

# GENERAL DISCUSSION - DAY ONE

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## **Chairperson: J.W. Penn**

*Bernard Bowen Fisheries  
Research Institute  
PO Box 20  
North Beach WA 6020*

## **Recorded by J.P. Glaister**

*Southern Fisheries Research Centre  
PO Box 76  
Deception Bay QLD 4508*

Highlights from today have included listening to our keynote speaker Chris Francis talk about the New Zealand experience with individual transferable quotas (ITQs). I was very pleased that he went through the process of explaining some of the problems that have come out of the quota management process, which do in fact replicate all the problems that we've had over the years with our individually transferable effort system here in Western Australia. We are looking forward to one day writing a book about Murphy's Laws of Fisheries Management and we will need to invite Chris to write the ITQ chapter. Particularly interesting also today was Kay Allen's History of Stock Assessment and I was interested in his quote from Huxley about all fish stocks being inexhaustible. I think it is probably fair to say that most fishers today still believe that to be true. I guess all fishery managers *hope* it is true and fisheries scientists *wish* it were true. Kay Allen also pointed out that two of the largest adaptive management experiences of the world were World War I and World War II. From my own experience the Persian Gulf conflicts had exactly the same impact, with prawn fisheries and prawn stocks in those areas expanding dramatically during the period of conflict and reduced fishing.

As we went through today, Rick Fletcher's presentation showed us that there is considerable value in starting the modelling process at the front end of the research program to try and determine what sort of data are likely to be

required. The benefits of adopting this approach also came through in the last presentations during the last Session. Phillip Sluczanowski gave us a very entertaining overview of the use of computer simulation models for education and I think there is a very salient lesson in that for a lot of people. We certainly do need to use models in the education process. However, I'm not sure that it is really appropriate to suggest a fishery model has similarities to an aeroplane. When you crash an aeroplane it doesn't go back together very well. I believe fisheries are more like sailing boats, very unstable boats - but when you do make them go belly-up at least they have a chance of righting themselves if you leave them alone.

We have seen today that modelling has many uses and we can all learn from this variety of experiences. Going back to Session 1, I'd like to open up some questions and further discussion about the models that we use and what value they have. The development of modelling tools for education is particularly important - for educating fishers, and training biologists, as well as managers. I have always considered, and Norm Hall alluded to this as well, that fisheries models are really predator/prey models, and we need to understand the behaviour of the fishers as well as the fish. This is often a critical issue. In W.A. for example, we have had some experience of occasions where fishers begin to understand how the models work, and start to modify the data they provide so as to obtain the

short term outcomes from the model that they would like in terms of management. The W.A. shark fishery was a classic case where the effort actually went up artificially when the modelling for management was showing that controls of effort might be required.

Perhaps we could start the discussion by asking Phillip Sluczanski to comment on any changes in the behaviour of fishers that he has observed which could have resulted from their understanding of the stock assessment modelling process. Phillip Sluczanski responded that a lot of financial institutions are exposed to both fishers and the advice of scientists. In the end it is going to pay to have correct data and in the long term the truth will out.

Patrick Coutin commented that there is a difficulty with publishing data used in spatial models. Catch and effort data, which are provided by fishers on a confidential basis, may become commercially sensitive at a high level of geographic resolution. This is particularly relevant in developing fisheries with just a few participants such as the Victorian King Crab fishery. Ultimately, data from a detailed spatial model of a fishery could also change fishing patterns and cause fishers to target areas or depths at a particular time, in the same way that tuna fishers use satellite and sea surface temperature information. This may then cause modelling difficulties due to changes in catchability and fishing efficiency.

Jeremy Prince did not think that it is just the visualisation of information through models which changes the behaviour of fishers. He recently spent an evening with one of the best catching skippers in the Northern Prawn Fishery who claimed to have learnt most of what he knows about prawns and fishing for them from reading CSIRO publications. The point is that fisheries evolve rapidly, fishers learn and develop new fishing techniques constantly in response to what they learn through experience, research or any other source. Fishers will al-

ways adapt to changes in management regime or information levels - the challenge is to manage the change and not be scared of it.

Rob Day suggested that there is a problem in the way that we are looking at the process if we talk about educating fishers and a process in which we extract data from them and then provide an answer. When you look into the process of educating students in a University and how you do that with computer-based techniques, you find that the literature rejects the whole idea of pushing information down students' throats. People are educated by taking in some of the information you offer them, mixing it with what they know, and building their own model in their minds of what it all means and how it fits together. You cannot educate anybody, you can only provide them with the opportunity to learn. That sort of learning process actually goes both ways when you work with fishers - you learn and they learn, and improve the models that you each have. They have a very good model of a fishery, with different data to yours, and when the two come together, you then have a joint model. Even if someone wants to cheat on tax, or cheat on fishery management, he is still interested in having the right data and the right information. If you both work on the same data you both want it to be correct. So if the fishers have the right incentives and they feel like they own the future fishery production, and they want to know how the fishery should be managed, it seems to me the situation that Jim Penn raised about misleading information from fishers just goes away.

Tony Koslow expressed the view that in discussions of co-management of fishery resources, it was necessary to remain clear on the issues of resource ownership and of the potentially conflicting interests of the different parties. The industry perspective is often dominated by short-term economic issues, whereas it is generally expected that the Government will take a longer-term view. Ownership of the resources resides with the Government and it must

be recognised that the interests of the Government and of the industry will often not coincide in managing fishery resources.

Phillip Sluczanowski, at the risk of bringing up a whole set of economic arguments, referred to the long term interest in fisheries which has resulted from transferable licences, which can be worth a great deal of money. Owners of such licences can be expected to see this as their capital or their superannuation with the result that they are less likely to have short term views. With such a very long term stake they would be likely to do as much as they can to raise the capital value of the fishery and the value of their licences.

Tony Smith offered a comment about the orange roughy fishery, where there are issues relating to economic factors and to the productivity of the stock. The suggestion had been made that in some fisheries, uncontrolled fishing may be a rational economic decision.

Jeremy Prince thought this also illustrates some of the points Norm Hall was making about the broad base, or basket, of data which is needed to model and manage a fishery. It is not just increasing knowledge levels which influence the behaviour of a fishery. Management regimes are probably more influential than education levels. For example, a system of ITQs (individual transferable quotas) where fishers can easily achieve their quota will inevitably lead to them fishing less on remote grounds and concentrating a greater proportion of effort on fishing grounds closest to the most favoured ports. This in itself may cause catch rates to fall without overall levels of stock abundance being affected. If valid model structures are to be framed for stock assessment your broad basket of data must capture these types of fishing practice in response to management regimes. You need a lot of the background information on a fishery before you can frame realistic stock assessments.

Campbell Davis wanted to remind the Workshop that we use fisheries models that assume random representative samples and yet we admittedly are involved with a predator that certainly does not hunt in a random fashion.

Norm Hall was concerned about the suggestion that we ought not to be relying on the fishers to provide data. As Geoff Rohan stated, the problem is that fisheries scientists haven't enough resources to obtain all the information that they require. There is therefore a need to utilise data supplied by the fishers, whether from selected fishers or from a broad range of fishers, in order to produce the desired spatial coverage. More precise information is required from the fishers. There is now an opportunity, with the technology that the fishers use, to collect extremely good information. At present, fisheries scientists fail to capture and collate much of the information that is potentially available. This information is wasted if it is not collected and then utilized to add to our understanding of the fishery. It is not only the collection of data, but the responsibility for, and ownership of, the data that is important. Someone must maintain the data base and be sufficiently familiar with it to understand any possible bias or deficiency, and the implications for analysis. This implies that fisheries scientists should attempt to use data supplied by the fishers, but will need to supplement these data with data from research programs.

Jim Penn, from the Chair, asked about the relative importance of variations in natural mortality in heavily exploited stocks where fishing mortality is high. Nic Bax responded by referring to a heavily fished stock - in the North Sea for example - where even then the mortality due to fish predation is still considerably higher than the mortality due to catch, even on a biomass basis. But the commercial fishery is catching the larger fish and the natural mortality is on the smaller fish, so that on a numbers basis, the natural mortality would be even greater. Clearly

you need to look at the whole system and at least have an idea of how that operates or how you think it may operate before you simplify it and base management advice on a single species model.

Tony Smith asked if a good deal of the predation is on the smaller fish which were not yet recruited to the fishery. If this is so, it may not matter at all as it will not make any difference to management, or estimates of sustainable yield, or anything else about that you would want to know about managing the fishery, as opposed to understanding the fish stock.

Nic Bax was sure that it makes a lot of difference to management of the fish stock - taking the North Sea example again, where you have the option of industrial fisheries or food fisheries. Multi-species modelling was first introduced by the Danes and pushed very heavily by them because of the importance of their industrial fisheries. The English however were initially less enthusiastic because of their focus on food fish. He therefore thought that the only time predation on small fish is not important is if you want to do a Virtual Population Analysis (VPA) just on a single fish stock, but it certainly is important if you want to examine the option for managing the whole stock or alternatively you have to manage two stocks. For example, if you want to know whether to fish down a predatory fish like cod to allow smaller fish to survive and contribute to the industrial fishery then that is a very difficult question for which you need a larger amount of data.

Chairman Jim Penn then requested a change of focus towards discussion of Session (3) on data requirements for stock assessment. Some reference had already been made to the issue, but he thought the manner of data collection is fundamental to the whole question of how we can use those data. For example, it is often suggested that independent surveys can be used as an alternative to maintaining fishery databases. He invited the Panel to consider whether the problems of gathering data on a stock with an

independent survey is likely to be any better or worse than the difficulties of standardising the database obtained from the fishery, especially where the fishery operates over a larger area.

David Smith responded that it obviously depends on the fishery. For certain fisheries such as orange roughy where it appears that CPUE is of very little use because of the aggregation problem, you need to look at some other index, for example Tony Koslow's surveys using acoustics. Independent surveys could perhaps be used for occasional tuning of catch and effort, but they are very, very expensive. Jeremy Prince, while accepting that direct estimation of the relative abundance of fish stocks is vastly superior to reliance on catch and effort data, noted that survey data can also fail to reflect trends in stock abundance. Survey data can be just as prone to bias as catch per unit effort data. The fundamental spatial structure of survey data must be recognised and handled appropriately through analysis if the same errors of aggregation to which catch per unit effort (CPUE) data are prone, are to be avoided. Spatial structure of fish stocks must be addressed before unbiased estimates of population abundance are to be expected from survey or CPUE data.

Derek Staples reminded the Workshop that Chris Francis had said that New Zealand is no longer using trawl surveys, and asked him to expand on that. Chris Francis however, replied that he was not saying that New Zealand does not use trawl surveys at all - but they are not using them extensively and then not for estimates of absolute biomass because that required you to know what effective area of sea floor you're sweeping, and this is not usually known. To a question by Mike Moran about what is used instead, Chris Francis replied that trawl surveys are used to give *relative* estimates of biomass - in other words, you are not interested in a single survey but in what changes from survey to survey. The trawl surveys are also used to gather length frequency data, spawning condition data and so on. They *are* used extensively, just not as absolute measures of biomass.

Karina Pepper commented that sometimes it seems that when there are no biological data available for a fishery and there aren't the time, money, or inclination to collect them, people often use "rules of thumb". She had not heard any discussion or mention of this approach in stock assessment in the data collection session as an alternative, and invited some discussion on it.

Chris Francis replied that New Zealand uses lots of rules of thumb. When the ITQ system was set up in 1986, most of the TACs were set on rules of thumb. For example, graphs of the catch history of the whole fishery were used to say "There is a period here that was fairly stable and people weren't complaining too much and those are probably sustainable catches". He also pointed out that for most of their fish stocks, in terms of economic value, they calculated Maximum Constant Yield (MCY). For fisheries of little commercial value where the cost of gathering data or doing research is more than the value of the fisheries, the rule of thumb is you keep the TAC where it is until somebody objects and then you try to figure out what to do.

Phillip Sluczanowski followed this up by asking whether there are rules of thumb about managing ecosystems, to which Chris Francis replied that managing ecosystems is like motherhood, everyone agrees that it is a good thing; however he could not see any quantitative management of ecosystems. The main value of ecosystems models in New Zealand and Australia, is as a means of getting some clue about what are the important interactions. It is not until there is a huge amount of data available that you can even start to do those sorts of things, and perhaps they can then actually be used in managing fisheries. So when we talk about managing ecosystems you do not do that through quantitative modelling, but in a qualitative way like, for example, saying "Are these fisheries having too much of an effect on the seagrass beds which are important for other reasons so we will cut fishing back".

Norm Hall noted that much of the benefit of modelling came from the process itself. The collection and organisation of available data, the need to consider the linkages between the data and to identify the underlying important processes within the system, and the discussion and communication within the modelling team, are important outcomes that supplement the quantitative results produced by the final model. The process provides a focus for consideration of the problem being addressed, and the resultant advice to managers reflects not only the model output, but also this improved awareness.

Karen Edyvane challenged Chris Francis on his comment about ecosystem management being fact-limited (interjection by Chris Francis - *quantitative* ecosystem management). From a strategic viewpoint integrated multi-use management is a concept that has been accepted for a long time, for example, the Great Barrier Reef Marine Park. We should also be looking at multiple use and multiple objectives and how they fit into an ecosystem framework. Waste water management and fisheries, and maybe the various components of fisheries, can also be treated within the same sort of management concept.

Jim Penn (as Chairman) in summing up the day's program underlined the importance of erecting models right from the start of a new program. In fact modelling is really to some extent a process of quantifying the results as they come in so you can readily see whether or not your hypothesis was correct in the first place. The other issue which came through today was the value of modelling in education - education is a valuable tool but it has to go in both directions. Educating managers and fishers is one thing but educating biologists who have not yet been involved in modelling is also important. Certainly the modelling approach can be used in a whole variety of research programs, and can be valuable even if it is only a means to persuade people who have got a lot of data in diverse locations to put it all together and see whether it makes any real sense.

The other aspect that came through strongly in the discussion was that there ought to be no rigid distinction between modellers, biologists and managers - modelling really is a multi-disciplinary approach and we have to get in there together and not see boundaries around the modellers which prevent all of us from being involved in the process. The final thing that really did come home to him in the end was the whole question of data quality. We really do have to have good time series of data otherwise it's very hard to judge where a fishery is at the present time and to be able to test whether the models are working or not. The alternative to having a good time series of data, of course is to go into the business of adaptive management proposed by Carl Walters. Adaptive management however, is fine in theory but when you listen to what Chris Francis has been saying about the New Zealand experience of trying to change TACs and our own experience in trying to change the pot entitlements in the rock lobster fishery, adaptive management is likely to be a very difficult process. The managers who achieve it often sustain a high level of career mortality - fishers don't like it! He thought it is an approach that we have to be very careful about, and at least maintain some non-negotiable sets of basic fisheries data on major fisheries.

With that, Jim Penn closed the discussion of the first day's proceeding by thanking contributors to the discussion. He hoped that the level of enthusiasm would be sustained right throughout the rest of the meeting.