



Australian Government

Australian Fisheries Management Authority

Northern Prawn Fishery Resource Assessment Group (NPRAG) Meeting

Meeting Minutes

Date: 20-21 May 2020

Tele/video conference

Attendees

Wednesday 20 May 2020	
Name	Member type
<i>Ian Knuckey</i>	<i>Chair</i>
<i>Tom Kompas</i>	<i>Economic Member</i>
<i>Phil Robson</i>	<i>Industry Member</i>
<i>David Brewer</i>	<i>Scientific Member</i>
<i>Rik Buckworth</i>	<i>Scientific Member</i>
<i>David Power</i>	<i>AFMA Member</i>
<i>Stephen Eves</i>	<i>Executive Officer – AFMA</i>
<i>Steve Bolton</i>	<i>Observer – AFMA</i>
<i>Annie Jarrett</i>	<i>Invited Participant – NPFI</i>
<i>Adrienne Laird</i>	<i>Observer – NPFI</i>
<i>Robert Curtotti</i>	<i>Observer – ABARES</i>
<i>James Larcombe</i>	<i>Observer – ABARES</i>
<i>Trevor Hutton</i>	<i>Observer – CSIRO</i>
<i>Gary Fry</i>	<i>Observer – CSIRO</i>
<i>Rob Kenyon</i>	<i>Observer – CSIRO</i>
<i>Judy Upston</i>	<i>Observer – CSIRO</i>
<i>Roy Deng</i>	<i>Observer – CSIRO</i>
<i>Eva Plaganyi</i>	<i>Observer – CSIRO</i>
<i>Laura Blamey</i>	<i>Observer – CSIRO</i>
<i>Alistair Hobday</i>	<i>Observer – CSIRO</i>
<i>Shijie Zhou</i>	<i>Observer – CSIRO</i>
<i>Tonya Van Der Velde</i>	<i>Observer – CSIRO</i>
Thursday 21 May 2020	
<i>Ian Knuckey</i>	<i>Chair</i>
<i>Tom Kompas</i>	<i>Economic Member</i>
<i>Phil Robson</i>	<i>Industry Member</i>
<i>David Brewer</i>	<i>Scientific Member</i>
<i>Rik Buckworth</i>	<i>Scientific Member</i>
<i>David Power</i>	<i>AFMA Member</i>
<i>Stephen Eves</i>	<i>Executive Officer – AFMA</i>
<i>Harry Needham</i>	<i>Observer – AFMA</i>
<i>Annie Jarrett</i>	<i>Invited Participant – NPFI</i>
<i>Adrienne Laird</i>	<i>Observer – NPFI</i>
<i>Robert Curtotti</i>	<i>Observer – ABARES</i>
<i>James Larcombe</i>	<i>Observer – ABARES</i>
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<i>Shijie Zhou</i>	<i>Observer – CSIRO</i>
<i>Tonya Van Der Velde</i>	<i>Observer – CSIRO</i>
<i>Sean Pascoe</i>	<i>Observer – CSIRO</i>
Additional participants for climate change adaptation project	
<i>Beth Fulton</i>	<i>Observer – CSIRO</i>
<i>Jess Melbourne-Thomas</i>	<i>Observer – CSIRO</i>
<i>Steve Bolton</i>	<i>Observer – AFMA</i>
<i>David Carter</i>	<i>Observer – Industry</i>
<i>Ron Earle</i>	<i>Observer – Industry</i>
<i>Andy Prendergast</i>	<i>Observer – Industry</i>
<i>Bryan van Wyk</i>	<i>Observer – Industry</i>

1 Preliminaries

1.1 Welcome and apologies

The Northern Prawn Fishery Resource Assessment Group (NPRAG) Chair, Ian Knuckey, opened the meeting at 9:30 am (AEST) on 20 May 2020 with an Acknowledgement of Country. The Chair noted apologies from Industry Member Ian Boot.

1.2 Adoption of Agenda

The Chair requested that the NPRAG consider the draft agenda (Attachment 1), identify any required amendments, and adopt the draft agenda for the meeting. The agenda was adopted without any changes.

1.3 Declaration of interests

The Chair requested that NPRAG members consider the standing table of declared interests (Attachment 2) and individually declare whether their stated interests remain accurate, and if not, provide an update on those.

Industry members, followed by researchers, left the meeting while the remaining participants considered whether any group or individual had a real or perceived conflict of interest with any of the agenda items. It was noted that industry participants had a potential conflict regarding broodstock collection, but the relevant agenda item (*P. monodon* stock assessment) was for noting and industry participation in the discussion was welcome. It was also noted that industry participants had a potential conflict regarding recommendations on total allowable effort (TAE) for tiger prawns and Redleg banana prawns, to be discussed under agenda items four and five, respectively, and that some industry and research participants had a potential conflict with agenda item eight (NT data analysis of commercially important species). CSIRO and industry participants' involvement in updating assessment assumptions for endeavour prawns was noted and Rik

Buckworth declared that he has been working with CSIRO on this project. Rik further advised that he is currently engaged with AFMA as a consultant on a project, and occasionally has contracts with NT Fisheries, which is of particular relevance when discussing agenda item eight (NT data analysis of commercially important species).

The RAG acknowledged all the potential conflicts and agreed that should any undue conflict arise for any agenda item, the relevant participants would be asked to leave the meeting for any RAG recommendation.

1.4 Minutes from previous meetings

It was noted that the minutes from the 11 March 2020 teleconference were accepted out-of-session via email as a true and accurate record of the meeting.

2 Update reports

2.1 Industry update

NPRAG noted an update from Industry on the status of improved bycatch reduction device (BRD) implementation in 2020, sawfish mitigation and reporting improvements, the Crew Member Observer (CMO) program, and the management of broodstock collection.

2020 BRD implementation

An industry code of conduct for the use of bycatch reduction devices (BRDs) in the 2020 banana prawn season was developed by NPF Industry Pty Ltd (NPFIL). The code requires NPF operators targeting tiger prawns to use an approved BRD that has been shown to reduce bycatch by at least 30 per cent. This requirement is only necessary for half of a vessel's nets in operation, the other nets can continue to be used with the current BRD configuration. The code of conduct will be reviewed prior to the 2021 banana prawn season.

An analysis of the quantity of tiger prawns caught in the banana prawn season (as a proportion of the yearly tiger prawn catch) will be undertaken to determine a future trigger value for review of BRD use in future banana prawn seasons. The results of the analysis will be reported to NPRAG in November 2020 with a view to seeking support for an appropriate trigger value to determine if and when a review of BRDs for use in the banana prawn season would occur.

Full implementation of BRDs that reduce bycatch by 30 per cent or more will be mandatory in all nets in the tiger prawn season from 2020. This has been legislated through the NPF Gear Requirements Direction 174.

Sawfish mitigation

The collaborative project between Flinders University and Charles Darwin University, 'Can sawfish bycatch within the NPF be mitigated using an electric field?', has been completed. The research found that although sawfish reacted and were repelled by electric fields, they did not display a fleeing behaviour from a distance far enough away to avoid entering trawl nets. Reaction distances were small, typically less than 1.2 metres, likely too small to avoid sawfish being captured by moving nets, and none of the waveforms tested could repel from distances likely to be sufficient to deter sawfish from entering trawl nets (3–4 m). Additionally, exposure to the electric fields tested did not consistently promote escape responses. This suggests that the electric pulses tested are unlikely to be useful to reduce sawfish bycatch in prawn trawlers. Increasing pulse voltage, frequency or duration could potentially improve the usefulness of an electric field repelling sawfish, but higher energy waveforms would be more challenging to implement (as larger units would be necessary to produce the electric

field, which would be more expensive and have higher power consumption); increase potential stress and harmful side-effects in sawfish and other non-target species; and, be more dangerous to crew deploying the devices.

The CSIRO project 'How does trawl gear configuration affect sawfish catches: mitigating interactions with sawfish in the NPF' has been funded through the government grant 'Our Marine Parks Round One'. It is investigating the effect of turtle excluder device (TED) orientation and trawl net configuration on escapement and entanglement of sawfish to identify potential mitigation measures using crew member observer (CMO) photos and videoing of sawfish behaviour in the trawl nets. Fishing vessels *Kodiak T* and *Admiralty Pearl* each deployed two camera systems in their nets during the 2019 tiger prawn season. The video footage is currently being analysed by CSIRO and the two vessels are continuing with the camera deployment during the current banana prawn season. Historical CMO photos have been analysed to determine TED orientation, location of sawfish entanglement, life condition, and injuries. This data is currently being modelled by the CSIRO Data61 team. This project will be finalised in June 2020. To continue the work and test possible mitigation measures, an expression of interest was submitted to the Fisheries Research and Development Corporation (FRDC) in September 2019 followed by the full proposal in February 2020. The 3-year project has been approved and the contract is currently being finalised.

The Charles Darwin University project 'Is the Northern Prawn Fishery interacting with a single population, or multiple populations of the Narrow Sawfish *Anoxypristis cuspidata*?' is progressing well with NPF continuing to work with researchers at Charles Darwin University to facilitate the collection of tissue samples of *A. cuspidata* and other sawfish species incidentally caught in the NPF. The tissue samples will be provided to CSIRO geneticists to sequence complete mitogenomes with the aim of determining the provenance of individuals caught. These samples, and samples previously collected by the CMO program, will be shared across research projects, for example the close kin mark recapture (CKMR) project. Approximately 160 samples have been collected in the NPF to date (over 140 in 2018-2019) by CMOs, operators, broodstock operators, and AFMA Scientific Observers. Sample collection is continuing during the 2020 banana prawn season by CMOs and NPF operators. Northern Territory Fisheries is also contributing approximately 165 samples to the project.

NPFI and CSIRO developed a sawfish species identification poster that was distributed to vessels during the 2019 tiger prawn pre-season briefings. In 2019, the reporting of unidentified species decreased overall compared to previous years. Species-level reporting in logbooks increased in the tiger prawn season, particularly for Narrow Sawfish, and the number of unidentified sawfish reported decreased. NPFI is working with AFMA to identify and target fishing vessels that aren't consistently reporting interactions with sawfish. During the 2020 banana prawn pre-season briefings, NPFI educated the relevant skippers on species reporting.

CMO program update

During 2019, thirteen CMOs collected data, two in the banana prawn season and 11 in the tiger prawn season. A total of 3414 shots were monitored by CMOs (13% of the fleets fishing activity) for Threatened, Endangered, Protected (TEP) and at-risk species, well above the target of 2350 shots. Three CMOs are collecting data during the 2020 banana prawn season.

Broodstock collection

NPFI is continuing to manage collection of *P. monodon* broodstock in the NPF for provision to prawn farmers as part of the NPFI/AFMA co-management agreement. Currently, one full-time and one part-time vessel operating under AFMA fishing permits are contracted to collect broodstock in 2020. An additional vessel may be contracted later in the year if required. The 9000 individual prawn cap on supply of broodstock animals to prawn farmers is still in place, noting 9000 individuals is different to the actual number of animals actually caught in broodstock fishing operations. A review of the 9000 cap may need to be undertaken, subject to the outcome of the *P. monodon* stock assessment. The number of broodstock required by prawn farms in 2020 is less than 9000.

Broodstock fishing vessels are complying with catch and effort data requirements (including in relation to discards) and are reporting and collecting sawfish data, including through log sheets, photographs and taking flesh samples (when safe to do so) using the supplied sampling kits.

NPF Industry Pty Ltd held discussions with the Australian Prawn Farmers Association (APFA) regarding the possibility of collecting length frequency data immediately after capture, but this was rejected due to the need to minimise handling to reduce stress to the animals. The APFA Standard Operations Procedures manual states that sexually mature *P. monodon* sizes are roughly considered to be 70 grams (or 205 mm tip of rostrum to tip of telson) for males and 100 grams or (220 mm) for females. Animals smaller than this are generally discarded unless catches are poor and farms are prepared to take smaller animals.

It was pointed out that there are some limitations with the way broodstock collection is currently reported which presents problems for the *P. monodon* stock assessment. Some of the issues identified included: 1) the estimated average weight for each *P. monodon* individual of 150 grams is too high; 2) the reporting of *P. monodon* catch between the NPF commercial fishery and targeted broodstock fishing is different; and 3) whether a length-weight ratio could be used to estimate the weight of individuals from the use of prawn grades. The RAG agreed it would be useful for AFMA, NPFI and CSIRO to consider some of the data limitations over the coming weeks to inform improvements to the stock assessment project.

2020 banana prawn season

The RAG noted that catches in the 2020 banana prawn season have been below average. The season started okay but catches dropped off considerably approaching the full moon period. Catches increased a little after the full moon phase but were still well below average. Winds in April were some of the calmest in a long time, but then conditions changed in May and were extremely windy and rough, leading to large temperature fluctuations in the Gulf of Carpentaria. Catches from west of Mornington Island through to Vanderlin Island were disappointing. Prawn sizes have been average, although slightly smaller than average at Fog Bay. Catches in the Joseph Bonaparte Gulf have been much higher compared to recent years. Due to the below-average catches, some boats have already stopped fishing and it's unlikely the fishery will remain open to banana prawn fishing through to the season closing date of 15 June. The price of prawns has increased compared to 2019 but is not as high as expected considering the limited volume of product caught. Prawn sales are going well, mainly due to the limited catch this year, and it is likely there will be a shortage of banana prawns later in the year. Consumer behaviour has been impacted in 2020 due to the influence of COVID-19. During the early stage of the pandemic, sales of prawns dropped dramatically along with sales of other luxury products. Consumers' preference then changed from

fresh to frozen prawns. More recently, consumer behaviour has changed again and the purchase of luxury items, including fresh and frozen seafood, is increasing.

It was noted that in December 2019 researchers had been in the Mitchell, Gilbert and Flinders rivers and there was no noticeable decrease in juvenile prawn recruitment in those areas. Even though catches have been lower in 2020, there was no evidence of recruitment failure to the in-shore areas.

The RAG was reminded the banana prawn MEY trigger was calculated to be much lower this year because of the decrease in fuel prices, but remained at the lower limit of 425 kg/boat/day because of the 15 per cent buffer in the NPF Harvest Strategy. Industry was asked whether, had the modelled trigger rate been adopted, the industry would have kept fishing. It was advised that the trigger is difficult to predict ahead of time due to unknown variables such as prawn price and prawn sizes, and the fuel price doesn't alter fishing behaviour as much as would be expected. Industry indicated that if the fuel price increases significantly, fishers might alter their fishing behaviour.

Action:

- AFMA, NPFI and CSIRO to discuss some of the *P. monodon* data issues and improvements that can be made to the stock assessment project.

2.2 AFMA management update

NPRAG noted an update provided by AFMA management including:

- AFMA office arrangements – AFMA is in its eighth week of working from home arrangements and the agency is performing well and continues to meet its objectives.
- NPF Harvest Strategy and Fisheries Management Strategy (FMS) – Development of the NPF FMS is progressing and will include relevant updates to the harvest strategy, an updated bycatch strategy along with a data plan and research plan. The research plan component is complete and will reflect the existing strategic research priorities along with annual updates. NPFI is leading the development of the bycatch strategy components which will be discussed during the meeting. It is anticipated that an updated draft of the FMS will be circulated to NPRAG members out of session in mid-2020. This will include the updates noted here for the harvest strategy along with the data plan and bycatch strategy. AFMA aims to have the 2020 FMS ready for consideration in session at the November 2020 RAG meeting. The FMS is a live document, subject to annual review at each November RAG meeting.
- NPF data plan – development of the data plan is continuing out of session and a draft is being prepared that reflects the outcomes of the November RAG meeting and the data planning session. The template for the data plan was circulated at the November RAG meeting and the next draft will be included in the FMS to be circulated to the RAG mid-year.
- Sawfish close-kin mark recapture (CKMR) project – on 30 April 2020, AFMA, NPFI, CSIRO and the Department of Agriculture, Water and the Environment (DAWE) met to discuss progress on developing a sawfish CKMR project. CSIRO has coordinated a project proposal but there is uncertainty as to the possible funding options. The NESP research hub is nearing the end of its current funding and the next iteration of the NESP is still being worked out. Funding from the FRDC is also uncertain as it has put any new project proposals on hold. The group agreed the most immediate priority is to continue the NPF sampling regime so that when the CKMR project is supported, there will be enough samples to immediately begin the project.

- Listing of Narrow Sawfish as Migratory and update on sawfish recovery plan – the Sawfish and River Sharks Multispecies Recovery Plan is due to be reviewed in 2020. Narrow Sawfish will be included for the first time as it is now listed as a Migratory species. The Narrow Sawfish is also undergoing an assessment for listing as a threatened species. This process will take some time and an outcome is not expected until 2022. Currently the other three sawfish species encountered in the NPF are listed as Vulnerable; however, there is a proposal being considered in 2020 to up-list the status of the largetooth/freshwater sawfish to Endangered. The Threatened Species Scientific Committee is scheduled to consider the listing this year. AFMA has been invited to provide comment on the following points:
 - whether the range jurisdictions have been recorded correctly;
 - whether there is any catch data and/or information on existing fisheries management arrangements in place for the species and which, if any, fisheries currently interact with these species; and,
 - views on the relative priorities of the nominated species for threatened species assessment under the Environment Protection and Biodiversity Conservation (EPBC) Act.

In response to these points AFMA has provided a summary of catches in the NPF, highlighting they are very low for *Pristis pristis* and has outlined management arrangements and the comprehensive research that is underway.

3 *P. monodon* stock assessment

The RAG noted a presentation from CSIRO on progress of the *P. monodon* stock assessment project. Key points on the progress of the project included:

- Two datasets were used to standardise catch per unit effort (CPUE) – NPF targeted broodstock fishing data and general NPF commercial fishing data;
- The data series for targeted broodstock fishing is short and, due to data issues, only data from 2017 to present is useful;
- The models indicate that CPUE was significantly higher in 2019 compared to 2017 and 2018;
- Catch data was categorised into four periods for each fishing day which indicates catch rates are lowest during dusk (5 pm to 7 pm);
- The models only explained 8.4% of the deviance which suggests confidence in the results is low;
- The catch data reported in logbooks is important to determine a catchability index for the commercial fishery. Clarification is needed on how small catches of *P. monodon* are reported in the commercial fishery, that is, are catches less than one kilogram reported or are they rounded to one kilogram or a combination of both (there is further discussion below);
- Preliminary results indicate that neither data from the targeted broodstock fishing nor the commercial fishery imply a decline in abundance since 2017.

It was questioned whether there were any shots in targeted broodstock fishing where all individuals were retained and zero discarded, and also if there were any shots where all individuals were discarded and zero retained. The RAG agreed AFMA and NPF should clarify the likelihood of these events occurring and inform CSIRO.

The RAG also noted that some preliminary work had been undertaken during the NPF surveys to assess the survivability of *P. monodon*. This information will be useful to inform the next component of the stock assessment project and Gary Fry advised he will provide this information to the project team.

It was pointed out that *P. monodon* are only targeted in few localised areas within the wider NPF area and the potentially limited value of the general NPF logbook data used across the fishery. Considering this, it was questioned whether a standardised index of abundance could be developed for each discrete area and whether this would allow a more useful approach by managing separate sub-stocks. It was noted that the initial stage of the project was to determine an index of abundance for the whole NPF area and including regions of low catch rates is still important in informing the total abundance. However, the project team suggested it could analyse the results from removing low density areas and only using catch rates from *P. monodon* hotspots to determine if the approach was viable. It was agreed that, from a biological perspective, it would make sense to determine CPUE abundance indices in areas where *P. monodon* are known to be caught in relative high abundance and the project team should investigate this further. It was further noted that information on the biology of *P. monodon* is poor and although aggregations are known, the connectivity of these aggregations or where the prawns are spawned from that form these aggregations is unknown.

The recording of *P. monodon* in the commercial catch was discussed and it was noted that using logbook data to obtain an index of catchability is problematic. Rarer species (such as *P. monodon*) are usually only recorded when a box is filled, which may take a few days of fishing. If a box is not filled it may not even be recorded. The RAG advised that CSIRO should reconsider how general logbook data is used as a catchability index in the assessment, as the current method may not give the most accurate results.

It was noted that the model deviance for the commercial CPUE abundance index ranged from 32 per cent to 47 per cent compared with 8 per cent of deviance explained for targeted broodstock CPUE. Although the delta-lognormal models fit the commercial data better than the generalised additive models (GAM) that fit to the broodstock data, directly comparing the two sub-fisheries can be tricky because of the difference in data quality and quantity (including spatial and temporal coverage, sample size per time step, observation errors, and the type of model used).

Observing the trend from the results for the commercial CPUE relative abundance index, it was commented that catch rates had increased in line with increases in catch limits. This suggests that catches rather than abundance may be being monitored.

Issues with the data and project assumptions were discussed and the importance of getting the abundance index as accurate as possible before continuing with the next stage of the project was highlighted. CSIRO advised that three potential ways to improve the CPUE standardisation include improving the data, improving the modelling technique or improving predictors in the model. It is unlikely the current data can be improved, but there is additional data that can be collected in the future that will better inform the stock assessment. The modelling technique has been thoroughly explored except for machine learning techniques, but it is unlikely such a technique would provide any significant benefit over current techniques. The third area that was considered worth exploring involves consulting industry on any important predictors that might be included in any model, that is, whether industry use any particular indicators that inform where they will fish. Industry was asked to consider the table of variables used to develop the model and inform if any important variables were not included. It was suggested that a meeting be organised with a sub-group of Industry, CSIRO and AFMA to consider the table of variables and the spatial aspects of the targeted broodstock fishery.

Actions:

- AFMA/NPFI to inform CSIRO of the likelihood of targeted broodstock shots where all individuals are retained and zero discarded, and also where all individuals are discarded and zero retained
- Gary Fry to provide the *P. monodon* stock assessment team with information regarding the survivability of discarded *P. monodon*

- AFMA/NPFI/CSIRO to consult broodstock operators to validate some of the results from the CPUE standardisation, e.g. catch rates are lowest at dusk
- AFMA/NPFI to clarify whether reported catches of 1 kg are rounded, i.e. are catches less than 1 kg not reported or rounded to 1 kg
- CSIRO *P. monodon* stock assessment team to assess whether CPUE indices can be determined for sub-areas based on known stock high catch areas
- Industry/CSIRO/AFMA to meet in the next few weeks to discuss the CPUE standardisation progress, inform of the spatial dynamics of the stock and consider the table of variables used to develop the *P. monodon* CPUE standardisation to inform if any important variables were not included.

4 Tiger prawn assessment

NPRAG noted the results of the 2020 tiger prawn stock assessment including logbook data up to the end of the 2019 season and the 2020 survey indices. The recruitment index for Brown and Grooved tiger prawns correlates well with the CPUE trend and it was observed that the results from the 2020 recruitment survey indicates that CPUE will be lower for Brown tiger prawns in 2020 but higher for Grooved tiger prawns. Effort levels for tiger prawns have remained relatively stable over the last ten years with only a slight increase in the effort trend. Fishing power has continued to increase, with slight gear changes and marked changes in the spatial pattern of fishing. The model results for the stock status (5-year moving average S_t/S_{MSY}) of the tiger prawn species are 129 per cent for Grooved tiger prawns (compared with 135% from last assessment) and 130 per cent for Brown tiger prawns (compared with 135% from last assessment). The stock assessment projected a total allowable effort (TAE) of 2816 boat days for Grooved Tiger Prawns and 3390 boat days for Brown Tiger Prawns in 2020, and 3877 boat days and 3363 boat days for Grooved and Brown tiger prawns, respectively, in 2021. The RAG also noted that the sensitivity test that removed the 2777 boat day limit resulted in the model converging and produced TAE projections similar to the base-case model. The other sensitivity tests did not result in any major difference in results compared to the base case.

It was pointed out that an additional sensitivity test was run to evaluate the effect of lower fuel costs on tiger prawn effort. The results indicated that a significant drop in fuel price, similar to reductions during the beginning of 2020, increased the projected TAE by approximately 17 per cent. The Economic Member suggested that the sensitivity test was important to note and highlights the importance of understanding potential elasticity in the model. It was agreed it would be useful to explore the elasticity calculation further and the Economic Member and the CSIRO stock assessment team advised they would undertake further analysis and report back to the RAG at its November 2020 meeting.

Actions:

- Tom Kompas/CSIRO to explore the stock assessment model sensitivity test of a significant drop in fuel price and report back to the RAG in November 2020.

5 JBG Redleg Banana Prawn sub-fishery

2019 stock assessment

CSIRO presented the final results of the 2019 Redleg banana prawn stock assessment. It was noted that the environmental variables (SOI and rainfall) that have been monitored the last few years project the stock biomass to be in the neutral zone (low to average CPUE expected). The fishing effort in 2019 in the Joseph Bonaparte Gulf (JBG) was again reduced, similar to 2015 and 2016, with less than 100 boat days. The fishing pattern was also unusual, with most of the effort occurring in the second quarter as opposed to the usual third quarter. It was noted the stock assessment projected TAE for Redleg banana prawns in 2020 is 300 boat days, which results in a catch of approximately 360 tonnes.

Considering the unusual fishing pattern in 2019, a sensitivity test was run assuming a nominal CPUE for the 2019 third quarter of 0.54 (i.e. 75% of expected normal third quarter fishing CPUE to simulate a worse than expected scenario). The results of the sensitivity test indicate that the stock biomass was projected to decline but not below the limit reference point. The results suggest that, although there is some concern with the stock, the current harvest strategy control rules are suitable for 2020 as there is a low risk the stock will decline beyond the limit reference point.

Management Strategy Evaluation

CSIRO presented the final results of the Redleg Banana Prawn management strategy evaluation (MSE) project and the RAG was asked to make a recommendation on its preferred harvest control rule (HCR).

The possible trajectories under each HCR were questioned as the trajectories show catches between approximately 500 and 1000 tonnes when the usual annual catch in the JBG is closer to 300 tonnes. It was advised the trajectories are more of a relative trajectory and the projected catch is not necessarily what could be expected¹. However, there have been years historically where the total catch has been quite high and under the proposed HCRs it would be expected to get higher catches than in recent years.

It was advised that nine sensitivity tests were run on HCRs two, three and four. These sensitivity tests included scenarios of extreme events such as increased future fishing mortality, increased recruitment variability, and increased error associated with catch. Harvest control rule four was the least sensitive to the extreme scenarios and HCR-3 appeared to be the most sensitive, but it was suggested that it was difficult to assess the risk of each HCR without knowing the likelihood of each extreme scenario actually occurring. Ultimately, all three HCRs performed relatively well and are a significant improvement on the current HCR.

It was noted that HCR-2, HCR-3 and HCR-4 all meet the Commonwealth Harvest Strategy Policy requirements of supporting the stock to approach the target reference point, and even in extreme scenarios, generally maintain the stock above the limit reference point. The RAG agreed that all

¹ This is also because there have been low catches in recent years corresponding to low effort years, whereas the MSE is testing projections using target effort levels and management strategies that maintain the stock around the BMEY level and therefore correspond to more optimal yields. The MSE also uses a set of OMs that have different parameterisations to the stock assessment model and hence some differences are expected, and also the MSE uses a range of assumed future fishing patterns and effort levels to try and robustly differentiate between the performance of different management rules. The OMs are based on a monthly model and the outputs from the model are similar, with regard to biomass trends as the assessment model, as will be explained in the Final Report (i.e. CSIRO to provide text so results shown are not misleading). The important aspect of this work is to compare relative differences between the application of alternative HCRs on the status of the stock and other performance metrics. Although it is possible to show relative catch differences – actual catches are a lot clearer.

three HCRs met the target and limit reference point objectives and it was up to industry and NORMAC to consider the risk, cost, catch trade-off to determine the preferred HCR to implement. NPFI advised it would be useful for CSIRO to present the results of the project at the July industry meeting for the trade-offs of each option to be considered.

The RAG noted the table outlining some of the trade-offs of each HCR and was asked to comment on any other trade-offs to be considered when making a final recommendation on the preferred HCR. Key points raised included:

- One of the disadvantages of HCR-4 is that it's more expensive and logistically difficult to implement compared with the other HCRs. It was suggested that it would be useful to get an estimate of the costs involved in developing and implementing HCR-4.
- Industry suggested HCR-4 may not perform as well as the other HCRs as the JBG fishery is not like other fisheries, if catches are low then boats will leave before any limit is triggered. HCR-3 may be unreliable as there are already so many variables to consider when opening or closing the fishery and adding more environmental variables complicates decisions further. HCR-2 is simple and, in the 1980s during the early days of the fishery, the highest catches always occurred in August. In addition, HCR-2 allows businesses to better plan their operations, such as marketing and selling the product. One essential consideration of the HCR chosen is that it needs to be cost effective.
- Some of the considerations with the operation of HCR-2 include the opportunity to fish in the first season, the value of catching large prawns in the first season, and the displaced effort of closing the JBG in the first season.
- HCR-3 has a higher risk to the stock than HCR-2 and HCR-4 and may be the first to be removed from the list if any were to be removed. However, HCR-3 would be less costly to implement than HCR-4. HCR-4 may be more accepted by industry given they are used to CPUE-triggers and HCR2 could be considered in the future if the stock declines further.
- Although the bycatch, byproduct and TEPs are minimal because the Redleg banana prawn effort is relatively small, they may still be worth considering when comparing the HCR options.
- The preferred HCR may be different for individual operators compared to the best option at an industry level.
- The cost per unit of effort is a lot higher during the second season, therefore the cost to target Redleg banana prawns is a lot higher, e.g. to forego tiger prawn fishing compared to banana prawn fishing.
- The Redleg banana prawn fishery is closely linked with the performance of other areas of the fishery. Permanently closing the first season (HCR-2) reduces fishing options during poor White banana prawn seasons. Furthermore, years with a poor White banana prawn season and/or a good tiger prawn season will likely result in very little effort in the JBG. HCR-2 reduces options for industry. HCR-4 may be more expensive but may be more preferable to industry than reducing fishing opportunities.
- It would be valuable to consider the trade-off between the opportunity to fish compared with the cost of management.
- Some of the logistical considerations with HCR-4 include the number boats needed to inform a reasonable CPUE index; the level of effort in the JBG is largely driven by catches in other areas of the fishery; a nominal CPUE would need to be used and, as the fishing power is increasing, the trigger would need to be periodically recalibrated; fishing in the JBG usually occurs over neap tides so the trigger may need to be based on two-week intervals encompassing neap tide periods, and hence may not align with the calculation of a monthly average; and, as the distance to steam to the JBG is extensive, there may be

operational difficulties for operators choosing to steam to the JBG just as the trigger is exceeded and are faced with no other fishing opportunities in the area.

- When the JBG was closed during the first season previously (2009 to 2011), one of the more significant challenges was the unit price of fishing for different species. The CPUE to fish for Redleg banana prawns was much higher because the benefit of fishing for tiger prawns had to be foregone. Therefore, HCR-2 is likely to be the most contentious option with industry due to the impact on other fisheries (i.e. more boats targeting White banana prawns), the missed opportunity to fish during the first season, and the higher unit cost to fish for Redleg banana prawns during the second season.

NPRAG recommended that HCR-2, HCR-3 and HCR-4 are suitable harvest control rules for the Redleg banana prawn fishery. It was agreed the feedback will assist industry and the NPF Management Advisory Committee (NORMAC) make an informed recommendation on the preferred HCR. An additional piece of information that would be useful would be an understanding of the cost implications of HCR-4. Initially an in-season trigger seems fairly simple but, as pointed out, it becomes complicated when you consider the JBG neap tides, the relatively few number of boats, and the distance that needs to be travelled to access the fishery. If HCR-4 is chosen, sufficient consideration of these complications is needed before the HCR can be implemented.

Actions:

- CSIRO to add text to the Final Redleg banana prawn MSE report to clarify differences between OM model (monthly) and original stock assessment model (quarterly)(so that the differences in biomass trajectories shown in results are not misleading)
- NPM and NORMAC to consider the outputs from the MSC and recommend a future harvest strategy option for the Redleg banana prawn fishery
- CSIRO to present MSE results to Industry in the next two months (and a recommendation to be made by November 2020 NPRAG meeting)

6 Research

Endeavour prawn research and proposed update to assessment assumptions

The RAG noted a presentation from CSIRO on proposed updates to the assumptions in the endeavour prawn stock assessment. The current model includes four stock regions and, using a time-series of annual catch and CPUE for each region, estimates annual biomass. The model also assumes a constant catchability over time, differing between each stock region.

The reason for the change to the underlying assumption in the assessment is that the model-estimated biomass levels for Blue and Red endeavour prawns have consistently been below their individual B_{MEY} (biomass at maximum economic yield), and this is unusual given they are short lived species and the catches over the years are not large. Although the biomass has been above the limit reference point and there are no sustainability concerns, certification by the Marine Stewardship Council (MSC) requires stock biomass to fluctuate around a target of at least B_{MSY} (biomass at maximum sustainable yield). The RAG has previously discussed potential issues with the current stock assessment catchability index for endeavour prawns as it doesn't account for changes in catchability associated with historical area and season closures. The concern is that using the CPUE data from the tiger prawn stock assessment (i.e. accounting for fishing power) is not capturing the underlying stock biomass in the current stock assessment model. It was suggested that updating the catchability index may provide a more accurate assessment of the stock and may indicate the biomass levels are higher than currently reported.

CSIRO has subsequently run a model with different assumptions as to the treatment of endeavour prawn catchability series (CPUE as a relative index of abundance) in the assessment which will account for significant changes in historical catchability, including the change to night-time fishing, reductions in fleet size, reductions in season length, and the introduction of spatial closures. It was suggested these changes may impact endeavour prawns catchability more than tiger prawns. Consequently, catchability was 'fit' over three separate time series based on significant events in the fishery. This technique assumes that CPUE can be used as an index of abundance if historical changes in catchability are accounted for. The RAG noted that this is not the only technique that can be used to more accurately reflect endeavour prawn stock abundance, but other techniques require significant research effort at a high cost and may not necessarily be suitable to Red endeavour prawns, in particular, due to the sparsity of data on this species.

The RAG noted that major changes in the fishery occurred in 1987 when the six week mid-year closure and the daylight trawl ban in the tiger prawn season (to protect spawning tiger prawns) were implemented. Given these significant events happened in the fishery they likely had changed the catchability of endeavour prawns and it may need to be adjusted. The first important period is 1970 to 1986 and the second period from 1987 to 1999. Again in 2000, the mid-year closure was extended (and later reduced back to the original six weeks) and the third time period is then from 2000 onwards. There was also a significant change during 2005 and 2006 where 43 boats were removed from the fishery due to the structural adjustment package, however, the impact from this event would be captured by the change in effort and catch and the tiger fishing power analysis. CSIRO noted the information and advised it would consider how these events influence the catchability index.

The new endeavour prawn stock assessment technique was applied as a sensitivity test in the current stock assessment model. The technique indicated that applying a three staged catchability index resulted in Blue Endeavour Prawn biomass increasing from 68 per cent (5-year moving average S_Y / S_{MSY}) to 92 per cent. Red Endeavour Prawn biomass was assessed as 113 per cent S_Y / S_{MSY} and slightly higher when the three-stage catchability index was applied. The RAG agreed it would be useful to include both the base case and sensitivity test results for endeavour prawns in the stock assessment report along with an explanation of the technique to allow the RAG to more thoroughly consider the robustness of the technique.

Northern waters developments and mangrove dieback update

The RAG noted the summary reports on the northern waters developments and mangrove dieback that were circulated. The reports were taken as read and no questions were raised.

Progress update on the MICE water development project

CSIRO provided a short summary on the progress of the MICE water development project. It was noted a summary report would be circulated out-of-session.

The RAG also noted that the water development projects undertaken during the last few years have become useful in quickly responding to information requests from various industries regarding the impact of proposed developments on the fishery.

Bio-economic model including banana prawns

The RAG noted an update on the progress of developing a full bio-economic model that included a banana prawn fishery component. CSIRO has been considering a full bio-economic model for many years but it has only become feasible recently with the NPF economic data that is now available. Survey indices for both banana prawns and tiger prawns are also now available together

with relationship information between different variables. The benefit of the proposed model is that it improves the accuracy of tiger prawn economic information (proportion of fixed costs) which is currently based on simplistic calculations. It is important for the fishery to have a model that accounts for the indirect effects of the banana prawn fishery on the tiger prawn fishery, such as how effort could shift to the tiger prawn fishery from a reduction in banana prawns (due to water development and/or climate impacts).

7 Bycatch strategy

NPFI presented its draft bycatch strategy and asked for RAG comment on the priorities identified. The NPF Bycatch Strategy 2015 – 2018 was specifically aimed at reducing small bycatch. In order to satisfy the objectives of the Commonwealth Government's policy on bycatch and the conditions for EPBC Act export approval, NPFI has proposed that the focus of bycatch mitigation should expand from small bycatch to include priority species (sawfishes and sea snakes). It is also proposed to continue to monitor the new BRD performance and allow for modifications and/or development of devices and further testing if and when required.

The RAG agreed the strategy was targeted toward the highest priority species and bycatch challenges. It was suggested that the order of objectives and performance indicators be rearranged as the monitoring and identification of species would occur before the other objectives can be achieved. It was also suggested that the performance indicators better represented actions and it would be useful to include another section that had measurable performance indicators. Example performance indicators for sawfish were discussed and it was acknowledged that performance indicators require careful consideration as they need to accurately inform whether the objectives are being achieved but also measure variables that the fishery is able to manage. Performance indicator four, collect and analyse data to determine catch rates of sea snakes and the type of BRD used, was highlighted as a potentially difficult action to undertake and may need to be revised. It was also suggested the trigger value described in performance indicator two, under general bycatch, could be more descriptive, that is, what action is taken if the trigger is exceeded.

8 NT data analysis of commercially important species

The RAG noted that this agenda item was previously discussed at its November 2019 meeting where it was suggested that the method used to determine the volume of Black Jewfish and snapper species taken as bycatch in the NPF may not capture some of the detail that is needed to ensure an accurate estimate of total bycatch. Some of the considerations to be taken into account include time, depth and strata and it was agreed that Gary Fry (CSIRO) look at results from previous MSC and ERA projects to determine the volume of bycatch caught in the NPF for each species NT Fisheries is interested in. The data has been reviewed and a number of issues have been identified. One of the more obvious issues is that one trip contributes half of the total tonnes reported by Scientific Observers between 2013 and 2018. Upon further investigation, it is likely the species were reported incorrectly on this trip. Another important issue identified is determining whether a record was collected as part of the sub-sample or as a species of interest (SOI), which is important to determine the correct method to scale-up the data to the fishery level.

Some of the RAG scientific members and observers that have experience with some of the species suggested that Black Jewfish are not a common species in the NPF as they are usually found in more reedy, coastal habitats and juveniles are particularly uncommon on trawl grounds. Adults are more common but would be excluded by the TED. Furthermore, there are a lot of small jewfish in the NPF but probably comprising species other than Black Jewfish. It is difficult to identify the

different species, particularly when they're small. It is common to only get one or two in a trawl, whereas in the data sometimes hundreds have been recorded per trawl. The issue appears to be a misidentification issue for a few of the species, as the data from 2013 contribute to more than 75 per cent of the total volume for some species. The *Pristipomoides* spp. are usually found in deeper water than NPF operators fish, so it is unlikely many should be recorded in the data whereas several hundred kilograms have been recorded.

The RAG agreed that it is important NT Fisheries is able to accurately estimate all sources of mortality for each of its commercial species and the NPF data is useful to achieve this. It was noted that there appears to be a number of issues with the data that requires further review, but the full dataset should be provided to NT Fisheries along with some expert guidance about how to best estimate total catch volumes considering the data issues. The RAG agreed that AFMA should have some editorial control in how the data is used and presented by NT Fisheries in the future. It was noted that appropriate protocols for future use of the data have been agreed between the two agencies.

9 Action items

The RAG noted the action items list and the progress of each item. No comments were made on the progress of any of the actions.

10 Other business

Impact of seismic surveys in the NPF

The RAG noted a paper provided by CSIRO outlining the research undertaken to better understand the potential impacts of seismic surveys on the NPF.

11 Climate change adaptation project

Beth Fulton and Jess Melbourne-Thomas from CSIRO, and industry participants David Carter, Ron Earle, Andy Prendergast and Bryan van Wyk, joined the RAG for a discussion on CSIRO's climate change adaptation project. The RAG was asked to provide feedback on potential fisheries responses to climate induced change in the fishery. Key points noted in the discussion included:

- Due to the highly variable nature of the NPF, industry is already familiar with dealing with variability and is well positioned to deal with climate induced variability. The challenge is determining what changes could be outside of the normal range of variabilities that would cause industry concern.
- There are examples from California on anchovy and sardine fisheries where, despite large annual fluctuations in the stock, there are tipping points that can be breached and the stocks can crash. It is important, through management, to build resilience into the stock to avoid reaching those tipping points.
- The mangrove dieback in the GoC was a good example of when things can go wrong and it is important the fishery measures the impact of such events and how to build resilience against catastrophic events.
- It is important to differentiate between profit and stock. A decrease in stock doesn't necessarily mean a decrease in profit, and an increase in stock doesn't necessarily mean an increase in profit.

- The fishery is likely to experience an economic tipping point before an ecological tipping point is reached. The industry has established economic indicators to inform when these tipping points are likely to occur and there are a number of adjustments the industry can make to respond to fluctuations in the fishery.

It was advised that a survey had been prepared that would be circulated to industry to provide further feedback. CSIRO also invited participants to provide any additional comments on the design and results of the project out-of-session.

The Chair closed the meeting at 1:30 pm (AEST) on 21 May 2020.

Signed (Chairperson):

A handwritten signature in black ink, appearing to read 'Ian A Knuckey', written in a cursive style.

Ian A Knuckey

Date: 17/06/2020

Draft Annotated Agenda

Northern Prawn Fishery Resource Assessment Group (NPRAG) videoconference

20-21 May 2020 9.30 am (Australian Eastern Standard Time)

Item	Responsibility	Paper
1. Introduction / Meeting Management <ul style="list-style-type: none"> • Welcome • Adoption of agenda • Declaration of interests • Minutes from previous meetings 	Chair	Yes
2. Update Reports <ul style="list-style-type: none"> • Industry <ul style="list-style-type: none"> ○ 2020 BRD implementation ○ Sawfish mitigation ○ CMO program update ○ Broodstock collection • AFMA <ul style="list-style-type: none"> ○ NPF Harvest Strategy / FMS ○ NPF data plan ○ Sawfish close-kin mark recapture (CKMR) project ○ Listing of narrow sawfish as Migratory and update on sawfish recovery plan ○ ERA <p><i>Outcomes: The RAG notes the various update reports.</i></p>	NPFI/AFMA	Yes
3. <i>P. monodon</i> stock assessment <ul style="list-style-type: none"> • CSIRO presentation on preliminary results of the <i>P. monodon</i> CPUE standardisation <p><i>Outcomes: The RAG note the progress of the <i>P. monodon</i> stock assessment project.</i></p>	CSIRO	Yes
4. Tiger Prawn Assessment <ul style="list-style-type: none"> • Stock assessment (fishing power update, and survey – most recent indices for inclusion in assessment) • Outputs from sensitivity tests • Recommended effort level for 2020 and 2021 <p><i>Outcomes: RAG to note the information provided on the 2019 tiger prawn stock assessment including catch and effort, the fishing power analysis, status of target</i></p>	CSIRO	Yes

<i>species and estimates of optimal effort levels for 2020 and 2021 fishing seasons.</i>		
<p>5. JBG Redleg banana prawn sub-fishery</p> <ul style="list-style-type: none"> • Results from 2019 assessment • Final report on the Redleg banana prawn MSE including results of additional sensitivity tests <p><i>Outcomes: The RAG note the results from the 2019 Redleg banana prawn stock assessment and the MSE project; recommend its preferred harvest control rule on the basis of those presented in the MSE Redleg banana prawn project.</i></p>	CSIRO	Yes
<p>6. Research</p> <ul style="list-style-type: none"> • Endeavour prawn research and proposed update to assessment assumptions • Northern waters developments (+ mangrove dieback update) • MICE water development project progress report on model • Bio-economic model including banana prawns <p><i>Outcomes: The RAG consider the proposed update to the endeavour prawn assessment assumptions; note an update on northern waters developments, MICE project progress, and a proposal for an NPF full bio-economic model.</i></p>	CSIRO/AFMA/NPFI	Yes
<p>7. Bycatch strategy</p> <ul style="list-style-type: none"> • Review draft bycatch strategy • Consider ERA results <p><i>Outcomes: The RAG to review and comment on the draft bycatch strategy taking into consideration the results of the ERA.</i></p>	NPFI / AFMA	Yes
<p>8. NT data analysis of commercially important species</p> <ul style="list-style-type: none"> • Review data request from NT Fisheries <p><i>Outcomes: The RAG to advise on limitations of the requested data and recommend how to support the disclosure of data.</i></p>	AFMA	Yes
<p>9. Action Items</p> <p><i>Outcomes: RAG to note progress on action items from previous meetings and provide feedback and comments where appropriate.</i></p>	AFMA	Yes
10. Other business	RAG	

<ul style="list-style-type: none"> Impacts of seismic surveys on marine biota – summary of project progress 		
<p>11. Climate change adaptation project</p> <ul style="list-style-type: none"> Impact pathways for the NPF <p><i>Outcomes: The RAG note the final project outcomes.</i></p>	CSIRO	Yes

NPRAG Declared Conflicts of Interest

Participant	Membership	Interest Declared
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.
Rik Buckworth	Scientific Member	Scientific Member - Torres Strait Finfish RAG Director - Aquatic Remote Biopsy Pty Ltd Director - Sea Sense Australia Pty Ltd University Professional Fellow – Charles Darwin University Current consultancy contract with NPF1 to review Red Endeavour Prawns 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.
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 AFMA and the Quandamooka Yoolooburrabee Aboriginal Corporation.
Tom Kompas	Economic Member – University of Melbourne	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.
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 (none of which are in JBG) in the past and may in future.
David Power	AFMA Member	AFMA employee, no pecuniary interest in the fishery.
Stephen Eves	Executive Officer (AFMA)	AFMA employee, no pecuniary interest in the fishery.
Steve Bolton	Observer - AFMA	AFMA employee, no pecuniary interest in the fishery.
Harry Needham	Observer - AFMA	AFMA employee, no pecuniary interest in the fishery.
Annie Jarrett	Observer - NPFI	CEO- NPFI Member of the MSC Stakeholder Council Chair - Australian Council of Prawn Fisheries (ACPF). Some research items are of relevance to NPFI.
Adrienne Laird	Observer - NPFI	Employed as a contractor by NPFI. Some research items are of relevance to NPFI.
Gary Fry	Observer - CSIRO	Research provider involved particularly in the NPF bycatch monitoring program. 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.
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.
Eva Plaganyi	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.
Roy Deng	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.
Judy Upston	Observer - CSIRO	Research provider. Has in the past and may in future seek and receive funding for research in the fishery.

Robert Curtotti	Observer - ABARES	Economics research provider. No current pecuniary interest in fishery. Potential to seek and receive funding for research in the fishery in future.
James Larcombe	Observer - ABARES	Economics research provider. No current pecuniary interest in fishery. Potential to seek and receive funding for research in the fishery in future.
Laura Blamey	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 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.
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.
Alistair Hobday	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.

NPRAG Action items

Item	Person responsible	Description of action item	Progress
18 May 2016 Meeting			
1.	Rik Buckworth/CSIRO	Upload research reports relevant to the NPF to the GovTEAMS site.	Ongoing – CSIRO has a student compiling a bibliography that will be available to NPF stakeholders
17-18 November 2016 Meeting			
2.	CSIRO	Review/update the assessment inputs to consider the influence of price elasticity.	Ongoing – Tom Kompas to follow up and investigate whether this can be done and coordinate with the AFMA working group to ensure resources looking into price elasticity are not being doubled up. Tom to discuss at the July 2018 working group meeting
3.	NPRAG Chair	Send a thank you letter to the crews involved in the operational testing of the BRD.	Ongoing – letters with Chair for signing, will be sent out before end of 2019 tiger prawn season. Adrienne Laird to advise who to send the letters to.
23-24 May 2018 Meeting			
4.	AFMA/NPFI	AFMA and NPFI to investigate the objective for collecting species abundance counts and whether this data should continue to be collected.	Ongoing – AFMA observers have collected data on bird warp strikes during 2019 and reported zero interactions. AFMA to consider the wildlife data collection protocols for the future. Will be

			considered as part of the NPF data plan.
5.	David Brewer, David Power, Steve Eves, Adrienne Laird	David Brewer, David Power, Steve Eves, Adrienne Laird and a representative from the CSIRO ERA team to form a working group to engage in the ERA process and report key results back to the RAG.	Ongoing ERA working group follow up meeting will be held when the revised ERA report is provided by CSIRO.
1 November 2018 Meeting			
6.	Rob Kenyon	Rob Kenyon to consult with NAWRA researchers to seek to provide the RAG with a summary of key results of the NAWRA side project report that details the impact of loss of late dry season flows (and other low-level flows) on banana prawn catch. Rob Kenyon to provide a copy of the report to the NPRAG when it is released	Complete – Attachment 6B
7.	AFMA	AFMA to look into New Zealand's protocols for counting bird abundance	Ongoing - Will be considered as part of the NPF data plan.
8.	AFMA	AFMA to check the observer protocols to ensure the collection of the 10 kg subsample is in accordance with the method outlined by <i>Heales et al.</i>	Ongoing - Will be considered as part of the NPF data plan.
9.	AFMA	AFMA to re-check the data within the 2017 annual observer report	Redundant – Annual Observer report has been updated.
10.	AFMA	AFMA to consider dividing up annual observer report by season and including the target number of days per season and target lengths	Complete – targets and any comments on performance will be included in the data plan. The data plan will also be reviewed and updated annually as required.

11.	David Brewer/Gary Fry	David Brewer and Gary Fry to provide comments/feedback to AFMA on the current observer manual and annual observer report	Ongoing - Will be considered as part of the NPF data plan.
30-31 May 2019 Meeting			
12.	Rob Kenyon	Circulate the Andrew Broadley NESP report when it becomes available	Ongoing – Rob to circulate when report published.
13.	AFMA/CSIRO	Collaborate with Parks Australia to identify if there are any areas of mutual benefit from the NPF survey data collection and if there are opportunities for co-funding	Complete – Lack of interest or support from Parks Australia. May be something to consider in the development of the NPF data plan.
14.	NPRAG Chair	Write to the CMOs acknowledging their efforts and contribution to the fishery	Ongoing – letters with Chair for signing, will be sent out before end of 2019 tiger prawn season. Adrienne Laird to advise who to send the letters to.
15.	AFMA	Investigate if data quality checks and rectifying data errors can be automated	Ongoing - Will be considered as part of the NPF data plan.
16.	AFMA	Consider including updating drivers of data needs to ensure they include habitat and communities, social licence/values and acceptability, market access, animal welfare and indigenous interests	Ongoing - Will be considered as part of the NPF data plan.
17.	AFMA/NPFI	Refine objectives and continue development of the data and monitoring plan in consultation with the RAG	Ongoing - Will be considered as part of the NPF data plan.
ERA species list review			
18.	AFMA/CSIRO	Split the ERA species lists by logbook data and all other data sources (e.g. observers)	Ongoing – will check final version of ERA

		to help clarify the species splits	
19.	CSIRO/AFMA	Consider splitting the logbook recorded squid species group in the ERA by the percentages recorded by CSIRO survey data	Ongoing – will check final version of ERA
20.	CSIRO/AFMA	Use the species split model to split the tiger prawns recorded in the banana prawn sub-fishery	Ongoing – will check final version of ERA
21.	CSIRO/AFMA	Double check the catch of Redleg banana prawns in the banana prawn sub-fishery	Ongoing – will check final version of ERA
22.	CSIRO/AFMA/ABARES	Review the ERA species value table and split the species using the species split model so that each species only appears once in the table	Ongoing – will check final version of ERA
23.	CSIRO/AFMA	Categorise all king prawns as a byproduct species group	Ongoing – will check final version of ERA
Harvest Strategy review			
24.	AFMA	Compile all available data on each byproduct species to enable the RAG to assess what level of assessment is feasible and review if current harvest strategy triggers are appropriate	Ongoing
Bycatch Strategy review			
25.	AFMA/NPFI	Prepare a draft of the NPF bycatch strategy by the November 2019 RAG meeting	Ongoing – agenda item 8.
26.	AFMA/NPFI	Split general bycatch and TEPs into sub-sections under the NPF bycatch strategy	Ongoing – agenda item 8.
27.	AFMA/NPFI	Include an overview of historical initiatives and bycatch reductions in the new bycatch strategy	Ongoing – agenda item 8.

28.	AFMA	Explore options for validating the CMO and Scientific Observer eyeball estimates of total bycatch	Ongoing – agenda item 8.
29.	AFMA	Update bycatch strategy template to align with the policy by including the words ‘reasonable and practical’ when the objective is to minimise bycatch or maximise post-release survival	Ongoing – NPF bycatch strategy wording to align with the wording of the Commonwealth policies
<i>P. monodon</i> assessment			
30.	APFA	Provide weight data on individual prawns to determine the average weight of each <i>P. monodon</i> collected for broodstock purposes	Ongoing – AFMA to also ask if length data is available.
31.	AFMA	Explore whether the Scientific Observers can measure the length of all <i>P. monodon</i> caught during targeted broodstock trips	Complete – not possible due to practicalities of handling live prawns. Additional data requirements may arise from undertaking the <i>P. monodon</i> stock assessment. Scientific observers may be able to collect biological data on the <i>P. monodon</i> discards but this may not be representative.
32.	NPFI/Tassal	Explore whether the crews on board broodstock trips can record the length of all <i>P. monodon</i> caught	Complete – not possible due to practicalities of handling live prawns. Additional data requirements may arise from undertaking the <i>P. monodon</i> stock assessment.
Sawfish			
33.	AFMA	Compare sawfish interactions with number of broodstock caught and provide analysis to APFA. AFMA to coordinate with	Complete - AFMA to give APFA a written update and report on 2019 and outlook for 2020.

		other jurisdictions and fisheries to expand the sawfish genetic sampling regime	AFMA collaborating with other jurisdictions through the development of the updated recovery plan.
29 August 2019 Teleconference			
34.	AFMA/NPFI	Develop terms of reference for the NPF harvest strategy review for scampi and other byproduct species in light of the revised HSP	Ongoing Exploring options to complete in second half of 2020.
7-8 November 2019 Meeting			
35.	NPFI	Provide RAG with results of the analysis of the quantity of tiger prawns caught in the first half (as a proportion of the yearly tiger prawn catch) to determine a trigger value for review of BRD use in the first season	Ongoing
36.	CSIRO	Explore options to provide an update on <i>P. monodon</i> stock assessment results before March 2020 and the preliminary report by May 2020	Ongoing – agenda item 3.
37.	Dave Brewer / Gary Fry	Review the AFMA Scientific Observer report and suggest a process for determining the temporal and spatial observer needs of the fishery, taking into consideration the scientific report that originally established the program	Ongoing - Will be considered as part of the NPF data plan.
38.	AFMA	Consider including the observer program targets in the annual observer report and a summary of how the program is tracking in relation to the targets	Ongoing - Will be considered as part of the NPF data plan.
39.	NPFI	Consider the NPF byproduct species and determine aspirations for each species to inform what level of	Ongoing – Deferred due to deferral of NPFI meeting

		assessment is required and what the data gaps are	
40.	AFMA	Explore options to maintain accessibility and usability of the various components of the FMS	Ongoing - Will be considered as part of the FMS development.
41.	CSIRO	Provide a spatial analysis of the annual tiger prawn catch time series as part of the MICE project	Complete – addressed under agenda item 4.
42.	AFMA	Explore the feasibility of changing the NPF logbook reporting requirement to a shot-by-shot report	Ongoing - Will be considered as part of the NPF data plan.
43.	CSIRO	Include price data in the Redleg banana prawn MSE project model and use projected value of catch landed (\$AUD) as an additional performance metric	Complete
44.	CSIRO	Provide preliminary results of the Redleg banana prawn MSE project to NPFI for consideration at its February 2020 meeting	Complete
45.	NPFI	Work with individual skippers to improve sawfish data reported in the NPF logbooks	Ongoing – completed for March 2020 pre-season briefings
46.	ERA sub-group	Review the draft ERA and identify species that need further enquiry and liaise with experts to try and fill any data gaps	Ongoing Meeting will be held when updated ERA document is available – Expected May
47.	AFMA	Revise the NPF Harvest Strategy for squid to clarify that there is a review point at an annual catch of 300t and an annual limit of 500t	Ongoing – HS updated, will be considered at the November 2020 meeting.
48.	AFMA / CSIRO	Review data for all byproduct species (i.e. mudbugs and scallops) to inform the development of sustainable	Ongoing

		catch triggers in the NPF Harvest Strategy	
49.	ERA sub-group / CSIRO	Include commentary in the ERA to clarify the different nature of scampi fishing (including the associated catch of red champagne lobster)	Ongoing – ERA subgroup to consider.
50.	NPFI	Draft an options paper for CSIRO to consider for the assessment of Red and Blue Endeavour Prawns, which includes updating the CPUE time series and/or catchability to reflect the temporal and spatial changes in the fishery	Complete – CSIRO has developed a new draft (different) approach to red and blue endeavour prawns – agenda item 6.
51.	CSIRO	Develop a full project proposal for the close-kin mark recapture research, with each component costed, for RAG review before being submitted to FRDC	Ongoing – update included as part of the AFMA management report.
52.	AFMA	Liaise with Queensland and Northern Territory Fisheries to coordinate collaborative support for the project and sample collection	Ongoing – update included as part of the AFMA management report.
53.	AFMA / NPFI / CSIRO	Coordinate a response to Steve Kennelly to inform of the additional information available that will enable a more accurate NPF bycatch figure to be determined	Complete
54.	Gary Fry	Look at results from previous MSC and ERA projects to determine the volume of bycatch NT Fisheries is interested in	Complete – agenda item 10
55.	AFMA	Scampi review project to assess the 'species identification problem'	Ongoing – will be considered as part of a scampi review project.