Northern Prawn Fishery Resource Assessment Group (NPRAG)

Meeting minutes

23 November 2021

Via teleconference

Agenda

Table 1. Final meeting agenda

Agenda Item	Purpose	Lead presenter
1. Preliminaries		
1.1 Welcome and apologies	For Action – open the NPRAG meeting with an Acknowledgement of Country	Chair
1.2 Declarations of interest	For Advice – consider the declared conflicts of interest and decide how conflicts of interest will be managed	Chair
2. Modelling growth of red endeavour prawns	For recommendation – review the results of stage 1 – modelling growth of red endeavour prawns – and consider whether the next stage of the project should proceed	Shijie Zhou
3. Other business		Darci Wallis

Meeting participants:

Members

Ian Knuckey	Chair
David Brewer	Scientific member
Rik Buckworth	Scientific member
Éva Plagányi	Scientific member
Phil Robson	Industry member
Darci Wallis	AFMA[1] member

Executive officer

Cate Coddington	AFMA

Invited participants

Annie Jarrett	NPFI

Observers

Laura Blamey	CSIRO[2]
Ian Butler	ABARES[3]
Josh Cahill	NPFI[4]
Trevor Hutton	CSIRO
Rob Kenyon	CSIRO
Sean Pascoe	CSIRO
Tonya Van Der Velde	CSIRO
Shijie Zhou	CSIRO

Apologies

Steve Bolton	AFMA
Ian Boot	Industry member
Robert Curtotti	ABARES
Roy Deng	CSIRO
Gary Fry	CSIRO
Tom Kompas	Economic member
Judy Upston	CSIRO
Bryan van Wyk	Industry member

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[1] Australian Fisheries Management Authority
[2] Commonwealth Scientific and Industrial Research Organisation

[3] Australian Bureau of Agricultural and Resource Economics
[4] Northern Prawn Fishery Industry

Agenda item 1. Preliminaries

1.1. Welcome and apologies

1. Ian Knuckey, the Chair opened the meeting at 1100 AEDT[5], and:

   - welcomed meeting participants;
   - made an Acknowledgement of Country;
   - informed participants that the meeting was being recorded and will be used for minute taking purposes, the recording will be deleted after minutes are finalised; and
   - commenced proceedings.

2. The RAG noted that there was a quorum for the meeting as per *Fisheries Administration Paper 12* (FAP12).

3. The RAG welcomed Josh Cahill and Cate Coddington to NPRAG.

1.2. Declarations of interest

4. The RAG members followed the conflict of interest declarations as outlined in FAP12. Members and observers provided declarations of conflicts of interest as prescribed in FAP12 prior to the commencement of the meeting (at **Appendix A**).

5. The RAG discussed potential conflicts of interest and participation under specific agenda items and agreed that all current CSIRO employees have a conflict of interest with Agenda Item 2: *Modelling growth of red endeavour prawns* and could participate in the discussion but not be present for the recommendation.

Agenda item 2. Modelling growth of red endeavour prawns

6. The RAG noted the information presented by Shijie Zhou about modelling the growth of red endeavour prawns, which is the first stage[6] of a three stage project *red endeavour prawn assessment – further potential improvements* (AFMA project number: 200806) in the Northern Prawn Fishery (NPF):

   - The red endeavour prawn stock has not been assessed previously in the NPF as it is a relatively data-poor species and there is not a rigorous enough growth model available.
   - The data used for this study were from the Maxim[7] surveys:
     - twenty one continuous monthly surveys were conducted between August 1983 and March 1985 in the north-western Gulf of Carpentaria;
     - distribution and length frequency distribution data were collected for all commercial prawn species including red endeavour prawns;
     - were adjusted to account for gear selectivity; and
     - prawns with a carapace length less than 10mm were not captured.
   - Six models were applied to each sex, because males and female red endeavour prawns have different body sizes and growth rates (12 models in total). Two versions of the von Bertalanffy

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[5] Australian Eastern Daylight Time

[6] Zhou, S., Hutton, T., Lei, Y., Miller, M., van Der Velde, T., and Deng, A. R. (2021) *Modelling growth of red endeavour prawns using new ELEFAN and Bayesian growth models*. Draft report to Australian Fishery Management Authority. Brisbane, Australia.

[7] Maxim: the fishing vessel (FV) used to undertake the surveys.

growth function (VBGF)[8] – the standard VBGF model and the seasonal oscillation model – were applied to three different methods:

- Two separate algorithms of Electronic Length Frequency Analysis (ELEFAN):
    1. genetic algorithms (ELEFAN_GA); and
    2. simulated annealing (ELEFAN_SA); and
- Bayesian growth models (BGM)[9] (developed in this study).

- Three separate cohorts or year classes are evident in all 12 models.
- All models provide comparable results (sex separated) and, while there are some variabilities amongst the methods and growth functions, the values are more consistent than studies on other prawn species.
- The results were compared with existing studies on the growth of red endeavour prawns outside Australia and in the NPF. The current analysis is considered both rigorous and reliable.
- The seasonal oscillation models fit the length frequency distribution data better than the standard VBGF, but the difference is statistically insignificant. For stock assessment and other applications, the recommended average estimates from the three methods are in **Table 1**.
- The next stages of the project are:
    - Stage 2: conduct CPUE standardisation for both blue and red endeavour prawns by incorporating environmental and fishery data; and
    - Stage 3: develop stock assessment methods for red endeavour prawns using standardised CPUE from stage 2 and incorporate the growth estimated in stage 1.

Table 2 Recommended growth parameters (mean with standard deviation in parenthesis) for male and female red endeavour prawns. Notes: C and ts are additional parameters from the seasonal oscillation model where C measures the magnitude of the oscillation and ts defines the beginning of the oscillation wave.

	L_{inf}	K	t_0	C	ts
Male	36.95 (0.91)	2.72 (0.37)	-0.06 (0.50)	0.48 (0.19)	0.40 (0.17)
Female	51.43 (1.80)	2.25 (0.35)	-0.02 (0.03)	0.39 (0.17)	0.66 (0.18)

7. The RAG discussed the results of Stage 1 (modelling growth) of the *Red Endeavour Prawn Assessment* project noting the following key points:

- The outcome from the models is solid; the analysis was comprehensive with a robust set of parameters applied.
- In generating the recommended growth parameters, the assumption made was that biological or seasonal information for red endeavour prawns has not changed since the 80's. Given the significant time period that has lapsed it would be beneficial to consider whether the biological or seasonal information may have changed. In considering this, the following points were raised:
    - It is likely that the growth curve itself is robust; wholescale increases in growth rates are not apparent and could be confirmed by considering whether maximum size has changed.
    - The timing of life history events, such as spawning, could have been impacted by changing climatic conditions.
    - It is unlikely that any existing datasets will include the necessary time series of samples for adult-size prawns.

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[8] The VBGF has been widely adopted for modelling prawn species. The two versions of VBGF are the standard 3-parameter model and a seasonal oscillation model (which involves two additional parameters).
[9] The BGM allows estimating ages, including the theoretical age at length zero, age at first capture, and consecutive ages in each survey time step using length frequency data alone.

8. The RAG outlined potential recent data that could be used to test the relevance of the model:
   - Northern Territory data from the 1990s (collected by Rik Buckworth). While the data will be solid, the magnitude of the data is unknown and is still being archived into a digital database.
   - Redleg banana prawn data is currently being reviewed as part of Éva Plagányi work and may have some red endeavour prawn data.
   - The current species split project[10], led by Judy Upston could also provide data, but:
     - the project is focussed on the commercial sector during the two fishing seasons so there will not be the continuity required nor are many endeavour prawns caught during the banana season.
     - the data is unlikely to be available before the conclusion of this project, but could be used in the future.
     - The data could be used to test if there has been a significant shift in the overall prawn size across the fishery since the period of the FV Maxim surveys, as prawns were fully commercial during the 1980s the data is comparable.

Action Item 1: CSIRO

Shijie Zhou to explore the potential for undertaking comparisons of size of prawns (maximum size) with more recent data (which as species split).

Action Item 2: CSIRO

Éva Plagányi to check if red endeavour prawns part of previous data focussing on JPG stocks of redleg banana prawns.

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9. CSIRO-employed participants left the meeting so that the remaining participants could consider a recommendation[11].

10. The remaining participants further discussed the outcomes of the project so far and agreed that stage 1 of the project had produced good results and should be endorsed by the RAG, noting:

   - there was a lack of information about juvenile prawns because these were not caught during the Maxim surveys and are not on the grounds where prawns are trawled in August to October. Rik Buckworth outlined that the location of the Juvenile Ecology and FV Maxim surveys generally covered all of the areas, including the inshore regions in 1982-83, from intertidal nursery areas to 40m depths.
     - after they have emigrated from juvenile habitats, red endeavour prawns are generally caught at depth, with the juvenile prawns, less than 10mm carapace length (CL), were captured in really shallow waters (in the nursery). Prawn trawl gear is not designed to catch juvenile prawns. Additionally, identification of juvenile prawns could be problematic, as other species appear very similar.

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[10] Project Title: *Updated NPF species distribution data, models and sampling schemes – towards regular ongoing monitoring* (AFMA reference: 190805)
[11] Prior to CSIRO leaving the meeting, Agenda Item 3 *Other Business* was discussed

- the work that Derek Staples and other research scientists undertook in the 1970s and 80s was focussed on banana and tiger prawns[12], the red endeavour prawn data was incidental: the abundance and size of this species was recorded at the time for the same locations as tiger prawn data, but not published. While red endeavour prawns were found mostly in seagrass and algae beds, they were generally found in most habitats examined and were quite abundant. Tiger and blue endeavour prawns were mostly found in seagrass beds and banana prawns in inlets and estuarine areas.

- Stage 2 of the project is due at the end of May 2022 and the final report incorporating Stage 3 is due in August 2022.

- The current NPF certification, which has conditions relating to red endeavour prawns, is up for Marine Stewardship Council (MSC) reassessment in 2022.

11. **The RAG recommended stage 2 of the project '*Conduct CPUE standardisation for both blue and red endeavour prawns by incorporating environmental and fishery data*' proceed.**

Agenda item 3. Other Business

12. The RAG noted that Steve Bolton is retiring and will be finishing at AFMA on 14 December 2021 and expressed their appreciation for the contributions he had made to the NPF over many years.

13. The RAG also noted Adrianne Laird's departure from NPFI and thanked her for the work that she had undertaken as NPFI Projects Manager on NPF bycatch initiatives, the crew member observer program and industry engagement.

Close of meeting

14. The Chair closed the meeting at 1220 AEDT.

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[12] Published data including:
- Loneragen, N.R., Kenyon, R.A., Haywood, M.D.E. & Staples, D.J. (1994) Population dynamics of juvenile tiger prawns (*Penaeus esculentus* and *P. semisulcatus*) in seagrass habitats of the western Gulf of Carpentaria, Australia, *Marine Biology* 119:133-143., and
- Loneragen, N.R., Kenyon, R.A., Staples, D.J., Poiner, I.R. & Conacher, C.A. (1998) The influence of seagrass type on the distribution and abundance of postlarval and juvenile tiger prawns (*Penaeus esculentus* and *P. semisulcatus*) in the western Gulf of Carpentaria, Australia. *Journal of Experimental Marine Biology and Ecology*. 228: 175-195

Appendix A - register of interest

Name	Membership	Declared interests
Ian Knuckey	Chair	Director - Fishwell Consulting Pty Ltd Director - Olrac Australia - a company associated with electronic logbooks. Scientific member - NORMAC Member - North Marine Parks Advisory Committee Chair - Tropical Rock Lobster RAG Chair - Victorian Rock Lobster RAG Scientific member - SESSF shark RAG Scientific member - GABRAG Works with Indigenous communities in capacity building activities Chair - South Australia's Gulf of St Vincent prawn fishery's research committee Scientific member - South Australia's Gulf of St Vincent prawn fishery's management advisory committee Current consultancy with NT Fisheries designing a snapper species survey Various research interests in other Commonwealth and State fisheries.
David Brewer	Scientific Member	Director - Upwelling P/L (David Brewer Consulting) Honorary Fellow - CSIRO Scientific member - NPRAG Scientific member - Torres Strait Fin Fish Working Group Chair - Torres Strait Fin Fish RAG Current consultancy work with the Quandamooka Yoolooburrabee Aboriginal Corporation, Moreton Bay and Newcrest mining.
Rik Buckworth	Scientific Member	Scientific Member - Torres Strait Finfish RAG Director - Aquatic Remote Biopsy Pty Ltd Director - Sea Sense Australia Pty Ltd Adjunct Professor - Charles Darwin University Appointed as a CSIRO Fellow in 2020 Current consultancy contract with NPFI to review Red Endeavour Prawns Chair of the NT Aquarium Fishery Management Advisory Committee Various consultancy work with NT Fisheries Current consultancy contract with AFMA and QDAF for a project in the Torres Strait Researcher involved particularly in stock assessment research in NPF. Has in the past and may in future seek and receive funding for research in the fishery.
Éva Plagányi	Scientific Member - CSIRO	Research provider involved particularly in stock assessment research in NPF. Also currently receiving FRDC funding related to development of a GoC ecosystem model. Has in the past and may in future seek and receive funding for research in the fishery. Scientific member of TRLRAG and TS HCRAG.
Phil Robson	Industry Member	Employee of A Raptis and Sons, responsible for managing NPF vessels & an NT demersal fish trawler. Has provided charter for scientific surveys in NPF in the past and may in future.
Darci Wallis	AFMA Member	AFMA employee, no pecuniary interest in the fishery.
Cate Coddington	Executive Officer (AFMA)	AFMA employee, no pecuniary interest in the fishery.
Annie Jarrett	Invited participant - NPFI	CEO- NPFI MSC-Asia Pacific director Chair - Australian Council of Prawn Fisheries (ACPF) Commonwealth Fisheries Association Director Member of the FRDC selection panel.

Name	Membership	Declared interests
Laura Blamey	Observer - CSIRO	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.
Ian Butler	Observer - ABARES	Economics research provider. No current pecuniary interest in fishery. Potential to seek and receive funding for research in the fishery in future.
Josh Cahill	Observer - NPFI	Executive Officer – Abalone Victoria Central Zone Executive Officer – Abalone Council Victoria Commercial sea urchin diver in the Victoria Central Zone Fishery Projects Manager – NPFI
Trevor Hutton	Observer - CSIRO	Research provider involved particularly in stock assessment research in NPF. Has in the past and may in future seek and receive funding for research in the fishery.
Rob Kenyon	Observer - CSIRO	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.
Sean Pascoe	Observer - CSIRO	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.
Tonya Van Der Velde	Observer - CSIRO	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.
Shijie Zhou	Observer - CSIRO	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.