Northern Prawn Fishery

Resource Assessment Group (NPRAG)

Chair's summary of NPRAG meeting – 26th November 2012

A Northern Prawn Fishery Resource Assessment Group (NPRAG) meeting was held on Monday 26th November 2012 in Brisbane, primarily to discuss:

- **Price elasticity and Maximum Economic Yield (MEY) for White Banana Prawns;**
- **Management Strategy Evaluation (MSE) of Total Allowable Catch (TAC) management versus status quo for the White Banana Prawn Fishery (including final results of Venables et al. work on potential catch prediction); and,**
- **Rules-based ITE proposal.**

RAG members noted that the tight timeframes under which all of these projects were operating in order to get advice to the December AFMA Commission meeting prevented the RAG from receiving papers/results prior to the meeting. It also prevented any suggestions/changes from the RAG being incorporated into revised research/analyses. As such, the following summarises RAG advice based only on what was presented on the day.

<u>Price elasticity and MEY for White Banana Prawns</u>

The NPRAG had a presentation from Prof. Tom Kompas on "Price elasticity and MEY for NPF Banana Prawns" based on the years 2009 – 2011 (Kompas and Chu 2012). At the outset, three important caveats were stated regarding the analyses and results of this work: 1) There is a limited amount of econometric data on which to base the price elasticity analysis, particularly because the MEY work of the second stage of the analysis focussed on the fishery post-structural adjustment; 2) MEY estimates rely on a measure of potential catch developed by Venables et al. and may be problematic in ~22% of years where actual catch is greater than estimated potential catch using the preferred effort weighted method, and in one case when using any of the methods; and, 3) The measure of "profit" used is more a relative term and does not relate to actual profit in the fishery (it is the difference between marginal profit and marginal costs); moreover, it correctly refers to only the variable cost components (which is typical in MEY calculations).

The analyses revealed that price elasticity was evident, with prices declining with large harvests of prawn being brought to the market. Some RAG industry members strongly emphasised that this was far more the case historically than at present, where recent efforts to develop domestic markets had assisted in maintaining good prices during recent high production years. Prices were also highly influenced by the Australian dollar. Of significant importance to MEY calculations was the non-linear (convex) relationship between catch and effort used to describe the harvest function where increasing effort will increase catch, but at a decreasing rate. This harvest function allowed estimation of operating profit in any year as a function of the catch and thereby the calculation of MEY catches that maximise profit (where the marginal revenue and marginal costs intersect). Importantly, overall revenues from the fishery increase even though prices may drop due to large catches. During 2009 and 2011, MEY would have been achieved with catch levels that were less than the actual catch; this is understandable primarily given the convexity of the catch effort relationship

but also the price elasticity. During 2010, actual profit is higher than what is obtained under MEY. Sensitivity tests showed that higher elasticity will reduce the catch at MEY and lower costs result in higher catch at MEY (all else being constant).

MSE of TAC management versus status quo for the White Banana Prawn Fishery

The CSIRO team presented the results from components of a Management Strategy Evaluation on "Comparison of TAC and current management for the White Banana Prawn Fishery". They have successfully developed a modelling framework to compare proposed TAC management against current management. Depletion estimates were used to calculate biomass and catchability based on catch and effort logbook data; these were independent of the Venables et al. method of estimating potential catch. Fishing effort patterns were derived from the time series of data from 1987 to 2011. There was an obvious difference in the effort patterns subsequent to the 2006 buyout package and RAG members were concerned that fitting over the entire series may have biased the results in applying the fishing pattern model to most recent years. An operating model was constructed from which daily and weekly catch was derived from fishing effort pattern. Revenue, costs and profits were then estimated over 1000 simulations using four alternative management arrangements:

- Status Quo with current 500kg/boat-day trigger
- Status quo with MEY trigger (using 0.3 elasticity compared to 0.25 by Kompas and Chu 2012)
- Pre-season TAC (based on predicted annual potential catch Venables et al. 2011 under CSIRO MEY formula)
- Pre-season TAC with in-season update (based on CSIRO method using Catch per Unit of Effort (CPUE) in first 3 weeks).

The results showed that compared to status quo, both of the TAC management options had a higher risk of negative profits (Profit – $Profit_{SQ}$) than positive profits; this risk of loss is in addition to the cost required to implement TAC management. Incorporation of an in-season update reduced the risk of large losses compared to no update, but nevertheless, still had higher risk of detrimental to profits in the fishery compared to status quo. In comparing performance in bad years (bottom third of historical catches), the pre-season TAC performed very poorly and this was only slightly improved by an in-season TAC update. The TAC options performed better in good years (top third of historical catches), particularly for in-season updates.

In the March 2012 meeting, numerous RAG members, (including both the independent scientific members) considered TACs were the wrong management tool for the NPF and the remaining members felt they could not endorse the move to TACs until the accuracy with which TACs can be set is improved and the long term economic risks of setting inaccurate TACs is quantified. Recent results from the Venables et al. project show the inaccuracies of predicting future potential catch are still an issue (particularly in recent years) and the MSE has quantitatively demonstrated that there is a greater risk of economic loss from the implementation of TACs than remaining with the status quo. These results reinforced concerns that TACs are not an appropriate tool for the fishery.

Conversely, status quo with the addition of a MEY trigger (rather than 500kg/boat-day trigger) had a higher probability of realising increased profits compared to status quo. This trend remains in both good and bad years.

The RAG commended CSIRO and Kompas team on the extensive work that had been undertaken and that they had been able to produce results within the tight timeframes of conducting this work before the December Commission meeting. There were a number of concerns and suggested improvements raised by both the researchers and RAG. Although these are outlined below, the imposed timeframes prevent the results of any further work from being included in RAG advice to NORMAC and the Commission.

The CSIRO method of deriving an MEY TAC used information from a longer time series than Kompas, who used 2009-2011 data only but at finer time intervals. Although there was general agreement that the methods were similar, there was concern that use of information that spanned the restructure of the fishery may not produce TACs that would be the same as those produced from just recent data (post-restructure). Conversely, RAG members also pointed out that subsequent to restructure there had been three years with very good rainfall and largely basing TAC estimates on these years may also introduce a bias compared to poor rainfall. The magnitude of the potential biases introduced by both these issues could not be determined, nor whether they would greatly influence the results.

There was also concern that the results from the pre-season TAC with in-season updates did not produce significant improvement over simply setting a pre-season TAC. A major reason for this was attributed to the method only changing the updated TAC figure if it was greater than the pre-season TAC (no change if it was less). Thus, the economic benefits of a reduced TAC in 'poor' years cannot be realised. It was also noted that the method CSIRO used to update the TAC was simpler, and may provide different results to the method used in the MRAG report because there was insufficient time to reproduce the Bayesian modelling conducted by MRAG for this purpose. Again, the RAG did not consider this to be a major issue, but noted that the magnitude of this difference could not be determined, and was uncertain if it would greatly influence the results.

In addition to this, the RAG did not have an opportunity to fully consider the assumptions made throughout the MSE project and provide feedback to the project team to improve and/or amend the modelling.

Overarching all of the above, was the issue of how well the Venables et al. method performed at predicting 'potential' catches in the most recent five years. Overall, the predictions are generally biased high, but of most concern is that the predictions over the last five years have been particularly different to actual catches, both in the positive and negative direction. The RAG has stated previously that it is at a loss to explain this change in trend, but suggested the difference may have been influenced by the reduction in fleet size, recent environmental changes (a series of La Nina years), spatial variation in catches as well as rainfall, or that the rainfall data used in the model had to be truncated to the end of February in each fishing year. It was reiterated by Prof. Kompas that value in using TAC as a management tool is highly dependent on the certainty by which an appropriate TAC can be set and in this case there was a level of "irreducible uncertainty" associated with the method.

Rules-based Individual Transferable Effort Quota (ITEQ) proposal

The RAG noted that a draft version of the NPFI proposal 'A rules-based Individual Transferable Effort Quota' Alternative for Managing the Northern Prawn Fishery' had been considered at the September

14 RAG meeting and subsequently discussed at a teleconference on 9 October. RAG members were generally comfortable that their comments were reflected in the updated document.

There was some discussion about whether input substitution had been addressed in the proposal, Prof. Kompas advised the RAG that he was comfortable with the proposed approach, particularly given the issues with predicting banana prawn abundance using the Venables et al. method. It was noted that the MRAG report had a similar finding.

The RAG also discussed whether the need for two surveys a year would remain under input controls given the concerns over missing the second survey in 2010. CSIRO advised that they were unsure of the impact of missing this survey. Dr Haddon raised concern over the meaningfulness of CPUE given the effort pattern changes in recent years and that as a result the independent surveys become more important in the stock assessment. NPFI agreed to amend the document to reflect the savings in research costs may be achieved, subject to whether or not the spawning survey needs to be undertaken every year.

The RAG noted that modelling of some components of the proposal had not occurred and that it would have been desirable if the CSIRO MSE project could have investigated these components.

In light of the results of the recent MSE work for White Banana Prawns and the poorer profitability performance of TAC/Individual Transferable Quota (ITQ) management options compared to status quo, some RAG members considered that a management system similar to the NPFI proposal could be superior to any currently proposed ITQ system. It was noted that inclusion of an MEY trigger would be likely to further enhance profitability of the proposed industry ITE system and align it with the Commonwealth Harvest Strategy Policy. Further, if tradeable catch quota under a TAC system was not appropriate for Banana Prawns, the issues of input substitution could largely be dealt with through tradeable effort quota, even noting it is not as easily transferable as catch quota, particularly during the season. Industry RAG members reiterated that if an ITQ system was not appropriate for White Banana Prawns, then some efficiencies of going to ITQs for just Tiger Prawns would be lost due to a reduced ability to trade between Bananas and Tigers.

In summary, the RAG supported the proposal as a basis for improved management under input controls.

Review of Tiger Prawn assessment

The RAG noted an additional paper from CSIRO on the predicted catch for the 2011 Tiger Prawn season versus actual Catches.

CSIRO undertook an investigation into whether the MSE for tiger prawns had detected such a variation between predicted and actual catch, and found that it did produce such results, but they were rare. The RAG noted that if repeated poor performance persists it means that the conditions on what the model was built may have changed.

The RAG noted that this was a matter of concern that should be monitored closely, and that an investigation into whether or not CPUE data is a less reliable indicator since 2006 given the smaller fleet post structural adjustment.

RAG comment on harvest strategy and bycatch policy reviews

The RAG noted that there was not sufficient time to consider each of the questions raised in the review documents during the meeting, and as such agreed that AFMA would summarise and prioritise the questions and distribute them to RAG members for comment.

Prof. Kompas volunteered to respond to the questions relating to MEY and economic analysis. Dr Buckworth advised that CSIRO were preparing a holistic response to the review documents but he was happy to provide NPF-centric advice back to the RAG.