Northern Prawn Fishery Resource Assessment Group (NPRAG)

3 March 2014
Minutes
Novotel Airport Hotel, Brisbane

ATTENDEES

Members
Ian Knuckey, Chair
Fiona Hill, Australian Fisheries Management Authority (AFMA)
Rik Buckworth, Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Malcolm Haddon, CSIRO
Ian Boot, Industry
Michael O'Brien, Industry
Norm Hall, Murdoch University
Ron Earle, Industry
Tom Kompas, Australian National University (ANU)
Brodie Macdonald, Executive Officer

Observers
Robert Curtotti, Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)
Annie Jarrett, Northern Prawn Fishery Industry (NPFI)
Matt Barwick, NPFI
Trevor Hutton, CSIRO
Roy Deng, CSIRO
Nick Ellis, CSIRO

Apology
Rodrigo Bustamante, CSIRO

Agenda Item 1 - Preliminaries

1.1 Welcome and apologies

The Northern Prawn Fishery Resource Assessment Group (NPRAG) Chair, Ian Knuckey, opened the meeting at 9:00 am, welcoming all members and observers. The Chair thanked CSIRO for the quick turnaround in undertaking the work requested from the last meeting on 10 February.

An apology was received from Rodrigo Bustamante.

1.2 Declarations of interest

The chairman asked members to announce any declarations of interests in regards to the agenda items. Members declared their interests and these are outlined in Table 1.

Table 1. NPRAG declarations of interest

Member	Declared Interest
Ian Knuckey	Independent Chair of the NPRAG and scientific member on the NPF management advisory committee (NORMAC). No pecuniary interest.
Fiona Hill	AFMA employee and NPF manager. No pecuniary interest.
Rik Buckworth	CSIRO employee. Participates in projects related to the NPF that currently receive funding and will seek to receive funding in the future. Rik Buckworth excused himself while the remaining RAG members discussed his participation in the meeting and it was agreed that CSIRO staff involvement in the discussion was necessary but there was a need to consider the conflict when discussing research items.
Malcolm Haddon	CSIRO employee. Not involved in any NPF research projects. .
Ian Boot	Managing Director of Austfish, a company which operates 4 NPF vessels The RAG agreed that all industry have lots to contribute to discussions and there was no need to exclude them from discussions.
Ron Earle	Owner of 3 NPF vessels. The RAG agreed that all industry have lots to contribute to discussions and there was no need to exclude them from discussions.
Michael O'Brien	Industry representative. Employee of a company that owns statutory fishing rights (SFRs) in the NPF. The RAG agreed that all industry have lots to contribute to discussions and there was no need to exclude them from discussions.
Tom Kompas	ANU employee. Undertakes some work on the NPF to do with economic data including the tiger prawn assessment. The RAG agreed that economic considerations are critical to the RAGs deliberations.
Norm Hall	Murdoch University and Western Australia Department of Fisheries employee. No pecuniary interest.
Brodie Macdonald	AFMA employee and NPRAG EO. No pecuniary interest.
Observers	
Robert Curtotti	ABARES employee who undertakes government funded research on the NPF. The RAG agreed that ABARES undertake valuable work on the NPF and that there are no specific conflicts in terms of the agenda items.
Annie Jarrett	EO of NORMAC and CEO for NPF Industry Pty Ltd (NPFI). No pecuniary interest in relation to holding NPF SFRs. It was agreed that NPFI makes an important contribution to meetings and an important role in research.
Trevor Hutton	CSIRO employee. Participate in projects related to the NPF that currently receives funding and will seek to receive funding in the future. It was agreed

		that CSIRO staff involvement in the discussion was necessary and any conflicts would not bias discussions of the agenda items.
Sean Pascoe	CSIRO employee. Participate in projects related to the NPF that currently receives funding and will seek to receive funding in the future. It was agreed that CSIRO staff involvement in the discussion was necessary and any conflicts would not bias discussions of the agenda items.
Nick Ellis	CSIRO employee. Participate in projects related to the NPF that currently receives funding and will seek to receive funding in the future. It was agreed that CSIRO staff involvement in the discussion was necessary and any conflicts would not bias discussions of the agenda items.

1.3 Adoption of minutes from previous meetings

Noting the comments provided by Dr Buckworth, the RAG accepted the minutes from the 10 February 2014 meeting as a true and accurate record of the meeting.

1.4 Actions arising from previous NPRAG meetings

The RAG discussed the action items listed in Table 2 and updated progress. The RAG discussed the actions arising from the 10 February 2014 meeting only. The outstanding agenda items from previous meetings will be discussed at the next full NPRAG meeting.

Table 2. Actions arising

Person responsible	Description of ACTION item	Progress
Fiona Hill	Fiona Hill to provide update to next RAG meeting on the progress of the review to the conflicts of interest process.	Ms Hill informed the RAG that AFMA is still waiting advice on the government position on the reviews conducted in 2013. RAG members will be advised of changes to these arrangements as soon as they are made.
CSIRO	CSIRO to inform NPRAG on the fuel consumption rate used in the MEY trigger calculation.	It was confirmed that fuel consumption rate used is 2267 litres per day.
CSIRO	CSIRO to confirm what refit costs are included in the MEY trigger calculation.	See Agenda Item 2.3.
ABARES	ABARES to distribute price forecasting model to NPRAG.	Not yet complete.
CSIRO	CSIRO to conduct: 1. Retrospective analysis for 2012 and 2013 using survey data. 2. Test sensitivities of outputs to price and costs. 3. Test scaling factor using 2012 and 2013 data to validate figure of 1.5.	See Agenda item 2.
NPFI/CSIRO	NPFI/CSIRO to make a template for collecting information required to calculate trigger, ensuring that the form of the data is consistent with that collected in the annual economic surveys.	Complete see Appendix 1.

CSIRO	CSIRO to prepare a proposal to assess the impacts of removing the spawner survey in 2016.	In progress noting that it is proposed to not have the survey in 2015, not 2016.
AFMA	AFMA to prepare a comparison of vessel charter costs over the last five years of the integrated monitoring program.	Not yet completed. The RAG requested that this be completed ASAP.
CSIRO	CSIRO to distribute full journal paper to the RAG.	Dr Buckworth advised that as the paper is still in press it may not be appropriate to distribute. However, copies are available by request from the NPRAG EO.
CSIRO	CSIRO to amend base case to include 'combined' model, and to include the 2012 base case as a sensitivity in the 2014 assessment.	As discussed at Agenda Item 4.

Agenda Item 2 – Implementation of a Maximum Economic Yield (MEY)-based catch trigger for the banana prawn fishery.

2.1 Presentation

The RAG noted a presentation from Nick Ellis on the additional work conducted by CSIRO following discussions at the February NPRAG meeting. This included:

– Retrospective analysis using economic survey data collected by NPFI;

– A sensitivity test of outputs to price and costs; and,

– Validation of the proposed scaling factor (1.5).

It was emphasised that MEY occurs at the break-even CPUE point where weekly marginal revenue equals marginal cost and (in theory) this is the point where fishing should cease. For the fishery to be stopped at MEY, however, a weeks' notice is required by the fleet. Thus, a "MEY trigger" CPUE needs to be developed whereby the MEY catch rate is back-calculated by one week using a scaling factor that accounts for the slope of CPUE reduction at the end of the season. The detailed calculation of the MEY point is outlined at Appendix 1.

2.2 Retrospective analysis

At its February 2014 meeting, the RAG requested that CSIRO undertake a retrospective analysis to investigate what would have happened if an MEY trigger had been applied to the 2007 to 2013 fishing seasons (post-adjustment). The analysis found that the MEY trigger would have been applied in four of the years (highlighted) but would have limited the fishery duration in only one of these years (2007), by one day. In the remaining three years, all boats had stopped fishing before the MEY trigger catch rate occurred. The RAG concluded that although the fleet generally stopped fishing before the MEY trigger was reached, the data suggested that fishery is already operating in a manner that is reasonably consistent with an MEY target.

	Banana price ($ kg^{-1})	Daily cost ($)	Marketing cost ($ kg^{-1})	Profit ($M)	Revenue ($M)	Cost ($M)	Trigger (kg day^{-1})	MEY Closure day	Final day fished
2007	9.15	1,818	0.89	10.8	16.8	6.0	443	56	57
2008	8.98	2,318	0.94	23.8	34.3	10.6	582*	84	79
2009	9.60	1,532	0.95	26.9	35.2	8.4	357	–	71
2010	9.19	2,054	0.98	24.3	34.1	9.8	506	–	71
2011	8.37	2,504	1.01	29.6	44.1	14.4	692*	84	77
2012	10.65	2,733	1.03	24.5	36.1	11.6	572	70	69
2013	12.66	2,784	1.05	16.2	24.4	8.3	480	–	75

The figures below show cumulative fishery profit (green line) from 2007 to 2013. The total profit curve is flat towards the end of all of the seasons, which shows that overall profit is not overly sensitive to the timing of the season closure in the later weeks. Moreover, the line does not obtain a negative slope, indicating that fishing is not entering non-profitable region under current arrangements. The vertical dashed line show the years where CPUE would have triggered closure of the fishery under an MEY trigger.
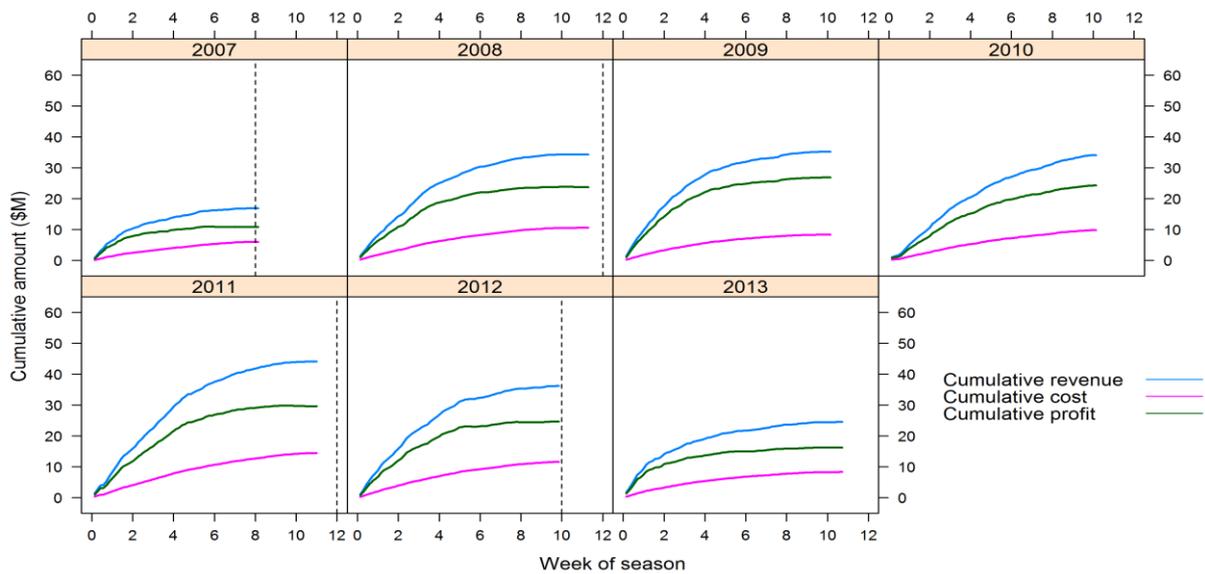
Figure 1 Time series of cumulative revenue, cost and profit as the season progresses for 2008–2013.

Generally the RAG considered that these results show that the choices made by industry under the current 500kg/day trigger are not largely out of line with those that would result under an MEY trigger.

2.3 Sensitivity Analysis

The following table was produced to understand the sensitivity of the MEY trigger to a range of cost and price levels. Trigger rates assumed a 1.5 scaling factor.

Price kg^{-1}	Cost boat-day^{-1}	Catch rate (kg day^{-1})		Price kg^{-1}	Cost boat-day^{-1}	Catch rate (kg day^{-1})	
		MEY	trigger			MEY	trigger
$8	$1,500	292	439 <	$11	$1,500	202	302 <
	$2,000	390	585 >		$2,000	269	403 <
	$2,500	487	731 >		$2,500	336	504
	$3,000	585	877 >		$3,000	403	605 >
$9	$1,500	254	381 <	$12	$1,500	183	274 <
	$2,000	339	508		$2,000	244	365 <
	$2,500	424	636 >		$2,500	305	457
	$3,000	508	763 >		$3,000	365	548
$10	$1,500	225	337 <	$13	$1,500	167	251 <
	$2,000	300	450		$2,000	223	334 <
	$2,500	375	562		$2,500	278	418 <
	$3,000	450	675 >		$3,000	334	501

Professor Kompas emphasised that the price of prawns is a key driver of the MEY prediction. Because ABARES figures are usually a year behind, the RAG agreed that prawn prices obtained from the NPFI economic surveys would be better to use. The RAG agreed that it would be preferable to use pricing information collected within season (at the end of week 4), but that if this is not available, then pricing information from the NPFI economic surveys from the previous year should be used.

The RAG recommended using price information collected within season (at the end of week 4), but that if this is not available, then price information from the NPFI economic surveys from the previous year should be used.

Boat costs are comprised of repairs and maintenance (R&M), crew costs, packaging and handling. In the calculation originally presented to NPRAG, CSIRO had assumed that all R&M costs were variable costs (dependent on fishing). At the February meeting, industry expressed a preference R&M costs to be excluded from the calculation, as they considered these fixed costs, independent of season length. This was further investigated and the results were presented.

The RAG recommended using fuel cost information collected within season (at the end of week 4), but that if this is not available, then information from the NPFI economic surveys from the previous year should be used.

The sensitivity calculations presented above assumed that 20% of R&M costs were variable and should be included in the calculation of daily effort related costs. The RAG noted that R&M costs will vary significantly across the fleet and that these costs may be reported differently by different operators in the survey results. Sean Pascoe presented information on R&M costs across a range of fishing industries. The study assumed that R&M costs depend on the size of the vessel and days fished and will also vary by fisher and gear type. The study found that for tropical prawn fisheries, R&M costs were 15% variable and 85% fixed. The large fixed component is explained by the remoteness of the fishery, which means that refit costs are required regardless of the amount of time fishing. Professor Kompas had data from the most recent economic survey data that supported these findings, estimating R&M costs at 13.4%.

The RAG recommended using R&M cost information collected from the NPFI economic surveys from the previous year. The RAG recommended the use of an R&M component sourced from the most recent NPFI economic survey, being 13.4% for 2014.

2.4 Scaling Factor

Previous analyses had indicated that due to the decline in CPUE that occurs after the first month of fishing, a scaling factor of 1.5 would need to be applied to the MEY value at the close of the season to obtain the trigger CPUE value one week prior. Further analysis of this was undertaken by CSIRO using data from 2008 to 2013. Figure 2 below demonstrates the relationship between the catch rate over the reference period and catch rate one week later (values of 1.3 and 1.7 and a mid-range value of 1.5 are demonstrated by the horizontal lines).

Although several models were used to fit the ratio, RAG members noted that the ratios varied considerably between the weeks (influenced by moon phase) and also between years. Ultimately, this made it very hard to predict what the catch rate will be one week later. It was agreed that it would be difficult to find a relationship that could be applied across all years (e.g. 2009 and 2013) and there was insufficient time to further explore this for 2014.
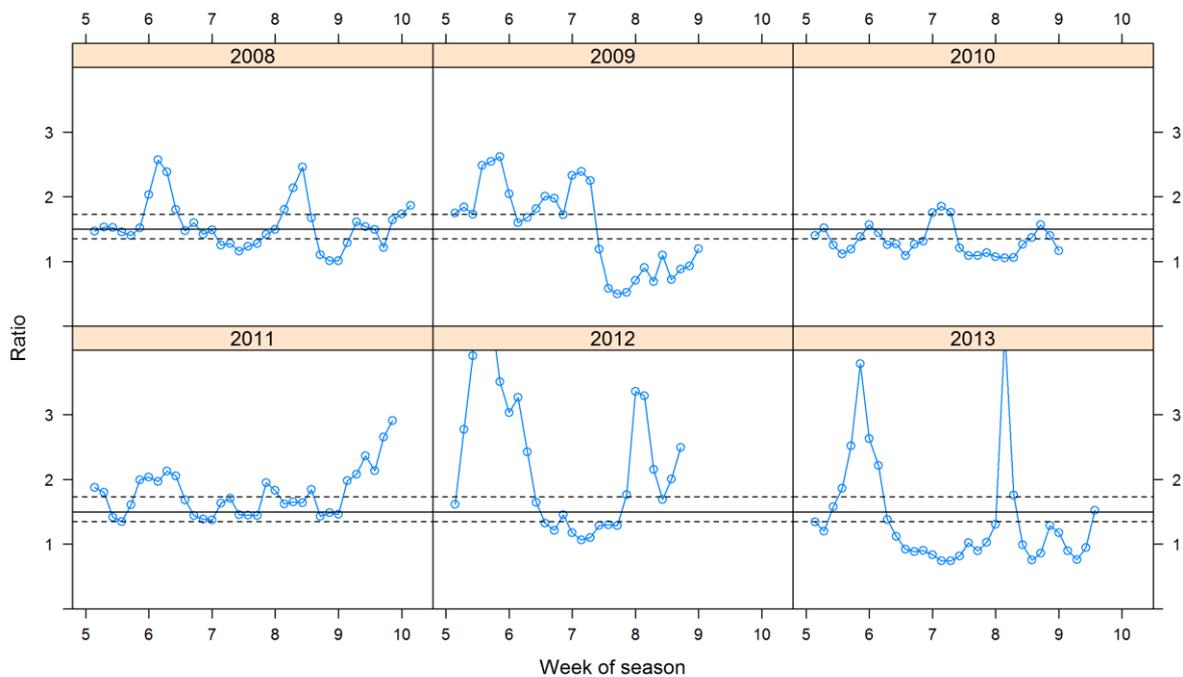
Figure 2 Ratio between the catch rate over the reference period and catch rate one week later towards the end of the season for 2008–2013.

Acknowledging that generally there is a drop in CPUE at the latter end of the season, the ratio was actually extremely variable, between 0.8 and 2.0. Dr Kompas noted that given the small number of boats operating at the end of the season, a scaling factor was probably not necessary. This was supported by Dr Pascoe who suggested that there may be no practical advantage in scaling the MEY trigger, as operators would be free to choose to leave the fishery or stay an additional week (past the MEY point) until the fishery closes.

Ultimately, the RAG considered that given the difficulty in determining an exact scaling factor and that cumulative profits were not overly impacted by the exact timing of the season closing (Figure 1), there was no need to scale the MEY-trigger amount to reflect catch rates in a weeks' time.

The RAG recommended no scaling factor for the MEY trigger be applied for 2014 and further evaluation of the need for scaling factors be explored once more information was made available.

Industry members repeated the concerns raised at the February meeting about the potential impact of the trigger on smaller boats with lower operating costs. The RAG acknowledged this was an issue but could currently only deal with MEY at a fleet level – not at the individual vessel level. Certainly it appears that the individual choices of skippers to leave the fishery at the end of the season were largely achieving MEY at the fleet level anyway. It was indicated that there may be an opportunity to explore this further through a PhD project.

2.5 Buffer value

At its February meeting, the RAG agreed that in the first year of application of an MEY trigger, there should be a buffer of a maximum of a 25% change to the current 500kg/boat/day trigger, to minimise the possibility of extreme changes and the risk this might place on the fishery in the first application of a real-time management trigger. At its meeting following the February NPRAG meeting, the NPF Industry Pty Ltd recommended a buffer level of 15%. This was used in the subsequent CSIRO analyses.

There was concern that both the 25% and 15% buffer values were not based on any science but after some discussion, it was agreed that there was no simple method available to the RAG to determine a more appropriate buffer value. It was suggested that if MEY triggers were low due to good prawn prices (as in recent years) then a buffer value of 15% would be more precautionary than 25% as it would restrict the downward movement of a trigger below 500kg (the current fixed trigger). This trigger is in the NPF harvest strategy and was based on some economics and because it allows for some level of escapement of banana prawns. Industry members in particular were nervous about lowering the trigger by more than 15% from the current trigger.

The RAG recommended an interim buffer level of 15% from the current 500kg trigger to minimise changes in the first year of the MEY trigger, and to continue to provide a level of escapement for banana prawns.

2.6 Implementation of an MEY trigger

The RAG has continued to emphasise that amount of time available to develop an MEY trigger for banana prawn that could be implemented in time for the 2014 season was unreasonable and again, CSIRO scientists and the RAG have been put under considerable pressure to develop harvest strategies and management options without appropriate levels of analysis and testing. As a result, the RAG has put a caveat on the harvest strategy that it should only be applied during 2014 and may be modified in future years. Further, a buffer is recommended for 2014 so that the real time management decisions required for an MEY trigger cannot place undue risk on fishery economics and stock sustainability. Fortunately, to this end, it appears that the current trigger and decisions of individual vessels of when to end fishing the banana season is reasonably within that required to achieve MEY at the fleet level.

Thus, only with agreement on all of the individual recommendations above, the RAG recommended implementation of the MEY trigger for the 2014 banana prawn season only based on the method highlighted above.

### Agenda Item 3 - Tiger prawn effort pattern

The RAG noted an update from Dr Buckworth including a presentation of the actual effort patterns by year for 2008 -2013. The recent work by Deng et al. indicated that the effort pattern that is used in the model is an important driver of the accuracy of the prediction of optimal catch and effort, and

that the application of the previous year's or averaged previous two year's effort patterns, improved predictive performance.

Dr Buckworth emphasised that the effort pattern in any tiger prawn fishing year is difficult to predict as it depends not just on the distribution and abundance of tiger prawns but also on the perceived performance of banana prawn season and other fisheries.

Dr Buckworth suggested that it would make sense to use the last two year's average as a starting point and then use the RAG's expert input to inform a better effort pattern. Dr Buckworth suggested that if 2014 is similar to 2013, the actual effort exhibited last year could also be a reasonable effort pattern.
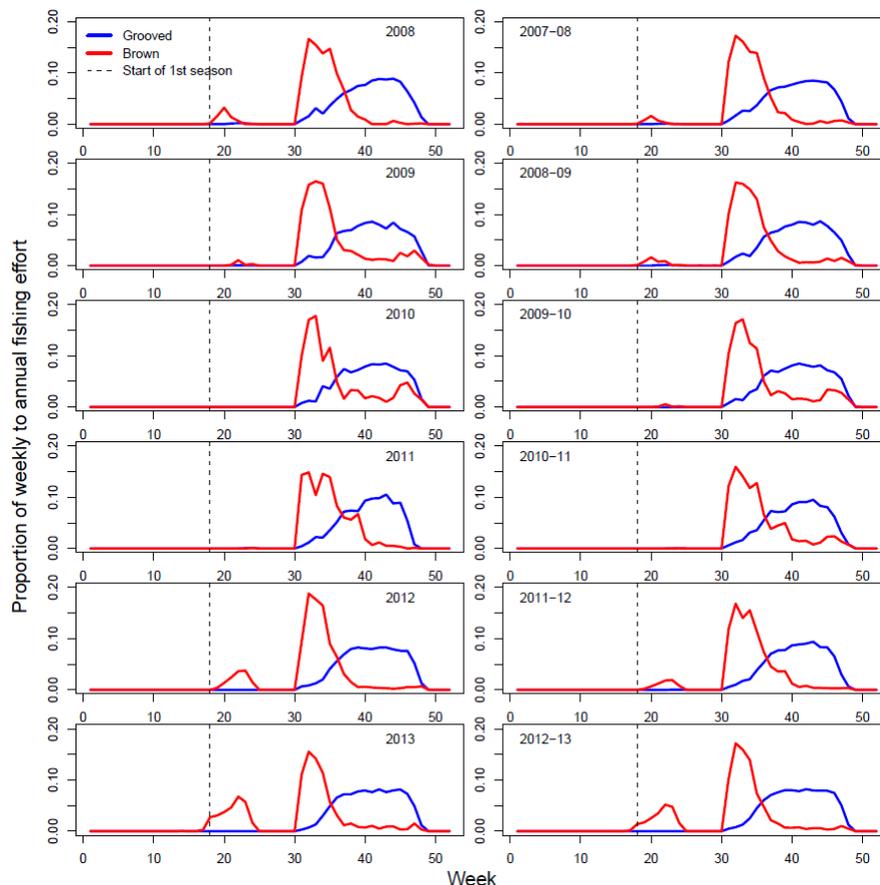
Figure 3. Actual effort patterns by year (left column) for 2008 -2013 and average actual effort patterns for the corresponding two year periods (right column). The RAG noted that effort data for 2013 are based on preliminary analyses.

Industry members suggested that with the rainfall seen to date, it could be expected that there will be more effort on bananas than there was last year. Industry members also suggested that, as the survey results are quite similar to last year, effort on tigers will be lower at the beginning of the season. It was also suggested that banana prawns will be easier to sell in 2014 as some operators still have surplus tigers from 2013.

Thus, based on the findings of the review discussed at the February meeting and consideration of expectations around the 2014 fishing season given rainfall and outcomes of the summer survey, the RAG agreed to use the average of the last two year's actual effort as the predicted effort for 2014.

Agenda Item 4 - Parameters for base case for tiger prawn assessment

Following the review of the tiger prawn assessment conducted by Deng et al. which was considered at the February meeting, the RAG discussed the new base case parameters to be used for the tiger prawn assessment in 2014.

The RAG discussed the removal of the low effort threshold, which was introduced to reflect the fishery prior to 2007. The RAG noted the explanation from Dr Buckworth that the model originally had 2777 days as the minimum effort allowable in a given year which was applicable to the number of boats operating in the fishery pre 2007. Following the licence buyback and the corresponding reduction in boat numbers, the Deng et al. review found this to be restrictive as the model could not 'search' for less effort i.e. the minimum effort allowance restricts the predictive bounds of the model.

Subsequently in order to model the current fleet more accurately, the RAG agreed that the low effort threshold of 2777 days should be reduced to 1000 days as a sensitivity test to the assessment. However, the 2777 day threshold will be maintained in the base case.

The RAG also agreed that consistent with the findings of the Deng et al. study and this discussion at the February 2014 meeting, the following parameters be included in the new base case assessment:
- *Dome-shaped selectivity for recruitment survey length frequency data;*
- *Dirichlet-multinomial method for length frequency data*
- *Ignoring the most recent length frequency information from surveys for brown tiger prawns.*

The RAG agreed that the superseded 2013 base case assessment should be maintained as a sensitivity test to the new base case assessment.

Agenda Item 7 - Base case for Red Leg Banana Prawn assessment

The RAG noted the presentation from Dr Buckworth on the base case parameters to be used in the red-leg banana prawn assessment. The RAG noted that the base case assessment assumes a distribution of catches per quarter based on actual effort in 2011.
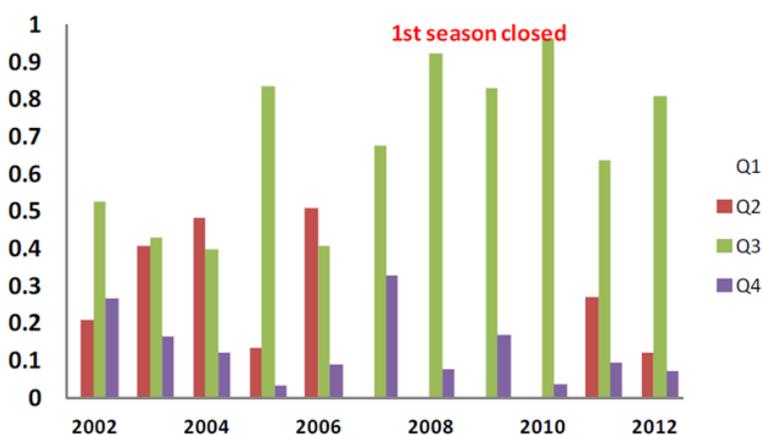
This pattern assumes that the future fishing effort will be spread evenly across the last three quarters of the year (noting that the fishery is closed in the first quarter).

The RAG agreed that the base-case used in the previous year should be applied in the 2014 assessment.

Agenda Item 8 - Development of the NPF Bycatch and Discard Workplan

The RAG noted that the previous workplan expired in January 2014 and that AFMA is required to implement a revised workplan by the start of the banana prawn fishing season. AFMA is seeking feedback from NRPAG and NORMAC on specific and achievable action items for inclusion in the workplan.

Ms Hill emphasised the need to define a goal for the fishery to achieve in terms of bycatch reduction. It was suggested that the public perceptions of bycatch are considerable risks for the fishery. Ms Hill noted that the public perception of bycatch issues in other trawl fisheries also attracts criticism to fishing in the NPF. Ms Hill also raised the potential for increasing interaction between the NPF and recreational fishing sector.

It was agreed that AFMA would work directly with NPFI to finalise the workplan but that the discussion of action against the workplan would become a standing agenda item for the RAG.

Agenda Item 9 - Timing and frequency of pre-season surveys

At the February NPRAG meeting, the RAG agreed to return to the practice of undertaking the winter survey every second year. The RAG also noted the resolution from the February 2014 meeting that the idea of removing the annual spawner survey would best be explored by conducting a management strategy evaluation and that CSIRO would be preparing a proposal for this project.

Next meeting

The RAG agreed that the next meeting would be held via teleconference to discuss the red-leg assessment.

Appendix 1 – Inputs required for MEY trigger calculation

Calculation of MEY trigger			
Rule: if the catch rate falls below the trigger rate in the two-week reference period, then the fishery will close at the end of the week following the reference period			
Item	Amount	Unit	Comment
Fuel cost	$2,457.00	$ per boat per day	Industry members will provide Annie with a fuel price figure based combination of fuel prices taken from Darwin, Cairns and the mothership at the end of week 4. The final price will be averaged out using an allocation of 70/30 port/mothership and will be net of gst & rebate. Annie to provide to RAG.
Capital cost with depreciation	$1,485.00	$ per boat per day	From previous year's economic survey. This is the figure that Tom provides, inclusive of depreciation. It may be possible instead to provide capital cost directly without depreciation at C6
Depreciation	23%		
Capital cost without depreciation	$1,143.45	$ per boat per day	See comment above
Gear cost	$237.00	$ per boat per day	From previous year's NPFI economic survey
Total repairs and maintenance (R&M)	$1,380.45	$ per boat per day	
Proportion of variable costs in R&M	20%		This figure is based on a paper in review by Pascoe et al. Industry suggests this should be 0%
Total variable R&M costs	$276.09	$ per boat per day	
Marketing costs	$1.03	$ per kg	From previous year's NPFI economic survey
Price	$12.00	$ per kg	The 5 industry NORMAC members (minimum of 3 if not all available) will have a phone hook up at the end of week four to determine the 'beach price' which will be given to Annie to provide to the RAG. The definition of 'beach price' will be - 'gross price for sale of product to cold store less freight and unloading charges'
Crew share of catch revenue	23%		Agreed by RAG
MEY catch rate	333	kg per boat per day	This is the rate at which marginal revenue equals marginal costs
Two-week scale factor	1.5		This is the estimated ratio of catch rate over the two week reference period ending one week prior to a given date to the catch rate at that date
Trigger catch rate	499	kg per boat per day	This is the estimated trigger rate over the two-week reference period when catch rate is at MEY one week later.
Buffer	15%		This is the buffer to protect against large changes from the original 500 kg/day trigger
Restricted trigger rate	499		This is the trigger rate restricted to the buffer either side of 500 kg per day
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Green cells need values to be input			
Yellow cells should not need to be changed			
Do not change orange cells; they contain formulas			