Northern Prawn Fishery

Resource Assessment Group

(NPRAG)

NPRAG MEETING – 15 & 16 MARCH 2012

A Northern Prawn Fishery Resource Assessment Group (NPRAG) meeting was held on Thursday 15 and Friday 16 March 2012 in Brisbane to discuss: technical papers available to the AFMA Commission at its February meeting; the 2012 tiger prawn assessment, including a summary of the 2011 tiger prawn season versus the outputs of the 2011 assessment; and the 2012 red-legged banana prawn assessment.

The RAG noted that a number of observers were attending the RAG for the first day to provide additional information and expertise to the technical papers that were presented to the Commission at its February meeting. These attendees included Dr James Findlay, David Galeano, and Melissa Brown from AFMA and Dr Ilona Stobutzki and Mr Simon Vieira from the DAFF Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES).

Authors of the three technical papers who were present reiterated that the papers were not RAG documents. The papers came about from concerns raised during the Northern Prawn Fishery Management Advisory Committee's (NORMAC's) review of submissions on the *Northern Prawn Fishery Management Plan 2012* (quota plan). It was felt that some of the information contained within the responses to submissions and some of the advice provided to NORMAC was technically incorrect, specifically: the interpretation of effort creep and how it is currently dealt with in the Northern Prawn Fishery (NPF); the interpretation of the Cost Benefit Analysis (CBA) for which the move to quota management is partly based; and a review of the 2011 tiger prawn assessment outcomes and the 2011 tiger prawn season, outlining risks in the assessment. The RAG noted that the AFMA Commission had specifically requested for RAG comment on these papers.

1. RAG member views on the move to TAC management

Over the last few years, the RAG has been working as directed by AFMA to explore the potential of various components of the fishery to be managed under TACs. A lot sound scientific work and good progress has been made to this end. Many members, however, have expressed concern that these efforts have been inferred as their support of this management change. In fact, most if not all RAG members hold grave reservations about the scientific validity and appropriateness of managing one or more components of the fishery under TACs and believe this move could be detrimental to the fishery. The Chair commended RAG members in their diligent work in the RAG to professionally explore the TAC options despite their reservations, but at this point, he gave each RAG member and observer the opportunity to individually express their technical opinion on quota management in the NPF based on the history of RAG exploration of TAC options. Each RAG member's comments are provided and the comments from observers are summarised (Attachment B).

Overall, based on the research over the last few years, numerous RAG members, (including both the independent scientific members) simply think that TACs are the wrong management

tool for the short-lived penaeid prawn fisheries of the NPF. Further, the remaining members feel they can't endorse the move to TACs until the accuracy with which TACs can be set is improved and the long term economic risks of setting inaccurately low TACs (cell highlighted in Table 2) is quantified. This is particularly the case for white banana prawns and to a lesser extent for red-legged banana prawns.

2. Effort, effort creep and fishing power in the NPF

This paper was introduced by Dr Rik Buckworth. There was some discussion about the terms "effort creep" and "input substitution". Dr Buckworth indicated that "assessment creep" had been used in the paper in the same sense that it had been used in the AFMA responses to the submissions on the Management Plan, and in the sense that it had been used in the fishery since the late 1980s.

The RAG discussed the economic definition of the term, effort creep, in terms of input substitution. When a fishery is managed by restricting the use of one or more fishing inputs (e.g. the amount of fishing gear allowed to be used) in order to limit the amount of fish caught, effort creep occurs when fishers substitute restricted inputs with unrestricted inputs in order to increase their effective fishing effort. Other inputs include the use of technology or fisher skill. Examples of changes that have resulted in effort creep in fisheries include the advent of Global Positioning Systems (GPS) into fishing operations; changes in echo sounding technology; and gear technology.

The management implication of effort creep, is that the allowable effort in the fishery needs to be reduced to ensure stocks are maintained on average at the biomass associated with maximum economic yield (MEY). Any such reductions in allowable effort further constrain the ability of fishers to use the combination of inputs that minimise fishing costs. In the longer term, the regulation of the particular fishing input can become ineffective at controlling the total catch and may require a complete change in the way in which inputs are regulated. Under an ITQ system effort creep is encouraged as it is effectively an efficiency gain (same output with fewer inputs). As long as the output (i.e. catch) is controlled, efficiency gains in effective effort are what the system is designed to do.

Dr Buckworth stated fishing power/effort creep is assessed from the catchability of prawns and as such believes that even if all components of fishing power are not understood the total amount of fishing power and changes over time can be assessed from catchability. Fishery stock assessments can sometimes capture the rate of increase in effective effort over time (worldwide estimates usually fall within the range 2-5 per cent per year) but these estimates are subject to much uncertainty and are estimated post fact. Without deliberate action, the fishing power of the NPF fleet has increased by around 1 – 2 per cent per year over recent times. The scientific members noted that generally effort creep is captured in the fishing power series within the tiger prawn assessment.

A number of RAG members believe the current input system has shown its capability to deal with technology changes that are usually associated with effort creep (i.e. the move to quad nets), and control increases or decreases in effort. Some participants, however, noted the impact of the structural adjustment packages, and the fact the move to ITQ management was expected to facilitate autonomous adjustment. The RAG noted that although the input controls have worked well in recent years, this does not stop outside factors influencing fishing power and there is no guarantee that there will not be excess capacity in the future under input management (although the fishery is now suffering from under-capacity).

While AFMA can reduce the amount of regulated inputs allowed to be used to account for the increased effectiveness (to ensure a fishery is sustainable) in the longer term, this propagates inefficiency as it forces fishers to use inefficient combinations of fishing inputs which drive up fishing costs and lower profitability.

Conversely under a pure ITQ system, where fishers are free to choose the combination of inputs to use, any increases in efficiency fishers are able to generate by using different inputs theoretically results in cost savings and higher profits. It was noted that in the NPF's proposed move to ITQs, however, a number of input restrictions will still be retained. For example, seasonal closures will remain necessary to enable some degree of separate management of the tiger prawns species and spatial closures might be necessary to protect individual stocks.

Industry members of the RAG outlined that they don't foresee any future issues by using the current gear unit system and that from their perspective the fishery is in the best place it has been for a long time and that this can be attributed to the current management arrangements, particularly the harvest Strategy.

3. NPF Stock Assessments and TAC Development

Dr Buckworth also introduced this paper. A main point of discussion was that a major component of the Tiger Prawn, Endeavour Prawn and Red-legged Banana Prawn stock assessments is the extensive Catch per Unit Effort (CPUE) data series which has been generated under input controls. Under output management, fishing efficiency (and the resultant CPUE) can change more freely and is likely to change significantly. The disjunct in the CPUE time series that is likely to result will bring more uncertainty into the assessment model, making the process of setting a Total Allowable Catch (TAC) less certain than the current process of setting a TAE. This uncertainty will continue for a number of years before a sufficiently long time series of CPUE under TACs is developed. The RAG noted that the fishery independent surveys will assist the model to cope with such change, but this is only available for the Tiger Prawn fishery.

Despite this, the RAG felt that although the effect on the CPUE data series would increase uncertainty in the assessment, it would not present a fundamental issue with the Tiger Prawn assessment. The same was not felt to be so for the other assessments. It was also pointed out that the effect of a management decision on a data series should not be the over-riding issue for making that management decision.

A point that had arisen in discussions during the NORMAC teleconference was that an inaccurate TAC would be more detrimental to the fishery than an inaccurate Individual Transferable Effort (ITE). The RAG spent some time qualitatively investigating this point for each of the stock assessment species, based on the currently available methods of determining TACs.

The RAG noted that an inaccurate TAC or an inaccurate TAE has the same potential to affect the level of fishing mortality, with some intricacies within this. There is some potential that a TAC may create more incentive for operators to try and keep fishing to achieve the catch (particularly if the quota has been leased or traded) than a TAE, which may more adequately control a proportional take of the available catch. Discussion surrounded whether economic

rationalism will rectify the issue or if people will continue to fish whether it is profitable or not. . It was noted that one of the key reasons for implementing the trigger limits for both the tiger and banana prawn fisheries was because some fishers continued to fish even when it was not profitable at a whole of fishery level. The RAG noted that the fishery's responses to input controls may better reflect the abundance of the stock, which is one of the key base theories to input controls – particularly for short-lived prawn species.

The tables in Attachment A outline the RAG's discussion of the qualitative risks and consequences of setting an inaccurate catch or effort level for each of the three proposed quota species.

4. Comment on Cost Benefit Analysis of management options for the NPF

The motivation for this paper was spawned from discussion among some RAG members after the NORMAC teleconference. Discussions in NORMAC were split between those discussing long term benefits of quota management (mainly based on the Kompas *et al* CBA, 2009), and those talking about the risks over the interim period.

The paper was not intended to dispute the economic findings of the CBA but was suggesting that it would perhaps have been better to forecast over a shorter time period than 50 years and particularly focus on the period post-implementation. Looking at the trajectories over the short term (sub-decadal) rather than averaged results may give a better understanding of how conditions might change over time, and how determinations of TACS or TAEs may affect performance of the fishery. Further, the authors felt that some key assumptions on which the CBA is based have somewhat changed since 2009, such as: quota management will reduce the race to fish; TACs can be accurately set, and the inclusion of in-season updates.

All RAG members agreed that a race-to-fish will remain in the Banana Prawn fishery due to the high availability and schooling behaviour shown by this species early in the season, and their high mortality rate. David Galeano noted that the race to fish analysis in the CBA originated from industry queries on whether there was potential for a price premium on product under quota management and that this was one of many scenarios tested in the CBA. It was noted that the CBA outcomes are not wholly predicated on quota management alleviating the race to fish.

At the present time, in-season TAC updates are not the preferred option for a number of reasons, including the potential impact on quota trading. Furthermore, the ability of current assessments to set appropriate or accurate TACs is questionable, particularly for Red-legged and Common Banana Prawns. These issues and their influence on the assumptions and outcomes of the CBA need to be further considered if the CBA is going to be used as a basis for the move to ITQ management.

It was noted that the CBA (Kompas et al. 2009) provided a quantitative risk analysis that was potentially more robust for tiger prawns where there was more variance in the harvest function than the stock recruitment relationship, making ITQs the preferred approach. But it is a different case for banana prawns where there is a highly uncertain stock recruitment relationship, heavily influenced by environmental factors. The assumption that a TAC can be set accurately remains problematic for white banana prawns although it is the focus of an ongoing research project. In the CBA, Kompas highlights that under a TAC arrangement there "may also be years in which potential catches of banana prawns are much larger than the typical historical range for harvest, indicating lost profitability..." Although this maybe

offset to some extent by longer term efficiency gains, the frequency and extent of such losses in the banana prawn fishery is one of the fundamental concerns of most RAG members. These losses can never be recouped and to date, there has been no analysis of whether these losses cumulated over the years would outweigh the benefits of the entire fishery moving to TACs. The CBA also highlighted that some of the benefits of trading in ITQs will not be realised if only part of the fishery moves to TACs. Until the accuracy with which TACs can be set is improved and the long term economic risks of setting inaccurately low TACs is quantified and weighed against the proposed benefits, these concerns will remain - particularly for the white banana prawns.

5. Review and update of Stock Assessments

Tiger prawns

a. *2011 prediction versus 2011 actual catch*

The RAG was presented with a synthesis of the 2011 season and compared it with the outcomes of the 2011 tiger prawn assessment. The RAG noted that the 2011 assessment output recommended a TAC of over 2,000 tonnes for 2011, while industry only recorded a catch of 814 tonnes (510 tonnes grooved tiger prawns and 304 tonnes brown tiger prawns, calculated from species split data). The RAG discussed what may have created the discrepancy between the predicted assessment outputs and the observed catch.

Dr Buckworth outlined that CSIRO had retrospectively looked at the data used in the assessment to gauge what may have caused the discrepancy. The main areas assessed were the actual effort pattern compared to the RAG agreed pattern used in the model; altering the weighting of length frequency data in the model; and the influence of the survey data. By altering some of these parameters the recommended TAC for tiger prawns was reduced. However, none of these changes singularly or combined could fully account for the difference. Dr Buckworth also advised the RAG that not conducting the spawning survey in 2010 may have held greater weight than was assumed and that this could have impacted the outputs of the model. It was noted that conflicting implications of different data types, as in this case where length frequency data indicated predicted higher abundance than the recruitment survey index, are a common and problematic in assessments.

The RAG also discussed other factors that may have contributed to the discrepancy such as environmental variables (e.g. cold water late into the year) and changes to the spatial pattern of fishing. Both of these factors were seen as plausible factors but are not represented in the model.

b. *2012 assessment*

The base case assessment for tiger prawns showed that both tiger prawn species are above the limit reference point and are on an MEY trajectory over the seven year horizon. For 2012, the model outputs recommend a TAE of 1129 boat days on tigers for the first season and a TAC of 1352 tonnes for the second season.

The RAG had significant concerns with managing tiger prawns under effort controls for the first half of the 2012 season and under quota controls for the second half. These concerns centred on the potential for over or under utilisation of the resource depending on the strength of the banana prawn season and response from operators (whether they switched to tiger prawn fishing during the first half or not). Industry members felt that a mid year start to quota management is not ideal for business planning and would restrict quota trading.

The RAG discussed the risks of changing management models if it is a poor banana prawn season, as some industry members are expecting. There are concerns that operators may target tiger prawns at an increased rate and exceed the recommended TAE of 1129 days. There were also concerns that if it is a good banana prawn season then there is a risk that for 2012 the tiger prawn resource will be under utilised due to reduced effort and the potential catch "lost" due to the change in management models. Rough calculations estimated that under utilisation of the resource could amount to around 200 tonnes,, with a value of approximately $4 million. Further, the RAG agreed that it is more likely that the resource would be under utilised in 2012 under the proposed change in management models mid year.

In light of the above risks the RAG recommended that, if implemented, quota management should not commence until the beginning of 2013, as this would reduce the risks of under and over utilisation of the resource. If the decision is made to implement quota management as of 1st August 2012 (as currently planned), the RAG recommends that a different effort pattern than currently applied be used to reduce the risk of under utilisation of the resource.

It was acknowledged that under the current fleet structure, it is difficult for industry to have the capacity to utilise the current Tiger Prawn MEY estimates of TAE allocated across the entire season. This issue is exacerbated by the move to quotas half way through the season. The industry members of the RAG considered that the effort allocated for the first season was too high and that it was more likely to be around half that allocated from the model (675 days). It was roughly calculated that if the unutilised first season effort was transferred into TAC for the second season it would amount to 160 tonnes (allowing for 20% mortality) and this should be added to the model estimate of second season TAC. Thus, if quota management does start in August, a TAC of 1480 tonnes is recommended.

Red-legged banana prawns

a. *Output controls*

The RAG was presented with the outputs from the 2012 red-legged banana prawn assessment. The recommended TAC from the model for 2012 is 519 tonnes. However the RAG noted that output management is scheduled to begin in August 2012 and as such the TAC needs to be altered to capture this. Dr Plaganyi-Lloyd reported back to the RAG that for the second season the recommended TAC is 330 tonnes.

The RAG expressed concerns in relation to the practicalities of dealing with a change in management arrangements in between seasons when targeting of both tiger prawns and red-legged banana prawns is allowed in the first season. The RAG recommended that, if implemented, quota management should commence at the beginning of 2013, as this would allow for a better transition in management arrangements. If this is not the case then the RAG recommended a TAC of 330 tonnes for red-legged banana prawns for the second season.

b. *Input controls*

As there is a RAG endorsed assessment model for red-legged banana prawns, the RAG noted that decision rules should be implemented for red-legged banana prawns under the input control harvest strategy. The RAG also noted that for MSC certification of the red leg fishery to be successful, appropriate Limit Reference Points and decision rules would need to be incorporated into the NPF Input Control Harvest Strategy. The RAG recommended the following arrangements:

- A limit reference point (LRP) of 390kg/boat day, assessed at the end of each tiger prawn season and only if there are greater than 100 days of effort in that tiger season.
- If catch is below the LRP then fishing will not be allowed in the following banana prawn season but will be allowed in the next tiger prawn season.
- If the catch is still below the LRP in the tiger prawn season for two years in a row then the fishery will be closed for the following calendar year. The RAG noted that some research fishing would need to occur to determine when the fishery should re-open.

Common banana prawns
The RAG noted that CSIRO has been approved to continue with the project to investigate the use of catchment rainfalls to estimate catches of common banana prawns. No assessment was available on the most recent data to enable a prediction of 2012 catches.

Yours sincerely,

Dr Ian Knuckey
NPRAG Chairman

Attendees

Dr Ian Knuckey	Chairman
Ms Fiona Hill	AFMA
Dr Rik Buckworth	Scientist
Mr Ron Earle	Industry
Mr Ian Boot	Industry
Mr Michael O'Brien	Industry
Dr Rodrigo Bustamante	Scientist
Dr Norm Hall	Scientist
Dr Malcolm Haddon	Scientist
Mr Josh Fielding	Executive Officer
Ms Annie Jarrett	Permanent Observer

Observers

Mrs Melissa Brown	AFMA
Dr Roy Deng	CSIRO
Mr Matt Barwick	NPFI
Dr Ilona Stobutzki	ABARES
Mr Simon Vieira	ABARES proxy
Dr James Findlay	AFMA
Dr Trevor Hutton	CSIRO
Dr Eva Plaganyi-Lloyd	CSIRO
Mr David Galeano	AFMA

Attachment A

Table 1 Qualitative risk and consequences of inaccurately setting a TAC for tiger prawns

Accuracy	Comment	Occurrence % of years	Risk= Occurrence X Outcome	TAE Consequence Short Term	TAE Consequence Long Term	TAC Consequence Short Term	TAC Consequence Long Term
Accurate	Most common	Medium	None	TAE set in line with stock abundance	Achieve/approach MEY target	TAC is set in line with stock abundance	Achieve/approach MEY target
Over-prediction, Moderate	Occasional	Low	Minor	Catch fewer prawns than planned, catch rates lower than expected, profitability down marginally, unprofitability may be reduced by trigger limits - compensatory for over estimate	In the area between MEY and MSY, assessment will rectify in following years	Minor reduction in economic performance, no recruitment effect, inefficient trading, wont see some of the economic benefits of ITQs, switching to alternative targets	In the area between MEY and MSY, assessment will rectify in following years

Accuracy	Comment	Occurrence % of years	Risk= Occurrence X Outcome	TAE Consequence Short Term	TAE Consequence Long Term	TAC Consequence Short Term	TAC Consequence Long Term
Over-prediction, Large	Rare - recruitment downturn; damage limited by capacity and costs	Rare	Substantial	Overall catch a lot lower, Lower catch rates, trigger limits will likely kick in and stop fishing at 6 weeks, reduced profitability, gear unit cm length may increase, capacity to adopt the increase is constrained by boat numbers etc.	May take some years to recover, effort may focus on other species. Impact should be limited by	Reduction in economic performance over subsequent years, recruitment reduction, TAC not triggered but economic reasons may end fishing	May take some years to recover, effort may focus on other species
Under-prediction, Moderate	Occasional	Low	Minor	A bonus in catch compared to expectations, catch rates better than expected, triggers wont kick in until later, profitability greater than expected, take a greater quantity of prawns but the same proportion of the stock	No real difference, essentially as if you are approaching MEY target	Minor reduction in economic performance – catch foregone, will be slightly more catch foregone in TAC than TAE; no recruitment effects, will drive quota trading	No real difference, essentially as if you are approaching MEY target, beneficial if the stock is depleted and rebuilding

Accuracy	Comment	Occurrence % of years	Risk= Occurrence X Outcome	TAE Consequence Short Term	TAE Consequence Long Term	TAC Consequence Short Term	TAC Consequence Long Term
Under-prediction, Large	Rare - recruitment pulse	Rare	Significant one year	A BIG bonus in terms of catch, catch rates significantly higher, gear unit cm length will be lower which may cause foregone catch, $ value of gear units will increase	No major impact unless stock is in recovery mode, losses from year 1 will be somewhat taken up after year 1	Bonus is foregone. No major impact unless stock is in recovery mode, losses from year 1 will be somewhat taken up after year 1	No major impact unless stock is in recovery mode, losses from year 1 will be somewhat taken up after year 1

Table 2 Qualitative risk and consequences of inaccurately setting a TAC for white banana prawns

Accuracy	Comment	Occurrence % of years	Risk= Occurrence X Outcome	TAE Consequence Short Term	TAE Consequence Long Term	TAC Consequence Short Term	TAC Consequence Long Term
Accurate	Current model biased upwards	Unknown	None	Input controls set in line with stock abundance	Achieve adequate escapement,	TAC is set in line with stock abundance,	Approach MEY target, possibly more specialised and efficient banana boats but unlikely to have completely separate fleets
Over-prediction, Moderate		Unknown	Minor	Trigger limits may kick in earlier than expected, profitability down compared to expected,	No impact	Lower than expected profitability, more uneconomical fishing practices, undue optimism, reduced in-season SFR leasing	No impact
Over-prediction, Large		Unknown	Substantial	Trigger limits will kick in MUCH earlier than expected, significantly lower than expected profitability	No impact	Lower than expected catches and profitability, increased operational costs, substantial loses in quota trading for people who buy/lease in	Could cause localised depletion, could override the escapement theory that operates under current arrangements and so impact recruitment in following years(s), loss of confidence in model and

Accuracy	Comment	Occurrence % of years	Risk= Occurrence X Outcome	TAE Consequence Short Term	TAE Consequence Long Term	TAC Consequence Short Term	TAC Consequence Long Term
							impacts of future quota trading
Under-prediction, Moderate		Unknown	Minor	Catch marginally more than expected, longer season than expected	No impact	Loss of potential catch and income, stimulated trading market, constrained quota, small ability to recover some losses in the second season	No major impact, small amount of catch is lost and never recovered
Under-prediction, Large		Unknown	Significant one year	Much larger than expected year, highly profitable, season likely to run full length	No impact	Large loss of potential catch and profits, stimulated trading market, ability to recover some losses in the second season without needing quota	Loss of confidence in the model, some longer term trading implications

Table 3 Risk and consequences of inaccurately setting a TAC for red-legged banana prawns.

Accuracy	Comment	Occurrence % of years	Risk= Occurrence X Outcome	TAE Consequence Short Term	TAE Consequence Long Term	TAC Consequence Short Term	TAC Consequence Long Term
Accurate		Low	None	No impact	Fishery remains above LRP, approach MEY target	Stock fished at sustainable levels	Approached MEY target
Over-prediction, Large		Low-medium	pretty high	LRP will be triggered at the end of tiger season	Minimal impact, response is quick, (after depletion in 1997 took 3 years for recovery)	Reduced profits, potentially large investment prior to fishing that cannot be returned, potential to overfish stock,	Lose confidence in the model, lose confidence in quota trading
Under-prediction, Large		Low-medium	pretty high	Fishery above LRP, higher than expected catch and profit, fishing will continue into next year	Minimal impact	Some remnant stock left in system for the next season.	Some positive feedback with stock caught next year.

Mr Ron Earle (Industry Member)
Mr Earle stated that he is very concerned about the ability to accurately set TAC's for either of the banana prawn species, but is also concerned about tiger prawns given the error seen in 2011. He is concerned that there will be a significant increase in costs with the move to output management. Mr Earle is also concerned that some of the discussion in the RAG has been about the use of a mixed management model which is not favourable in his opinion.

Dr Rik Buckworth (Scientific Advisor)
Dr Buckworth is concerned about the RAG's ability to set defensible robust TAC's, less concerned about this ability with tiger prawns. Dr Buckworth went further to say that even though there is a very good assessment for tiger prawns the RAG is still dealing with a highly variable species and as such there may be concerns with the ability to accurately set TAC's for tiger prawns in every year.

Dr Ian Knuckey (Chair NPRAG)
Dr Knuckey outlined that he does agree with some of the comments in relation to the benefits of quota management and could see that tiger prawns could be managed under output controls. Dr Knuckey is however concerned with the risks of setting inaccurate TAC's for the two banana prawn species, particularly white banana prawns where, if there is a large underestimate of the TAC, there is a risk of a large profit being lost from the fishery that cannot be recovered in the future.

Ms Fiona Hill (AFMA Member)
Ms Hill outlined that she supported concerns raised in relation to the risk of future adjustment and concerns regarding effort creep under the current management system. Ms Hill stated that she was confident with the assessments for tiger prawns and red-legged banana prawns. Ms Hill acknowledged the concerns raised by other members in relation to white banana prawns, and agreed that was the biggest risk to quota management in the NPF. Ms Hill added that the interim results of the Venables *et al*.2011 work were promising and was looking forward to receiving a milestone report on the additional work being undertaken to refine the white banana prawn assessment model.

Dr Rodrigo Bustamante (Scientific Member)
Dr Bustamante finds it quite frustrating that after all the work that has been put in over the last couple of years the RAG is in the same place and having very similar conversations. Dr Bustamante has no preference for which management arrangement is used for the NPF at this stage. There has been a lot more data collected and is now a greater understanding of the fishery and as such Dr Bustamante believes some more analysis on management options could be conducted.

Dr Norm Hall (Independent Scientist)
Dr Hall is very concerned that the inability to accurately do the assessment with the impact of the change in the CPUE data series being severely underestimated. Dr Hall also believes that the CBA did not consider the variability within the actual assessment as well as the variability in the prawn stocks, which may increase the uncertainty in estimating a correct TAC. Dr Hall considers that as prawns are a short lived highly variable species the ability to shift effort around and make the gains associated with quota management will not be realised. He believes that quota management is the wrong vehicle to manage a short lived species.

Dr Malcolm Haddon (Independent Scientist)
Dr Haddon believes the current management system balances the needs of a diverse array of species. He doesn't believe that continuing effort creep necessarily has to led to government financial input and there is no requirement for Government to pay for restructuring in the future.

There are no proven methods for calculating acceptable TACs for the species required under output controls, particularly banana prawns. The main risks reflect the uncertainty that is well recognised in white banana prawns, related to their biology and the effect of environmental variables. The risks are primarily related to the lost opportunity costs of missing out on the big year. If there was some in season management this may be less.

Dr Haddon is concerned that the move to output controls seems to be based on an economic driver rather than selecting a management strategy which matches or reflects the biology of the species concerned. Personally Dr Haddon wished to reiterate that he does not endorse the move to output controls for prawns.

Ian Boot (Industry Member)
Mr Boot is concerned about the ability to set a TAC for banana prawns under quota management. He outlined that from his industry perspective he is not as concerned about effort creep as some others in the RAG have discussed. He does not discount that effort creep is alive and well in the fishery but he believes industry has shown an ability to deal with it and will be able to continue to deal with it into the future.

Mr Boot agrees that he as a RAG member has worked hard to try and find a way for quota management to work but at no point has he endorsed it as the best option for the NPF. He is also disappointed that industry continues to be told that because they took money in the 2006 structural adjustment they must now take quota even though he believes that the ability for quota management to work has not been proven.

Mike O'Brien (Industry Member)
At this stage Mr O'Brien does not have confidence in the ability to set accurate TAC's. He believes that TAC's should be within 10% of an accurate value, or within 10% of the actual catch of the fishery. Mr O'Brien does not support output based management with the TAC setting systems currently available. He fears that industry will be in a position where the fishery will move to output controls for tiger prawns in August and there will be no systems in place for the other species. Mr O'Brien is also concerned that he as a RAG member has been assumed to support a move to quota where he feels he has worked in good faith to try and find a mechanism for quota management but at this stage it does not present the best management option for the fishery.

Annie Jarrett (Permanent Observer)
Ms Jarrett outlined that she is mainly concerned about how TACs will be set for banana prawn species, but is also concerned about managing tiger prawns under output control and the impact of setting inaccurate TACs. The current management works well and the trigger limits add the safeguard to adequately manage the stocks sustainably if errors are made in setting TAE's for the fishery.

Observers:
The majority of observers expressed some concerns with the accuracy of methods to determine TACs for banana prawns, with the main concern being potentially lost revenue in years when the TAC was too low. Also included in this is concern that even though there is a method to estimate catches for white banana prawns in 2013 there is no certainty in relation to a long term method to set TACs for banana prawns. Introducing a management plan without an approved model to set a TAC for banana prawns was raised as a risk to AFMA, as there will be an ongoing legislative requirement to set a TAC.

Some observers noted that the basis for setting TACs for tiger prawns was more robust and that the CBA undertaken to date suggest that there are benefits for moving to ITQs for tiger prawns.

Some observers noted the substantial investment in the CBA undertaken to date and the RAG engagement in this research. The results of the CBA were regarded as informative, particularly for tiger prawns. The risk of continual input adjustment, resulting in inefficiencies and the need for future re-structures, was also highlighted.

There were some comments from observers about the potential to conduct a CBA on the uncertainty in the assessment against the target species. For some species it may be acceptable to have a higher level of uncertainty than for others.