

Torres Strait Tropical Rock Lobster Resource Assessment Group Meeting 30

Meeting Record

16 December 2020

Video Conference

Note all meeting papers and record available on
the PZJA webpage: www.pzja.gov.au



Australian Government

Australian Fisheries Management Authority

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Meeting participants

Members

Name	Position	Declaration of interest
Ian Knuckey	Chair	<p>Chair/Director of Fishwell Consulting Pty Ltd and Olrac Australia (electronic logbooks). Chair/member of other RAGs and MACs. Conducts various AFMA and FRDC funded research projects including FRDC Indigenous Capacity Building project. Nil interests in TRL Fishery and no research projects in the Torres Strait.</p> <p>In 2019, delivered components of TSRA Induction Program for Traditional Inhabitant members on PZJA advisory committees.</p> <p>Has been approached by TSRA to deliver capacity building workshops for the new Zenadth Kes board members.</p> <p>Full declaration of interests provided at Attachment A.</p>
Dr Andrew Penney	Scientific member	<p>Director of Pisces Australis Pty Ltd, an Australian registered marine/coastal research and management consultancy based in Canberra - interests in any opportunities in this regard.</p> <p>Currently Principal Investigator on FRDC Projects Nos 2017-180: Design and implementation of an Australian National Bycatch Report: Phase 1 – Scoping; and 2019-036: Implementation of dynamic reference points and harvest strategies to account for environmentally-driven changes in productivity in Australian fisheries, potentially red leg banana prawns or TRL.</p> <p>Independent scientific member on the AFMA Southeast RAG, the Tropical Rock Lobster RAG and the Small Pelagic Fishery RAG. Member of the AFMA ERA Technical Working Group.</p> <p>No shareholding and hold no positions relating to any other companies, including any fishing companies or industry associations.</p>
Dr Éva Plagányi	Scientific member	Lead scientist for PZJA funded TRL research projects conducted by CSIRO.
Aaron Tom ¹	Traditional Inhabitant member	Traditional Inhabitant Gudumalulgal and TIB licence holder.
Harry Nona	Traditional Inhabitant member	Traditional Inhabitant Kaiwalalgal

¹ Joined the meeting at the end of Agenda Item 5

Name	Position	Declaration of interest
James Ahmat	Traditional Inhabitant member	Traditional Inhabitant Maluililgal
James Billy	Traditional Inhabitant member	Traditional Inhabitant Kulkalgal. TIB licence holder, Coxwains holder and free diver.
Brett Arlidge	Industry member	General Manager, MG Kailis Pty Ltd. MG Kailis Pty Ltd is a holder of 5 TVH licences. Seafood buyer from Torres Strait, Queensland and PNG TRL fisheries.
Selina Stoute	AFMA member	Nil.
Mark Anderson ²	TSRA member	Nil. Employee of TSRA. TSRA holds multiple TVH TRL fishing licences on behalf of Torres Strait Communities but does not benefit from them.
Georgia Langdon	AFMA Executive Officer	Nil.

Observers

Name	Position	Declaration of interest
Dr Judy Upston	CSIRO observer	Scientist for PZJA funded TRL research projects conducted by CSIRO.
Roy Deng	CSIRO observer	Scientist for PZJA funded TRL research projects conducted by CSIRO.
Steven Edgar	CSIRO observer	Scientist for PZJA funded TRL research projects conducted by CSIRO.
Dr Leo Dutra	CSIRO observer	Scientist for PZJA funded TRL research projects conducted by CSIRO. Recently received Fisheries Research and Development Council (FRDC) funding to undertake a capacity building project. Also the project lead on an AFMA funded climate change project (2019/0830).
Nicole Murphy	CSIRO observer	Scientist for PZJA funded TRL research projects conducted by CSIRO. Project lead on AFMA funded Torres Strait Beche-de-mer project (2019/0826).
Dr Laura Blamey	CSIRO observer	Scientist for PZJA funded TRL research projects conducted by CSIRO.
Alex Kailis	Industry Observer	Group Director of MG Kailis Pty Ltd. MG Kailis Pty Ltd is a holder of 5 TVH licences. Seafood buyer from Torres Strait, Queensland and PNG TRL fisheries.
Patrick Mills	Industry observer	TRLRAG member for Kaiwalagal and Torres Strait Scientific Advisory Committee.

² Left the meeting during Agenda item 3, between 10:30am and 11am. Was absent from meeting from 1:20pm onwards.

Name	Position	Declaration of interest
Quinten Hirakawa	TSRA observer	TSRA senior project officer, TIB licence holder, with a TRL entry

1 Preliminaries

1.1 Welcome and apologies

1. The meeting commenced at 9:08 am on Wednesday 16 December 2020. Attendees were welcomed by the Chair who provided an Acknowledgement of Country.
2. Attendees at the RAG meeting are detailed in the meeting participant tables at the start of this meeting record.
3. Apologies were received from:
 - a) Les Pit, Traditional Inhabitant member, Kemer Kemer Meriam; and
 - b) Dr Ray Moore, Industry member.
4. Members and permanent observers not in attendance were:
 - a) Samantha Miller, Queensland Department of Agriculture and Fisheries member;
 - b) Malu Lamar RNTBC representative, permanent observer; and
 - c) Papua New Guinea National Fisheries Authority (PNG NFA) representative, permanent observer.

1.2 Adoption of agenda

5. The RAG considered and adopted the draft agenda circulated to members on 13 November 2020 with the following items added to be discussed within the agenda:
 - a) The independent scientific member suggested expanding the discussion under Agenda Item 5 – Recommended Biological Catch (RBC) to include discussions relating to the empirical harvest control rule (eHCR) and developing meta rules to deal with extraordinary circumstances (such as COVID-19) in future.
 - b) A CSIRO Observer requested some time during Agenda Item 6 – Other Business, to present information to the RAG on a recently approved FRDC project on capacity building.
6. The draft agenda, adopted without change is at **Attachment B**.

1.3 Declaration of interests

7. As provided in PZJA Fisheries Management Paper No. 1 (FMP1), all members of the RAG must declare all real or potential conflicts of interest in the Torres Strait TRL Fishery at the commencement of the meeting.
8. Where it is determined that a direct conflict of interest exists, the RAG may allow the member(s) 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. The Chair noted that this is a standard RAG and Working Group process that aids in protecting the integrity of the advice provided by the group as well as the individual members.
9. The Chair requested that members update the record of declarations. These are detailed in the meeting participant tables at the start of this meeting record.

10. The RAG agreed that given no research priorities were being discussed at this meeting, there were no agenda items that would require the scientific members to leave the discussion.
11. The RAG acknowledged that although the eHCR provides automated outputs on an RBC, industry may be required to leave the meeting temporarily during discussions/recommendations relating to alternative RBC scenarios.
12. The RAG agreed that otherwise, it was acceptable for all RAG members and observers to participate in the discussions.

1.4 Action items

13. All updates on the status of actions items arising from previous TRLRAG, and where relevant, TRL Working Group meetings (**Agenda item paper 1.4a**), were taken as read and discussed by exception:
 - a) Action item 1 – AFMA thanked Dr Ray Moore for his contributions to the updated draft TRL Management History timeline. The RAG acknowledged the importance of such a document in capturing changes and key events in the fishery through time. RAG members and observers were encouraged to read through the document out of session and provide any comments or updates to AFMA. The RAG also noted that although not considered management changes, the events of 2020 (i.e. COVID-19 related market disruptions, and more recently ongoing trade disruptions) will be important to include in the timeline.

1.5 Out of session correspondence

14. All out of session correspondence on RAG matters since the previous meeting was taken as read and were not explicitly discussed.

2 Updates from members

2.1 Industry and scientific members

15. The RAG noted verbal updates provided by industry and scientific members and observers on the trends and observations in the TRL fishery during the 2019-20 season, and the start of the 2020-21 season, in particular:
 - a) That there are fewer lobsters around the inner and near western islands this December, compared with previous seasons. Lobster sizes are small and new recruits (1+) don't appear to be moving in to the fishery yet.
 - b) Kulkalgal communities are also not seeing many 1+ lobsters around, with a slow start to the season so far, however there are high numbers of little crays (0+) on the reeftops. The weather and water temperatures seem normal, and conditions are expected to change when the north-west winds set in. There are lots of moulting lobsters that are residuals from the previous fishing season, which appear to be moulting later in the season than usual. COVID-19 and the current issues with lobster trade into China is impacting on prices in the outer islands. Prices ranges between buyers from \$20/kg for <1kg lobsters, \$28/kg for 1-1.5kg lobsters and \$35 for >1.5kg lobsters, and from \$30 to \$36/kg.
 - c) Fishing earlier in the 2020 calendar year was very good, and previous Decembers have been good with plenty of lobsters around, though this year is different. The Maluilgal traditional inhabitant member noted that there are differences in other species as well, including turtles. In this year's recent turtle breeding season there were very few turtles observed mating on top of the water which raises concerns for climate change as this is a frequent occurrence in previous years. He noted that while there are lots of turtles around, there are no male turtles. He reiterated that there are no lobsters around, which

is causing some operators to cease fishing, whilst waiting for the hookah season to start on 1 February 2021. This trend is very different to previous seasons.

- d) Lobster numbers declined as expected in a normal year towards the end of the 2019-20 fishing season, however between the end of the season (30 September) and the start of the new season (1 December), there appears to be no new recruits.
 - e) Industry member Brett Arlidge noted that although it was a very disruptive year, prices improved as the year went on and as the pandemic situation in China improved. However, since China has banned the import of lobsters from Australia (in mid-November 2020), it is unlikely that Australia will be able to sell any live TRL in to China this season. MG Kailis is aiming to continue buying TRL from the Torres Strait, and is exploring alternative markets into Hong Kong, Taiwan, south east Asia and domestically, however the price will be very different from what industry are used to (down 30-40 per cent), and there may not be as much demand for live product. He reiterated other industry observations that the new recruits to the fishery are to come through and that many lobsters appear to be residual lobsters from the previous season. Sizes are small, though this is not unusual for December.
 - f) The Chair noted that in separate, informal discussions with a South Australian Rock Lobster industry operator, industry is experiencing a 30-50 per cent price cut on usual market prices due to the inability to export live to China. The AFMA executive officer also provided a brief summary of recent price information and trends in rock lobster fisheries in other jurisdictions around Australia:
 - i. South Australia - \$15-30/kg;
 - ii. Tasmania beach price \$35/kg;
 - iii. Western Australia - \$10-20/kg;
 - iv. Many boats are increasing their 'back of boat' sales, and selling directly to restaurants;
 - v. Some processors are cooking their product to sell both fresh, and frozen.
 - g) Noting that at TRLRAG 27 (10-11 December 2019), industry members advised that increased dugong numbers could have contributed to declining seagrass, the CSIRO scientific member questioned whether there were ongoing changes to seagrass coverage and if this was impacting on turtle and dugong populations or observations. Industry agreed to provide updates on this when discussing the results of the pre-season survey which includes seagrass coverage.
16. The RAG noted that CSIRO are collating all available data on water temperature in the Torres Strait. There are some gaps in water temperature data, with no consistent ongoing times series, however more recent monitoring programs undertaken by TSRA and other agencies will help contribute. There are no updates on water temperatures for this year however from the little data available, there have been some temperature anomalies. The impact on turtles is very well known, as warmer temperatures result in higher proportions of female turtles hatching which is an issue for turtle populations all around Australia. It is also known that warmer water temperatures can affect lobster growth, moulting and survival, so any additional data on water temperature is encouraged.
17. No additional specific updates were provided by scientific members.

2.2 Government agencies

18. The RAG noted an overview of key management updates relating to the TRL Fishery provided by the AFMA member, in particular:

Fisheries bilateral meeting between AFMA and PNG NFA

- a) On Friday 27 November 2020, AFMA CEO Wez Norris met via videoconference with the acting Managing Director of PNG NFA, Mr Noan Pakop and other NFA staff to discuss

fisheries bilateral issues. This included general updates on fisheries, catch sharing arrangements for TRL, pearl shell, prawn and Spanish mackerel, updates on catch data from the PNG TRL fishery, whether PNG catches deemed as outside the Torres Strait Protected Zone (TSPZ) are within the area AFMA understands to be the PNG 'outside but near' area, opportunities for research collaboration and fisheries compliance updates.

- b) AFMA continues to encourage the provision of timely and accurate catch and effort data by NFA to support TRL scientific and stock assessment processes, and PNG NFA remain interested in opportunities for collaborative research.
- c) Further work is required to develop a common understanding of catch sharing arrangements in relation to outside but near areas to the TSPZ. NFA indicated that their understanding is that the global TRL TAC does not apply to areas outside the TSPZ, which is different to AFMA's understanding, and the way Australia accounts for catches in the Australian outside but near area.
- d) NFA indicated that the recently agreed Memorandum of Understanding (MOU) between PNG and Fujian Zhong Hong Fishery Co., Ltd. is to undertake a feasibility study to set up an 'integrated and multi-use fishery industrial park' in the Western Province of PNG. The priority remains to engage with AFMA's PNG counterparts to learn and understand more about the MOU. AFMA continues to liaise with the Department of Foreign Affairs and Trade (DFAT) who are working closely with PNG at all levels of Government learn more.
- e) The traditional inhabitant member for Maluililgal reiterated previously raised comments regarding the need for a representative of the TIB fishing industry to attend future fisheries bilateral meetings. AFMA expressed support for this, and noted that regular Treaty bilateral meetings are facilitated by DFAT, with a dedicated meeting for traditional inhabitants (referred to as the Traditional Inhabitants Meeting (TIM)) which is currently co-chaired by Councillor Getano Lui. The TSRA member committed to assist with connecting the traditional inhabitant member for Maluililgal with DFAT and the TIMs.

19. The RAG also noted a brief update provided by the TSRA member regarding TSRA activities relevant to the management of the TRL Fishery, namely:

- a) As of 3 December 2020, the newly formed *Zenadth Kes Fishing Company* was formally registered as a company limited by guarantee, with 25 elected board members comprised of five members from each cluster nation.
- b) Over the coming two years, the assets that TSRA currently holds on behalf of traditional inhabitants will be transitioned across to the Company in a staged approach.
- c) The *Wapil (Many Fish)* project is continuing with funding in place to deliver fisheries related infrastructure and 90 traineeships for 14 outer island communities. Erub (Darnley Deep Seafoods) has commenced trading in fish products (TRL, coral trout and mackerel). Other communities including Saibai, Mabuyag, Masig and Mer are all in the planning phase.

2.3 Papua New Guinea National Fisheries Authority

20. No update was provided as a PNG National Fisheries Authority representative was not in attendance.

2.4 Native Title

21. A native title update was not provided as a representative from Malu Lamar (Torres Strait Islanders) Corporation Registered Native Title Body Corporate (RNTBC) was not in attendance

3 Catch and effort analyses for 2019-20 fishing season

22. The RAG considered an overview of total reported catches for Australia and PNG and the following catch and effort analyses for the Australian TRL Fishery for the 2019-20 season undertaken by CSIRO and presented by Dr Éva Plagányi, CSIRO Scientific Member. Further detail is available in Attachments 3e, 3f and 3g of the meeting papers. A copy of the presentation is provided at **Attachment C**.

Catch and Effort

23. Total reported catch for the Australian TRL fishery (1 December 2019 – 30 September 2020) was 361.3 tonnes, with 216.2 tonnes caught by the Traditional Inhabitant Boat (TIB) sector and 145.1 tonnes caught by the Transferable Vessel Holder (TVH) sector.
24. Total reported catch from Papua New Guinea was 90.4 tonnes (January – August 2020) however, the RAG noted that this number is incomplete for the PNG TRL season. Using the same methodology applied last year (at TRLRAG 27), and assuming an average monthly catch is also caught in the months yet to be reported, the total extrapolated PNG catch is increased to 126.4 tonnes (1 December 2019 – 30 November 2020).
25. This extrapolated PNG catch results in a total Torres Strait TRL catch of 487.7 tonnes, under a 582 tonne global TRL TAC, equating to 83.8% of the TAC.
26. Given the disruptions fishers experienced during the early impacts of COVID-19 on the markets, it was expected that the proportion of tailed product would increase in 2020, however the data indicates there was no strong signal for an increase in tail proportions since the last season.
27. The RAG noted that data coverage for voluntary data in the TIB sector was similar to the 2018-19 season, with the percentage of catch reported against Area-Fished increasing slightly. The RAG was reminded of the importance of providing the voluntary data where possible to help better understand changes in the fishery and the stock, particularly in anomalous seasons such as 2019-20.
28. Both the TVH and TIB sectors recorded significant effort decreases coinciding with initial COVID-19 outbreaks in early 2020, however catch rates for both sectors increased substantially later in the 2019-20 fishing season, and the annual CPUE point estimates were the highest values recorded in the past five seasons.

TVH CPUE Standardisation

29. The RAG noted that there was very little variance between the nominal CPUE index and the other standardised indices, that consider the effects of month, area, method, vessel, proportion of tails, Southern Oscillation Index and moon-phase.
30. The point estimates of each standardised index, and the nominal CPUE index for 2019-20 indicate that the TRL spawning stock is healthy, and is a positive indicator from the fishery to contribute to the empirical Harvest Control Rule (eHRC).
31. **The RAG noted that the “Int-1 model” is the previously agreed default model used in the eHCR.** The Int-1 GLM includes an ‘area-by-month’ interaction, but does not include a ‘year-by-month’ interaction that might have changed in the 2019-20 season. For this reason, another model was considered as a sensitivity test in the eHCR. More detail on this is provided under Agenda Item 5.
32. Two of the GLMs that account for ‘year-by-month’ effects (Int-2A and Int-2C) indicate large deviations in monthly fishing patterns in the 2019-20 fishing season, in particular for March, April and May. While this change in monthly fishing patterns is widely understood by the RAG through reports from industry, it is important that the data reflects these changes as well.

TIB CPUE Standardisation

33. Both the nominal and standardised indices all illustrate the highest CPUE on record for the TIB sector, which correlates with anecdotal reports of a good fishing season and high lobster abundance. The positive TIB CPUE index also reinforces that there are no concerning trends for

the fishery and the stock is looking healthy. The potential for positive bias in the CPUE point estimates was discussed when considering the recommended biological catch.

34. The RAG noted that the “**Seller model**” is the default model used in the eHCR, which accounts for an increase in the relative fishing efficiency of *Sellers* in recent seasons.

Further work for data analyses

35. The RAG noted a series of further work to be potentially undertaken, informed through discussions of the RAG data sub-group including:

- a) Investigation the potential for effort creep:
 - i. Is ‘vessel-effect’ a proxy for skill of divers?
 - ii. Increase in boat size; can larger boats search more?
 - iii. Other changes in fishing gears leading to increased CPUE
- b) What factors influence the spatial distribution of lobsters and ‘hot-spots’, and what influences the spatial distribution of fishing effort?
- c) How do fishing aggregations influence CPUE, and what factors influence aggregation dynamics?
- d) Influences of COVID-19 impacts on CPUE and potential biases
- e) Influence of oceanographic conditions?
 - i. Water temperatures
 - ii. Prevailing winds

4 Results of the pre-season survey

36. The RAG considered a presentation provided by Dr Leo Dutra, CSIRO Scientific observer detailing the preliminary results of the 2020 pre-season survey (**Attachment D**).
37. The pre-season diver survey was conducted between 2-12 November 2020 aboard the “Wild Blue” with a CSIRO dive tender. The survey was undertaken by five divers; Mark Tonks, Nicole Murphy, Kinam Salee, Steven Edgar and Leo Dutra. The inclusion of an additional diver was to aid in transition from Mark Tonks as survey leader and to provide some contingency in planning due to possible impacts from COVID-19 and changing circumstances with travel restrictions.
38. Dive transects were conducted at 76 repeat pre-season sites, starting with shallow dives in the western Torres Strait while currents were at their weakest and moving in an easterly direction to utilise stronger currents for deeper dives.
39. The pre-season TRL surveys provide indices of abundance for recruiting age lobsters (age 1+) and recently-settled lobsters (age 0+), abundance indices by stratum (region) and length-frequency and sex ratios. At the time of the survey, most older lobsters (age 2+) have migrated and those that remain are mostly remnant males.
- a) At each survey site:
 - i. Two divers swim with the current to survey a 500m transect, covering 2m each;
 - ii. Lobsters are counted for each age-class and collected where possible;
 - iii. Habitat is assessed (i.e. substrate type and biota);
 - iv. Temperature/depth profiles are collected; and,
 - v. lobsters are measured (TW), sex determined and datasheets completed.
 - b) Age 1+ recruiting lobster counts and index:

- i. The 2020 1+ abundance index for the mid-year only (MYO) sites was similar to the long-term average (2005-2020) and the survey variance was roughly average compared with higher variances observed in the 2018 and 2019 surveys.
- ii. Lobster counts were generally consistent across the sites in 2020, but there were high counts of lobsters made along the eastern side in both 2020 and 2019, compared to 2018 where high lobster counts were made along the western side of the Torres Strait.
- iii. The abundance index for 1+ lobsters in 2020 indicates that recruitment into the fishery is generally widespread across the different strata surveyed, with the highest recruitment recorded at Warraber Bridge, Kirkaldie and Buru, and the lowest recruitment recorded at Mabuyag.
- iv. Warraber Bridge and Buru exhibited the greatest count variability among sites indicated by the larger standard error at these strata.
- v. Warraber Bridge recorded one of the highest densities across all surveys in 2020, with Kirkaldie and Warraber Bridge above the long-term survey average, and Reef Edge and Buru about average.

c) Age 0+ recently settled lobster counts and index:

- i. The 2020 0+ abundance index is above the long-term pre-season survey average index (2005-2020) and has steadily increased from its lowest point estimate in 2017.
- ii. The 2020 survey indicated a typical lobster settlement pattern, with most 0+ lobsters counted on the western side of the survey area.
- iii. The highest abundance of 0+ indices were recorded for Mabuyag and Buru strata, however unlike previous surveys, Warraber Bridge on the eastern side showed the third highest 0+ abundance index. Historically, 0+ observations were higher in numbers on the western side of the survey area.
- iv. Abundance indices in 2020 were higher than average for Mabuyag, Buru and Warraber Bridge.

d) Size frequency and sex ratio:

- i. Length frequency data in 2020 was similar to most surveys, comprised mostly of 1+ lobsters, although the number of 0+ observations was higher in 2020 (101 lobsters counted compared to 92 in 2019).
- ii. The sex ratio of sampled lobsters was typical of previous surveys with 45 per cent males.

e) Habitat changes and temperature data:

- i. Percentage coverage of seagrass was considerably down in 2020, with a very pronounced decline in seagrass coverage since 2019.
- ii. Some minor sand incursions were observed at one site.

40. Noting the results summarised above, the RAG discussed the following:

- a) Some divers have seen increased amounts of fine, white sand moving around more than normal, covering up the substrate, which has reportedly been getting worse throughout the 2019-20 season. This also reportedly is linked to the decline in seagrass coverage observed by fishers. The AFMA member queried whether other seagrass surveys (conducted by James Cook University, and the TSRA Ranger Program) would be useful in strengthening the RAGs understanding of seagrass habitat changes.
- b) The increased number of 0+ lobsters in the eastern side of the survey area appears consistent with the reports and observations from industry about lots of smaller lobsters on the reef tops.

- c) An industry member expressed a level of comfort and satisfaction with the CPUE analyses, experiences in the fishery in 2020 being congruent with the results of the 2019 pre-season survey and stock assessment.
41. The RAG noted that although 2020 exhibited slightly different trends in the data and indicators (i.e. higher catch rates exhibited by both the TIB and TVH sectors, and lower than average 1+ lobster index) there are positive trends with nothing alarming in the data to consider the stock is not in a healthy position, despite it being an anomalous fishing season.
42. On behalf of the RAG, the Chair acknowledged and thanked the CSIRO team for the significant level of work undertaken to complete the survey safely and successfully; and within a matter of weeks, analyse and report on the survey results in time for the RAG meeting.

5 Recommended Biological Catch

43. The RAG considered advice by the Scientific Member Dr Éva Plagányi on the RBC for the 2020-21 fishing season as derived through the application of the empirical harvest control rule (eHCR) under the final TRL harvest strategy (presentation at **Attachment E**), as detailed in agenda item paper 5a, *Torres Strait tropical rock lobster (TRL) Panulirus ornatus empirical Harvest Control Rule (eHCR) Recommended Biological Catch (RBC) for 2021*.
44. The eHCR is applied in December and outputs a RBC for the following year. This formula is the multiple of the average annual catch over the last 5 years (using available catch from TIB, TVH, PNG) and a statistic which measures the relative performance of the fishery based on the following data inputs:
- Pre-season survey recruiting lobster (1+) standardised relative numbers (70%);
 - Pre-season survey recently-settled lobster (0+) standardised relative numbers (10%);
 - nominal CPUE for TIB sector (10%); and,
 - standardised CPUE for TVH sector (using data available up until end of October) (10%).

Average annual catch

45. The RAG noted that the eHCR uses the average catch over the past five years as a multiplier to inform the RBC. This dampens the influence of the most recent catch value. Nevertheless, if the recent value is negatively biased (as was possible in 2019-20 due to COVID-19) then it can have an effect on RBC calculations.
46. When considering total reported PNG catch for 2020, the total TRL 2020 catch was 77.6 per cent of the global TAC, with a substantial proportion of the shortfall attributable to impacts of COVID-19 in early 2020 (TRLRAG 28). However, if the PNG catch is extrapolated up, using the methodology from TRLRAG 27, the total TRL catch is increased to 83.3 per cent of the TAC. Without the scaling up of PNG catches, the 2020 PNG catch is quite low compared to previous years, noting that on average over the period 2004-2019, PNG have caught 94 per cent of their TAC allocation. The total reported catch for the TIB sector is also below the TIB TAC (75.1 per cent caught in 2019-20, and 79 per cent caught in 2018-19). By comparison, the TVH sector were almost fully caught (97.5 per cent caught in 2019-20 and 93 per cent caught in 2018-19).
47. The 2019 pre-season survey suggested that 2020 would be a good TRL fishing year, and the 2020 CPUE data generally aligned with a TRL abundance higher than average. Despite this, catches appeared to be lower than expected. If the lower than expected catch is not a function of stock abundance, but is due to other reasons (i.e. COVID)) then using the actual catch value may unjustifiably bias the RBC downwards.
48. A comparison of TIB and TVH relative proportions of the total annual catch taken in each month illustrates a significant difference for the TVH sector in 2020, with substantially less catch in February and reduced catch in March (due to market disruptions). This is compensated by increased catches in April, followed by an extended increase in effort through till July as the TVH allocation limit is approached (Figure 1). By comparison, the TIB sector demonstrates less catch than usual in February, followed by increased effort until August, reducing to average levels as

the end of the season is reached (Figure 2). PNG also fished less over February and March, with their highest reported catches in May (Figure 3).

Alternative scenarios – Average catch

49. To inform discussions on whether ad-hoc adjustments to the eHCR inputs were warranted by COVID-19 impacts, a number of alternative scenarios (or sensitivities) were investigated by CSIRO to explore the potential impacts of average catch on RBC calculations.
50. The RAG considered five alternative scenarios for calculating average catch (2016 - 2020) as an input to the eHCR:
- Using the actual reported total catch;
 - Substituting the TAC value for the 2020 actual catch – based on the argument that if catch rates were good, lobster abundance was high, but due to a late start to the season (from COVID-19 impacts) the TAC was unable to be fully caught (discussed at TRLRAG 28);
 - Substituting increased catch for PNG – based on the assumption that only PNG caught their TAC allocation, and uses actual catches for the TIB and TVH sectors;
 - Assuming in 2019-20 season that fishers would have caught the same percentage (95%) of the TAC as they did in the 2018-19 season; and
 - Extrapolating the PNG catch through to the end of the season using the same method as last year (TRLRAG 27).
51. A summary of the average catch alternative scenario values was provided to TRL RAG as outlined in Table 1.

Table 1. Examples of alternative scenarios for calculating an average catch value for input in to the eHCR.

Season	Total catch_actual (t)	Substituting TAC for 2020 catch	Substituting increased catch for PNG	Assuming in 2020 would have caught same percentage (95%) of TAC as in 2019
2016	758.2	758.2	758.2	758.2
2017	390.8	390.8	390.8	390.8
2018	412.2	412.2	412.2	412.2
2019	583.6	583.6	583.6	583.6
2020	451.7	285.0	553.4	553.5
Average	519.3	545.4	539.6	539.7

52. Given the lower than expected fishing effort in the 2019-20 season, the RAG was asked to consider whether the levels of catch reflect what was expected, or were they biased downwards due to impacts from COVID-19.

Catch per unit effort trends

53. Catch rates for the TIB sector in February were the highest catch rates on record relative to all previous point estimates available since 2004; both nominal and standardised indices were the highest in the series, both being approximately 50 per cent higher than the average value of the respective series.
54. The RAG noted that given the differences in fishing patterns by month, and a 'pause' in fishing early in the season, it could be expected the lobsters grew in size while not being fished, and also may have aggregated as they were not being significantly disturbed on the reefs, which may have enhanced catch rates once fishing resumed. These trends could also be confounded by some inter-sector interactions (causing a positive bias) which may become increasingly important to understand as a review of input controls in the fishery is commenced.

55. When comparing both TIB 'Seller' series and TVH 'Int-1' CPUE indices with the 2019 stock assessment-based 2+ lobster biomass estimate, the results suggest that the two CPUE indices show similar trends with the estimated stock biomass, that is increasing over the recent period which provides confidence that the stock assessment predictions accurately reflected the observed catch rates the following year
56. Consistent with TRLRAG 27 advice, the TIB 'Seller' series and TVH 'Int-1' series were used as default inputs to the eHCR for 2020 RBC calculations. However, as 'year-by-month' interactions were expected to be different this season CSIRO did examine two alternative CPUE standardisations (nominal TIB and TVH 'Int-2C' which includes a 'year-by-month' interaction, because year-by-month interactions were expected to be different this year) and did not result in a substantial difference in RBC calculations relative to comparable scenarios (using alternative average catch values).

Application of the empirical Harvest Control Rule (eHCR)

57. When examining recent trends in eHCR indices, both the TIB CPUE and TVH CPUE indices showed very positive slopes, and both the pre-season 1+ and 0+ survey indices exhibited positive trends (Figure 4). Although the 0+ index is less reliable, the positive trend provides an indication of what is to be expected in future seasons. The RAG noted that the eHCR is shown to be reasonably robust. It captures longer-term trends over a five-year period, it places substantially more weighting (70%) on the pre-season survey which is not affected by trade and other disruptions. Also, using a five-year average (including average catch) helps to dampen the influence of a single anomalous year.
58. Table 2 illustrates a comparison of all eHCR RBC outputs under all alternative scenarios, ranging between 614.9 tonnes and 647.5 tonnes.

Table 2. Comparison of eHCR RBC under alternative scenarios.

Key sensitivities / scenario		Average catch input	TVH model	TIB model	TVH CPUE	TIB CPUE	PSS 0+	PSS 1+	RBC (tonnes)	Difference to Scenario 1
1	Scenario 1 (using actual catch)	519.3	Int-1	Seller	1.51	1.15	3.301	4.143	614.9	-
2	Substitute TAC for 2020 catch	545.4	Int-1	Seller	1.51	1.15	3.301	4.143	645.8	30.9
3	Substitute increased catch for PNG	539.6	Int-1	Seller	1.51	1.15	3.301	4.143	639.0	24
4	Assume 2020 has same proportion of TAC caught (95%) as in 2019	539.7	Int-1	Seller	1.51	1.15	3.301	4.143	639.1	24.2
5	Alternative CPUE standardisation	519.3	Int-2C	Nominal	1.47	1.34	3.301	4.143	616.3	1.3
6	Alternative CPUE standardisation & average catch	545.4	Int-2C	Nominal	1.47	1.34	3.301	4.143	647.5	32.2
7	PNG extrapolated catch	526.5	Int-1	Seller	1.51	1.34	3.301	4.143	623.5	8.6

59. Having regard to the outcomes of the alternative scenarios presented in Table 1, the RAG considered whether to recommend the default implementation of the eHCR (as per last year), or to undertake an ad-hoc adjustment and discussed the following key points:

- a) The independent scientific member expressed concern that having a series of RBC options available, and no clear guidance to determine what is appropriate, that the RAG could be “RBC shopping”. He added that anecdotal reports from industry about not seeing many recruits in the fishery and some reported sand incursions coupled with a decreased pre-season 1+ index (although increasing over the longer-term) may be slightly concerning and therefore warrant being precautionary as Table 1 is discussed.
- b) The Chair acknowledged that “RBC shopping” is an issue that must be considered when assessing options with different RBCs, however with the extensive work that has been undertaken to develop and test the eHCR, the RAG preference should be to proceed with the agreed inputs unless there is sufficient evidence that would support a deviation of the default application of the eHCR. He noted that some of the alternative scenarios are likely beyond what could be reasonably justified without further detailed analyses. The CSIRO scientific member reiterated that some of the alternative scenarios (scenarios 5 and 6 in Table 1 above) are not reasonably applicable but were presented as sensitivities to the RAG, to illustrate that there is little difference between different GLM standardisations.
- c) An industry member agreed that 2019-20 was an anomalous year. Had fishing occurred as normal, total catch would likely have been higher. He added that the TIB sector had an opportunity to catch the remaining TAC but there were few crays on the ground as they underwent their usual migration into the Gulf of Papua. He noted that MG Kailis purchases a considerable amount of PNG TRL catch, and considered that the actual PNG catch is likely considerably higher than what is reported.
- d) A traditional inhabitant member added that early in the year TIB catches were high, and effort was high because fishers needed to continue to make a living, even though the prices were down. The TSRA observer added that typically once the hookah season opens, there would be an increase in TIB catches however due to the impacts of COVID, low market prices and fuel prices, catches were not as high. Another traditional inhabitant industry member claimed that the TAC was under-caught due to the inability to employ non-indigenous crew on TIB boats, however impacts such as fuel prices and crewing requirements have been taken into account, hence this point was refuted as that has been the case consistently through time and is therefore not a viable factor in this instance.
- e) The RAG noted that scenario 2 is not very realistic as there have been numerous seasons where both sectors have not fully caught their TACs, however it is presented to illustrate what the maximum benefits would be relative to scenario 1.
- f) Scenario 4 assumes that if COVID-19 hadn’t impacted, it could have been predicted that the average catch proportion for all sectors would have been similar to the 2018-19 fishing season, assuming that 95 per cent of the total TAC would have been caught.
- g) An industry member agreed that only two scenarios (scenario 4 and scenario 7, the default) are reasonable, and that scenario 4 using an assumed total catch proportion of 95% is more likely. Traditional inhabitant industry members also shared this same view.
- h) For an abundance of clarity, AFMA restated that there is an agreed harvest strategy with very clear decision rules that guide how the TAC is set each year. As such, the advice needs to be very clear if it is to depart from the agreed process. The harvest strategy already accounts for variability on impacts of fishing (e.g. weather conditions, fuel prices). The current situation is contemplating extraordinary variability that has impacted people’s ability to go fishing.

60. The Chair recognised industry’s conflict of interest at this point of the RBC discussion. To maintain the integrity of the RAGs advice, the Chair requested that industry members temporarily leave the meeting while the remaining members discussed and provided advice on an agreed application of the eHCR.

- a) Noting that TVH sector was almost fully caught and that the preferred approach for handling PNG catch is to use the extrapolation method (consistent with the eHCR application in 2019), the AFMA member proposed a variation on scenario 4 that applied

only a proportional scale up of catches only to the TIB sector catches, which were considered under caught this season.

- i. After CSIRO undertook some preliminary calculations using this adjustment, the RBC output was 637 tonnes.
 - b) The scientific member agreed that an ad-hoc adjustment of this nature could be justified, provided that the reasons for scaling-up the TIB catches were clear in explaining why they were anomalous.
 - c) The independent scientific member expressed concern over applying a scaled-up approach without sufficient time and rationale to understand clear reasons why the TIB sector catches have been scaled-up. The RAG agreed that the forthcoming 2020-21 season is likely to experience similar disruptions, and therefore further analysis and discussion will be required.
 - d) RAG members considered that the CPUE series for the TIB sector could be positively biased. This assumes that the lobsters would have grown larger and aggregated, and that some inter-sector competition was absent in the early months of the season, resulting in different fishing patterns, and higher catch rates. Most notably, the TIB CPUE nominal and standardised index was the highest in the series, and relatively higher than can be explained by past high stock abundances (based on the fishery independent survey, which is the main indicator of abundance, and stock assessment) (i.e. in previous high abundance years, the TIB CPUE wasn't nearly as high). The 2020 nominal and standardised TIB CPUE relative to 2019 increased 32% and 22% respectively. By comparison, total average catch could be considered to be negatively biased.
61. **The RAG members (excluding industry members) acknowledged that the 2019-20 season was an anomalous year due to the impacts of COVID-19, which has impacted the eHCR indicators in different ways. The RAG members agreed that the total average catch could be considered negatively biased, but the recent increase in catch per unit effort series for the TIB sector could be considered positively biased. In lieu of additional information to understand the COVID-19 impacts on those indicators, RAG members agreed to recommend the default application of eHCR (scenario 7) using the PNG extrapolated catch and no further ad-hoc adjustments to the eHCR inputs.**
62. **In the absence of pre-agreed meta rules to guide how extraordinary anomalous years are handled within the harvest strategy, when outside the bounds of MSE tested ranges, RAG members also acknowledged that further work and discussions will be required as a priority to better understand the anticipated impacts associated with ongoing trade disruptions in the 2020-21 season.**
63. With industry members re-joining the discussion, the Chair explained the rationale for the above advice to industry members. A TSRA observer queried why the RAG member advice differed from the original traditional inhabitant views put forward earlier in the meeting. It was explained to Industry members that there was no clear way of discerning that either of the biases (i.e. assuming that the TIB TAC would have been fully caught in the absence of COVID-19 (considered anomalously low) or the unusually high TIB CPUE trends (considered unusually higher than normal) were more influential than the other.
64. Agreeing with the rationale and that the difference in RBCs between scenarios was not significant, an industry member agreed with the recommended approach and agreed that the eHCR is working well.
65. The RAG noted that in recommending an RBC, other sources of mortality (included both Torres Strait and PNG Traditional catch, and recreational catch) should be considered. Traditional inhabitant members advised that there has been no major change in recent levels of traditional or recreational catch of TRL.
66. **Having regard to RAG member advice on which scenario of the eHCR was to be applied, the RAG recommendation resulted in an RBC value of 623.5 tonnes for the 2020-21 season with no deduction of catches taken by non-commercial fishing sectors.**

6 Other business

67. The RAG noted a brief presentation from Dr Leo Dutra, CSIRO observer regarding an FRDC funded project aimed at providing opportunities to Torres Strait industry representatives to learn about the latest developments in fisheries research and management and build capacity through co-authoring talks with CSIRO researchers and attending international fisheries conferences.
68. Traditional inhabitant members noted that those willing to participate will be required to submit and expression of interest to attend or present, and must seek nomination from a relevant Traditional owner representative body, Research Advisory or Working Group. The project will involve successful nominees submitting a conference abstract and committing to post-conference communication activities (i.e. presentations at RAG and relevant Working Group meetings).

7 Date and venue of next meeting

69. The RAG noted that:
- a) The second RAG Data Sub-group meeting is proposed for 30-31 March 2020 noting industry member availability.
 - b) The next TRL RAG meeting (TRLRAG 31) is tentatively scheduled for May 2021 to consider data sub-group outcomes, and research priorities for the TRL Fishery. Members noted that another TRLRAG meeting may be required in early 2021 to consider ongoing impacts of trade disruptions and how that might impact application of the eHCR in 2021.
70. The 30th TRL RAG meeting was closed in prayer at 2:00pm on Wednesday 16 December 2020.

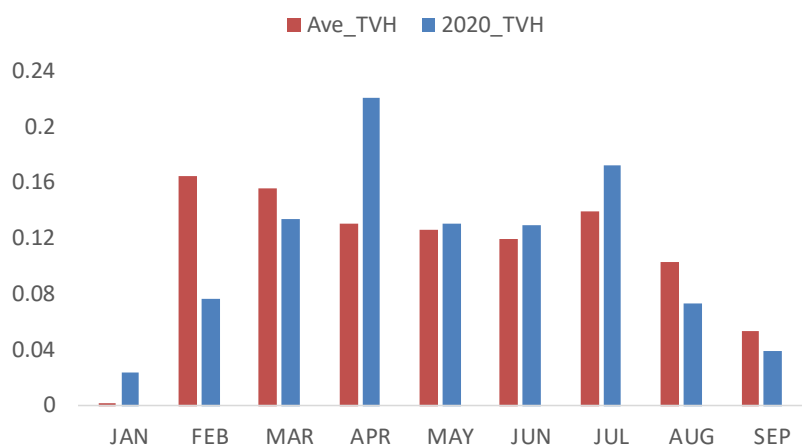


Figure 1. TVH proportion fished per month relative to average.

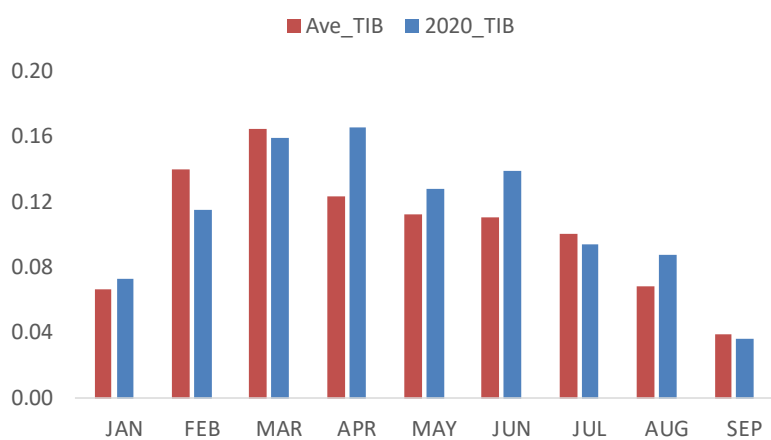


Figure 2. TIB proportion fished per month relative to average.

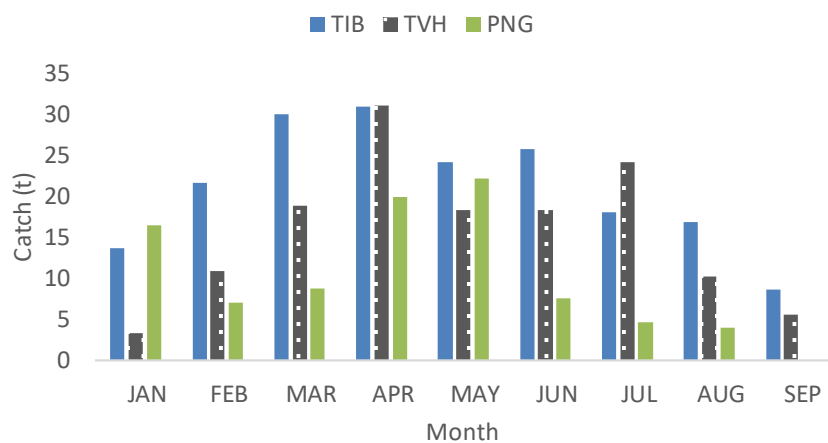


Figure 3. Total catch per month by sector.

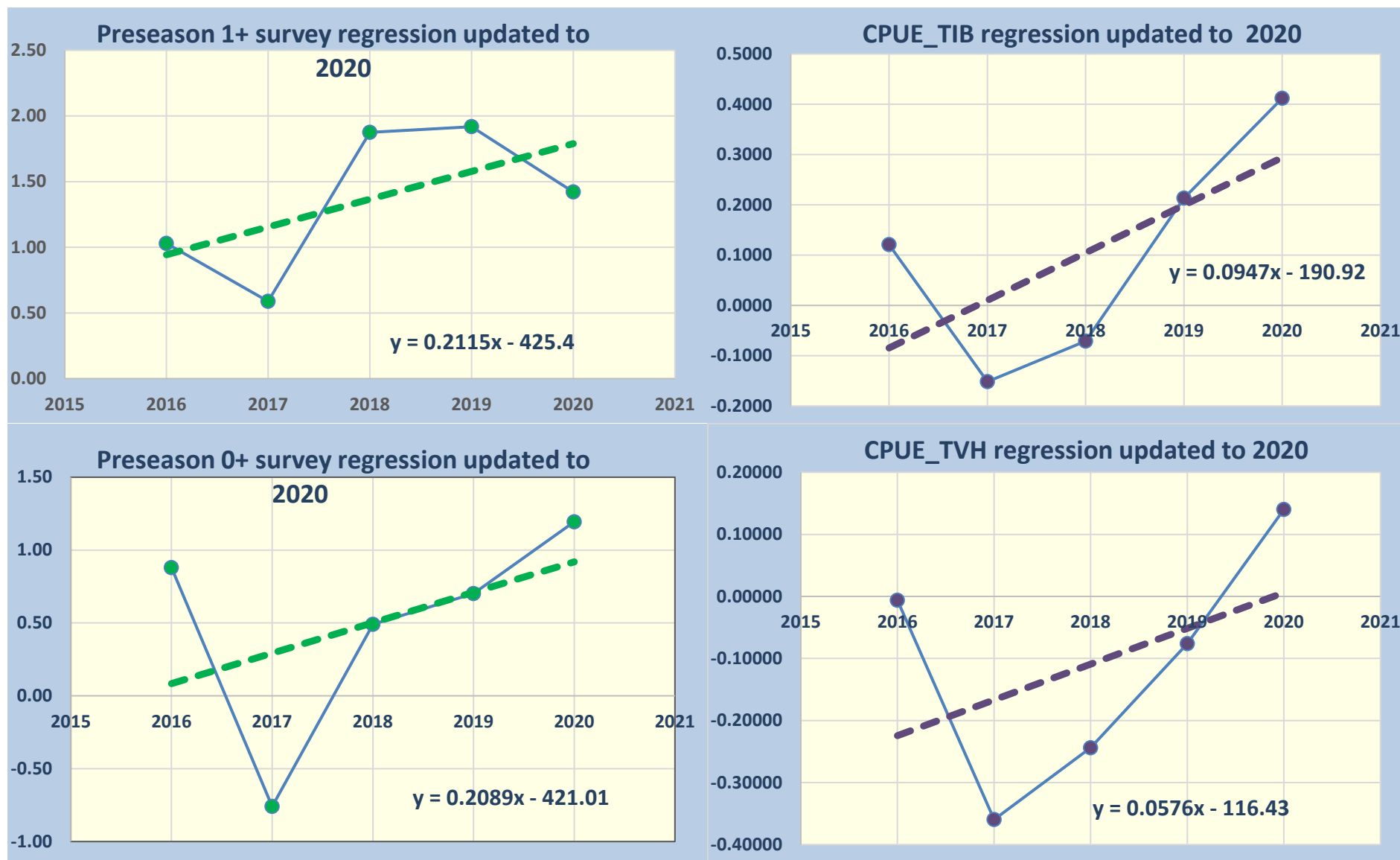


Figure 4. Regression slopes of each eHCR index; pre-season 1+ survey, pre-season 0+ survey; TIB CPUE and TVH CPUE.

Declaration of interests

Dr Ian Knuckey – October 2020

Positions:

Director –	Fishwell Consulting Pty Ltd
Director –	Olrac Australia (Electronic logbooks)
Deputy Chair –	Victorian Marine and Coastal Council
Chair / Director –	Australian Seafood Co-products & ASCo Fertilisers (seafood waste)
Chair –	Northern Prawn Fishery Resource Assessment Group
Chair –	Tropical Rock Lobster Resource Assessment Group
Chair –	Victorian Rock Lobster and Giant Crab Assessment Group
Chair –	Victorian Central Zone Abalone Fisheries Resource Advisory Group
Chair –	Gulf of St Vincent's Prawn Fishery MAC Research Scientific Committee
Scientific Member –	Northern Prawn Management Advisory Committee
Scientific Member –	SESSF Shark Resource Assessment Group
Scientific Member –	Great Australian Bight Resource Assessment Group
Scientific Member –	Gulf of St Vincent's Prawn Fishery Management Advisory Committee
Scientific Member –	Tropical Tuna Resource Assessment Group
Scientific participant –	SEMAC, SESSF Resource Assessment Group

Current projects:

AFMA 2020/0807	Bass Strait Scallop Fishery Survey – 2020-22
FRDC 2017/069	Indigenous Capacity Building
FRDC 2016/116	5-year RD&E Plan for NT fisheries and aquaculture
Traffic Project	Shark Product Traceability
FRDC 2018/021	Development and Evaluation of SESSF multi-species harvest strategies
FRDC 2017/014	Informing structural reform of South Australia's Marine Scalefish Fishery
NT Fisheries	Design and implementation of a tropical snapper trawl survey
Sea Cucumber Ass.	Design and implementation of a sea cucumber dive survey
FRDC 2019-072	A survey to detect change in Danish Seine catch rates of Flathead and School Whiting resulting from CGG seismic exploration.

**ROCK LOBSTER RESOURCE ASSESSMENT
GROUP (TRLRAG 30)**

WEDNESDAY 16 December 2020

9:00 AM – 12:00 PM AEST

1:00 PM – 3:00 PM (if required)

Video Conference

ADOPTED AGENDA

1 PRELIMINARIES

1.1 Welcome and apologies

The Chair will welcome members and observers to the 30th meeting of the RAG.

1.2 Adoption of agenda

The RAG will be invited to adopt the draft agenda.

1.3 Declaration of interests

Members and observers will be invited to declare any real or potential conflicts of interest 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 RAG will be invited to note the status of action items arising from previous meetings.

1.5 Out-of-session correspondence

The RAG will be invited to note out of session correspondence on RAG matters since the previous meeting.

2 UPDATES FROM MEMBERS

2.1 Industry & Scientific members

Industry and scientific members will be invited to provide a verbal update on matters concerning the Torres Strait TRL Fishery, in particular, providing comment on fishing patterns, behaviours, prices, and market trends this season.

2.2 Government agencies

The RAG will be invited to note updates from AFMA, TSRA and QDAF on matters concerning the Torres Strait TRL Fishery.

2.3 PNG National Fisheries Authority

The RAG will be invited to note a verbal update from the PNG National Fisheries Authority.

2.4 Native Title

The RAG will be invited to note a verbal update from Malu Lamar (Torres Strait Islander) Corporation RNTBC.

3 CATCH AND EFFORT ANALYSES FOR THE 2019-20 FISHING SEASON

The RAG will be invited to discuss TRL Fishery catch and effort data for the 2019-20 fishing season, including catch-per-unit-effort (CPUE) analyses to be presented by the CSIRO.

4 RESULTS OF THE NOVEMBER 2020 PRE-SEASON SURVEY

The RAG will be invited to discuss the results of the November 2020 pre-season survey to be presented by the CSIRO.

5 RECOMMENDED BIOLOGICAL CATCH

The RAG will be invited to provide advice on a recommended biological catch (RBC) for the TRL Fishery for the 2020-21 fishing season, based on estimates derived through the application of the empirical harvest control rule (eHCR) under the TRL Harvest Strategy.

6 OTHER BUSINESS

The RAG will be invited to raise other business for consideration.

7 DATE AND VENUE FOR NEXT MEETING

The RAG 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 join the meeting as an observer must contact the Executive Officer – Georgia Langdon (georgia.langdon@afma.gov.au)



CPUE-Based Annual Abundance Indices for Torres Strait Rock Lobster

Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar, Nicole Murphy
Mark Tonks, Kinam Salee, Leo Dutra

CSIRO Oceans and Atmosphere
www.csiro.au

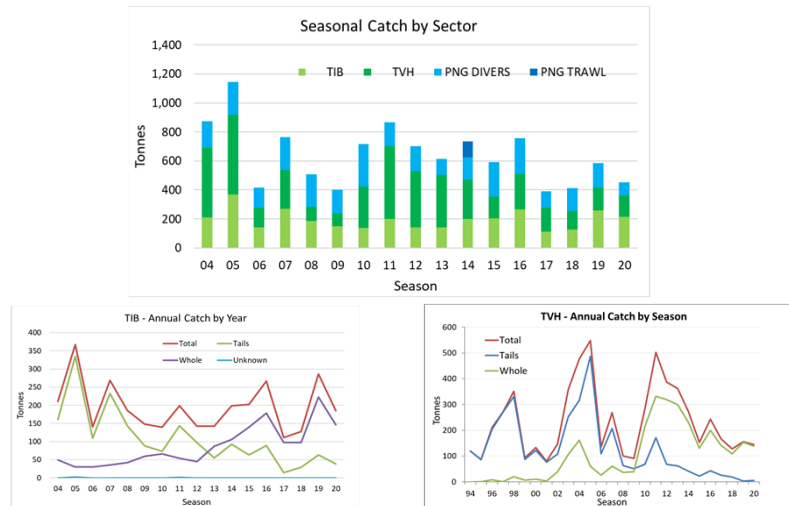
TRLRAG30 Dec 2020



TRL Catches per sector

SEASON	TIB	TVH	PNG-DIVERS	PNG_TRAWL	TS_TOTAL	EAST_COAST
2010	140.0	282.6	292.8	0.0	715.5	128.8
2011	199.1	503.5	165.0	0.0	867.6	146.6
2012	142.4	387.3	173.7	0.0	703.4	157.6
2013	142.5	361.7	108.3	0.0	612.5	166.2
2014	198.8	273.2	151.4	109.8	733.2	176.4
2015	202.6	152.7	235.7	0.0	591.0	125.0
2016	267.1	243.0	248.0	0.0	758.2	194.0
2017	111.5	166.3	113.0	0.0	390.8	194.9
2018	127.4	128.3	156.4	0.0	412.2	159.8
2019	260.6	155.9	167.0	0.0	583.6	108.0
2020	216.2	145.1	90.4	0.0	451.7	111.0
Last 5 year mean	196.6	167.7	155.0	0.0	519.3	153.6

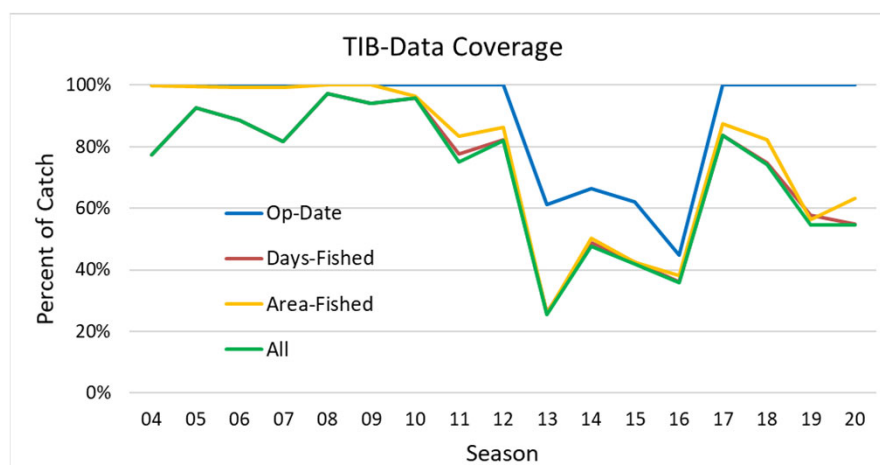
Catch by sector and Product form



3 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar



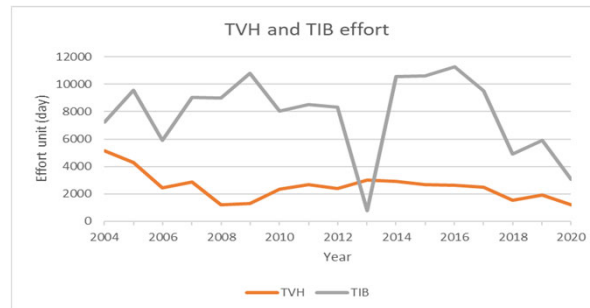
Data Records – missing information



4 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar



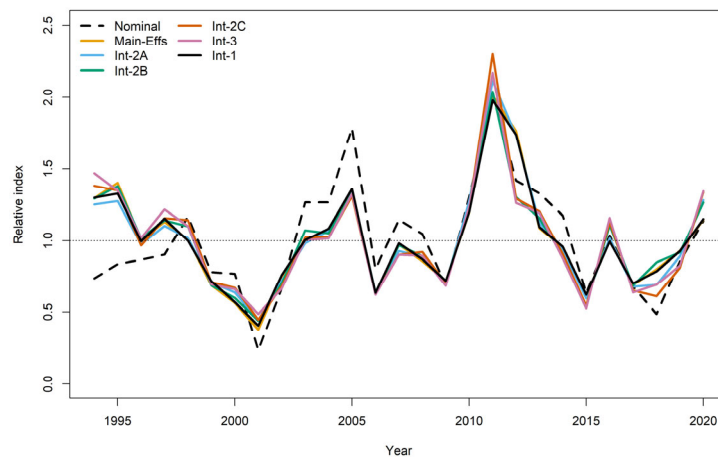
Lower than expected effort in 2020



5 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar



TVH CPUE standardisation



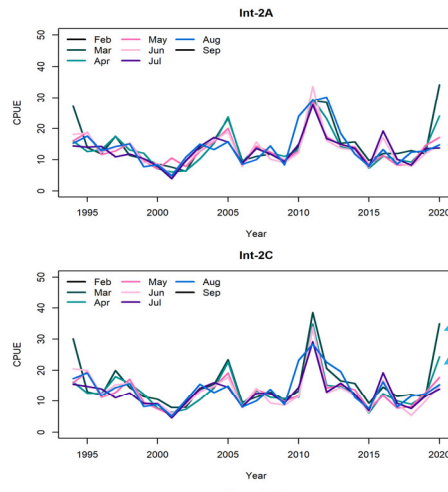
Int-1 is default used in eHCR:

$CPUE = \text{Intercept} + \text{Year} + \text{Month} + \text{Month} * \text{Area} + \text{Vessel} + \text{Fishing-Method} + \text{Proportion-Tails} + \text{SOI} + \text{Moon}$
/ distribution = gamma, link = log

6 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar



2020 deviations in monthly fishing pattern



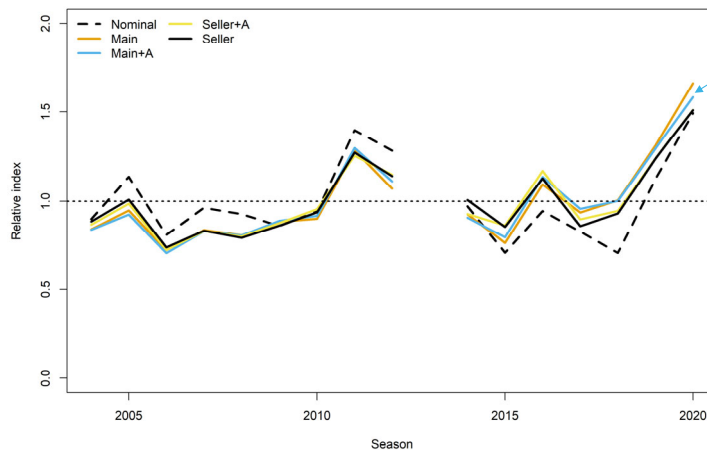
Example TVH models including combinations of year/month and area interactions

As expected some large differences in 2020 for March, April, May (high values)

7 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar



TIB CPUE standardisation



'Seller' is default used in eHCR: accounts for increase in the relative fishing efficiency of *Sellers* in recent seasons

8 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Plagányi, Judy Upston, Steven Edgar




Further work

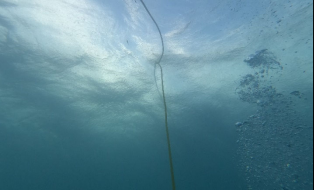
- Investigate potential for effort creep:
 - Is 'vessel-effect' a proxy for skill of divers?
 - Increase in boat size (can larger boats search more)
 - Other changes in fishing gears leading to increased CPUE
- What factors influence the spatial distribution of lobsters and 'hot-spots', and what influences the spatial distribution of fishing effort?
- How do fishing aggregations influence CPUE, and what factors influence aggregation dynamics?
- Influences of COVID-19 impacts on CPUE & potential biases
- Influence of oceanographic conditions?
 - Water temperatures
 - Prevailing winds

9 | Torres Strait TRL Data & CPUE | Roy Deng, Éva Pláganyi, Judy Upston, Steven Edgar










Thank you

Oceans and Atmosphere
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Judy Upston
Steven Edgar
Rob Campbell
Mark Tonks
Nicole Murphy
Kinam Salee
Leo Dutra

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RESULTS OF TRL 2020 PRE-SEASON SURVEY

Leo Dutra, Nicole Murphy, Mark Tonks, Steven Edgar, Kinam Salee, Roy Deng, Judy Upston and Eva Plaganyi

TRL RAG Meeting #30 – Item # 4
16 December 2020

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Australian Fisheries Management Authority

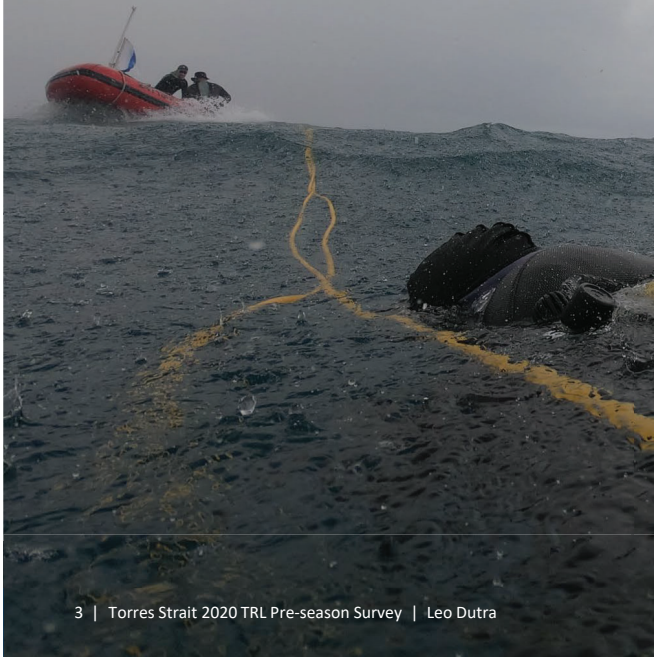
Trip Details

Dive surveys were conducted between November 2-12 2020 using the “Wild Blue” and CSIRO tender



Divers: Mark Tonks, Nicole Murphy (senior dive supervisor & lead field logistics), Kinam Salee, Steven Edgar and Leo Dutra (lead science survey)

Started in the western side

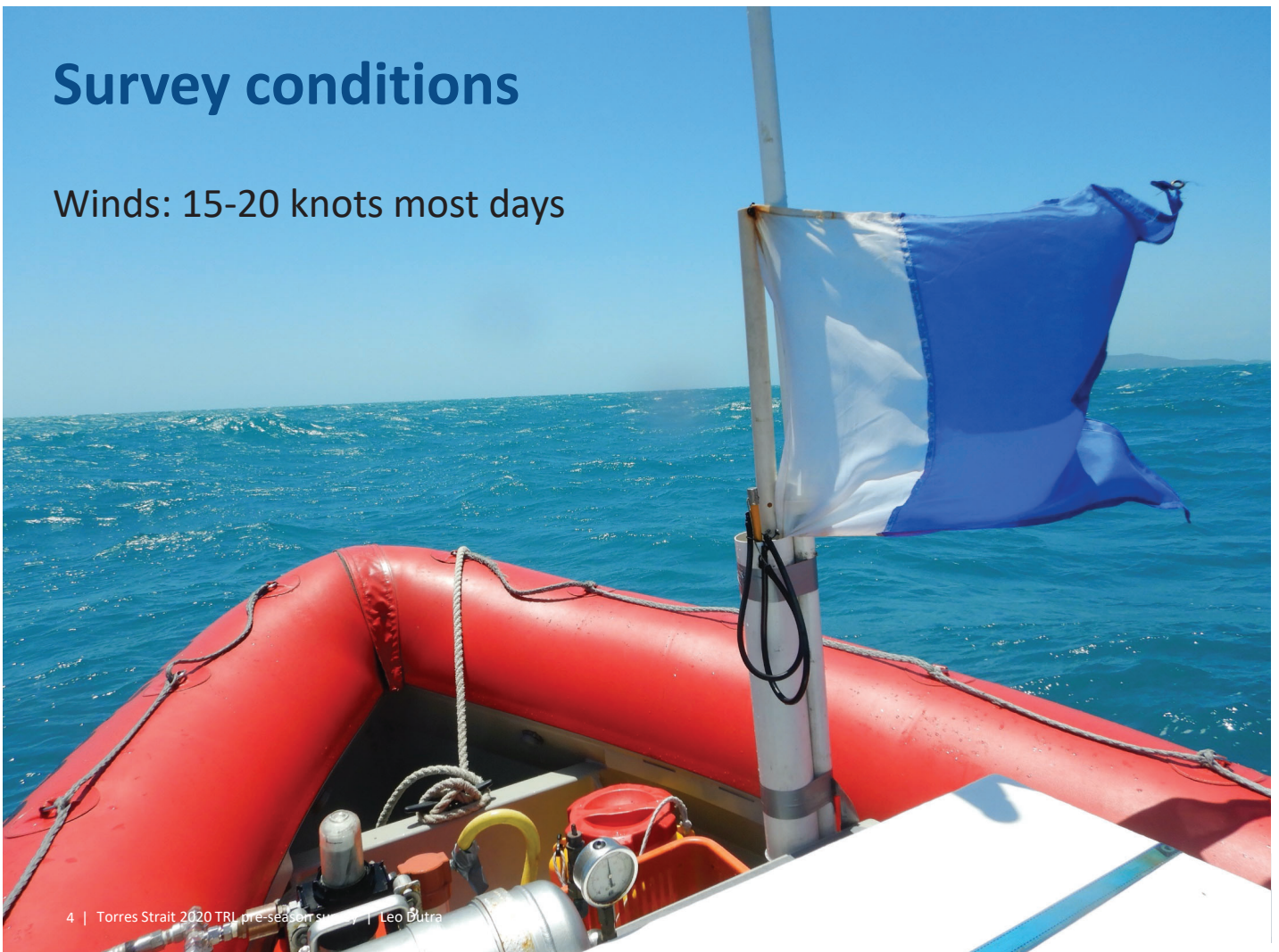


A map of Indonesia showing 25 bird sighting locations marked with yellow dots. The locations are labeled with codes and island names:

- N291 (Dauan (Mt Cornwallis Is.))
- N284 (Gebar (Two Brothers Is.))
- N995 (Zagai (Dungeness Is.))
- E2 (Zagai (Dungeness Is.))
- 9991 (Zagai (Dungeness Is.))
- N1020 (Jama (Yam Is.))
- 1831 (Sasi (Long Is.))
- 1911 (Sasi (Long Is.))
- N990 (Bubui (Lowry Islet))
- N963 (Bara (Bet Islet))
- N961 (Warraber (Sue Is.))
- N987 (Warraber (Sue Is.))
- N912 (Naghir (Mt Ernest Is.))
- 781 (Naghir (Mt Ernest Is.))
- N960 (Naghir (Mt Ernest Is.))
- N934 (Naghir (Mt Ernest Is.))
- 1112 (Naghir (Mt Ernest Is.))
- N909 (Naghir (Mt Ernest Is.))
- N908 (Naghir (Mt Ernest Is.))
- N393 (Naghir (Mt Ernest Is.))
- 1121 (Naghir (Mt Ernest Is.))
- 1081 (Naghir (Mt Ernest Is.))
- 1151 (Naghir (Mt Ernest Is.))
- 901 (Naghir (Mt Ernest Is.))
- 751 (Naghir (Mt Ernest Is.))
- 541 (Naghir (Mt Ernest Is.))
- 551 (Naghir (Mt Ernest Is.))
- 57801 (Naghir (Mt Ernest Is.))
- 471 (Naghir (Mt Ernest Is.))
- E19 (Naghir (Mt Ernest Is.))
- 461 (Muri (Mt Adolphus Is.))
- N363 (Muri (Mt Adolphus Is.))
- 421 (Muri (Mt Adolphus Is.))
- 591 (Muri (Mt Adolphus Is.))

A scale bar indicates 50 km. A logo for "CIB" is visible in the bottom right corner.

Winds: 15-20 knots most days



Survey conditions

Diving on neap tides, therefore reduced current for many dives

Good visibility ranging from 1-8m
Most dives around 2m

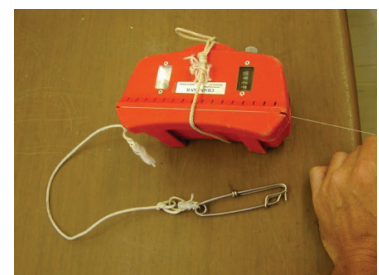
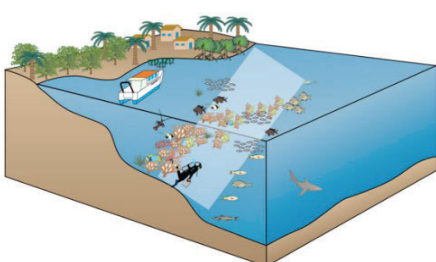
Lowest visibility recorded 1m (2 dives)



Diving survey method

At each survey site:

- 2 divers scanning standard transect using Chainman® device
 - Direction and distance swum is recorded, as well as:
 - Lobsters counted for each age-class and collected where possible
 - Depth, visibility, current strength
 - Habitat characterisation: substrate type and biota
 - Temperature and depth profiles
- On the surface: lobsters are measured (TW), sex determined and datasheets completed



Pre-season age classes

Pre-season TRL surveys provide abundance indices for:

- Recruiting (Age 1+)
- Recently-settled (Age 0+)

Note: Most (Age 2+) have migrated



2+



1+



0+

What information does survey give us?

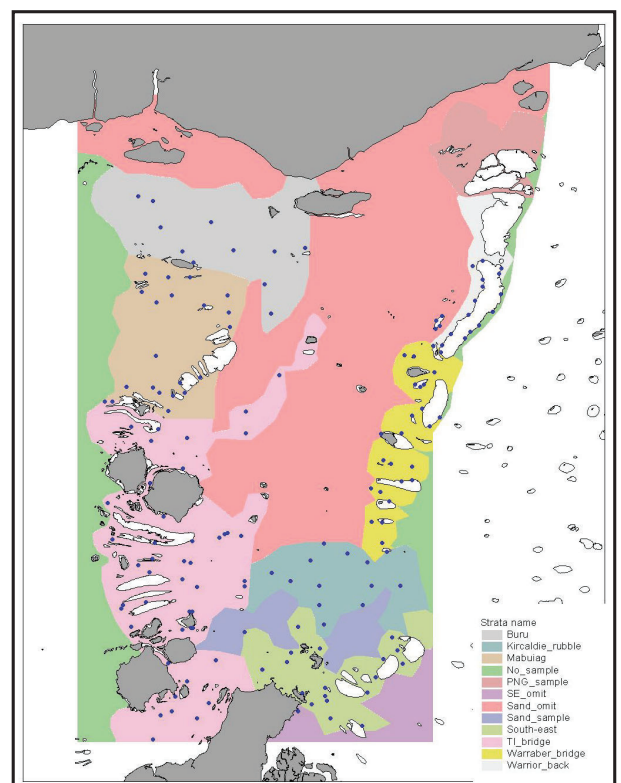
Survey data are used to produce:

- Overall abundance index (Age 1+ and 0+)
- Abundance indices by Stratum (region)
- Length-frequency and sex ratio

Stratum

- Torres Strait divided into strata
- 7 key strata used in analyses:
 - Buru
 - Mabuiag
 - Kircaldie
 - TI Bridge
 - Warraber Bridge
 - Reef Edge
 - South-East

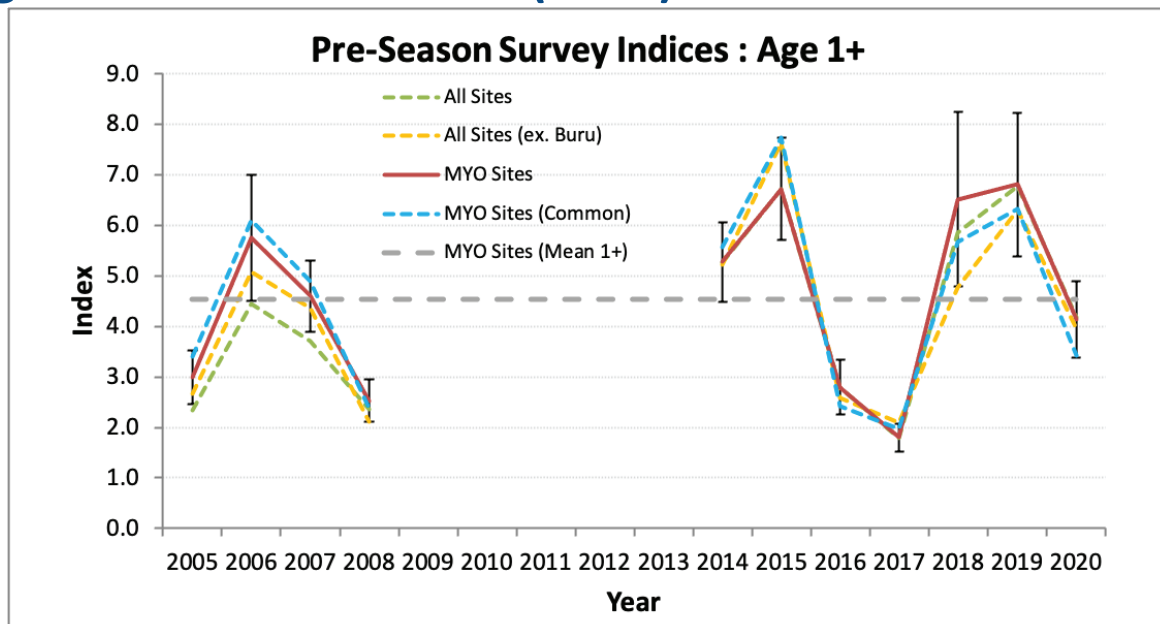
Note: Survey sites were originally randomly selected within each stratum



Age 1+ TRL Results

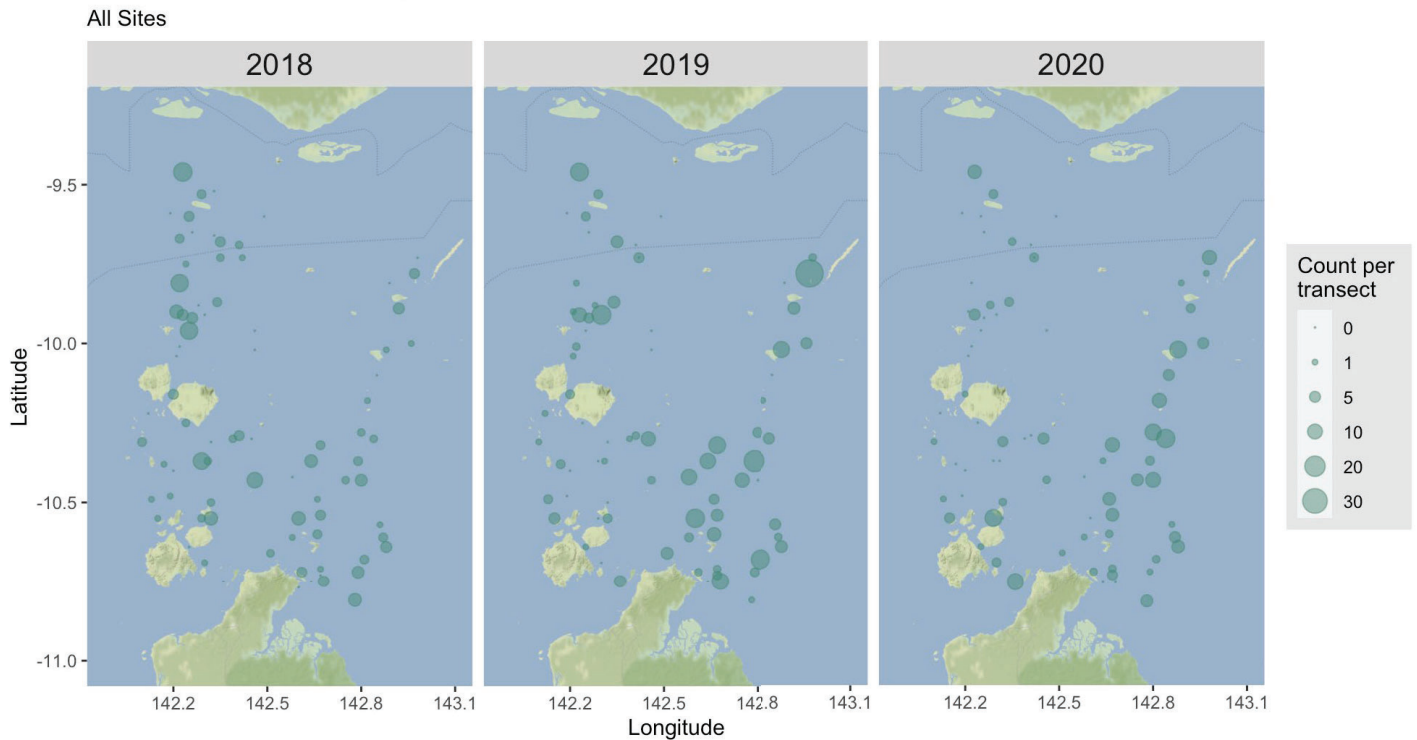


Age 1+ abundance index (2020)



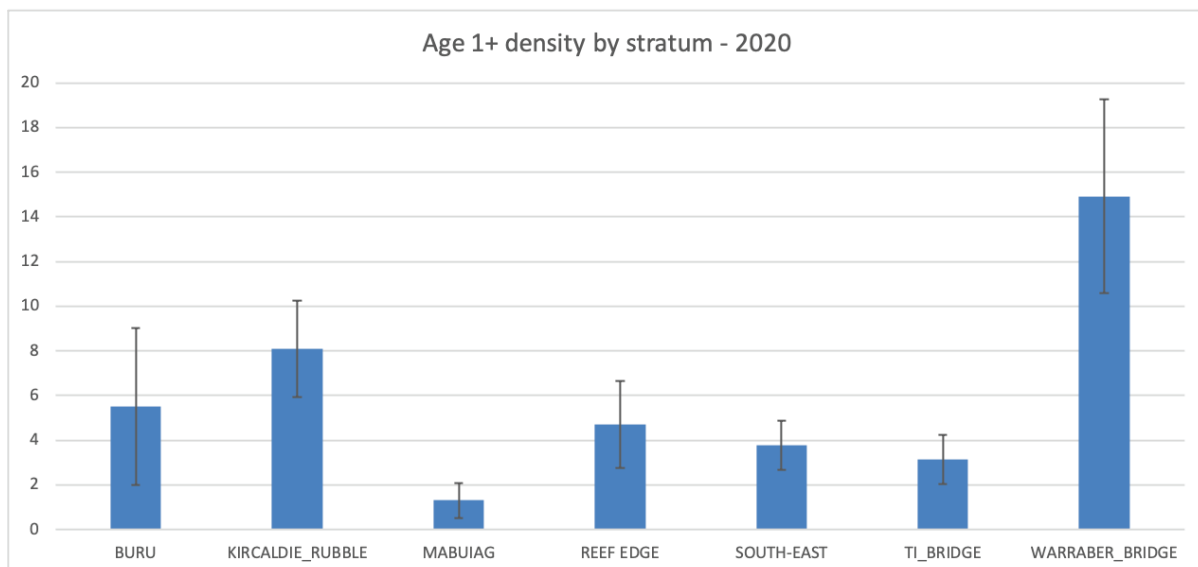
- 2020 index is similar to long-term average (grey line)
- Survey variance was roughly average (note high variances 2018-19)

Age 1+ Counts per transect

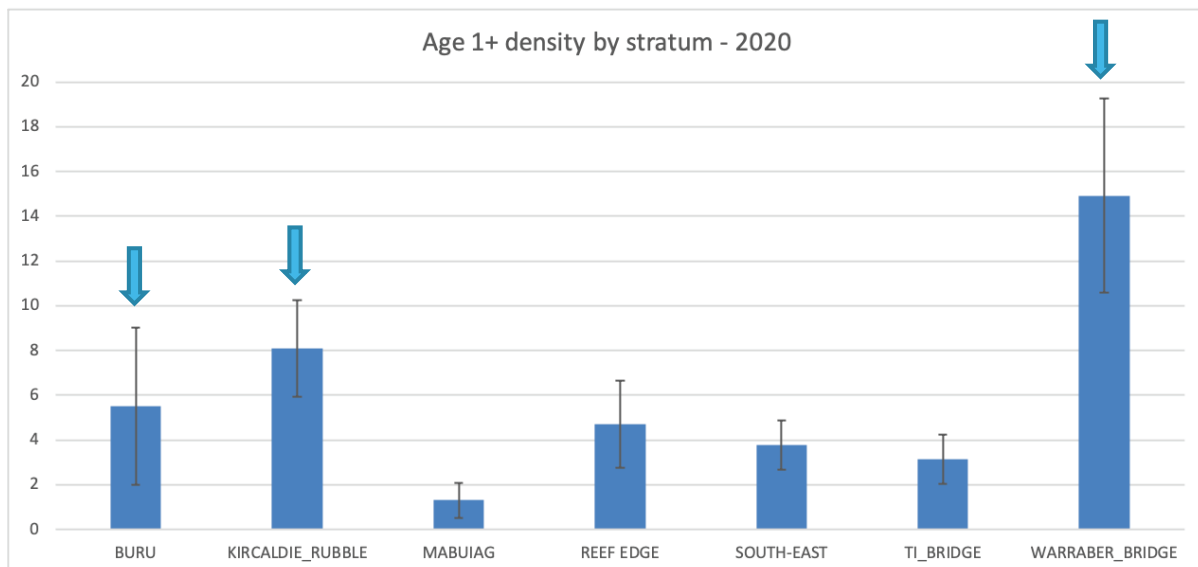


- 2018 - Higher counts along western side
- 2019 and 2020 - Higher counts on the eastern side

Age 1+ index by stratum (2020)



Age 1+ index by stratum (2020)

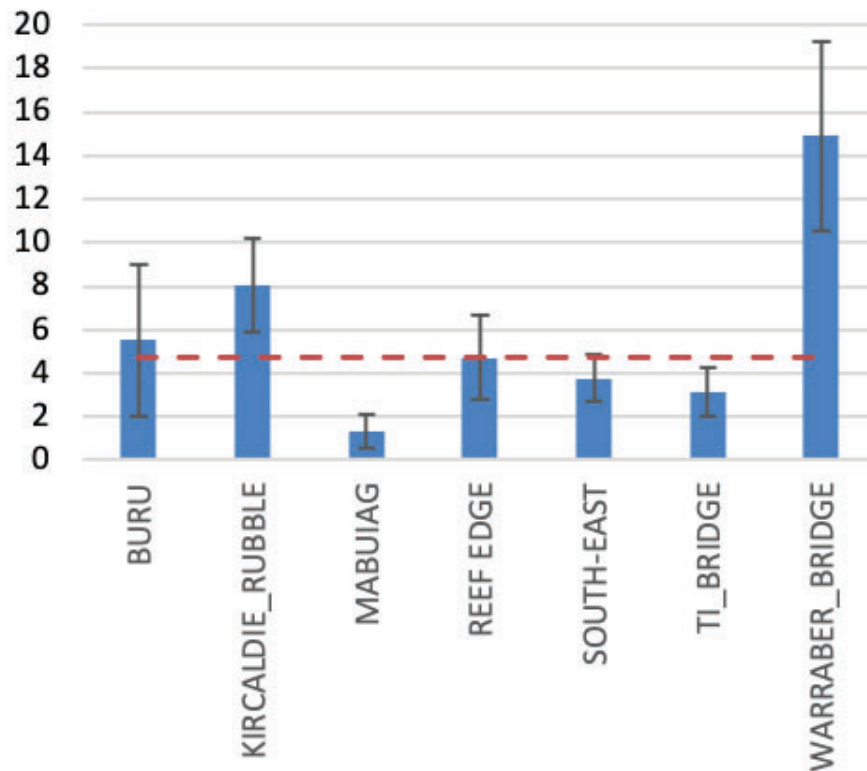


- Warraber Bridge, Kircaldie, and Buru strata with highest indices
- High standard error for Buru and Warraber Bridge because of high count variability between sites

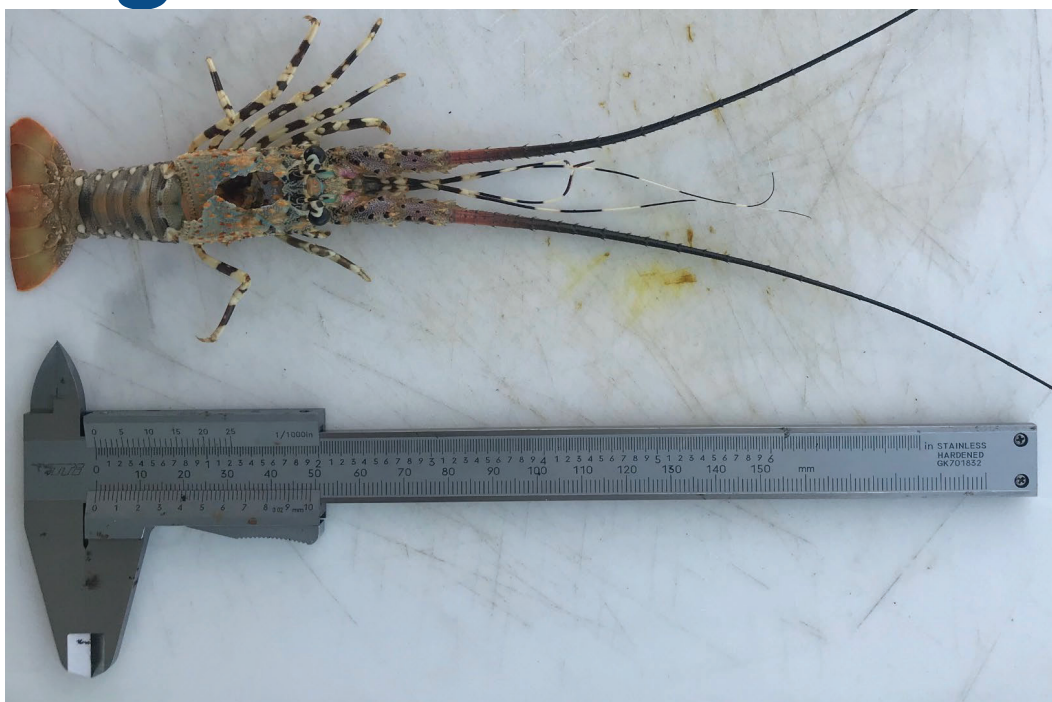
Abundance Index for (Age 1+)



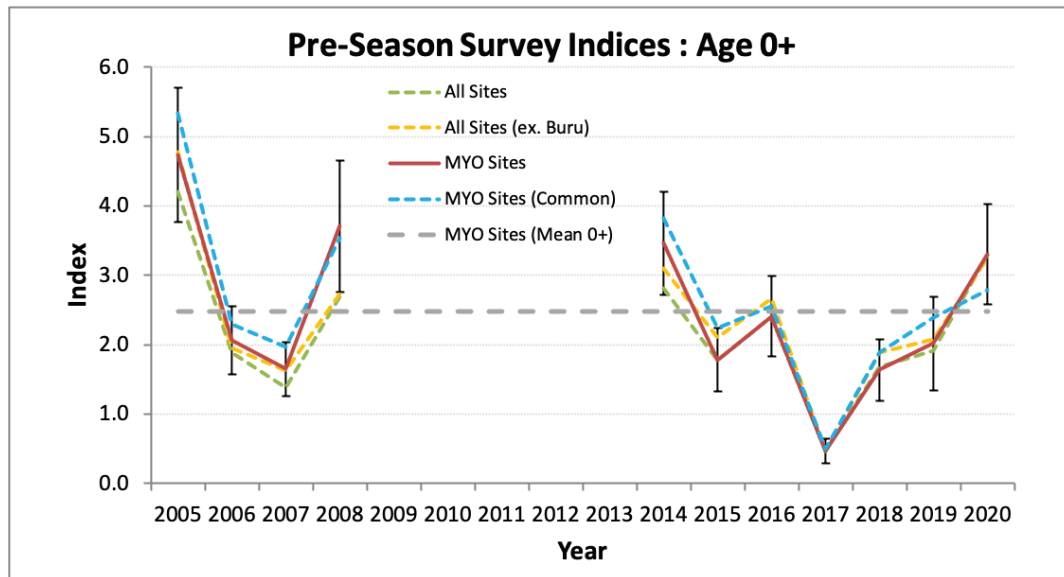
Age 1+ index in 2020



Age 0+ TRL Results

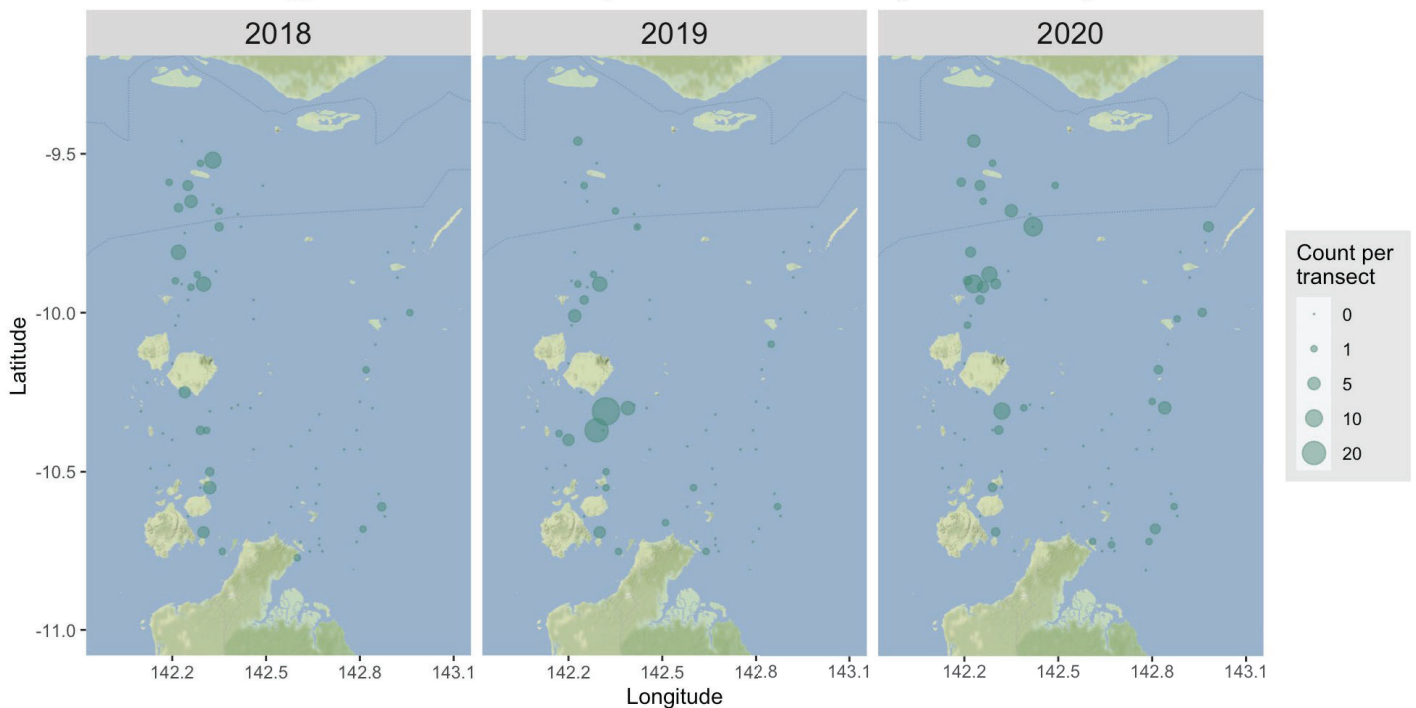


Age 0+ abundance index (2020)

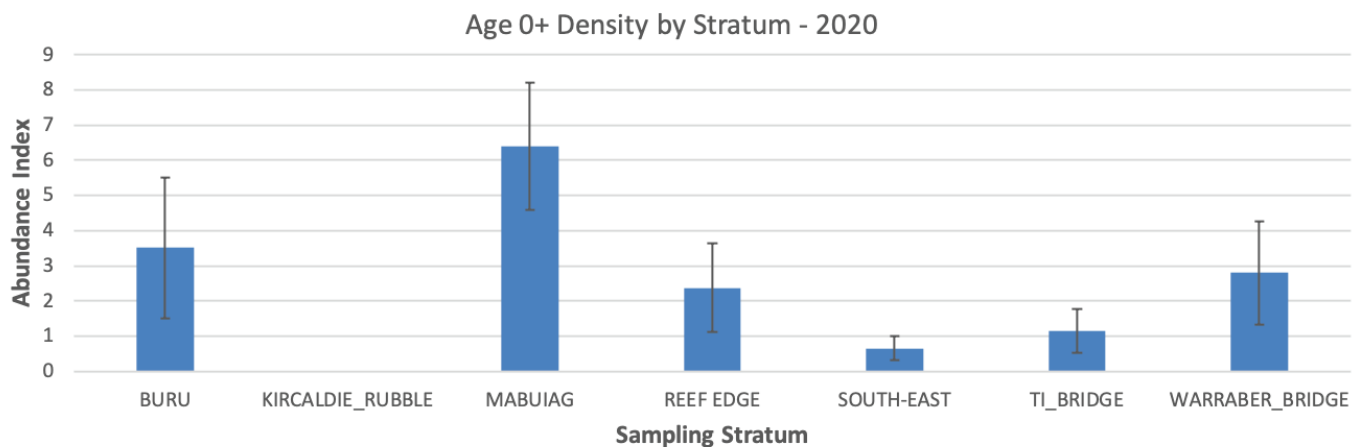


- Steady increase from its lowest in 2017
- Above the long-term pre-season survey average index (2005-2020)

Age 0+ Counts per transect (all sites)

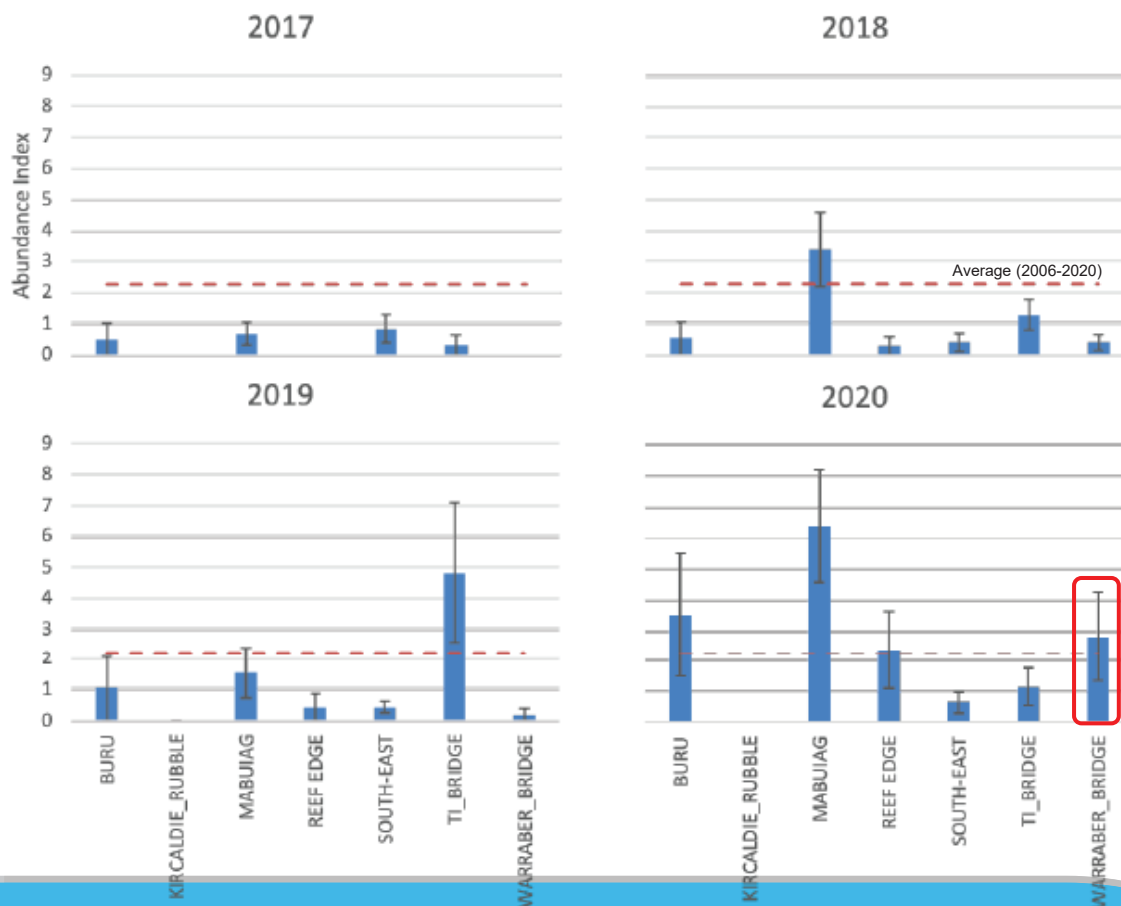


- 0+ settle typically on western side of survey area



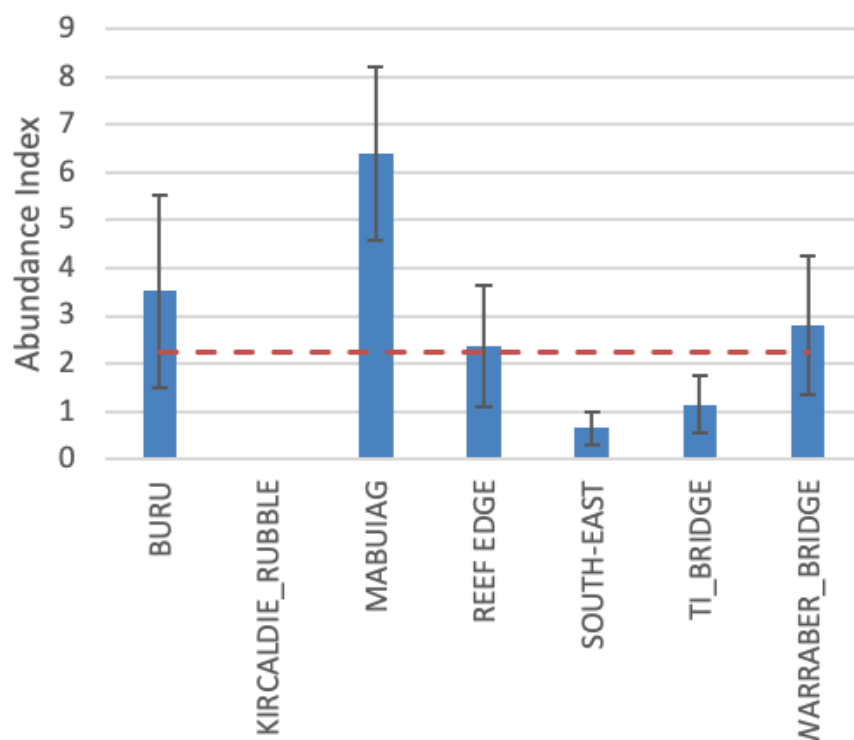
- Highest abundance indices recorded for Mabuiag and Buru

Abundance Index for (Age 0+)



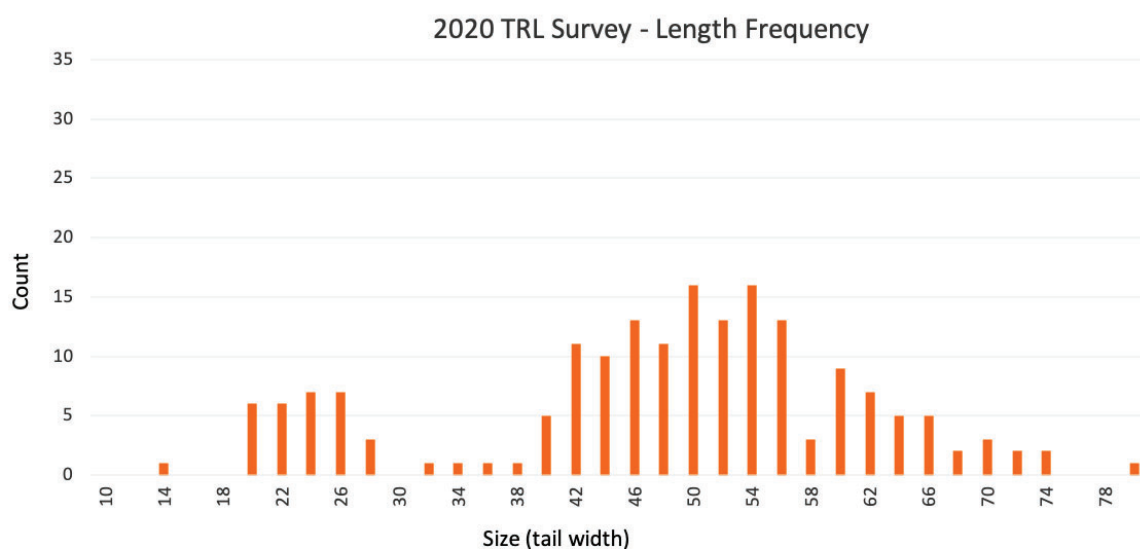
Age 0+ index in 2020

2020

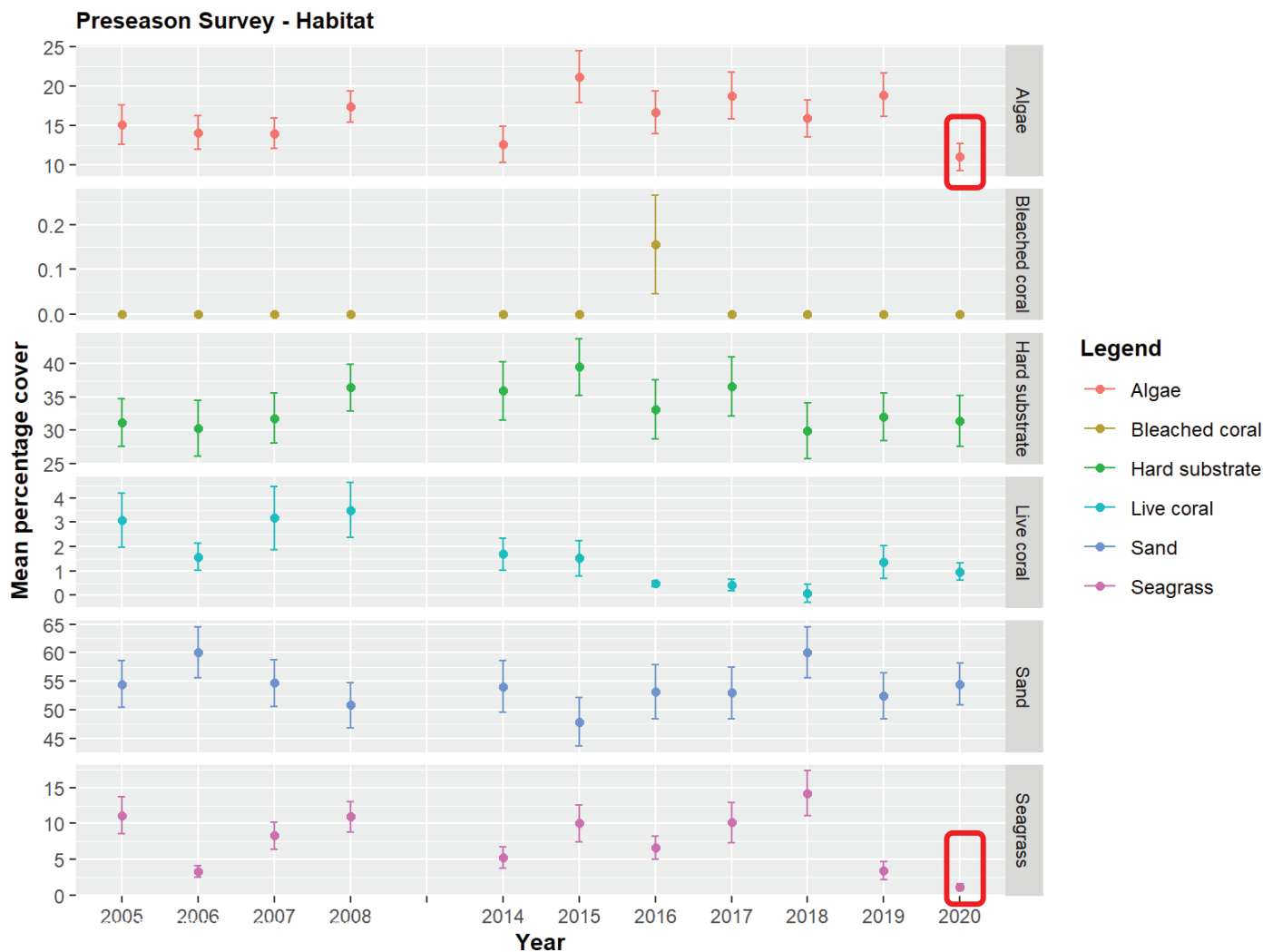
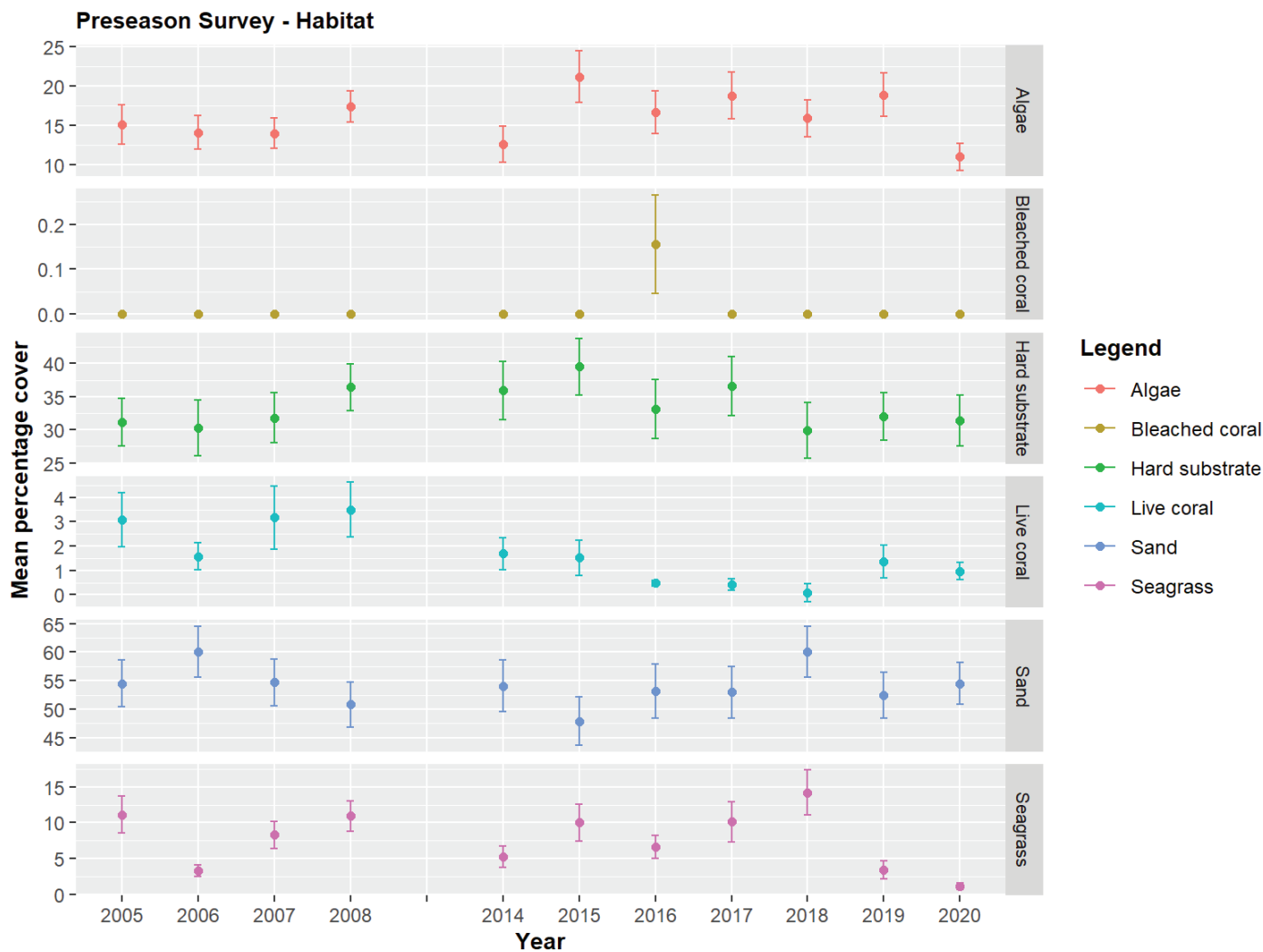


Length frequency and sex ratio (2020)

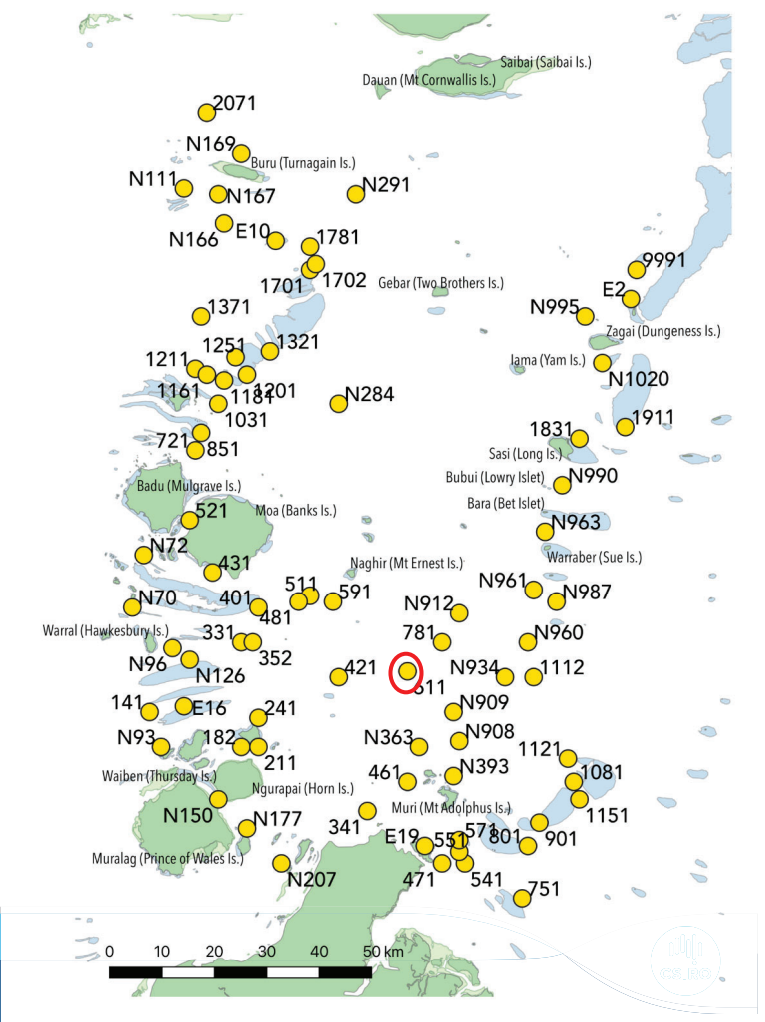
2020 length frequency similar to most surveys



Sex ratio typically around 1:1



- Minor sand incursions



Thank you

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Torres Strait tropical rock lobster (TRL) *Panulirus ornatus* empirical Harvest Control Rule (eHCR) Recommended Biological Catch (RBC) for 2020/21

Éva Plagányi, Roy Deng, Steven Edgar, Judy Upston, Leo Dutra, Nicole Murphy
Mark Tonks, Kinam Salee

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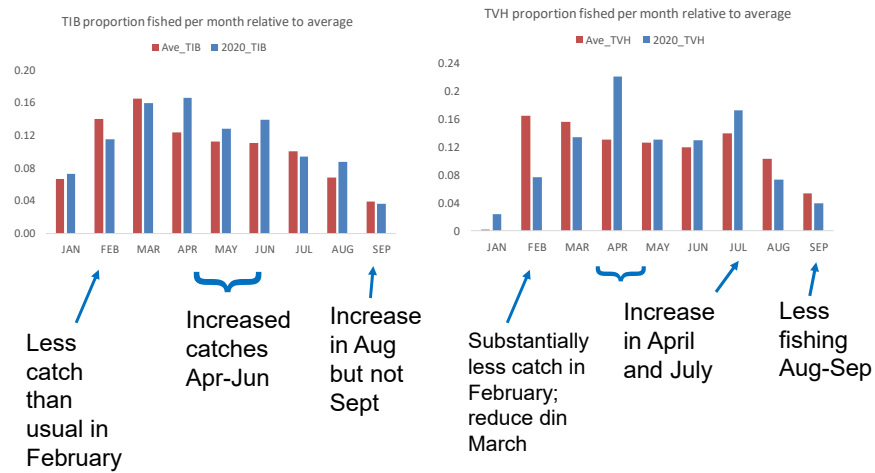
TRLRAG30 Dec 2020



TRL Catches per sector

SEASON	TIB	TVH	AUS-TOTAL	PNG-TOTAL	TS_TOTAL	TAC	Catch/ TAC
2013	142.5	361.7	504.2	108.3	612.5	871	70.3%
2014	198.8	273.2	472.0	261.2	733.2	616	119.0%
2015	202.6	152.7	355.3	235.7	591.0	769	76.9%
2016	267.1	243.0	510.1	248.0	758.2	796	95.2%
2017	111.5	166.3	277.8	113.0	390.8	495	79.0%
2018	127.4	128.3	255.7	156.4	412.1	320	128.8%
2019	260.6	155.9	416.5	167.0	583.5	641	95.1%
2020	216.2	145.1	361.3	90.4	451.7	582	73.2%

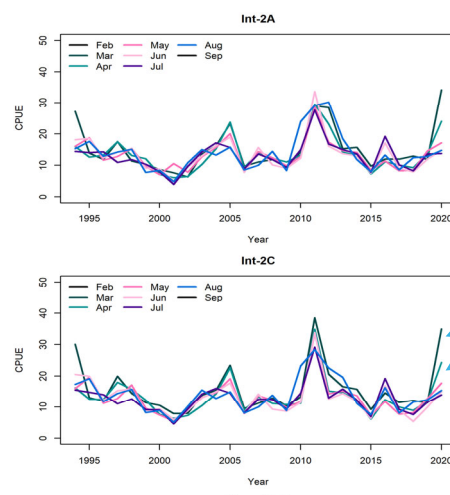
2020 Monthly Fishing Pattern compared with Average



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2020 deviations in monthly fishing pattern



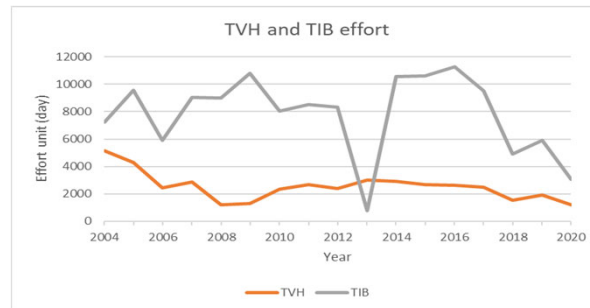
Example TVH models including combinations of year/month and area interactions

As expected some large differences in 2020 for March, April, May (high values)

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Lower than expected effort in 2020



5 | Torres Strait eHCR | Éva Plagányi



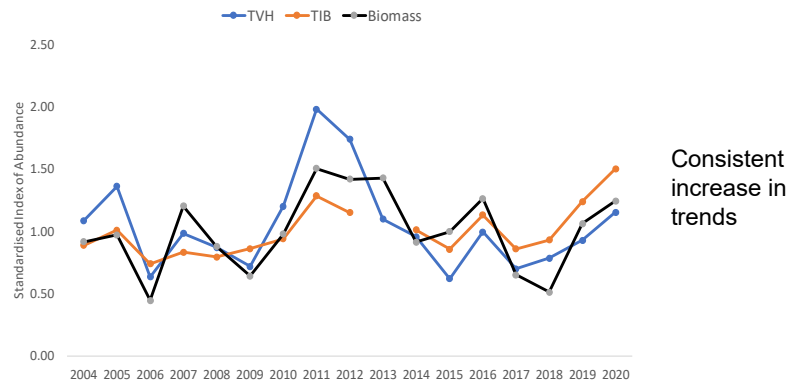
Average Catch : Alternative Scenarios

SEASON	Total Catch_actual (t)	Substituting TAC for 2020 catch	Substituting increased catch for PNG	Assuming in 2020 would have caught same percentage (95%) of TAC as in 2019
2016	758.2	758.2	758.2	758.2
2017	390.8	390.8	390.8	390.8
2018	412.2	412.2	412.2	412.2
2019	583.6	583.6	583.6	583.6
2020	451.7	582.0	553.4	553.5
AVERAGE	519.3	545.4	539.6	539.7

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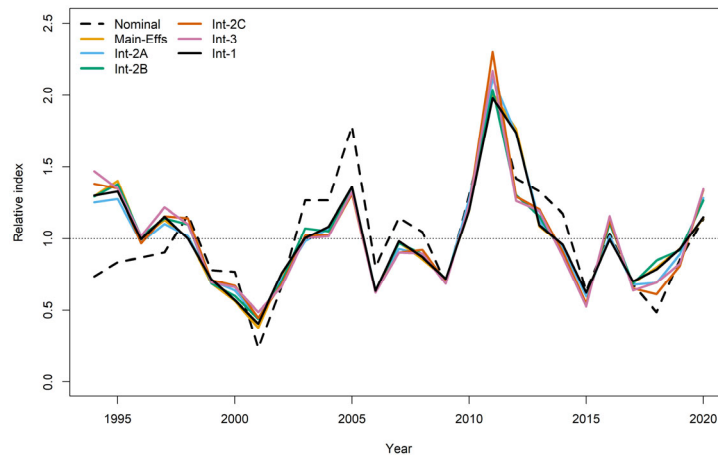
Comparison of CPUE indices and 2019 stock assessment spawning biomass estimate



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TVH CPUE standardisation



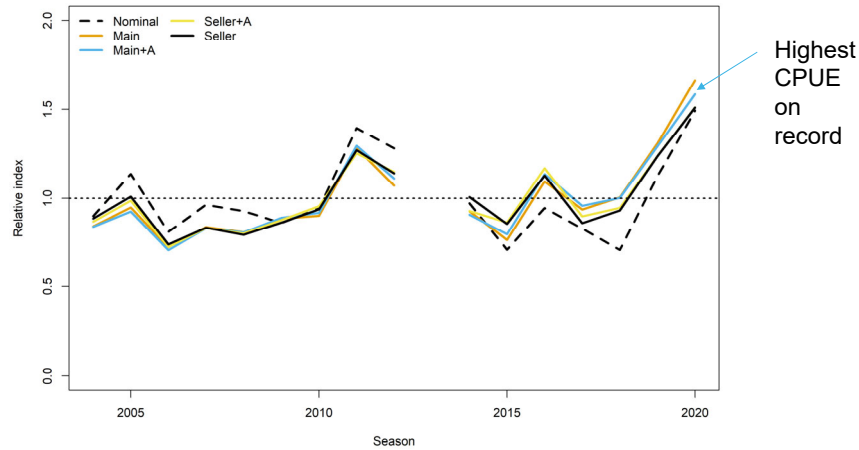
Int-1 is default used in eHCR:

$CPUE = \text{Intercept} + \text{Year} + \text{Month} + \text{Month} * \text{Area} + \text{Vessel} + \text{Fishing-Method} + \text{Proportion-Tails} + \text{SOI} + \text{Moon}$
/ distribution = gamma, link = log

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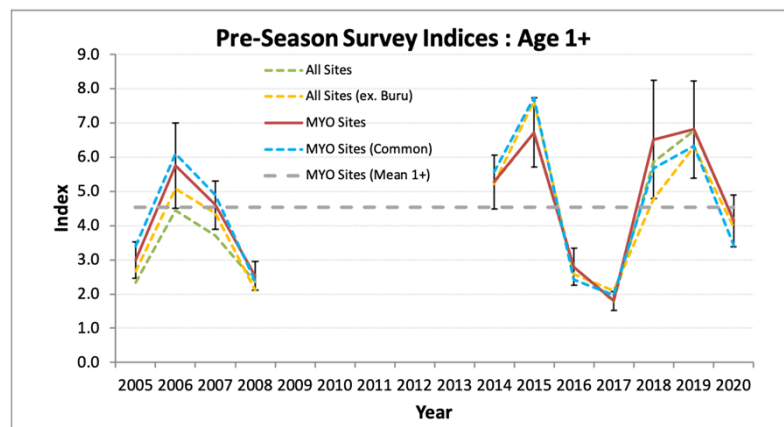


TIB CPUE standardisation

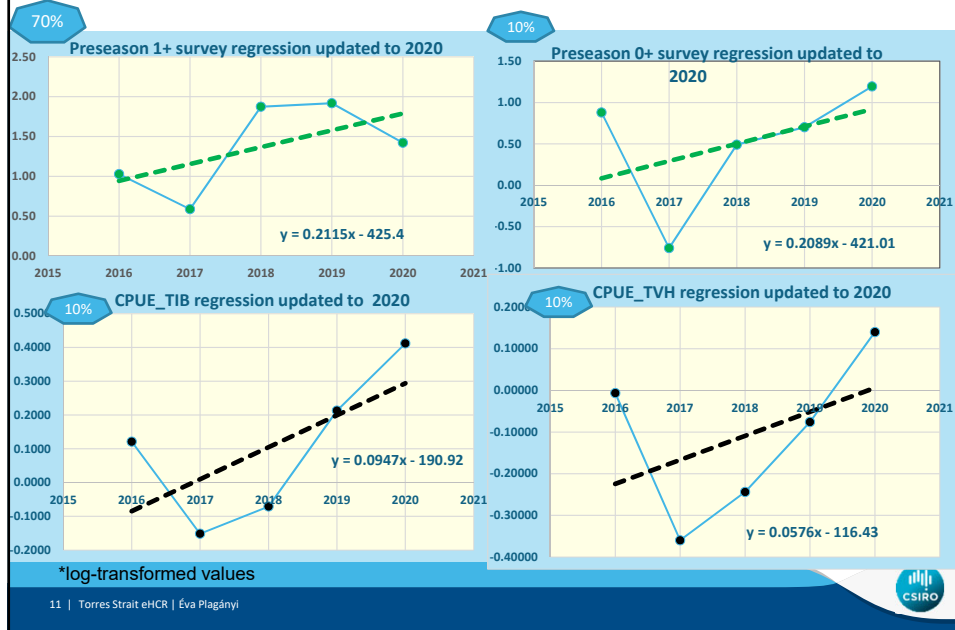


'Seller' is default used in eHCR: accounts for increase in the relative fishing efficiency of *Sellers* in recent seasons

Age 1+ abundance index (2020)



Slopes of recent data* to inform eHCR



eHCR Recommended Biological Catch (RBC)

Key sensitivities	Average Catch input	TVH model	TIB model	TIB CPUE	TVH CPUE	Ps 0+	Ps 1+	RBC (t)	Diff to SCENARIO 1
Scenario 1 (using actual catch)	519.3	Int-1	Seller	1.51	1.15	3.301	4.143	614.9	
Substitute TAC for 2020 catch	545.4	Int-1	Seller	1.51	1.15	3.301	4.143	645.8	30.9
Substitute increased catch for PNG	539.6	Int-1	Seller	1.51	1.15	3.301	4.143	639.0	24
Assume 2020 has same proportion of TAC caught as in 2019	539.7	Int-1	Seller	1.51	1.15	3.301	4.143	639.1	24.2
Alternative CPUE standardisation	519.3	Int-2C	Nominal	1.47	1.34	3.301	4.143	616.3	1.3
Alternative CPUE standardisation & Average Catch	545.4	Int-2C	Nominal	1.47	1.34	3.301	4.143	647.5	32.2



Thank you

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