

Torres Strait Tropical Rock Lobster Resource Assessment Group

Meeting Record 20

4 & 5 April 2017

In-session meeting

Note all meeting papers and record available on
the PZJA webpage:

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Australian Government

Australian Fisheries Management Authority

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Meeting participants

Members

Name	Position	Declaration of interest
Ian Knuckey	Chair	Nil Member of other RAG's and conducts various AFMA research projects
Dean Pease	TRLRAG Executive Officer	Nil
Selina Stoute	AFMA Member	Nil
John Ramsay	TSRA Member	Nil
Mariana Nahas	TSRA Member	Nil
Tom Roberts	Queensland Fisheries	Nil
Eva Plaganyi	CSIRO Scientific Member	Project staff for PZJA funded TRL research projects.
Andrew Penney	Independent Scientific Member	Member of other RAG's and research consultant
Maluwap Nona	Chairperson Malu Lamar	TIB licence holder
Aaron Tom	Industry Member	Nil
Mark David	Industry Member	TIB licence holder
Terrence Whap	Industry Member	Nil
Les Pitt	Industry Member	TIB licence holder
Daniel Takai	Industry Member	Pearl Island Seafood, Tanala Seafood and TIB licence holder
Ray Moore	Industry Member	TVH licence holder
Brett Arlidge	Industry Member	General Manager MG Kailis Pty Ltd, holder of TVH licences

Observers

Name	Position	Declaration of interest
Jerry Stephen	TSRA Deputy Chair TSRA Fisheries Portfolio	TIB licence holder
Ian Butler	AFMA Observer	NIL
Mick Haywood	CSIRO Scientific Observer	Project staff for PZJA funded TRL research projects
Mark Tonks	CSIRO Scientific Observer	Project staff for PZJA funded TRL research projects
Patrick Mills ¹	Chairperson Torres Strait Fishers Association	TIB licence holder

¹ Attended the meeting only on the morning of day two.

Action items and recommendations

Action Items

Number	Action
1.	Malu Lamar RNTBC to provide AFMA with the map of traditional boundaries and regional area and reef names for each of the Torres Strait Island nations and for CSIRO to examine possible revised naming conventions for survey sites
2.	AFMA and CSIRO to provide a more detailed explanation of each data filtering rule (including statistics about the number of records it corrected by each rule) and provide this to the RAG out of session.
3.	AFMA to contact the research applicant (CSIRO) to propose tropical rock lobster to be included as an indicator species for the project ' <i>Decadal scale projection of changes in Australian fisheries stocks under climate change.</i> '
4.	CSIRO to provide further advice on how use of the stock assessment and CONNIE 3 larval transport modelling outputs may improve the understanding of climate change impacts to growth, mortality and recruitment of TRL.
5.	AFMA in collaboration with CSIRO and TSRA to put together a list of all climate change projects in the region or that may be relevant to the region more broadly.

Recommendations

Recommendations

The **operational objectives** of the Harvest Strategy be revised to place greater emphasis on the importance of the Fishery for traditional way of life and livelihood of traditional inhabitants:

- Maintain the stock at (on average), or return to, a target biomass point B_{TARG} 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.
 - The agreed B_{TARG} is more precautionary than the default proxy B_{MEY} (biomass at maximum economic yield) level as outlined in the Commonwealth Harvest Strategy Policy and Guidelines 2007 (HSP).
- Maintain stocks above the limit biomass level (B_{LIM}), or an appropriate proxy, at least 90 per cent of the time.
 - The agreed B_{LIM} is more precautionary than the default proxy HSP B_{LIM} .
- Implement rebuilding strategies if the spawning stock biomass is assessed to have fallen below B_{LIM} in two successive years.

The following decision rules:

eHCR and stock assessment cycle

- The eHCR is run in November each year to provide a RBC for the following fishing season.
- A stock assessment update is run every three years unless the need for an updated stock assessment is triggered by the eHCR or another applicable decision rule. The three-yearly updated stock assessment will be used to determine the Fishery stock status, evaluate the performance of the eHCR and identify whether any revisions to the eHCR are required.
- If the eHCR needs to be revised, a stock assessment will be conducted annually to estimate the RBC until the revised eHCR is agreed.

Pre-season survey trigger

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

Biomass limit reference point triggered

- If the eHCR limit reference point is triggered in any year, a stock assessment update must be conducted in March the following year. In this case, discussions will be held on preventative measures to reduce the risk of closure.
 - If the stock assessment confirms that the stock is below the biomass limit reference point, it is optional to conduct a mid-season survey to inform the next stock assessment; the pre-season survey must continue annually.
- If the eHCR limit reference point is triggered two years in a row, a stock assessment must be conducted in December of the second year.

Recommendations

Fishery closure rules

- If stock assessment updates determine the stock to be below the biomass limit reference point in two successive years, the Fishery will be closed to commercial fishing.
 - In this case, discussions will be held on future management arrangements.
 - Management strategy evaluation (MSE) testing of the eHCR has shown that it is extremely unlikely (<1% probability) that the Fishery would be closed under the eHCR.

Re-opening the Fishery

- Following closure of the Fishery, fishery-independent mid-season and pre-season surveys are mandatory to inform annual stock assessments, and the fishery can only be re-opened when a stock assessment determines the stock to be above the biomass limit reference point.

Graphic flowchart representations of alternative possible scenarios under application of the eHCR are provided in **Attachment B** for the following scenarios:

Four decision rule scenarios:

- Scenario 1 – eHCR limit not breached. Harvest control rule operates as expected. Stock status, fishery dynamics and RBCs remain within ranges tested by MSE. Updated assessment does not indicate any need for revision of the HCR.
- Scenario 2 – eHCR limit not breached. Harvest control rule operates as expected. Stock status, fishery dynamics and RBCs appear to remain within ranges tested in MSE. However, updated assessment indicates that stock status, stock dynamics or fishery dynamics have moved outside ranges tested in MSE, or that TACs recommended by the HCR are not appropriate given the revised estimate of stock status, indicating that the HCR should be revised.
- Scenario 3 – eHCR limit is breached in one year, stock assessment determines the limit is not breached. Application of the HCR in a particular year results in the limit being triggered, requiring a special assessment update to confirm whether the limit has indeed been breached. However, this assessment update determines that the limit has not been breached. The assessment cycle is reset and application of the eHCR continues.
- Scenario 4 – eHCR limit is breached in two successive years, stock assessment confirms the limit is breached. Application of the HCR in a particular year results in the limit being triggered, requiring a special assessment update to confirm whether the limit has indeed been breached. Special assessment update confirms that the limit has indeed been breached. Application of the HCR the following year results in the limit being triggered for the second successive year, requiring a second rapid assessment update to confirm whether the trigger has been breached a second time. Assessment update confirms that the trigger has been breached again. The commercial fishery is closed until an assessment update confirms that the stock has recovered to above the limit.

Agenda Item 1 - preliminaries

1.1 & 1.2 Apologies / adoption of agenda / declaration of interest

Apologies were received from Phillip Ketchell (industry member), Ian Liviko (PNG NFA) and Meremi Maina (PNG industry observer).

The RAG adopted the agenda with no changes.

The RAG generally noted that there could be potential conflicts of interest for members and observers when providing information and advice on some agenda items. These conflicts should be tabled by members.

1.3 Ratification of RAG #19 meeting record

The RAG noted that the RAG 19 meeting record was ratified out-of-session on 20 February 2017. No comments were received on the draft record.

1.4 Action items from previous meetings

The RAG noted progress against action items from previous meetings. The list of action items and progress is provided in **Appendix A**.

Agenda Item 2 - updates

Industry

The RAG noted the updates provide by industry members that:

- Fishers from Darnley Island have had lower than average catches since the start of the 2017 fishing season.
- Fishers from Mabuig Island have reported catches to be lower than expected and similar to the 2016 fishing season. Mabuig fishers report that sand incursions persist on the nearby reefs and it is thought that the sand is causing lower catches of TRL. A higher number of Mabuig fishers participated in lamp fishing during December and January and as a result a higher number of live TRL were landed. The AFMA member noted TIB and TVH fishers have reported that some areas around Mabuig previously inundated by sand are recovering to seagrass and reef habitat.
- The Queensland East Coast Fishery had its best start ever for a fishing season, 97 t of the 195 t TAC was caught in the first three months of fishing (January to March 2017).
- The Torres Strait Fishery hookah opening started well with catch rates above expected, based on the TAC of 495 t. However, catch rates have now dropped and are at a level consistent with a 495 t TAC. Fishing in PNG has been consistent with the Torres Strait. Some industry members noted that return of the south-easterly trade winds may improve fishing conditions.
- The price at the start of the year (during the Chinese New Year and Lantern Festival) was strong. The price is currently at its lowest point in the year (Tomb-Sweeping Day)

4 April 2017). The price is likely to return to normal (approx. average price \$40-\$50 per kilogram) by May.

AFMA

The RAG noted the update provided by the AFMA member that:

- The introduction of a mandatory fish receiver system (also known as catch disposal record) for Torres Strait fisheries is being considered by the PZJA. If agreed, the system will require buyers and processors to record the species and amount of product they purchase. The TRL Working Group supported the introduction of a mandatory fish receiver system at its meeting on 4-5 April 2016.
- Research funding is almost fully committed for the next two financial years and as a result there will be no call for new research proposals in 2017/18. The Torres Strait research budget is due to be underspent by \$80,000 for 2016/17 and it is forecast to be underspent by \$20,000 in 2017/18. Funding is committed to conducting a TRL pre-season survey in 2017/18 and 2018/19.
 - The RAG noted advice from CSIRO that the stock assessment is funded on a three-year cycle and that in every 3rd year the cost of running the assessment is slightly higher because more work is undertaken to review and update stock assessment model.

QDAF

The RAG noted the update from the QDAF member:

- The Queensland East Coast Fishery had an exceptional start to the fishing season, the catch (97 t in 3 months) is the highest ever recorded for the first 3 months of fishing (January to March).
 - CSIRO noted that it will be presenting preliminary results of the Coral Sea gyre advection modelling at Agenda Item 7 and it may be at least part of the explanation for higher catches of TRL on the East Coast.
- The QLD fisheries green paper (policy to guide sustainable fishing) public consultation period has closed. Taking into account consultation outcomes a 'Sustainable fishing Strategy' has been developed and with the Government for consideration.

TSRA

The RAG noted the update from the TSRA member that TSRA is continuing to pursue the roadmap to 100 per cent ownership of commercial fisheries by Traditional Inhabitants through the PZJA process. The member noted the recent increase of TIB catch (Agenda Item 1.2, Attachment A) supports the growing capacity to transition to 100 per cent ownership.

Native title

The RAG noted the update from the Chairperson of Malu Lamar that Malu Lamar RNTBC has contracted two Queensland Council lawyers to provide an independent report on transitioning to 100 per cent ownership of Torres Strait commercial fishing rights by Traditional Inhabitants. The final report is due by the end of April 2017.

Agenda Item 3 – updated fishery assessment

The RAG noted an update on the TRL stock assessment presented by the scientific member based on the paper titled '*Torres Strait rock lobster (TRL) fishery surveys and stock assessment. AFMA Project 2016/0822*':

The scientific member noted that:

- The RAG accepted the 2016 updated Fishery stock assessment and recommended an RBC of 495 t for the 2016/17 fishing season at meeting no. 19 on 13 December 2016.
- At RAG 19, CSIRO noted some final checks of the stock assessment would be undertaken in early 2017 with updated data.
- CSIRO finalised the Fishery stock assessment with the updated data and the RBC remained unchanged at 495 t.

The RAG noted advice from the scientific member that:

- There was an initial key-punching error in the 2014 reported total catch used. The 2014 total catch was corrected from 572.6 t to 682.4 t.
- There is uncertainty in the PNG reported catch for 2016 and one industry member has reported that the PNG catch of 127 t used in the assessment was possibly under reported.
- If PNG caught an additional 100 t in 2016 the fishing mortality rate (F) would increase from approximately 0.10 to 0.15 (F = 0.15 is the target fishing mortality rate). This level of increase would not have a significant impact on the stock sustainability.

The RAG noted advice from the scientific member about the pre-season survey:

- As previously agreed by the RAG, the fishery-independent survey reduced its number of survey sites 2015 (78 sites) and 2016 (74 sites), down from 144 historically to reduce survey costs.
- When using the reduced number of sites, the survey results follow the same trend as the full-scale survey, although they are slightly more uncertain (larger error bars). The reduced number of survey sites still gives a reliable index of abundance and is considered to optimise cost-benefits for the Fishery.

The RAG noted advice from the representative of Malu Lamar that traditional names should be used to describe research areas. This would also assist stakeholders in understanding the nature and extent of survey sites underpinning TRL research.

1. The RAG **AGREED** that Malu Lamar RNTBC is to provide AFMA with the map of traditional boundaries, regional and reef names for each of the Torres Strait Island nations and for CSIRO to examine possible revised naming conventions for survey sites.

The RAG noted that the 2017 RBC derived from the assessment was 495 t compared to 624 t from the eHCR. The reason for the difference was explained:

- The stock assessment model integrates all available information into a single framework to output a RBC. The information includes pre-season survey data, CPUE data for TIB and TVH sectors, and size frequency; the model RBC is not averaged in the same way as for the eHCR.
- The eHCR on the other hand uses averages from the last four years of four of the data inputs, weighted as follows:
 - 1+ TRL indices (70% weighting);
 - 0+ TRL indices (10% weighting);
 - TIB standardised CPUE (10% weighting); and
 - TVH standardised CPUE (10% weighting).

It was also noted that the two-year projection of RBC from the 2015 assessment (719 t) was higher than the RBC from the current assessment. The reason for this was explained:

- the 2015 pre-season survey 0+ (recently settled TRL) index of abundance used in the 2-year projection was relatively high but there is a higher level of uncertainty using the 0+ index compared to the 1+ index, due to the small size and cryptic behaviour of 0+ TRL and a range of factors affecting mortality in the intervening period. Therefore the forecast RBC based on the 0+ indices is less reliable than using the 1+ indices which estimates the abundance of TRL recruiting into the Fishery that will be of fishable size.

The RAG noted the updated data summary for the commercial catch-at-age data detailed in the paper titled '*Summary of Torres Strait and QLD East Coast lobster commercial catch monitoring by MG Kailis Pty Ltd 2001-2017*'. The RAG noted:

- The collection of commercial catch-at-age data from M.G Kailis Pty. Ltd. is cost-effective and provides important information on the size distribution of commercially caught TRL for the Torres Strait and East Coast fisheries.
- The TSRA member noted that a fishery independent observer program may be useful for collecting Torres Strait fishery information such as catch at age. It was noted however that:
 - There may be data other than catch-at-age information, which would be more valuable for an observer program to collect.

- If an observer program or another data collection program is developed it will need to be spatially extensive and overlap with current data collection programs to confirm that the data are representative and compatible with historical data.

The member for TSRA questioned whether recreational and traditional catch of TRL should be taken into account in the fishery stock assessment. Scientific members advised that:

- there needs to be a time series of data or an estimate of historical catch to indicate if catch has increased or decreased over time;
- if recreational and traditional catch has remained constant over time then it may not be worthwhile including in the assessment because it is unlikely to adjust the RBC estimate;
- it is important to understand if catches are a lot bigger than assumed as that could impact the stock assessment; and,
- recreational and traditional catch data are often expensive to collect because this requires surveys to be conducted periodically, therefore it may not be affordable to collect this information.

Agenda Item 4 – finalisation of the harvest strategy

The RAG noted an update from the AFMA member as detailed in the paper titled '*Torres Strait Tropical Rock Lobster Fishery Working Draft Harvest Strategy*' and the scientific member as detailed in the presentation titled '*Summary of empirical Harvest Control Rule for the Torres Strait tropical rock lobster (TRL) fishery.*'

4.1 – Summary of agreed Harvest Strategy to date

- The draft TRL Fishery Harvest Strategy was considered by the RAG at meeting no. 18 and 19 (2-3 August 2016 and 13 December 2016 respectively). The process for finalising this is for the RAG to agree to the final draft Harvest Strategy and the draft final report to be sent to the TRL Working Group and Protected Zone Joint Authority (PZJA) to be agreed.
- The RAG agreed eHCR fits a regression line to the logarithm of last five years of fishery indicator data to determine if the stock size is trending up or down. The indicators used are the pre-season survey 1+ indices (70% weighting), 0+ indices (10% weighting), TIB standardised CPUE (10% weighting) and TVH standardised CPUE (10% weighting). The logarithm is used to reduce the variability in the data and as a result there is also a reduction in the inter-annual variability in the RBC.
- In response to an industry request to consider the simple option of a fixed TAC, it was noted that a Fishery TAC (Australian and PNG inclusive) set as a constant catch would need to be set at 360 t annually to allow for the necessary precaution in years when the stock size may be low. If a constant TAC was set at 360 t the Fishery total

catch would be much lower in the long term due to forgone catch in years of high stock abundance.

4.2 – Operational objectives of the Harvest Strategy

The RAG discussed and provided advice on the objectives of the Harvest Strategy. The RAG **RECOMMENDED** the operational objectives of the Harvest Strategy be revised to place emphasis on the importance of the Fishery for traditional way of life and livelihood of traditional inhabitants:

- Maintain the stock at (on average), or return to, a target biomass point B_{TARG} 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.
 - The agreed B_{TARG} is more precautionary than the default proxy B_{MEY} (biomass at maximum economic yield) level as outlined in the *Commonwealth Harvest Strategy Policy and Guidelines 2007* (HSP).
- Maintain stocks above the limit biomass level (B_{LIM}), or an appropriate proxy, at least 90 per cent of the time.
 - The agreed B_{LIM} is more precautionary than the default proxy HSP B_{LIM}
- Implement rebuilding strategies, if the spawning stock biomass is assessed to fall below B_{LIM} in two successive years.

4.3 – Harvest Strategy Decision Rules

The RAG discussed and provided advice on the Fishery Harvest Strategy decision rules, including the necessary timing of fishery monitoring and assessment and the various scenarios that may occur under the Harvest Strategy.

One industry member and two observers suggested that if the Fishery is facing closure there should be a ban on hookah diving or the Fishery should be closed to the TVH sector.

The RAG **RECOMMENDED** the following decision rules:

eHCR and stock assessment cycle

- The eHCR is run in November each year to provide a RBC for the following fishing season.
- A stock assessment update is run every three years unless the need for an updated stock assessment is triggered by the eHCR or another applicable decision rule. The three-yearly updated stock assessment will be used to determine the Fishery stock status, evaluate the performance of the eHCR and identify if any revisions to the eHCR are required.
- If the eHCR needs to be revised, a stock assessment will be conducted annually to estimate the RBC until the revised eHCR is agreed.

Pre-season survey trigger

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

Biomass limit reference point triggered

- If the eHCR limit reference point is triggered in any year, a stock assessment update must be conducted in March the following year.
 - In this case, discussions will be held on preventative measures to reduce the risk of closure.
 - If the stock assessment confirms that the stock is below the biomass limit reference point, it is optional to conduct a mid-season survey to inform the next stock assessment; the pre-season survey must continue annually.

Fishery closure rules

- If stock assessment updates determine the stock to be below the biomass limit reference point in two successive years, the Fishery will be closed to commercial fishing.
 - In this case, a stock assessment must be conducted in December (of the second year).
 - Discussions will be held on future management arrangements.
 - It should be noted that management strategy evaluation (MSE) testing of the eHCR has shown that it is extremely unlikely (<1% probability) that the Fishery would be closed under the eHCR.

Re-opening the Fishery

- Following closure of the Fishery, fishery-independent mid-season and pre-season surveys are mandatory to inform annual stock assessments, and the fishery can only be re-opened when a stock assessment determines the stock to be above the biomass limit reference point.

Based on the above rules, the independent scientific member provided flowcharts depicting various alternative possible scenarios that may occur under application of the eHCR.

Scenario 1 – eHCR limit not breached. Harvest control rule operates as expected. Stock status, fishery dynamics and recommended TACs remain within ranges tested by MSE. Updated assessment does not indicate any need for revision of the HCR. Application of the eHCR continues unchanged.

- A graphic representation of Scenario 1 is provided in **Attachment B, Figure 1**.

Scenario 2 – eHCR limit not breached. Harvest control rule operates as expected. Stock status, fishery dynamics and recommended TACs appear to remain within ranges tested in MSE. However, updated assessment indicates that stock status, stock dynamics or fishery dynamics have moved outside ranges tested in MSE; or that TACs recommended by the

HCR are not appropriate given the revised estimate of stock status; indicating that the HCR should be revised. Annual RBCs need to be set using annual stock assessments until a revised eHCR has been agreed, after which the revised eHCR is applied.

- A graphic representation of Scenario 2 is provided in **Attachment B, Figure 2**.

Scenario 3– eHCR limit is breached in one year, stock assessment determines limit is not breached. Application of the HCR in a particular year results in the limit being triggered, requiring a special assessment update to confirm whether the limit has indeed been breached. However, this assessment update determines that the limit has not been breached.

- If the biomass limit reference point is breached once, discussions will be held on preventative measures to reduce the risk of closure.
- A graphic representation of Scenario 3 is provided in **Attachment B, Figure 3**.

Scenario 4 – eHCR limit is breached in two successive years, stock assessment confirms limit is breached. Application of the eHCR in a particular year results in the limit being triggered, requiring a special assessment update to confirm whether the limit has indeed been breached. Special assessment update confirms that the limit has indeed been breached. Application of the HCR the following year results in the limit being triggered for the second successive year, requiring a second rapid assessment update to confirm whether the trigger has been breached a second time. Assessment update confirms that the trigger has been breached again. The commercial fishery is closed until an assessment update confirms that the stock has recovered to above the limit.

- If the Fishery is closed to commercial fishing, discussions are held on future management arrangements.
- Fishery independent mid-season and pre-season surveys are mandatory and conducted on an annual basis. The Fishery will only re-open when the Fishery is assessed to be above the biomass limit reference point by the stock assessment.
- The eHCR must be revised before being re-implemented to reduce the risk of the Fishery breaching the biomass limit reference point and for the eHCR to incorporate rebuilding requirements.
- A graphic representation of Scenario 4 is provided in **Attachment B, Figure 4**.

Agenda item 5 – data rules

The RAG noted proposed data rules for the TRL Fishery as detailed in the paper titled '*Separating TIB, TVH and Processor catch records from Docket-Book Data*.' The RAG noted the significant work that had been undertaken to develop the rules and considered having an agreed procedure for filtering the docket book (TDB01) data was a high priority.

For clarity and to enable the RAG to properly assess the data rules, the RAG **AGREED** that AFMA and CSIRO should provide a more detailed explanation of each rule (including

statistics about the number of records it corrected by each rule) and provide it to the RAG out of session.

Agenda item 6 – climate change

The RAG noted presentations from AFMA, TSRA and CSIRO about ongoing and planned climate change research for the region and Australia more broadly. The purpose of the discussion was to improve the RAG's understanding on climate change research initiatives and information relevant to the fishery.

AFMA

The AFMA observer noted that AFMA is involved with two funding applications for projects relating to climate change titled:

- 1) *'Adaptation of Commonwealth fisheries management to climate change.'*
 - This project proposes to use the findings of previous research that identifies how fisheries may be impacted by climate change to adapt or generate management strategies for Commonwealth fisheries that will be resilient to the predicted changes.
 - The project is not specifically related to the Torres Strait; however the findings and outcomes may be useful for adapting the management strategies of Torres Strait fisheries.
- 2) *'Decadal scale projection of changes in Australian fisheries stocks under climate change.'*
 - This project will evaluate species and fisheries vulnerability to climate change using ecosystem modelling for the oceans around continental Australia.
 - The species selected will be based on the vulnerability assessment and with consideration of geographic coverage, economic value and known abundance and distribution trends.
 - The RAG **AGREED** that AFMA should contact the research applicant (CSIRO) to propose that tropical rock lobster be included as an indicator species for the project.
 - The scientific member noted there had been some preliminary discussions with the principal investigator to include tropical rock lobster; however the Torres Strait lobster stock is not included in other ecosystem models (for example Ecopath, Ecosim and Atlantis). A supporting project may need to be developed for the inclusion of TRL into the modelling.

TSRA

The TSRA member provided an update as detailed in the paper *'Update on TSRA climate change projects – marine focus'* (**Attachment C**).

- TSRA and AIMS established marine monitoring stations at Masig, Maize Kauri (Bramble Cay) and Tuesday Island that monitor meteorological parameters and ocean temperature and salinity.
- A number of temperature data loggers have been deployed off islands across the Torres Strait, the data are monitored by AIMS and it is incorporated into the coral reef bleaching risk assessment.
- In 2016 aerial and in-water surveys were conducted to assess the extent of the mass coral reef bleaching event. A number of permanent reef monitoring sites have been established.
- The Torres Strait Regional Adaptation and Resilience Plan was developed to address climate change risks and build resilience.
- TSRA will be facilitating a workshop on 7-8 June 2017 in Cairns to evaluate the shipping risks in the Torres Strait and the potential impacts to fisheries.

CSIRO

The CSIRO observer provided an update as detailed in the presentation titled '*Climate influences in Torres Strait and the TRL Fishery.*'

- Since 1970 the sea surface temperature in the Coral Sea has consistently been above the long term average (data from 1900 to 2017).
- The El Nino event from 2015/16 was more intense than previous events in recent history. The impacts to the Fishery include increased mortality of cage-held lobsters and increasing coral mortality that may result in a reduction of suitable habitat. The influences on the larval phases of TRL are poorly understood.
- Updated oceanographic larval transport models (CONNIE 3) show that El Nino Southern Oscillation (ENSO) cycles may impact the delivery of TRL larvae to the Torres Strait. The models can be used to estimate how larval dispersal is impacted by climate change.
- Preliminary modelling indicates a strengthening of the Coral Sea gyre during El Nino events.
- Seabed habitat monitoring as part of the TRL fishery independent surveys identified:
 - seagrass habitat declined up to 2001 and has since increased;
 - increase in sand habitat in the north-west region (Mabuiag), supported by fisher observations; and
 - decrease in live coral cover and an increase in bleached coral.

The independent scientific member noted that CONNIE 3 which models oceanographic conditions in the Coral Sea is likely to be useful to predict how TRL larvae would be

transported from PNG to the Torres Strait and how climate change may impact larval transport and recruitment.

The scientific member noted that the biggest climate change risk that is likely to affect TRL and should be accounted for in the stock assessment model is likely to be changes to sea temperature and its influence on growth and mortality of TRL. The member noted the assessment could be updated using information from climate projections and higher resolution projections from CONNIE 3 to identify the possible impacts of climate change.

The RAG **AGREED** that CSIRO should provide further advice on how updating the stock assessment with CONNIE 3 modelling outputs may improve the understanding of climate change impacts to growth, mortality and recruitment of TRL.

The RAG **AGREED** for AFMA in collaboration with CSIRO and TSRA to put together a list of all climate change projects in the region or that may be relevant to the region more broadly.

Agenda item 7 – other business

The Chair noted that due to time constraints the following agenda items will need to be discussed at the next meeting:

- Agenda item 6 *'options for supporting industry run TRL surveys'* (paper sent to RAG out of session)
- Agenda item 8 *'future work – developing a tiered approach for the harvest control rule.'*

The next meeting was agreed for December 2017.