Australian Government

Australian Fisheries Management Authority

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP 38

TRLRAG 38

Tuesday 10 December 2024
830am – 5pm
Wednesday 11 December 2024
830am – 5pm

TSRA Boardroom, Thursday Island

Meeting Papers

38th MEETING OF THE TROPCIAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP
TRLRAG 38 – THURSDAY ISLAND – 10-11 DECEMBER 2024

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TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP 38

(TRLRAG 38)

Tuesday 10 December 2024 | 830am – 5pm

Wednesday 11 December 2024 | 830am – 5pm

TSRA Board Room | Thursday Island

DRAFT AGENDA (v2)

1 PRELIMINARIES

Welcome and apologies

The Chair will welcome members and observers to the 38th meeting of the TRL RAG.

Adoption of agenda

The RAG will be invited to adopt the draft agenda.

Action items from previous meetings

The RAG will be invited to note the status of action items arising from previous meetings.

Out of session correspondence

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

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.

2 UPDATES FROM MEMBERS

Industry and Scientific members

Industry, scientific and government agency members and observers will be invited to provide verbal updates on matters concerning the Torres Strait TRL Fishery including updates on fishing patterns, behaviours, prices, and market trends for the 2023-24 season and the start of the 2024-25 season.

Government agencies

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

Papua New Guinea National Fisheries Authority

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

Native Title

The RAG will be invited to note a verbal update from Malu Lamar (Torres Strait Islander) Corporation RNTBC and other RAG members on native title matters relevant to the TRL Fishery.

3 REVISING THE HARVEST CONTROL RULE

Noting that consensus was not reached at TRLRAG 37 (9 October 2024) on revising the empirical Harvest Control Rule (eHCR), the RAG is invited to provide advice an appropriate application of a eHCR for the 2024-25 fishing season and beyond. Advice is sought in advance of consideration of any data inputs to the HCR.

4 CLIMATE ADAPTATION

4.1 AFMA Climate Risk Framework

The RAG is invited to provide advice on the application of AFMA's Climate Risk Framework (CRF) to Tropical Rock Lobster in the Torres Strait. The draft assessment is based on initial input at a CRF Working Group meeting held on 1 November, 2024.

4.2 Other Climate Updates

The RAG is invited to note:

- the Climate and Ecosystem Status report for the TRL Fishery; and
- an update on the project "Modelling climate change impacts on key fisheries in the Torres Strait to co-develop adaptation and mitigation strategies" by the CSIRO.

5 CATCH AND EFFORT ANALYSES FOR THE 2023-24 FISHING SEASON

The RAG will be invited to discuss TRL fishery catch and effort data for the 2023-24 fishing season, including catch-per-unit-effort (CPUE) analyses to be presented by the CSIRO.

6 RESULTS OF THE NOVEMBER 2024 PRE-SEASON SURVEY

The RAG is invited to discuss the results of the November 2024 pre-season survey to be presented by the CSIRO.

7 RECOMMENDED BIOLOGICAL CATCH 2024-25

Having regard to the discussions from TRLRAG 37 and Agenda Item 3, including the analyses and results from agenda items 4, 5, and 6, the RAG will be invited to consider the outputs of the agreed eHCR and provide advice on a recommended biological catch (RBC) for the TRL Fishery for the 2024-25 fishing season.

8 REVIEWING THE TRL HARVEST STRATEGY

The RAG is invited to consider any other broader changes required to the TRL Harvest Strategy.

9 OTHER BUSINESS

The RAG will be invited to raise any other matters for consideration. There is no agenda paper for this item.

10 DATE AND VENUE FOR NEXT MEETING

The RAG will be invited to consider the RAGs workplan and discuss a suitable date for the next RAG meetings.

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 (fisheriesti@afma.gov.au)

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
PRELIMINARIES	Agenda Item 1 For NOTING and DECISION

RECOMMENDATIONS

1. That the RAG **NOTE** an acknowledgement of Traditional Owners, the Chair's welcome address, and any apologies received from members unable to attend.
2. That RAG members and observers:
    a. **DECLARE** all real or potential conflicts of interest in the Torres Strait Rock Lobster Fishery at the commencement of the meeting (**Attachments 1a** and **1b**);
    b. **DETERMINE** whether the member may or may not be present during discussion of or recommendations made on the matter which is the subject of the conflict;
    c. **ABIDE** by decisions of the RAG regarding the management of conflicts of interest; and
    d. **NOTE** that the record of the meeting must record the fact of any disclosure, and the determination of the RAG as to whether the member may or may not be present during discussion of, or recommendations made, on the matter which is the subject of the conflict.
3. That the RAG consider and **ADOPT** the draft agenda, which was circulated to members on 29 October 2024.
4. That the RAG **NOTE** the status of actions arising since TRL RAG 37 (**Attachment 1c**).
5. That the RAG **NOTE** the draft meeting record for TRLRAG 37 will be out for member comment shortly.
6. **PROVIDE ADVICE** on any new key events to be added to the TRL Management History timeline (**Attachment 1d).**
7. That RAG members **NOTE** the out of session correspondence since TRL RAG 37 (held on 9 October 2024 (**Attachment 1e**).

BACKGROUND

8. As at 12 November 2024, no apologies had been received.

Declarations of interest

9. 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.
10. RAG members are asked to confirm the standing list of declared interests (**Attachments 1a** and **1b**) is accurate and provide an update to be tabled if it is not.
11. FMP1 recognises that members are appointed to provide input based on their knowledge and expertise and therefore, 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.

12. 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.
13. 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 recommendation 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 recommendations by the forum, must be recorded accurately in the meeting minutes.

Adoption of agenda

14. This meeting was noted by members at TRL RAG 35 (held on 12-13 December 2023) and TRLRAG 37 (9 October 2024) with draft agenda was circulated to members on 29 October 2024.

Actions arising

15. Updates are provided on the status of actions arising from previous TRLRAG meetings at **Attachment 1c**.

Meeting record

16. The draft meeting record for TRLRAG 37 held on 9 October 2024 will be circulated for comment shortly.

TRL Management History Timeline

17. As an action arising from TRLRAG 14 (25-26 August 2015), AFMA and CSIRO were tasked with preparing a timeline of key events that have occurred in the Torres Strait Tropical Rock Lobster Fishery.
18. The timeline is intended to be a living document, to be updated as relevant management events in the fishery occur. AFMA proposed at TRLRAG 32 that this document be a standing agenda item under Preliminaries to be updated as required.
19. The RAG is asked to provide advice on any new key events to be added to the Management History timeline since the last RAG meeting (provided at **Attachment 1d**)

Out of session correspondence

20. Correspondence between AFMA and the RAG was circulated out-of-session since the TRLRAG 37 on 9 October 2024 is provided in **Attachment 1e**.

Attachment 1a

TRLRAG Declarations of interests from most recent meetings

Name	Position	Declaration of interest
Members		
Ian Knuckey	Chair	Full declaration of interests provided at **Attachment 1b.**
Eva Plaganyi	Scientific Member	Lead scientist for PZJA funded TRL research projects conducted by CSIRO. Contribute to other Torres Strait research projects that receive research funding, including currently Torres Strait climate change project and shared science and Indigenous knowledge to support fisheries capacity building in Torres Strait. No other interests in the fishery. Independent scientific member of HCRAG and NPFRAG.
Andrew Penney	Scientific Member	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. 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. 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. No shareholding and hold no positions relating to any other companies, including any fishing companies or industry associations.
Les Pitt	Traditional Inhabitant Member – Kemer Kemer Meriam	Traditional Inhabitant Member Kemer Kemer Meriam, TIB licence holder and runs an independent freezer facility on Erub Island. Board member of Zenadth Kes Fisheries.
Charles David	Traditional Inhabitant Member - Kulkalgal	Traditional Inhabitant Member Kulkalgal, TSRA Fisheries Advisory Committee and Zenadth Kes Fisheries member.
Patrick Mooka	Traditional Inhabitant Member – Guda maluylgal	Traditional Inhabitant Member, Guda maluylgal. Zenadth Kes Fisheries member.
Jermaine Reuben	Traditional Inhabitant Member - Maluyilgal	Traditional Inhabitant Member Maluyilgal, TIB licence holder. Zenadth Kes Fisheries member.

Thomas Fujii	Traditional Inhabitant Member - Kaiwalalgal	Traditional Inhabitant Member Kaiwalalgal. Queensland East Coast TRL and TIB licence holder. Zenadth Kes Fisheries member.
Brett Arlidge	Industry Member	Director of MG Kailis Pty Ltd. MG Kailis Pty Ltd is a holder of 5 TVH licences. Seafood buyer from Torres Strait, QLD and PNG TRL fisheries.
Ken McKenzie	Industry Member	TVH licence and quota holder. Queensland East Coast TRL licence and quota holder.
Damian Miley	TSRA Member	TSRA Fisheries Project Manager, TSRA holds multiple TVH TRL fishing license on behalf of Torres Strait Communities but dos not benefit from them. No personal pecuniary interest.
Jenny Keys (online)	QDAF Member	Queensland Fishery manager of tropical rock lobster fishery, aquarium and coral fisheries. Nil interests.
Steven Harris	AFMA Member	Nil interests.
Georgia Langdon	Executive Officer	Senior Management Officer for Tropical Rock Lobster Fishery. Nil interests.
Observers		
Joseph Posu	PNG National Fisheries Authority	Nil interests.
Yen Loban	TSRA Fisheries Portfolio member	Traditional Owner. TSRA Board member and TSRA Fisheries Portfolio member. Chair of Zenadth Kes Fisheries
Quinten Hirakawa	TSRA	TSRA employee, TIB license holder with a TRL endorsement.
Brooke D'Alberto	Australian Bureau of Agricultural Resource Economics and Sciences	Nil interests.
Laura Blamey	CSIRO and TRL Working Group scientific member	Contributes to Torres Strait research projects that receive research funding, including leading the Torres Strait climate change project. No other interests in the fishery..
Leo Dutra	CSIRO	Contributes to Torres Strait research projects that receive research funding, including currently Shared science and Indigenous knowledge to support fisheries capacity building in Torres Strait, viability of sea cucumber aquaculture, and tropical rock lobster survey. No other interests in the fishery.
Steph Brodie (online)	CSIRO	Scientist for PZJA funded TRL research projects conducted by CSIRO.

Denham Parker (online)	CSIRO	To be declared.
Richard Takai	TIB fisher	To be declared.
Kevin Sabatino Snr	TIB fisher	To be declared.
James Ahmat	Former TIB fisher	To be declared.
Paul Drummond	Traditional fisher	To be declared.

Declaration of interests
Dr Ian Knuckey – August 2024

Ian Knuckey positions:

Director –	Fishwell Consulting Pty Ltd
Director –	Olrac Australia (Electronic logbooks)
Chair –	Northern Prawn Fishery Resource Assessment Group
Chair –	Tropical Rock Lobster Resource Assessment Group
Chair –	Victorian Rock Lobster and Giant Crab Assessment Group
Chair – Group	Victorian Central Zone Abalone Fisheries Resource Advisory
Chair – Committee	Gulf of St Vincent's Prawn Fishery MAC Research Scientific
Scientific Member –	Northern Prawn Management Advisory Committee
Scientific Member – Committee	Gulf of St Vincent's Prawn Fishery Management Advisory
Scientific Member –	Tropical Tuna Resource Assessment Group
Scientific Member –	SESSF Resource Assessment Group
Member –	The Geelong Agri Collective

Fishwell current projects:

AFMA 2022-mammal interactions,	Annual monitoring, reporting and assessment of SPF marine including effectiveness of mitigation measures
AFMA 2020-0807	Bass Strait Scallop Fishery Survey – 2024/ 25
FRDC 2019-027 GABTS	Improving and promoting fish-trawl selectivity in the SESSF and
FRDC 2018-021 strategies	Development and evaluation of SESSF multi-species harvest
Traffic Project	Shark Product Traceability
Sea Cucumber Ass. surveys.	Design and implementation of various sea cucumber dive
Australia Bay	Queensland Gulf of Carpentaria Developmental Fin Fish Trawl Fishery

Actions arising from previous TRL RAG meetings

#	Action Item	Meeting	Responsible Agency/ies	Due Date	Status
1.	CSIRO to discuss potential survey with NFA	TRLRAG 33 (13-14 Dec 2022)	CSIRO/NFA	Ongoing	**Ongoing.** Update to be provided at the meeting.
2.	Ben Liddell (AFMA Observer) to provide further information to CSIRO on two migrations of TRL in the year.	TRLRAG 33 (13-14 Dec 2022)	AFMA		**Ongoing.** Update to be provided at the meeting.
3.	Members to provide their input to CSIRO's revision of the eHCR on issues they may want reflected in the operating model options and implementation errors.	TRLRAG 35 (12-13 Dec 2023)	TRL RAG members	By TRLRAG 37 (9 October 2024)	**Complete.** Feedback received by members was incorporated into the MSE testing that was presented to TRLRAG 37 on 9 October 2024.
4.	The AFMA to discuss further with TSRA on how AFMA raises and addresses compliance issues and how this may be improved, Including the possibility of employing Torres Strait Islanders in compliance roles.	TRLRAG 35 (12-13 Dec 2023)	AFMA/TSRA		**Ongoing.**
5.	CSIRO member to circulate connectivity studies from Indonesia	TRLRAG 35 (12-13 Dec 2023)	CSIRO		**Complete.** Dr Eva Plaganyi circulated the paper via email to all TRLRAG members on 3 October 2024.

Attachment 1d

Timeline of key events in the Torres Strait Tropical Rock Lobster Fishery[1]
Last updated November 2024

Commonly used acronyms and terms:

- **FMN** means Torres Strait Fisheries Management Notice.
- **FMI** means Torres Strait Fisheries Management Instrument.
- **LN** means Logbook Notice
- **PZJA** means Protected Zone Joint Authority.
- **TRL** means Tropical Rock Lobster.
- **TRL Fishery** means the Torres Strait Tropical Rock Lobster Fishery.
- **Instrument** means the *Torres Strait Fisheries (Tropical Rock Lobster) Management Instrument 2018*
- **Management Plan** means the *Torres Strait Fisheries (Quotas for Tropical Rock Lobster (Kaiar)) Management Plan 2018*

Time period	Topic/Keywords	Description
Late 1960's	Fishery development	Commercial fishing for TRL by the non-Traditional Inhabitant sector began in the Torres Strait
1970s-1980s	Fishery development	Traditional Inhabitant fishers begin to enter the fishery.
Dec-1978	Treaty, PNG	Torres Strait Treaty signed
Feb-1985	Legislation, regulations, PZJA	Torres Strait Treaty entered into force, *Torres Strait Fisheries Act 1984* and *Torres Strait Fisheries Regulations 1985* commenced and the PZJA is established
Feb-1985	Regulations	Under FMN 1: • Method restrictions introduced - only diving, collection by hand and use of spear permitted
Feb-1985	PNG, catch sharing	Agreement between PNG and Australia for the joint management of the TRL fishery concluded.

[1] This is intended to be a living document and is to be updated as key events happen.

Time period	Topic/Keywords	Description
Jul-1985	Regulations	Under FMN 9 (replaced FMN 1): • Method restrictions amended to introduce a time period within which the method restrictions are in place – only diving, collection by hand and use of spear permitted between 15 Jul-31 Oct
Jan-1986	Management arrangements	Introduction of prohibition on prawn trawlers taking TRL during the annual migration period (1 Jul-31 Oct) in order to reduce fishing pressure on the lobster population - in place until 1987, when all prawn trawlers were prohibited from taking TRL
Jun-1986	Regulations	Under FMN 12 (replaced FMN 9): • Method restrictions amended to change the dates between which methods are restricted – only diving, collection by hand and use of spear permitted between 1 July - 31 October only
Mar-1988	Regulations	Under FMN 19: • Introduction of prohibition on the take, processing or carrying of TRL by boats with a prawn endorsement
Jun-1988	Regulations	Under FMN 22: • Minimum size limit introduced - 100 mm tail length
Oct-1988	Regulations	Under FMN 24 (replaced FMN 12): • Method restrictions amended - only diving, collection by hand and use of spear permitted, no underwater breathing apparatus except hookah, no underwater mechanical propulsion • Introduction of exemption which can be sought for some method restrictions, specifically the use of underwater breathing apparatus and underwater mechanical propulsion • Traditional fishing bag limits introduced - 3 per person up to 6 per boat
October 1988	Management objectives	PZJA agrees to six key management objectives for the fishery: - To conserve the stock of tropical rock lobster - To maximise the opportunities for traditional inhabitants of both countries to participate, including by managing the fishery for tropical rock lobster as a dive fishery - To promote the dive fisheries for tropical rock lobster in Torres Strait - Encouragement and facilitation of participation by Australian traditional inhabitants for whom future expansion of the fishery should be reserved - Containment of the capacity of the existing commercially licensed fleet and elimination of entrepreneurial speculation and subsequent upgrading/replacement of commercially licensed dinghies with large boats

Time period	Topic/Keywords	Description
		- To minimise impact of any new management measures on existing operators.
March 1989	Traditional Inhabitant access, identification, definition	Tropical Rock Lobster Working Party agrees to Island Coordinating Council suggestion that "amnesty" Papua New Guineans be considered Traditional Inhabitants for fisheries management purposes. Following this, PZJA agrees to "measures to be used for identifying those Papuans resident in Torres Strait who should be treated as Australian traditional inhabitants for all fisheries management and enforcement purposes, including community fishing rights" in the fishery.
Aug-1989	Regulations	Under FMN 31 (replaced FMN 24): • No substantive changes to FMN 24
November 1989	PNG, catch sharing, cross-endorsement	Catch-sharing arrangements for the fishery agreed by PNG and Australia. 27 PNG lobster dinghies to be allowed to operate in Australian TSPZ waters, while Australian operations in PNG waters are precluded.
1989	Management arrangements, fishery surveys	Fishery independent surveys commence in the TRL Fishery
February 1990	PNG, catch sharing, cross-endorsement	Catch-sharing arrangements come into effect 15 February, but no PNG boats begin fishing.
Oct-1990	Regulations	Under FMN 34 (replaced FMN 22): • No substantive changes to FMN 22
1991-1992	Traditional Inhabitant access, identification, definition	PZJA establishes a working group to consider the involvement in PZJA fisheries of Torres Strait Islanders and Aboriginals living in the Northern Peninsula Area of Cape York and Australian citizens of Papua New Guinean origin.
June 1991	PNG, catch sharing, cross-endorsement	Cross-endorsements issued to 4 PNG mother ships with 18 dinghies on 14 June. PNG boats agreed to respect home reefs closures, not go ashore on Australian territory, and make no contact with Australian inhabitants, Australian vessels, or PNG traditional fishers.
Jun-1992	Native title	Mabo High Court decision recognises existence of native title (Aboriginal and Torres Strait Islander rights and interests to land and waters according to their traditional law and customs)

Time period	Topic/Keywords	Description
1993	Community licensing	Concerns about the current licensing systems run by the PZJA and Queensland for community fishing begin to be raised by Island Coordinating Council. Concerns include that Traditional Inhabitants living outside the Island Coordinating Council area are excluded from obtaining licences, the administrative and financial burden placed on island councils by the systems, a lack of detailed information to inform fisheries management decisions, and the fact that island chairmen rather than individual fishers are legally responsible for any fishing violations.
February 1993	PNG, catch-sharing, cross-endorsement	New PNG catch-sharing arrangements commence on 15 February 1993 for a three-year period to 14 February 1996. Allow for cross-endorsement of 27 PNG dinghies and associated freezer boats. Nominations received for cross-endorsement of 3 PNG TRL freezer boats with 27 associated dinghies.
Oct-1993	Regulations	Under FMN 38 (replaced FMN 31): • Introduction of prohibition on taking TRL using hookah between 1 Oct-30 Nov • Traditional fishing bag limits amended - 3 without a boat, 3 with 1 person in a boat, 6 with more than 1 person in a boat • All other requirements remained unchanged - method restrictions
Dec-1993	Native title, legislation	*Native Title Act 1993* commences, legislating the framework for recognition of native title (including over maritime areas) in Australia following the High Court's Mabo decision. The Act covers the determination of whether native title exists, acts affecting native title, and compensation for acts affecting native title.
1994	Logbooks	Noted under LN 8: • Tropical Rock Lobster Logbook TRL02 implemented – voluntary, records frozen tails only
1994	Legislation, TSRA	Torres Strait Regional Authority established under the *Aboriginal and Torres Strait Islander Commission Act 1989*
April-June 1995	Single jurisdiction, licensing	PZJA establishes Task Force to investigate the feasibility of introducing single jurisdiction fisheries management and to advise on matters such as eligibility criteria for entry to the newly created fisheries. Investment warning is issued.
Jul-1995	Regulations	Under FMN 42 (amended FMN 38): • No changes to regulation of fishing provided under FMN 38. Amendments made to correct a drafting error that excluded several words from the section relating to bag limits for traditional fishing.
October 1996	Single jurisdiction, licensing,	PZJA endorses single jurisdiction (the management of all Torres Strait fisheries by the PZJA, rather than a division of responsibility between the PZJA and the Queensland government) and the Task Force's

Time period	Topic/Keywords	Description
	community licences, TIB licensing	recommendations for licensing reform. Due to opposition from Islander representatives, related to broader issues such as autonomy and the desire for a regional agreement for Islander control over Torres Strait waters, the implementation of these reforms was delayed and then boycotted until agreement was reached in 1999.
Mar-1997	Regulations	Under FMN 44 (amended FMN 38): • Method restrictions amended - only collection by hand, use of spear or other handheld implement permitted, no underwater breathing apparatus except hookah, no underwater mechanical propulsion
May-1997	Logbooks	Under LN 8: • Tropical Rock Lobster Logbook TRL03 implemented – both TRL02 and TRL03 mandatory for boats with freezing capacity, records both live and frozen tails
Apr-1998	Regulations	Under FMN 48 (replaced FMN 34): • Minimum size limits amended - 80 mm carapace length, 100 mm tail length
1999	Traditional Inhabitant access, identification, definition	PZJA agrees that children of “amnesty” Papua New Guineans be considered Traditional Inhabitants, following the 1989 decision to include “amnesty” people within the definition of Traditional Inhabitants.
July-December 1999	Single jurisdiction, licensing, community licences, TIB licensing	Islander representatives propose a series of principles to underlie community licensing, consistent with the previously proposed system.
Apr-2000	Single jurisdiction, licensing, community licences, TIB licensing	Following a meeting between the PZJA and Islander representatives, the Traditional Inhabitant Boat (TIB) licence is introduced for a one year trial period.
Nov-2001	Regulations	Under FMN 58 (replaced FMN 38, 42, 44, 48): • Introduction of fishery closure from 1 Oct-30 Nov (revoking previous prohibition on taking TRL using hookah between 1 Oct-30 Nov). Exemption from closure but bag limits apply - 3 without a boat, 3 with 1 person in a boat, 6 with more than 1 person in a boat

Time period	Topic/Keywords	Description
		• Introduction of prohibition on taking or carrying of TRL while using, or in the possession of, hookah gear between 1 Oct-31 Jan • All other requirements remained unchanged - method restrictions, minimum size limits
2002	Legislation, TSRA, PZJA	*Torres Strait Fisheries Act 1984* is amended to make the Torres Strait Regional Authority Chairperson a member of the Protected Zone Joint Authority
Nov-2002	Latent effort, fishery participation	A 30% reduction in the number of tenders attached to each non-Traditional Inhabitant licence package was implemented, except where only 1 tender exists, in which case the tender will be entitled to continue working. This was done in order to reduce latent effort in the fishery and restrict expansion of effort by non-Traditional Inhabitant fishers. This arrangement was in place until 2011.
November 2002	Traditional Inhabitant access, Skehill report, management objectives	Skehill report – "A Fair Share of the Catch" – is delivered, evaluating Torres Strait fisheries and establishing an order of priority for their management. Recommends Traditional Inhabitants be given priority of access to the TRL Fishery.
Dec-2002	Regulations	Under FMN 62: • Introduction of prohibition of processing or carrying TRL meat removed from the shell on a boat. Exemption provided for traditional fishing.
Dec-2003	Latent effort	Cap on Traditional Inhabitant licences for boats greater than 6 m with a TRL Fishery endorsement – in place until 2006
2003	QLD East Coast Fishery	Size limit increased to 90mm carapace length and 115m tail length. Seasonal to be in place from 1 October to 31 January implemented.
Late 2003	Logbooks	Torres Strait Seafood Buyers and Processors Docket Book (TDB01) implemented – voluntary
Jun-2003	Logbooks	Under the *Torres Strait Fisheries Logbook Instrument No. 1*: • Tropical Rock Lobster Logbook TRL04 implemented – mandatory for all non-Traditional Inhabitant operators
Jan-2005	Management arrangements	Moon-tide hookah closures (a periodic closure on the use of hookah gear three days either side of the full or new moon each month during between Februrary and September) introduced – first implemented in 2005 as a way to reduce fishing effort to levels recorded in 2002. In 2013 the closures were removed following a buy-out

Time period	Topic/Keywords	Description
		of non-Traditional Inhabitant licences however were reintroduced in 2014 following agreement from both the sectors, and continue to date
Jul-2005	Management plan	PZJA agreed to create a plan of management to implement a quota management system in the fishery.
July 2005	Allocation	PZJA agrees to transition to initial 50:50 sectoral split in the fishery, brought about by government funded buyout, with a later goal of a 70:30 split between Traditional Inhabitants and non-Traditional Inhabitants, funded by an “open market and self-funded tender process”.
2006	TAC	Notional total allowable catches implemented (notional as allocation had not yet been undertaken nor a management plan developed)
Mar-2006	Regulations	Under FMN 73 (replaced FMN 58, 62): • Introduction of fishery closure from 1-30 Nov (revoking previous fishery closure from 1 Oct-30 Nov). Exemption from closure for traditional fishing only but bag limits apply - 3 without a boat, 3 with 1 person in a boat, 6 with more than 1 person in a boat • Introduction of prohibition on carriage of diving equipment between 1900-0600 AEST. Exemption can be sought, but all diving equipment (face mask and fins) in possession of that person, or on board the boat, is stowed and secured during the prohibited hours. ES states that this was implemented in response to concerns that night diving may occur in the Fishery • All other requirements remained unchanged - method restrictions, prohibition of processing or carrying TRL meat, minimum size limits, hookah gear restrictions
April 2006	IAAP, allocation	PZJA agrees to create an Independent Allocation Advisory Panel (IAAP) to advise on the appropriate basis for the allocation of fishing concessions in the non-Traditional Inhabitant sector.
Sep-2006	Regulations	Under FMN 80 (replaced FMN 73): • Correction made to error in FMN 73 regarding the fishery closure, reinstated to 1 Oct-30 Nov. Exemption from closure for traditional fishing only but bag limits apply - 3 without a boat, 3 with 1 person in a boat, 6 with more than 1 person in a boat • All other requirements remained unchanged - method restrictions, prohibition of processing or carrying TRL meat, minimum size limits, hookah gear restrictions, prohibition on carriage of diving equipment between 1900-0600 AEST
Jun-2007	IAAP, allocation	PZJA agrees to final Independent Allocation Advisory Panel (IAAP) report and a sectoral catch share ratio of 35:65 between the Traditional Inhabitant and non-Traditional Inhabitant sectors as detailed in the ‘Report to

Time period	Topic/Keywords	Description
		stakeholders on the data used to establish the historical catch ratios of the Community and non-community sectors'
Apr-2008	Buyback, structural adjustment	Australian Government buy-back of non-Traditional Inhabitant licences. 13 primary licences and 29 associated tenders removed from the TRL Fishery. Based on the provisional allocations associated with the 'bought-out' licences the sectoral catch share between the Traditional Inhabitant and non-Traditional Inhabitant sectors changed to 53.5:46.5.
2008	Conversion factor	TRL tail to whole weight conversion ratio (2.677) implemented
2009	Harvest strategy	Interim Harvest Strategy implemented for the TRL Fishery in response to the planned transition to a quota management system, laying out the biological objectives for the fishery and how this could be achieved.
Mar-2010	Environment	Torres Strait coral bleaching event
Aug-2011	Regulations	Under FMI 9 (replaced FMN 80): • Application of arrangements extended to PNG Treaty endorsed operators • All other requirements remained unchanged – method restrictions, prohibition of processing or carrying TRL meat, minimum size limits, hookah gear restrictions, prohibition on carriage of diving equipment between 1900-0600 AEST, fishery closure. FMI 9 was intended to amend an administrative oversight that had excluded cross-endorsed fishers from the provisions of FMN 80.
Apr-2012	Buyback, structural adjustment	Based on a further buy-out of one licence (1 primary and 1 tender) the sectoral catch share between the Traditional Inhabitant and non-Traditional Inhabitant sectors changed to 56.2:43.8
7-Aug-2013	Native title, sea claim	The High Court hands down decision regarding Torres Strait Sea Claim Part A. The decision overturned the Full Federal Court decision from March 2012 and found that the native title rights in the sea claim area include the right to take fish for commercial or trading purposes. This was found to be a non-exclusive right, and native title holders are still required to hold the appropriate licences and abide by the relevant laws and regulations.
2014	Fishery participation, Traditional Inhabitant access, 100% ownership	The Protected Zone Joint Authority acknowledges and supports the aspiration of Torres Strait Communities to own 100% of access to commercial Fisheries in the Australian area of the Torres Strait Protected Zone

Time period	Topic/Keywords	Description
May-2014	Native title	Malu Lamar (Torres Strait Islander) Corporation is appointed as the Registered Native Title Body Corporate for the Sea Claim Area Part A.
Mar-2016	Environment	Torres Strait coral bleaching and sea cage mortality event
Oct-2016 to Oct-2017	Buyback, structural adjustment	Based on a further buy-out of three licences (3 primaries and 7 tenders) the sectoral catch share between the Traditional Inhabitant and non-Traditional Inhabitant sectors changed to 66.17:33.83
Jul-2017	Vessel monitoring	Vessel monitoring system (VMS) implemented – mandatory for primary boat and/or operating with a Carrier Boat License (Class A, B, or C). Vessels operating for freight shipping are exempt from installing VMS. Exemptions may also be provided for carrier vessels that are six meters or less in length.
Dec-2017	Logbooks	Torres Strait Fisheries Catch Disposal Record (TDB02) implemented – mandatory for all Torres Strait licence holders
10-Apr-2018	Management arrangements	Following a low Recommended Biological Catch, additional moon-tide hookah closures introduced covering all new and full moon periods for the remainder of the 2017-18 fishing season, in order to slow down fishing effort and provide the TIB sector with the longest possible fishing season, avoiding an early closure of the fishery.
27-Apr-2018	Management arrangements, hookah	Prohibition on the carriage and use of hookah gear for the remainder of the 2017-18 fishing season.
29-Jun-2018	Management arrangements, hookah	Federal Court of Australia order to revoke prohibition on the carriage and use of hookah gear – reverted to additional moon-tide hookah closures.
20-Jul-2018	Regulations	Under the TRL Management Instrument 2018 (replaced FMI 9): • Traditional fishing bag limits removed. Noted that PZJA does not have jurisdiction in relation to traditional fishing conducted by Traditional Inhabitants • Introduction of capacity to close the TRL Fishery early to commercial fishing, when the total allowable catch is reached • Introduction of capacity to prohibit the use of hookah gear (i.e. moon-tide hookah closures) during the hookah season (1 Feb-30 Sep)

Time period	Topic/Keywords	Description
		• All other requirements remained unchanged – method restrictions, prohibition of processing or carrying TRL meat, minimum size limits, hookah gear restrictions, prohibition on carriage of diving equipment between 1900-0600 AEST, fishery closure
31-Jul-2018	Management arrangements	TRL Fishery closed for the remainder of the 2017-18 fishing season due to total allowable catch being reached.
1-Dec-2018	Management plan	*Torres Strait Fisheries (Quotas for Tropical Rock Lobster (Kaiar)) Management Plan 2018* commenced
1-Dec-2018	Regulations	Under the TRL Management Instrument 2018 (amendment to Jul-2018 Instrument): • Ability to close the TRL Fishery early to commercial fishing revoked • Implementation of a split of the total allowable catch for the TRL Fishery between the Traditional Inhabitant (66.17% of the total allowable catch) and non-Traditional Inhabitant sectors – applied from 1 Dec 2017-30 Sep 2018 only • Introduction of capacity to close of the TRL Fishery to the Traditional Inhabitant sector once their part of the total allowable catch is reached – applied from 1 Dec 2017-30 Sep 2018 only • Provide for individual transferrable quota arrangements to be established for the non-Traditional Inhabitant sector via licence conditions – applied from 1 Dec 2017-30 Sep 2018 only • Provide for the operation of the proposed Management Plan should the quota allocation process be finalised before the start of the 2019-20 fishing season • All other requirements remained unchanged – method restrictions, prohibition of processing or carrying TRL meat, minimum size limits, hookah gear restrictions, prohibition on carriage of diving equipment between 1900-0600 AEST, fishery closure, moon-tide hookah closures
16-Sep-2019	Management plan, allocation	Quota units allocated under the Management Plan: • 662,016 quota units to the Torres Strait Regional Authority (TSRA) comprising: 562,000 to hold for the benefit of the traditional inhabitant sector; and 100,016 for the TVH licences it holds • 337,981 quota units to the remaining TVH principal licence holders
19-Nov-2019	Harvest strategy	PZJA adopts final Harvest Strategy for the TRL Fishery
1-Dec-2019	Management plan, management arrangements	TRL Fishery commences operation under a quota management system as per the Management Plan

Time period	Topic/Keywords	Description
Early 2020	Markets, price, export	• Live export market into China closed temporarily prior to 2020 Chinese New Year. • Prices in the fishery were down significantly, similar to lowest prices on record in 2002-03. • TVH boats in Torres Strait and QLD East Coast were forced to stop fishing. • Whole frozen product only purchased at reject prices. • COVID-19 impacts affect flights and freight routes from Australia to Asian markets
~ October 2020	Markets, export, Cadmium	China began to increase inspection levels and testing of cadmium in Australian live lobster at the point of entry in major Chinese ports, causing considerable delays while inspection and testing was being undertaken. This resulted in high mortality rates of lobster product (not Torres Strait product).
November 2020	Markets, export	China formally notified the DAWE of two instances of non-compliance of lobster shipments with detections of cadmium above the maximum levels set by the Chinese Government.
November 2020	Management Plan, allocation	The PZJA (meeting 36) agreed to amend the TRL Management Plan to provide the PZJA with additional time in which to commence a review of the allocation of quota units to the Traditional Inhabitant sector, to within 4 years of the Plan commencement.
December 2020	Markets, export	China banned the import of Australian lobster product
December 2020	Wildlife Trade Operation	On 4 December 2020 the TRL Fishery was re-accredited as an approved Wildlife Trade Operation (WTO) under the *Environment Protection and Biodiversity Conservation Act 1999*.
December 2023	Wildlife Trade Operation, LENS	In October 2023 the TRL Fishery was re-assessed under the *Environment Protection and Biodiversity Conservation Act 1999* and added to the List of Exempt Native Specimens (LENS). Coming into force on 4 December 2023, this allows extended export approval though to 4 December 2033.
April 2024	Cross-endorsement	For the first time in ten years, the first PNG licenced boats with Treaty Endorsements commenced their first cross-endorsed fishing trips in the Australian jurisdiction of the TRL fishery. The boats *FV Jupiter* and *FV Dinh Thang* undertook 4 and 5 fishing trips respectively, with their last trip of the season completed on 2 July 2024.
October 2024	Markets, export	Announcement that China would lift its four-year import ban on Australian rock lobsters. This did not address the specific protected species listing of Tropical Rock Lobsters.

Attachment 1e

Out of session correspondence since TRL RAG 37 (9 October 2024)

Date	Item
11 October 2024	The TSRA sent a statement to the TRLRAG Chair and AFMA on behalf of the RAG traditional inhabitant members (and casual observers) with a summary of their views on TRLRAG 37 meeting Agenda Item 3, Amending the empirical Harvest Control Rule (eHCR). This statement was then circulated to all RAG members by AFMA and is also provided at **Attachment 3a.**
29 October 2024	AFMA circulated a series of TRL RAG updates covering off on: a. The final TRLRAG 35 meeting summary; b. Announcement of TRLRAG 38 (10-11 December 2024) with a draft agenda for comment; c. An update on the TRL pre-season survey; and d. the latest TRL catch watch report.
29 October 2024	AFMA sent a Teams meeting invite for TRLRAG 38.
	AFMA circulated a copy of the draft TRLRAG 37 meeting record for member comment.
12 November 2024	AFMA circulated the meeting papers for TRLRAG 38 with a slightly revised agenda (v2), noting that some late attachments will be circulated once available.

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
UPDATES FROM MEMBERS	Agenda Item 2 For NOTING

RECOMMENDATIONS

1. That the RAG **NOTE** updates provided by:
    a) Industry members by
        i. TIBs;
        ii. TVH
    b) Scientific members;
    c) Government agencies, including a written update from AFMA (**Attachment 2a**);
    d) Papua New Guinea National Fisheries Authority (PNG NFA) representatives; and
    e) Native Title body representatives (if in attendance).

BACKGROUND

2. Verbal reports are sought from traditional inhabitant and transferrable vessel industry and scientific members under this item, with particular emphasis on market and export impacts to the current 2023-24 fishing season.
3. It is important that the RAG develops a common understanding of any strategic issues, including economic, fishing and research trends relevant to the management the TRL Fishery. This includes within adjacent jurisdictions. This ensures that where relevant, the RAG can have regard for these strategic issues and trends.
4. RAG members are asked to provide any updates on trends and opportunities in markets, processing and value adding. Industry is asked to contribute advice on economic and market trends where possible. Scientific members are asked to contribute advice on any broader strategic research projects or issues that may be of interest to the Torres Strait in future.
5. Government agency members are asked to provide updates relevant to the TRL Fishery. Specific AFMA updates are provided in **Attachment 2a.**
6. AFMA has a standing invite for officials from the PNG National Fisheries Authority (NFA) and a Native Title Body representative to attend all PZJA advisory committee meetings. If in attendance, updates are welcome from these participants.

UPDATE FROM AUSTRALIAN FISHERIES MANAGEMENT AUTHORITY

ABARES fishery status report

1. Each year, the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) compiles fishery status reports which provide an independent assessment of the biological status of fish stock and the economic status of fisheries managed, or jointly managed by the Australian Government (Commonwealth fisheries).
2. The latest ABARES Fishery Status Report 2024 (covering the performance of fisheries in 2022) have now been released. The reports assess all key commercial species from Commonwealth managed fisheries and examines the broader impact of fisheries on the environment, including on non-target species.
3. ABARES fishery status reports can be accessed on the ABARES website at:

https://www.agriculture.gov.au/abares/research-topics/fisheries/fishery-status

4. In summary, the TRL Fishery has been assessed for the 2023 period as outlined below.

Table 16.1 Torres Strait Tropical Rock Lobster Fishery – biological status

Stock	Fishing mortality 2022	Biomass 2022	Fishing mortality 2023	Biomass 2023	Comments
Tropical rock lobster (*Panulirus ornatus*)	Not subject to overfishing	Not overfished	Not subject to overfishing	Not overfished	Fishing mortality is less than the recommended biological catch. Spawning stock biomass is above the target reference point.

PNG Cross-endorsed fishing season

5. 2024 was the first year in a decade that Australia has granted Treaty endorsements to PNG licenced boats to fish in the Australian jurisdiction of the Torres Strait Protected Zone.
6. In September 2023, AFMA received nominations from a Papua New Guinea licenced operator for two boats and their associated tenders (7 each) to fish for TRL in areas of under cross-endorsement arrangements in the 2023-24 fishing season.
7. After careful consideration of the nominations in accordance with the PZJA Guidelines for authorising cross-endorsement in areas of Australian Jurisdiction of the Torres Strait Protected Zone (the Guidelines), as of Friday 1 March 2024, AFMA as the licencing delegate approved two Treaty endorsements to fish for the remainder of the TRL season.
8. The cross-endorsed boats commenced their first fishing trip in Australian waters on Saturday 13 April 2024. FV Jupiter undertook four fishing trips and FV Dinh Thang undertook five trips. Neither has boat fished in Australian waters since 2 July 2024.
9. The boats primarily fished on South Warrior Reef and were been boarded and inspected twice by authorities.
10. A summary of the boats' catch and effort will be presented under **Agenda Item 5.**

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) **Thursday Island**	**MEETING 38** **10-11 December 2024**
REVISING THE EMPIRICAL HARVEST CONTROL RULE	**Agenda Item 3** **For DISCUSSION and ADVICE**

RECOMMENDATIONS

1. That the RAG:
    a. **NOTE** that TRLRAG 32 recommended formal revision of the empirical Harvest Control Rule (eHCR) be investigated in response to anomalous circumstances impacting the application of the current eHCR as specified in the TRL Harvest Strategy.
    b. **NOTE** that although ad-hoc adjustments have been justifiably applied in recent seasons, it is considered best practice to review current methods and seek refinements and improvements that continue to best achieve the objectives of the Fishery and the Harvest Strategy. This is especially true in the rapidly changing conditions (both economic and environmental) that the Fishery is expected to face in coming years.
    c. **NOTE** that in response to TRLRAG 32 recommendations, CSIRO undertook updated management strategy evaluation (MSE) testing and analysis of options which were presented to TRLRAG 37 (9 October 2024). These options took into account changing climate and environmental factors, uncertainty with discards and feedback from traditional inhabitants and industry members to be more precautionary in 'bad years'.
    d. **NOTE** that at TRLRAG 37, RAG consensus was not reached on a suitable option to revise the eHCRto be applied when providing advice on a recommended biological catch (RBC) for the 2024-25 fishing season and future seasons.
2. Therefore, the RAG is being asked to reconsider the analyses presented by CSIRO to TRLRAG 37 and **RECOMMEND** a suitable revision of the eHCR to be applied when providing advice on a RBC for the 2024-25 season and beyond.

KEY ISSUES

Amending the empirical Harvest Control Rule (eHCR)

3. In response to extenuating circumstances which have led to the application of ad-hoc adjustments to the eHCR over several seasons, TRLRAG 32 recommended that formal revision of the eHCR be investigated by CSIRO.
4. This recommendation was put forward because the average catch multiplier currently used in the eHCR in the TRL Harvest Strategy was considered an unreliable indicator as actual catches have been lower than expected due to non-stock-related reasons. As such, the RAG has been applying an ad-hoc adjustment by substituting the actual catch figure with the season's TAC in the five-year average catch multiplier. The current eHCR in the Strategy is robust to, and tested against the TAC being fully caught, therefore the application

of the ad-hoc adjustments in recent years is justified and has been suitable as a short-term fix. However, ongoing use of the ad-hoc adjustment would have a ratcheting-down effect on the RBC over time.

5. TRLRAG 35 and TRLRAG 37 considered a range of MSE tested options and meta rules to account for ongoing exceptional circumstances in the Fishery.
6. CSIRO's analysis of potential options to amend the eHCR included changes to the overarching average catch multiplier; changes in the weighting of different indicator inputs, and changes to the number of recent years informing the slope of the indicator inputs, as well as additional constant fixed TAC value scenarios as per TRLRAG 35 feedback.
7. TRL RAG 37 discussions narrowed the suite of options down to two options or candidates:
    a. **The 'turtle rule':**
        (i) Considered the most similar to the current eHCR and would change the existing average catch multiplier value (which has been impacted by low total catches in recent years) with a new multiplier value that does not use actual average catch numbers.
        (ii) Low variability - depending on whether the indicator slopes are trending up or down, the turtle rule will adjust the RBC but will dampen inter-annual variability.
        (iii) Based on a run of 800 computer simulations of 20-year projections, the turtle rule would expect to generate a RBC in the range of 512-680t, 80 per cent of the time.
        (iv) Has a lower catch limit of 300t and an upper catch limit of 1000t.
    b. **The 'dolphin rule':**
        (i) Similar to the current eHCR and the turtle rule but includes an extra multiplier term based on the results of the most recent pre-season 1+ index (which has a 70% weighting in the eHCR). In years when the pre-season 1+ index is low the RBC will come down and provides a small bonus when the index is higher. This variation is not symmetrical though. The RBC can decrease by up to 40% in bad years, but in good years the 'bonus' is up to around 12%. This feature was included to address feedback from traditional inhabitant members to be more precautionary in 'bad years'.
        (ii) Accounts for survey precision (e.g. variability in average survey index could be due to survey methods or spatial stock variability). The more precise survey index has a greater weighting versus downweighting a less precise survey estimate.
        (iii) Depending on whether the indicator slopes are trending up or down, and how good or bad the current year's preseason survey 1+ index is, plus how precise it is, the dolphin rule will adjust the RBC more strongly up or down (more variable).
        (iv) Based on a run of 800 computer simulations of 20-year projections, the dolphin rule would expect to generate a RBC in the range of 432-912t, 80 per cent of the time.
        (v) Has a lower catch limit of 300t and an upper catch limit of 1000t.
8. Both options continue to retain the following elements of the current eHCR:

a. Being data-based rather than model-based i.e. only using data as inputs to inform the RBC;

b. No changes to the relative weighting (i.e. contribution) of different data sources; pre-season survey 1+ index (70%) and pre-season 0+ survey index, catch per unit effort indices for both TIB and TVH all with a weighting each of 10%; and

c. Using a trend based on the five most recent data points (i.e. five year slope).

9. The table below shows the RBC statistics for the turtle rule and dolphin rule using 800 simulations of 20-year projections.

	Median RBC (20 yr projection period)	50% of time RBC in range	80% of time RBC in range	mini mum	maxim um
Turtle rule	590t	538-637t	512-680t	300t	845t
Dolphin rule	624t	520-767t	432-912t	300t	1000t

10. TVH industry members expressed a preference for the 'dolphin' rule as it is more responsive (to the survey count).

11. Either the 'turtle' or 'dolphin' rule were acceptable from AFMA's perspective as both options meet the objectives of the *Torres Strait Fisheries Act 1984* and the TRL Harvest Strategy; Those being to maintain the TRL stock fluctuating around the precautionary target reference point (65% of unfished biomass) with a very low risk of fishing causing the stock to decrease to the limit reference point (32% of unfished biomass).

12. The CSIRO scientific member noted that the best scientific advice taking into account feedback from RAG members is that the 'dolphin' rule would better meet the objectives, and was confident that either rule was suitably precautionary and performed well. Dr Plaganyi further expressed a preference that the current eHCR is updated to a rule that is safer and more adaptable to current circumstances, and to not default to the ad-hoc adjustment of recent years.

13. The independent scientific member supported either the 'turtle' or 'dolphin' rule with no preference for one over the other.

14. The TSRA member also supported either the 'turtle' or 'dolphin' rule.

15. Advice from traditional inhabitant industry members (including views of traditional inhabitant casual observers) with the support of TSRA, out of session, indicated that those members were not in support of either the turtle or dolphin rule, and do not wish to amend the current eHCR but rather continue to apply the ad-hoc method that has been applied in the past three fishing seasons. A copy of the complete statement from traditional inhabitant members and observers via TSRA is provided at **Attachment 3a**.

16. As a result, the RAG was unable to reach consensus on an agreed way forward for amending or applying the eHCR for the 2024-25 fishing season and beyond. Therefore, the RAG is being asked to revisit this discussion and provide a recommendation on a way forward.

BACKGROUND

Harvest Strategy review

17. The Commonwealth Fisheries Harvest Strategy Policy and Guidelines, upon which the TRL Harvest Strategy is based as best practice, specifies that harvest strategies are to be reviewed every five years but may be reviewed earlier if necessary.

18. Section 2.13 of the TRL Harvest Strategy provides guidance on when a review may be required earlier than 5 years, including relating to changing external drivers.

19. As external drivers, ongoing market and economic pressures recently encountered in the fishery are beyond what was considered when the eHCR was developed and warrant a revision of the eHCR, TRL RAG recommended this revision at their 32nd meeting in December 2021.

The empirical Harvest Control Rule (eHCR)

20. The eHCR is an integral component of the TRL Harvest Strategy that is used to rapidly determine an RBC each fishing season.

21. The eHCR formula is the multiple of the average annual catch over the last five years (using available catch from TIB, TVH and PNG sectors), and a statistic which measures the relative performance of the fishery based on the following data inputs:

    a. the pre-season survey index of abundance of juvenile recruiting 1+ lobsters (70 per cent weighting);

    b. the pre-season survey index of abundance of newly recruited 0+ lobsters (10 per cent weighting);

    c. the standardised CPUE index from the TVH sector (10 per cent weighting)

    d. the standardised CPUE index from the TIB sector (10 per cent weighting).

Attachment 3a

From:	Adam White
To:	Ian Knuckey; LANGDON, Georgia; COUCHMAN, Natalie; Office of the CEO; Office of the Chairperson; Caitlin Paton
Cc:	charles.a.david@hotmail.com; Jermaine Reuben; Patrick Mooka Member Dauan; Richard Takai; Yen Loban
Subject:	TIB response to proposed change of model TRLRAG 37 [SEC=OFFICIAL]
Date:	Friday, 11 October 2024 11:18:20 AM
Attachments:	image001.png

OFFICIAL

To the Chair of the TRLRAG Ian Knuckey,

Good morning. I refer to Wednesday's TRLRAG 37 where a request was made to the TSRA to respond on behalf of the TIB members: Charles David, Thomas Fuji, Kevin Sabatino, Less Pitt, Patrick Mooka, Graham Hirakawa, Richard Takai, Jermaine Bowie, and James Ahmat.
After individual phone conversations with myself and each TIB member, followed by a group Teams meeting yesterday via the TSRA Fisheries office on TI, a unanimous decision has been reached by our TIB members NOT to change from the existing model, therefore, not supporting either of the Turtle, or Dolphin model as proposed for the 24-25 season. TSRA support this decision.

The members expressed many concerns around changing from the existing model and feel that there is no direct benefit to the TIB Industry, rather a risk that changing the model may cause an increase in the TAC which has been flagged as high risk to the TIB community. The following reasons were given for their decision:

1. Due to the lack of data around discard, mortalities, Traditional catch, and illegal activity, members feel that this is not reflected accurately in any proposed model therefore it potentially increases the risk of additional pressure on the resource. Localised stock depletion contradictory to current data is also of great concern and of high priority to the TIB community. A conservative approach towards preserving the stock by way of not encouraging any potential increase to the TAC has been agreed to and believe that the current model will best represent their view. TSRA supports this view.

2. The low TIB catch over the previous two years must be considered. This has occurred for several reasons including: TS market freeze on live TRL x 3 in the 2024 season, record low beach prices on offer to TIB fishers, and increasing record high fuel prices. While these factors directly contribute to a lack of participation by the TIB community, they are factors totally out of their control, as a result, there has been significant uncaught quota. TIB members all agreed that this is a preferable outcome for the sustainability of the resource and view this as a potential offset for the discrepancy in the lack of data on the above mentioned in point 1. The TIB members wish to continue with the current model to reflect this, even if it again results in further under caught. TSRA support this view.

3. The TIB community are currently in discussions around how best to utilise any under caught quota to benefit the broader TS community, should the situation arise in the future. The TIB members feel that given the fact that the current model recognises under caught, it is critical to keep this model until a decision is reached on how best to utilise this within the TS community. TSRA support this view.

While the TIB members have given their unanimous consensus, it has been asked of me on their behalf to sincerely thank SCIRO for a huge amount of hard work and recognise the direction that is proposed for the industry. They appreciate the multiple options for a model going forward, and there is a good chance one of the proposed models will suite the fishery at some point, however given the current state of ownership, the aspiration for 100% ownership, and the concerns around some of the data not yet incorporated into any model, they feel this will not benefit the TIB Industry, and it is not yet time to make the change to a new model. TSRA support this decision.

It is important to recognise the decision-making process from the TIB perspective. This is a huge decision that could potentially reshape the industry forever going forward, for better or for worse. Therefore, it deserves the time required to process and discuss the nuances of any proposal and this time frame should be offered to them to decide how long, and with whom. I feel this is a reminder to us all that the TIB members present are representatives of the TRL industry in their respective communities, not the decision makers, the community are in fact the decision makers. Acknowledgement and respect need to be shown to the ways of the Torres Strait decision making culture.

In closing, the TIB members have requested a review of the model in 12 months from now, where they have the time to discuss with the broader community and see how the other models respond over the 24-25 season. TSRA support this request.

Adam White
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We acknowledge the Traditional Owners and Custodians of the lands and waters on which we work.

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
CLIMATE ADAPTATION	Agenda Item 4 For Discussion and Advice

RECOMMENDATIONS

1. That the RAG:
   a) **NOTE** work being undertaken to incorporate climate change information into fisheries management advice and decisions in other Commonwealth managed fisheries, with a view to implementing a similar process for Torres Strait fisheries;
   b) **DISCUSS** the Climate and Ecosystem Status report for the Torres Strait Tropical Rock Lobster Fishery (**Attachment 4a**)
   c) **PROVIDE ADVICE** on the trial application of AFMA's Climate Risk Framework (**Attachment 4b**) to Tropical Rock Lobster in the Torres Strait (species assessment report at **Attachment 4c**).

BACKGROUND

2. At its meeting on 19 July 2023, the Protected Zone Joint Authority (PZJA) agreed that a standing agenda item "Climate and ecosystem update" be introduced to all RAG and Working Group agendas where total allowable catch (TAC) and/or effort limits are to be considered. This is in line with discussions during TRLRAG33 in December 2022, where the RAG agreed that consideration of climate change was a priority for the Tropical Rock Lobster (TRL) fishery.

KEY ISSUES

Climate and Ecosystem Status Reports

3. Climate and Ecosystem Status Reports are a useful tool to provide an update or indication on the current state (or health) of the environment or ecosystem, relative to longer-term trends or target states. They provide a way to integrate a variety of diverse data into a simple overview that can be easily communicated, providing managers and stakeholders with up-to-date trends for a specific region or ecosystem.
4. Climate and Ecosystem Status Report Cards, incorporating readily accessible indicators and forecasts, were provided to TRLRAG in December 2023 (TRLRAG 35). RAG feedback was incorporated and the report card was published on the AFMA Website – TRL Fishery Climate and Ecosystem Status Report.
5. A draft 2024 Climate and Ecosystem Status Report is provided at **Attachment 4a** and will be presented by Dr Steph Brodie (CSIRO). This information builds on that provided in December 2023 and is to be used as contextual information in the RAGs consideration of the stock assessment and TAC.
6. AFMA is seeking any additional observations from industry to include in the report.

AFMA's Climate Risk Framework

7. AFMA has developed a draft Climate Risk Framework (CRF) (**Attachment 4b**) to assess the risk to AFMA-managed species from climate change utilising the most robust information available, and then respond to or manage that risk using the tools that are available within the existing scientific, management and industry adaptation pathways.

8. The AFMA Commission has approved a proposal to proceed with a trial implementation of CRF as an approach to integrate climate risks into formal decision-making processes at AFMA.

9. A Working Group was established to support the trial implementation of the CRF and provide strategic advice to the AFMA Commission and AFMA Management on the development, coordination and implementation of the CRF across AFMA-managed fisheries. The Working Group membership includes Dr Beth Fulton, Dr Alistair Hobday, Dr David Smith and Dr Keith Sainsbury, with administrative support from AFMA's Climate Adaptation team.

10. The Working Group has already evaluated multiple species assessments using the CRF, including through seeking input from fisheries managers and assessment scientists. The CRF has been revised based on Working Group feedback, and the AFMA Commission has endorsed continued trials.

11. Over the past two months, AFMA has introduced the CRF to PZJA resource assessment group (RAG) meetings for Beche-de-mere (HCRAG, 17-18 Sept), Finfish (FFRAG, 15 October), and the PZJA Standing Committee (30 October). The CRF has been received well and stakeholders have expressed an interest in adapting the framework (currently focussed on Commonwealth fisheries) for the Torres Strait.

12. The Working Group met with TRL industry representatives, management and scientific stakeholders at a meeting on 1 November 2024 to consider the trial application of the CRF for TRL. A summary of the Working Group discussion follows here:

    - The process is not intended to be duplicative of work already completed or underway. It serves as a valuable tool for assessing the climate risks facing TRL in the Torres Strait and record the extensive research and management strategies implemented that allow the fishery to continuously assess, monitor, and adapt to these risks.
    - The CRF should include mechanisms to incorporate traditional knowledge into the risk assessment and decision-making process.
    - Additional management will only be required where the existing measures are considered insufficient to manage the risk of climate change.
    - The draft CRF Species Assessment Report (presented to the working group) will be updated to include more contemporary research which should allow further refinement of the climate risk score (Step 1) and capture the management arrangements that allow for adaptive responses to climate-driven changes in stock status (Step 2).

13. The draft CRF Species Assessment Report (**Attachment 4c**) has been updated based on feedback received at the Working Group and from fishery scientists and managers since the 1 November meeting.

14. AFMA is seeking feedback from TRLRAG on the overall approach adopted in the CRF, including advice on each of the four steps applied to TRL:

    - Consider risk to the species based on climate risk and estimated stock status.

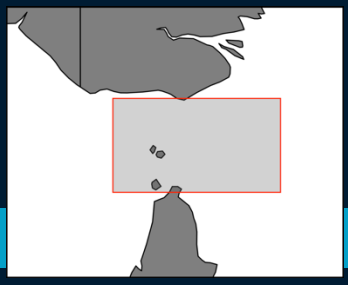
- Identify whether there is sufficient precaution in the existing science, management or industry adaption.
- Determine the residual risk after considering the adequacy of mitigation in place.
- Provide advice on any additional measures required to respond to climate risk.

15. AFMA will also seek advice from the Tropical Rock Lobster Working Group at its 12 December 2024 meeting.
16. Following application of the CRF to other species, AFMA will prepare a trial report in 2025 for consideration by the AFMA Commission. Subject to the outcomes of the trial and Commission views, AFMA will engage with the PZJA regarding implementation of the CRF in the Torres Strait.

33 Climate & Ecosystem Status Report

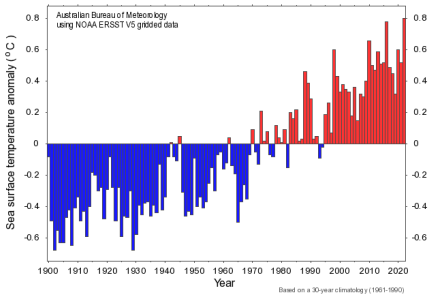
Torres Strait Kaiar - Tropical Rock Lobster Fishery

November 2024

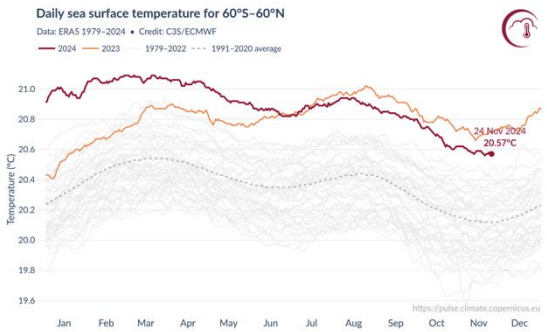


Historical Period

Climate Drivers

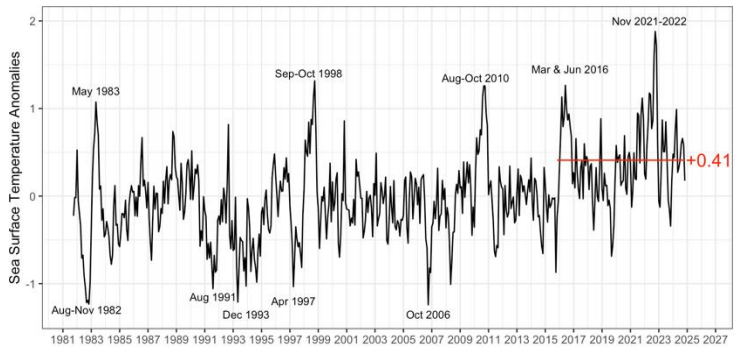


Australian waters have warmed significantly over time (link)[1]. The last decade has been ~0.5°C warmer than the 1960-1990 average.



Global Sea Surface Temperature (SST) have been at record highs 2023-2024 (link)[2].

Regional Dynamics: SST time-series

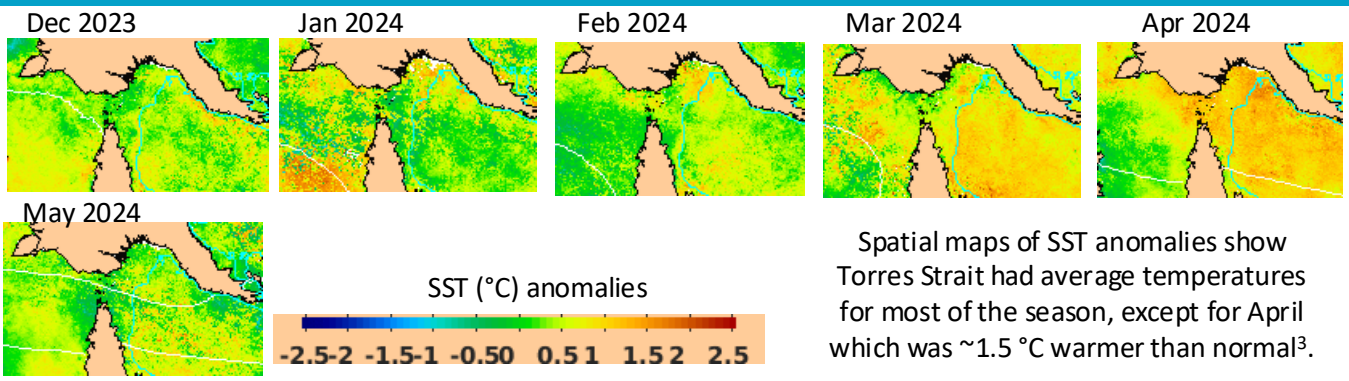


Mean monthly SST temperature anomalies (1982-2024) in Torres Strait[2].

Torres Strait has warmed over time. Hot and cool years are shown by text.

Mean SST anomaly for the last 10 years (2015-2024) was 0.41°C.

Regional Dynamics: 2024 SST



Spatial maps of SST anomalies show Torres Strait had average temperatures for most of the season, except for April which was ~1.5 °C warmer than normal[3].

Observations

To be sourced at RAG
Inc. non-TRL species abundances

Examples from 2023

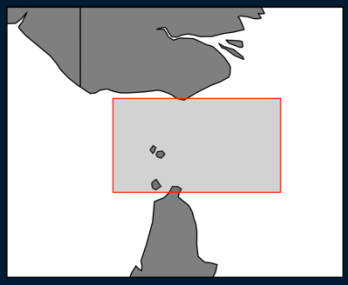
- Lots of sponge grass around that prohibits lobster movement. Typically, early onset of westerlies helps clear habitat for lobsters.
- Reports of sand incursion covering up seagrass.
- Reports of winds being different to normal.
- Recreational fishing observed to be higher in Oct-Nov.
- Fishing effort was low but reports of abundance being good in some areas. More smaller and medium sized lobsters observed.

Sources: BOM[1] CMEMS[2] IMOS[3] CSIRO[4]

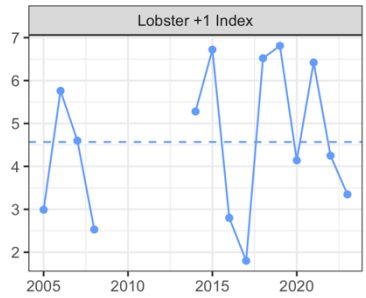
34 Climate & Ecosystem Status Report

Torres Strait Kaiar - Tropical Rock Lobster Fishery

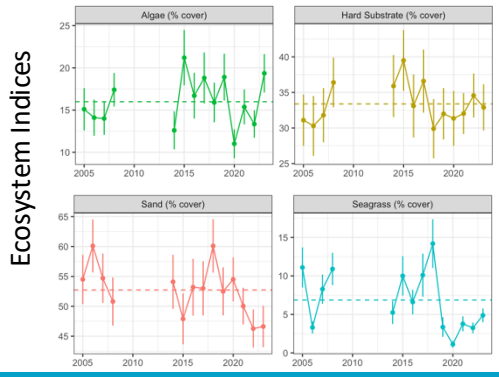
November 2024



Ecosystem Trends[4]



Lobster+1 index in 2022 & 2023 was below the long-term average.

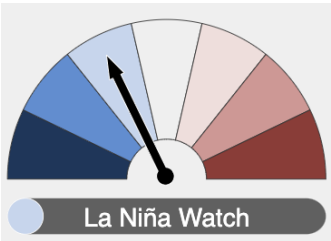


Live Coral and Hard Substrate cover has been increasing since 2018.

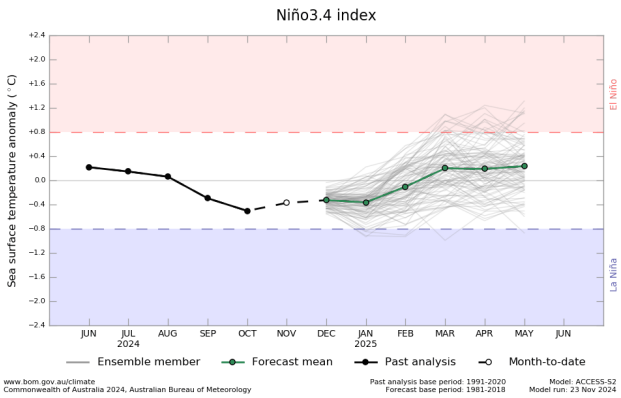
Algae cover has been below or close to average since 2020. Sand and Seagrass cover has been low in recent years.

Forecast Outlook for 2024-2025

Climate Drivers



BOM Outlook is La Niña watch (chance of La Niña in 2024/2025 summer) (link)[1].



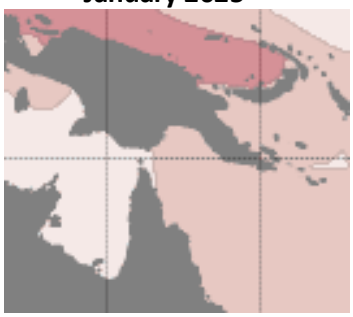
ENSO is currently neutral.

Most forecasts indicate neutral conditions will remain (link)[1].

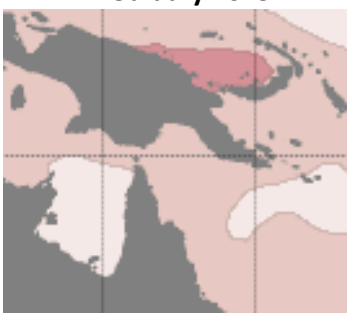
Ocean Forecasts

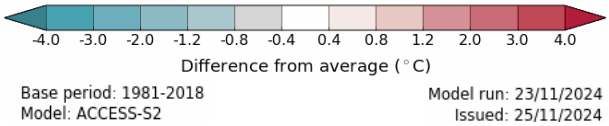
December 2024

January 2025



February 2025





Forecasts of SST anomalies[1]. SST is forecast to be 0.4-1.2 C warmer than average (link).[1]

Sources: BOM[1] CMEMS[2] IMOS[3] CSIRO[4]

Australian Government

Australian Fisheries Management Authority

Climate Risk Framework

Integrating climate risk in decision-making

Securing Australia's fishing future

www.afma.gov.au

Executive summary

The impact of climate change on Commonwealth fisheries is becoming increasingly evident. The effects of climate change on marine ecosystems are accelerating and Intergovernmental Panel on Climate Change (IPCC) projections indicate that fish production will be further affected within the relatively short term (e.g., 10 years), to the point where management advice that does not consider this change could be rendered invalid[1].

AFMA has developed the Climate Risk Framework (the Framework) to integrate climate risk into management decisions for Commonwealth-managed species/stocks (herein referred to as species). The framework is based on a risk assessment approach, similar to that which has been utilised in other fisheries internationally to integrate ecosystem and environmental considerations and uncertainty into existing management frameworks.

The Framework involves a four-step process that seeks to:

1. Assess the overall risk to a species based on the impacts of climate change and the biological status of the stock using the best available information,
2. Consider whether there are sufficiently precautionary measures in the existing science, management or industry adaptation pathways to respond to the impacts of climate change,
3. Assess the residual risk to a species, and where required
4. Provide advice to the AFMA Commission on any additional measures required to respond to the impacts of climate change.

The Framework is structured to ensure risks and appropriate adaptation measures are considered on an annual basis, with a view to providing advice to the AFMA Commission as part of the Total Allowable Catch (TAC) or Total Allowable Effort (TAE) setting process for the coming fishing year.

The Framework is one element of a broader program of climate adaptation work being undertaken by AFMA. It is intended as a transitional mechanism, to enable rapid integration of climate risk into decision-making processes until such time as climate impacts are more explicitly integrated into science and management processes, such as harvest strategies, stock assessments or Ecological Risk Assessments (ERAs). For data-poor species, the Framework will likely remain an appropriate tool to assess and respond to the impacts of climate change into the future.

[1] Duplisea DE, Roux MJ, Hunter KL, Rice J (2021) Fish harvesting advice under climate change: A risk-equivalent empirical approach. PLOS ONE 16(2): e0239503. https://doi.org/10.1371/journal.pone.0239503

Contents

Version	Updates	Approver
12 Jan 2024	Version for trials, commencing Feb 2024.	Alice McDonald
10 Jul 2024	Revised version for trials, commencing Aug 2024.	Dan Corrie

1 Introduction

Climate change is already impacting Australia's marine ecosystems and fisheries in a range of complex ways. Australian waters are becoming warmer and more acidic, sea-levels are rising, major ocean currents are changing, and extreme weather events are becoming more severe. The effects of climate change on marine ecosystems are accelerating and Intergovernmental Panel on Climate Change (IPCC) projections indicate that fish production will be further affected within the relatively short term (e.g., 10 years), to the point where management advice that does not consider this change could be rendered invalid (Duplisea, et al. 2021).

Research predicts that climate change will have both positive and negative impacts on reproduction, recruitment, and distribution of biomass of Australia's commercially important marine species (Fulton, et al. 2021). The Commonwealth Harvest Strategy Policy (HSP) and HSP Implementation Guidelines (the Guidelines) recognise that non-fishery effects can see species abundance fluctuate and conclude that timely responses by management to changes in stock productivity and distribution are important in areas where climate is shown to be changing rapidly.

AFMA's legislative obligations include the need to ensure that the exploitation of fisheries resources is conducted in a manner consistent with the principles of ecologically sustainable development, including the exercise of the precautionary principle:

> *Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

To ensure that these objectives continue to be met, AFMA has initiated a dedicated program focused on incorporating climate change information and potential risks into our decision-making processes. By doing so, we aim to make fisheries management more adaptable to the evolving marine environment.

1.1 Impacts of climate change on Commonwealth Fisheries

An increasing amount of information, research and data is available on the sensitivity of fish stocks to climate change and associated impacts on current and future stock status. This information is being considered by AFMAs Resource Assessment Groups (RAGs), Management Advisory Committees (MACs) and managers when providing advice and making management decisions for Commonwealth-managed species and stocks (herein generally referred to as 'species').

Climate and Ecosystem Status Reports are available for key fisheries, drawing upon readily accessible climatic and environmental data and trends. The first iterations of these reports are relatively high level, containing hindcast and forecasts derived from information such as sea surface temperature, El Nino Southern Oscillation (ENSO) cycle status, water chemistry and fishers' observations. These reports are still in their infancy in terms of development and use in Commonwealth fisheries, however as the indicators are refined and their relevance and influence on stock abundance and distribution is better understood, these will also provide an insight into climate impacts and risks for some stocks.

Over time, the Climate and Ecosystem Status Reports could evolve to include more sophisticated population and environmental indicators of climate-influence. Several Australian researchers have been leaders in the field of identifying ecosystem indicators and have close connections with US and EU groups who are applying indicators in this way. Lessons gained from that network suggest it is a useful framework which can be adapted to Australian conditions and refined through time, as has occurred elsewhere.

Potential indicators that could be considered in the future, to provide more sophisticated insight into climatic impacts and ecosystem shifts, can be found in the Alaska Marine Ecosystem Status Reports and in a list proposed by the National Oceanic and Atmospheric Administration (NOAA) for US fisheries in Link, et al., 2021.

Ideally the influence of climate and ecosystem factors on stocks would be integrated quantitatively into stock assessments and harvest strategies, so that they would directly influence Recommended Biological Catches (RBCs). However, many of these approaches are complex and unlikely to be implemented in the near-term. A fully quantitative integration may also not be necessary, possible, or cost effective for many species.

1.2 A transitional mechanism to integrate climate risk and impact

AFMAs legislative obligations include the need to ensure that the exploitation of fisheries resources is conducted in a manner consistent with the principles of ecologically sustainable development, which includes the exercise of the precautionary principle. The precautionary principle requires AFMA to address uncertainty and account for known risk, and potential risks, in decision making[2].

Given the increasingly evident impacts and risk of climate change, and the understanding that climate change is accelerating (Duplisea, et al. 2021), a mechanism to integrate climate risk into management decisions is needed in the short term, while more sophisticated longer-term solutions are being developed.

While climate and ecosystem status reports provide valuable contextual information, AFMA must ensure that climate and ecosystem risks are explicitly considered and appropriately integrated in the production of management advice for Commonwealth-managed fisheries. While 'Climate-ready' stock assessments and harvest strategies are unlikely in the near-term for most species, and may never be necessary or possible for others, semi-quantitative or qualitative approaches are already used in some jurisdictions.

Risk assessment approaches are utilised widely in fisheries, including in assessing and responding to ecological risks in Commonwealth fisheries under the Ecological Risk Management Framework. A risk table (see Dorn and Zador 2020) is being utilised in Alaskan groundfish fisheries to support TAC decision making in the North Pacific Fisheries Management Council (NPFMC). In these fisheries, RBC estimates and final TAC levels are presented alongside relevant information around assessment uncertainty or modifications, population dynamics not explicitly addressed in the model, and ecosystem state. This provides the context for the decision making, particularly when there are lower catch recommendations than the 'acceptable

[2] OECD Joint Working Party on Trade and Environment (2002) *Uncertainty and Precaution: Implications for Trade and Environment*, OECD, September.

biological catch' due to ecosystem/environment concerns (including climate impacts). The use of this Alaskan risk table is dependent on informative ecosystem indicators that have been identified and refined through time in Alaska (see for example the Alaska Marine Ecosystem Status Reports).

AFMA has developed the Climate Risk Framework to assess the risk to Commonwealth-managed species from climate change utilising existing information, and then respond to or mitigate that risk using the tools that are available within the existing scientific, management and industry adaptation pathways. While this might be considered a transitional mechanism for some species as the science evolves and more sophisticated approaches are developed, it will likely remain an appropriate measure for many data poor species into the future.

Development of the Climate Risk Framework has been an iterative process, including trial application in several AFMA-managed fisheries during early development. Ongoing development and refinement will continue to be a focus as more information becomes available and the utility of the framework becomes apparent. This current version will continue to be used on a trial basis throughout 2024. A trial report is scheduled for early 2025 to include a review of the trial process, and recommendations for future implementation (Figure 1).

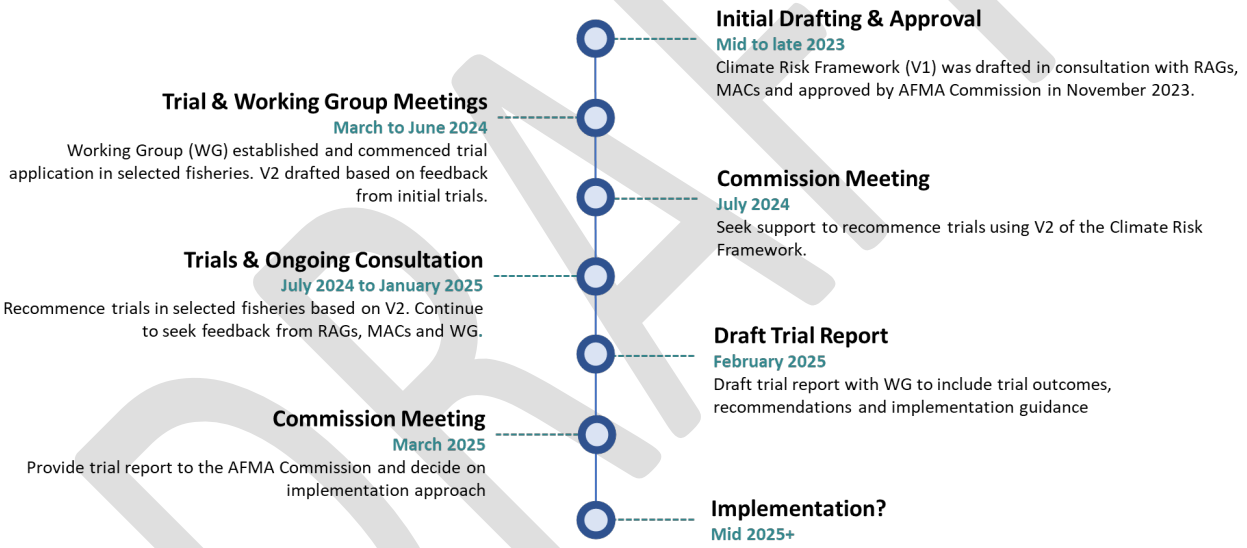


Figure 1 Development timeline for AFMA's Climate Risk Framework

2 AFMA Climate Risk Framework for Commonwealth Fisheries

The Climate Risk Framework employs a risk-based assessment approach to identify and integrate climate impacts and uncertainty into formal decision-making processes. The process allows for rapid identification of expected climate-driven changes in productivity using readily available information, and then determine whether additional measures are required to respond to the identified change. The approach has been adapted to integrate with existing management processes (Figure 2) and utilise tools already available to fisheries scientists, managers, and industry.

Figure 2 Linkages between the Climate Risk Framework, Science and Research, Management & Regulation and Commercial Fishing Industry

The Framework involves a four-step process that seeks to:

1. Assess the overall risk to a species based on the impacts of climate change and the biological status of the stock using the best available information,
2. Consider whether there are sufficiently precautionary measures in the existing science, management or industry adaptation pathways to respond to the impacts of climate change,
3. Assess the residual risk to a species, and where required
4. Provide advice to the AFMA Commission on any additional measures required to respond to the impacts of climate change.

The following section provides a detailed overview of each of the steps, including implementation guidance.

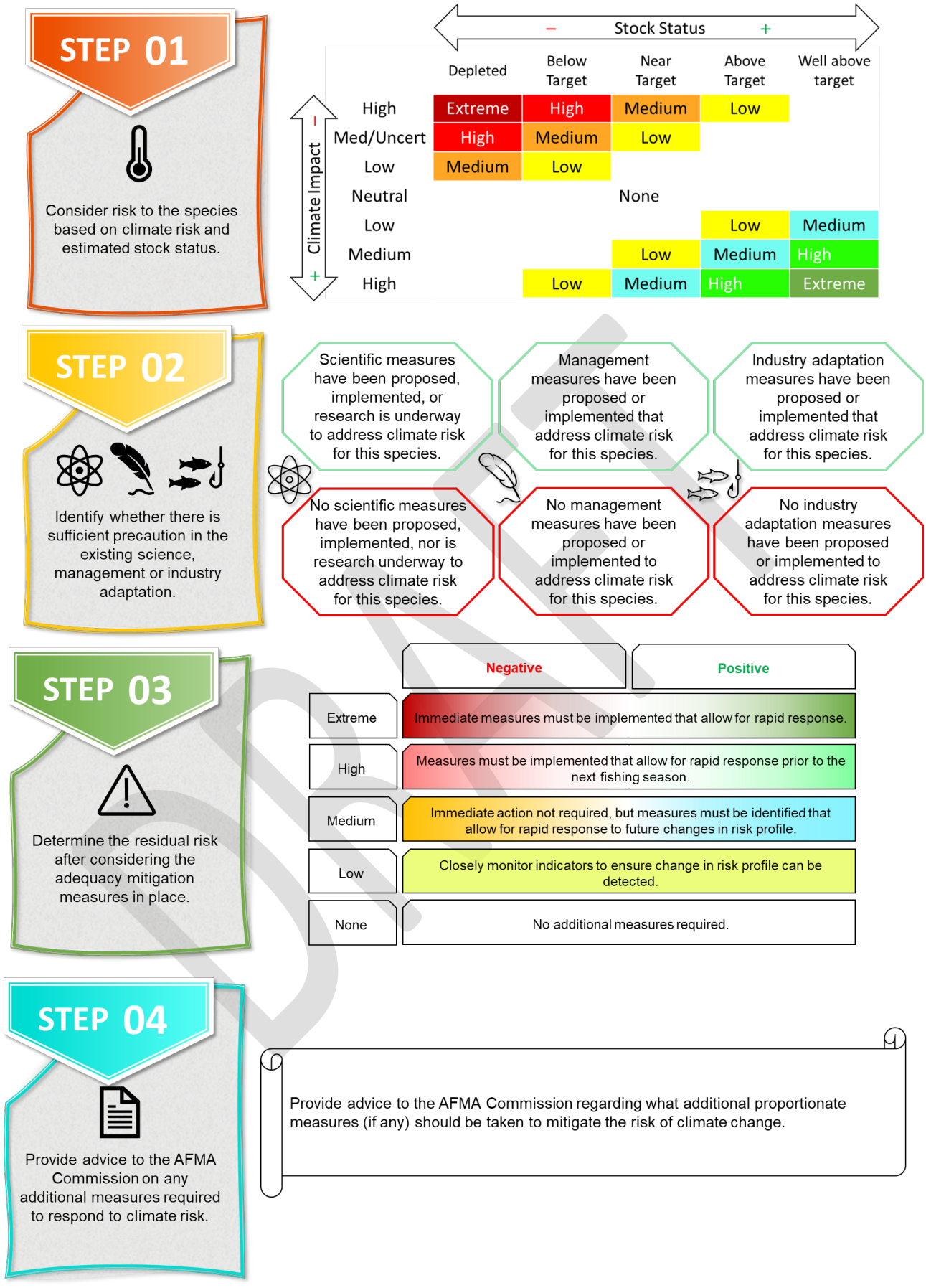


Figure 3 The AFMA Climate Risk Framework 4-step process

2.1 Implementation process

The Framework is designed to integrate with the existing consultation and advisory group processes and align with the annual TAC/E setting process. For each species, relevant RAGs and MACs (with support from AFMA management) will step through the process and provide advice to the AFMA Commission, prior to the start of the next fishing season. The Framework will be established as a guidance piece, rather than established as policy. This will allow for improvements over time, based on trials and implementation experience and as our understanding of climate impacts and appropriate mitigation evolves.

The RAG will complete Step 1 through to Step 4, including providing advice to the AFMA Commission. The MAC can review the risk ranking established at Step 1 but are largely responsible for validating or adding to the measures identified at Step 2, and then revising or validating the residual risk ranking at Step 3. Depending on the measures identified at Step 2, both groups should provide advice to the AFMA Commission at Step 4. It will be the responsibility of AFMA management to consolidate this advice and have it cleared by both groups, including where there is conflicting advice, and produce the Species Assessment Report (example at **Appendix A**).

The AFMA Commission will consider the advice, including where there is conflicting advice from the RAG and MAC, and make a final decision.

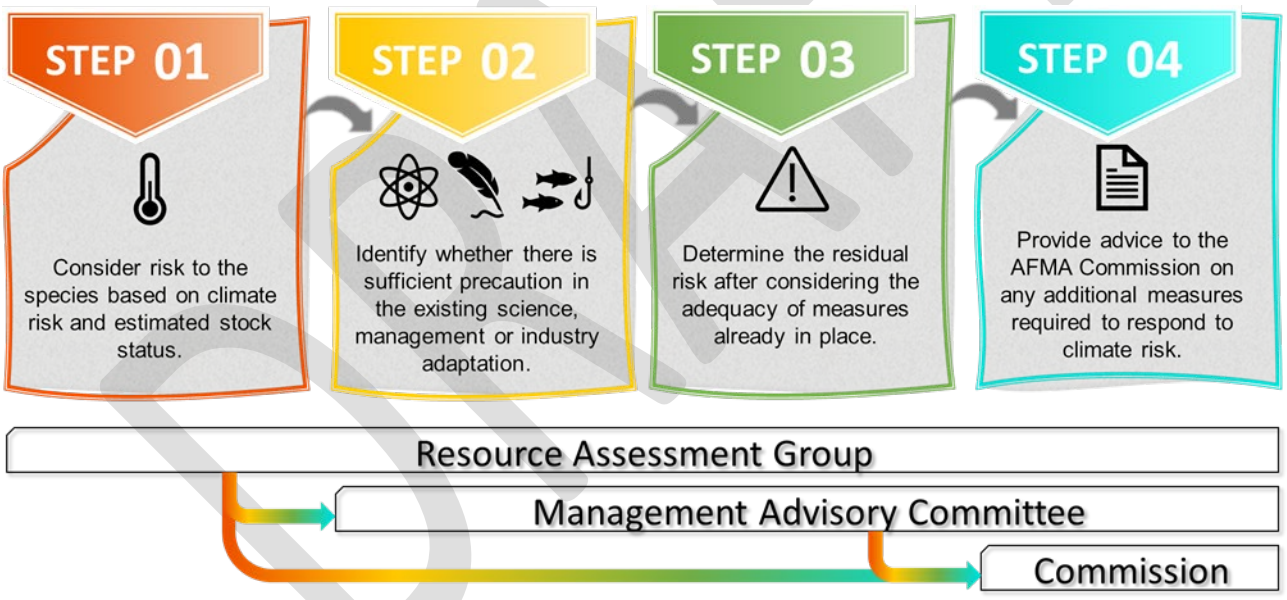


Figure 4 The role of RAGs, MACs and the AFMA Commission in implementation of the Climate Risk Framework

Step 1: Assess species risk due to climate change and stock status

Climate Risk

The RAG, utilising the best available climate information for the species, undertake an assessment of the climate risk ranking using the criteria set out in **Table 1** below. The RAG should draw upon the most robust information source available for the species, listed here as categories 1-4.

1. Attribution studies of counterfactual simulations include sophisticated ecosystem modelling of existing and projected climate impacts. These and are available for some Commonwealth species, for example climate forced modelling using CSIRO Atlantis ecosystem simulations for key species in the Southern and Eastern Scalefish and Shark Fishery (SESSF) (Fulton, et al. 2024). Models of Intermediate Complexity for Ecosystem assessments (MICE) being undertaken for some Commonwealth fisheries (CSIRO n.d.), are also more specifically fit. These robustly fit models have good model skill scores (i.e., have real information content that exceeds what would be gained from a time series alone).

2. Preliminary projections of change in abundance due to climate change is available for most Commonwealth fish species from the FRDC Project "Guidance on Adaptation of Commonwealth Fisheries management to Climate Change" (Fulton, et al. 2021). These projections come with varying levels of confidence and additional interpretive comments (e.g., likely geographic shifts) for some species. They are based on quantitative models that consider additional factors not picked up in the sensitivity assessments described below.

3. Climate sensitivity based on an assessment of life history characteristics is also available for all fish species in Commonwealth fisheries (Fulton, et al. 2021). This information poor assessment provides a climate sensitivity rating of 'low', 'medium' or 'high' for each species following the method of Pecl, et al. (2014) applied to all species currently listed in the ERA level 2 productivity-susceptibility analysis for each fishery.

4. Climate and ecosystem indicators are now actively considered as a standing agenda item at most AFMA RAG and MAC meetings when TACs or TAEs are being considered. Climate and Ecosystem Status Reports provide information that is useful in predicting species or stock-specific responses.

Only a few species are likely to have attribution studies or counterfactual simulations available, while most species will have preliminary projections and climate sensitivity assessments available to draw upon. AFMA will support the RAG by ensuring the available information for the species of interest is available.

Stock Status Risk

It is important to understand the most recent estimate of stock status in the context of climate risk. For species that are above the Target Reference Point (TRP), the potential risk of climate change impacting sustainability is lower than that for a species that is near or below the Limit Reference Point (LRP).

Estimates of stock status vary across AFMA-managed species and are based on a range of assessment approaches, from robust data-rich methods that provide estimates of spawning biomass and depletion, to data-poor methods that provide estimates of recent fishing mortality but provide no estimate of stock status.

Table 2 provides guidance on how to rank stock status based on a range of assessment methods, grouped here into three categories. The examples provided here (and in Table 2) are not considered exhaustive, and RAGs should use their own discretion and expertise when determining how stock status should be characterised at Step 1 where assessment methods/outputs do not reasonably align with the examples provided. (Derived from NOAA[3], ICES (2012) and Dowling, *et al*. (2016)).

1. Robust assessments of fishing mortality (F) and biomass (B) based on fishery-independent and/or fishery-dependent data. The models utilize statistical techniques to match information about age classes to assumptions about a stock's birth, growth, and death rates to estimate a stock's current size, harvest rate, and its management reference points associated with a target reference point. These models also provide forecasts of catch and biomass that managers can use to evaluate the risk associated with a range of harvest options.
2. Empirical or index-based models providing estimates of F (based on size and/or age data) or trends in relative abundance based on as indicator such catch-per-unit-effort (CPUE) from fishery-independent (e.g., surveys) or fishery-dependent (e.g. logbooks) data. Trends are analysed over time, including how they respond to various levels of catch, to provide advice on catches that are expected to maintain the index (considered a proxy for biomass) at a preferred level (i.e., a target reference point).
3. Data-poor or weight of evidence methods are used when there is little to no knowledge of a stock's size or fishery characteristics. Estimates of F might be available, so while they cannot determine the current status of the stock, they can assess whether recent fishing pressure is sustainable. In some instances, the collective outputs of multiple data poor assessment types can be used in a 'weight of evidence' approach to provide TAC/E advice.

Assessment uncertainty and trends in abundance

The precision of stock assessments depends on the quality and quantity of data available, the complexity of the models used, and the inherent variability of the fish population itself. Generally, the risk to a resource increases as fewer data are available due to biases in the assessments and slow response times to unexpected declines in resource status (Dichmont, et al. 2016).

While species assessed using data-limited methods are inherently at more risk due to uncertainty in the assessment outputs, even those assessed using robust quantitative stock assessments can be uncertain if the assumptions around life-history parameters are erroneous or dated (Evans, et al. 2022). Similarly, climate risk assessments will become uncertain (or less reliable) over time unless assumptions about species productivity and climate drivers are reviewed or updated. In addition, new climate information will become available (e.g., improved projections of physical environmental change which could modify estimates of future productivity at all levels). This means climate projections for individual species or ecosystem will also age, potentially becoming less reflective of likely future states.

Trends in estimated biomass should also be considered. Two species might have similar estimates of biomass, however, if one has an increasing trend in biomass, and the other a declining trend in biomass, the latter should be considered higher risk. If increased variability is predicted for a species, the risk should be based upon the likely overall trend over time.

[3] https://www.fisheries.noaa.gov/insight/stock-assessment-model-descriptions#stock-assessment-models

This framework does not propose to incorporate a buffer to account for time-induced uncertainty in stock assessments or climate risks, however, to ensure a level of risk equivalency at Step 1, the RAGs should use expert judgement (or metrics where available) to determine whether time-induced uncertainty associated with the stock assessment outputs and overall trends in estimated (or proxies) warrant a change to the risk ranking.

Example: Species A is assessed using a quantitative stock assessment that incorporates a long-term time-series of fishery dependent data and biological information derived from sampling in the early 2000's. The median estimate of stock abundance is 38%B_0 – a decline from 41%B_0 at the time of the last stock assessment[4]. Assuming a target of 48%B_0 this stock would be ranked as 'medium' risk with regards to stock status (See Table 2). However, likelihood profiles suggest a broad range of plausible biomass estimates ranging 28-44%B_0. The declining trend in biomass, dated biological information, and uncertainty around the estimate of current biomass should be taken into consideration when resolving the stock status risk at Step 1. In this instance, the RAG may consider a risk ranking of 'high' more appropriate.

Guidance notes – Step 1

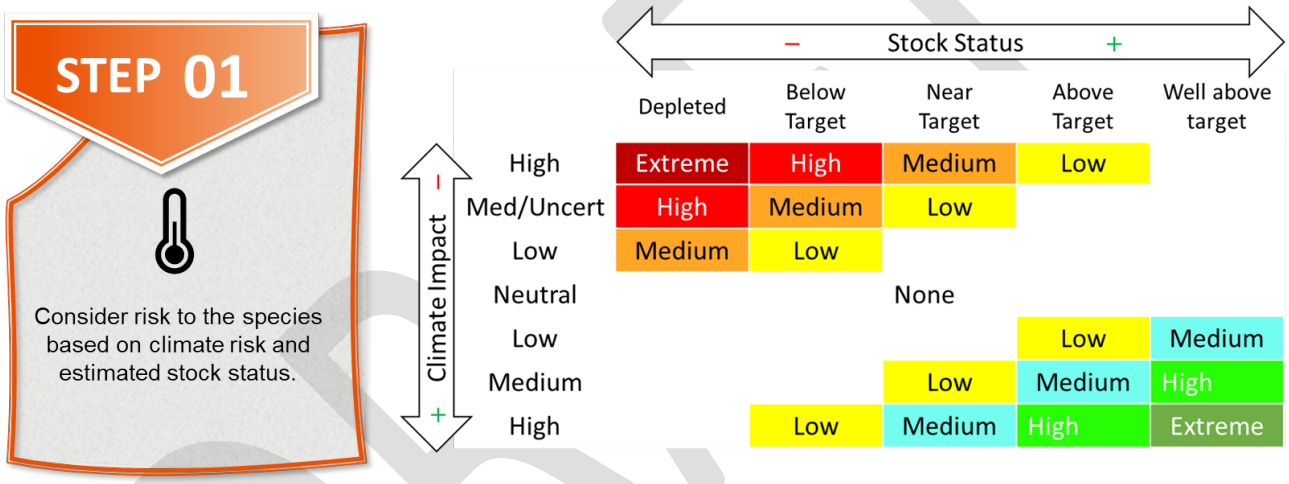


Figure 5 (Step 1) Preliminary risk rankings based on climate risk and stock status risk.

It is the role of the RAG to assess the overall risk to a species from climate risk (Table 1) and stock status risk (Table 2) using the most recent and robust information available. If two equally robust pieces of information indicate different risk rankings, the highest risk ranking should be used.

Using the matrix in Figure 5, a preliminary risk score can be determined. These progress from 'Extreme Negative' where a species is below the limit reference point and highly susceptible to climate change, to 'Extreme Positive' where a species is near virgin biomass levels and expected to benefit from climate change.

Note: Only species with a score of medium or above (positive or negative) need to progress to Step 2. Step 4 must be completed for all species.

[4] Revised in the most recent stock assessment.

Table 1 AFMA Climate Risk Framework - climate risk ranking criteria

CLIMATE RISK	1. Attribution studies or counterfactual simulations	2. Preliminary projections of change in abundance	3. Climate sensitivity assessment	4. Climate and ecosystem indicators
High	Climate change is the primary driver of stock abundance.	>20% change by 2040 with moderate to high confidence, OR >40% change with low confidence.	If projections are not available, where climate sensitivity has been rated high.	Relevant climatic or ecosystem indicators show adverse/positive signals in the near history and in short-medium term predictions
Uncertain	Where no information is available, significant uncertainty exists in available modelling and/or assessments, or both increases and decreases are considered equally possible.			
Medium	Climate change is contributing to changes in stock abundance.	10-20% change by 2040 with medium or high confidence, OR 10-40% change with low confidence.	If projections are not available, where climate sensitivity has been rated medium.	General climatic or ecosystem indicators indicate some changes to system productivity (e.g., recent marine heatwave in the fishery region)
Low	Climate Change is only a minor contributor to changes in stock abundance.	Up to 5% change by 2040 with medium or high confidence, OR 5-10% change with low confidence.	If projections are not available, where climate sensitivity has been rated low.	General climatic or ecosystem indicators indicate negligible changes to system productivity.
Neutral	Climate change does not have an influence on the stock.	Projections predict relative stability in abundance.		General climatic or ecosystem indicators indicate no change in system productivity

Table 2 AFMA Climate Risk Framework Stock Status Risk Ranking Criteria

STOCK STATUS RISK	1. Robust assessments of F and B	2. Empirical or index-based assessments	3. Data-poor methods or weight of evidence approaches
Depleted	Biomass is estimated to be below the limit reference point (LRP).	Recent index of abundance is estimated to be below the LRP. e.g., $CPUE_{REC}$ <$CPUE_{LIM}$	Available information suggests that the stock is depleted. Assessed as extreme high risk in the most recent ERA.
Below Target	Biomass is estimated to be above the LRP, but less than 75%B_{TARG}. e.g., <36%B_0 relative to a B_{48} target.	Recent index of abundance is estimated to be above the LRP but less than 75% of the TRP. e.g., $CPUE_{REC}$ < .75*$CPUE_{TARG}$.	Available information suggests the stock is not depleted or biomass is uncertain. Assessed as high risk in the recent ERA.
Near Target	Biomass is estimated to be within 25% of B_{TARG}. e.g., Between 36%B_0 and 60%B_0 relative to a B_{48} target.	Recent index of abundance is estimated to be within 25% of the TRP. e.g., $CPUE_{REC}$ is 0.75-1.25*$CPUE_{TARG}$.	Available information suggests the stock is sustainable and not subject to overfishing. Assessed as low risk in the most recent ERA
Above Target	Biomass is estimated to be more than 25% above the TRP. e.g. >60%B_0 relative to a B_{48} target.	Recent index of abundance is estimated to be more than 25% above the TRP. e.g., $CPUE_{REC}$ is >1.25*$CPUE_{TARG}$.	Available information suggests the stock has only been lightly exploited. Assessed as low risk in the most recent ERA
Well above target	Biomass is estimated to be within 25% of virgin biomass. i.e., >75%B_0.	Recent index of abundance is estimated to be more than 50% above the TRP. i.e., $CPUE_{REC}$ is >1.5*$CPUE_{TARG}$	

Step 2: Review existing mitigation and adaptation measures

Once the risk to the stock has been determined, the RAG needs to consider whether the existing science, management or industry adaptation measures in place are sufficiently responsive to the impacts of climate change, be they positive or negative. The mechanisms that are available and appropriate will depend on the fishery, species, and the sophistication of the stock assessments, harvest strategy and management arrangements.

The intent of Step 2 is to identify measures that have been taken to mitigate the risk of climate change for a species. Examples are provided here to illustrate how the impact of climate change on a species can be mitigated using measures this framework broadly refers to as 'science', 'management' or 'industry' adaptation.

There is not always a clear delineation between 'science', 'management' and 'industry' measures, as they are often intrinsically linked. For example, changes to stock assessment parameters (science) will translate to changes in TACs allocated as quota (management) which may influence fisher behaviour (industry adaptation). The examples are not exhaustive, and in some cases are still being explored as concepts. In practice, a mix of the three will exist in most fisheries. Provided these measures are sufficiently articulated, and their impact understood, the category they fall into is less important.

While many measures can be expected to reduce risk, it is important to consider the potential risks of 'maladaptive' responses. For example, fishing effort is redistributed due to shifts in stock distribution or the introduction of closures – this may increase the susceptibility of a different life history stage of the species or susceptibility of another species.

Science measures

Time-varying (or recent estimates of) life history and productivity parameters included in stock assessment models and projections. For example, high or low recruitment scenarios should be used to project future biomass where recruitment deviations show a long-term and consistent trend in recruitment success indicative of a change in productivity. These projections are typically only valid for a short period of time but are a useful way to illustrate the consequence of changes in recruitment and explore options for adjusted TACs.

Linking parameters in stock assessments to environmental variables. For example, sea-surface temperature could be used to modify the assumptions regarding life history traits, such as growth, used within a model. Careful consideration must be given to the resulting behaviour of the other standard parameter estimates.

Harvest Control Rules (HCRs). These are pre-determined rules that link the status of the fishery to management actions and typically result in more precautionary management actions if fishery status is low, or opportunistic measures if the fishery status is high. They are expected to account for uncertainties in both the current and prospective future stock status, and could include any uncertainties or observed changes that are caused by climate change (e.g., changes in species productivity, spatial distribution, ecosystems or fisheries operation). HCRs are usually selected on the basis of Management Strategy Evaluation (MSE) testing.

Management Strategy Evaluation (MSE). Compares the potential outcomes of alternative management actions across the objectives of management and can include climate scenarios when climate change is agreed to have caused, or is causing, a change. Where climate impacts are unknown, MSEs could include evidence from the fishery, or other similar fisheries, to understand the relative chance of the climate

effect occurring and the consequences to the fishery if it does occur. These are steps that are common in risk assessments, but they are not often applied to actual or potential climate change effects.

Dynamic reference points. Can be used to account for shifts in productivity. Shifts in productivity (non-stationarity) can be addressed by defining stock status (i.e., spawning biomass relative to unfished spawning biomass) using 'dynamic B_0' – the spawning biomass that would be expected in the absence of fishing. The implications of adopting a dynamic B_0 approach differs among species, with quite major changes in stock status and catch limits for some species and negligible changes for others (Bessell-Browne, et al. 2022). It has been shown that, in some cases, application of dynamic reference points can lead to a higher risk. This needs to be considered.

Ecosystem information provides context for stock assessment processes. This involves providing best available information on ecosystem and environmental properties to set the context for decision making or for any adjustments to be made to recommendations coming from stock assessments. For example, in years where environmental conditions have been poor (e.g., marine heatwaves or lower levels of primary production) then caution would be advised around any expansion of the fishing footprint or increases in recommended biological catch.

Ecosystem modelling informs stock assessment processes. This is where output from ecosystem modelling is used to modify operational considerations. For example, checking for unintended ecosystem consequences of recommendations coming from stock assessments; or considering driver interactions; or deriving time varying parameter values, reference points or exploitation rates from the ecosystem model (as has been done in a small number of systems in the USA and Scandinavia) and using that to modify what is used by (or comes from) the standard stock assessment process. Or joint climate informed "ecoviability" envelopes that look to find levels of fishing pressure that account for climate influenced productivity, economic and social objectives (as have been calculated for a small number of fisheries in Europe)**.**

Ecosystem model-based indicators. For example, ecosystem models can be used to correct target F to account for food web interactions. Another example is when recommended catches from single species assessments are selected against ecosystem measures (such as the "green band") to check for distortive pressure on ecosystem structure.

Monitoring and research. While on its own will not reduce on-the-water risk to a species, can provide fisheries scientists (and managers) with further insight to reduce uncertainty and understand risk, which then enables more tangible actions to be taken. For some species, particularly those ranked as negligible or medium risk, promoting monitoring and research may be a sufficient response to climate risk in the short-term. However, it cannot be used to reduce risk unless other measures are also in place.

For species with less sophisticated stock assessments, or no assessment at all, the RAG may choose to use less technical options to mitigate risk. These are likely to be case-specific but could include 'borrowing' attributes from species with similar life-history characteristics (e.g., in ERAs) or applying generic discounts (buffers) to assessment outputs.

Management Measures

The management measures available will also depend on the size and complexity of the fishery. In small single-species fisheries, targeted measures like closures or gear restrictions are likely to be effective mitigation options. However, in larger and more complex fisheries, particularly multi-species and multi-gear fisheries, technical interactions (the catch of a mix of species using a single gear type) may render similar options ineffective or undesirable. Positive climate impacts may not be able to be realised in multi-species fisheries with clear technical interactions. The management options listed here are not exhaustive and will be more applicable in some fisheries than others.

Catch limits. These can be adjusted to control total mortality of a species, depending on the risk profile. Catch limits are typically derived from outputs of a stock assessment or survey followed by application of a harvest strategy and are sometimes subject to **discount factors** or **buffers** that account for uncertainty or risk. In some cases, particularly in multi-species fisheries, they can be further adjusted to minimise unintended catch of associated bycatch species.

Spatial/temporal closures. Typically designed to control catches of at-risk species by preventing fishing in an area, either permanently or at certain times of the year. While closures are particularly effective for sessile species like scallops, they can also be targeted temporally and spatially to protect vulnerable age-classes of mobile or migratory species, such as juveniles or older spawning fish. Changes in zoning, or other reductions in fishing footprint as a result of other users of the marine estate (e.g., wind farm exclusion zones) should also be considered as they may indirectly mitigate climate-fishery risks for some species. Managers should consider modifying closure boundaries as risk profiles change, or as shifts in distribution become apparent.

Flexible season dates. Allows for key biological process to occur undisturbed by fishing activity (e.g., spawning prawn migration from estuaries to the ocean) or to align with expected aggregations and promote catching efficiency (e.g. orange roughy on seamounts). Flexible season dates allow industry to adapt to climate-driven changes in the fishery.

Gear modification can include amendments to existing gear to improve selectivity (e.g., increase mesh size) or the addition of exclusion devices to prevent capture of vulnerable species (e.g., turtle exclusion devices). Gear modification may be an effective solution if climate change is known to impact a particular species or age-class.

Buffers may be considered an appropriate option to adjust the TAC/E for a stock where the risk or uncertainty has not been sufficiently dealt with elsewhere. The RAG and MAC should use their expert judgment to recommend the size of the buffer, with consideration for the following factors:

- The climate risk rating and stock status of the species,
- The impact climate change is having (or is predicted to have) on the species,
- The role of the species in the ecosystem and fishery,
- Other discounts already included in the development of the RBC, and
- Other mitigating factors in the management of the fishery (e.g., spatial closures).

There are often a mix of management controls in place for each fishery. Some are species-specific, while others are broader. The RAG and MAC should take note of the various measures in place and determine the cumulative benefits to the species.

Industry Adaptation Measures

While governments and natural resource managers consider climatic changes, many marine-dependent individuals, organisations, and user-groups in fast-changing regions of the world are already adjusting their behaviour to accommodate these (Pecl, et al. 2019). The fishing industry is constantly adapting to change – market demands, operational challenges, legislative reform, technology advancements, and certainly, climate change. Some examples are provided here to illustrate how industry could adapt to climate-driven risks in the fishery, and would be considered voluntary (i.e., not enforced by management).

Regional catch limits. Can be agreed across a fleet to allow for vulnerable populations to rebuild. While catch could be taken equally across the species distribution, industry may agree to constrain catches in some areas of the fishery without the need for formal closures or catch limits.

Gear modification. Can be an effective way of excluding non-target species or age-classes that are particularly vulnerable to climate change. These may be adopted across an entire fleet (e.g., increased mesh size) or used only by operators that work in certain parts of the fishery.

Changes to fishing effort. This can take many forms. Redistribution of effort across the area of the fishery is likely to occur as stocks shift in response to changed oceanic conditions. Industry may actually fish less days, or fish longer/harder on some days, if severe weather conditions mean there are less days when it is safe to fish.

Data collection programs. These are becoming more prevalent in Australia as the fishing industry and management agency establish co-management agreements. While this typically involves collecting traditional biological data to support stock assessments (length and age) it could also include routine collection of environmental data to support ecosystem modelling and forecasting (Souza, et al. 2023).

Switching target species may occur in response to a change in a stocks size or distribution. This may occur in a change in the species mix rather than complete species shifts.

Guidance notes – Step 2

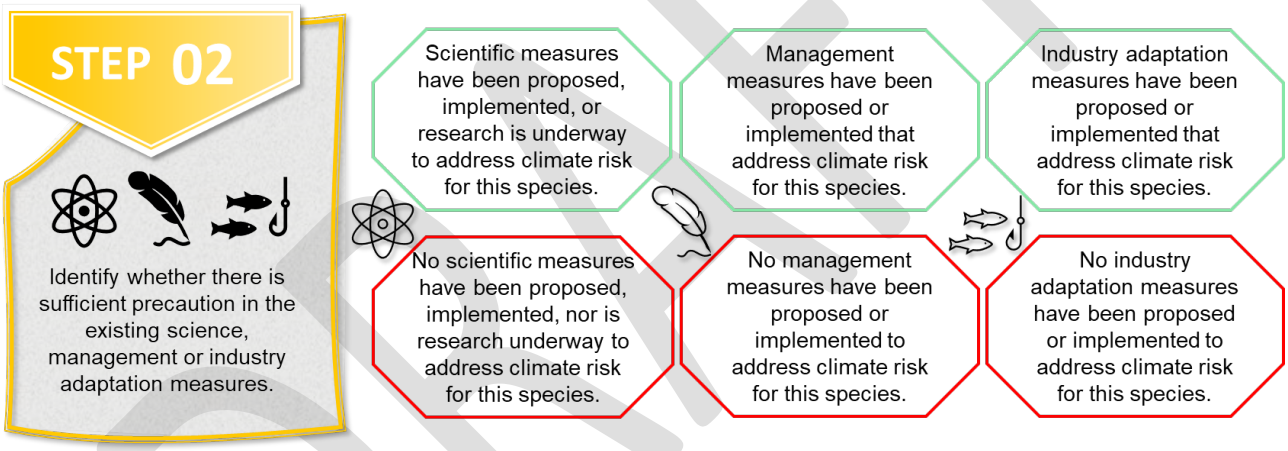


Figure 6 (Step 2) Review of existing science and management measures

The RAG should record the measures identified and how they translate to a reduction in risk for each species. This will not always be easily quantifiable, however, if there are instances where alternate scenarios have been forecast to understand their impact, this should be included. An example is provided at **Appendix A**.

Where a species is expected to benefit from climate change, the RAG and MAC should consider whether the arrangements are sufficiently responsive to potential productivity benefits. For example, can TACs be modified within season, or closures removed to allow full utilisation.

Step 3: Determine the residual risk

Once the measures in Step 2 have been recorded, the RAG and MAC need to determine the residual risk ranking. Each residual risk ranking is associated with additional guidance (Figure 7) that should inform advice provided to the AFMA Commission at Step 4.

Guidance Notes – Step 3

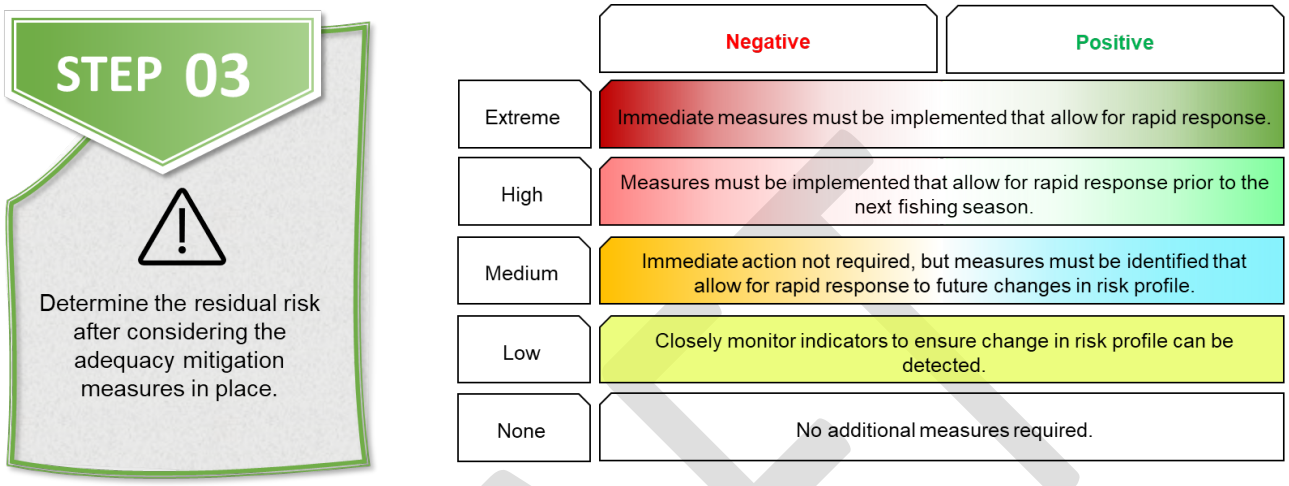


Figure 7 (Step 3) Residual risk analysis rankings and associated guidance

The risk profile can change where there are clear and demonstrable measures in place to mitigate or respond to the impacts of climate change for a species. The extent to which the risk changes is at the discretion of the RAG and MAC but should be supported by data or modelling where it is available. When providing advice to the AFMA Commission, there must be sufficient detail about how the measures identified at Step 2 are expected to take account of or mitigate the impacts of climate change. A detailed justification for each of the proposed measures will build confidence and facilitate informed decision-making by the AFMA Commission.

In some instances, it might be the case that research is underway, or measures have been proposed but are not yet implemented. In this case, the risk has not actually been treated, so the residual risk should remain the same.

If there are no measures identified in Step 2 that reduce the risk for a species, the original risk ranking will remain the same.

Some examples are provided at **Appendix B** to demonstrate how risk could be adjusted (or not) at Step 3 based on measure identified at Step 2.

Step 4: Provide advice to the AFMA Commission

The RAG and MAC must provide advice to the AFMA Commission for each species to conclude the process. The advice can be simple for species assessed as low risk at Step 1 (where Steps 2-3 have been bypassed) and conclude that no additional measures are required. For species with higher risk rankings, advice to the AFMA Commission will be more detailed. In providing their advice, RAGs need to demonstrate and clearly articulate the reasons for that advice.

The intent of the Climate Risk Framework is to identify proportionate adjustments to mitigate climate risk. Some will be short-term measures, such as TAC reductions, while others will be longer-term, such as incorporating environmental variable in stock assessments.

Longer-term and more comprehensive adaptation plans are also being progressed by AFMA through the Climate Adaptation Program.

Guidance notes – Step 4

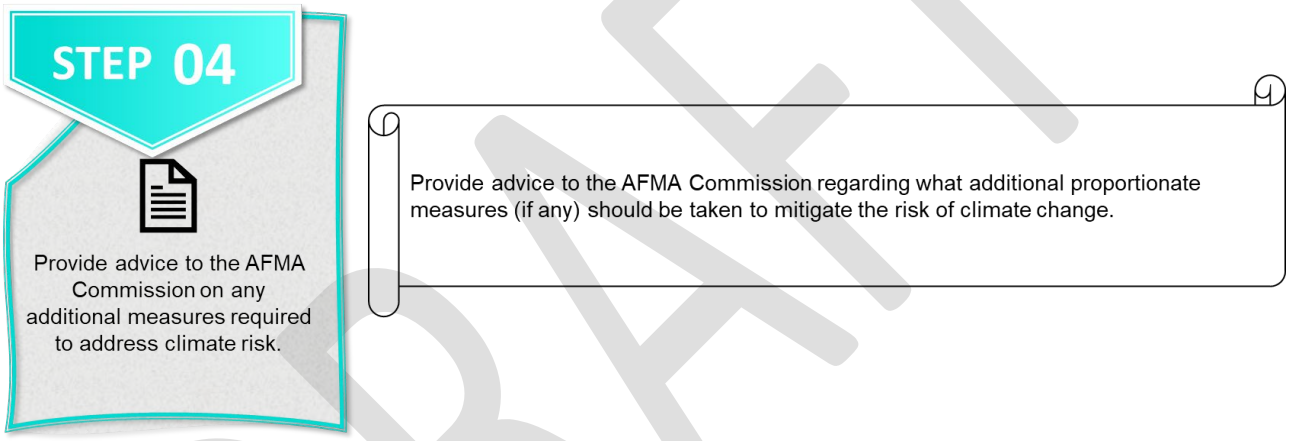


Figure 8 (Step 4) Providing advice to the AFMA Commission

A risk ranking of 'low' does not preclude the RAG or MAC from providing advice about additional measures, particularly where they are designed to reduce uncertainty or future-proof the fishery. This might include additional data collection or more frequent review of fishery indicators.

For any species with a residual risk ranking of medium or higher, the RAG and MAC must provide advice to the AFMA Commission regarding additional proportionate measures to mitigate risk to the species. For species with an extreme or high-risk ranking, particularly where the risk is associated with climate drivers, these should be tangible measures beyond application of the harvest strategy that are expected to mitigate risk.

An example is provided at **Appendix A** to demonstrate how Steps 1-4 should be recorded for each species.

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Appendix A

Species Assessment Report (Example)

Common Name	Southern Kraken
Species Name	*Piscis Fictitious*
Fishery	East Australian Squid Jig Fishery
Stock Assessment	Sverre (2022)

Step 1 – Consider risk to species based on climate risk and estimated stock status

Climate Risk	High **(Negative)** (Criteria 1) Atlantis modelling suggests that climate change has a major influence on the biomass and is contributing to a much lower biomass than would have occurred otherwise.
Stock Status Risk	Low (Category 1) The 2022 Tier 1 stock assessment estimated the 2023 biomass to be 44%B_0.
Overall Risk	Medium **(Negative)**

Step 2 – Identify whether there is sufficient precaution in the existing science or management setting

Science	A low recruitment scenario was used to project future catches on the basis that recruitment deviations are estimated to be below (albeit only slightly) the long-term average since 2012. Additional model sensitivities were explored: - Changing weighting on length and age data resulted in small changes to stock status estimates. - Doubling and halving weighting on the survey index resulted in large changes to total likelihood estimates but had minimal impact on stock status (41% and 49% of B_0). - All model sensitivities estimate the stock status to be at or above 40%B_0.
Management	No management measures have been proposed or implemented to respond to climate risk for this species.

Industry	Industry has implemented a voluntary move-on arrangement. If catches include large amounts of juvenile fish, vessels will steam 3nm and not return to the area for 48 hours.

Step 3 – Determine the residual risk after considering the adequacy of science and management measures in place

Residual Risk	Low **(Negative)**
Comments	Implementing the low recruitment scenario takes account of a potential shift in productivity and resulted in a lower TAC, allowing recovery towards the target reference point. While no specific management measures have been implemented (beyond a reduction to the TAC) additional industry move-on agreements should provide a level of protection to younger cohorts. The next stock assessment is scheduled for 2025 which will provide an opportunity to review the indicators and effectiveness of these measures.

Step 4 – Provide advice to the AFMA Commission on any additional measures required to respond to climate risk

Recommendation	The RAG and MAC are satisfied that the measures are proportionate to the risk identified for this species. No additional measures are required. The stock assessment will go ahead as scheduled in 2025 and the RAG will monitor fishery indicators.

Appendix B

Residual Risk Examples

Extreme → Medium (Negative): A species is ranked extreme (negative) risk because it was recently assessed as depleted (using a robust stock assessment) and is considered high risk from climate change. The stock assessment parameters were updated to include a revised estimate of natural mortality, and a low recruitment scenario was used to project biomass under various catch scenarios. A bycatch TAC was implemented based on catches that are expected to allow recovery, and a series of targeted closures were implemented to ensure total mortality is constrained. Recent catch and effort data suggests that total mortality is sufficiently low to allow recovery. This species' risk ranking could be reduced to medium because there are a number of science and management measures in place, and there is data to show total mortality has been constrained. The RAG and MAC might consider additional measures such as species-specific monitoring to closely monitor range shift and ensure spatial closures remain effective.

Medium → Low (Negative): A species is ranked medium (negative) risk because it was recently assessed as being just above the limit reference point (using an empirical stock assessment) and is considered medium risk from climate change. The default reference period in the stock assessment was adjusted and is now based on a period considered to be comparable with current environmental conditions. The RBC is based on fishing mortality that is expected to allow recovery, however, this species is primarily caught as a byproduct species, and it is unclear whether total mortality can be constrained to this level. This species could be ranked as 'low' risk and the RAG should continue to monitor total mortality.

High → High (Negative): A species is ranked as high (negative) risk because it was recently assessed as being just above the limit reference point (using an empirical stock assessment) and is considered high risk from climate change. The index of abundance has declined over the last two assessments, the estimate is considered uncertain, and the TAC is almost fully utilised. The RAG has recommended that an alternative and more robust stock assessment is pursued, and data collection has commenced. While data collection has commenced, it will be several years before the stock assessment is expected to yield results. This species should remain at high risk, and the RAG and MAC should consider additional measure to ensure risk is mitigated until a more robust assessment is available.

High → Medium (Positive): A species is ranked as medium (positive) risk because it is expected to benefit from climate change and was recently assessed as being well above the target reference point – approaching virgin biomass. The estimate of spawning biomass is derived from estimates of daily egg production (survey) and species-specific fecundity. Adult reproductive parameters used in the assessment are based on research conducted approximately 15 years ago, and there is evidence to suggest that fecundity will increase due to recent and future expected environmental conditions. The RAG and MAC may consider a short-term increase to the TAC to promote fishing and support data collection that will enable revisions to life-history parameters. Stock status should be closely monitored.

Last Updated: 2-Dec-24

Climate Risk Framework Species Assessment Report

Common Name: Tropical rock lobster

Species Name: *Panulirus ornatus*

Fishery: Torres Strait Tropical Rock Lobster Fishery

Stock Assessment: Plaganyi et al 2022

Step 1: *Consider risk to species based on climate risk and estimated stock status*

Climate Risk – High (Category 2 – See Table 1)

Tropical rock lobster (TRL, *Panulirus ornatus*) are a relatively short-lived species of spiny lobster that experience large fluctuations in recruitment depending on prevailing environmental conditions (Plagányi et al. 2019). There is a long history of considering climate change impacts and ways to account for these in the management of TRL (Plagányi , Weeks, et al. 2011). Biomass trajectories (Category 2) from climate-linked stock assessment models (Plagányi, et al. 2019a, 2019b), preliminary MICE (Fulton et al. 2018) and other studies (Plagányi, et al. 2018a) suggest a decrease of more than 20-40% is possible.

An integrated assessment of climate-change impacts on lobsters (Norman-Lopez, et al. 2013) as well as an information poor assessment of life history characteristics (Category 3) indicated a high sensitivity to climate change.

Climate & Ecosystem Indicators

Global trends

- 2024 continues to set records for sea surface temperature (SST). June 2024 marked the 12th month of global SSTs reaching 1.5°C above pre-industrial levels (Copernicus 2024).
- In the last decade, sea surface temperatures have been ~0.5°C warmer than the 1960-1990 mean (Bureau of Meteorology 2024), and eight of the ten warmest years on record have occurred since 2010 (Bureau of Meteorology, CSIRO 2022).

Fishery trends

- Increased ocean acidification is expected to occur into the future (State of the Climate 2024).
- Climate & Ecosystem Status Report Torres Strait Kaiar - Tropical Rock Lobster Fishery November 2023 (CSIRO, 2023)
    - Live coral and substrate cover has been increasing since 2018.
    - Seagrass cover has been low in recent years.
    - Industry noted that there has been lots of sponge grass that inhibits lobster movement and sand incursion covering up seagrass.

- Traditional owners and industry representatives also noted that winds have been different to normal and lobster abundance has been good in some areas, with more smaller and medium sized lobsters observed.
- The lobster 1+ (recruits) index in 2022 and 2023 was marginally below the long-term average.

- Comparison between sites and surveys between 2019 and 2021 shows approximately a 1°C increase in temperatures across all sites between the two years (Plagányi, Dutra, et al. 2022).

Stock Status Risk – Well Above Target (Category 2 – See Table 2)

The 2022 stock assessment estimated the 2022 biomass to be 4305 t or 104%B_0 (90% CI 2937-5637 t), which is well above the Target Reference Point (TRP) of 65%B_0 (Plagányi, Dutra, et al. 2023). This is an increase from the 2019 stock assessment which estimated the 2019 biomass to be 93%B_0 (Plagányi, Dutra, et al. 2022). However, the biomass of this short-lived highly variable species can be expected to fluctuate widely from year to year as recruitment is strongly linked to the environment.

The stock assessment uses a baseline biomass (B_0) value of B_{1973}; the model-estimate of spawning stock biomass in 1973 before the start of the fishery, and uses as a target a constant low fishing proportion (F=0.15) that accounts for the large natural variability and precautionary management preferences.

The fishery transitioned from an annual stock assessment to using an empirical Harvest Control Rule (eHCR) in December 2019 to inform the recommended biological catch (RBC) (Plagányi, et al. 2018b) (Plagányi, et al. 2022). The eHCR is a highly adaptive decision rule that is applied annually and adjusts TACs up or down based principally on the results of a fishery-independent pre-season survey (Plagányi, et al. 2024). In other words, the eHCR allows fisheries management to rapidly respond if environmental conditions are unfavourable for lobsters. Further, the long-term lobster and habitat monitoring provides baseline information to inform on climate change and is also an effective method to enable rapid adaptation to changing levels of recruitment (Plagányi et al. 2024). The eHCR is currently being revised with associated Management Strategy Evaluation (MSE) accounting for a broad range of climate change impacts in order to better climate proof the eHCR (Plagányi et al. in prep). Stock assessments are undertaken every three years and the next assessment is due to be completed in 2025.

Overall Risk – None

While there is a high level of risk associated with climate change, the stock is assessed to be 'well above target' resulting in an overall risk rating of 'None'.

Step 2: *Determine if current scientific, management, and industry practices have sufficient precaution*

Science

Stock assessments

A parallel climate-linked stock assessment model has been presented at TLRAG meetings since 2017 and is currently being revised to utilise updated physical data and climate projections (Plagányi, Dutra, et al. 2023).

Research

Dutra, *et al* (2020) found that the Tropical Rock Lobster is at risk from climate change based on life-history characteristics. In particular:

- There were negative effects associated with increased larval and juvenile mortality related to higher sea surface temperatures and detrimental effects on the juvenile lobster's seagrass habitats;
- Experimental studies demonstrated enhanced growth in all life history stages by warmer sea surface temperatures of up to 30 degrees;
- There was an increase in mortality for sea surface temperatures above 29 degrees;
- In contrast to the relatively simple trophic interactions documented in the temperate lobster fisheries, it is likely that a multitude of complex environmental factors influence the TRL population; and
- Changing environmental drivers may also have substantial impacts on the availability of stocks to fishers.

Increased ocean acidification is expected to occur in the future which is an important threat to crustaceans such as the Tropical Rock Lobster. A recent study demonstrated that increasing ocean acidity is impacting the shells of crab larvae, making them more vulnerable to predation as well as weakening support structures for muscles and possibly leading to a loss of important sensory and behavioural functions (Bednarsek, et al. 2020);

The project "Modelling climate change impacts on key fisheries in the Torres Strait to co-develop adaptation and mitigation strategies" will provide fishers and managers with information about the current and future risks of climate change to help them manage fisheries such as the Tropical Rock Lobster (Kaiar), sea cucumber (Aber) and finfish (CSIRO 2023).

A number of studies have also been undertaken to identify critical links in the Torres Strait lobster supply chain in order to build robustness to climate change and other external shocks (Plagányi, et al. 2014) as well as studies to investigate price integration in the Australian lobster industry to inform climate adaptation (Norman-López, et al. 2014).

Management

The fishery is managed using a precautionary approach rather than applying a B_{MEY} target because the stock is a shared resource and is important for traditional fishing. The stock has high variability and industry members recommended that the harvest strategy maintain the stock at a high level (Plagányi, Dutra, et al. 2022).

Within the harvest strategy, there is a decision rule that requires an additional stock assessment to be undertaken for the following year if the pre-season survey indicates that the stock is below the limit reference point (LRP) (Plagányi, Dutra, et al. 2023).

Industry

Since the extreme heating event in 2016, there ae ongoing discussions between scientists, industry and processor around capture and handling of lobsters when sea surface temperature is high. Advice was provided and implemented, for example:

- To keep lobster holding cages deeper in cooler water;
- To pack less densely when temperatures are high because this also reduces oxygen levels;
- Closer monitoring and discussion of discards because it is recognised that this is more of an issue during hot periods;
- The MSE modelling being conducted to inform revision of the eHCR also takes this into account.

The Australian and PNG catch has averaged 673 t per year over the period of 1989-2019. In 2022, the combined PNG-Australia catch was 380 t (Plagányi, Dutra, et al. 2023)

- TLRAG (2022) noted that the lower catch is due to market factors and not because of low lobster abundance, which was taken into account when calculating the RBC for the 2022-23 season (TLRAG 2022).

Step 3: *Determine the residual risk after considering the adequacy of measures identified at Step 2*

Residual Risk – To be resolved by working group, RAG and WG.

Step 4: *Provide advice to the PZJA*

Recommendation - To be resolved by working group, RAG and WG.

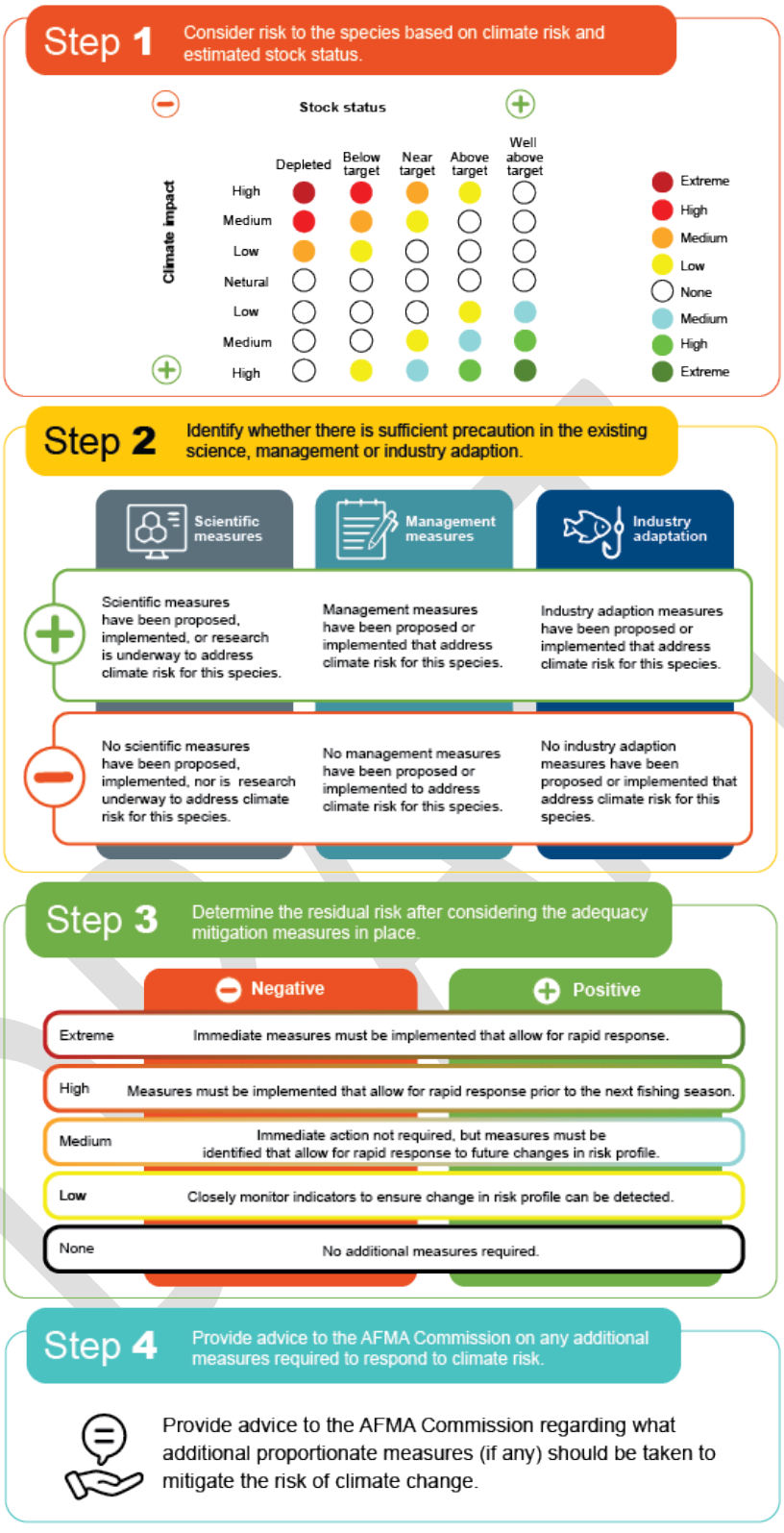

Figure 1 Climate Risk Framework 4-Step Process

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Table 1 AFMA Climate Risk Framework - climate risk ranking criteria

CLIMATE RISK	1. Attribution studies or counterfactual simulations	2. Preliminary projections of change in abundance	3. Climate sensitivity assessment	4. Climate and ecosystem indicators
High	Climate change is the primary driver of stock depletion	>20% change by 2040 with moderate to high confidence, OR >40% change with low confidence.	If projections are not available, where climate sensitivity has been rated high	Relevant climatic or ecosystem indicators show adverse signals in the near history and in short-medium term predictions
Uncertain	Where no information is available, significant uncertainty exists in available modelling and/or assessments, or both increases and decreases are considered equally possible.			
Medium	Climate change is contributing to a decline in stock abundance.	10-20% change by 2040 with medium or high confidence, OR 10-40% change with low confidence.	If projections are not available, where climate sensitivity has been rated medium.	General climatic or ecosystem indicators indicate changing system productivity (e.g., recent marine heatwave in the fishery region).
Low	Climate Change is only a minor contributor to changes in stock abundance.	Up to 5% change by 2040 with medium or high confidence, OR 5-10% change with low confidence.	If projections are not available, where climate sensitivity has been rated low.	General climatic or ecosystem indicators indicate negligible changes to system productivity.
Neutral	Climate change does not have an influence on the stock	Projections predict relative stability in abundance.		General climatic or ecosystem indicators indicate no change in system productivity.

Table 2 AFMA Climate Risk Framework Stock Status Risk Ranking Criteria

STOCK STATUS RISK	1. Robust assessments of F and B	2. Empirical or index-based assessments	3. Data-poor methods or weight of evidence approaches
Depleted	Biomass is estimated to be below the limit reference point (LRP).	Recent index of abundance is estimated to be below the LRP. e.g., $CPUE_{REC}$ <$CPUE_{LIM}$.	Available information suggests that the stock is depleted. Assessed as extreme high risk in the most recent ERA.
Below Target	Biomass is estimated to be above the LRP, but less than 75%B_{TARG}. e.g., <36%B_0 relative to a B_{48} target.	Recent index of abundance is estimated to be above the LRP but less than 75% of the TRP. e.g., $CPUE_{REC}$ < .75*$CPUE_{TARG}$.	Available information suggests the stock is not depleted or biomass is uncertain. Assessed as high risk in the recent ERA.
Near Target	Biomass is estimated to be within 25% of B_{TARG}. e.g., Between 36%B_0 and 60%B_0 relative to a B_{48} target.	Recent index of abundance is estimated to be within 25% of the TRP. e.g., $CPUE_{REC}$ is 0.75-1.25*$CPUE_{TARG}$.	Available information suggests the stock is sustainable and not subject to overfishing. Assessed as low risk in the most recent ERA.
Above Target	Biomass is estimated to be more than 25% above the TRP. e.g. >60%B_0 relative to a B_{48} target.	Recent index of abundance is estimated to be more than 25% above the TRP. e.g., $CPUE_{REC}$ is >1.25*$CPUE_{TARG}$.	Available information suggests the stock has only been lightly exploited. Assessed as low risk in the most recent ERA.
Well above target	Biomass is estimated to be within 25% of virgin biomass. i.e., >75%B_0.	Recent index of abundance is estimated to be more than 50% above the TRP. i.e., $CPUE_{REC}$ is >1.5*$CPUE_{TARG}$.	

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
CATCH AND EFFORT ANALYSES FOR THE 2023-24 FISHING SEASON	Agenda Item 5 (updated) For discussion and advice

RECOMMENDATIONS

1. That the RAG:
    a. **NOTE** the reported landed catch for the Australian Torres Strait Tropical Rock Lobster Fishery (TRL Fishery) (**Attachment 5a**).
    b. **NOTE** the reported landed catch for the PNG Licenced boats operating under cross-endorsement arrangements in the Australian jurisdiction of the TSPZ;
    c. **NOTE** the 2024 reported landed catch for the PNG TRL Fishery as reported by the PNG National Fisheries Authority (NFA) (**Attachment 5b**) and an update to the 2023 reported landed catch (**Attachment 5c**).
    d. **DISCUSS** and **PROVIDE ADVICE** on the catch, effort and catch per unit effort (CPUE) data analyses for the Australian TRL Fishery and cross-endorsed PNG Boats for the 2023-24 fishing season undertaken and presented by CSIRO (**Attachment 5d**).

KEY ISSUES

Australian TRL Fishery catch

2. The Australian TRL Fishery fishing season runs from 1 December through to 30 September the following year. There is a prohibition on the use of hookah gear from 1 December through to 31 January the following year and periodically each month throughout the remainder of the season.
3. The reported landed catch for the Australian TRL Fishery for the 2023-24 fishing season is 200.21 tonnes. All reported catches are from inside the Torres Strait Protected Zone (TSPZ) and Australia's declared outside but near area combined.
4. This equates to about 55.936% per cent of Australia's 357.75.0 kilogram (357.75 tonnes) total allowable catch (TAC) for the 2023-24 fishing season. This catch data is sourced from Torres Strait Fisheries Catch Disposal Record (TDB02) and electronic Catch Disposal Records (e-CDRs) and covers the Traditional Inhabitant Boat (TIB) and Transferable Vessel Holder (TVH) sectors.
5. The TIB sector caught 107.67 tonnes of TRL which equates to 45.46 per cent of the TIB TAC and the TVH sector caught 92.54 tonnes of TRL which equates to 75.53% per cent of the TVH TAC.
6. A summary of the reported landed catch for the Australian TRL Fishery is provided at **Attachment 5a.**

PNG Cross-endorsed catch

7. Two PNG Licenced boats fished in the Australian jurisdiction of the TSPZ under cross-endorsement arrangements. The boats were granted Treaty endorsements on 1 March 2024 and permitted to fish until the earlier of catching their 92.75 tonne entitlement, or the end of the TRL season on 30 September 2024. The two boats, *FV Jupiter* and *FV Ding Thang* undertook four, and five fishing trips respectively between 13 April and 2 July 2024.
8. The total reported landed catch for both boats is 12.49 tonnes, with 5.71 tonnes caught by *Jupiter* and 6.79 tonnes caught by Dinh Thang. This equates to 14 per cent of the total 92.75 tonne catch entitlement for PNG licenced boats in Australian waters.
9. Both boats were required to complete the TRL04 daily fishing logbooks. An analysis of this will be presented by CSIRO.

PNG TRL Fishery catch

10. The PNG TRL Fishery fishing season runs from 1 January through to 31 December each year. There is a prohibition on the use of hookah gear in the waters of Western Province and Torres Strait from 1 December through to 31 March the following year.
11. The total reported catch of the PNG TRL Fishery for 2024 is provided in **Attachment 5b**.
12. The TAC for the PNG TRL Fishery in 2024, in PNG waters was 79.5 kilograms.
13. On 3 June 2024, AFMA received updated PNG TRL Fishery catch data for the 2023 fishing season (Attachment 5c). The RAG is invited to note the update to the reported catch total for the 2023 season.

Total reported commercial catch for the TRL stock

14. The total reported commercial catch for the TRL stock is:

Area	Total (kg)	TAC (kg)	Remaining (kg)
Australian TRL Fishery (1 Dec 2023 – 30 Sept 2024)	200,206.19	357,750	157,543.81
PNG TRL Fishery* (January – September 2024)	120,642.04	79,500	-41,142.04
catches inside the TSPZ	80,946.12		
catches outside the TSPZ	39,695.92		
PNG catch allocation within Australian waters	12,493.14	92,750	80,256.86
Total	**333,341.37**	**530,000**	**196,658.63**

* Reported as at 12 November 2024.

Catch and catch per unit effort (CPUE) data analyses

15. The annual data summary to be presented by CSIRO under this agenda item reviews the nominal and standardised catch per unit effort (CPUE) from the TIB and TVH sectors, as well as total catch from all sectors, the size-frequency information provided from a sub-sample of commercially caught TRL and the fishery-independent survey indices of 0+ and 1+ age lobsters. The data summary is used as an indicator to identify if catches correspond to the RBC, and to monitor CPUE (section 2.9 of the TRL Harvest Strategy).
16. The RAG is asked to consider the following catch and CPUE analyses CSIRO has prepared for the 2023-24 fishing season and provide advice as appropriate (*TS TRL Data and CPUE summary paper* (**Attachment 5d**).
17. These analyses will be presented by CSIRO at the meeting. The total catch data and standardised CPUE indices for the TVH and TIB sectors are key inputs to the empirical harvest control rule (eHCR)).
18. Further analyses of the November 2024 pre-season survey data will be presented under **Agenda Item 6**.

Table 1. Reported landed catch (kilograms whole weight) of Tropical Rock Lobster (TRL) for the Australian Torres Strait TRL Fishery by month and sector for the 2023-24 fishing season.
Source: Torres Strait Fisheries Catch Disposal Records (TDB02) and electronic Catch Disposal Records as at 4 November 2024.

Month	Traditional Inhabitant Boat (TIB) sector	Transferable Vessel Holder (TVH) sector	Total (kg)
Dec-23	8,316.79	-	8,316.79
Jan-24	7,844.58	-	7,844.58
Feb-24	15,395.83	19,481.13	34,876.96
Mar-24	16,496.76	3,851.79	20,348.55
Apr-24	14,515.04	11,306.15	25,821.20
May-24	9,910.90	8,910.64	18,821.54
Jun-24	15,222.84	38,467.32[#]	69,122.46
Jul-24	8,682.43		
Aug-24	6,749.88		
Sep-24	4,531.65	10,522.45	15,054.11
Total reported catch (kg)	**92,539.48**	**107,666.71**	**200,206.19**
TAC (kg)	**236,836.94**	**120,913.06**	**357,750**
Reported catch as a per cent of the TAC*	**45.46%**	**75.53%**	**55.96%**

[#] In accordance with AFMA's Information Disclosure policy (*Fisheries Management Paper 12*), catches by month have been aggregated for June through to August 2024, as less than 5 boats operated in the Transferable Vessel Holder (TVH) sector. This data is sourced from raw Catch Disposal Records (TDB02) and electronic Catch Disposal Records, and may not account for data cleaning undertaken by CSIRO during CPUE analysis.

Table 2. Reported landed catch (kilograms) of TRL for the PNG Torres Strait TRL Fishery by month and processed weight for the 2024
Source: PNG National Fisheries Authority as at 12 November 2024

PNG Jurisdiction of the TSPZ: Jan - Sept 2024				
Month (2023)	Tail weight (kg)	Tail wt converted to whole wt (C. factor 2.677)	Whole weight (kg)	Total Catch (kg)
JANUARY	287.50	769.6375	4,453.71	5,223.35
FEBRUARY	24.30	65.05	4,537.60	4,602.65
MARCH	8.30	22.22	2,125.00	2,147.22
APRIL	2,387.10	6,390.27	2,386.90	8,777.17
MAY	1,374.70	3,680.07	4,675.70	8,355.77
JUNE	1,200.50	3,213.74	15,022.00	18,235.74
JULY	1,147.00	3,070.52	6594.2	9,664.72
AUGUST	877.63	2,349.42	11477.8	13,827.22
SEPTEMBER	140.90	377.19	9,735.10	10,112.29
TOTAL	**7,447.93**	**19,938.11**	**61,008.01**	**80,946.12**

PNG Waters outside but near TSPZ: Jan - Sept 2024				
Month (2023)	Tail weight (kg)	Tail wt converted to whole wt (C. factor 2.677)	Whole weight (kg)	Total Catch (kg)
JANUARY	47.40	126.89	2,175.50	2,302.39
FEBRUARY	406.50	1,088.20	1,322.80	2,411.00
MARCH	11.30	30.25	1,665.70	1,695.95
APRIL	677.70	1,814.20	1,810.60	3,624.80
MAY	84.10	225.14	2,558.70	2,783.84
JUNE	14.40	38.55	6,816.30	6,854.85
JULY	23.80	63.71	2,424.70	2,488.41
AUGUST	22.40	59.96	11,416.30	11,476.26
SEPTEMBER	30.90	82.72	5,975.70	6,058.42
TOTAL	**1,318.50**	**3,529.62**	**36,166.30**	**39,695.92**

PNG Catch Total: Jan - Sept 2024				
Month (2020)	Tail weight (kg)	Tail wt converted to whole wt (C. factor 2.677)	Whole weight (kg)	Total Catch (kg)
JANUARY	334.90	896.53	6629.21	7,525.74
FEBRUARY	430.80	1,153.25	5860.4	7,013.65
MARCH	19.60	52.47	3790.7	3,843.17
APRIL	3,064.80	8,204.47	4197.5	12,401.97
MAY	1,458.80	3,905.21	7234.4	11,139.61
JUNE	1,214.90	3,252.29	21838.3	25,090.59
JULY	1,170.80	3,134.23	9018.9	12,153.13
AUGUST	900.03	2,409.38	22894.1	25,303.48
SEPTEMBER	171.8	459.91	15710.8	16,170.71
TOTAL	**8,766.43**	**23,467.73**	**97,174.31**	**120,642.04**

Table 3. Reported landed catch (kilograms) of TRL for the PNG Torres Strait TRL Fishery by month and processed weight for the Jan – Dec 2023.
Source: PNG National Fisheries Authority reported as at 6 June 2024.

PNG Catch Total: Jan - Dec 2023				
Month (2020)	Tail weight (kg)	Tail wt converted to whole wt (C. factor 2.677)	Whole weight (kg)	Total Catch (kg)
JANUARY	700.30	1,874.70	6,659.97	8,534.67
FEBRUARY	265.80	711.55	8,155.84	8,867.39
MARCH	832.90	2,229.67	15,469.40	17,699.07
APRIL	431.00	1,153.79	15,531.30	16,685.09
MAY	653.70	1,749.95	13,781.10	15,531.05
JUNE	34.00	91.02	8,681.90	8,772.92
JULY	326.40	873.77	9,342.01	10,215.78
AUGUST	138.11	369.72	8,305.30	8,675.02
SEPTEMBER	757.6	2,028.10	6207.7	8,235.80
OCTOBER	147.9	395.93	5725.5	6,121.43
NOVEMBER	10.1	27.04	493.1	520.14
DECEMBER	30.5	81.65		81.65
TOTAL	**4,328.31**	**11,586.89**	**98,353.12**	**109,940.01**

PNG Jurisdiction of the TSPZ: Jan - Dec 2023				
Month (2023)	Tail weight (kg)	Tail wt converted to whole wt (C. factor 2.677)	Whole weight (kg)	Total Catch (kg)
JANUARY	376.20	1007.0874	3,516.23	4,523.32
FEBRUARY	152.10	407.17	4,804.71	5,211.88
MARCH	437.80	1,171.99	9,781.00	10,952.99
APRIL	328.90	880.47	8,790.60	9,671.07
MAY	181.30	485.34	6,893.50	7,378.84
JUNE	18.40	49.26	3,506.70	3,555.96
JULY	71.60	191.67	6341.4	6,533.07
AUGUST	41.90	112.17	6044.2	6,156.37
SEPTEMBER	642.60	1,720.24	4,408.60	6,128.84
OCTOBER	73.70	197.29	3335.4	3,532.69
NOVEMBER	4.5	12.0465		12.05
DECEMBER	2.1	5.6217		5.62
TOTAL	**2,331.10**	**6,240.35**	**57,422.34**	**63,662.69**

PNG Waters outside but near TSPZ: Jan - Dec 2023				
Month (2023)	Tail weight (kg)	Tail wt converted to whole wt (C. factor 2.677)	Whole weight (kg)	Total Catch (kg)
JANUARY	324.10	867.62	3,143.74	4,011.36
FEBRUARY	113.70	304.37	3,351.13	3,655.50
MARCH	395.10	1,057.68	5,688.40	6,746.08
APRIL	102.10	273.32	6,740.70	7,014.02
MAY	472.40	1,264.61	6,887.60	8,152.21
JUNE	15.60	41.76	5,175.20	5,216.96
JULY	254.80	682.10	3,000.61	3,682.71
AUGUST	96.21	257.55	2,261.10	2,518.65
SEPTEMBER	115.00	307.86	1,799.10	2,106.96
OCTOBER	74.20	198.63	2,390.10	2,588.73
NOVEMBER	5.60	14.99	493.10	508.09
DECEMBER	28.40	76.03	-	76.03
TOTAL	**1,997.21**	**5,346.53**	**40,930.78**	**46,277.31**

Reported catch at Dec 2023	Extrapolated catch from TRLRAG 35 (Dec 2023)	Updated reported catch as at June 2024
30 tonnes	36.6 tonnes	109.4 tonnes

Torres Strait Tropical Rock Lobster Fishery – Summary of Catch and Effort Data pertaining to the 2024 Fishing Season (Dec-2023 to Sep-2024)

Roy Deng, Denham Parker, Steven Edgar, Éva Plagányi, Laura Blamey, Nicole Murphy, Leo Dutra, Kinam Salee and Mark Tonks

CSIRO Environment

December 2024

1. Introduction

This paper provides a summary of the catch and effort data pertaining to the Torres Strait Tropical Rock Lobster (TSTRL) fishery during the 2024 fishing season. (Note, a fishing season begins on 1st December each year and extends through to 30th September the following year).

2. Catch summary

The catch summary in Table 1 is updated with 2024 season data for TSTRL. The TIB sector data are mainly updated from TDB02 - the Torres Strait Catch Disposal Record (CDR) and TVH data are updated mainly from TRL04 and ELOGS - the Torres Strait Tropical Rock Lobster Fishery Daily Fishing Log. PNG data are provided by PNG NFA data via AFMA.

The 2024 fishing season combined catch recorded by the TIB and TVH sectors was 200.2 tonnes (rounded) which represents a 19.3% decrease from last season and equates to about 55.9% of the quota for that year. TIB and TVH caught 107.7 and 92.5 tonnes respectively, representing a 16.9 and 21.9 decrease from the previous season. The Australian sector catches represent 45.4% and 76.4% of the allocations for the TIB and TVH sectors respectively.

The PNG TRL catch data are provided annually up until September each year, and hence a pre-agreed method is used to extrapolate the data to obtain a total catch estimate for the current year to represent the period December (of previous year) to November (current year). The method involves using the available catch data over January to September to calculate an average monthly catch which is then substituted for the "missing/forthcoming" months. This means that once data updates are provided each year, it is also necessary to retrospectively update the PNG catch total from the previous year.

The 2023 season total PNG catch estimate was 36t, based on data provided to October 2023 totalling 30t. The 2023 PNG total catch has been revised upwards based on updated catch totals provided by PNG. This yields a total PNG catch for 2023 of 109.9 t. Hence the retrospectively adjusted total TRL catch from all sectors (TIB, TVH, PNG) for 2023 was 358.0t which equates to 68.7% of the 2023 TAC. We note that the total catch used in the 2023 calculations was 277.2t which was 46.3% of the TAC and hence a considerable under-estimate.

PNG 2024 catch data were provided for Dec 2023 as 0.08t and Jan to Sep 2024 totals 120.1t. The PRELIMINARY total of 141.5t shown (Table 1) for use in analyses is an extrapolated value based on the method as used previously, i.e. substituting the average catch from Jan-Sept for the remaining months. However, we received a copy of a notice that PNG are implementing

a hookah ban from 15 Nov 2024 to 31 March 2025. As for the Australian sector hookah bans, this does not mean zero catches given free diving, and hence for simplicity we simply here that 10% of the usual catch will be caught via free diving over this period. We note that data on the relative proportions of free diving versus hookah diving would improve these estimates. Assuming full compliance with the hookah ban on fishing, we therefore assume that for the second half of November, the catch is 10% of half an average month's catch, i.e. 0.1 x 0.5 x 13.4t. This suggests a total PNG catch estimate from Dec 2023 to November 2024 of 141.5t taken from catches inside and outside the TSPZ in the PNG jurisdiction (Table 1). In addition, we note from the AFMA catch report to be tabled at the forthcoming TRLRAG, a reported PNG catch allocation within Australian waters during 2024 of 12.493 t which needs to be added to the PNG total, yielding a total catch of 154t.

Based on these estimates, the total TRL catch from all sectors (TIB, TVH, PNG) for 2024 becomes 354t which equates to 66.8% of the 2024 TAC (which was 530t).

Please refer to the following figures and tables for summaries of catch:

- Table 1 for the annual catch for TSTRL shown by fishing season (Dec-Sept for each year)

3. Effort summary and nominal CPUE

The effort summary in Table 2 is updated from the same data sources as catch records. The effort unit for TVH is tender-shot day and TIB is crew day fished, adjusted from the original data source.

The 2024 TVH sector fishing effort was 452 tender-days and TIB sector was 1,659 days fished which equates to a 60.9% and 31.8% decrease, respectively, relative to the previous season.

The nominal catch rates for both TIB and TVH sectors increased but increases were significant for the TVH sector during the 2024 season. However, the record low effort level for both sectors, can be expected to substantially bias the nominal CPUE, hence also why a standardised index is preferred (see TVH_CPUE and TIB_CPUE updates).

Summaries of the effort data and CPUE data are provided in the following figures and tables:

- Table 2 for the annual effort for TVH and TIB sector
- Figure 1 for TIB and TVH annual effort trajectories.
- Figure 2 for TIB and TVH annual nominal CPUE trajectories.

Acknowledgements

Thanks to AFMA and fishery participants for providing fishery data and to PNG NFA for providing catch summaries. Funding for this research is provided by AFMA and CSIRO.

Table 1. Total annual catch (in tonnes) for each of the sectors as indicated

SEASON	TIB	TVH	PNG DIVERS	PNG TRAWL	TS TOTAL
2001	52.0	79.9	173.0	5.4	310.3
2002	68.0	147.2	327.0	42.8	585.0
2003	123.0	358.8	211.0	5.4	698.2
2004	210.4	481.0	182.0	0.0	873.4
2005	367.6	549.0	228.0	0.0	1144.6
2006	140.5	135.4	142.0	0.0	417.9
2007	268.7	268.6	228.0	0.0	765.3
2008	185.7	100.4	221.0	0.0	507.1
2009	147.8	91.1	161.4	0.0	400.3
2010	140.0	282.6	292.8	0.0	715.4
2011	199.1	503.5	165.0	0.0	867.6
2012	142.4	387.3	173.7	0.0	703.4
2013	142.5	361.7	108.3	0.0	612.5
2014	198.8	273.2	151.4	109.8	733.2
2015	202.6	152.7	235.7	0.0	591.0
2016	267.1	243.0	248.0	0	758.1
2017	111.6	166.3	113.0	0	390.9
2018	127.4	134.1	156.4	0	417.9
2019	260.6	156.1	167.0	0	583.7
2020	216.3	143.2	126.4	0	485.9
2021	127.6	116.3	97.0	0	340.9
2022	150.1	139.7	88.8	0	378.6
2023	129.6	118.5	109.9	0	358.0
2024	107.7	92.5	12.5+ 141.5*	0	354.2
Mean of last 5 years	146.3	122.0	115.2	0.0	383.5

* Note: see text for details re PNG 2024 catch estimate and 2023 catch total updates

Table 2. Effort for TVH (tender-shot days) and TIB (days fished)

SEASON	TVH	TIB
2004	5235	4823
2005	4393	8606
2006	2435	4791
2007	2869	7099
2008	1211	5787
2009	1308	4859
2010	2368	3715
2011	2668	3457
2012	2380	2330
2013	3008	288
2014	2910	2925
2015	2683	3217
2016	2654	2932
2017	2515	3100
2018	1506	3537
2019	1911	4530
2020	1267	2742
2021	1621	2962
2022	1352	3296
2023	1156	2433
2024	452	1659

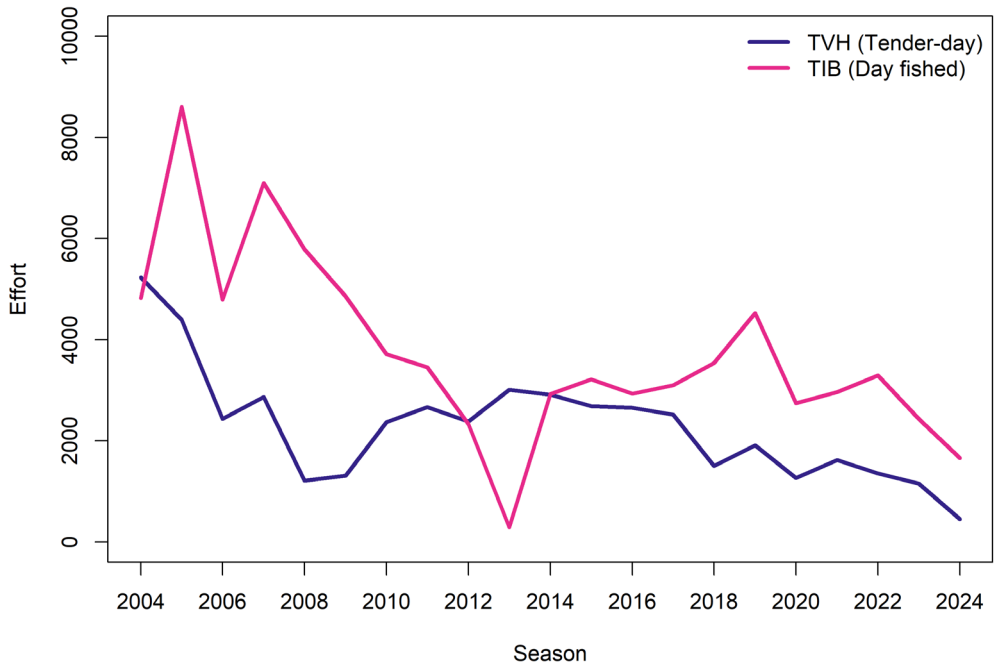

Figure 1. TIB and TVH annual effort trajectories.

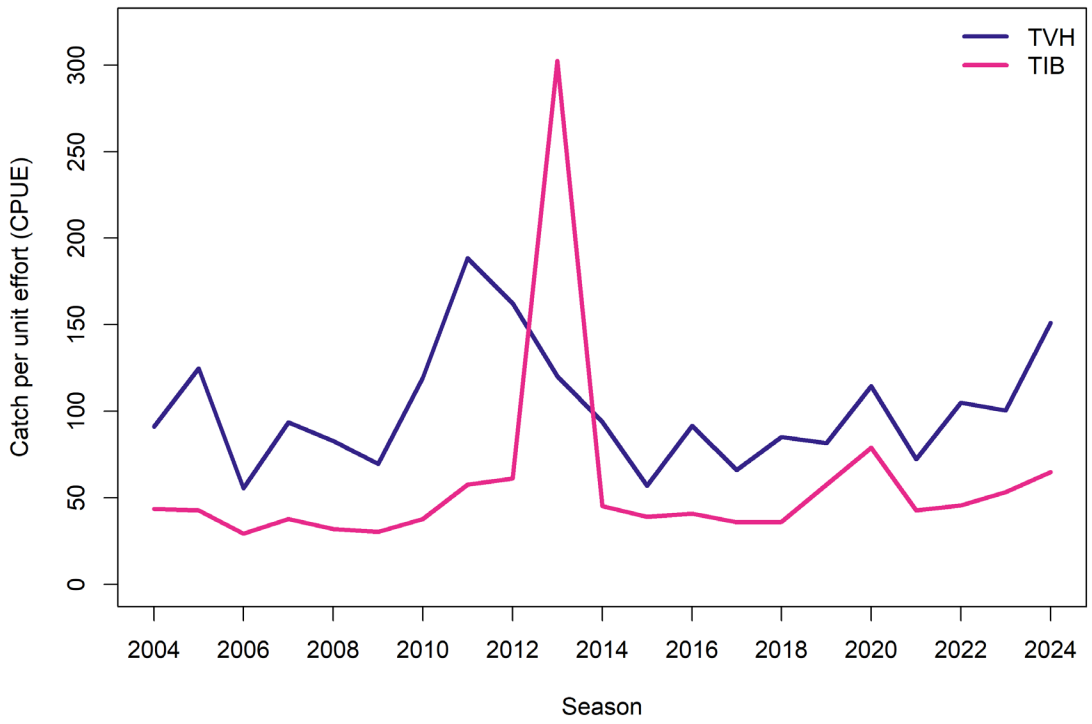

Figure 2. TIB and TVH annual CPUE trajectories.

Use of TVH Logbook Data to construct an Annual Abundance Index for Torres Strait Rock Lobster – 2024 Update

Denham Parker, Roy Deng, Steven Edgar, Éva Plagányi, Laura Blamey, Nicole Murphy, Leo Dutra and Kinam Salee

CSIRO Environment

December 2024

1. TVH Data

The Torres Strait Tropical Rock Lobster Fishery Daily Fishing Log (TRL04) was used to record the catches taken in the TVH sector of the Torres Strait Tropical Rock Lobster fishery. Logbook data obtained from AFMA consists of over 100,000 individual catch records for the TVH rock-lobster fishery for the 29 years from 1994 to 2024. For each vessel-day there can be multiple shots (up to 4) with each shot consisting of up to 8 tenders. Each tender has a catch recorded by diving method (hookah, free or unknown) and the catch is recorded by processed form (whole, tailed or unknown). The data were aggregated so that each record refers to the rock-lobster catch for a unique vessel-day, shot, tender and diving method. This gave 78,233 records.

The distribution of these 78,358 catch records was analysed by season and month, diving method, processed state of catch and area. The analysis was limited to the 8 months between February and September, the other months had minimal effort recorded and were omitted (see Campbell et al., 2019 and 2021 for details). Similarly, the analysis was also limited to those records with a known MSE-area (i.e. areas designated A0 and A99 were excluded). MSE-areas 201 and 202 were combined and designated as area 101 (to provide a better data coverage), and area 401 (GBR) was also excluded.

2. Method

As in previous years, several different General Linear Models (GLMs) were used for analysing the data in order to obtain a standardised index of stock abundance in each year. The GLM methods applied were the same as those previously applied (see full technical details provided in Campbell et al. 2019 and 2021, Plagányi et al. 2020).

The GLM models include:

<u>Model-1: Main Effects Model</u>

To explore the impact of each main effect included in the GLM, the first set of analyses was based on the following model where no interactions between main effects were included:

$$
\begin{aligned}
CPUE = {} & Intercept + Season + Month + Area + Vessel + Fishing\text{-}Method \\
& + Proportion\ of\ Catch\ Landed\ as\ Tails \\
& + Southern\ Oscillation\ Index\ (SOI) + Moon\text{-}Phase \\
& / \text{ distribution} = \text{gamma, link} = \log
\end{aligned}
$$

where:

a) *Season* has 30 levels: 1994-2024 (see below)
b) *Month* has 8 levels: February–to-September.
c) *Area* has 10 levels (Campbell, et al 2021, Table 3)
d) *Vessel* has 51 levels (Campbell, et al 2021, Figure 9)
e) *Fishing-Method* has 3 levels: (1) Hookah, (2) Free Diving, (3) Unknown
f) *Proportion*-Tails has 5 levels: (1) <20%, (2) 20-40%, (3) 40-60%, (4) 60-80%, (5) ≥80%
g) *SOI* is the monthly value of the Southern Oscillation Index
h) *Moon-Phase* has 30 levels: the number of days after the last full moon.

The models are fitted using the R package "mgcv" (Wood, 2017, 2023). All effects were fitted as categorical effects except for SOI which was fitted as a continuous cubic function. A log-gamma distribution was assumed for the distribution of CPUE values. The annual index of abundance was determined using the method described in the next section.

The simple structure of this Main Effects model is based on some simplified assumptions. For example, it assumes that the influence of each level of a given main effect is the same across all other combinations of the other main effects. For example, the relative influence of each *Month* is assumed to be the same across all *Seasons* and *Areas*, and similarly the relative influence of each *Area* is the same across all combinations of *Month* and *Season*. Whilst these assumptions may to some extent approximate reality, there may be instances where some assumptions are not fulfilled. For example, there appears to be a degree of inter-annual variation in the relative level of catch rates in different areas across different seasons. Such variation can be accounted for in the "Interaction models" described below.

As shown in Campbell (2004) a bias in the annual abundance index can result when there is an unequal number of observations within each spatial-temporal stratum used for calculating the abundance index. To overcome this problem a weighting of the observations needs to be incorporated when fitting the data to the GLM. Each observation was therefore weighted such that the sum of the weights for all observations in each of the *Season-Month-Area* strata was the same for all strata. Furthermore, in order to account for the weighting given each observation in determination of the annual influence of each main effect, the sum of the weights for all observations within a given level was used instead of just the number of observations.

Interactions Models

A second set of analyses was undertaken to explore whether the inclusion of interactions between the main spatial-temporal effects improved the model fit to the data. Specifically, the following three models were examined:

Model-2: Int-1:

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

Model-3: Int-2:

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

where * indicates an interaction between the related effects. The inclusion in these interactions allows for the relative distribution of the resource between the different areas and months to be different between seasons.

In previous years, a Model-4: Int-3 has been applied. This is the most complex model, with a three-way interaction between Season, Month and Area. Attempts were made to fit this model to the data, however it did not converge. This is likely due to a paucity of data given the complex interaction structure of the model.

Using results from each GLM an annual abundance index was constructed based on the standardised CPUE with the major effects from the *Season*, *Month* and *Area* factors to derive the annual index. In total there are 2,400 (30 seasons x 8 months x 10 areas) *Season-Month-Area* strata. The standardised CPUE was taken as an index of the density of fish within each stratum, which is then integrated across the month and area strata to provide an overall index of the abundance of lobsters across the fishery in each season. Finally, a relative annual abundance index, B_y, was calculated such that the mean standardised index over all seasons equals 1.

3. Results of Annual Abundance Indices

The relative abundance indices based on each of the four GLM models are listed and displayed in Table 1 and Figure 1 respectively. Relative to the nominal index (see Fig. 1), each of the standardised indices is similar but is higher at the start of the time-series (particularly prior to 1999) and lower from 2012-2019. The 2024 standardised CPUE values for all models are substantially lower than the nominal index (Table 1). Moreover, the nominal index is above the long-term average, while all standardised indices are below the average. Overall, the annual relative CPUE index fluctuates about the standardised mean of 1 and there is no clear trend throughout the time series.

After the annual effect (e.g., *Season*), *Vessel* is the second most influential variable in the main effects standardisation model (Table 2). The influence of *Vessel* is likely twofold; (1) variation in fishing efficiency between vessels operating within the same season and (2) the (expected) increase in the relative fishing power of vessels over time. The relative influence of the *Vessel* effect is seen to be greatest towards the start and end of the time- series and explains the divergence seen between the nominal and standardised indices at these times. *Area* also explains a substantial proportion of variation in the CPUE observations, indicating spatial variability in lobster densities (Table 2). While Moon-phase explains a significant proportion of the variability in the CPUE data, the annual influence of Moon-phase across the entire period is seen to be negligible, because the proportion of fishing during each level of Moon-phase is likely to have remained unchanged over time (likely being relatively equal each season).

Table 1. Relative abundance indices based on standardised CPUE data for the TVH fishery. Note, each index is scaled so that the mean of the index over all years is equal to 1. The model "Int-1" has previously been adopted by the TRLRAG as the default for input to the eHCR.

Models	Main Effs	cpue = season month area method tails vessel soi			
	Int-1 (Int-M*A)	cpue = season month*area method tails vessel soi			
	Int-2 (S*M+S*A+M*A)	cpue = season*month season*area month*area method tails vessel soi			
Season	Nominal	Main-Effs	Int-1	Int-2	Mid-year Survey
94	0.89	1.46	1.45	1.23	1.03
95	0.86	1.42	1.39	1.32	1.76
96	0.93	1.04	1.04	1.47	0.91
97	1.01	1.20	1.19	1.09	0.79
98	1.06	1.13	1.12	2.06	1.05
99	0.71	0.67	0.67	0.70	0.35
00	0.60	0.70	0.69	0.76	0.47
01	0.43	0.44	0.43	0.38	0.18
02	0.70	0.68	0.67	0.45	0.64
03	1.09	1.05	1.04	0.76	1.71
04	1.10	1.16	1.16	1.02	1.24
05	1.54	1.48	1.48	1.24	1.60
06	0.67	0.69	0.69	0.49	0.59
07	1.11	0.98	0.98	0.85	1.20
08	0.84	0.86	0.87	1.04	0.71
09	0.61	0.65	0.65	0.61	0.90
10	1.24	1.13	1.16	1.14	1.01
11	2.06	1.77	1.77	2.12	1.71
12	1.58	1.40	1.41	1.09	1.11
13	1.29	1.23	1.24	1.58	1.04
14	0.97	0.94	0.95	0.77	1.01
15	0.61	0.63	0.63	0.43	
16	1.17	1.10	1.11	1.45	
17	0.74	0.73	0.73	0.64	
18	0.88	0.70	0.70	0.57	0.58
19	1.04	0.92	0.93	0.64	
20	1.22	1.23	1.23	1.28	
21	0.77	0.68	0.68	0.82	
22	1.01	0.96	0.96	1.19	
23	1.00	1.05	1.06	0.99	
24	1.26	0.92	0.93	0.83	
Mean	1.00	1.00	1.00	1.00	1.00

Table 2. Model statistics for the main effects of the GLM applied to TVH data.

Fixed Effect	Residual Deviance	DF	Chi - Squared	Pr > ChiSq
Intercept	37177	-	-	-
Season	30296	30	6881	<0.0001
Month	30137	7	159	<0.0001
Area	29562	9	575	<0.0001
Method	29507	2	55	<0.0001
Tails	29291	4	216	<0.0001
Moon-Phase	26018	50	3272	<0.0001
Vessel	25704	29	314	<0.0001
SOI	25643	1	62	<0.0001
SOI2	25642	1	0	0.7537
SOI3	25629	1	13	<0.0001

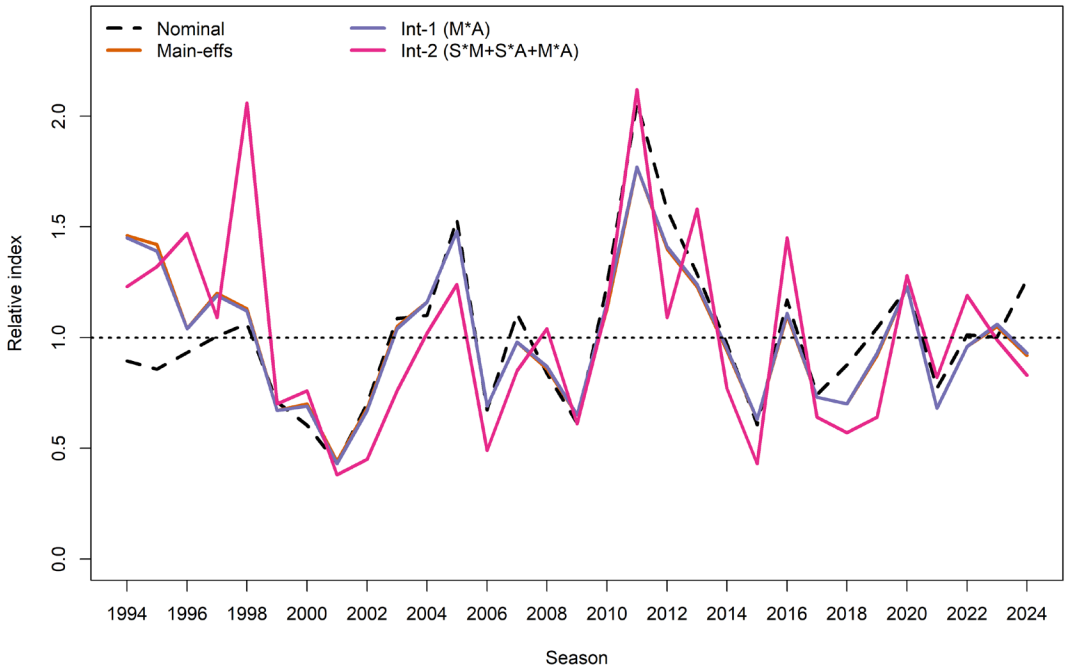

Figure 1. The seasonal abundance indices for the TVH sector of the Torres Strait rock lobster fishery based on the standardised CPUE from the Main-Effects and several interaction models.

Acknowledgements

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Use of TIB Logbook Data to construct an Annual Abundance Index for the Torres Strait Rock Lobster fishery– 2024 Update

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CSIRO Environment

December 2024

1. Selection of TIB Data for CPUE analysis

Considerable effort has gone into understanding the nature of both the TDB01, TDB02 Docket-Book and TRL04 Logbook data so as to identify the catch records that should be assigned to the TIB sector of the fishery. A full description of the approach and data-rules used to identify and remove these duplicate records from the Docket-Book data is described in Campbell and Pease (2017) and Campbell et al. (2021). Each catch record in the TIB data is associated with a Record-No, and the structure of the Docket-Book would seem to indicate that there should be a unique Record-No for each vessel, date and seller-name. However, investigation of the data indicates that there are often multiple Record-Nos associated for a given vessel, date and seller-name. The reason for these multiple records remains unknown but may be due to incorrect recording of dates, etc.

In order to identify an appropriate data structure for analysis, we used the same procedure as previously to filter the data:

1. The TIB data was aggregated over vessel-symbol, date and seller-name. Where the vessel-symbol or seller-name was null these fields were set to 'Unknown'. Data was limited to the seasons 2004 to 2024 resulting in a total of 68,919 aggregate Vessel-Day-Seller records (hence-forth known as VDS records);
2. It was assumed that where the vessel or seller were unknown, that selection of only those GLM records having a unique Record-No limited the GLM records chosen to those associated with a single vessel and a single seller;
3. VDS records were also deleted where any of the number of fishers, the number of days fished, the number of methods, the area fished, and the Seller-Home were not unique or remained unknown (i.e. not recorded). Records associated with the TRL04 logbook or where the catch was zero were also deleted. This resulted in 51,677 VDS-records being retained.
4. Finally, VDS records were only retained where they satisfied the following criteria:
    a. the month was not October or November,
    b. the fishing method listed in Table 2 was either 'Hookah diving', 'Free diving', 'Lamp fishing' or some combination of these three methods (denoted 'Mixed'),
    c. the number of fishers was between 1 and 3,
    d. the number of days fished was between 1 and 9,

e. the recorded catch weight was between 1kg and 500kg, Note, the distribution of catches is over-dispersed, with 0.54% of records having a catch greater than 500kg and 0.17% of records having a catch greater than 1000kg.

The records for a few large vessels which were considered non-representative of the TIB fishing sector were also removed.

5. Finally, the records for the 2013 season were also deleted due to the small number of records for this season (72) compared to all other seasons (between 1,018 and 5,459). The small number for 2013 was because many of the fields on the TDB-01 Docket-Book that season were left blank.
6. This procedure resulted in 51,677 VDS records being selected for analysis.

2. Method

As in previous years, several different General Linear Models (GLMs) were adopted for analysing the data in order to obtain a standardised relative index of stock abundance in each year. Rob Campbell originally implemented the GLM methods to apply to TIB CPUE standardisation, and the full technical details are provided in Campbell et al. (2019), Plagányi et al. (2022) and Campbell et al. (2021).

General Linear Models (GLM) were fitted to the selected TIB data in order to standardise the CPUE to account for changes in the distribution of records across several main effects (e.g. Season, Month, Area and Fishing-Method). The measure of effort for the TIB data was taken to be days-fished. The catch rate associated with each GLM record was then defined to be the mean weight of lobsters caught per day-fished, i.e.

$$CPUE = \frac{Whole\ Weight\ of\ landed\ lobsters}{Number\ of\ days\ fished}$$

In order to investigate the influence of the various effects on the catch rate associated with each GLM data record, and to help account for the possible misreporting of the Area fished on Docket-Book records (as noted by TSRL-RAG23 in May 2018), the following two models were fitted to the data records as described above. All GLMs were weighted as described in Campbell (2019) and Campbell et al. (2021). The models are fitted using the R package "mgcv" (Wood, 2017, 2023).

Model-1: Main Effects Model

To explore the impact of each main effect included in the GLM, the first set of analyses was based on the following model where no interactions between main effects were included:

$$CPUE = Intercept + Season + Month + Area\text{-}Fished + Fishing\text{-}Method + Proportion\text{-}landed\ as\ Tails + Southern\ Oscillation\ Index + Moon\text{-}Phase$$
/ distribution = gamma, link = log

$$= I + S + M + SI + + F + P + SOI + Moon$$ / dist= gamma, link=log

where:

a) *Season* has 19 levels: 2004-2012, 2014-2024.
b) *Month* has 10 levels: December–to-September.
c) *Area-Fished* corresponds to the *Seller-Home* and has 13 levels.
d) *Fishing-Method* has 4 levels: (1) Hookah, (2) Free Diving, (3) Lamp Fishing, and (4) Mixed methods.
e) *Proportion*-Tails has 5 levels: (1) <20%, (2) 20-40%, (3) 40-60%, (4) 60-80%, and (5) ≥80%.
f) *SOI* is the monthly value of the Southern Oscillation Index.
g) *Moon-Phase* has 30 levels: the number of days after the last full moon.

Interactions Models

A second set of analyses was undertaken to explore whether the inclusion of interactions between the main spatial-temporal effects improved the model fit to the data. Specifically, the following three models were examined:

Model-2: Int-1:

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

Model-3: Int-2:

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

Model-4: Int-3:

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

where * indicates an interaction between the related effects. The inclusion in these interactions allows for the relative distribution of the resource between the different areas and months to be different between seasons.

A further set of models were run to include the "Seller" effect, this model has previously been adopted by the TRLRAG as the default for input to the eHCR. All effects were fitted as categorical effects except for SOI which was fitted as a continuous cubic function.

Using results from each GLM, an annual abundance index was constructed. As the standardised-CPUE is taken as an index of the density of fish within each stratum, an index of the abundance of lobsters across the fishery for each season can be obtained by taking the average across the *Month* indices in each season. Finally, a relative annual

abundance index, B_s, was calculated such that the mean index over all seasons equals 1.

3. Results of Standardisation of Annual Abundance Indices

The seasonal abundance indices based on each of the four GLM models listed in the previous section are listed in Table 1 and Figure 1 respectively. Relative to the nominal index, each of the standardised indices displays substantive shifts, generally being lower than the nominal index over the first half of the time-series and higher than the nominal index during the second half (i.e. since 2012 to 2024). The nominal and standardised TIB CPUE suggest an increasing trend in catch rates since the 2015 season and all relative index values have been >1 since 2019 (Figure 2).

As outlined in Campbell et al (2019, 2021), the reasons for these changes can be investigated using the seasonal influence of each factor for the Main and Seller models. The parameter with the most substantive influence on the annual index is the *Seller* (Table 2), and while displaying a variable influence over time, the influence of this effect has increased in recent seasons resulting in an increase in catch rates. This indicates that there has been an increase in the relative fishing efficiency of *Sellers* in recent seasons, which when accounted for in the standardisation model leads to a decrease in the standardised CPUE relative to the nominal values – it is important to note that 2024 is an exception to this as the nominal index is higher than standardised estimates derived from all of the models applied. This is likely due to fewer *Sellers* operating in 2024 (52) compared to 2023 (77) and previous years in general (353). Nonetheless, the influence of the *Seller* effect in recent seasons therefore explains the divergence seen between the standardised indices based on the Main and Seller models during this period (Figure 3).

Area is the second most influential parameter, followed by *Season*, suggesting that the model is able to reasonably account for variation in CPUE observations across space and time (Table 2). While Moon-phase explains a significant proportion of the variability in the CPUE data, the annual influence of Moon-phase across the entire period is seen to be negligible, because the proportion of fishing during each level of Moon-phase is likely to have remained unchanged over time (likely being relatively equal each season).

Based on discussions over the past few years, Model “Seller” is considered the preferred model.

Table 1. Relative abundance indices based on standardised CPUE data for the TIB fishery. Note, each index is scaled so that the mean of the index over all years is equal to 1. The model "Seller" has previously been adopted by the TRLRAG as the default for input to the eHCR.

Models	Main	ln(CPUE) = Season + Month + Method + Percent_Tails + SOI + Moon
	Int - M*A	ln(CPUE) = Season+ Month + Month*Area + Area + Method + Percent_Tails + SOI + Moon
	Seller	ln(CPUE) = Season + Month + Method + Percent_Tails + Seller + SOI + Moon
	Seller -Int M*A	ln(CPUE) = Season + Month +Month*Area + Area + Method + Percent_Tails + Seller + SOI + Moon
	Index scales so mean over all years = 1	

Season	Nominal	Main	Int - M*A	Seller	Seller Int-M*A
04	0.93	0.82	0.82	0.88	0.89
05	1.12	0.94	0.94	1.05	1.06
06	0.79	0.71	0.71	0.73	0.73
07	0.96	0.82	0.83	0.85	0.87
08	0.94	0.76	0.77	0.82	0.82
09	0.90	0.91	0.91	0.97	0.98
10	0.98	0.96	0.96	0.99	0.99
11	1.37	1.36	1.37	1.42	1.41
12	1.04	1.12	1.12	1.16	1.17
13					
14	1.00	0.91	0.91	0.94	0.93
15	0.67	0.76	0.75	0.81	0.79
16	1.06	1.05	1.05	1.03	1.02
17	0.76	0.95	0.95	0.88	0.89
18	0.75	0.81	0.81	0.77	0.78
19	0.98	1.20	1.18	1.06	1.06
20	1.35	1.33	1.35	1.19	1.19
21	0.97	1.12	1.12	1.04	1.04
22	0.97	0.97	0.97	1.04	1.03
23	1.18	1.33	1.31	1.25	1.23
24	1.27	1.17	1.17	1.13	1.12
Mean	1.00	1.00	1.00	1.00	1.00

Table 2. Model statistics for the main effects of the Seller Model applied to TIB data.

Main Effects	Residual Deviance	DF	Chi-Squared	Pr > ChiSq
Intercept	29326	-	-	-
Season	27788	19	1538	<0.0001
Month	27320	9	467	<0.0001
Area	24832	12	2488	<0.0001
Method	24299	3	533	<0.0001
Tails	23488	4	811	<0.0001
Moon-phase	23199	29	289	<0.0001
Seller	18467	352	4732	<0.0001
SOI	18437	1	30	<0.0001
SOI2	18423	1	14	<0.0001
SOI3	18413	1	10	<0.0001

Figure 1. Relative indices of resource abundance based on each of the models fitted to the catch and effort data for the TIB fishery. The nominal CPUE is also shown for comparison. The model "Seller" is the default series used for the eHCR.

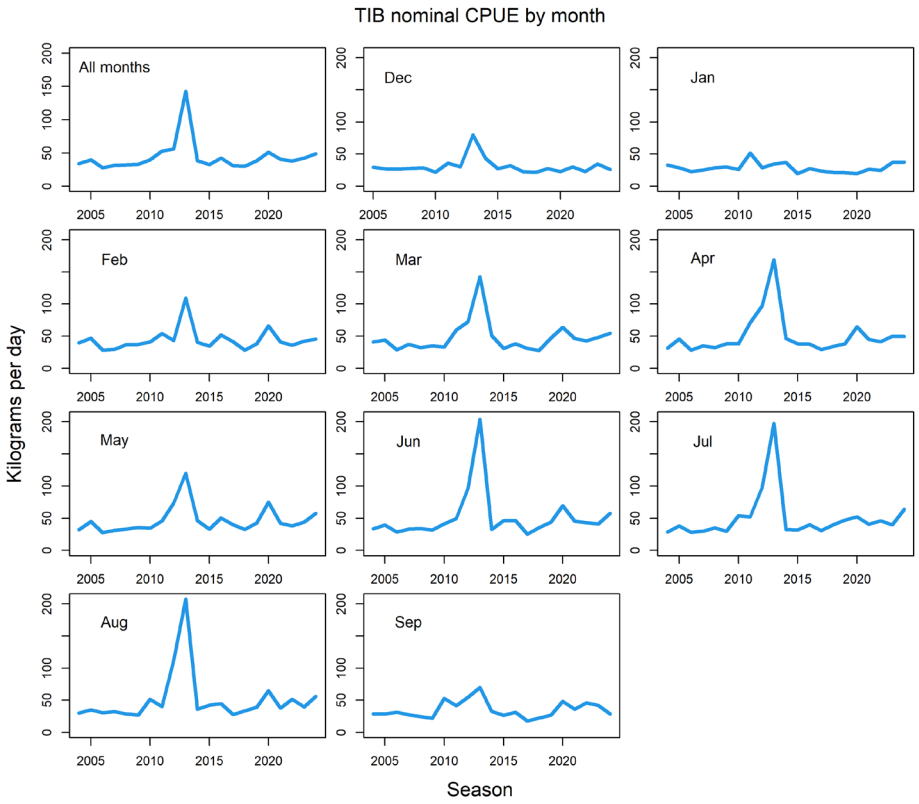

Figure 2. The TIB CPUE nominal time series shown per month.

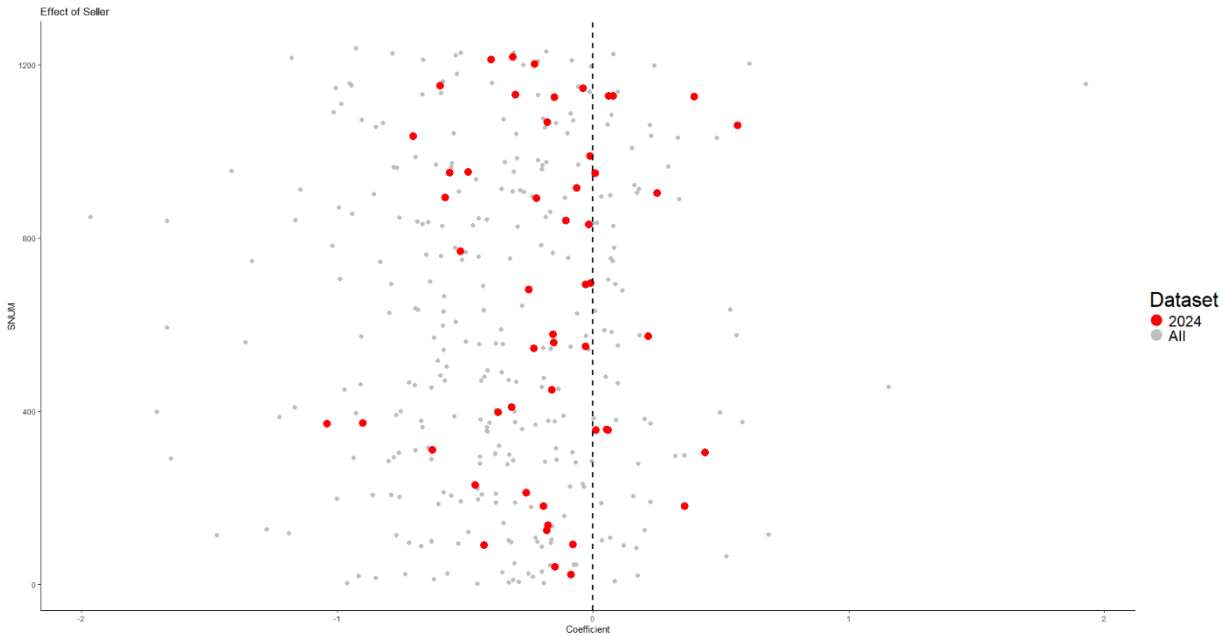

Figure 3. The model coefficient values for *Seller*. Coefficients from the entire list of Sellers is shown in grey, and only Sellers that operated in 2024 are shown in red.

Acknowledgement

Thanks to AFMA and fishery participants for providing the fishery data for the analysis. Funding for this research is provided by AFMA and CSIRO.

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TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
RESULTS OF THE NOVEMBER 2024 PRE-SEASON SURVEY	Agenda Item 6 For DISCUSSION and ADVICE

RECOMMENDATIONS

1. That the RAG:
    a) **DISCUSS** and **PROVIDE ADVICE** on the results (**pending**) of the November 2024 pre-season survey to be presented by CSIRO at the meeting. A summary of the survey activities (excluding results) is provided at **Attachment 6a**; and
    b) **NOTE** that in accordance with the TRL Harvest Strategy, under section 2.10 Decision Rules, if in any year the pre-season survey 1+ index is 1.25 or lower (average standardised number of 1+ age lobsters per survey transect) it triggers a stock assessment.

KEY ISSUES

2. CSIRO conducted the annual pre-season survey from 3 to 20 November 2024. A total of 77 sites were surveyed, selected to provide for comparison with previous surveys. The amount of seabed biota (plants and some selected animals) and substrate type was also recorded at each survey site. Length frequency data was collected from captured TRL.
3. The pre-season survey data is a key data input (with a 70 per cent weighting) in the empirical harvest control rule (eHCR), and the integrated stock assessment when it is run (every three years under the TRL Harvest Strategy).
4. The results of the November 2024 pre-season survey will be presented by CSIRO at the meeting. A summary of the survey activities is provided at **Attachment 6a (pending)**.
5. The RAG will be asked to review the analysis and results presented by CSIRO and where relevant provide advice on the findings and/or need for further analysis.
6. Of relevance, section 2.10 Decision Rules of the Harvest Strategy provides that:
    - **If in any year the pre-season survey 1+ index is 1.25 or lower (average standardised number of 1+ age lobsters per survey transect) it triggers a stock assessment.**

BACKGROUND

7. Each year in November, the CSIRO undertake an independent scientific pre-season survey to determine the relative abundance and size of lobsters in the Torres Strait, together with an assessment of the habitat. Benchmark fishery-independent surveys (1989 and 2002) identified regions of lobster habitat within the TRL Fishery area. This allowed scientists to design ongoing annual population surveys using a few randomly selected sites, with the number of sites commensurate with the subregion area and lobster abundance.

8. Fishery-independent surveys have been conducted in the Fishery since 1989. Historically (1989-2014 and 2018), mid-season (July) surveys focused on providing an index of abundance of the spawning (age 2+) and juvenile (age 1+) lobsters. Mid-season surveys have been replaced with pre-season (November) surveys (2005-2008; 2014 to current) which focus on providing an index of recruiting (age 1+) lobsters as close as possible to the start of the fishing season to support the change to a quota management system and setting of a TAC. Pre-season surveys also provide indices of recently-settled (age 0+) lobsters, which may become useful depending on how reliable they are, as they allow forecasting of stock one year in advance and are used in the eHCR.

9. The 2024 preseason survey is a key annual output as part of the three-year AFMA/TSRA funded project "*Fishery independent surveys, stock assessment, Harvest Strategy and Recommended Biological Catch calculation for the Torres Strait Tropical Rock Lobster Fishery*" which was supported by the Torres Strait Scientific Advisory Committee (TSSAC) at their meeting on 6 to 7 April 2022, funded from 2022-23 through to the end of 2024-25.

Torres Strait Tropical Rock Lobster 2024 Pre-season Population Survey

Leo Dutra, Nicole Murphy, Steven Edgar, Kinam Salee, Mark Tonks, Roy Deng, Laura Blamey, Denham Parker and Éva Plagányi

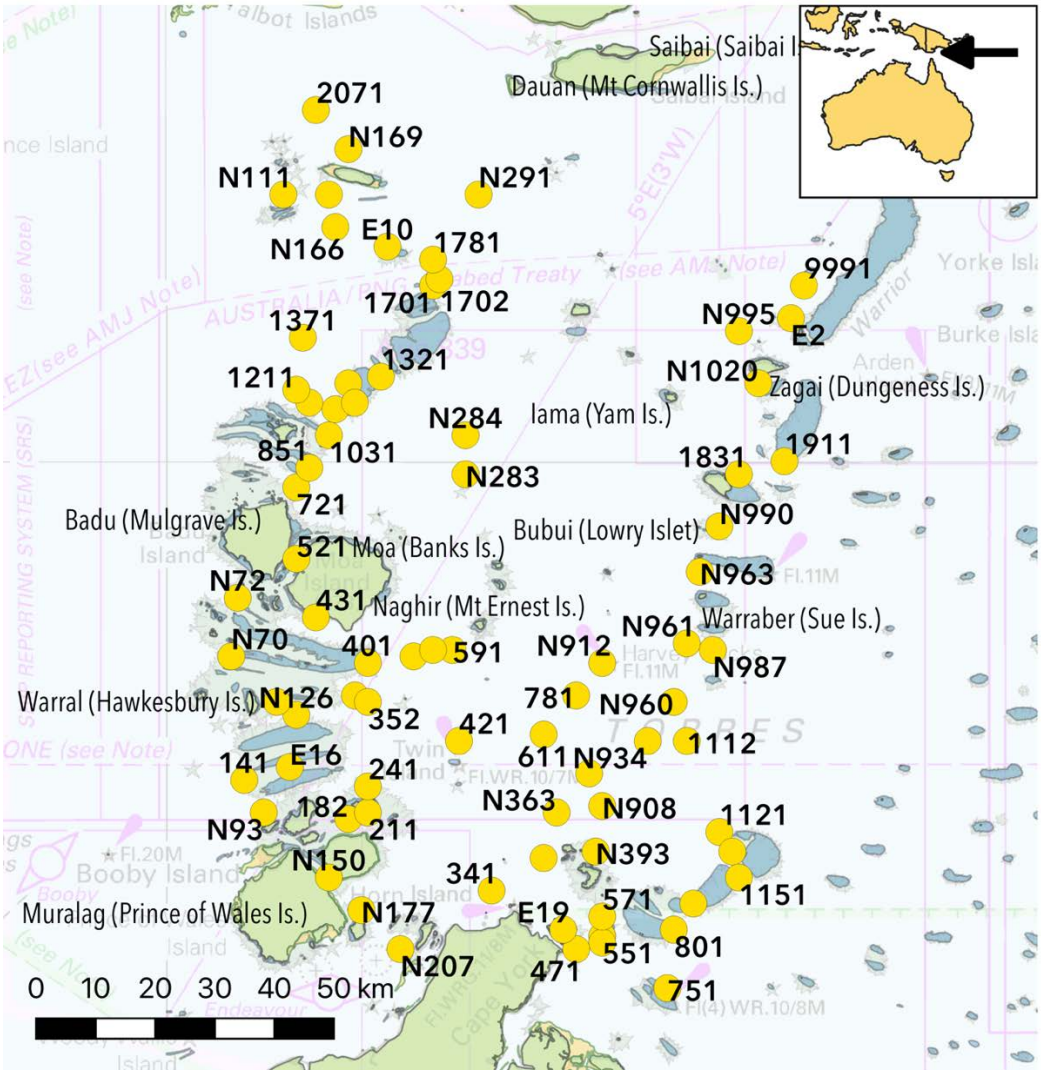
CSIRO Environment

Tropical Rock Lobster Pre-Season Survey Milestone Report – 26 November 2024

Milestone Progress Report – AFMA project no. 2021/0816

The 2024 Tropical Rock Lobster (TRL) Pre-season survey was conducted between the 4th and the 16th of November 2024. The CSIRO TRL dive survey team included Leo Dutra (science leader), Nicole Murphy (survey leader), Kinam Salee, Steven Edgar (dive coordinator) and Mark Tonks who completed 77 survey sites (Figure 1) using the tender "CHRIS B" to conduct the dives, supported by the mothership "Wild Blue" (Rob Benn Holdings) (Figure 2).

Figure 1. Map of western Torres Strait showing the sites surveyed during the 2024 TRL pre-season survey. The yellow dots and corresponding numbers are site identifiers for the survey.



Winds during the 13-day survey ranged between 15-25 knots (Figure 3) and underwater visibility averaged around 4m (range 1-10m). In 2024 the survey started at neap tides, with weak currents in the first half of the survey, shifting to stronger spring tidal flow in the second half. Conditions allowed for a good visual census and collection of TRL.

Figure 2. Boats used during the 2024 pre-season survey: Mothership "Wild Blue" (left) and tender ("Chris B") (right) used to support dive operations.

Figure 3. Prevailing weather conditions during the 2024 TRL pre-season survey were windy (15-25 knots) and mostly cloudy during the survey.

1.1 Survey permits

Three research permits are required to conduct research associated with 2024 TRL population surveys. These included:

- Protected Zone Joint Authority Permit
  - Collect no more than 430 lobster per survey within the area of Australian Jurisdiction in the Torres Strait Tropical Rock Lobster Fishery
- Queensland General Fisheries Permit
  - Collect no more than 430 lobster in tidal waters east of longitude 142˚ 31′ 49″ east and north of latitude 14˚ south
- Great Barrier Reef Marine Park Authority Permit
  - Collect no more than 35 juvenile lobster in total (≤90mm carapace length) per year from 7 sites from within the Great Barrier Reef Marine Park Zone (Figure 1; sites E19, 471, 541, 551, 571, 751, 801), and
  - Collect no more than 5 juvenile lobster per site per year from within the Great Barrier Reef Marine Park Zone

1.2 Site survey

The Dive Team used the standard 2000m^2 belt transect method (2 divers per site each scanning 2m by 500m; Figure 4) with transect distance measured using a Chainman® device. Divers follow the no decompression limits set by the Australian scientific diving code (AS2299.2). As a result, when time limits are reached before completion of the full 500m transects – often due to a lack of tidal current and depth – observed lobster counts are standardised to an area of 2000m^2. At the completion of each transect divers recorded:

- The number of TRL caught per age-class;
- The number and age-class of those observed but not caught;
- Depth;
- Visibility;
- Current speed;
- Distance and direction swum from site co-ordinate;
- Habitat and substrate characteristics of the site.

In addition, species of interest (i.e. pearl oyster (*Pinctada maxima*), crown-of-thorns starfish (*Acanthaster planci*) and holothurian species e.g. *Stichopus herrmanni*) were counted and the habitat characterised using percent cover for the various substrate and biota types (sand, mud, hard substrate (consolidated rubble, limestone pavement, boulders), seagrass, algae, sponges, whips and live coral). The presence of bleached coral was also recorded, where applicable. These data are recorded onto data sheets.

Representative samples of TRL were caught and measured (tail width, TW) to provide fishery-independent size-frequency data.

Since 2019, temperature and depth profiles were measured at sites using a small Van Essen CTD Diver logger attached to a diver's harness. Since 2021, additional water column data (chlorophyll, depth, fluorescent dissolved organic matter, conductivity, dissolved oxygen, salinity, turbidity, total suspended solids, total dissolved solids, pH and temperature) were collected (up to 25m) using a hand-held sounder (Xylem - YSI EXO2 Multiparameter water quality sonde) deployed from the mothership 'Wild Blue' (Figure 5).

Figure 4. CSIRO Divers sampling a standard belt transect for the annual Torres Strait Tropical Rock Lobster surveys.

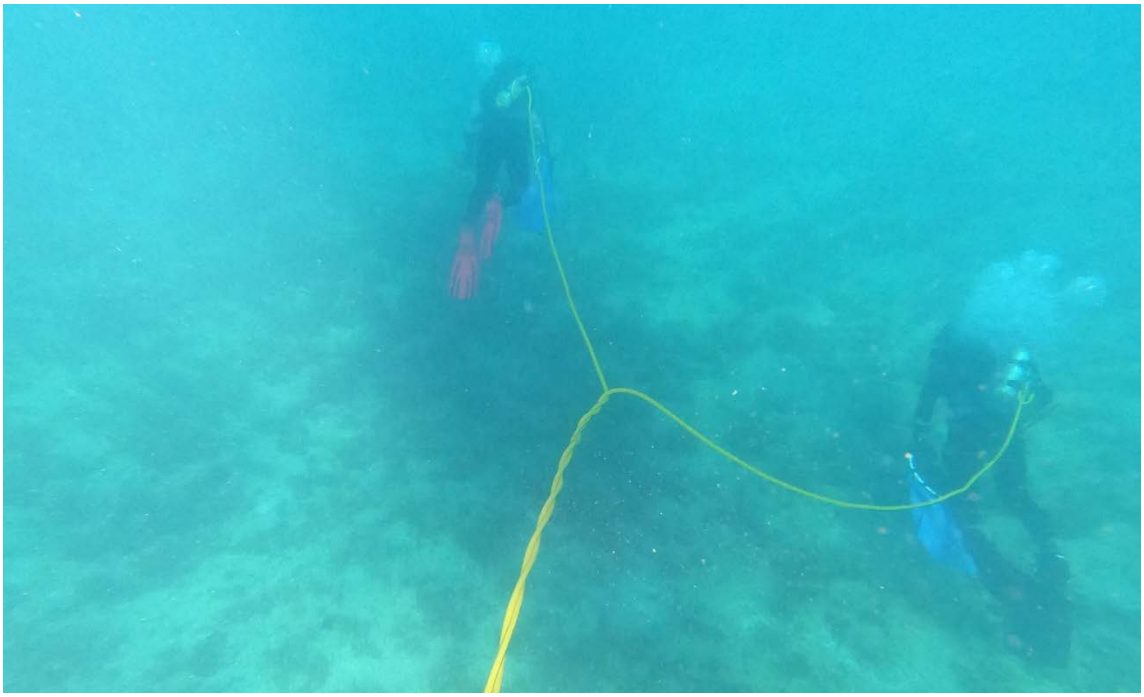


Figure 5. Additional water column data collected onboard the mothership using a hand-held sonde (Xylem - YSI EXO2 Multiparameter water quality sonde).

1.3 Results

The survey results are being processed and will be presented at the forthcoming TRLRAG meeting on Thursday Island.

Acknowledgements

We wish to sincerely thank the master (Rob Benn) and crew (Graci Dean) of the Wild Blue for excellent assistance in all aspects of the pre-season dive survey in Torres Strait, and in logistic support. We gratefully acknowledge funding support for the survey from AFMA and CSIRO.

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
RECOMMENDED BIOLOGICAL CATCH	Agenda Item 7 For DISCUSSION and ADVICE

RECOMMENDATIONS

1. That the RAG:
    a. **NOTE** the climate and ecosystem status report as presented under **Agenda Item 4**;
    b. **NOTE** the catch, effort and Catch Per Unit Effort (CPUE) analyses from the 2023-24 fishing season as presented under **Agenda Item 5**, including:
        (i) total reported catch of the Australian Torres Strait TRL fishery including effort trends from both TIB and TVH sectors;
        (ii) the agreed standardised Catch Per Unit Effort (CPUE) indices for the TIB and TVH sectors;
        (iii) the total catch of the Papua New Guinea Torres Strait TRL fishery; and
        (iv) the total reported catch and CPUE indices of the cross-endorsed PNG licenced boats (if available);
    c. **NOTE** the pre-season survey indices for 1+ recruiting lobsters and 0+ recently settled lobsters as presented under **Agenda Item 6**.
    d. Having regard to:
        (i) the RAG advice from Agenda Item 3 on amendments to the eHCR; and the decision rules under the 2019 TRL Harvest Strategy;
        (ii) **PROVIDE ADVICE** on a Recommended Biological Catch (RBC) estimate derived through the application of the recommended revised eHCR.
    e. The RAG should **NOTE** that a separate process will be undertaken to formally adopt the recommended revisions (a PZJA decision) to the eHCR and any other Harvest Strategy revisions, following broader consultation including with the TRL Working Group (to be discussed under **Agenda Item 8**).

KEY ISSUES

2. It is expected that the RAG will provide a recommendation on amendments to the empirical Harvest Control Rule (eHCR) under Agenda Item 3.
3. The RAG will then use this advice in conjunction with the results presented under Agenda Items 5 and 6, and the TRL Harvest Strategy decision rules, the RAG is being asked to provide advice on a Recommended Biological Catch value for the 2024-25 fishing season
4. In providing advice on a RBC, the RAG should consider the relevant 2019 TRL Harvest Strategy decision rules:

(i) section 2.10 Decision Rules of the TRL Harvest Strategy which provides that if in any year the pre-season survey 1+ index is 1.25 or lower (average standardised number of 1+ age lobsters per survey transect) it triggers a stock assessment.

(ii) section 2.10 Decision Rule Scenarios of the TRL Harvest Strategy which provides that under Scenario 1 or 2, if the pre-season trigger has not been triggered, the RAG should consider whether the eHCR RBCs remain within the ranges tested by management strategy evaluation (MSE).

BACKGROUND

5. Prior to the advice of TRL RAG 37, each season (since 2019-20) the RAG has been considering two possible options for dealing with under-catch in the overarching catch multiplier of the eHCR.

    a. **Option 1:** replace the actual catch values and substitute them with the TAC value in outlier years and use the actual catches in the three years prior and apply an average of all five years catch values.

    b. **Option 2:** noting that there has been a change in the relative proportion of the TAC caught between the TIB and TVH sectors in recent years, use the combined sector (TIB, TVH and PNG) average catch proportion against the global TAC over the recent five-year period, capping any overcatch at 100 per cent of the TAC, and apply this proportion to the TAC for 2019-20 and 2020-21 to obtain an estimated catch value for those years.

6. The RBC values for the past three fishing season have been calculated using an ad-hoc method whereby the actual catch value for anomalous seasons was substituted with the total fishery TAC, to account for the exceptional circumstances experienced in the fishery.

TAC setting process

7. Under subsection 13 of the Plan, the Minister must determine a TAC for the TRL Fishery prior to the start of a fishing season. In making a TAC determination, the Minister must:

    a. consult with any advisory committee that the PZJA has established under subsection 40(7) of the *Torres Strait Fisheries Act 1984*, to provide advice relating to the TRL Fishery; and

    b. have regard to Australia's obligations under the Torres Strait Treaty.

8. Under section 13 the Minister may also consider the views of any person with an interest in the TRL Fishery or the ecologically sustainable use of the TRL Fishery and take into account the amount of TRL taken in the TRL Fishery as a result of other fishing, such as traditional fishing or recreational fishing.

9. Subsection 14 provides for the Minister to determine an increase to the TAC for a fishing season. Subsections 8-11 prescribe how a TAC is to be administered, including the issuing of a notice when the TAC for the Traditional Inhabitant sector has been reached.

10. Further background on the TAC setting process, how catch is shared between Australia and PNG, and how each sector's catches will be managed for the 2022-23 fishing season is provided in the Tropical Rock Lobster Fishery Management Arrangements Booklet 2022-23 available from the PZJA website.

Setting the start of 2024-25 season TAC

11. At its meeting on 18-19 October 2018, the TRLRAG advised that the start of season catch limit should cover 1 December through to the end of February, and be based on the maximum annual catch amount for the period 2005-2018, being 200 tonnes. This is to minimise the risk that the limit could artificially constrain fishing effort, particularly in a year of high TRL abundance.
12. The RAG also advised that if needed, an additional 100 tonnes be added to the start of season catch limit amount, to account for catches from PNG.
13. It was further agreed that the start of season catch limit be overridden in seasons where the TRL stock abundance is exceptionally low and the final RBC is likely to fall below the start of season catch limit or where overridden by the Harvest Strategy decision rules. In such cases, the use of the start of season catch limit should not be used in subsequent seasons until reviewed by the TRLRAG.
14. The above approach was applied for setting the start of season TAC for the 2024-25 fishing season with no objections from the TRLRAG at their meeting on 9 October 2024.
15. Accordingly, on 5 November 2024, the Minister determined start of season TAC of 200,000 kgs (unprocessed weight) for the 2024-25 fishing season under section 13 of the *Torres Strait Fisheries (Quotas for Tropical Rock Lobster (Kaiar)) Management Plan 2018* (the Management Plan).
16. It is expected that the TAC will be increased once the outcomes of the scientific assessment process and the TAC sharing arrangements under the Treaty between Australia and PNG have been considered. Any increase in the TAC is expected to be determined by the end of February 2025.

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
REVIEWING THE TRL HARVEST STRATEGY	Agenda Item 8 For discussion and advice

RECOMMENDATIONS

1. That the RAG:
    a. consider section 2.10 of the TRL Harvest Strategy (**Attachment 8a**) and **PROVIDE ADVICE** on whether any decision rules require amendments in line with the recommended revisions of the eHCR, or if new rules are required. Including:
    b. Exceptional circumstances (e.g. unable to complete the pre-season survey)
2. **NOTE** that a separate process (see expected timeline at **Attachment 8b**) will be undertaken to formally adopt the recommended revisions (a PZJA decision) to the eHCR and any other Harvest Strategy revisions, following broader consultation including with the TRL Working Group.

KEY ISSUES

3. Although designed to give industry confidence in decision making, harvest strategies are intended to undergo regular review and may require ongoing refinement. This is especially true in the rapidly changing conditions (economic and environmental) that we are likely to experience in the coming years.
4. The Commonwealth Fisheries Harvest Strategy Policy and Guidelines, upon which the TRL Harvest Strategy is based as best practice, specifies that harvest strategies are to be reviewed every five years but may be reviewed earlier if necessary.
5. Section 2.13 of the TRL Harvest Strategy provides guidance on when a review may be required earlier than 5 years, including relating to changing external drivers.
6. While the eHCR is considered to be the most critical component of the TRL Harvest Strategy in providing advice on a RBC, the decision rules contained within the broader Harvest Strategy should also be examined for completeness.
7. The RAG is therefore being asked to consider section 2.10 of the TRL Harvest Strategy (**Attachment 8a**) and whether any decision rules require amendments in line with the recommended revisions of the eHCR or if new rules are required. Including:
    a. Exceptional circumstances (e.g. unable to complete the pre-season survey)
8. Earlier preliminary work was undertaken by CSIRO in 2016 on development of a tiered harvest strategy approach for TRL to accommodate potential changes in the amount of monitoring information available and the number and timing of surveys (therefore changes in the associated level of confidence in scientific advice for decisions making).
9. This work indicated that in a scenario where no data are available to inform on trends in the stock, the RBC would need to be set at a lower level to be adequately precautionary. The testing indicated an RBC of 360t however with additional climate change factors, testing

has indicated that 360t may not be precautionary enough on an ongoing basis. This is because it will be difficult to monitor any possible stock decline due to climate change impacts.

10. Formally amending the TRL Harvest Strategy will require a PZJA decision (see expected timeline **Attachment 8b**) however, it is anticipated that pending advice from this RAG:
    a. the revised eHCR will be applied at to calculate a recommended biological catch (RBC) for the 2024-25 fishing season and beyond; and
    b. that subject to caretaker periods for both the TSRA and Queensland Governments, a PZJA decision to formally amend the TRL Harvest Strategy will be sought at the earliest opportunity (likely early 2025).

BACKGROUND

11. The TRL Harvest Strategy was developed in consultation with the RAG and Working Group between 2016 and 2019.
12. It was developed to take into account key fishery specific attributes including:
    a. potential for large, unpredictable inter-annual variations in availability and abundance of TRL;
    b. that TRL is a shared resource important for the traditional way of life and livelihood of traditional inhabitants, commercial and recreational sectors; and
    c. advice from the RAG industry members to maintain stock abundance at recent levels (2005-2015) (TRLRAG17 on 31 March 2016).
13. The RAG recommended harvest strategy objectives that place greater emphasis on the on the importance of the TRL Fishery for traditional way of life and livelihood of traditional inhabitants. The operational objectives of the Harvest Strategy are to:
    a. Maintain the stock at (on average), or return to, a target biomass point BTARG equal to recent levels (2005-2015) that take account of the fact that the resource is shared and important for the traditional way of life and livelihood of traditional inhabitants and is biologically and economically acceptable.
    b. The agreed BTARG is more precautionary (65%) than the default proxy BMEY (biomass at maximum economic yield) level as outlined in the Commonwealth Harvest Strategy Policy and Guidelines 2007 (HSP).
    c. Maintain the stock above the limit biomass level (BLIM), or an appropriate proxy, at least 90 per cent of the time.
    d. The agreed BLIM is more precautionary than the default proxy HSP BLIM.
    e. Implement rebuilding strategies, if the spawning stock biomass is assessed to fall below BLIM in two successive years.

2.10 DECISION RULES

The decision rules for the HS are:

Maximum catch limit

- The eHCR includes a maximum catch limit of 1000 t. Once the HS is implemented the cap will be reviewed after three years using MSE testing with the updated stock assessment model.

Pre-season survey trigger

- If in any year the pre-season survey 1+ index is 1.25 or lower (average standardised number of 1+ age lobsters per survey transect) it triggers a stock assessment.

Biomass limit reference point triggered

- If the pre-season survey trigger is triggered in the first year, a stock assessment update must be conducted in March.
    - If after the first year the stock is assessed below the biomass limit reference point, it is optional to conduct a mid-season survey, the pre-season survey must continue annually.
- If the pre-season survey trigger is triggered two years in a row, a stock assessment must be conducted in December (of the second year).

Fishery closure rules

- If the stock assessment determines the stock to be below the biomass limit reference point in two successive years, the Fishery will be closed to commercial fishing.
    - MSE testing of the eHCR has shown that it is extremely unlikely (<1%) for the Fishery to be closed based on its current performance (Plagányi *et al.* 2018).

Re-opening the Fishery

- Following closure of the Fishery, fishery-independent mid-season and pre-season surveys are mandatory. The Fishery can only be re-opened when a stock assessment determines the Fishery to be above the biomass limit reference point **(Attachment A, Figure 5)**.

Attachment 8b

Process for formally amending the eHCR and TRL Harvest Strategy

STEP	TASK	TIMING (Indicative only, subject to capacity)
1	**CSIRO presented potential options** Consider options for amending the eHCR.	TRLRAG37 – October 2024
2	**RAG discussed options and recommended a way forward – no consensus reached**	TRLRAG37 – October 2024
3	**RAG to re-consider options for a revised eHCR to be applied when calculating 2024-25 RBC**	TRLRAG38 – December 2024
4	**RAG to provide advice on 2024-25 season RBC and review of draft changes to Harvest Strategy** Having regard to the advice from TRLRAG 38 and noting that formally amending the Harvest Strategy through a PZJA decision is expected in early 2025, the RAG can apply the new agreed eHCR/method to calculate the 2024-25 RBC.	TRLRAG38 – December 2024
5	**WG to provide advice on 2024-25 season TAC** The WG will consider the draft amendments to the Harvest Strategy and having regard to the advice from TRLRAG 37 and 38, provide advice on a TAC for the 2024-25 fishing season.	TRLWG 17 – December 2024
3	**AFMA to prepare draft updates to the Harvest Strategy** Having regard to the advice from TRLRAG 38 and TRLWG 17, AFMA will prepare draft amendments to the Harvest Strategy in preparation for TRLRAG and WG review out of session.	Out of session
6	**Update provided to the DCCEEW** As per Condition 3 of the TRL List of Exempt Native Species (LENS) approval under the Environment Protection Biodiversity and Conservation Act (EPBC Act), AFMA will update the Department of Climate Change, Energy, the Environment and Water (DCCEEW) regarding the intended updates to the Harvest Strategy, and feed any comments or questions back to the RAG.	Early January 2025
7	**Public/community consultation** Letter detailing the proposed change to be sent to all licences holders and made available on the PZJA website. There may also be the opportunity to provide an update during community visits if these occur.	Early 2025
8	**RAG and WG consider outcomes from public consultation period and final draft amendments to Harvest Strategy** Having regard to any comments received during the public comment period, the RAG and WG will have an opportunity to consider final draft amendments to the Harvest Strategy.	Out of session (TBC)
9	**PZJA approve amendments to Harvest Strategy**	Earliest opportunity 2025
10	**Update provided to DCEEW** AFMA to provide a further update to DCEEW following PZJA approval and finalisation of the amendments to the harvest strategy.	Mid 2025

TROPICAL ROCK LOBSTER RESOURCE ASSESSMENT GROUP (TRLRAG) Thursday Island	MEETING 38 10-11 December 2024
DATE AND VENUE FOR NEXT MEETINGS	Agenda Item 10 For DISCUSSION

RECOMMENDATIONS

1. That the RAG **DISCUSS** a date and a venue for the next meeting noting proposed meeting dates in the table below alongside key agenda items.

Proposed Date	Key agenda items
Late January 2025 (Teams meeting)	TRLRAG (meeting 39) - Discuss research proposal for next three-year TRL stock assessment, survey and RBC calculations project - Discuss research priorities and any updates to the five-year research plan.
First half of 2025 (during a moontide closure) (TBC)	TRLRAG Data Sub-Group (meeting 2) - Assess and identify improvements to fisher dependent data inputs to the Torres Strait TRL Fishery assessment framework - Consider a draft data plan
9-10 December 2025	TRLRAG (meeting 40) - Consider results of the November 2025 pre-season survey - Consider CPUE analyses for the 2024-25 fishing season - Consider the recommended biological catch (RBC) estimates derived through the application of the empirical harvest control rule (eHCR) under the TRL Harvest Strategy and provide advice on a RBC for the 2025-26 fishing season