Figure 4-40).

Table 4-40. Density (No. per Ha) for *H. edulis* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	25.0	0	1.8	-	4.5
Cumberland	0	24.3	36.2	0	9.2
Darnley	2.2	6.7	44.1	0	8.1
Don Cay	25.3	9.4	26.5	2.6	15.7
GNE Channel	0	0	54.2	-	6.4
Seven Reefs	8.2	0	12.5	0	5.1
All	4.2	9.2	28.6	0.5	8.5

*The current deep-water strata area is assumed to be the same as the reef edge area.

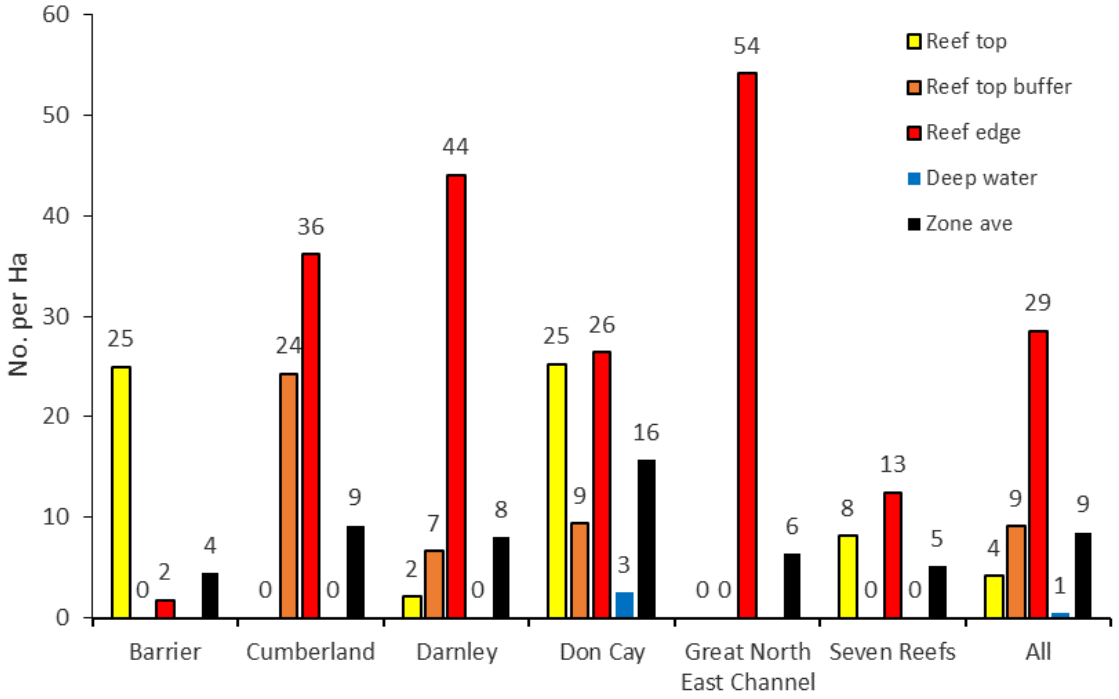

Figure 4-40. Zone and strata average density (No. per Ha) for H. edulis in 2019/20.

4.15.2 Density trends

The highest zone and survey density for Pinkfish (*H. edulis*) was for Don Cay, with Seven Reefs showing a notable drop between the last two surveys. The overall zone average was similar to 2009 (Table 4-41; Figure 4-41).

Table 4-41. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. edulis* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0.1	14.0	4.6	10.0	9.2	0	9.0
2002	2.8	19.1	7.5	39.8	35.5	26.1	19.5
2005	2.7	24.4	7.5	31.4	-	1.4	17.6
2009	-	9.8	16.8	1.7	15.1	93.8	11.8
2019	4.5	10.1	9.1	17.9	6.4	5.6	10.3

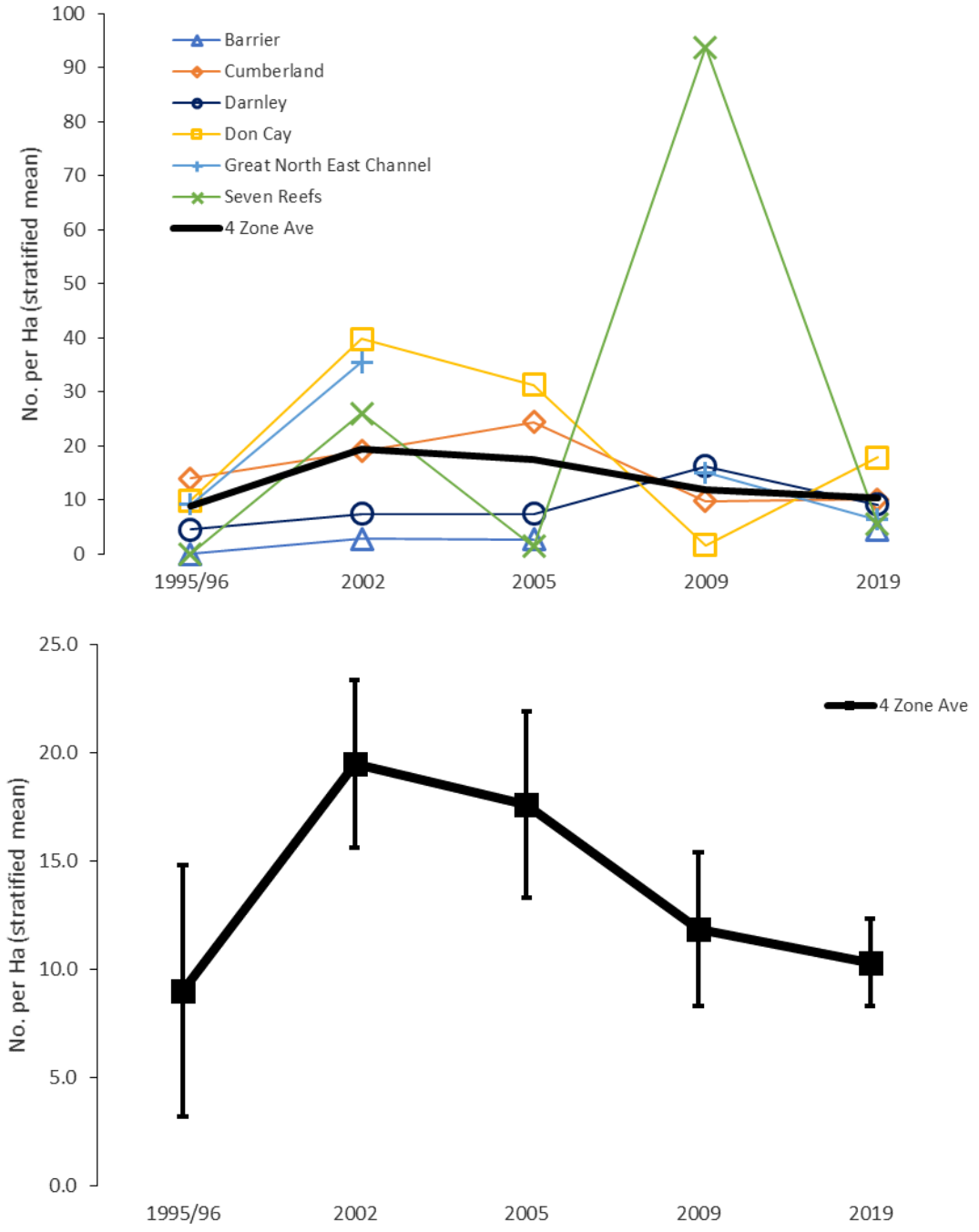

Figure 4-41. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. edulis* from five surveys (does not include deep water strata).

4.15.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Pinkfish (*H. edulis*) in 2019/20 is 87t (Table 4-42).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-42. Stock estimate for *H. edulis*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	4.5	0.2	72,604	14.7	6.4	5.5
Cumberland	50	53,665.5	9.2	9.6	494,238	99.9	43.6	24.5
Darnley	89	34,808.4	8.1	8.4	281,440	56.9	24.8	13.3
Don Cay	104	17,055.6	15.7	21.2	268,009	54.2	23.6	14.7
GNE Channel	6	14,472.5	6.4	25.1	92,937	18.8	8.2	-
Seven Reefs	33	15,117.5	5.1	16.3	77,377	15.6	6.8	-
ETS	297	151,323.6	8.5	2.3	1,286,605	260.1	113.4	87.3

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.15.4 Length frequency

The length frequency for Pinkfish (*H. edulis*) was comparable to previous survey years with a higher number of larger sizes recorded. Overall numbers were lower (Figure 4-42).

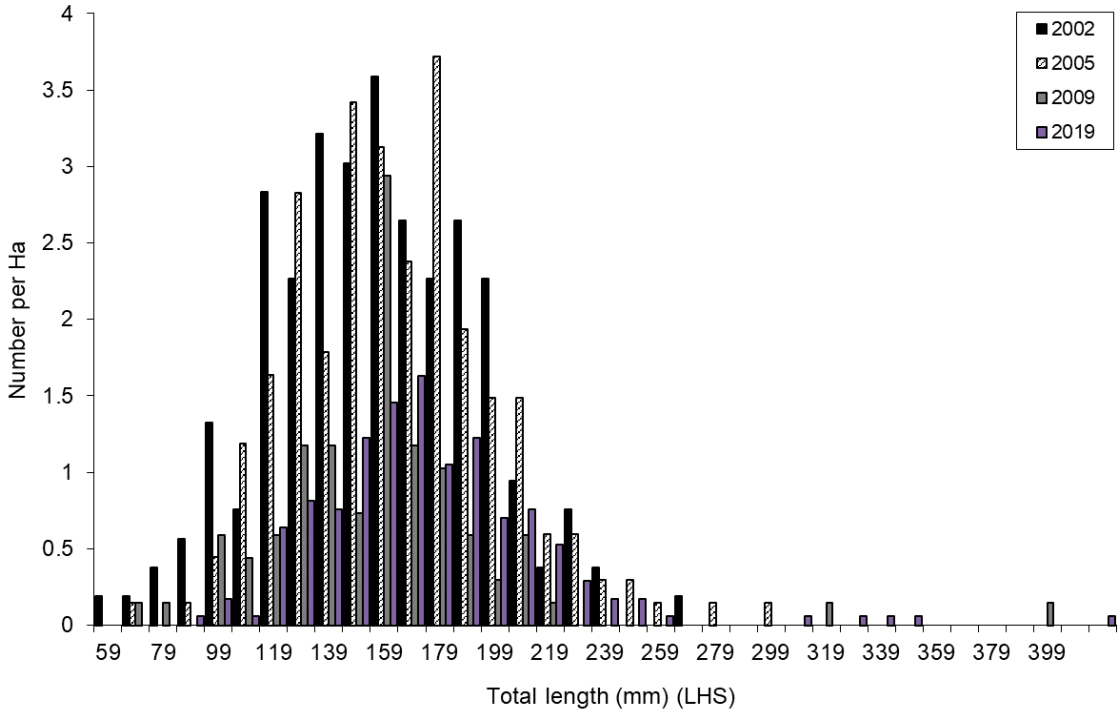

Figure 4-42. Length frequency for *H. edulis* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

4.16 Deepwater blackfish (*A. palauensis*)

4.16.1 Density

The highest density for Deepwater blackfish (*A. palauensis*) was for the reef top buffer strata, for the Barrier zone, which also had the highest overall average zone density (Table 4-43; Figure 4-43)

Table 4-43. Density (No. per ha) for *A. palauensis* in each zone and strata in 2019/20 (GNE = Great North East).

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	8.9	5.4	-	6.6
Cumberland	0	0	0	0	0
Darnley	0	0	0.9	0	0.1
Don Cay	0.8	1.5	7.2	0	1.9
GNE Channel	0	0	0	-	0
Seven Reefs	0	2.5	1.6	0	1.0
All	0.1	2.1	2.5	0	1.0

*The current deep-water strata area is assumed to be the same as the reef edge area.

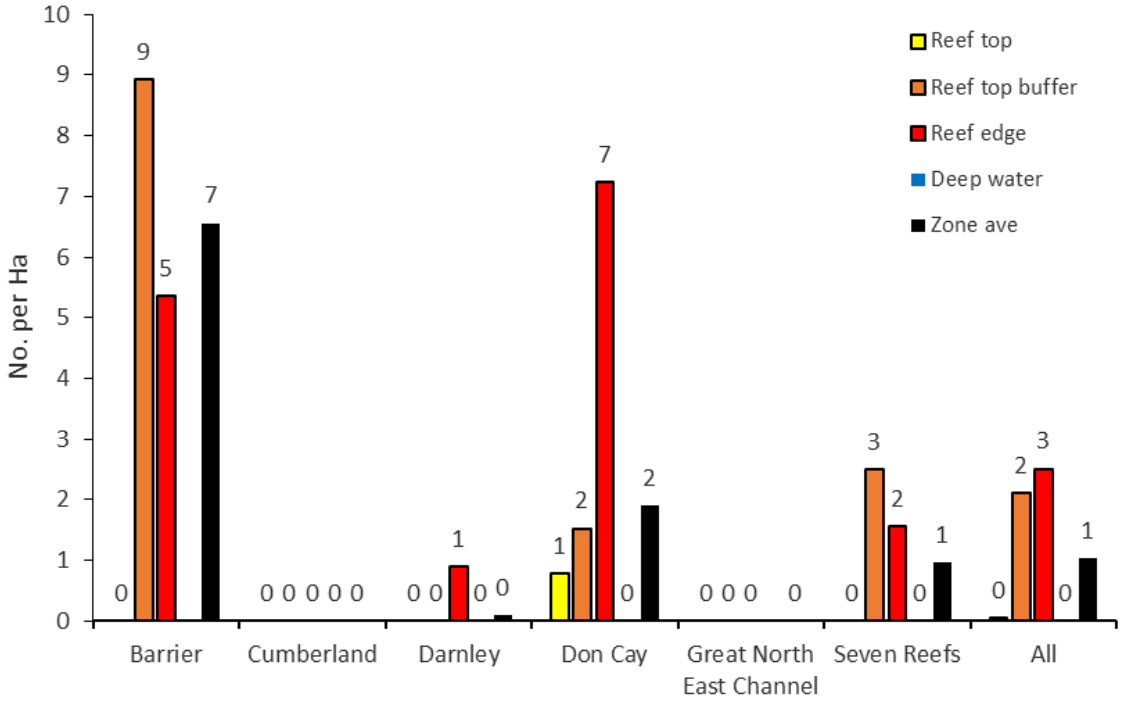

Figure 4-43. Zone and strata average density (No. per ha) for A*. palauensis* in 2019/20.

4.16.2 Density trends

The highest zone density for Deepwater blackfish (*A. palauensis*) was for Barrier (Table 4-44; Figure 4-44).

Table 4-44. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. palauensis* for five surveys (does not include deep water strata) (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2005	0	0	0	0	-	0	0
2009	-	0	0	0	0	0	0
2019	6.6	0	0.1	2.2	0	1.1	0.5

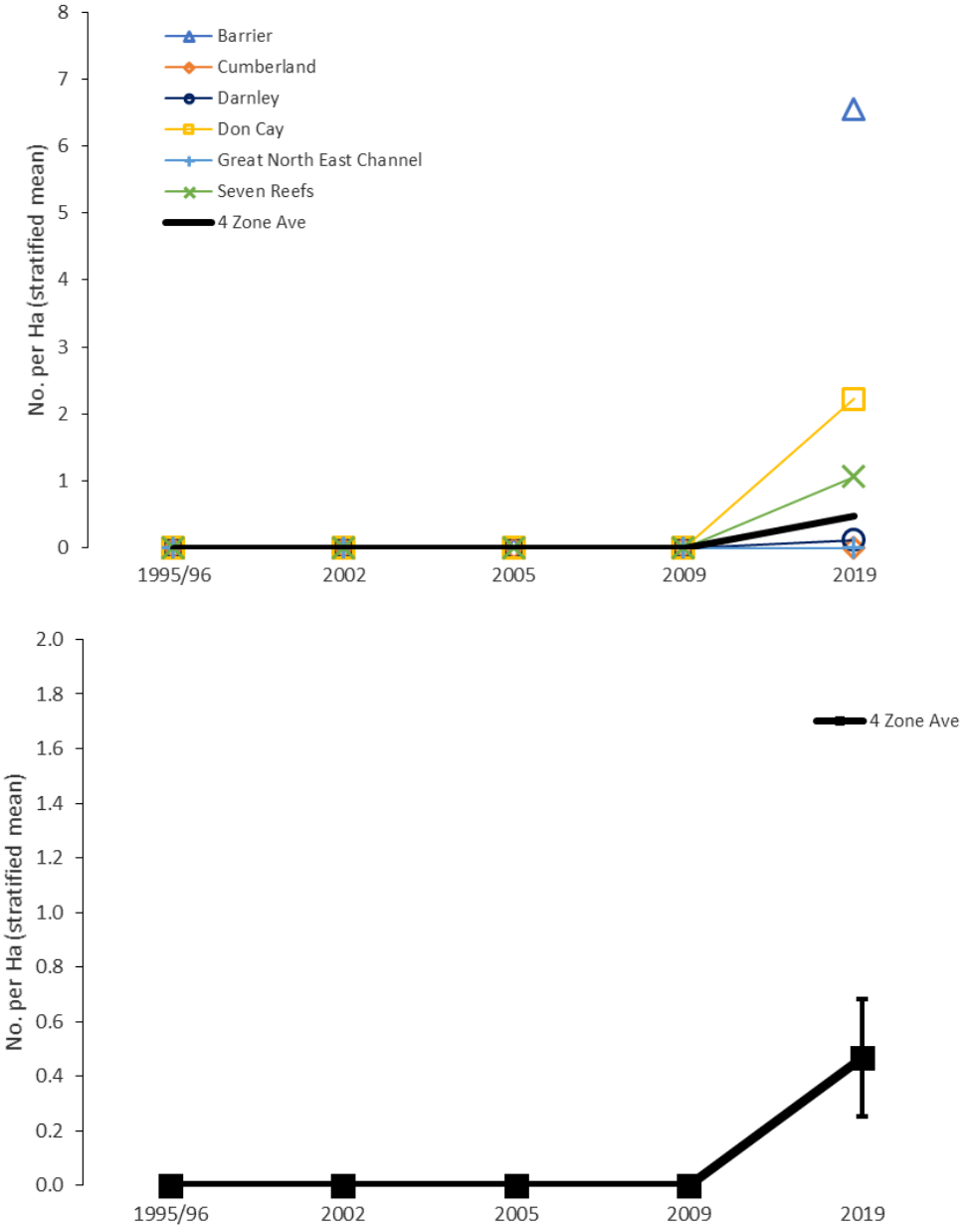

Figure 4-44. Zone and East Torres Strait (4 zone) average (stratified) density (No. per Ha) for reef strata for *A. palauensis* from five surveys (does not include deep water strata).

4.16.3 Population estimate

Fishery biomass population estimate (lower 90th percentile as gutted weight) for Deepwater blackfish (*A. palauensis*) in 2019/20 is 30t (Table 4-45).

(Note: Deep water strata area is assumed to be the same as the reef edge).

Table 4-45. Stock estimate for *A. palauensis*. For each Zone and for East Torres Strait, the number of sites, total area of fishery habitat, stratified mean density, stratified variance, population stock estimate (numbers and weight) and the lower 90th percentile of the stock estimate in whole live weight, and landed (wet gutted) weight (fishery biomass, B) (ETS = East Torres Strait, GNE = Great North East; Wt = Weight).

Zone	Sites	Total area (Ha)	Mean density	Var (st)	Number of individuals	Live Wt survey (t)	Wet Wt gutted (t)	L90th *B* (t) Wet Wt gutted
Barrier	15	16,204.1	6.6	27.4	106,242	152.8	73.3	-
Cumberland	50	53,665.5	0	0	0	0	0	-
Darnley	89	34,808.4	0.1	0.0	3,543	5.1	2.4	-
Don Cay	104	17,055.6	1.9	1.2	32,396	46.6	22.4	5.4
GNE Channel	6	14,472.5	0	0	0	0	0	-
Seven Reefs	33	15,117.5	1.0	0.7	14,609	21.0	10.1	-
East Torres Strait	297	151,323.6	1.0	0.3	156,790	225.5	108.2	30.2

*Weight statistics calculated using average weight data for species for survey year, or across survey years.

4.16.4 Length frequency

Length frequency for Deepwater blackfish (*A. palauensis*) showed fewer smaller and larger sizes were recorded (Figure 4-45).

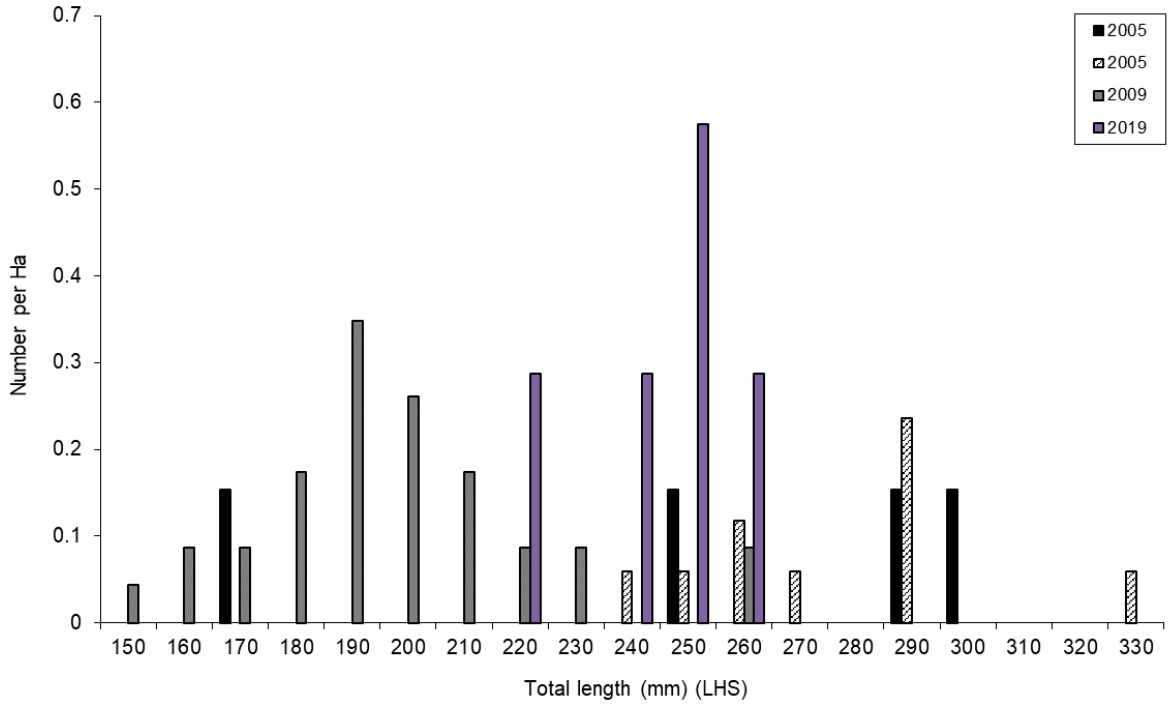

Figure 4-45. Length frequency for *A. palauensis* collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019.

5 Catch data

5.1 Catch Disposal Records

Catch data were obtained from Catch Disposal Records (CDR) as part of the Fish Receiver System implemented in 2017 for the TSBDMF. Catch per Unit Effort (CPUE) calculations used standard weight (conversion ratio applied). For multi-species fisheries where species targeted change according to factors such as markets, locations and weather conditions, CPUE outcomes need to be interpreted with caution. Moreover, in most cases, there are currently too few data for these to be considered reliable.

5.1.1 Mean catch

Mean recorded catch for sea cucumber species (combined fisher records) showed an apparent decline for *T. ananas*, combined Curryfish species and *S. chloronotus* (**Error! Reference source not found.**).

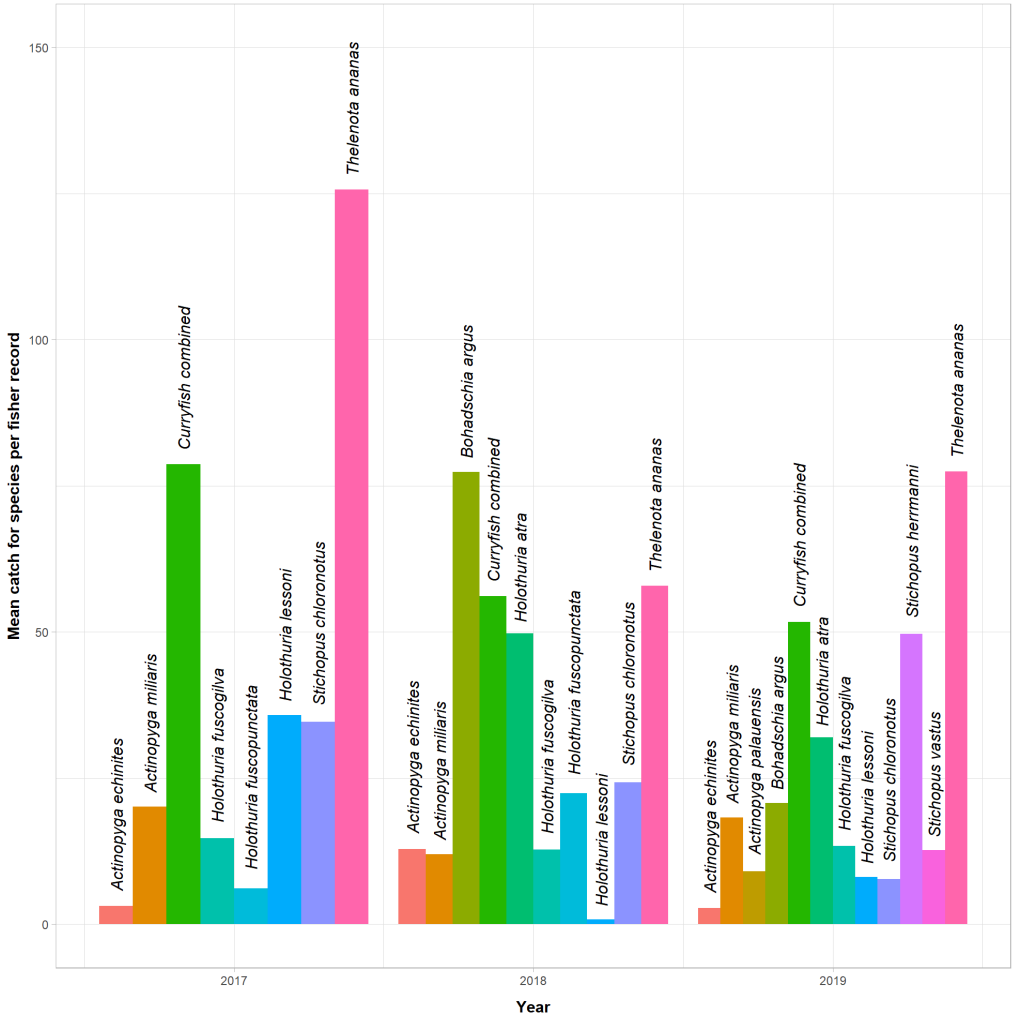

Figure 5-1. Mean catch for sea cucumbers species for year fished. Bar width is representative of catch amount. Species are only shown for cases with >10 catch records to preserve data confidentiality.

5.1.2 CPUE

While CPUE trends are not particularly meaningful due to the small (three year) time series available, of note is the possible decline for Curryfish combined and targeting of Prickly redfish (*T. ananas*) and White teatfish (*H. fuscogilva*) (Figure 5-2).

Also of note is the identification to species in 2019 for Curryfish – *Stichopus herrmanni* and *S. vastus*, given that the new TSBDM Harvest Strategy stipulates the need to separate target species (Figure 5-2).

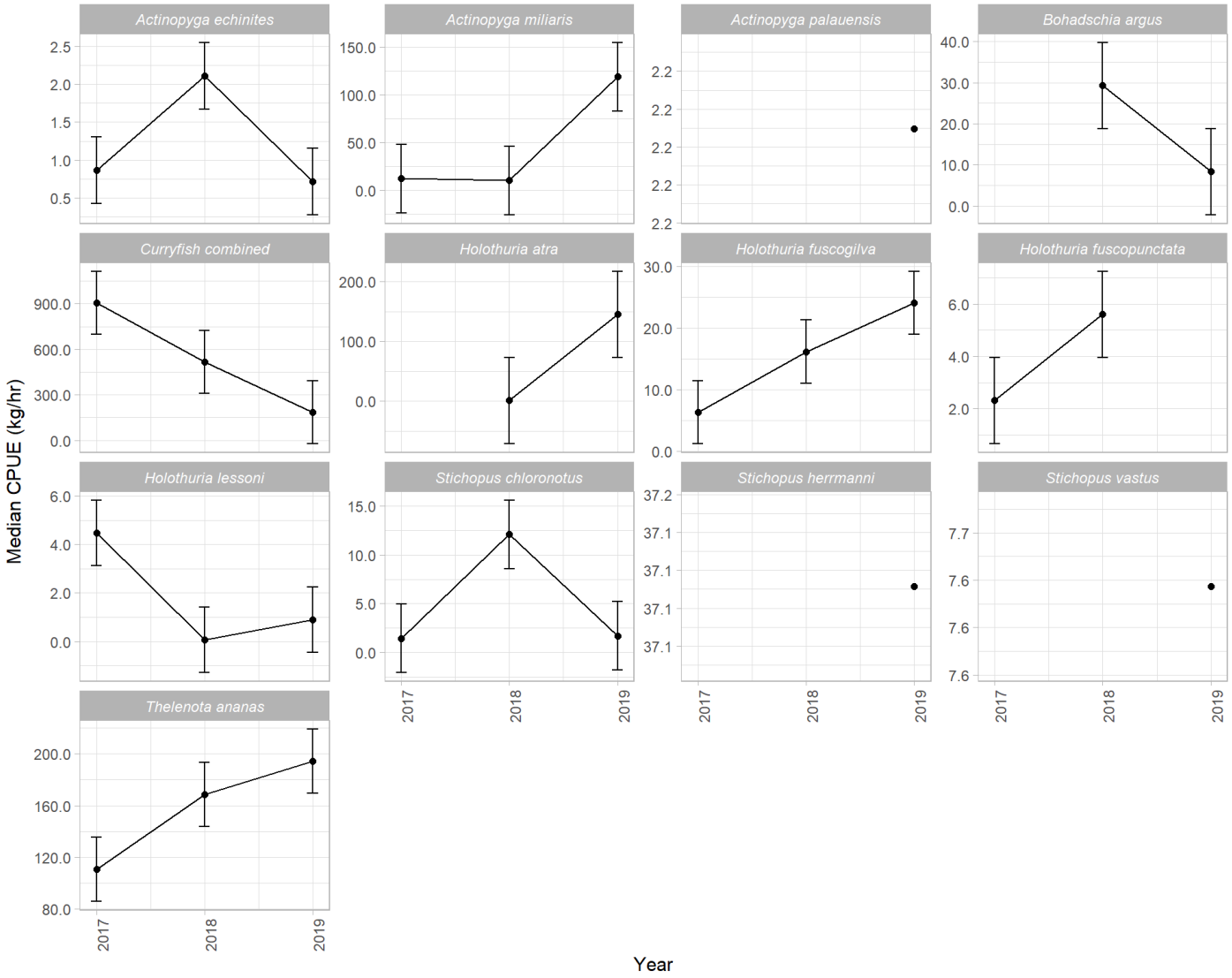

Figure 5-2. Catch per unit effort for sea cucumber species for yearly time series 2017, 2018 and 2019. Species are only shown for cases with >10 catch records to preserve data confidentiality.

5.1.3 Catch processing method

The majority of product was for Prickly redfish and Curryfish combined. The main processing method for sea cucumbers was ‘salted and boiled’ and ‘salted’ (Figure 5-3).

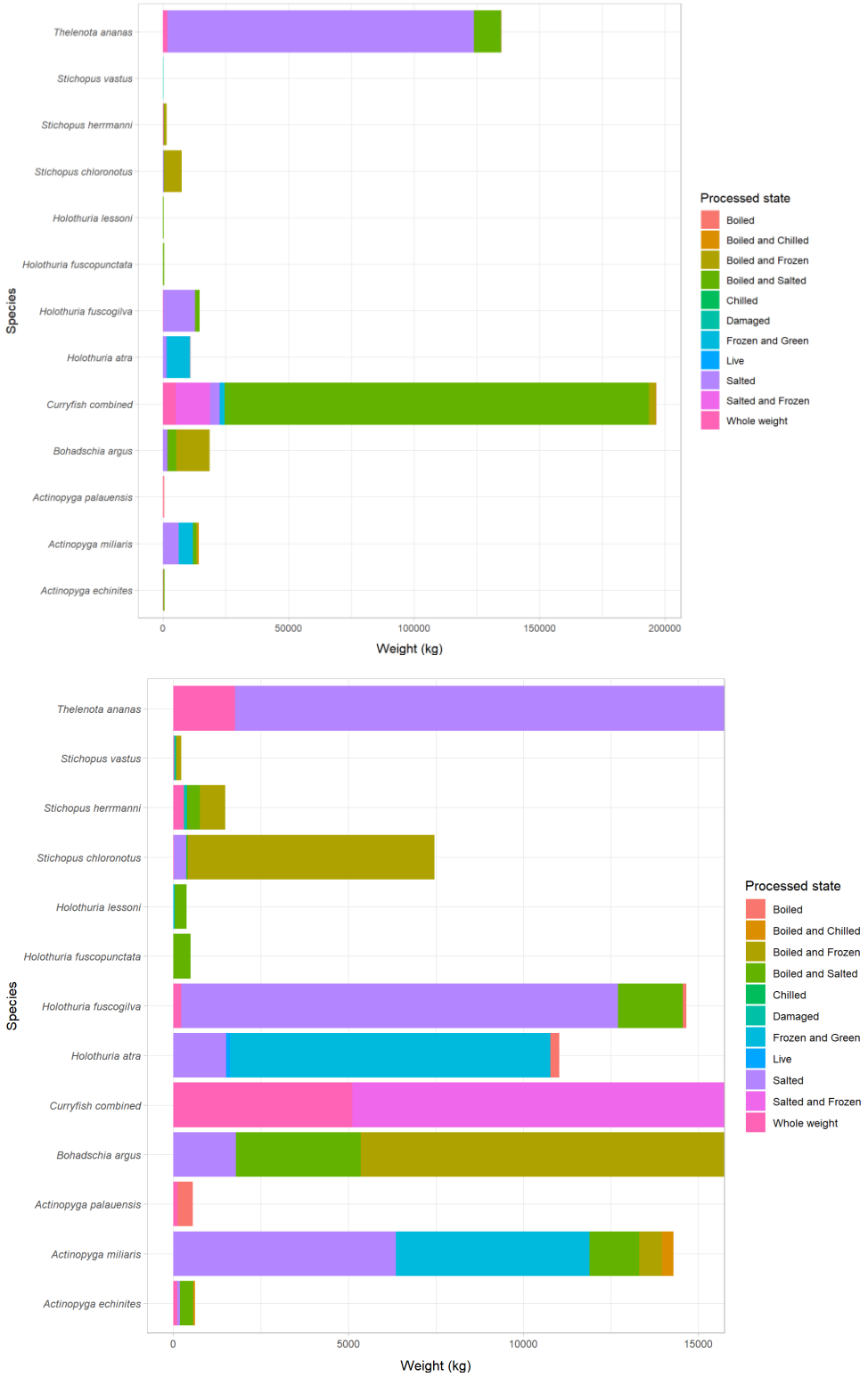

Figure 5-3. Catch processing methods used for sea cucumber species for Catch Disposal Records. Top plot: Overall values shown and Bottom plot: *T. ananas* and Curryfish combined are partly represented. Species are only shown for cases with >10 catch records to preserve data confidentiality.

6 Future work

6.1 Project outputs

The outputs from the project will include a survey report and analysis of the relative density for commercial species of sea cucumber for East Torres Strait. This information will be used for implementing decision rules outlined in the new Torres Strait Bêche-de-mer Harvest Strategy (Plaganyi et al., 2020; Murphy et al., in review; Murphy et al., in prep) and will directly inform management decisions, future fishery changes and potential fishery expansion.

Mapping of gross environmental values will also inform on monitoring of the environment in general.

Population parameters will also be further refined, with such information important input into population models that can be developed in the future, as part of robust sustainable management strategies.

6.1.1 Further analyses

Additional analyses will involve the representation of habitat substrate and biota for mapping of environmental variables for the 2019/20 survey and between survey years.

Sea cucumber densities and population estimates will also be further defined.

6.1.2 Deep water strata

Where possible, further quantification of deep-water strata will be undertaken to more adequately define these strata.

6.1.3 Historic seabed survey

The review of remaining sampling records e.g. reviewing photos will be finalised and any new species distribution and abundance information updated into sea cucumber survey data sets.

6.2 Project documentation

Information from the project will be provided to AFMA, TSRA and Torres Strait Island stakeholders in the form of a plain English summary document.

7 References

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A.1 Community consultation

Surveys of Beche-de-mer:
East Torres Strait and Warrior Reef

Project Engagement Strategy

Pre-Consultation on proposal

Project information flyer and a request for feedback to be sent to identified stakeholders.

Stakeholders to be contacted

- Hand Collectable Working Group members
- Island Councillors and PBC Chairs for Iama, Mer, Masig, Poruma, Erub, Warraber and Ugar
- Fisheries portfolio member Mr Jerry Stephen
- Those fishers that collected a sea cucumber processing pack at recent Beche-de-mer Harvest Strategy/HCWG meetings
- Upon advice from AFMA and the TSRA

Consultation for project

Type of engagement

Initial engagement will be through email and post to stakeholders. For islanders that may be involved in the proposed work, a letter detailing project information will be also be sent to the Island Councillor and Fisher and community representatives. A request will also be made for a project information flyer to be posted on the community notice board.

As with previous sea cucumber surveys where Islanders from Mer and Erub participated in sampling of east Torres Strait in 2009, Islanders will be invited to be part of the proposed field work.

Engagement will be undertaken at key times during the project, this will include before and after the survey and we will also act on advice from island representatives and community feedback. Such engagement may be the development of plain English summaries of survey results, meeting with councillors during survey work, or opportunistic Q&A's with communities where feasible.

Engagement options

On the previous Warrior Reef survey in 2010, an Iama fisher was employed as a field assistant. We once again will endeavour to employ a sea country representative for the Warrior survey, to work as part of the field team.

Traditional knowledge

Special consideration will be taken with any Traditional Knowledge (TK) collected during the project. TK will only be used with the express permission of the traditional owners. Guidance will be sought from local Island leaders and the TSRA to ensure full local support and agreement over the handling of TK information.

Cultural respect

As a project team, the principal investigator (Nicole Murphy), collaborator (Tim Skewes) and co-investigator (Eva Plaganyi), have over 45 years combined experience working together on the Torres Strait Beche-de-mer fishery, including regular consultation and communication with traditional owners. This has afforded the team an understanding and great respect for Torres Strait Islanders and their culture.

Surveys of Beche-de-mer: East Torres Strait and Warrior Reef

Project application - We would like community feedback for this proposed project.

Project Need

The Torres Strait Beche-de-mer Fishery (TSBDMF) has become an important source of income for Torres Strait islanders since early 1990s. While most beche-de-mer species are in good condition, several species are closed or recovering, such as Sandfish, Black teatfish and Surf redfish. Other species have been under increasing fishing pressure, such as Prickly redfish and Curryfish.

Fishery dependent data (logbooks) were introduced to the TSBDMF in December 2017. However, there is considerable uncertainty about the status of many beche-de-mer populations. The last surveys were carried out in 2009 for east Torres Strait and 2010 for Warrior Reef. A stock survey is the only way at present to find out the status of fished beche-de-mer populations in Torres Strait.

Proposed Survey Work

We are seeking feedback on the following proposed sea cucumber surveys:

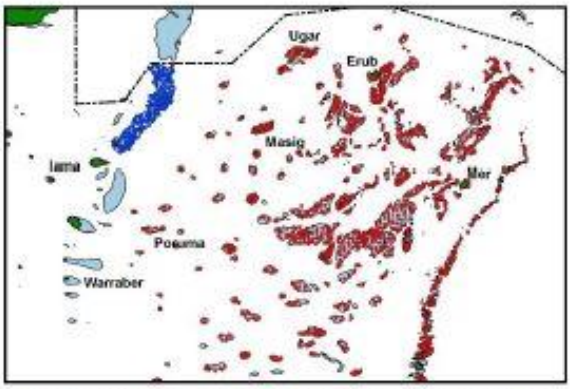
1. Survey of Sandfish on Warrior Reef.
2. Survey of east Torres Strait mainly focused on Prickly redfish, Curryfish, Black teatfish and Surf redfish.
3. Exploration of deeper habitats for additional white teatfish population (e.g. with cameras).

Timing

Surveys need to be done during the same months as past surveys, due to burrowing behaviour of sea cucumbers. Based on past surveys, the best time to survey the east Torres Strait is February or March, and January for surveying sandfish on Warrior Reef. We are also looking at a combined survey to reduce costs in late January or March, 2020.

Where

Sites will be selected from previous surveyed sites in Eastern Torres Strait and Warrior Reef. This will allow for direct comparisons of density to be made. We will also take advice from Torres Strait fishers on additional likely high-density areas for investigation. Any deep water sites for white teatfish will be highly targeted, using previous data records, habitat mapping and advice from fishers.



All previous survey sites in east Torres Strait (red) and Warrior Reef (blue)

Survey methods

The proposed surveys will be conducted using the same sampling methods as used in previous years. Divers will swim fixed length transects and count beche-de-mer and record habitat information.

The survey work being undertaken does not damage the environment in any way. At times sea cucumbers may be collected for length measurements. When this is done, the animals are measured on the spot, or if they are taken to the surface, they are measured and returned to the water as soon as possible and are not taken away from where they were found.

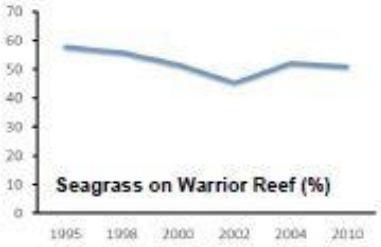
Community Involvement

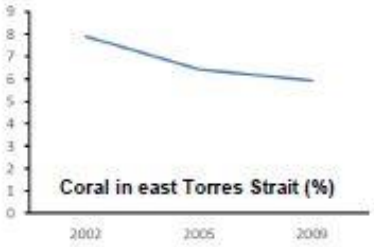
As with previous sea cucumber surveys, we will be investigating ways to involve Islanders in the field work. We will endeavour to employ a local research assistant for the Warrior Reef survey at least, to work as part of the field team.

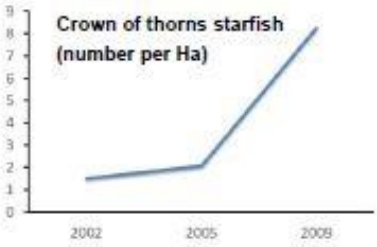
Surveys of Beche-de-mer: East Torres Strait and Warrior Reef

Results of Survey Work

- Updated stock estimates for beche-de-mer species in Torres Strait.
- Better fishery management for a sustainable future.
- Potential fishery expansion and reopening of closed fisheries.
- Habitat monitoring and mapping (e.g. seagrass, coral, and crown of thorns starfish), to inform on climate change.







Other Benefits of Proposed Surveys

As many of the world's beche-de-mer fisheries are over-exploited and demand looks to be increasing, the Torres Strait BDM fishery will likely increase in value in the future. Data from survey results is of the highest value to the Beche-de-mer Harvest Strategy for Torres Strait and sustainable management.

Habitat monitoring undertaken during the proposed surveys will also directly link to climate adaptation research in the Torres Strait. Results will be able to be used for other projects exploring how we need to manage fisheries differently in the future as a result of climate change.

Respecting Traditional Knowledge

Special consideration will be taken with any Traditional Knowledge (TK) collected during the project. TK will only be used with the express permission of the traditional owners. Guidance will be sought from local Island leaders and the TSRA to ensure full local support and agreement over the handling of TK information.

Who – Researchers involved

Nicole Murphy - CSIRO

Steven Edgar - CSIRO

Tim Skewes – BDM expert

Please contact us for more information, or with any questions:

Nicole Murphy
CSIRO
Brisbane
nicole.murphy@csiro.au
Phone: (07) 3833 5948

Lisa Cocking
AFMA
Canberra
lisa.cocking@afma.gov.au
Phone: (02) 6225 5451

Georgia Langdon
AFMA
Thursday Island
georgia.langdon@afma.gov.au
Phone: (07) 4069 1990

Nicholas Boucher
TSRA
Thursday Island
fisheries@tsra.gov.au
Phone: (07) 4069 0745

CSIRO

Australian Government
Australian Fisheries Management Authority

Australian Government

CSIRO
Queensland BioSciences Precinct
306 Carmody Road St Lucia QLD 4072

csiro.au | ABN 41 687 119 230

19th December 2019

HABITAT SURVEY OF UGAR ISLAND

Mr Sereako Stephen
Chairperson Ugar RNTBC
Ugar Island

Dear Mr Stephen

CSIRO is currently engaged to carry out a survey of Beche-de-mer (sea cucumber) in Torres Strait. We will be undertaking the second part of the survey from 9th – 22nd January 2020.

As part of this work, we seek permission please to undertake a habitat survey of Ugar Island to support the re-seeding proposal that Mr Rocky Stephens and CSIRO researcher Dr Leo Dutra are developing.

The habitat survey will involve a number of measured transects from 40m to 100m long, that a SCUBA diver or Snorkeller will swim along and record the following:

Water depth
Transect length
Substrate type - sand, rubble, rock
Coral
Seagrass
Algae
Sponges
Sea cucumbers
Urchins
Trochus

These transects will be undertaken around the perimeter of Ugar and will include sand and reef top areas, as well as reef edges. This information will be of high value to the re-seeding proposal as it will provide important data on zonation of habitat types. We are also happy to include any locations that may be of interest to the community and ask for you to please let us know.

We are planning to undertake the habitat survey over one day around the 10th or 11th of January 2020, with timing dependent on weather and sea conditions. We are also more than happy for anyone to come and see what we are doing and to answer any questions.

At the completion of the survey a map will be produced displaying habitat information surrounding Ugar Island, which will be provided to the community as well as to Mr Rocky Stephens and Dr Leo Dutra.

Kind Regards

Nicole Murphy
Experimental Scientist
07 3398 4958
nicole.murphy@csiro.au

A.2 Bêche-de-mer Harvest Strategy supporting information - Species ecology, status and sampling approach.

Species (value)	Location/habitat	Fishery status	Population status	Survey Approach
Sandfish (high) *Holothuria scabra*	Sandfish are almost exclusively found on Warrior Reef. It is a shared stock with PNG, with approximately half the population on each side. Muddy-sand seagrass beds and reef flats. 0.5-20 m	The Australian fishery was closed in 1998, after a few years of heavy fishing pressure. The PNG sandfish fishery was closed in 2009, after it was severely depleted. It has recently reopened but we have not received any reports of the population status, or recent catch in that fishery.	The virgin biomass of the entire population was likely in the order of 6,000 tonnes (landed weight) or more. On the Australian side, several population surveys have been carried out since closure, the most recent being in February 2010 (survey) and March 2012 (experimental fishing). While these surveys showed there is a significant population of sandfish on Warrior Reef, they did not indicate a substantive recovery of the population at that time.	The most efficient way to determine the current status of the stock is to carry out a stock survey of Warrior Reef. Surveying the PNG side at the same time would provide a whole of population stock status estimate. Requires careful consideration of diurnal, seasonal, tidal and moon phase survey timing due to burrowing. Therefore, needs a dedicated survey.
Black teatfish (high) *Holothuria whitmaei*	Found on shallow reefs of east Torres Strait. It is almost entirely an Australian population. Reef flats, reef fronts and reef passes. 1-20 m	The Australian fishery was closed in 2001, after a decade of fishing pressure. This species has been recently reopened after a decade long closure, based on survey data from 2009. It has been fished in 2 of the last 6 years under a conservative TAC of 15 t.	The 2009 survey indicated that the BTF population had recovered to near virgin biomass levels. The fishing effort since the fishery has reopened has not been large (even though annual quotas have been exceeded in years that it has opened). There are recent anecdotal reports of high densities in east Torres Strait.	Stratified dive survey of shallow reefs in east Torres strait.

Species (value)	Location/habitat	Fishery status	Population status	Survey Approach
White teatfish (high) *Holothuria fuscogilva*	This species is found in deeper reef edge and reef pass waters in far east Torres Strait. There is no evidence it is found in deeper open water habitats (e.g. it was not observed during Torres Strait seabed surveys). Lagoons and passes on pavement or sand. 3-40 m	Catches have been modest in recent years, and below the recommended TAC. The current ban on hookah gear in the fishery limits access to the population to fishing.	Currently uncertain but likely to be above sustainable limits, due to inaccessibility of most of the population to fishing.	This species is difficult to survey as it is mostly found in deeper reef edge and pass waters. A survey using remote cameras could be trialled (as a pilot study first). A targeted sample design would be essential for a feasible survey approach, using previous survey and fishery data. Habitat estimation will also be a critical component of this study. Note: This species is also the focus of an effort to carry out a survey on the Qld east coast fishery.
Prickly redfish (medium) *Thelenota ananas*	This species is found in reef edge and pass waters in east Torres Strait. Lagoons, in areas with rubble and passes. 1-35 m	This species has been heavily targeted in recent years, with a likely overshoot of the TAC.	The most recent survey in 2009 indicated that the population was above sustainable population levels. However, the population has been heavily targeted in recent years, and there are anecdotal reports of at least localised depletion. There is the possibility of some protection of this species due to inaccessibility of deepwater populations.	Stratified dive survey of reef edges and passes in east Torres strait. This information would be comparable to previous surveys. Potential for deeper populations could also be investigated using remote cameras.
Surf redfish (medium) *Actinopyga mauritiana*	High energy zone on the front of east Torres Strait reefs. Murray Island, Don Cay. 0-10 m	This species is currently closed. Catches of deepwater redfish was mistakenly reported as surf redfish early in the modern Torres Strait fishery, adding uncertainty to	Generally unknown. Previous survey data is uncertain due to sampling difficulties and identification problems.	Difficult to survey due to high energy habitat and cryptic nature. Will require a dedicated survey approach – if one can be formulated that is feasible.

Species (value)	Location/habitat	Fishery status	Population status	Survey Approach
		population status assessment.	There have been anecdotal reports of high densities of surf redfish on east Torres Strait reefs.	
Deepwater redfish (medium) *Actinopyga echinites*	Shallow reef habitat in central Torres Strait and Warrior Reef. Coastal reef in rubble, seagrass beds or sand between corals. 0-10 m	Previously important fishery species in Torres Strait. Current catch still uncertain due to identification and reporting issues.	Unknown	Stratified dive survey of shallow reefs in central Torres Strait and Warrior Reef.
Blackfish (medium) *Actinopyga miliaris* *A. spinea* *A. palauensis*	Broad distribution. High density on shallow reef habitat in central Torres Strait and Warrior Reef. Muddy-sand lagoons, reef flats, fore reef pavement. 1-20 m	Significant catches at times throughout fishery. Catch history uncertain due to identification and reporting issues.	Unknown	Stratified dive survey of shallow reefs in east Torres strait and Warrior Reef. Species ID an important component of research.
Curryfish (medium) *Stichopus herrmanni* *S. vastus* *S. ocellatus*	Protected reef edges in central, east Torres Strait and Warrior Reef. 1-30 m	Recent increased commercial interest in these species. Currently being heavily targeted. Requires specialised processing techniques.	Unknown? Surveys have indicated a large population estimate for the common curryfish (*S. herrmanni*) but lowered for other species.	Stratified dive survey of protected reef edges in central and east Torres strait and Warrior Reef. Spatial catch information from fishers critical for guiding surveys.

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Contact us

1300 363 400
+61 3 9545 2176
csiroenquiries@csiro.au
csiro.au

For further information

Oceans & Atmosphere
Nicole Murphy
+61 07 3833 5948
n**icole.murphy**@csiro.au
csiro.au/o**ceans&atmosphere**

Australia's National
Science Agency

Ugar Island sea cucumber survey

Field survey and results

Nicole Murphy, Tim Skewes, Eva Plaganyi, Steven Edgar and Kinam Salee

July 2020

AFMA Project 2019/0826

Multi-Use Ecosystems

OCEANS & ATMOSPHERE

Citation

Murphy NE, Skewes TD, Plaganyi EE, Edgar S and Salee K (2020) Ugar Island sea cucumber survey. Milestone Report. July 2020. CSIRO, Australia. 28 pp.

Copyright

Important disclaimer

Contents

Figures

Tables

Acknowledgements

This project is funded by the Torres Strait Regional Authority (TSRA), the Australian Fisheries Management Authority (AFMA) and The Commonwealth Scientific and Industrial Research Organisation (CSIRO).

We would like to thank the Captain and crew of the MV Wild Blue and staff of Rob Benn Holdings for their valuable support and assistance during the survey.

Thank you to Leo Dutra for comments on the report.

Thank you to all Torres Strait Traditional Owners for regularly hosting us on their land and supporting this research.

Summary

Scientific surveys of Torres Strait sea cucumbers were conducted during December 2019 and January 2020. This report summarises the findings of intensive sampling of Ugar Island and Campbell reefs to investigate sea cucumber populations and their habitats, in order to identify suitable species and locations for reseeding research.

A number of high value commercial sea cucumber species including Teatfish, Curryfish, Sandfish, Redfish, Blackfish and Prickly redfish were found at Ugar and Campbell reefs, and the sizes of animals was generally large. The survey data also show there are suitable habitats to release hatchery-produced sea cucumbers, which supports the development of future aquaculture prospects for the Ugar community. The survey also provided information for clam species, in particular the Giant clam, a species of interest to the Ugar community.

1 Ugar Island habitat survey

Surveys of Ugar Island and Campbell Reef to map habitats and quantify populations of sea cucumbers and giant clams were undertaken in order to provide information to the community, and for support of a sea cucumber reseeding proposal currently being developed by Mr Rocky Stephens and CSIRO researcher Leo Dutra. This work will help improve sea cucumber stocks for the benefit of local communities in Torres Strait.

This survey received approval from Mr Sereako Stephen, Chair of the Ugar RNTBC, Councillor Rocky Stephen and had community support following survey consultation (see Appendix A.1).

1.1 Objective

The objective of the sea cucumber survey was to map the reef and quantify habitats and sea cucumber populations of Ugar home reef, to support the potential sea cucumber re-seeding proposal (see Figure 1-1).

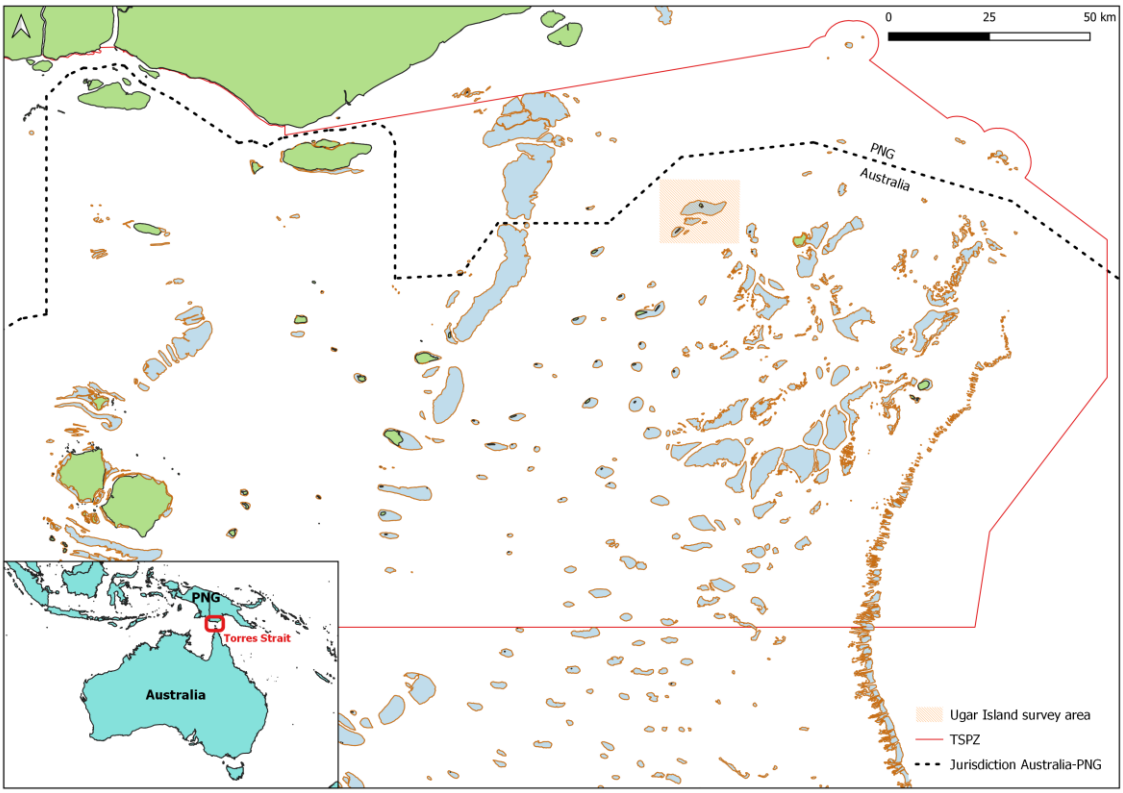


Figure 1-1. Map of Torres Strait showing location of Ugar Island and the survey area.

1.2 Sample design

The survey involved intensive sampling of Ugar Island and Campbell reefs to investigate sea cucumber populations and their habitats, in order to identify suitable species and locations for the re-seeding research.

1.2.1 Ugar Island survey

Sixty snorkel and dive transects were undertaken as part of the surveys carried out in December 2019 and January 2020. Of the sites sampled, 38 were previously surveyed in one or more surveys carried out in 1995/96, 2002, 2005, 2009 (repeated measures), with 22 new sites that included reef top, reef top buffer and representative reef edge sites to inform on sea cucumber species, distribution and habitat (Table 1-1; Figure 1-2).

Table 1-1. Survey sites for survey year.

Survey year	Site number
1995/96 & 2019/20	23
1995/96, 2002, 2019/20	1
2002, 2005, 2019/20	2
2002, 2009, 2019/20	3
2002, 2019/20	9
2019/20	22

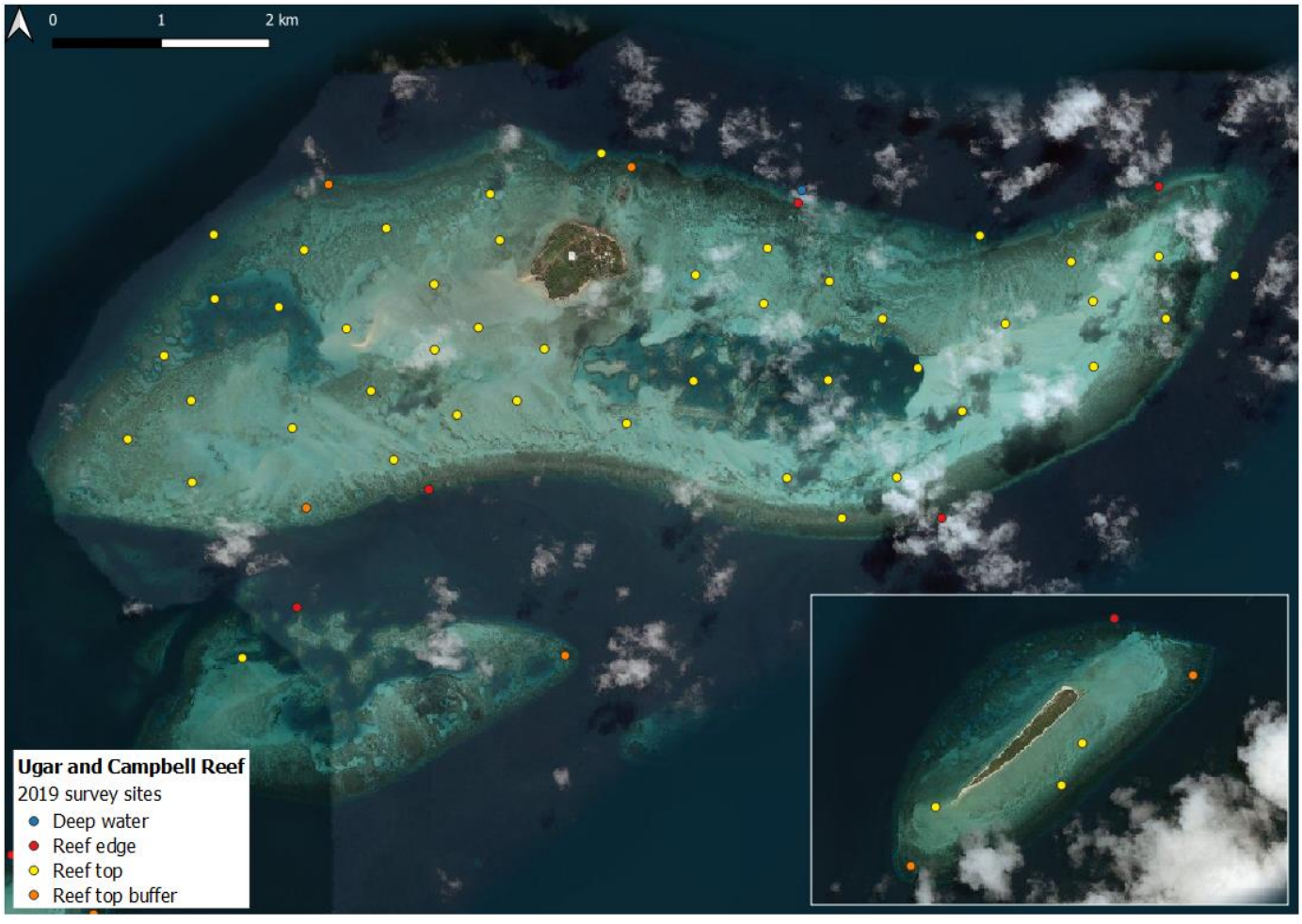


Figure 1-2. Survey sites at Ugar Island and Campbell Reef for the 2019/20 field survey, Torres Strait.

1.3 Survey Methods

A marine habitat map that delineated shallow reefs was used as the basis for the survey. This was imported into a Geographical Information System (GIS) software (QGIS) and the area surveyed superimposed onto the map. The area was further divided into the following three habitat strata:

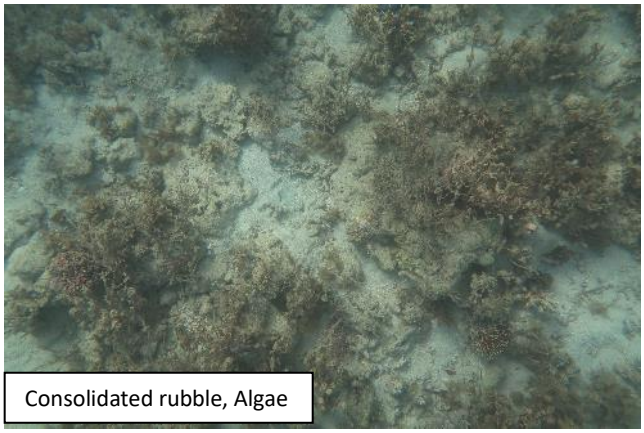
- the reef edge,
- the reef top, and
- a reef top buffer stratum, being a 200 m wide buffer around the inside of the reef margin.

The survey was conducted using rapid marine assessment techniques consistent with previous Torres Strait beche-de-mer surveys undertaken in 1995-96, 2002, 2005 and 2009 (Skewes et al., 1999; Skewes et al., 2004; Skewes et al., 2010). Two of the survey staff - Nicole Murphy and Tim Skewes, have led or participated on all previous sea cucumber surveys.

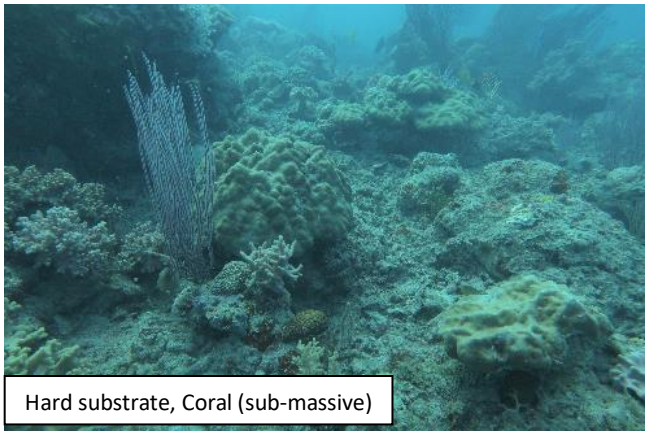
The survey was undertaken by a team of divers operating from a dinghy and locating sample sites using hand-held GPS. On the reef top, divers swam along a 40m-100m transect line recording resource and habitat data from the line out to 1-2m either side. On the reef edge, a diver swam along a measured length transect between 1m and 15m water depth. Sea cucumbers, and other benthic fauna of commercial or ecological interest (e.g. clams and pearl oysters) were counted. Where possible, sea cucumbers were collected for total length and weight measurements taken in the dinghy and subsequently returned to the water, at or near the site collected.

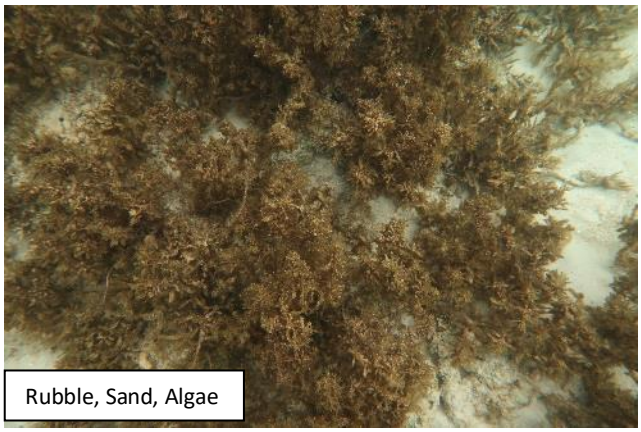
For each site, substrate was described in terms of the percentage of unconsolidated (sand, rubble) and consolidated (consolidated rubble, pavement and live coral) substrate. The growth forms and dominant taxa of the live coral component and the percentage cover of all other conspicuous biota such as seagrass and algae were also recorded (see Figure 1-3).

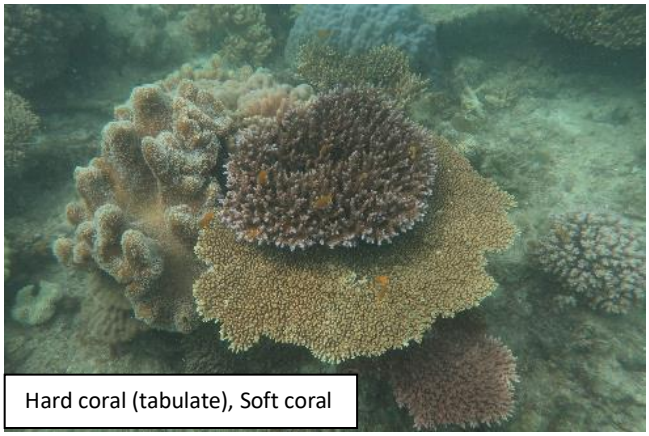
The timing of the survey was planned to coincide with the seasonal timing of previous surveys to reduce biases related to differences in sea cucumber burrowing behaviour, caused by seasonal and tidal factors.

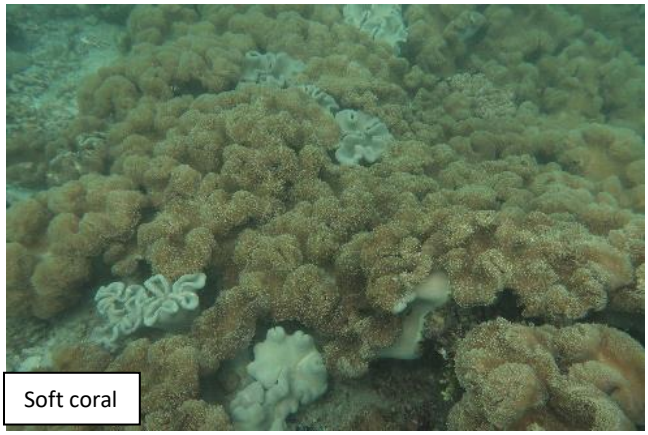

Consolidated rubble, Algae

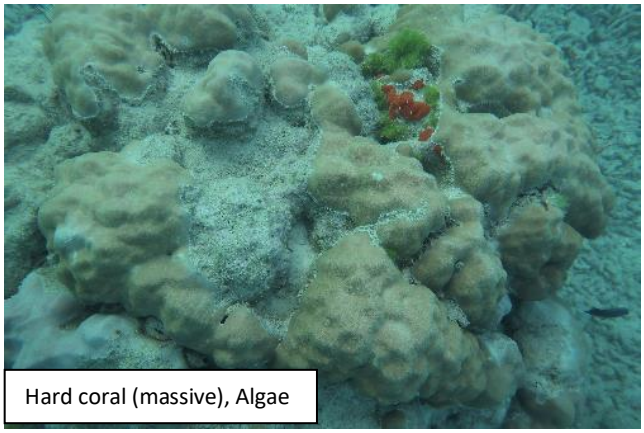

Sand, Seagrass

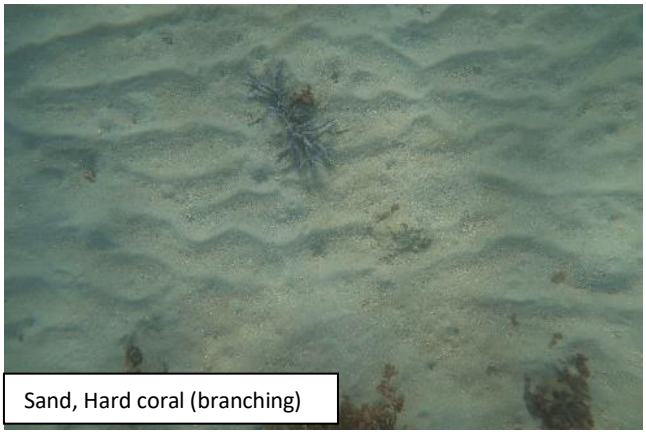

Hard substrate, Coral (sub-massive)


Rubble, Sand, Algae


Hard coral (tabulate), Soft coral


Soft coral


Hard coral (massive), Algae


Sand, Hard coral (branching)

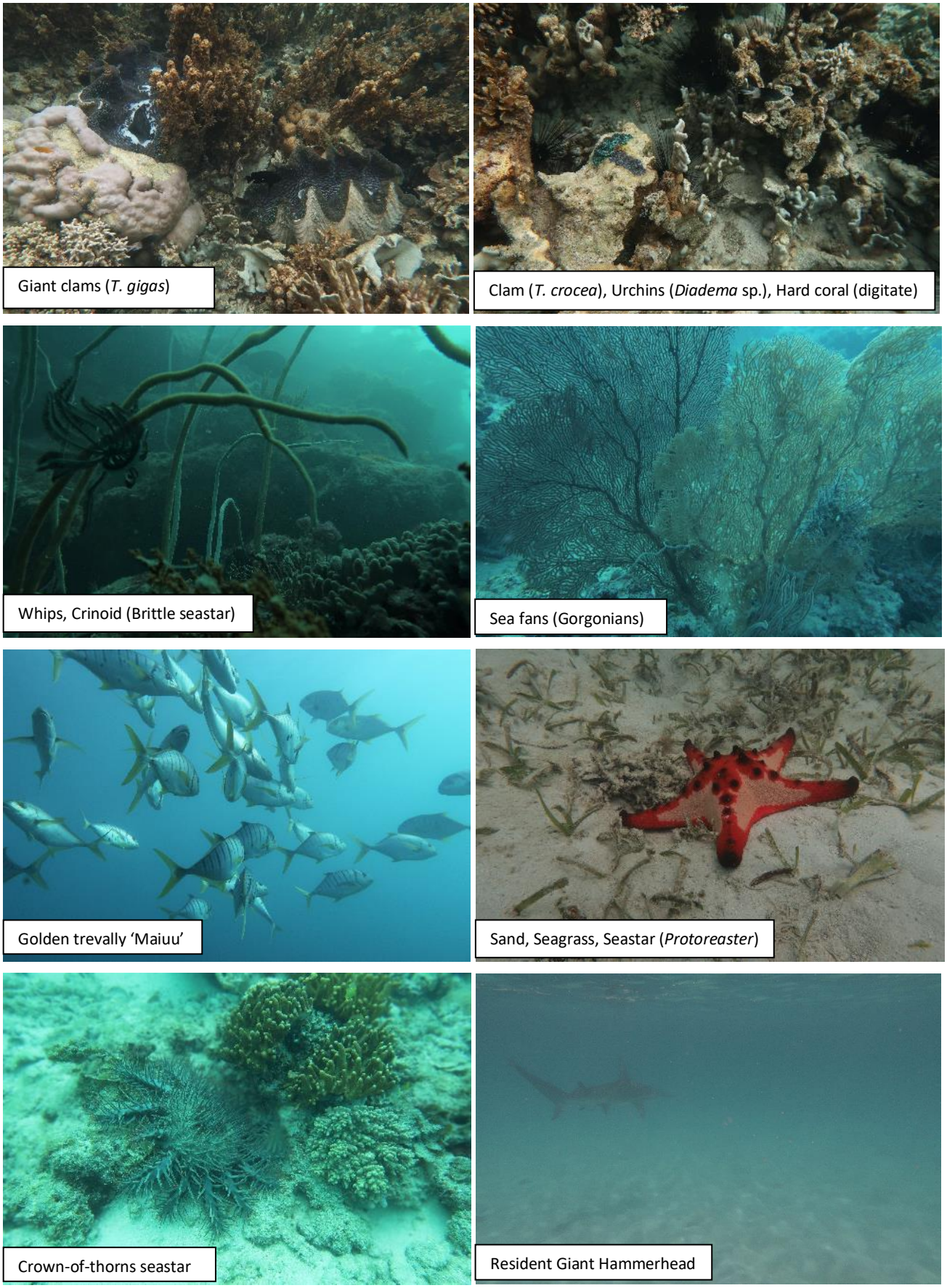


Figure 1-3. Substrate and biota examples.

1.4 Data Analyses

Transect and sample data collected during the field survey have been entered into an Access database and imported into a centralised Oracle database for long-term storage. The data have also been used as input into statistical and GIS software for analysis.

1.4.1 **Maps**

Estimates of mean density (count per hectare) were derived using a stratified analysis of transect counts based on reef strata. This calculation takes into account heterogeneity in the variance of observed counts and is representative of the physical size differences of the varying habitats in the survey. Mean densities for sea cucumbers species, dominant substrate and biota cover, and species of interest were represented in maps using coloured composition (see Figure 2-1; Figure 2-2; Figure 2-3).

1.4.2 **Data outputs**

Size frequency estimates were produced for combined sea cucumber species and for species groups (see Figure 2-4; Figure 2-5; Figure 2-6; Figure 2-7).

Stratified estimates for sea cucumber species for reef strata (reef top, reef top buffer and reef edge) were represented using plots of sea cucumber species mean density (see Figure 2-8; Figure 2-9; Figure 2-10).

Representation of dominant habitat and biota used average mean percent estimates of count data shown on *Lollipop* plot for substrate (see Figure 2-11), represented as substrate categories on the y axis and percentage cover on the x-axis, with hierarchical biota data represented as proportionate triangles (*Treemap* plot in RStudio) (see Figure 2-12).

A further finer representation of seagrass, algae and clam species used donut plot showing proportional break down of substrate and biota for reef strata - reef top, reef top buffer and reef edge (see Figure 2-13; Figure 2-14; Figure 2-15).

2 Results

2.1 Sea cucumber species

Nineteen species were recorded during the Ugar and Campbell reefs survey (Figure 1-2; Table 2-1). Twenty-three commercial sea cucumber species occur in Torres Strait, with fifteen recorded from Ugar and Campbell reefs.

Table 2-1. Species list of recorded sea cucumbers.

Species	Common name	Erub-mer Language
Actinopyga echinites	Deepwater redfish	'Mamam Aber'
Actinopyga miliaris	Hairy blackfish	Musmus Aber'
Actinopyga palauensis	Deepwater blackfish	'Goleh-Goleh Aber'
Bohadschia argus	Leopardfish	'Kepkep Aber'
Bohadschia ocellata	Polka-dotted or Ocellated sea cucumber	
Bohadschia vitiensis	Brown sandfish	'Parak Aber'
Holothuria edulis	Pinkfish	
Holothuria fuscogilva	White teatfish	'Zarzer Pauraber'
Holothuria fuscopunctata	Elephant trunkfish	"Berber Aber'
Holothuria lessoni	Golden sandfish	'Susus Aber'
Holothuria scabra	Sandfish	'Burbur Aber'
Holothuria whitmaei	Black teatfish	'Pauraber or Goleh-Goleh Pauraber'
Pearsonothuria graeffei	Black-spotted or Graeffe's sea cucumber	
Stichopus chloronotus	Greenfish	Kerir Aber'
Stichopus herrmanni	Curryfish (common/yellow)	'Bambam Aber'
Stichopus vastus	Curryfish (vastus/green)	'Warwarr Aber'
Thelonota ananas	Prickly redfish	'Seker Aber'
Thelonota anax	Amberfish	
Holothuria atra	Lollyfish	"Wehwehsor Aber'

2.2 Mapping of species composition

2.2.1 **Main outcomes**

- The most common species (found for most sites) for the survey was Lollyfish (*H. atra*) (Section 2.2.2; Figure 2-1).
- The least abundant species was Graeffe's sea cucumber (*P. graeffei*) (Section 2.2.2; Figure 2-1).
- Most of the sites surveyed had predominantly soft sediment (Section 2.2.3; Figure 2-2).
- Lollyfish (*H. atra)* had the smallest size class for length frequency distribution, with Prickly redfish (*T. ananas*) having the largest (Section 2.3.1; Figure 2-7).
- A mix of juveniles and adults of Golden sandfish (*H. lessoni*) was found at one particular area of the reef top (Figure 2-1), close to the east side of Ugar island - predominantly dominated by sand (Figure 2-2) (see details for implications to re-seeding in Section 3).
- One adult sandfish (*H. scabra*) was found off transect where Golden sandfish (*H. lessoni*) were observed (Figure 2-1) (see details for implications to reseeding in Section 3).
- Lollyfish (*H. atra*) was the most abundant species for the reef top buffer and reef top strata (Figure 2-8; Figure 2-10).
- Pinkfish (*H. edulis)* was the most abundant species for the reef edge strata (Figure 2-9).
- Soft (sandy) substrate was the most common substrate for all strata for sites surveyed, followed by 'consolidated rubble' for the reef top buffer, 'hard' for the reef edge, and 'rubble' for the reef top (Figure 2-11), suggesting a relative high energy.
- Soft coral was the dominant biota for both reef edge and reef top strata, where the reef top buffer was equally dominated by sea urchins, soft corals and Fungiid corals (Figure 2-12).
- *Thallassia emprichi* was the dominant seagrass species for reef top and reef top buffer strata, followed by *Halophila ovalis* (Figure 2-13).
- The reef top, reef top buffer and reef edge strata were dominated by algae *Sargassum* spp. (Figure 2-14).
- *T. crossea* was the most frequent clam species. Most sites surveyed had one species of clam, but three species of clam were found at one site at Campbell reef (Section 2.2.4; Figure 2-3; Figure 2-15).

2.2.2 Sea cucumber species

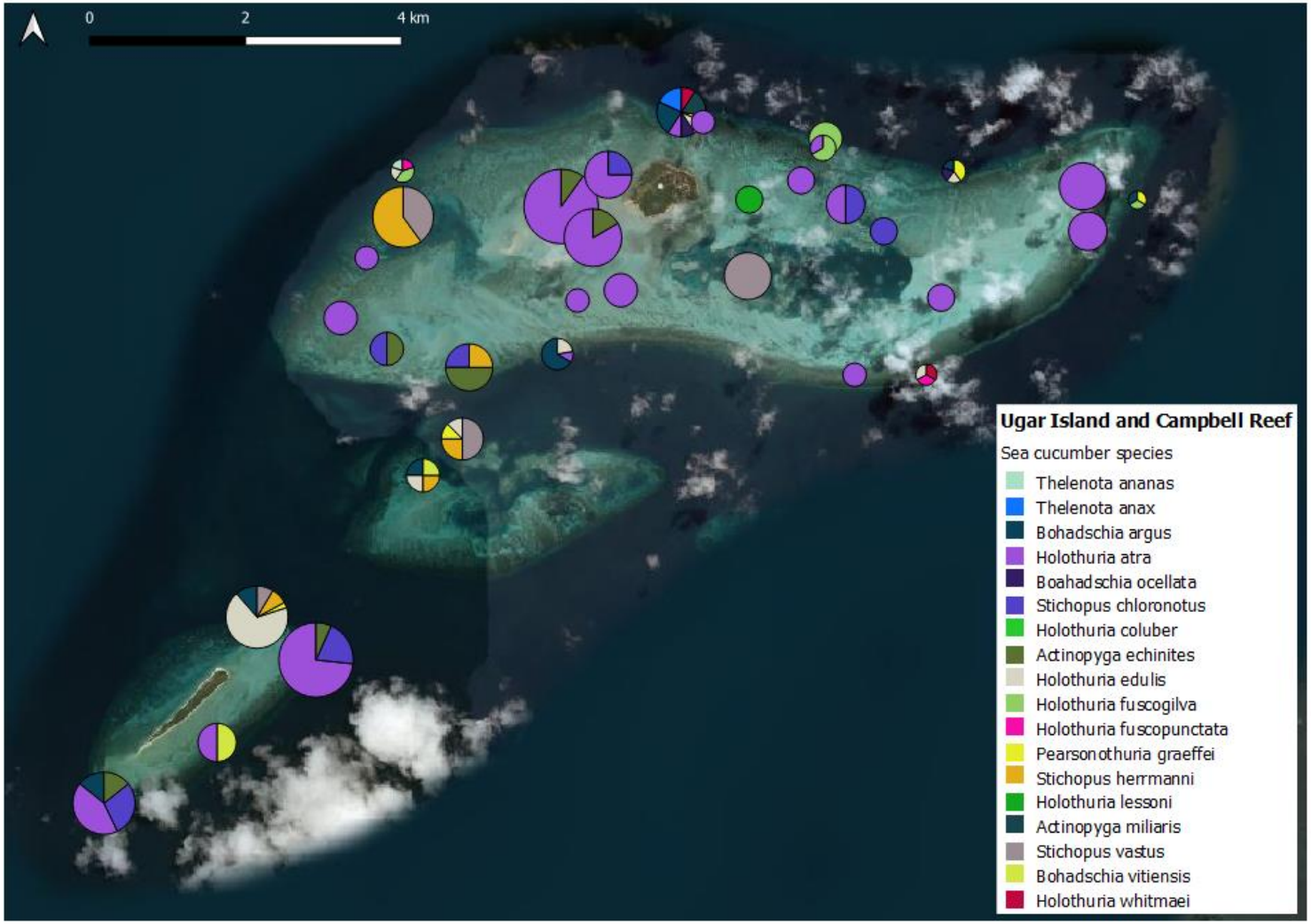


Figure 2-1. Relative abundance of sea cucumber species for survey sites.

2.2.3 Substrate and biota

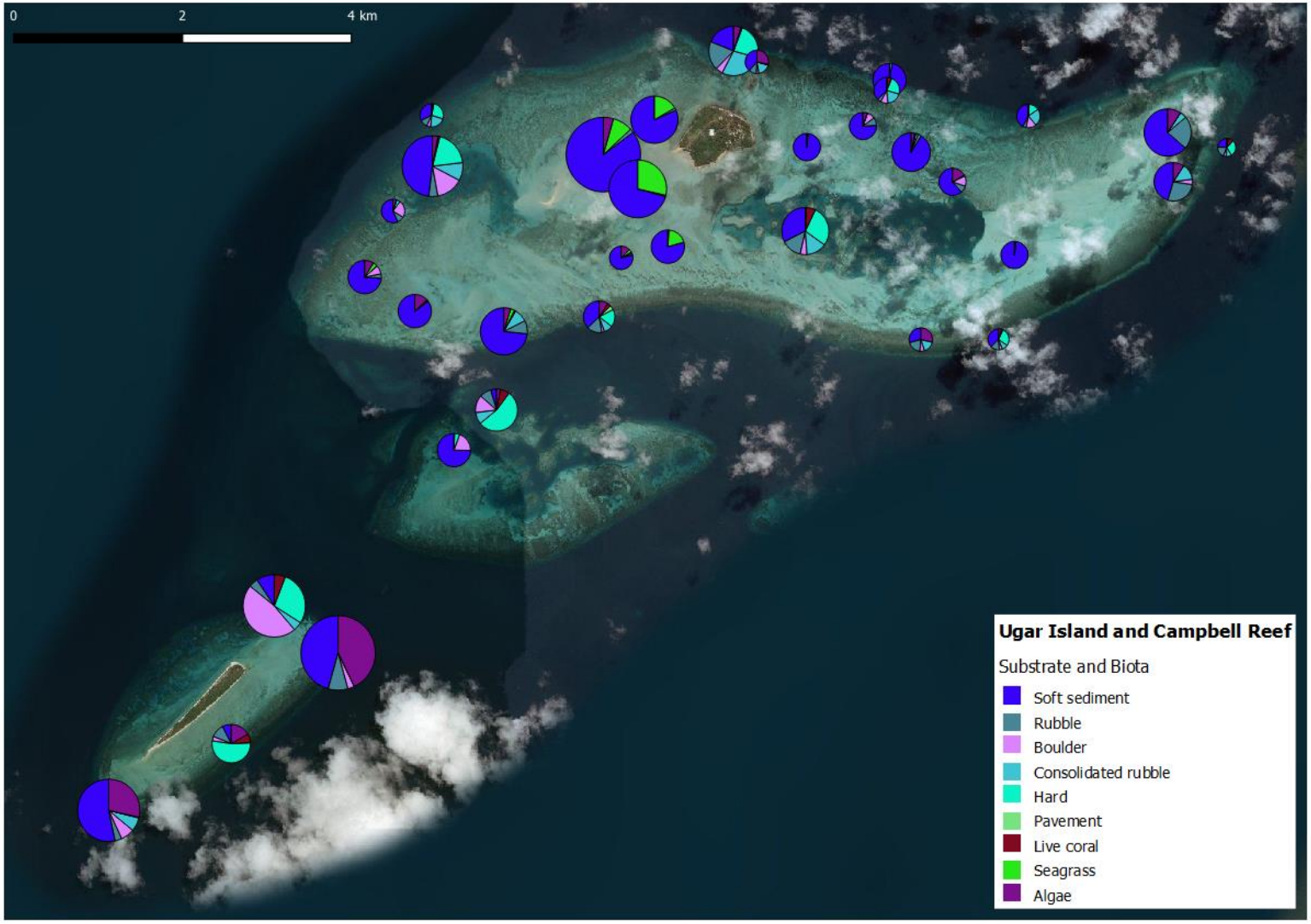


Figure 2-2. Percentage cover of substrate and biota for survey sites.

2.2.4 **Clam species**

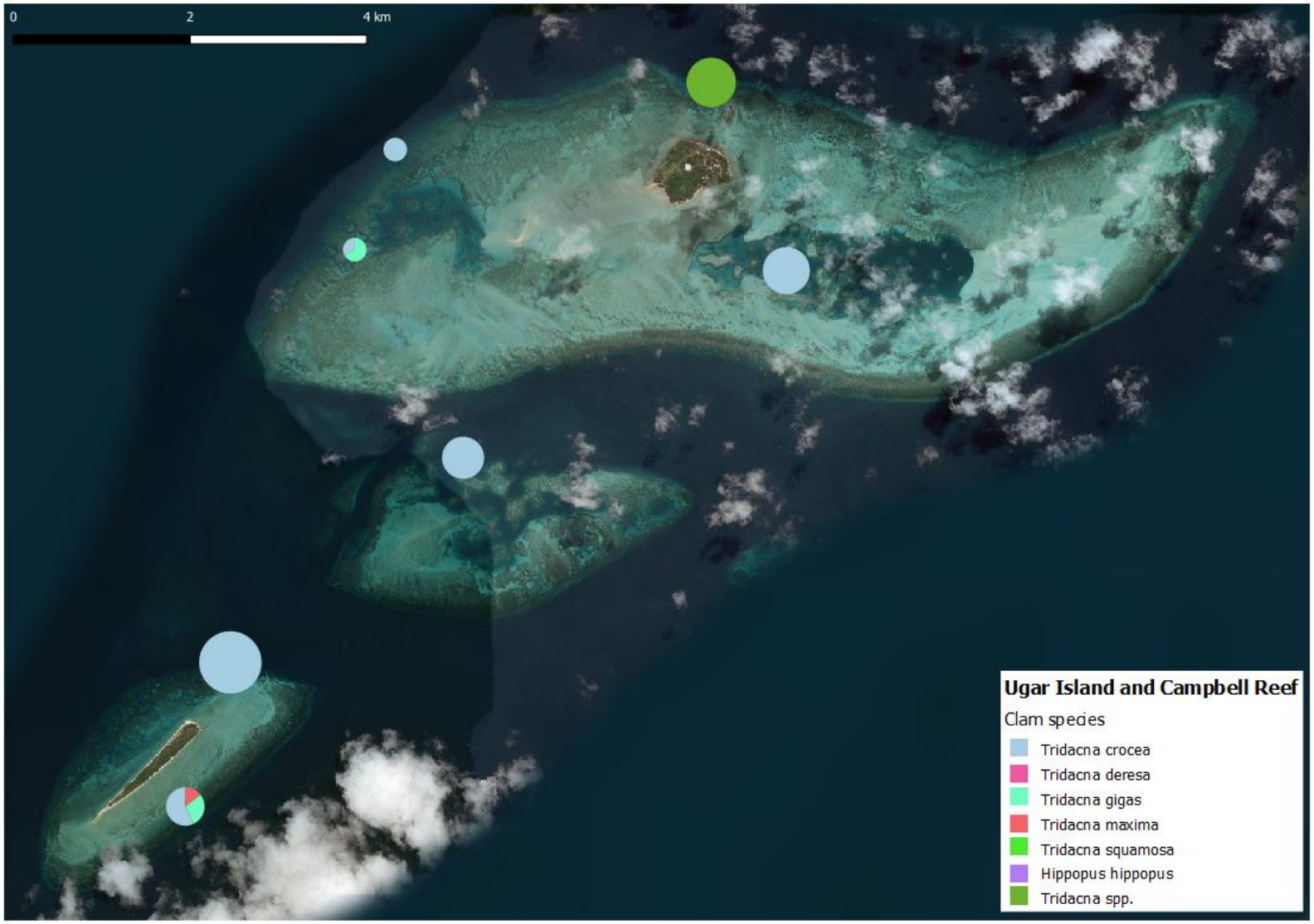


Figure 2-3. Percentage cover of clam species for survey sites.

2.3 Data outputs

2.3.1 **Length frequency for grouped sea cucumber species**

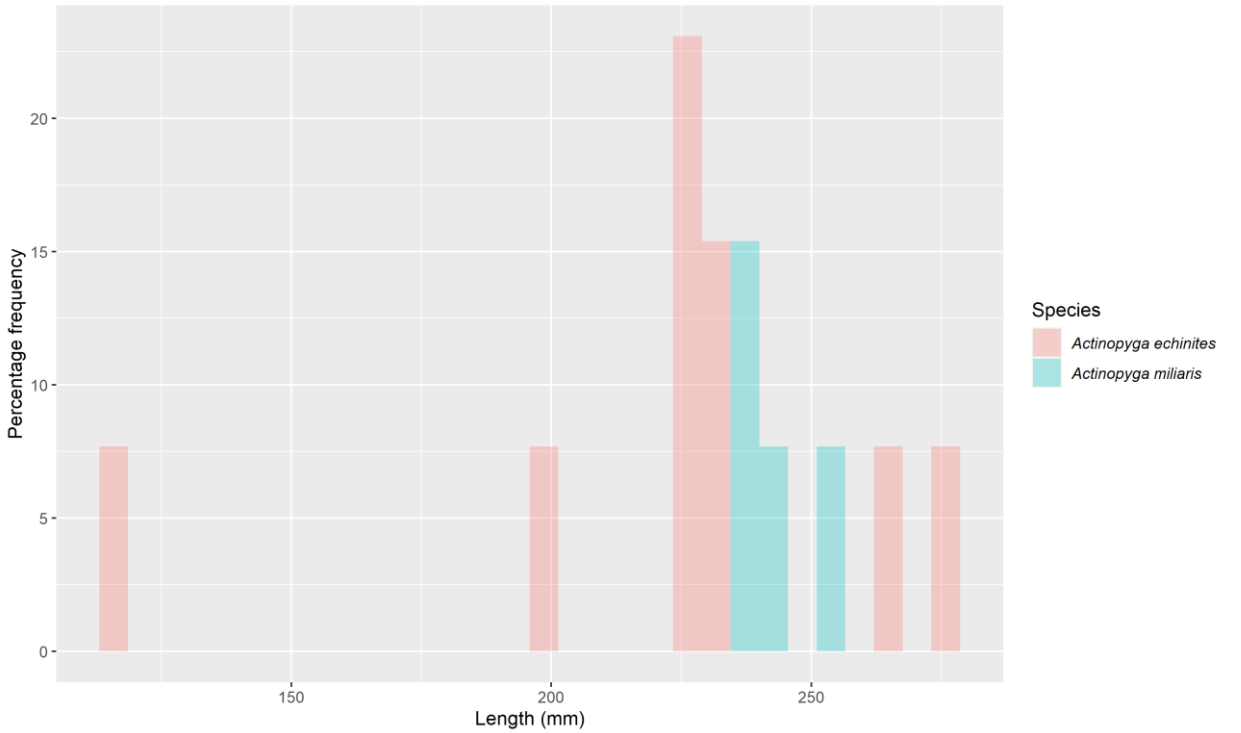


Figure 2-4. Length frequency for *A. echinites* and *A. miliaris*.

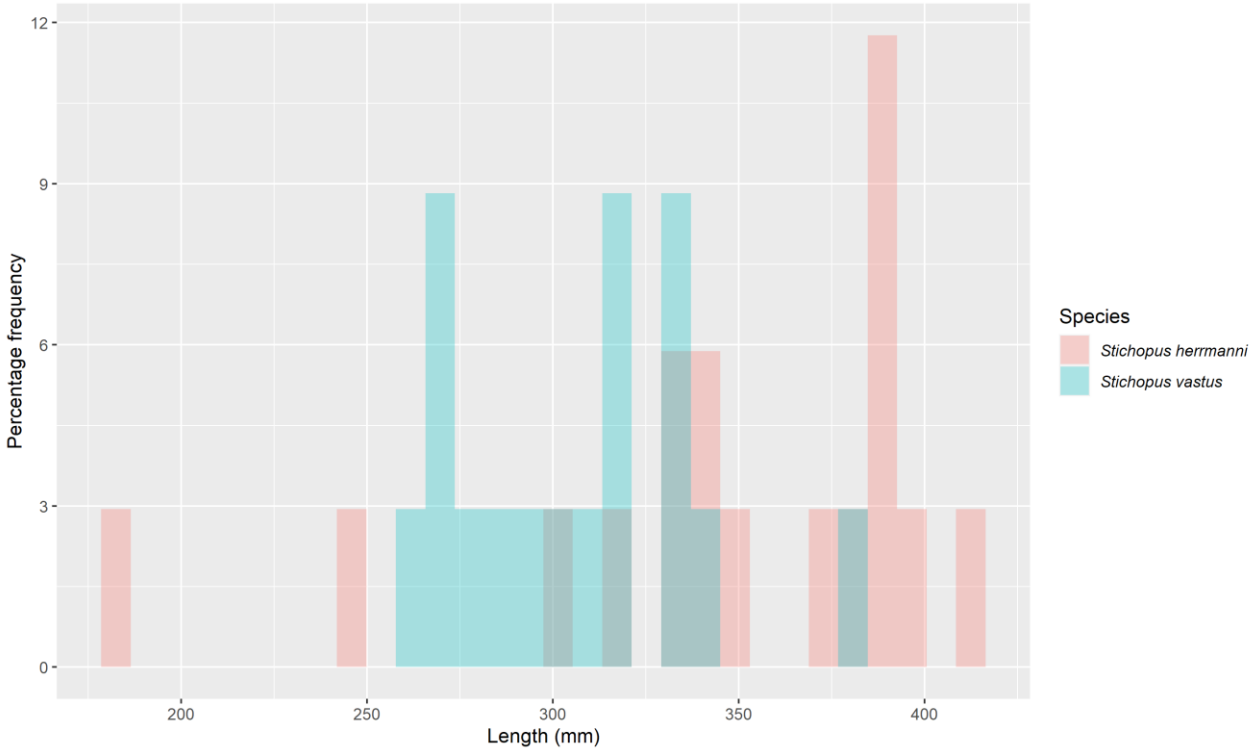


Figure 2-5. Length frequency for *S. herrmanni* and *S. vastus*.

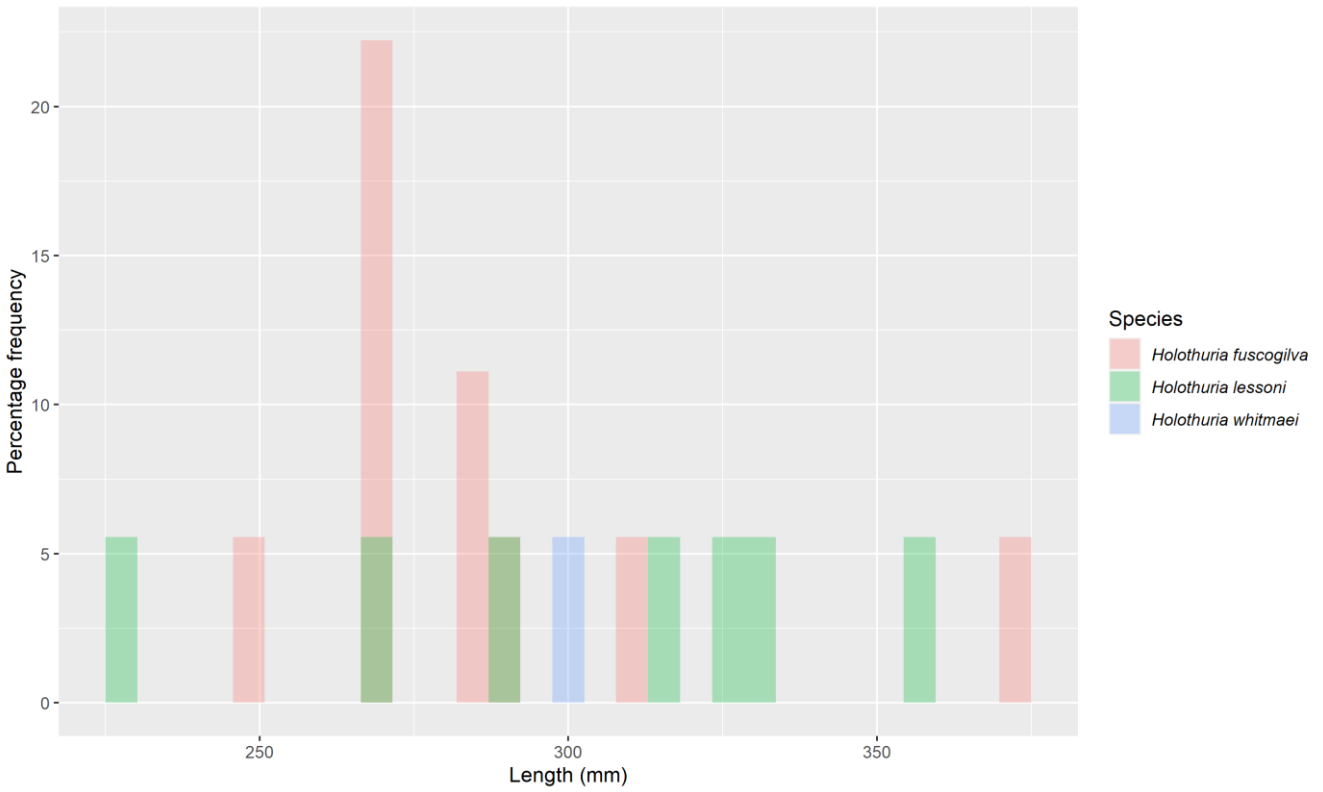


Figure 2-6. Length frequency for H. *fuscogilva*, *H. whitmaei and H. lessoni*.

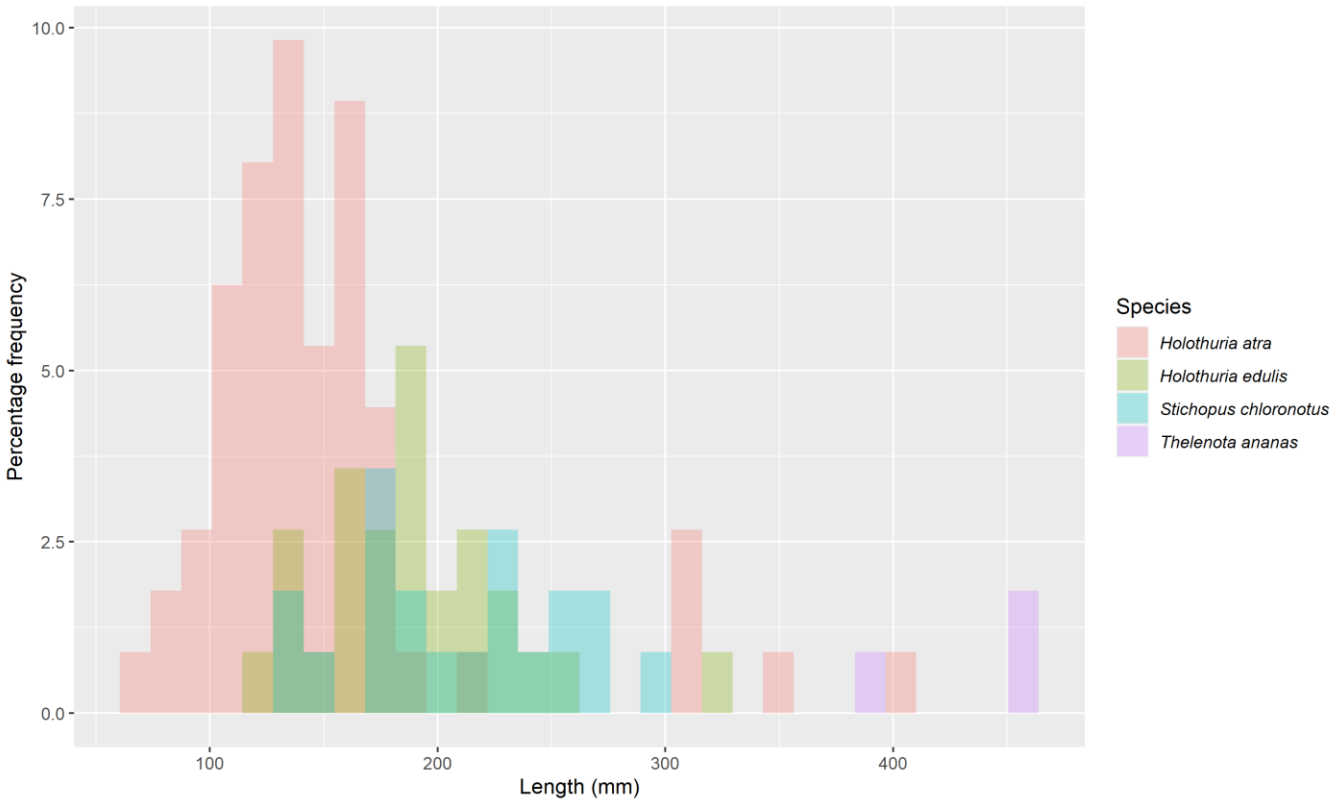


Figure 2-7. Length frequency for *H. atra*, *H. edulis*, *S. chloronotus* and *T. ananas*.

2.3.2 **Stratified density - strata**

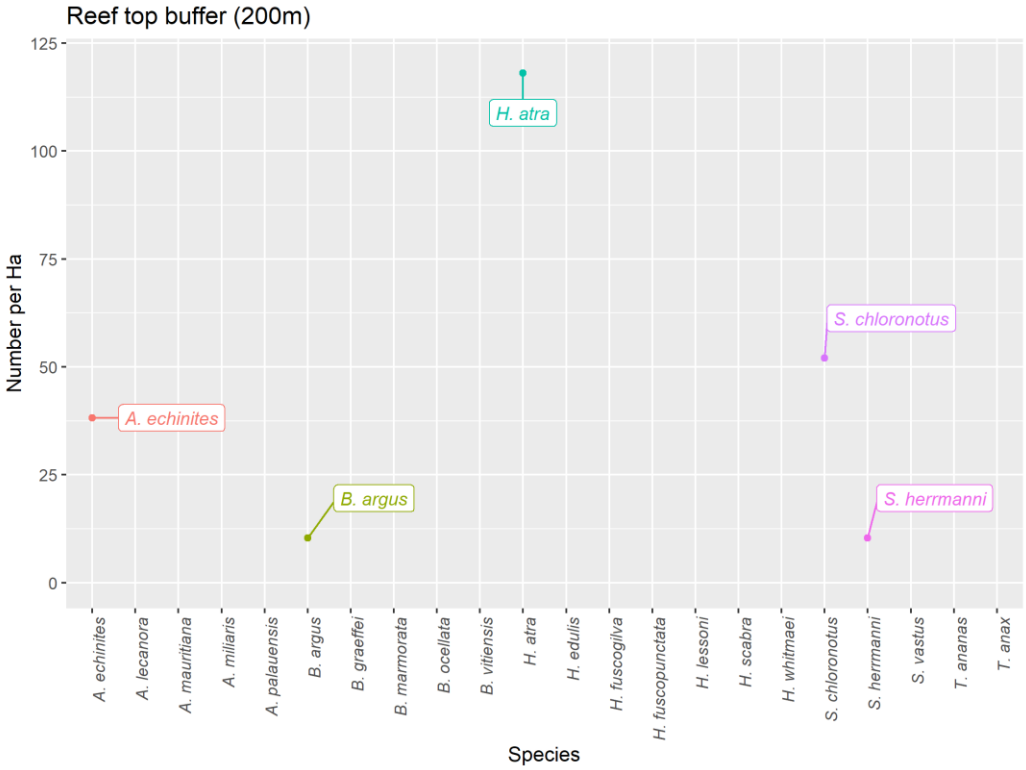


Figure 2-8. Stratified density for reef top buffer.

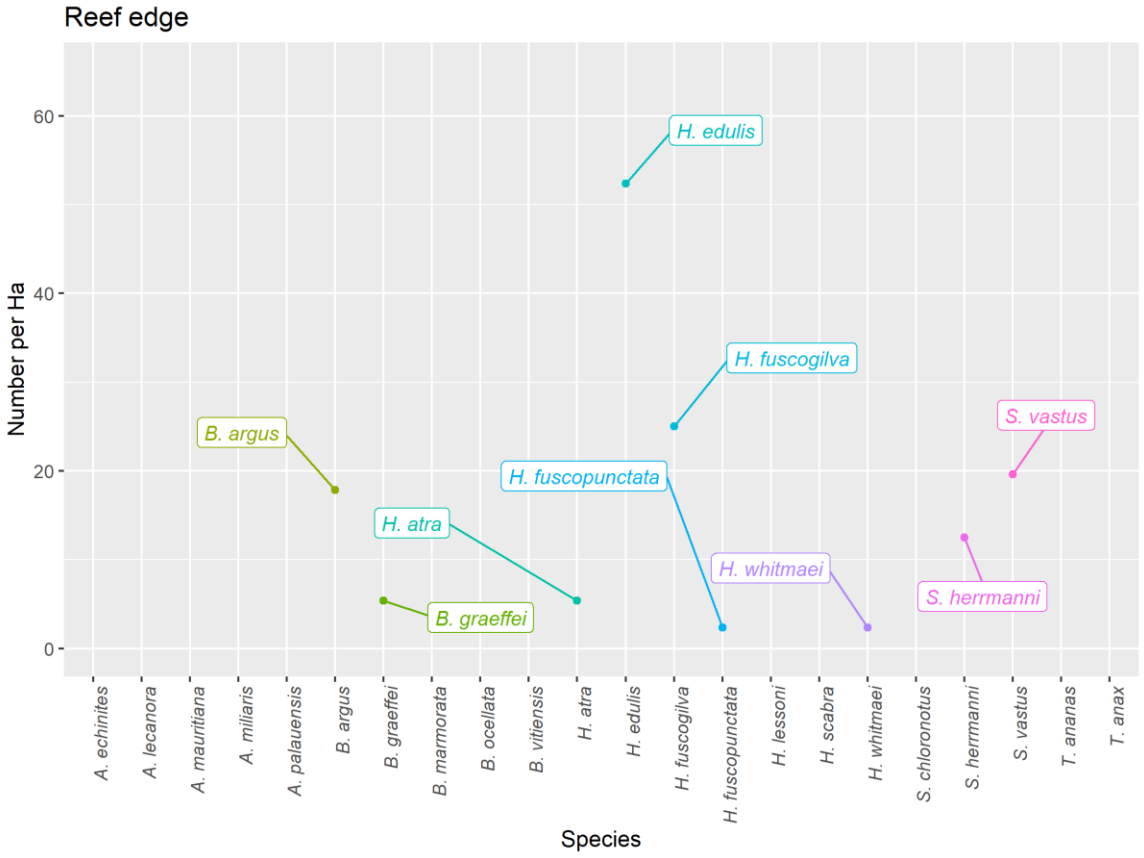


Figure 2-9. Stratified density for reef edge.

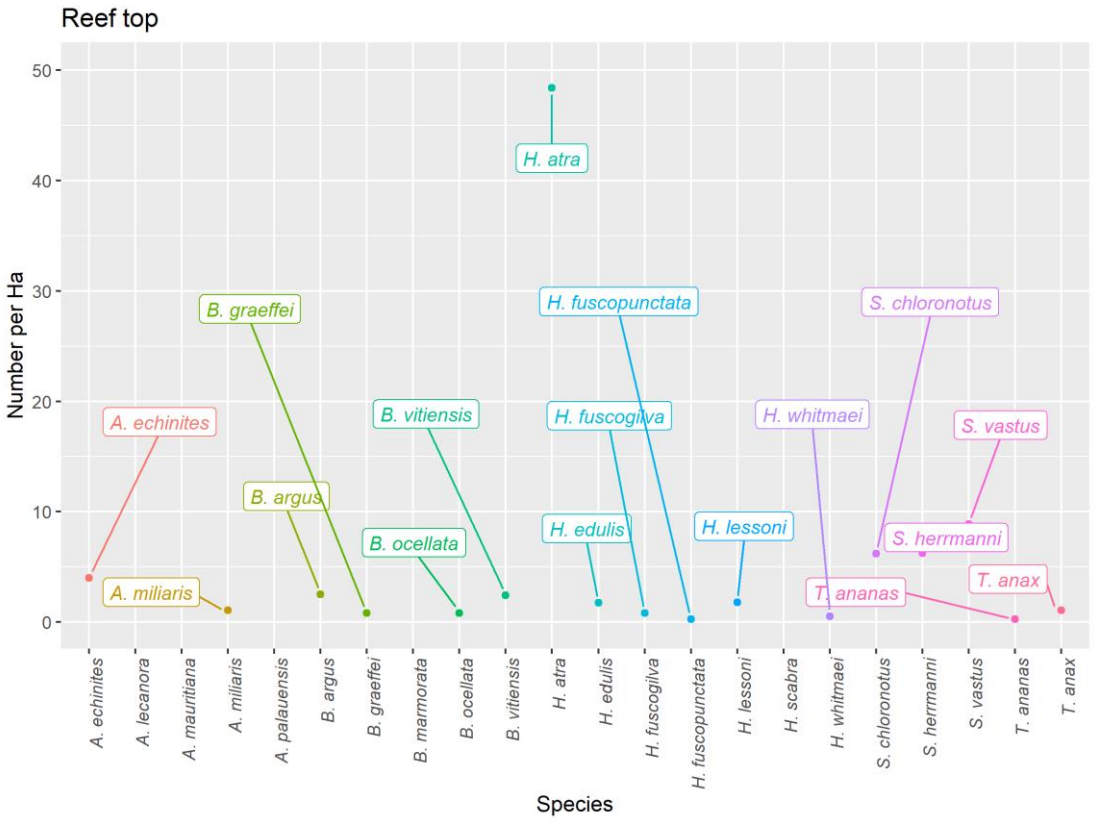


Figure 2-10. Stratified density for reef top.

2.3.3 **Substrate**

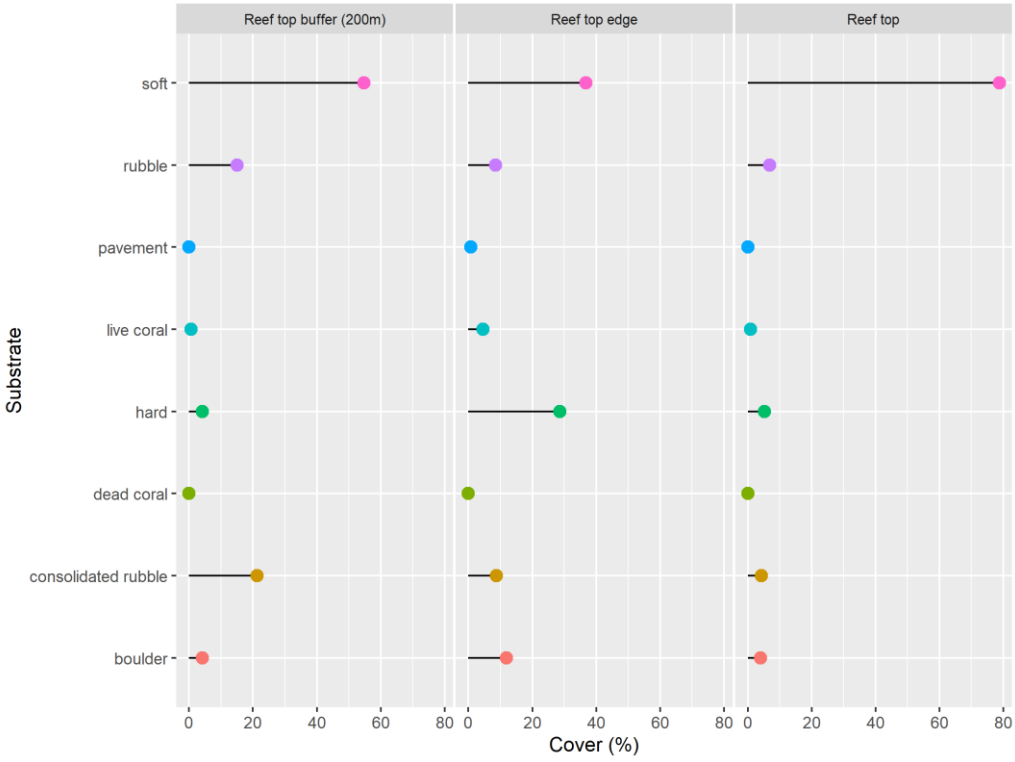


Figure 2-11. Mean percentage cover of substrate for strata.

2.3.4 **Biota**

Figure 2-12. Proportion of dominant biota for strata.

2.3.5 **Seagrass**

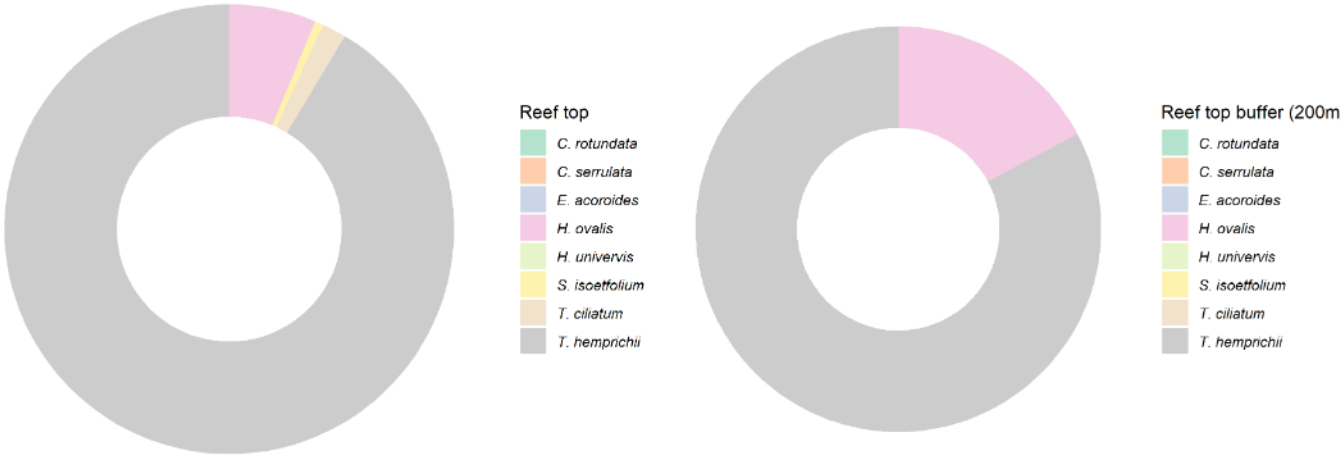


Figure 2-13. Composition of seagrass species for strata.

2.3.6 **Algae**

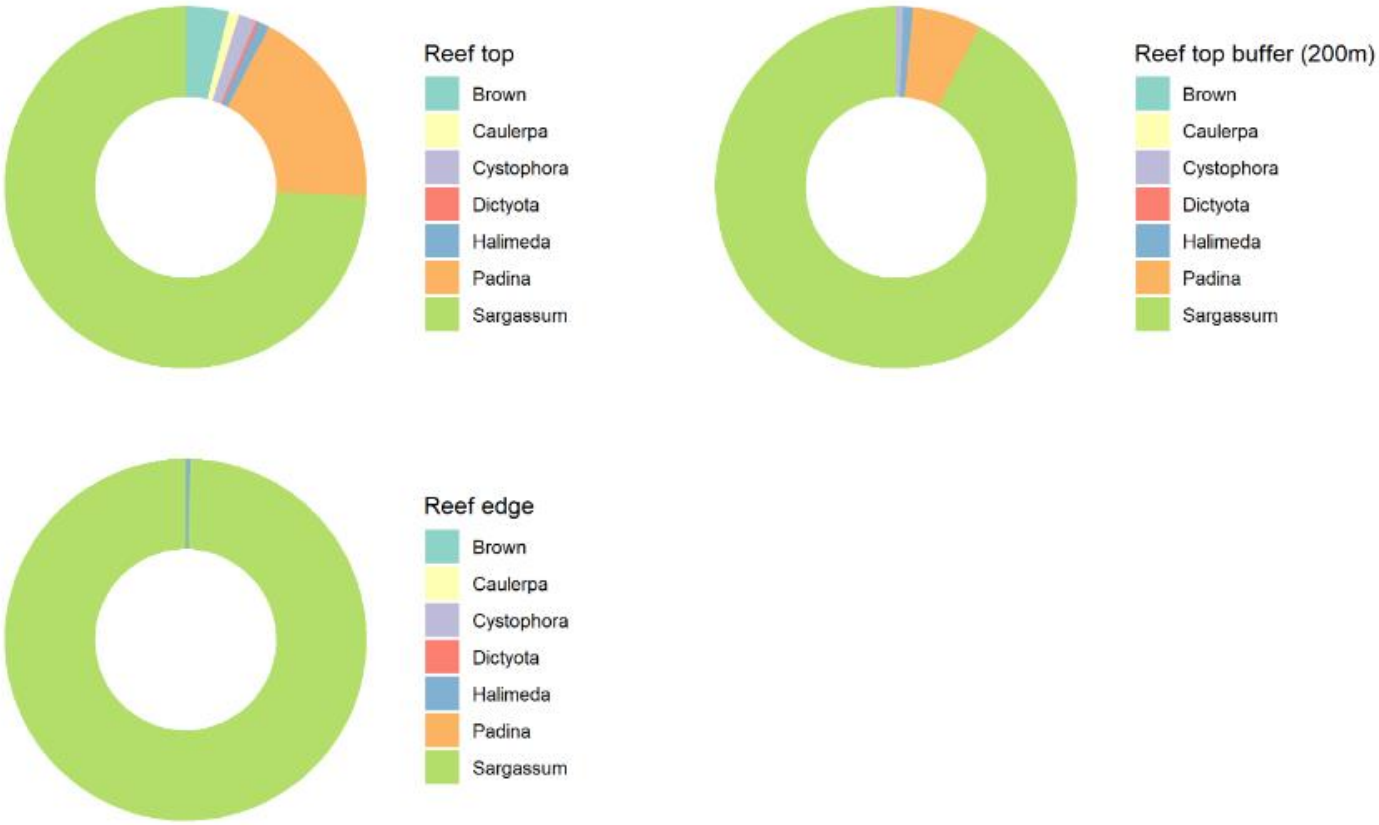


Figure 2-14. Composition of algae species for strata.

2.3.7 **Clam**

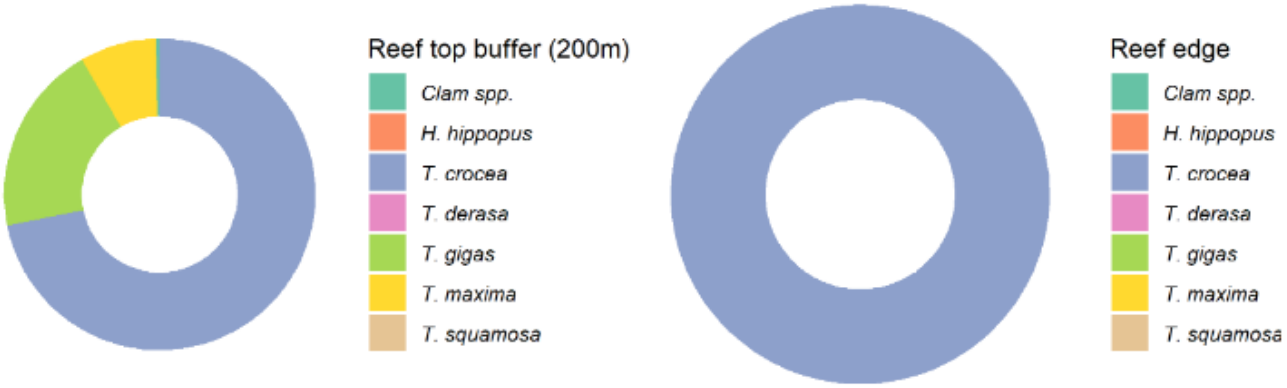


Figure 2-15. Composition of clam species for strata.

3 Key findings – reseeding

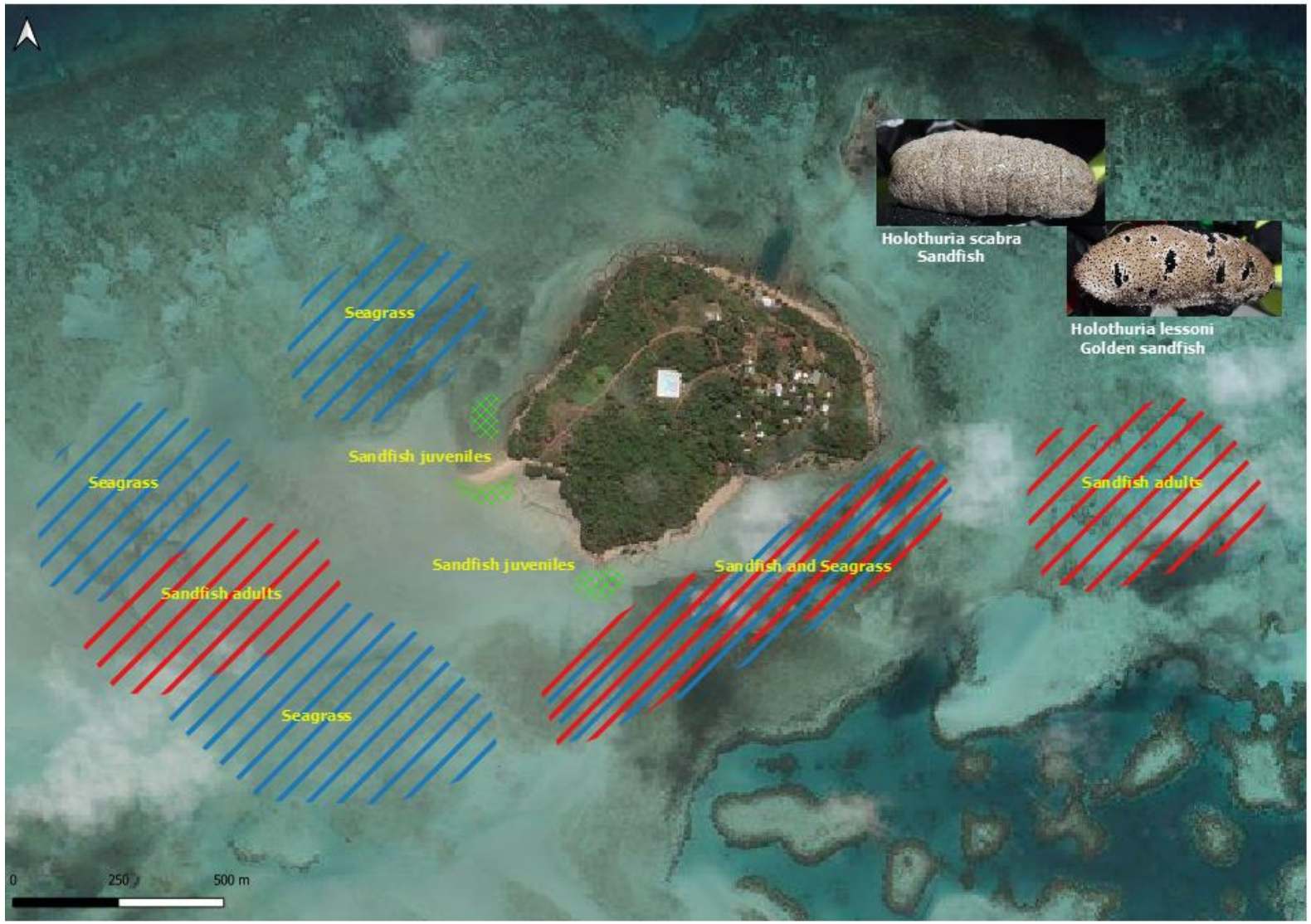


Figure 3-1. Sandfish locations and seagrass areas of interest for Ugar Island.

3.1 Survey notes

- A number of high value commercial sea cucumber species including Teatfish, Curryfish, Sandfish, Redfish, Blackfish and Prickly redfish were found at Ugar and Campbell reefs. Length frequency ranges for species showed sea cucumber populations to be above fishery size limits (Table 3-1).

Table 3-1. Sea cucumber species length frequency range and fishery limits.

Species	Common name	Length frequency (mm)	Size limit (mm)
Holothuria fuscogilva	White teatfish	250-425	320
Holothuria whitmaei	Black teatfish	250-300	250
Stichopus herrmanni	Common Curryfish	185-415	200
Stichopus vastus	Curryfish (vastus)	265-380	200
Holothuria lessoni	Golden sandfish	225-355	220
Holothuria scabra	Sandfish	240	200
Thelenota ananas	Prickly redfish	390-460	350

*Size limits set in The Torres Strait Beche-de-mer Harvest Strategy.

- Adults and juveniles of Sandfish species were identified from the current survey and from discussions with fishers providing photos (Figure 3-1).
- A number of Golden sandfish (*H. lessoni*) were located at an area to the East of Ugar island and were either almost fully or partially buried (Figure 3-1; Figure 3-2).
- One adult Sandfish (*H. scabra*) was found (off transect) at the same location as Golden sandfish (Figure 3-1).
- Golden sandfish (*H. lessoni*) measured during the survey were from various class sizes, suggesting the area provides suitable habitats for both adults and juveniles (Table 3-1).
- The Sandfish site was re-visited at different times of the day to account for sea cucumber burying behaviour, with more observed past early morning.

Figure 3-2. Golden sandfish (*Holothuria lessoni*), partially or almost fully buried.

- A remarkable clam garden was found at Campbell reef with three species of clam recorded - *Tridacna crocea*, *T. maxima* and *T. gigas*. Of note for the Giant clam (*T. gigas*) was the presence of a number of juveniles and adults (Figure 2-3).
- Two Crown-of-thorn seastars (*Acanthaster planci*) were found.
- Live coral looked healthy – no bleaching or disease was seen.
- Larger amounts of soft coral at sites may have resulted from recovery of a previous mortality event (Norstrom et al., 2009) eg. mass bleaching event recorded in 2017; or from elevated inorganic nutrient concentrations (Bednarz et al., 2012), from the possible influence of Fly River waters in the south-east trade wind season every few years for Torres Strait (Waterhouse et al. 2018).

3.2 Conclusions

The field survey of Ugar Island and Campbell Reef quantified the abundance of sea cucumber species and identified a number of habitats supporting high value sea cucumber species. The survey also provided information for clam species, in particular the Giant clam (*T. gigas*), a species of interest to the Ugar community.

The survey data provides essential information for the development of the re-seeding initiative for Ugar island. The data provides evidence of the occurrence of Sandfish species (*H. lessoni* and *H. scabra*) of different class sizes at Ugar, suggesting the habitat is suitable and hence they reproduce and grow in the area. Consequently, there is a strong potential to reproduce and rear these naturally occurring species in a local hatchery. The survey data also show there are suitable habitats to release hatchery-produced sea cucumbers, which supports the development of future aquaculture prospects for the Ugar community.

New understanding for species occurrence and knowledge of ecological systems is also of community benefit for future fishing and for safe-guarding important habitat area.

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A.1 Community consultation

CSIRO
Queensland BioSciences Precinct
306 Carmody Road St Lucia QLD 4072

csiro.au | ABN 41 687 119 230

19th December 2019

HABITAT SURVEY OF UGAR ISLAND

Mr Sereako Stephen
Chairperson Ugar RNTBC
Ugar Island

Dear Mr Stephen

CSIRO is currently engaged to carry out a survey of Beche-de-mer (sea cucumber) in Torres Strait. We will be undertaking the second part of the survey from 9th – 22nd January 2020.

As part of this work, we seek permission please to undertake a habitat survey of Ugar Island to support the re-seeding proposal that Mr Rocky Stephens and CSIRO researcher Dr Leo Dutra are developing.

The habitat survey will involve a number of measured transects from 40m to 100m long, that a SCUBA diver or Snorkeller will swim along and record the following:

Water depth
Transect length
Substrate type - sand, rubble, rock
Coral
Seagrass
Algae
Sponges
Sea cucumbers
Urchins
Trochus

These transects will be undertaken around the perimeter of Ugar and will include sand and reef top areas, as well as reef edges. This information will be of high value to the re-seeding proposal as it will provide important data on zonation of habitat types. We are also happy to include any locations that may be of interest to the community and ask for you to please let us know.

We are planning to undertake the habitat survey over one day around the 10th or 11th of January 2020, with timing dependent on weather and sea conditions. We are also more than happy for anyone to come and see what we are doing and to answer any questions.

At the completion of the survey a map will be produced displaying habitat information surrounding Ugar Island, which will be provided to the community as well as to Mr Rocky Stephens and Dr Leo Dutra.

Kind Regards

Nicole Murphy
Experimental Scientist
07 3398 4958
nicole.murphy@csiro.au

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1300 363 400
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csiroenquiries@csiro.au
csiro.au

For further information

Oceans & Atmosphere
Nicole Murphy
+61 07 3833 5948
nicole.murphy@csiro.au
csiro.au/oceans&atmosphere

Australia's National
Science Agency

Stock survey of sea cucumbers in East Torres Strait

Black teatfish – Supplemental results

Nicole Murphy, Eva Plaganyi and Tim Skewes

July 2020

AFMA Project 2019/0826

Multi-Use Ecosystems

OCEANS & ATMOSPHERE

Citation

Murphy NE, Plaganyi EE and Skewes TD (2020) Stock survey of Béche-de-mer in East Torres Strait – Black teatfish. Supplemental report. CSIRO, Australia. 37 pp.

Contents

Figures

Tables

Acknowledgments

This project is funded by AFMA and CSIRO. Underwater video cameras were kindly provided for use by TSRA. We would like to thank the Captain and crew of the MV Wild Blue and staff of Rob Benn Holdings for their valuable support and assistance during the survey.

Thank you to all Torres Strait Traditional Owners for regularly hosting us on their land and supporting this research.

1 Introduction

The sea cucumber fishery in Torres Strait, referred to as the Torres Strait Bêche-de-mer Fishery (TSBDMF) (Figure 1-1), is likely the oldest commercial trade fishery in Torres Strait, and has again become an important source of local income for Torres Strait islanders since it was re-established in the early 1990's.

Sandfish (*Holothuria scabra*) on Warrior Reef provided the bulk of the early catches for the TSBDMF, however, after Sandfish were closed to fishing in 1998 due to overexploitation (Skewes et al., 1998), the TSBDMF targeted several other species in east Torres Strait, including Black teatfish (*H. whitmaei*), Deepwater redfish (*Actinopyga echinites*), Surf redfish (*A. mauritiana*), and Blackfish (mostly *A. miliaris*).

Between 1994 and 2002, an estimated 205 t (landed weight) of Black teatfish was reported as being caught in the TSBDMF—an average of 26 t per yr. However, catch reporting was not compulsory at the time and this is likely an underestimate.

A survey in March 2002 found that Black teatfish and Surf redfish were most likely overexploited (Skewes et al., 2002) and a prohibition on the harvest of these species was introduced in January 2003. A survey in 2009 found that the Black teatfish population had recovered to near unfished densities (Skewes et al., 2010) and it was recommended that this species be reopened to fishing with a modest Total Allowable Catch (TAC), and community based harvest strategies to manage the spatial effort for the species (Skewes et al., 2010). Trial openings of the Black teatfish fishery were conducted in 2014 and 2015 with a maximum catch of 15 t. However, on both occasions the catch limit was exceeded (with a combined estimate of 40 t (landed weight) caught) and the fishery was closed again.

Fishery-dependent data for the TSBDMF is patchy. Mandatory Catch Disposal Records were only introduced to the TSBDMF in December 2017, so there is limited information available to assess the status of sea cucumber fishery populations, with incomplete catch and effort time series data available prior to 2017. A stock survey was therefore carried out in December 2019 and January 2020 to determine the size and status of sea cucumbers species in east Torres Strait and allow comparison to previous surveys undertaken in 1995/95, 2002, 2005 and 2009.

There is a strong desire from Torres Strait fishers to reopen the Black teatfish fishery. Fishery and contemporary estimates of population size and status for Black teatfish will support management decisions for this species and assist in the implementation of the new Torres Strait Bêche-de-mer Harvest Strategy (TSBDMHS) (AFMA, 2019).

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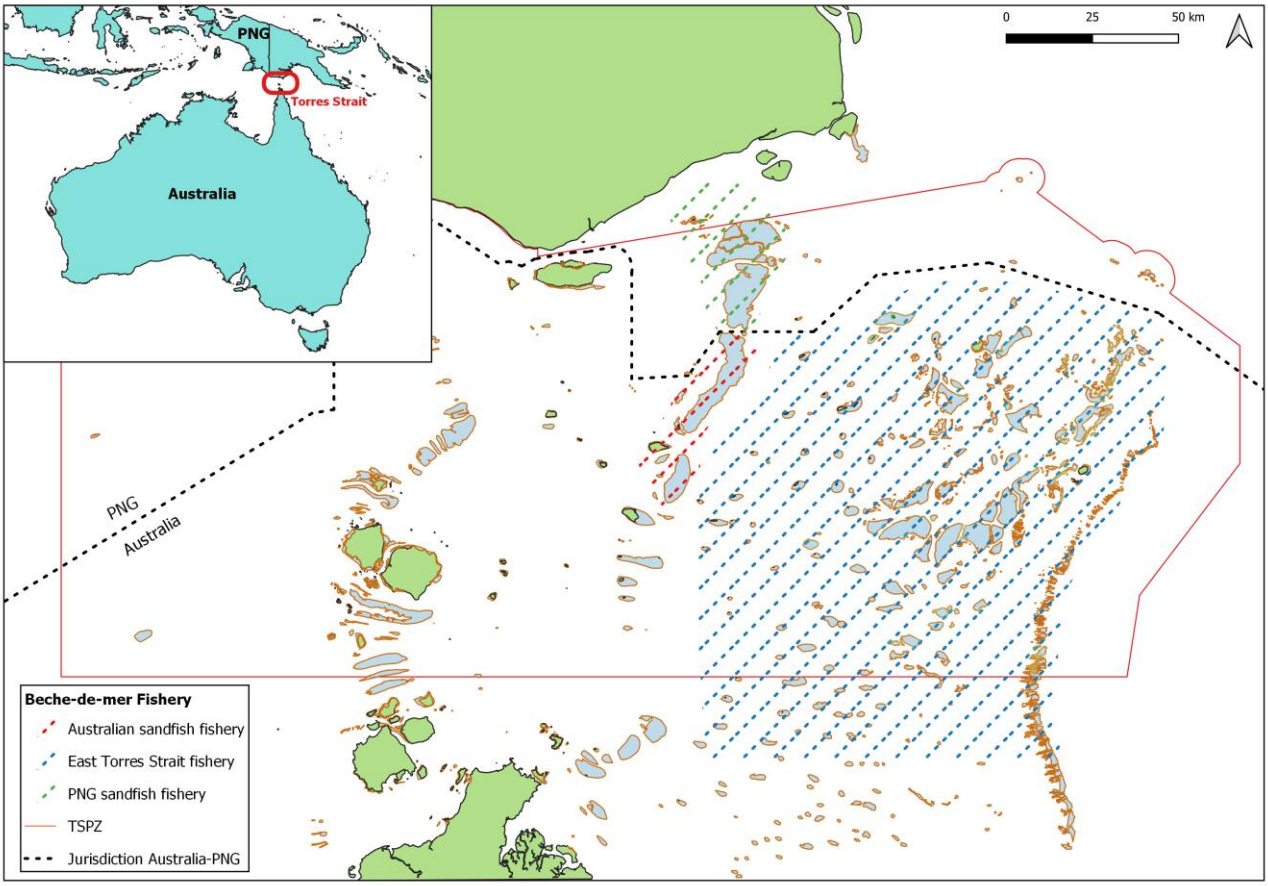

Figure 1-1. Map of Torres Strait showing the approximate location of the three sea cucumber fisheries in Torres Strait.

2 East Torres Strait survey

2.1 Study area

The east Torres Strait fishery is a 16,844 km^2 area of Torres Strait situated at its eastern extreme, which includes the Australian side of the Torres Strait Protected Zone east of Warrior Reef (Figure 1-1, Figure 2-1). It contains about 700 km^2 of shallow reef top habitat, 504 km^2 of shallow reef top buffer habitat and 185 km^2 of reef edge (<20 m deep) habitat, which accounts for about 64 % of reef habitats in Torres Strait (Skewes et al., 1999).

2.2 Sample design

The east Torres Strait study area was divided into 7 zones (these now form the basis of the fishery logbook zones), based on available catch information, likely Holothurian abundance and physiographic characteristics of the fishery habitats (Figure 2-1). These zones formed the basis for the sample design and stratified analysis.

A marine habitat map that delineated shallow reefs was superimposed on the fishery zones and used as the basis for the survey. Reef habitat was further divided into three habitat strata; the reef top, the reef top buffer and the reef edge stratum, with the reef top buffer strata being defined as a 200 m wide buffer around the inside of the shallow reef margin. During previous surveys, the reef top buffer was identified as an area likely to contain higher abundance of targeted species, especially Black teatfish (Skewes et al., 2010).

Past sea cucumber surveys of east Torres Strait have been undertaken in 1995-96 (full scale), 2002 (full scale), 2005 (relative – subset of sites from full scale survey) and 2009 (relative) (Skewes et al., 1999; Skewes et al., 2004; Skewes et al., 2010). The current survey was conducted using similar methods applied to previous surveys, with the addition of a new method to survey deep water habitat (drop cameras). Two of the survey staff - Nicole Murphy and Tim Skewes, have led or participated on all previous sea cucumber surveys.

The timing of the current survey was planned to coincide with the seasonal timing of previous surveys. This was to reduce differences in survey observer rates resulting from changes in sea cucumber burrowing behaviour, caused by seasonal and tidal factors.

2.3 Field work

We carried out the field surveys during November 2019 and January 2020. Across the two surveys, we visited 297 sites in East Torrs Strait. Most of the reef sites were those previously surveyed in the 2002 to 2009 surveys (Table 2-1).

Additionally, we also surveyed 53 deep-water (20-60 m) sites to investigate potential populations of sea cucumber in deep-water reef associated habitats.

Table 2-1. Number of sites by year, zone and strata for the 2019/20 Torres Strait sea cucumber survey.

Year	Zones	Reef top	Reef top buffer	Reef edge	Deep water	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

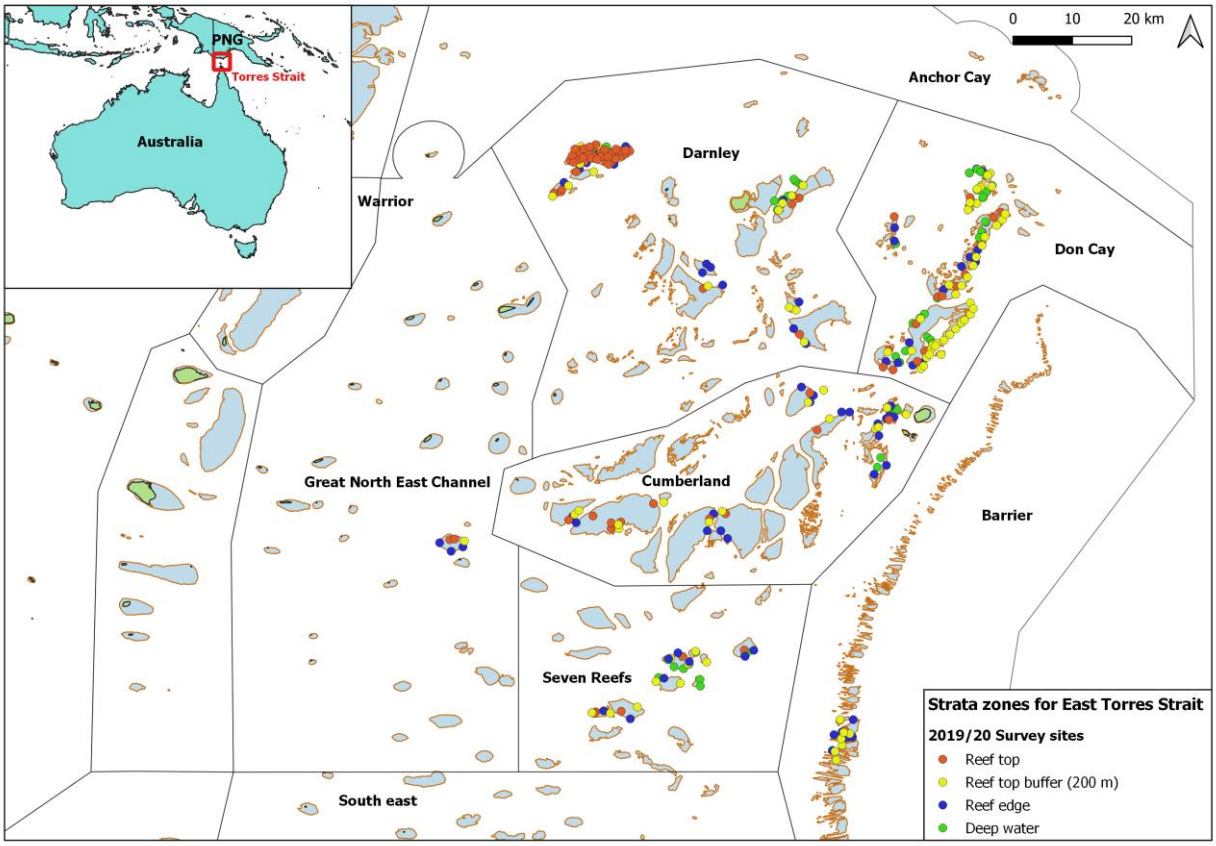

Figure 2-1. Sites visited by zone and strata, for the 2019/20 Torres Strait sea cucumber survey.

2.4 Analysis

Stratified density

Estimates of mean density (count per hectare) were derived using a stratified analysis of transect counts based on zones and reef strata (Figure 2-1). This takes into account the heterogeneity in the variance of observed counts and is representative of the physical size differences of the varying habitats in the surveys.

Density trends

For investigating trends in species density, we compared survey sites within zone and strata that were sampled in previous years. For all surveys since 1995, three zones were sampled consistently: Cumberland, Darnley and Don Cay zones. Four zones were consistently sampled in 1995, 2002, 2009 and 2019/20: Cumberland, Darnley, Don Cay and Great North East Channel.

Morphometrics

Length and weight measurements were used to produce frequency distributions, regression analyses and calculation of fishery size statistics.

Standing stock

Estimates of standing stock were calculated as the product of estimates of density, reef area and average weight from size frequency data collected during the survey. These data are suitable for calculating standing stock estimates for the surveyed areas, but not for direct comparison between years.

As the fishery catch in Torres Strait is recorded as (mostly) landed (gutted) weight (AFMA, 2019), we converted this estimate to landed (gutted) weight (referred to as fishery stock estimate) for comparison with catch data using updated fishery conversion factors (Murphy et al., 2020).

The population standing stock for the 2019/20 survey represented zones that equate to 138,849 Ha, which is over 80% of the total reef area in east Torres Strait.

Mirror-match bootstrapping

The combination of some small within-stratum sample sizes; zero-inflation of counts; and the skew and nonconformity of the distribution of observed densities renders many standard parametric analyses inappropriate.

To obtain comparable measures of uncertainty in density estimates across surveys, bootstrap confidence intervals were derived via the mirror-match bootstrapping technique developed by Sitter (1992). Mirror-match bootstrapping extends standard resampling methodology to stratified, multistage sample designs by emulating the original within-stratum sampling procedure.

Confidence intervals were set as the quantile corresponding to the desired percentile of the distribution. We calculated the bottom 90th percentile of the bootstrapped mean estimate distribution (this assumes that the real estimate would be 90% certain of being greater than this value) as a conservative stock estimate for formulating TAC recommendations. This approach is consistent with the new Harvest Strategy specification that the “Trial opening TAC needs to be set at a demonstrably conservative level” (AFMA, 2019).

3 Results

3.1 Density

Zone

The Barrier zone had the highest "whole of reef" density followed by Don Cay, Darnley and Grant North East Channel zones had a very low density. Cumberland and Seven Reef zones were intermediate. This follows the common pattern in Torres Strait (Skewes et al., 2010; Murphy et al., 2020) and the GBR (Benzie and Uthicke, 2003; Knuckey and Koopman, 2016), with Black teatfish more common in the barrier and outer shelf reefs (Table 3-1).

Strata

The highest densities of Black teatfish in 2019/20 were found for the reef top buffer strata of the Barrier (27 per Ha) and Don Cay (21 per Ha) zones, and overall, the reef top buffer strata had the highest density of all reef strata (Table 3-1; Figure 3-1). Reef edge had the next highest density, followed by the reef top strata. No Black teatfish were observed in the deep water (>20 m) strata. This distribution pattern is consistent with previous surveys in Torres Strait (Skewes et al., 2010) and also on the adjacent Great Barrier Reef (Benzie and Uthicke, 2003; Knuckey and Koopman, 2016).

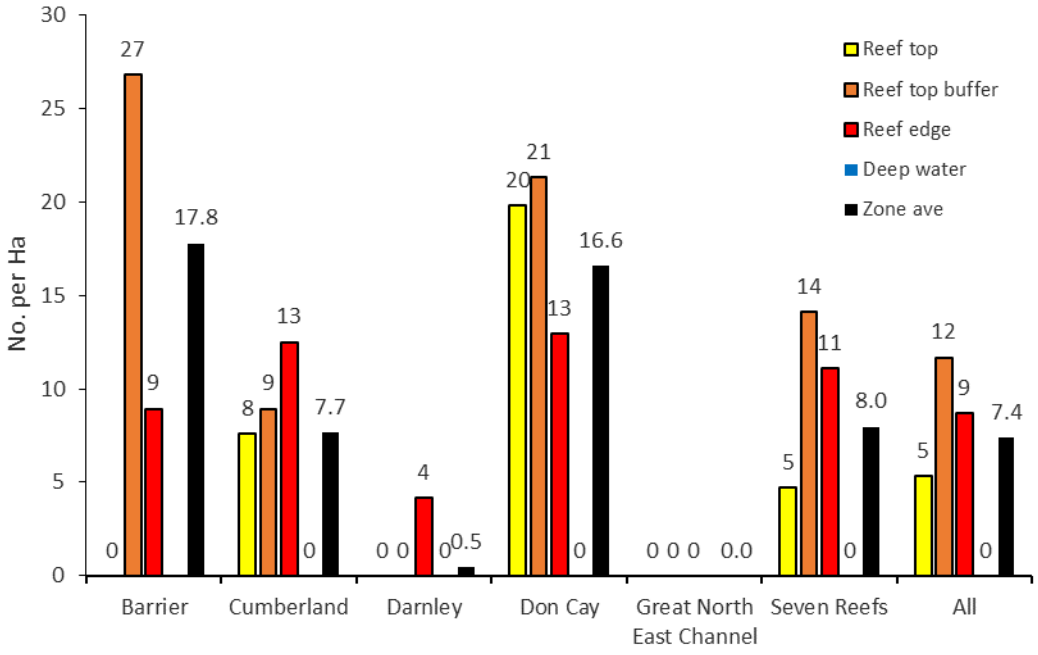

Figure 3-1. Black teatfish (*H. whitmaei*) average density for logbook zone and strata distribution for the 2019/20 Torres Strait sea cucumber survey.

Table 3-1. Density (No. per Ha) for Black teatfish (*H. whitmaei*) in each zone and strata in 2019/20 (GNE = Great North East). Includes sites that are not Black teatfish specific habitat.

Zone	Reef top	Reef top buffer	Reef edge	Deep water	Zone Ave
Barrier	0	26.8	8.9	-	17.8
Cumberland	7.6	8.9	12.5	0	7.7
Darnley	0	0	4.2	0	0.5
Don Cay	19.8	21.3	12.9	0	16.6
GNE Channel	0	0	0	-	0
Seven Reefs	4.7	14.1	11.1	0	8.0
All	5.3	11.7	8.7	0	7.4

*The current deep-water strata area is assumed to be the same as the reef edge area.

3.2 Stock estimate

3.2.1 Available stock biomass

The estimated biomass of Black teatfish in east Torres Strait in 2019/20 was 1,238 t (gutted weight) (Table 3-2). However, the bootstrapped lower 90th percentile of the stock estimate was 817.8 t.

Of that biomass, the available stock above fishery size limit (> Minimum Legal Size = 250 mm) for Black teatfish was 154.5 t (Table 3-3).

Table 3-2. Number of sites, total area of fishery habitat, whole live weight and landed (wet gutted) weight for Black teatfish (*H. whitmaei*) for the 2019/20 east Torres Strait survey (GNE = Great North East; Wt = Weight).

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

3.3 Size and weight

3.3.1 Length-frequency

Length measurements for Black teatfish in 2019/20 were represented across a wide size range (100 mm to 325 mm). This was the widest of any survey (Table 3-3, Figure 3-2) and had some of the largest Black teatfish also recorded, indicating a healthy population. However, the average size was slightly smaller than in 2009, with a slightly lower proportion of legal size animals (>250 mm) (Table 3-3, Figure 3-2).

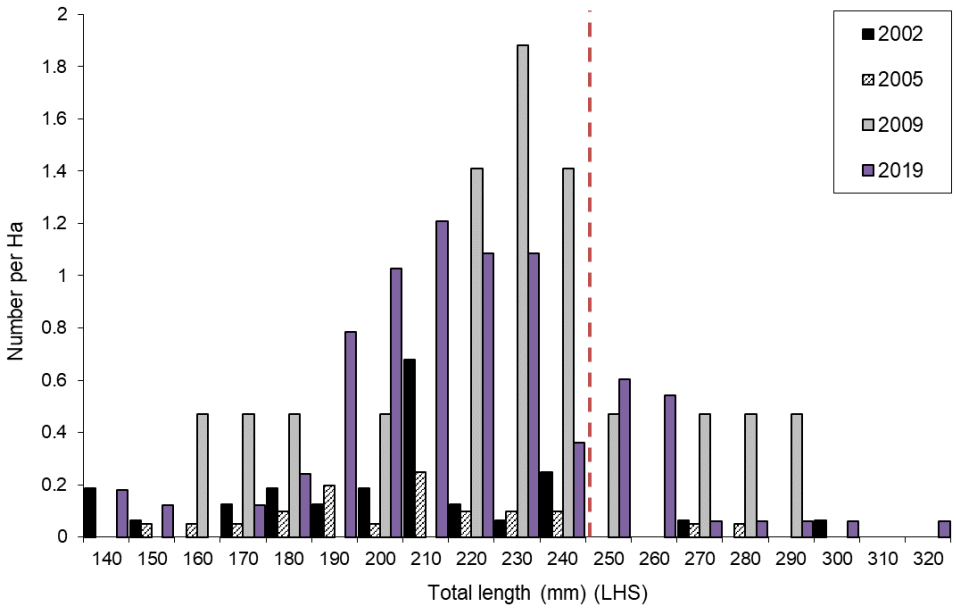

Figure 3-2. Length frequency for Blackt teatfish (*H. whitmaei*) collected during population surveys in east Torres Strait in 2002, 2005, 2009 and 2019. Minimum Legal Size (MLS) of 250 mm indicated.

Statistics

Size and weight measurements for Black teatfish collected during surveys in 1995/96, 2002, 2005, 2009 and 2019/20 were used to calculate fishery size statistics and their application to Minimum Legal Size (MLS = 250 mm) (Table 3-3).

The percentage of legal size Black teatfish stock (MLS >250 mm) for the 2019/20 survey was 18.9 % (Table 3-3).

Table 3-3. Size statistics for measured Black teatfish (*H. whitmaei*) during 5 surveys between 1995 and 2019.

Length and weight	1995/96	2002	2005	2009	2019/20
Count	7	35	23	18	127
Mean Length (mm)	203.9	209.3	209.3	228.1	219.0
Standard Deviation (mm)	58.8	44.5	31.9	34.5	31.5
% Legal size (250 mm)	14.3	8.6	8.7	22.2	18.9
Mean Weight (g)	1542.9	1666.5	1704.3	1701.0	1632.1
Standard Deviation (g)	383.4	387.8	251.8	216.6	344.1
Mean Wt (g) >MLS (250 mm)	1900.0	2051.9	1900.0	1976.4	1891.2
Standard Deviation (g)	-	127.6	318.2	103.7	399.8
Min length (mm)	106.3	120.5	156.7	160.0	100.0
Max length (mm)	259.9	300	280.0	290.0	325.0

Size

From the literature, the maximum size for Black teatfish is around 300 mm, with individuals commonly measuring 150 mm (Murphy et al., 2019). The maximum size recorded for the 2019/20 survey was 325 mm and the average size was 219 mm, which was lower than the 2009 survey but

larger than historical surveys. This indicates that full size adults are present in the population, with average size Black teatfish above common size and almost at size at maturity - determined as 220-260 mm (Murphy et al. 2019) (Table 3-3).

Weight

The average (live) weight for Black teatfish for the 2019/20 survey was 1632 g, with the weight range recorded as 580-2980 g for 91 individuals. The mean weight of Black teatfish >MLS (250 mm) for Torres Strait was 1891 g (Table 3-3).

Measurements of Black teatfish from the Great Barrier Reef (GBR) during a survey in 2015, recorded an average (live) weight of 1820 g and a weight range of 500-2900 g for 207 individuals (Knuckey and Koopman, 2016). The average weight of Black teatfish for Torres Strait was lower than the GBR, which may be due to more, smaller sized individuals being sampled during the 2019/20 survey, or smaller sized individuals present in the population. The weight range for the GBR was comparable to Torres Strait.

3.3.2 Length-weight relationships

Length and weight measurements for Black teatfish collected during Torres Strait surveys were analysed by linear regression using the power function according to Pauly (1996), to formulate a relationship between the two measures (Table 3-4): $W = aL^b$

Where W = weight in grams
L = length in mm
a = intercept
b = slope

Analyses were undertaken for measurements for combined survey years and for the 2019/20 survey (Table 3-4).

Table 3-4. Number of Black teatfish (*H. whitmaei*) measured, length-weight relationship and regression parameters for combined survey years (All = 1995/96, 2002, 2005, 2019/20) and for the 2019/20 survey.

Survey	n	Length-Weight relationship	r	a	b
All	131	$W=18.248\ L^{0.835}$	0.276	18.248	0.835
2019	91	$W=9.918\ L^{0.943}$	0.135	9.918	0.943

The results show a relatively poor correlation between length and weight for Black teatfish in the size range measured in Torres Strait (though still statistically significant; $p<0.001$), indicating there was considerable variation in weight for animals for the length range of 150 - 300 mm (Figure 3-3).

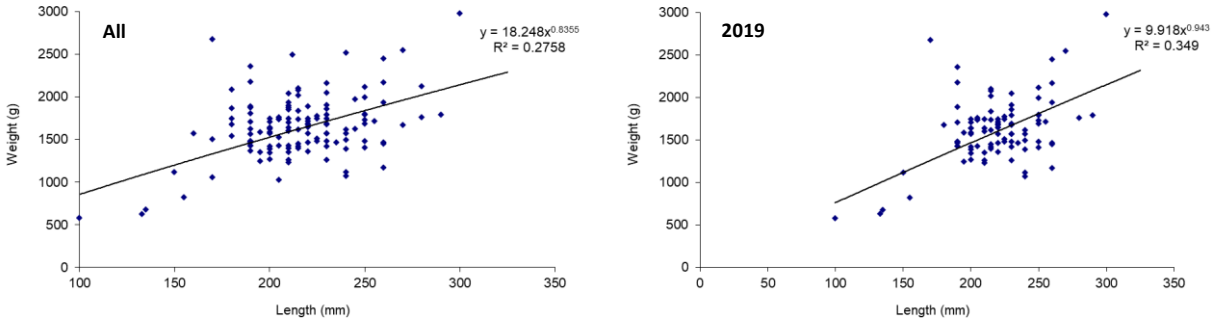

Figure 3-3. Length-weight relationship for Black teatfish (*H. whitmaei*) for combined survey years (All n = 131) and for the 2019/20 survey (n = 91).

3.4 Stock status

Stock status is usually assessed as the populations density or biomass relative to its virgin (before fishing) density/biomass (often referred to as B_0), which is related to the ecological system carrying capacity for that species. This can be a difficult process when dealing with species that may have variable recruitment and/or population density over time, or have a patchy distribution between or even within fishery habitat areas.

Additionally, fisheries depend on increases in productivity as populations are reduced by fishing, with the maximum productivity at B_{MSY}, and the maximum economic yield at B_{MEY}. Population depletion to levels lower than this will reduce productivity and can eventually lead to levels where recruitment is impaired, resulting in a very slow recovery or the even local extinction. Understanding these levels is important for maintaining populations in a healthy state. Unfortunately, for sea cucumbers, these "reference" levels (often expressed as the target biomass reference level – B_{TARG} – where we want the population to be based on B_{MEY}; and the limit reference biomass level – B_{LIM} – where the danger of recruitment failure is unacceptably high) are not well understood.

While default values of B_{TARG} and B_{LIM} in the Commonwealth Harvest Strategy Guidelines (DAF, 2007) are 48% B_0 for B_{TARG} and 20% B_0 for B_{LIM}, there is wide recognition that these reference levels may be too low for sea cucumbers, due in part to the "Allee" affect where there is low fertilisation success in the water column at low densities.

The Torres Strait Beche-de-mer Fishery Harvest Strategy acknowledges this uncertainty by specifying a conservative proxy value of B_{LIM} of 40% B_0. It is envisaged that values of B_{TARG} will be developed as more data becomes available.

The current status of the Black teatfish fishery population can be assessed by comparison of current density, with density estimates from previous surveys and with survey in neighbouring fisheries and regional surveys.

Note

Unbiased comparisons of animal densities over time and between locations is dependent on a clear delineation of the surveyed habitats, and the application of objective and repeatable sampling approaches. Sea cucumbers, particularly Black teatfish, are found at variable densities

across reef morphometric habitats and in relation to distance from terrigenous influence (across shelf)—and likely several other lesser known gradients.

Fortunately, historic surveys in Torre Strait have been carried out using the same sample design and survey approach, therefore comparisons of density over time likely indicate actual population status (within the bounds of statistical confidence). While the Torres Strait surveys sample all reef habitats and the majority of the geographical range of Black teatfish in Torres Strait (at least at the level of Zones), other surveys on the GBR have only surveyed "suitable habitat" (usually defined as the weather edge reef buffer (200 m) zone) (Benzie and Uthicke, 2003; Knuckey and Koopman, 2016), making comparisons difficult. Other reference values from the South Pacific are even more poorly defined.

3.4.1 Comparison to previous surveys in Torres Strait

The overall average density for Black teatfish in 2019/20 was slightly lower than 2009, which in turn, were the highest ever observed in Torres Strait since surveys began (though with low statistical precision) (Table 3-5, Figure 3-4).

The highest zone averages were found in the Barrier and Don Cay zones (Table 3-5, Figure 3-4, Figure 3-5), which is consistent with earlier surveys, and is consistent with surveys in other regions (e.g. GBR has highest population density in outer shelf and barrier reefs—Benzie and Uthicke, 2003; Knuckey and Koopman, 2016). Cumberland zone density in 2019/20 was lower than in 2009 but still higher than historic surveys, and Seven reefs was the highest since surveys have been undertaken. Darnley zone was the lowest ever observed (though never a high-density zone in any year) and the Great North East Channel zone had no observed Black teatfish.

The highest density reef habitats were the reef top buffer (outer 200 m) strata of reefs in the Don Cay and Barrier zones (Figure 3-1, Table 3-3, Figure 3-5) at 21.3 and 26.8 per Ha respectively, which was consistent with previous surveys and studies elsewhere.

Given the low levels of exploitation since the fishery was closed in 2003 (~40 t) relative to current estimates of fishery biomass, and current density relative to previous surveys, we can say with some confidence that the population is likely to be above the limit refence point (B_{LIM}) of 40% B_0. Furthermore, high densities observed in the preferred Black teatfish habitats of Don Cay and Barrier for reef-top buffer strata, and observations of long-term Traditional Owner fishers, indicate the population is likely near virgin biomass levels (B_0).

However, there are still some uncertainties in the assessment, particularly with regard to the lower density values in the Darnley and Cumberland zones (Figure 3-4, Figure 3-5)—two zones that would likely be subject to the highest fishing pressure in the reopened fishery.

Table 3-5. Zone and east Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for Black teatfish (*H. whitmaei)* for five surveys (does not include deep water strata) (GNE = Great North East). Note: Includes sites that are not Black teatfish specific habitat.

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	9.6	3.9	2.7	7.9	0	0	3.6
2002	6.8	1.8	1.2	7.2	0	0	2.2
2005	10	0	2.7	2.7	-	0	1.1
2009	-	13.2	1.1	9.1	1.7	0	8.5
2019	17.8	8.4	0.4	19.9	0	8.4	7.7

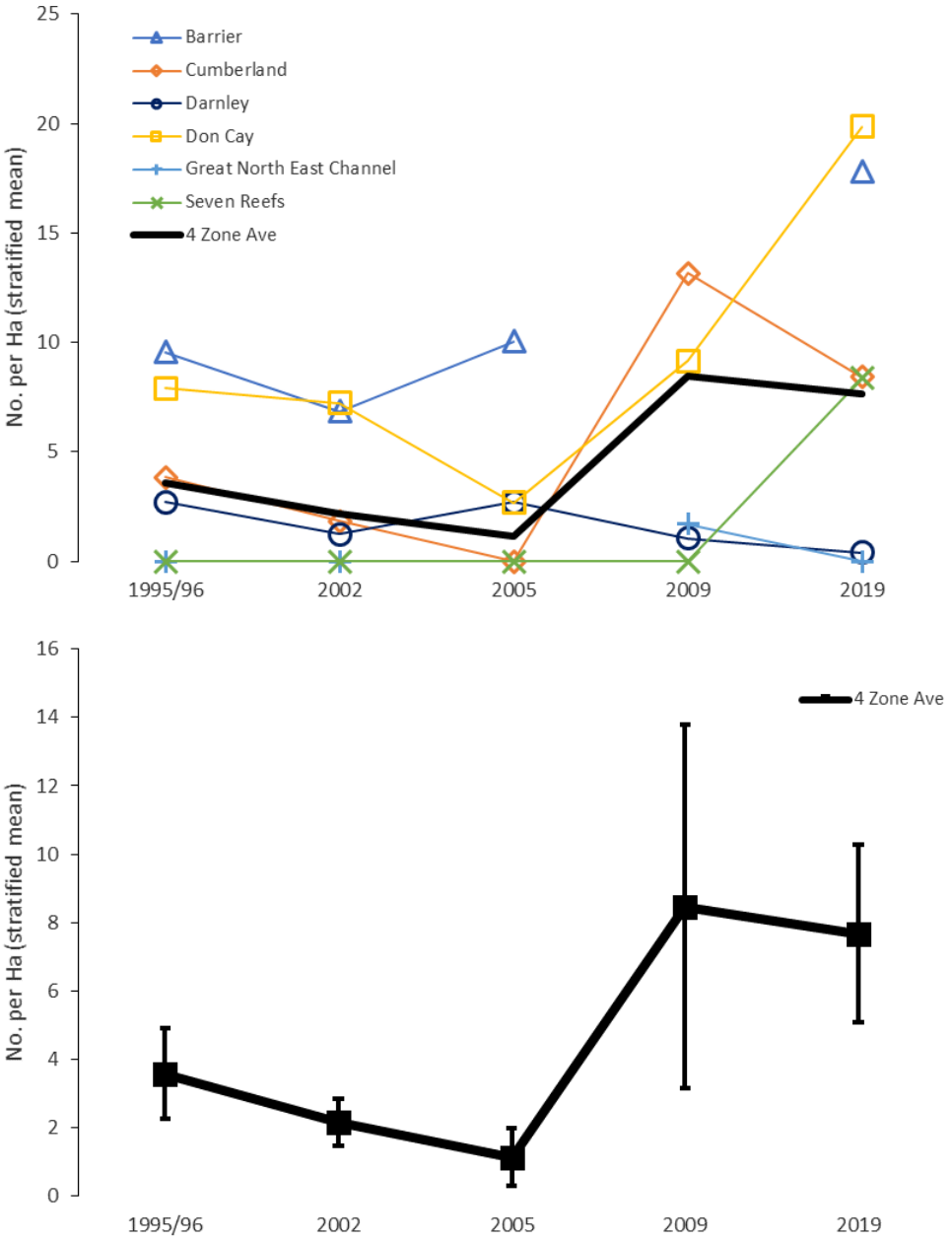

Figure 3-4. Zone (top) and east Torres Strait (4 zone) (bottom) average (stratified) density (No. per Ha) for all reef strata for Black teatfish (*H. whitmaei*) from five surveys (not including the deep-water strata). Note: Includes sites that are not Black teatfish specific habitat.

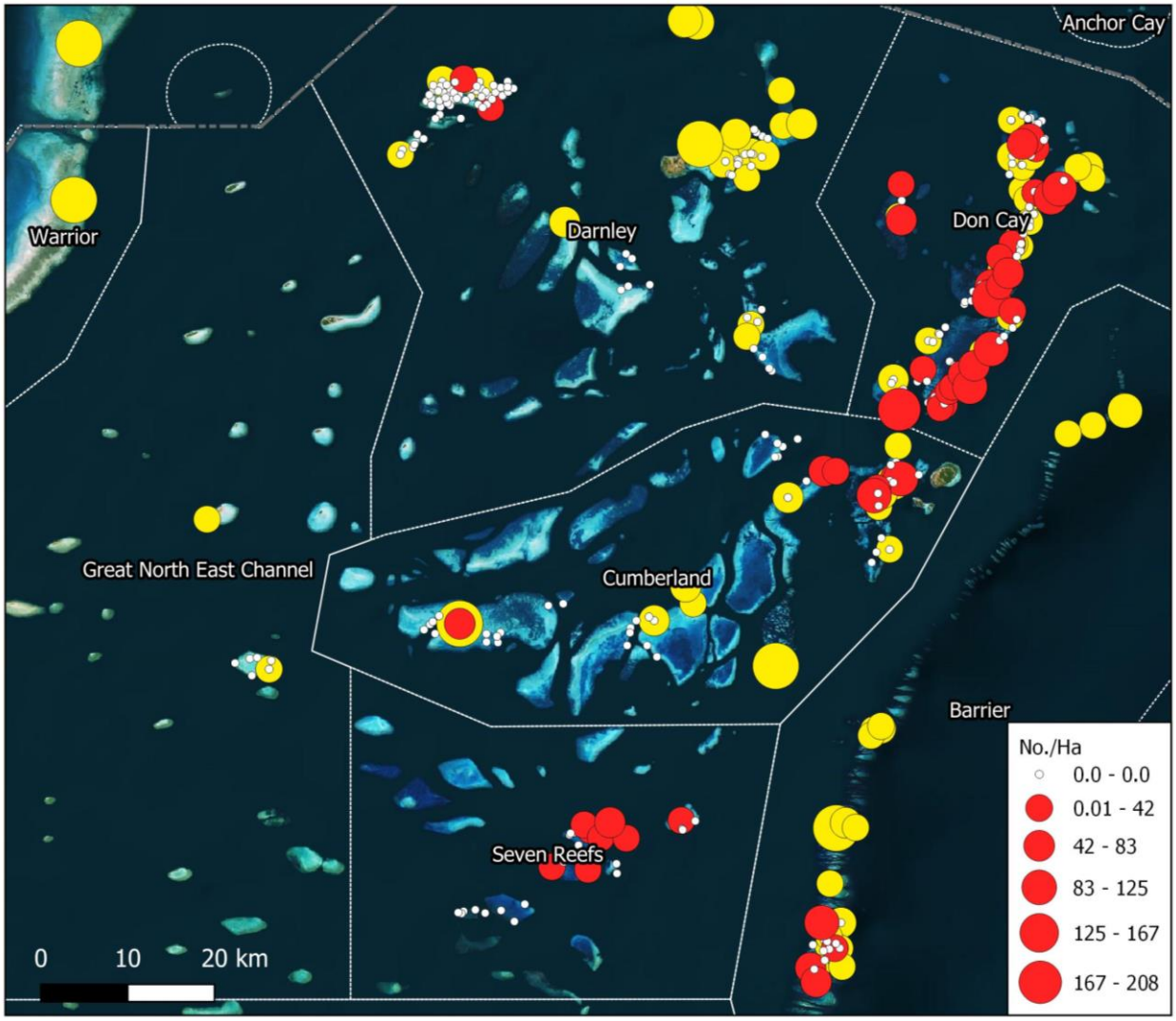

Figure 3-5. Density of Black teatfish (*H. whitmaei*) at individual survey sites during surveys in east Torres Strait from 1995 to 2009 (yellow) and 2019 (red).

3.4.2 Comparisons to other Black teatfish populations

Great Barrier Reef (East Coast Fishery)

A survey on the Great Barrier Reef (GBR) mid and outer shelf reefs in the "area of the fishery" (12-19° S—Princess Charlotte Bay to Lucinda) was carried out in 1999 (Benzie and Uthicke, 2003; Uthicke and Benzie, 2000). The habitat for the survey was described as the "shallow reef flat, though "areas with > 60% sand cover were avoided" (Benzie and Uthicke, 2003) and "we excluded areas from the reef flat that are unlikely habitat" (Uthicke and Benzie, 2000). Other than that, it is not clear how reefs were sampled, or the transect start locations (Knuckey and Koopman, 2016). Density estimates from that survey were:

- Black teatfish in the "main habitat" on the shallow reef flat on 'closed reefs' were 20.97 individuals/Ha (n=6, 95% confidence interval [CI] = 16.3–25.73).
- Density of Black teatfish on the same habitat on 'open reefs' was 5.01 individuals/Ha (indicating a severe depletion caused by the fishery, and the fishery was closed in 1999).
- The biomass estimate for the "fishery area" (Princess Charlotte Bay to Lucinda) was 5,585 t.

A recent (2015) survey in the northern zone of the GBR (Knuckey and Koopman, 2016) found:

- Densities of Black teatfish of 13.5 (closed reefs) and 12.5 (open reefs) individuals/Ha in exposed mid-shelf reefs, and;
- Densities of 27.0 (closed reefs) and 23.6 (open reefs) individual/Ha for outer barrier reefs, in the exposed reef buffer (200 m) habitat.
- Overall, total gutted biomass estimated as 379 t. This was from a very restricted area of habitat (18,365 Ha) of the dry reef in this area (out of 636,500 Ha of dry reef area in GBR—2.9%). (Note that the habitat area for the 2019/20 east Torres Strait survey was 138,849 Ha.)

Based on the results of the 2015 survey, the GBR Black teatfish population in the GBR "area of the fishery" was determined to have recovered to >70% of virgin biomass, therefore the fishery was opened in 2019 with a 30 t TAC.

Both studies indicate that densities in the reef buffer zone of midshelf and outer barrier reefs had a carrying capacity in the order of 12.5 to 27 individuals per Ha. This compares well with the density observed in the reef top buffer strata for the current Torres Strait survey, with densities of 21 to 27 per Ha recorded.

Natural Densities

A review of survey data from throughout the West Pacific concluded (Kinch et al., 2008):

- Densities above 12.5 per Ha represent a "natural density" in "suitable habitat".
- Noting "the range of densities found at "closed" sites it seems a conservative assumption that densities above 12.5 ind. ha^{-1} represent a "natural" density for this species on suitable habitat."

Densities higher than this are also possible. Guidance from the Secretariat Pacific Community provides "rule of thumb" regional reference densities of 50 individuals per Ha for Black teatfish—estimated from the upper 25% of densities across 91 sites assessed in 17 countries over the period 2002–2012 (Pakoa et al., 2014).

The highest site density observed during the 2019/20 survey of Torres Strait was 167 per Ha, and the mean of the upper 25% of densities in the reef top buffer strata for all reefs was 62.6 per Ha, and 82.3 per Ha for the Don Cay and Barrier zones combined.

Other estimates of "natural" density for Black teatfish in Western Australia include: 11.4 to 17.1 individuals/Ha in "habitats occupied by Black teatfish" and likely represents minimum natural population densities for Ningaloo Reef (Shiell and Knott, 2010).

Note

Comparisons with regional density data from the Great Barrier Reef and West Pacific indicate that the Black teatfish populations in Torres Strait observed during the survey undertaken in 2019/20, are at near natural (unfished) densities and further corroborate Traditional Owners observations reported to HCWG meetings.

4 Sustainable yield

4.1 Preliminary Population Modelling

4.1.1 Summary

A simple Pella-Tomlinson biomass dynamics population model is applied to the Torres Strait Black teatfish population as a whole, and is fitted to all available survey indices of abundance. The model is a preliminary simple model only, used for illustrative purposes and recommendations are provided for improved modelling that could be done in future. The modelling exercise acknowledges that there are limited data and large uncertainties. Nonetheless, when considering a range of uncertainties and across a number of model sensitivities, the modelling results suggest that 15 t is likely a sustainable annual TAC whereas a sustained 30 t TAC may result in the stock declining in future years. As more data become available, it will be possible to refine and substantially improve modelling results.

4.1.2 Introduction

To complement recent survey estimates and associated analyses for Black teatfish (BTF) in Torres Strait, some simple population modelling of Black teatfish was done. There are a large number of uncertainties and limited data available to inform a population model. However, as a time series of survey estimates have become available, the purpose of the preliminary modelling was to assist in informing whether an increased initial reopening TAC might be possible for this species, considering some key uncertainties. We note that it would be better to use the spatial age-structured operating model used in previous Management Strategy Evaluation (MSE) analyses (Plagányi et al. 2013, 2015) but there was insufficient time and resources to provide updated modelling results for current purposes. Hence as an additional method for investigating what level of fishing might be sustainable, a simple aggregated modelling approach was applied here.

Methods

Population Model

One of the simplest population models that assumes logistic growth is the Schaefer model, for which Maximum Sustainable Yield (MSY) is achieved at half the carrying capacity (or pre-exploitation biomass) *K*. A more generalised form which allows a different shape of the production curve is the Pella-Tomlinson model. The following discrete Pella-Tomlinson equation with annual time-step was thus applied to the BTF population as a whole, with start year 1994:

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

where

N_t is biomass of BTF at start of year *t*;

K is the carrying capacity of BTF, which is assumed to be the total population biomass in 1994 when the fishery in TS started in earnest;

μ controls the shape of the production curve, with default value 1 (Schaefer model)

r is the net growth rate (encompassing somatic and population growth rate and including all non-anthropogenic sources of mortality);

C_t is the total annual catch (in tons live weight) of BDM in year *t*.

Fitting to Data

The model was fitted to the 5 available survey indices of abundance, together with their associated standard errors. The contributions by each of these to the negative of the log-likelihood (*-ln L*) are calculated assuming that the observed abundance index is log-normally distributed about its expected value:

$$I_t^s = \hat{I}_t^s e^{\varepsilon_t^s} \qquad \text{or} \qquad \varepsilon_t^s = \ln(I_t^s) - \ln(\hat{I}_t^s) \tag{2}$$

where I_t^s is the survey *s* abundance index for year *t*,

$\hat{I}_t^s = q\ N_t$ is the corresponding model estimated value, where N_t is the model value for resource biomass, which uses the average of the four-zone estimates for each of the survey years (Table 3-6);

q is the constant of proportionality, and

ε_t^s from $N\left(0,\left(\sigma_t^{sp}\right)^2\right)$.

The contribution of the abundance data to the negative of the log-likelihood function (after removal of constants) is given then by:

$$-\ln L = \sum_t \ln \sigma_t^{sp} + \left(\varepsilon_t^s\right)^2 / 2\left(\sigma_t^{sp}\right)^2 \tag{3}$$

The survey catchability coefficient *q* is estimated by its maximum likelihood value which, for the case of a log-normal error distribution, is given by:

$$\ln \hat{q} = \frac{\sum_t 1/\left(\sigma_t^{sp}\right)^2 \left(\ln I_t^s - \ln \hat{N}_t\right)}{\sum_t 1/\left(\sigma_t^{sp}\right)^2} \tag{4}$$

where $\left(\sigma_t^{sp}\right)^2 = \ln\left(1+\left(CV_t\right)^2\right)$ and the coefficient of variation (CV_t) of the resource abundance estimate for year *t* is input.

A similar approach is used in a model version that fits to the absolute abundance estimate for 2019.

Model Alternative Versions and Parameter Estimates

The two key parameters estimated by the model were *r* and *K.* Alternative model versions were also attempted with these parameters fixed one at a time at plausible values, but these

simulations didn't yield any more insights than the preliminary results presented here. The default setting of parameter μ which controls the shape of the production curve, was 1 such that it corresponds to a Schaefer model. This parameter was also estimated by the model. The base-case model fitted only to the survey relative abundance indices. An alternative model was also run which included also fitting to the absolute estimate of abundance from the 2019 survey.

Base-case Model

The base-case model used was a Schaefer model that was fitted to the survey relative indices of abundance (4-zone averages; Cumberland, Darnley, Don Cay, Seven Reefs). As it is likely that the 1995 survey may have under-estimated stock size given it was an initial exploratory survey, the 1995 survey estimate is doubled in the base-case model. It is also recognised that here is uncertainty regarding historical catches (under-reporting and wastage), as in the early years in particular it was not compulsory to record catches. For this reason, the historical annual catch estimates have been multiplied by a factor of 1.5 (i.e. assumed 50% larger). Conversion rate for Total weight estimate to convert to landed (gutted) weight (to be equivalent to catch data) is 0.677.

Sensitivity Tests

A number of sensitivity tests were conducted and the results of a few key tests are presented here. These include different assumptions regarding the 1995 survey estimate, catches are double the base-case estimates and estimating the production shape parameter.

4.1.3 Results

A summary of the model results are given in Table 4-1.

Table 4-1. Summary of model results when fitting to 4-zone survey averages. Model variants shown are either S=Schaefer model or P=Pella-Tomlinson form (with associated parameter mu) and dbl represents doubling the 1995 survey estimate. The hessian-based standard deviations are shown in square brackets where appropriate. Models 3 and 8 are in italics because they resulted in a significantly poorer fit and hence there is substantially less confidence in these model versions.

	Description	No.pars	r & [STDEV]	K (t) & [STDEV]	q	-lnL	AIC	MSY (t)	BMSY (t)	B(2019) (t)	B2019/BMSY
Model 1	S; fix r	1	0.15	490.7 [67]	0.014	-2.336	-2.672	18.5	245.4	336.9	1.37
Model 2	double surv(95)	1	0.15	450.0 [257]	0.0233	-3.552	-5.104	16.9	225	242.3	1.08
Model 3	*S; fix r*	*1*	*0.1*	*600.9 [172]*	*0.01*	*-1.605*	*-1.21*	*15*	*300.5*	*385.7*	*1.28*
Model 4	S; fix r; dbl	1	0.2	416.6 [150]	0.025	-4.442	**-6.884**	20.8	208.3	274.7	1.31
Model 5	S; est r,K	2	0.29 [0.13]	391.8 [60]	0.017	-3.173	-2.346	28.5	195.8	344.3	1.75
Model 6	S; est r,K; dbl	2	0.25 [0.08]	396 [35]	0.025	-4.665	-5.33	24.6	197.8	308.2	1.56
Model 7	P; est r,K,mu; dbl; mu=3.5	3	0.25 (0.08]	396 [35]	0.025	-4.665	-3.33	49.7	257.4	308.2	1.19
Model 8	*Fix K, est r*	*1*	*0.097 [0.08]*	*820.6*	*0.0068*	*-1.23*	*-0.46*	*19.9*	*410.2*	*647.8*	*1.57*

The model was fitted for a range of fixed r values from lower to higher values, but the model failed to converge for very low *r* values and yielded a poor fit for the more conservative value of 0.1. When r was estimated together with *K*, the model estimate was 0.25, but the estimation of an additional parameter using the AIC criterion means that it was not considered the best model. The model version with *r*=0.2 was therefore selected as the base-case model based on it having the lowest AIC score (noting that model selection criteria cannot be used to compare models with and without the 1995 survey estimate doubled, but the version with the 1995 survey estimate doubled was used as the base-case and sensitivities presented to support that this did not substantially affect model results). The fit of the base-case model is shown in (Figure 4-1).

The base-case model estimate of MSY was 20.8 t with 90% Hessian-based confidence interval 19.6-22.1 t (Table 4-1). Across all model versions and sensitivity tests, a TAC of 20 t was found to be sustainable whereas there were indications from most models that 30 t per year may be unsustainable in the longer term (Figure 4-1). Model 3 uses a more conservative r value which suggests a lower sustainable TAC of 15 t, but the model does not adequately fit the data. The Pella-Tomlinson MSY estimate is much higher but the model could not satisfactorily estimate the shape parameter mu (parameter could not be reliably estimated (C.V. >1) and hence the associated MSY estimate is highly uncertain. The model version (Model 8) that fixed K at higher values (821 t used in Model 8) resulted (as expected) in lower associated estimates of r (0.1 in Model 8) but did not satisfactorily fit the data (see AIC in Table 4-1) and hence is not considered further here, but this aspect will be investigated further in future work and as more data become available.

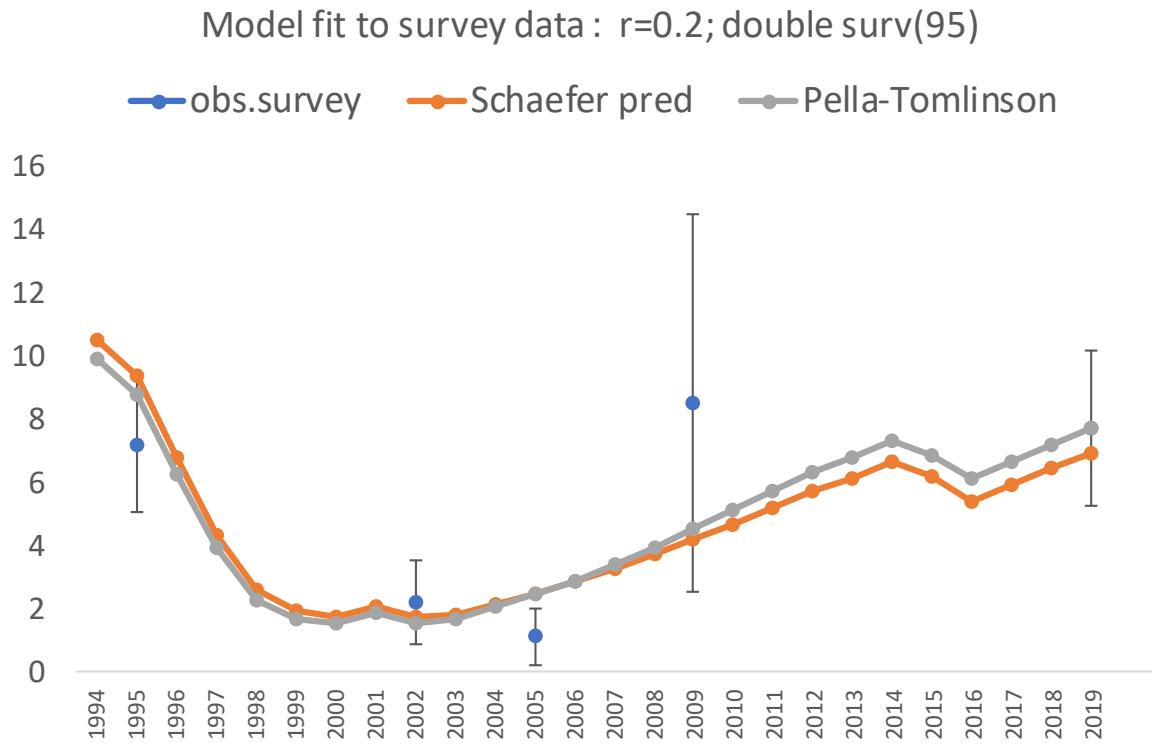

Figure 4-1. Base-case Schaefer model fit to observed survey data using observed standard error estimates (S.E.), and compared with model trajectory estimated using Pella-Tomlinson model version. Note: 1995 estimate doubled.

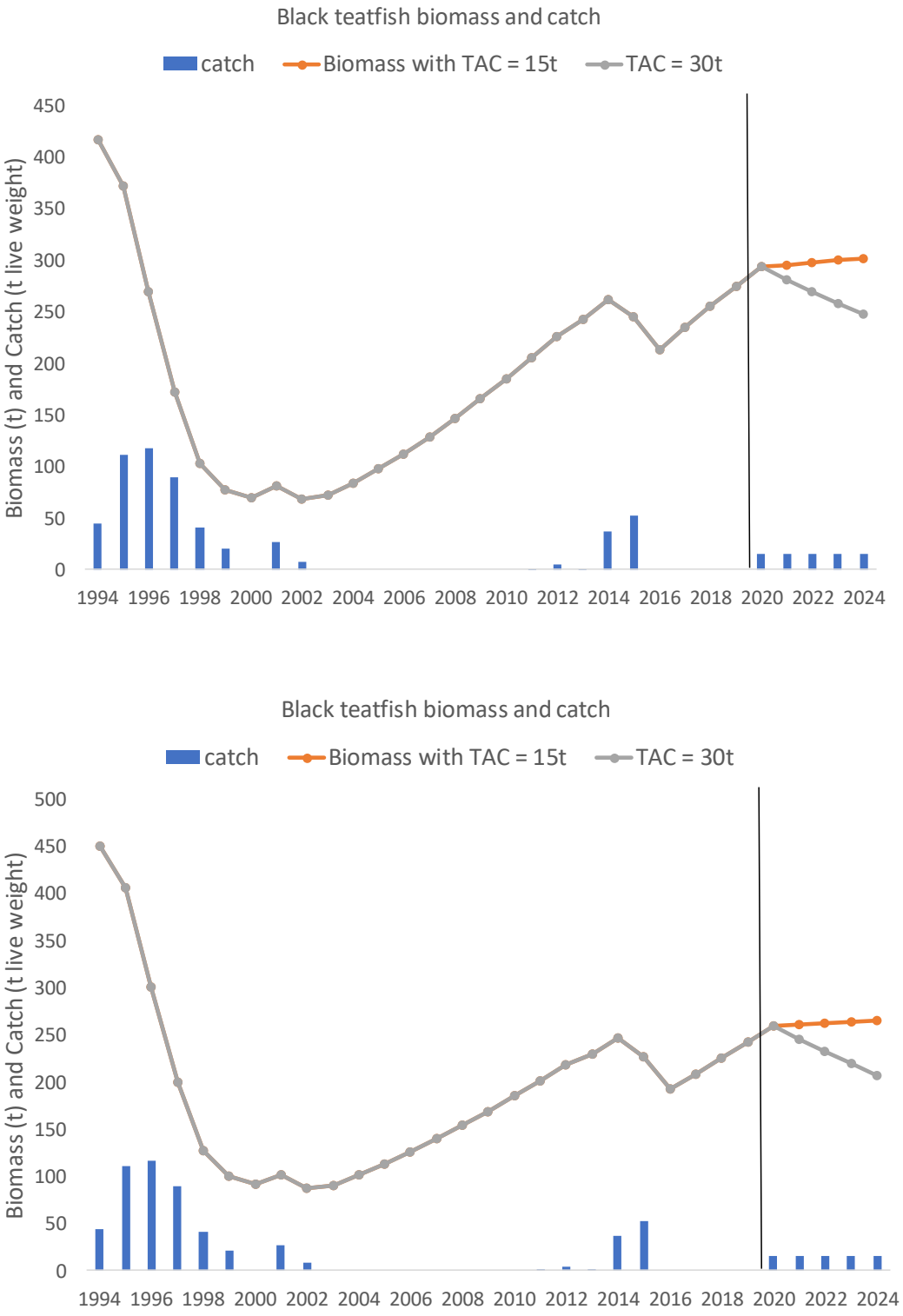

Figure 4-2. Base-case (Model 4) model-estimated (top) and model with lower r value (Model 2) (lower figure) total BTF biomass historical trajectory and showing 5-year forward projections when assuming an annual TAC of 15 t compared with 30 t.

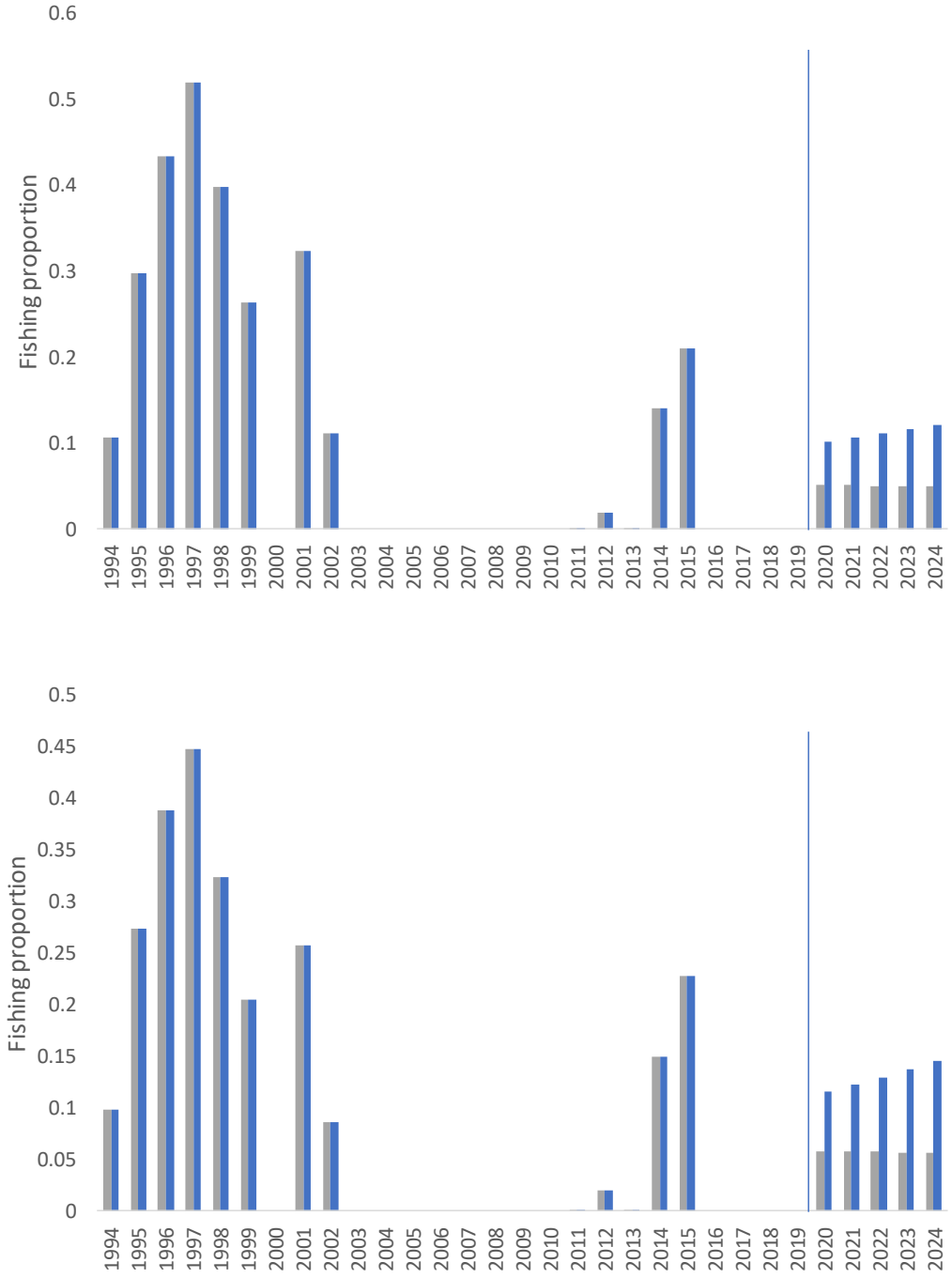

Figure 4-3. Base-case (Model 4) model-estimated fishing proportions (top) and Model 2 (bottom), computed simply as the total annual catch as a proportion of the total biomass. The vertical line separates the future projected illustrative catch proportions, where the grey bars correspond to a 15 t TAC and the blue bars a 30 t TAC.

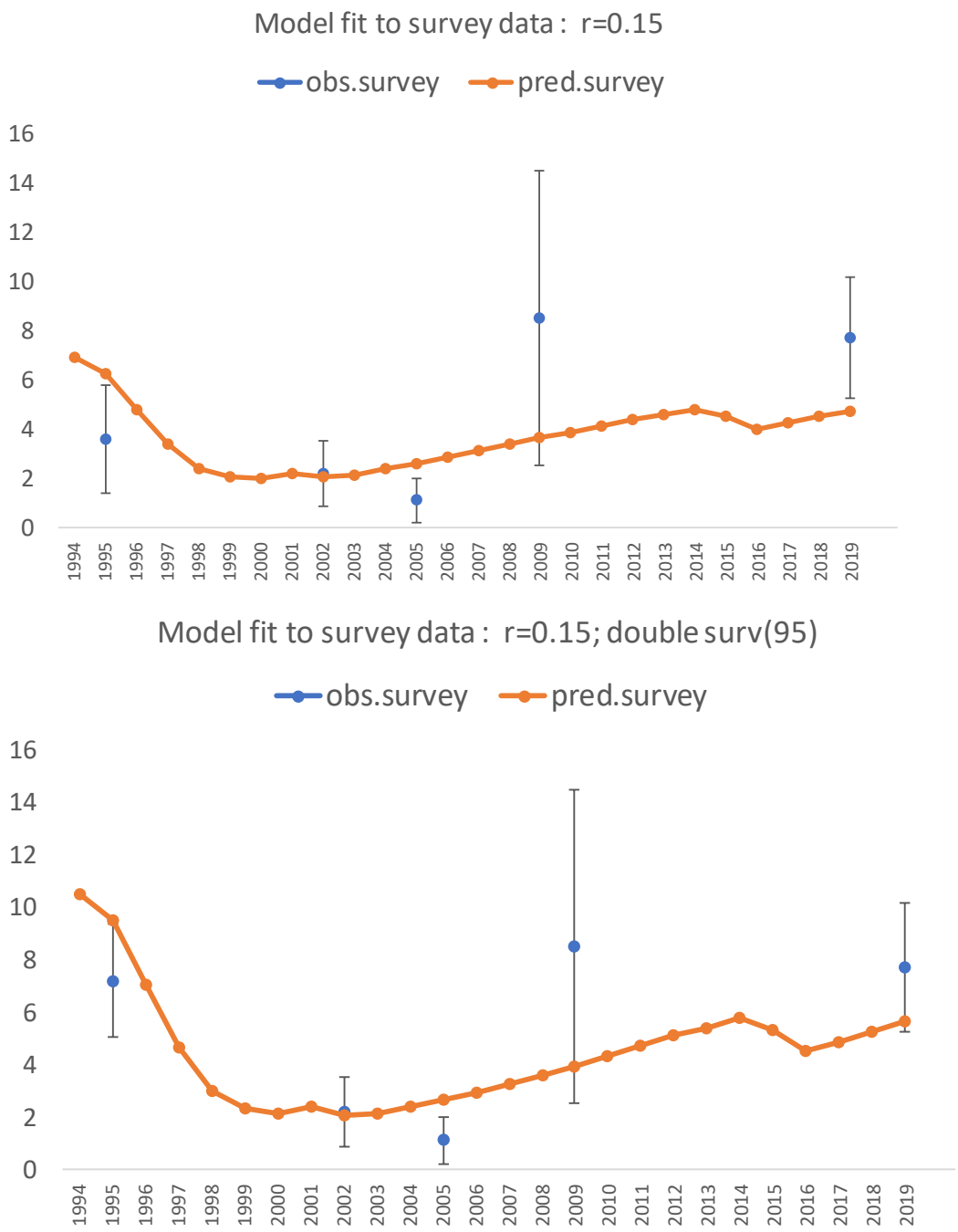

Figure 4-4. Alternative models fit to survey data: (A) Model 1 and (B) Model 2.

4.1.4 Discussion

These model results are preliminary only, acknowledging that there are limited data to inform a model and that the preferred modelling approach is that used in previous MSE testing, but that that approach requires more time to implement. Nonetheless, the modelling results may be useful to quantify likely sustainable catch limits when considering some key uncertainties. It wasn't possible with this simple model to match the absolute estimate of abundance of 2019 as the corresponding estimate of r was too low and the historical catches much smaller than the biomass so that the survey data could not be satisfactorily fitted. However, it is well known for surplus production models that the replacement yield is a much more robust estimate than the *r* and *K* parameters on their own, i.e. estimates of what level of future catch is likely to be sustainable.

The base-case model estimate of *r* had fairly large associated uncertainty but across all the model versions, *r* was estimated to be roughly 0.2 which is a relatively low turnover rate as expected. In the MSE model, a number of more detailed slow growth sensitivities are explored. A useful diagnostic used here was to consider the model-estimated fishing proportions as shown in Figure 4-3. This suggests that the base-case model is not unrealistic as the maximum annual fishing proportions were approximately in the range 0.1-0.5.

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.

5 Harvest Strategy

5.1.1 Based on analyses of survey data from most recent surveys 2019/20

Species status – CLOSED (Torres Strait Beche-de-mer Harvest Strategy (TSBDMHS))

Table 5-1. Torres Strait Beche-de-mer species category definitions as at November 2019 (AFMA, 2019).

Category	Examples of species in category as at Nov 2019	Category definition
Closed	sandfish surf redfish black teatfish	Species closed to fishing due to concerns of overfishing or stock depletion, underreporting, or significant overcatch of the TAC

Table 5-2. Starting Torres Strait Harvest Strategy TAC recommendations (TSBDMHS, 2019).

Common name	Scientific name	Commercial value	Pre-HS TAC (t)	Recommended HS Starting TAC (t)	Max middle tier TAC increase (based on indicators) before needing survey	Max recorded historical catch and year (not necessarily sustainable catch)
Black teatfish	*Holothuria whitmaei*	High	Closed	Trial 15t	25	52.7 t (1996)*

* Catch record data provided by AFMA

*Re-opening Decision Rule **applies** for species that have been closed to fishing due to concerns of overfishing or stock depletion, significantly exceeding catches beyond the TAC, or in the absence of reported catches.*

1. Using all available information, first establish that the stock is above a limit reference point level.

If the recommended Limit Reference point of 0.4 B0 is applied, then that would be equivalent to 4 per Ha. The 2019/20 (global) density was 8.12 per Ha (area = 138,849 Ha; calculated as part of stock estimate), which is well above the Limit Reference point, indicating a healthy population that may be closer to a target reference point, noting the challenges of trying to specify these reference levels. As more data and information become available, it will be possible to refine these estimates.

The biomass in 1995/96 when the first survey was undertaken could be considered as being at the Limit reference level $\boldsymbol{B_{LIM}}$ ***3.58*** (Table 5-3).

Table 5-3. Zone and East Torres Strait (4 zone) average (stratified) density (No. per ha) for reef strata for *H. whitmaei* for 1995/96 survey (GNE = Great North East).

Year	Barrier	Cumberland	Darnley	Don Cay	GNE Channel	Seven Reefs	4 Zone Ave
1995/96	9.6	3.9	2.7	7.9	0	0	3.6

- Only proceed to the next step in potential opening if the survey or available information suggests the stock is above a limit reference point.

*Stock **above** B_{LIM}*

*BDM survey 2019-2020 density estimates **8.12** > B_{LIM} 3.58.* Evaluate whether monitoring and management are adequate.

- This involves ensuring data collection and monitoring are clearly specified and in place before proceeding to next step in potential opening.

Compulsory catch reporting 2017

1. If the above conditions are met, then a trial opening is possible with the following conditions attached:

- Accurate daily catch and effort reporting is required

To be demonstrated

- A precautionary trigger limit may be set to temporarily pause fishing while catch records are collated to ensure that overfishing does not inadvertently occur.

Pause fishing at 8t

- 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.

To be demonstrated

- 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).

- Trial opening dates should be considered in relation to seasonal fishing dates. For example, industry have advised that the opening of a high value species such as Black teatfish should preferably occur during the same time that the TRL fishery is open to hookah fishing to reduce pressure on the BDM stocks. This may also account for equity considerations for fishers dedicated to working in eastern areas where the BDM stocks are mostly located. Trial opening dates also need to take into account favourable weather and tides to ensure safe and efficient fishing can occur.
- Consideration should also be given to cultural laws and community agreements with respect to who can fish where.

2. The Trial opening TAC needs to be set at a demonstrably conservative level with reference to values as shown in **Error! Reference source not found.**.

- See Table 3 of the Harvest Strategy as a starting guide.

First year (2020): Recommended Harvest Strategy starting TAC = Trial 15 t (TSBDMHS, 2019)

3. 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.
4. 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.
5. 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 re-opened periodically after a pre-specified interval.
6. 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 **Error! Reference source not found.**).

5.1.2 BDM HARVEST STRATEGY DECISION RULES

When is the low tier applied?

In the absence of data other than the total amount of reported catch by species or combined basket (BDM Harvest Strategy, 2019).

*Low tier does **not** apply: BDM survey 2019/20 meets BDM Harvest Strategy requirements.*

When is the Middle Tier applied?

The Middle tier applies when high quality data are available from several primary indicators in addition to total catch per species (BDM Harvest Strategy, 2019).

BDM survey 2019/20 meets BDM Harvest Strategy requirements.

The Middle Tier is not applicable during the first two years of HS implementation as insufficient detailed historical fishery data are available, but it provides a pathway for improving and growing the fishery in line with the HS objectives (TSBDMHS, 2019).

*2022: Max middle tier TAC increase (based on indicators) before needing survey = **25 t** (Table 3; BDM HS)*

When is the High Tier applied?

The high tier utilises high quality survey data - requirements for survey data to meet the criterion of being adequately high quality and representative (BDM Harvest Strategy, 2019).

c) Full-scale scientific surveys conducted over a large representative area and surveying multiple species.

BDM survey 2019/20 meets BDM Harvest Strategy requirements

*High tier **not** applied due to Re-opening Decision rules:*

- Demonstration of accurate daily catch and effort reporting is required

- Demonstration of 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.

Higher tier application can be reviewed at 8 t fishing pause if demonstrated 'accurate' and 'effective' catch reporting eg. pause at 15 t and possible additional catch - 5 t.

5.1.3 Note

2019-20 survey stock estimate for Black teatfish = **818 t** (B (t) L90th; Table 3-1).

Density standardised by habitat **greater than** B_{LIM} **3.58**; current density estimate: **8.12*** (Global; 2019/20 survey)

*Global estimate for total area, including sites that are not Black teatfish specific habitat. The highest habitat density for Black teatfish was **27** per Ha for Barrier (zone), reef top buffer strata (Figure 3-1) and highest site density for the 2019/20 survey **167** per Ha.

Starting TACs under the Harvest Strategy have been set at less than **10 %** of population biomass and are designed to be sustainable medium-term annual limits that result in low risk to over exploitation (AFMA, 2019).

Percentage of legal size stock = **18.9 %** (MLS >250 mm; Table 3-3); of the stock estimate **= ~155 t**

Trial TAC based on conservative **10 %** of biomass of the stock available (~155 t) to fishing = ~**16 t***

*Trial TAC is deliberately low given uncertainties about stock productivity (which will be increasingly resolved as further data are collected) and the need to first demonstrate reliable catch reporting.

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1300 363 400
+61 3 9545 2176
csiroenquiries@csiro.au
csiro.au

For further information

Oceans & Atmosphere
Nicole Murphy
+61 07 3833 5948
nicole.murphy@csiro.au
csiro.au/oceans&atmosphere

Torres Strait Scientific Advisory Committee research application

Please indicate the type of application you are submitting – an EOI in response to a call for research; or a full proposal in response to TSSAC advice that your initial application has been approved for further development:

Pre-proposal **(Please complete Sections 1-4 inclusive)**

Full Research Proposal **(Please complete sections 1-8)**

X

SECTION 1 - ADMINISTRATIVE SUMMARY

Project title:	Stock survey of Torres Strait Beche-de-mer species
Applicant (organisation or person):	CSIRO Ocean & Atmospheric Research

Contacts

Administrative

Title/Name:	Cathy Minnucci	Phone:	03 6232 5505
Position:	Finance Advisor	Email:	cathy.minnucci@csiro.au
Organisation:	CSIRO Oceans & Atmosphere	Postal address:	GPO Box 1538 Hobart, TAS 7001

Principal Investigator (person)

Title/Name:	Nicole Murphy	Phone:	07 3833 5948
Position:	Experimental Scientist	Email:	nicole.murphy@csiro.au
Organisation:	CSIRO Oceans & Atmosphere	Postal address:	Queensland BioSciences Precinct (QBP) 306 Carmody Rd, St Lucia, QLD 4072

Co-investigator (s)

Title/Name:	Tim Skewes	Phone:	0419 382 697
Position:	Collaborator	Email:	timskewes@outlook.com
Organisation:	Scientific expert	Postal address:	12 Watsonia St Redland Bay, QLD 4165

Co-investigator (s):

Title/Name:	Eva Plaganyi	Phone:	07 3833 5508
Position:	Principal Research Scientist	Email:	eva.plaganyi-lloyd@csiro.au
Organisation:	CSIRO Oceans & Atmosphere	Postal address:	Queensland BioSciences Precinct (QBP) 306 Carmody Rd, St Lucia, QLD 4072

Planned Start and End Date

Start Date:	01/07/2019	End Date:	15/12/2020

SECTION 2 – PROJECT DESCRIPTION

PROJECT BUDGET: (Excluding GST)

Financial Year	AFMA	Applicant (in kind)	Applicant	Other
2019/2020	$207,641	$88,989		$0.00
2020/2021	$81,598	$34,971		$0.00
	$0.00	$0.00		$0.00
Totals	$289,239	$123,960		$0.00

SECTION 3 – PROJECT DESCRIPTION

Background and need (max 250 words) - *detail any important background relating to the project. Why it is important and being proposed (need). Any related projects or other information the TSSAC should know when considering it for funding.*

Beche-de-mer fisheries in Australia and the South Pacific have been subjected to increased fishing pressure in recent years due to increased prices for beche-de-mer in Asia. Research has shown that many South Pacific beche-de-mer fisheries have been over-exploited, with recovery being slow and sporadic (Purcell, 2013).

The Torres Strait Beche-de-mer Fishery (TSBDMF) has become an important source of income for Torres Strait islanders since it was re-established in the early 1990s. While most sea cucumber species are considered to be in good condition, closure or catch limits have been implemented for several high value fishery species such as sandfish, black teatfish and surf redfish. Currently, fishing is mainly focused on white teatfish, blackfish, deepwater redfish, prickly redfish and of late, curryfish species. Recently, there has been some evidence of local depletion for prickly redfish and curryfish i.e. fishermen reporting decreased catch rates.

Fishery dependent data (logbooks) were introduced to the TSBDMF in December 2017. There is still however, limited information available to assess the status of fishery populations, with incomplete catch and effort time series data available prior to 2017. A stock survey is presently the only viable method for determining the size and status of fished beche-de-mer populations for Torres Strait.

Objectives / performance indicators (max 250 words) **-** *list the major objectives or planned outcomes of the project. These will form your project milestones:*

We plan to develop a research program based on three population surveys:

1. Survey of the east Torres Strait fishery with the focus on prickly redfish, curryfish species, black teat fish and surf redfish.

2. Additionally, a limited exploration of deep-water habitats will be undertaken to extend our knowledge of the full extent of the White teatfish resource in east Torres Strait.

3. Survey focussed on sandfish on Warrior reef. We will also engage with Papua New Guinea to look at oportunities for collaborating to undertake a full scale survey (inclusion of northern Sandfish population).

Deliverables:

1. Produce stock size estimates and distribution data, and assess the fishery status for each population of beche-de-mer in Torres Strait, including the sandfish fishery.

2. Use survey data to make recommendations on potential fishery expansion (eg. TAC's) and reopening of closed fisheries.

3. Map important habitat variables, especially those relevant to fishery production.

4. Make survey outputs available in a form suitable for use in the new Beche-de-mer Harvest Strategy for Torres Strait.

5. Information from the project will be provided to AFMA and Torres Strait Island stakeholders in the form of formal final reports and a plain English summary document. Special consideration will be taken with Traditional Knowledge (TK).

Consultation and Engagement - *Note consultation is required for both the pre- and full-proposal phases for TSSAC projects. This differs from AFMA Research Committee Proposal requirements.*

Pre-proposal phase consultation

Briefly detail (this will form the skeleton of your community engagement strategy which must be developed as part of full proposal phase):

- *the areas in the Torres Strait region where the proposed research activities may occur*
- *the Torres Strait community groups or individuals that you will engage/involve from these areas in the development of and or during the project if it reaches full proposal phase (refer to Step 2 of Attachment A - Procedural Framework for Researchers in the Torres Strait).*
- *how you plan to engage/involve key stakeholders (e.g. community notices, telephone, email, employment, interviews, meetings, workshops) in the project development. Note, any potential fee for service rates need to be factored into your research project budget.*

CSIRO has carried out research on the Torres Strait Beche-de-mer Fishery since 1995. During this time, a number of abundance surveys of eastern Torres Strait, including two full scale surveys in 1995/96 and 2002 and two abbreviated surveys in 2005 and 2009 have been undertaken. Additionally, two full scale surveys for sandfish on Warrior reef were undertaken in 1995/96 and 2000, with relative abundance surveys also undertaken in 1998, 2002, 2004 and 2010.

As a project team, the principal investigator (Nicole Murphy), collaborator (Tim Skewes) and co-investigator (Eva Plaganyi), have over 45 years combined experience working together on the Torres Strait Beche-de-mer fishery, including regular consultation and communication with traditional owners.

Previous surveys have included a high level of interaction with Torres Islanders, both in the design and carrying out of the survey, and interpretation of results. The history, status and research of the fishery has been communicated to Torres Strait islanders through TSHCWG meetings, dedicated Island workshops and supply of appropriate communication material for conveying the outcomes of research projects to islander communities. Our belief is that there is a high level of awareness for the fishery among traditional owners. Any future surveys will be conducted at the same level of consultation with respect to community desires. Detailed survey designs will be discussed and ratified during targeted consultations with islander representatives, including Fisher representatives, Prescribed Body Corporates and Island Councillors, with the chance also for whole of community feedback.

As with previous surveys where Islanders from Mer and Erub participated in 2009 sampling, Islanders will be invited to be part of field work. The initial plan will be to invite those Islanders from Ugar, Poruma and Masig who volunteered to take one of the sea cucumber processing packs at the last Beche-de-mer Harvest Strategy workshop and meeting, in October 2018.

*If there has been any initial consultation and engagement outline with whom and key outcomes (note consultation is **not** necessary at the EOI stage but has sometimes occurred through existing relationships).*

A stock survey to understand the status of sandfish on Warrior Reef was identified as a research priority during the most recent sitting of the HCWG in October 2018. Additionally, understanding the current stock status for all beche-de-mer species was identified in the TSSAC research project scope for 2019-20.

Beche-de-mer Harvest Strategy supporting information will be used to guide the survey design, with information for species, habitat, fishery and population status, used to determine the approach to sampling (see Appendix A).

Additional opportunistic research will also be welcomed where possible. Previously, habitat mapping was undertaken at Iama in 2010 during the Warrior survey, as Island representatives had expressed a desire to investigate the potential for sea ranching of sandfish in the lagoon. Habitat mapping could be undertaken at Ugar (if desired/involved in survey work), as this links directly to a project opportunity by Traditional Inhabitant Fishers from Ugar and CSIRO researcher Leo Dutra, for the enhancement of beche-de-mer stocks.

Full proposal consultation and engagement

In accordance with the Procedural Framework for Researchers in the Torres Strait (Nakata 2018; Procedural Framework), the TSSAC full proposal requires two different aspects be completed.

1. Develop a stakeholder engagement strategy, including a plain-English community consultation package which should be used to undertake preliminary consultation with relevant stakeholders as part of your full proposal application. Follow instructions in Appendix 4 of the procedural framework (Attachment A).

2. Provide documentation and outcomes from the preliminary consultation and engagement conducted, including:

- *The level of stakeholder support – particularly from Traditional Inhabitants for the proposed work (include a list of who was contacted and whether they support the project, or if not, why).*
- *Any perceived risks or stakeholder considerations with the project.*
- *How traditional knowledge might be considered or incorporated to enhance the project, its outcomes and benefits.*
- *Any activities suggested by Traditional inhabitants to improve the project, or bring it into alignment with community needs.*
- *How the research outcomes will benefit Traditional Inhabitants directly or indirectly, or why it is not relevant/ applicable (i.e. projects in the prawn fishery).*

Attach the stakeholder engagement strategy (which should have been updated as required following initial consultation) with your full proposal application.

Please see attached additional Stakeholder Engagement Strategy documents. A supplementary document to the full proposal will be provided to the TSSAC Executive Officer by 10 May, which will detail further comments or feedback received from communities during the consultation process.

Methods (max 250 words) – *Please detail the basic methods that will be used to undertake this project.*

The survey will be conducted in accordance to surveys undertaken in previous years. Site counts at repeated survey sites will be used to calculate population trends. The analysis will include an assessment of recruitment from site counts and size frequency data, a technique that has been shown to be viable from previous surveys. Estimates of gross environmental parameters such as seagrass and coral cover, will be collected during the survey, not only for assessing the effects of fishing, but for mapping and monitoring the environment in general.

Planned east Torres Strait and Warrior reef surveys need to be undertaken at similar times to previous year's surveys to coincide with seasonal and lunar phase cycles of sea cucumber activity. This reduces differences in survey observer rates that may result from changes in sea cucumber burrowing behaviour, due to seasonal and tidal factors and can better detect changes in sea cucumber population abundance.

Based on previous survey times, the optimal period to undertake the east Torres Strait survey is February or March, and January for surveying sandfish on Warrior Reef. However, taking into account timing of previous surveys, a combined survey to reduce costs could be undertaken in late January or March.

Planned outcomes and benefits (max 150 words) – *this should include how the research will be used by management to benefit the fishery and other stakeholders:*

A sustainable beche-de-mer fishery would provide a substantial source of income and employment for Torres Strait Islander communities and downstream industries. Given that many of the world's beche-de-mer fisheries are fully or over-exploited, and that demand looks to be increasing, this fishery will likely be more valuable in the future.
Survey results will be made available in a form suitable for use in the new Beche-de-mer Harvest Strategy for Torres Strait. This will directly inform management decisions and possible future fishery expansion. It will also provide a framework for broader application of fishery data for monitoring.
We will also gather information on gross environmental parameters, not only for assessing the effects of fishing, but for mapping and monitoring the environment in general.

Project extension (max 100 words) - *are there possible future research options that could result from this project?*

There is a high probability of future research resulting from the currently proposed stock surveys, as project data will be prepared for inclusion in the new Beche-de-mer Harvest Strategy for Torres Strait.
Additionally, possible habitat mapping at Ugar links directly to a project opportunity by Traditional Inhabitant Fishers from Ugar and CSIRO researcher Leo Dutra, for the enhancement of beche-de-mer stocks.

Risk Analysis - *be sure to consider risks specific to conducting research in the Torres Strait including community support or lack there-of.*

CSIRO have successfully carried out a number of similar surveys in Torres Strait, as well as beche-de-mer research in areas across northern Australia and in PNG. The project team has extensive experience working together on the Torres Strait Beche-de-mer fishery, including regular consultation and communication with traditional owners.

Capacity (max 100 words) - *Are there any past or current projects relevant to this proposal funded through the TSSAC, TSRA, FRDC or other organisation? Outline the Investigators' experience in the proposed*

Past Beche-de-mer surveys of east Torres Strait have been undertaken in 1995-96 (full scale), 2002 (full scale), 2005 (relative) and 2009 (relative); and sandfish surveys of Warrior Reef undertaken in 1995-96 (full scale), 1998 (relative), 2000 (full scale), 2002 (relative), 2004 (relative) and 2010 (relative).
The project team has over 45 years combined experience working on the Torres Strait Beche-de-mer Fishery.

research and Torres Strait region.

SECTION 4 - Schedule of Payments

As a general rule, up to 10% of the total project cost may be provided as an initial payment and a minimum of 30% of the total project cost must be left for the final report.

Milestones	**Deliverable date (Please refer to instructions)**	**Schedule of AFMA payment(s) (excluding GST)**
1. Initial payment on signing of contract	On signing	$28,923
2. Conduct BDM survey of East Torres Strait	31 March 2020	$122,557
3. Milestone report	15 July 2020	$20,050
4. Draft final report	31 Oct 2020	$30,938
5. Final report	15 Dec 2020	$86,771
TOTAL		**$289,239**

SECTION 5 - Description of Milestones

Details on each milestone must provide sufficient information to justify the milestone cost and should match the performance indicators. The description field will describe the work to be completed for that milestone with the justification field elaborating further on the categories of cost - for example salary.

Milestone: 1. $28,923 **Date:** On signing

Financial Year	Salaries	Travel	Operating	Capital	Total
	$17,716	$1,008	$10,199	$0.00	**$28,923**

Description:

Initial payment on signing of contract

Justification:

10% of project cost on initial signing of contract

Milestone: 2. $122,557 **Date:** 31 March 2020

Financial Year	Salaries	Travel	Operating	Capital	Total
	$75,070	$4,272	$43,215	$0.00	**$122,557**

Description:

Conduct BDM survey of East Torres Strait, including review of historic CSIRO seabed mapping data

Justification:

Data analysis, field and gear costs associated with mobilization and field work

Milestone: 3. $20,050 **Date:** 15 Julv 2020

Financial Year	Salaries	Travel	Operating	Capital	Total
	$12,281	$699	$7,070	$0.00	**$20,050**

Description:

Submission of milestone report

Justification:

Write up of survey work and results

Milestone: 4. $30,938 **Date:** 31 October 2020

Financial Year	Salaries	Travel	Operating	Capital	Total
	$18,950	$1,079	$10,909	$0.00	**$30,938**

Description:

Submission of draft final report for comment

Justification:

Results of analyses of data and write up

Milestone: 5. $86,771 **Date:** 15 December 2020

Financial Year	Salaries	Travel	Operating	Capital	Total
	$53,150	$3,024	$30,597	$0.00	**$86,771**

Description:

Submission of final report, addressing of comments from draft final report

Justification:

30% of project cost for final report

Section 6 – Special Conditions

If relevant, this field will be used to assist in contract preparation for any special conditions. Examples of special conditions
may relate to marine spatial closures (including access) or any other clauses not specifically contained in the contract.

Section 7 - Data management

Identify the appropriate Intellectual Property category applicable to this application. Choose ONE from below:

Code	Description
1	Published, widely disseminated and promoted, and/or training and extension provided. Relates mainly to outputs that will be available in the public domain.
2	Published, widely disseminated and promoted, and/or training and extension provided. Related products and/or services developed. Relates mainly to outputs that will largely be available in the public domain, but components may be commercialised or intellectual property protected.
3	Published, widely disseminated and promoted, and/or training and extension provided. Related products and/or services developed. Relates mainly to outputs that may have significant components that are commercialised or intellectual property protected.

The following IP category applies to this application:

2. Published, widely disseminated and promoted, and/or training and extension provided. Related products and/or services developed. Relates mainly to outputs that will largely be available in the public domain, but components may be commercialised or intellectual property protected.

I have searched for existing data (refer to guidelines on how to search the Australian Spatial Data Directory and Oceans Portal):

[Yes / ~~No~~]

Provide a brief description of the data to be generated from the project and how this data will be stored for future protection and access, including:

- information on data security or privacy issues and applying to the data
- Nominated data custodian

Survey data e.g. counts and measurements, will be entered into and stored in existing Access and Oracle databases. Data storage, protection and access is governed and managed according to CSIRO policy guidelines, in accordance with CSIRO rules and regulations.

- Document how research data, traditional knowledge and intellectual property will be handled during your project, including but not limited to:
- Acknowledging where the data or information used in research comes from, so that any income made from selling a concept in the future will be adequately linked to a community's contribution/ knowledge so they also receive financial or other benefit from "selling" a concept onward.
- How you will negotiate use and publish of traditional knowledge with communities. For example do traditional inhabitants allow public publication of information or only for project activities and reported on in internal reports? This will depend on data sensitivity and privacy (such as fishing grounds etc).
- Are there any other ethical considerations you have identified for this project which need to be managed?
- Are you committed to gaining ethics approval for this project from a suitable body such as a university or AIATSIS?

- Acknowledging where the data or information used in research comes from, so that any income made from selling a concept in the future will be adequately linked to a community's contribution/ knowledge so they also receive financial or other benefit from "selling" a concept onward.

N/A

- How you will negotiate use and publish of traditional knowledge with communities. For example do traditional inhabitants allow public publication of information or only for project activities and reported on in internal reports? This will depend on data sensitivity and privacy (such as fishing grounds etc).

Special consideration will be taken with any Traditional Knowledge (TK) collected during the project. TK will only be used with the express permission of the traditional owners. Guidance will be sought from local Island leaders and the TSRA to ensure full local support and agreement over the handling of TK information.

- Are there any other ethical considerations you have identified for this project which need to be managed?

N/A

Are you committed to gaining ethics approval for this project from a suitable body such as a university or AIATSIS?

N/A

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
Black teatfish opening	**Agenda Item 5** **For Discussion and Advice**

RECOMMENDATIONS

1. That the PZJA Hand Collectables Working Group (HCWG):

    a. **DISCUSS** and **PROVIDE ADVICE** on an appropriate total allowable catch (TAC) and management arrangements as guided by the Re-opening Decisions Rule (s2.11.4) of the Torres Strait Beche-de-mer Harvest Strategy for a sustainable black teatfish opening. Re-opening Decision Rule and the HCWG16 application of the conditions to a future re-opening of black teatfish are provided at **Attachment 5a**.

2. In providing its advice, that the HCWG:

    i. **NOTE** the preliminary stock survey results for black teatfish from the Torres Strait beche-de-mer species stock survey undertaken in late 2019-early 2020 (presented under Agenda Item 4);

    ii. **NOTE** that as a result of the COVID-19 pandemic AFMA cannot undertake the same compliance and potentially educational activities originally planned to support a black teatfish opening. As a result, the risks of a total allowable catch (TAC) overcatch cannot be mitigated through compliance activities in the current and likely medium-term operational environment to the extent envisaged when the trial opening was last discussed by the HCWG. This places greater reliance on having high levels of voluntary compliance if a black teatfish opening were to proceed at this time.

    iii. **NOTE** any additional conditions that may apply to the Fishery's Wildlife Trade Operation (WTO) approval depending on the outcome of the non-detriment finding (NDF) assessment by the Department of the Agriculture, Water and the Environment (DAWE) leading up to the implementation of the Appendix II CITES listing on 28 August 2020 (As discussed under **Agenda Item 2.2.1**); and

KEY ISSUES

3. At their meeting of 21 February 2020, the Working Group recommended a trial fishery reopening of black teatfish subject to a 15 tonne TAC and implementation of additional management arrangements (such as daily reporting of landed catch). In making their recommendation to the PZJA, the Working Group prioritised ensuring the TAC was demonstrably conservative as required by the harvest strategy.
4. In line with the harvest strategy (section 2.11.4), the PZJA Hand Collectable Working Group (HCWG) recommended at its meeting on 21 February 2020, a trial reopening of the fishery for black teatfish, subject to a 15 tonnes TAC (to be fished competitively) and daily reporting to AFMA of landed catch. The HCWG noted that AFMA would enable landed catch records (Catch Disposal Records) to be submitted electronically (email, SMS) with hard copies still to be sent to AFMA. The HCWG:

a. agreed that based on all available information, including preliminary results from scientific dive surveys in November 2019 and January 2020, that the biomass of black teatfish is likely to be over the limit biomass reference point (40 percent of estimated unfished biomass);

b. agreed that monitoring and management arrangements (with daily reporting) are adequate;

   i. a mandatory landed catch reporting system is in place and reporting standards in the Torres Strait Beche-de-mer Fishery have progressively improved since the system was introduced.

   ii. AFMA is now responsible for domestic compliance and is committed to undertake a targeted compliance program to support a future opening.

c. agreed to recommend the harvest strategy default reopening TAC for black teatfish of 15 tonnes. Although the preliminary results of the recent scientific survey suggest the stock could sustain a higher TAC, priority was given to ensuring the TAC was demonstrably conservative, a requirement of the harvest strategy;

d. welcomed the commitment from Malu Lamar, with support from TSRA, to work with fishers to agree voluntary measures to reinforce cultural lore with respect to who can fish where, and further advocate accurate daily catch and effort reporting. The HCWG noted that these arrangements would likely compliment regulatory efforts to reduce the risk of exceeding the TAC.

5. The PZJA's consideration in April of the Working Group's recommendation to re-open fishing of black teatfish was delayed on TSRA's request to allow for the consideration of a more complete CSIRO report on the stock status of Black teatfish in setting a Trial TAC and opening the species for fishing again. This was to also allow the TSRA time to consider options for filling the vacant position on the Working Group for a Traditional Inhabitant member for Maluialgal, following Frank Loban's resignation in February (the HCWG was notified by email on 20April 2020).

COVID-19 impacts on AFMA's planned education and compliance program and the ability of stakeholders to develop and agree further voluntary measures.

6. Prior to the COVID-19 pandemic, AFMA was satisfied that the risk of exceeding the black teatfish TAC had been substantially reduced, though not eliminated. This was as a result of the introduction of the Fish Receiver System, demonstrated improvements in reporting by the industry and AFMA's ability to undertake a dedicated education and compliance program.

7. The Australian Government's response to the COVID-19 pandemic has impacted the way in which government services, including fisheries management and compliance programs, can be delivered. Conducting the trial opening in the absence of a comprehensive compliance program increases the risk of the TAC being exceeded (regardless of what level it is set at). This has implications for industry as the BDM harvest strategy re-opening decision rule recommends automatically pausing fishing for one year if the Trial TAC stipulated in the harvest strategy is exceeded by 5%. In developing advice for the PZJA on a possible opening in the short to medium, industry members therefore need to consider the risk that the fishery could be closed in 2021. These risks can be mitigated through high levels of voluntary compliance.

8. AFMA's support for a further opening was also reliant on having an ability to meet with stakeholders ahead of an opening; first, to explain the rules and provide education on the importance of catch reporting. Secondly, AFMA and TSRA committed to supporting Malu Lamar and industry to undertake meetings to agree on voluntary measures that reinforce

cultural lore with respect to who can fish and where, and further advocate accurate daily catch and effort reporting (such as single points of landing within communities). BDM stakeholders have consistently placed great value on having a level of community ownership over the rules for a future opening. Meeting with stakeholders ahead of an opening is also considered by AFMA to be an important initiative for encouraging voluntary compliance (raising awareness of the rules and their purpose).

9. AFMA's ability to travel to communities to meet with stakeholders will be subject to COVID 19. At present AFMA is minimising all face to face engagement with stakeholders. AFMA recognises that any future travel would be subject to relevant local approvals.

10. The initial Malu Lamar (Torres Strait Islander) Corporation RNTBC (Malu Lamar) led industry workshop was postponed in line with the Australian Government's COVID-19 pandemic response measures. A subsequent workshop was planned for 4-5 August, however it is no longer proceeding. TSRA advise that a series of meetings in communities may now be pursued.

11. If a black teatfish opening were to go ahead in the current operating environment, AFMA welcomes advice from members on alternative/additional approaches to promote awareness and voluntary compliance and to support industry to develop and agree on further measures.

Compliance program

12. Should the trial opening commence during COVID-19 restrictions in force, AFMA's compliance program will place an emphasis on education, the promotion of voluntary compliance, which will require a strong commitment from operators. Other monitoring activities would also be undertaken where operationally practicable, taking into account the risks posed by the COVID-19 pandemic and associated restrictions in place to mitigate those, namely:

    a. Lack of access to ABF platforms due to higher priorities (patrolling border closure)
    b. Limited access to state platforms/resourcing due to higher priorities and limited timeframe
    c. AFMA's current policy on interstate travel and broader travel restrictions
    d. Social distancing requirements

13. It is important to note that compliance activities will be limited and less direct in this environment compared to a program delivered in a COVID-19 free or less restricted situation. As such there is a greater risk of the TAC being exceeded if there is not high levels of voluntary compliance. Proposed compliance activities would include those outlined in **Table 1** below.

Table 1. Proposed compliance program under COVID-19 precautions and restrictions

Communication	**Monitoring**
media releases	Aerial surveillance
mail outs	Monitoring catch reports
direct SMS alerts	Limited landings / shipment inspections and tracking – (catch and consignment inspections where achievable)

community notices	Regular communication with fishermen and receivers
Website posts	TAC monitoring and the provision of assistance with the provision of Catchwatch notifications to stakeholders
Social media posts	Limited at sea patrols

BACKGROUND

14. After consecutive over-catches of a conservative 15 tonnes TAC during trial openings for black teatfish in 2014 and 2015, the PZJA decided that fishing would remain closed until the risk of exceeding the TAC is substantially reduced through cost-effective management tools. The 2015 trial opening of the fishery resulted in the catch limit being exceeded by more than 50% and saw the participation of 64 fishers compared to 29 in 2014.
15. The PZJA has since agreed for the implementation of two key management tools to mitigate the risk of future over-catch:
    a. The Torres Strait Fish Receiver System (implemented on 1 December 2017), requiring the mandatory reporting of all commercial catch in Torres Strait Fisheries (except Torres Strait Prawn); and
    b. The *Torres Strait Beche-de-mer Fishery Harvest Strategy, November 2019* (the harvest strategy) (agreed in November 2019), providing a transparent and pre-agreed protocol for setting TACs and developing arrangements for opening a closed species.
16. The HCWG recommended adhering to the harvest strategy default trial opening TAC of 15 tonnes for black teatfish (see Table 3 of the Harvest Strategy). In making this recommendation, the HCWG discussed whether a larger, but still sustainable, TAC could alleviate some of the risk of the conservative 15 tonnes TAC being overshot as occurred with the 2015 trial opening. One option was to set a 40 tonnes TAC that is a little bit less than the sustainable catch estimate of 5 per cent of the preliminary biomass estimate obtained from the scientific survey.
17. As part of its deliberations, the HCWG considered the scientific member's advice that while a 40 tonnes 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 would allow for greater confidence to set higher TACs in future seasons.
18. A higher TAC will clearly provide additional economic return in the short-term. However, consistent with the HCWG's previous advice and guidance under the harvest strategy for re-opening a closed species, industry needs to carefully consider the potential longer-term costs of pursuing a higher TAC at this time for this species.
19. The harvest strategy is focused on providing for the sustainable use of all BDM in the Torres Strait taking into account long-term sustainability for future generations. In terms of re-opening fishing to a species, such as black teatfish, the harvest strategy is clear in recommending precautionary measures so that overfishing does not occur or the stock does not become overfished. Consistent with the harvest strategy, the HCWG advice on recommending a further black teatfish opening took into account:
    a. an assessment of whether or not the stock is above the limit reference point level;
    b. an assessment of monitoring and management arrangements; and

c. the need to set a demonstrably conservative TAC with reference to default starting TAC values within the Harvest Strategy.

20. The intention of having trial openings for closed species is to ensure the sustainable redevelopment of fishing for the species overtime. Whilst there have been great improvements in CDR reporting for the Fishery, it will be some time before the Fishery builds a detailed catch and effort data (CPUE) series. Improved CPUE data together with the survey data will enable more detailed stock assessments with more accurate estimates of sustainable yields (and therefore more appropriate TACs).

21. A further important consideration for HCWG is that black teatfish has been listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to which Australia is a party. Species listed in Appendix II of CITES may still be traded internationally provided the trade, or a specified level of trade, has been determined to be non-detrimental to the survival of the species in the wild and the product has been legally obtained. The Department of Agriculture, Water and the Environment will soon be assessing a nationally-supported application seeking a non-detriment finding for both black teatfish and white teatfish harvested in Australia. The performance of management arrangements for the Torres Strait BDM Fishery will be relevant to the independent assessment of the sustainability of international trade of black teatfish caught in Australia.

Attachment 5a – Summary of the HCWG16 application of the conditions of the Torres Strait Beche-de-mer Harvest Strategy Section 2.1.1.4 Re-opening Decision Rule to a future re-opening of black teatfish for fishing

Conditions of the TS BDM HS Section 2.1.1.4 Re-opening Decision Rule	**HCWG16 application of the conditions to a future re-opening of black teatfish fishing**
Condition 1 – Using all available information, is the stock above a limit reference point level?	Noting the preliminary survey outcomes together with: a) outcomes of the 2009 survey, and b) the limited recorded fishing effort on black teatfish since its closure in 2003 (two openings 2014 and 2015) 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).
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. The Working Group 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. Members noted the harvest strategy recommends that a) if a trial TAC is exceeded by more than 5% then the fishery should be automatically paused for the following year; and b) if data collection during the Trial opening was note conducted satisfactorily, then the fishery should be closed again and the re-opening rule process applied again.
Condition 3. If conditions 1 and 2 are met then a conditional trial opening is possible subject to the following conditions: *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. AFMA advised that it would make provision for catch disposal records to be submitted electronically (SMS, Email) with hard copies to be forwarded to AFMA through the mail. 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.
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.

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.
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 where considered at this time to be unnecessary, complex and/or not supported by current PZJA licencing policy.
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.
3.6 Cultural laws and community agreements	Traditional Inhabitant members reiterated that agreed that 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).
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). In making this recommendation, the Working Group discussed whether a larger, but still sustainable, TAC could alleviate some of the risk of the conservative 15 t TAC being overshot as per the 2015 trial opening. One option was to set a 40 t TAC that is a little bit less than the sustainable catch estimate of 5% of the preliminary biomass estimate obtained from the scientific survey. 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 is 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

TORRES STRAIT HAND COLLECTABLES WORKING GROUP	Meeting 17 7 August 2020
DATE AND VENUE FOR NEXT MEETING	Agenda Item 6.2 For DISCUSSION

RECOMMENDATIONS

1. That the Working Group **NOMINATE** a date and venue for the next meeting noting proposed meeting dates in the table below alongside key business items.

Proposed Date	Key Business
Week beginning 5 October 2020	HCWG 18 (if required) - Management responses to preliminary stock survey outcomes – for example advice on BDM total allowable catch (TAC) limits for 2021 season. - Research priorities for 2022-23 (can be progressed OOS). - Legislative instrument amendments.
Week beginning 5 April 2021	Future management priorities workshop - Including longer term strategic discussions on the use of hookah in the BDM Fishery.
Week beginning 5 April 2021	HCWG 19 - Final outcomes of BDM stock survey results - Overview of black teatfish opening (TBC) - Outcomes of Malu Lamar BDM workshop (TBC) - Outcome of the application for WTO renewal - Final catch and effort summary of 2020