

DISCUSSION OF SESSION 1

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Each panel presentation was followed by a time for questions, after which the session was opened for more general discussion.

Don Hancock commented on *Kay Allen's* panel presentation that, without being too nostalgic, he wanted to emphasise the incredible changes which had taken place in technology in the short space of just 40 years. He recalled the first fish population dynamics course he attended at Lowestoft, where a 'new hand-operated calculating machine' was made available. He emphasised that in those days they had a lot of data but very little capacity to deal with it, whereas now we have the capacity to deal with huge amounts of data and a tremendous responsibility for ensuring the quality of those data.

Jeremy Prince asked Kay Allen and Don Hancock what impact developments in technology had had on the process of fisheries modelling. Kay Allen replied that technological developments had changed the kind of modelling being done - the speed and capacity for analysis of modern technology had opened up the investigation of stochastic processes. He expanded on an example he had given where he had used 7-figure log tables when modelling fish trophodynamics, and where each point on the graph had taken several days of working with the tables to produce. Don Hancock also thought technology had had an effect on the thought processes involved in modelling, and likened it to the change from eating three meals a day which were well digested to the era of

'constantly nibbling at fast food', which can produce a more stressful state. He commented that many biologists who had been brought up with log tables actually enjoyed exponential functions, and it would be nice if today we could have a combination of "fast food which was easily digested".

Alistair Gray asked Kay Allen how he would rate the importance of efforts such as those of Colin Clarke in modelling the behaviour of fishers, through the consideration of economic forces. Kay Allen replied that, despite the valiant efforts of workers such as Colin Clarke, we haven't really made anything like the progress that perhaps we could have in the amalgamation of economic and social factors into fisheries models, and (although his personal bias may be showing) he felt the economists had lagged behind the biologists in this area.

Rob Lewis then observed that in the 100 years of fisheries population dynamics covered in Kay Allen's paper, Australian authors were noticeable by their lack of representation, and asked what this said of Australia's input in this field. Kay Allen agreed that Australian scientists certainly weren't prominent in this field prior to about 10 or 15 years ago, and pointed out that in his paper he had not said very much about this most recent period.

Jeremy Prince asked *Rick Fletcher* which of the assessments outlined in his paper he considered best described the situation. Was the

fishery for pilchards in WA in trouble? Rick Fletcher replied that he didn't think the fishery was in trouble - several adult stocks occurred in the south coast area, but the spawning stock was bigger than the local Albany stock and had a biomass estimated to vary between 14 and 25 thousand tonnes.

Patrick Coutin commented on the use of information on fuel consumption as an indicator of fishing effort, and asked if this information could perhaps be used more analytically, as an input for economic modelling. Rick Fletcher replied that this may be possible, although he was unsure of the form of economic model which would be involved. It may also possibly be utilised in further reducing effort in the King George Sound region, where boats are already on individual quotas. Catch rates apparently varied with recruitment strength, and it could be that if effort could be reduced a long term increase in catch rates may result.

Rick Officer commented that the European community was in fact pursuing the kinds of 'open' objectives mentioned in *Phillip Sluczanski's* paper, by creating a separate centre for data compilation and analysis, thereby reducing the level of suspicion. Phillip Sluczanski suggested to Bruce Phillips that it may be beneficial for the Australian Fisheries Management Authority to obtain information on such developments from the International Council for the Exploration of the Sea.

Dave Smith mentioned the 'Government Industry Technical Liaison Committee' (GITLC) which was operating in the Southern Fisheries arena, as an example of close and successful collaboration between industry, scientists and managers. Phillip Sluczanski thought that collaboration needed to be more on an individual basis, but Dave Smith countered that it was still necessary to formally bring about the right environment for such collaboration to occur.

Chris Chubb stressed the need to be careful about how fish stock assessment information is

communicated to industry, especially how the inherent assumptions in the assessment were discussed. Phillip Sluczanski agreed, and gave as an example the development and public discussion of 'SHARKSIM', which he thought had been a significant agent for change - once industry was made aware of the general form of the model at fishing port meetings, their knowledge of the fishery sparked a more detailed analysis which produced the spatial structure identified by Carl Walters.

The same general theme was pursued by Geoff Gordon who stressed the desirability of having model assumptions 'transparent', and Rob Day who commented that industry have a lot to contribute to model development, and needed to be included, especially as it was they who were expected to believe the answers which resulted from such exercises.

Peter Doherty raised the problem of corporate 'greed' in the exploitation of wild resources, and asked how best to guard against this factor if managers intend moving to a more deregulated system. Phillip Sluczanski reiterated the need for trust between the main players - the key things that helped develop that trust were communication and education.

Chairman Jeremy Prince then opened up the discussion to cover all the presentations, and reminded the meeting of the topic of the session - the ROLE of population models in MANAGING fisheries. Rick Fletcher remarked that modelling is not as scary as it may first appear, and is especially useful if one spends a good deal of time talking to fishers and then includes their ideas in the model structure.

Mike Moran pointed to the increased complexity of models which has resulted from advances in computer technology, and pointed out the danger that some of the more complex models may generate outputs whose biases may not be readily obvious.

Peter Doherty commented that the theory behind most modelling hadn't changed appreciably, and the continuing problem was still ad-

equate parameter estimation. Jeremy Prince developed this further by suggesting that, because of some apprehension on the part of biologists, modelling was still undertaken by an "elite" group, with perhaps a potential for 'getting away with sins' during the modelling process. Peter Doherty replied that, although there was a definite need for the respective disciplines to cooperate more fully, he felt it was still necessary for each discipline to stick within their own area of expertise. Geoff Gordon agreed, and added that it was possible to arrange for external review of models by suitably qualified independent experts. He added that he was glad that modellers were now getting proper recognition, as mathematics was just an extension of ordinary thinking.

Peter Rogers reminded the meeting that models were just one of the many analytical tools available to fishery scientists and managers, and at the end of the day what really mattered was to arrive at the correct decisions. Fisheries management is a very diverse and demanding discipline, and it is important that all the players correctly understand the process, and are seen to be accountable within the process - however, even with the best critical review, the potential for 'getting it wrong' is always there, and models need to be continually reviewed.

Dave Smith commented that he thought biologists needed to be better able to conceptualise what occurs within models before going to the modeller to 'get a model written'. He gave as an example the potential for doing simple yield/recruit analyses on desktop computers using commonly available spreadsheet software.

Derek Staples agreed with Peter Rogers that models were only hypotheses about what we understood about the particular fishery, and as such should not be expected to provide an exact representation of the real situation.

Yogan Wang commented that while biologists preferred simple models, mathematicians

tended to develop more complicated models - there was a need for them to discuss the accuracy of their models with the biologists, and then to re-evaluate the model.

Alistair Gray developed this point further by noting that everyone seemed to expect models to produce lots of numbers, whereas a significant use of modelling can be to enhance our understanding of the dynamics of certain situations (e.g. yield/effort, density dependent effects etc). He emphasised that fisheries models do not generally produce very good numbers, so tight estimates should not be expected.

Tony Smith, in defence of modellers, suggested that, generally, they do understand the models they construct and they do submit them to critical review (he cited Patrick Cordue's evaluation of the risk assessment process), however he added that this did not obviate the need for adequate technical review of major assessments. One way of keeping modelling on the right track is to continue to address real management issues.

Phillip Sluczanowski commented that although he had been trained as a mathematician, he had no great affinity for numbers, and that's why he built ABASIM to understand the dynamics - the concepts are more important than the numbers, and the models provide a means of understanding the concepts, somewhat like reading information off a map which can contain far more meaning than simple latitude and longitude co-ordinates. He emphasised that this approach does not go away from critical review, and more was needed - the difficulty, he said, is whether we can raise consciousness in time to save the fish stocks (or the planet!).

Frank Prokop emphasised the need for accountability in the process. He described fisheries management as a team effort which involves many aspects (including non-government and enforcement) - and until we can learn to work together we will see more destruction of fish stocks.

Terry Walker raised a point he had heard Phillip Sluczanowski make previously that models capture all the information we have available on a fish stock, and act rather like a "straw man" to be reviewed and perhaps knocked down or perhaps to give rise to other models. Commenting on who should drive models (biologists or statisticians), he said he preferred the term 'partnership' which had been used earlier in the workshop, however we should not lose sight of the fact that industry also has a useful contribution to make - fishers are very keen observers and they have their own models in their heads.

In summing up Jeremy Prince reiterated that the role of population modelling in fisheries management is to provide a well documented process into which many different groups should have input. In the absence of models, fishery managers will still make decisions concerning management of the fishery, but the logic behind these decisions cannot be inspected. The process of modelling encourages this logic to be clearly documented and helps ensure accountability in the management decision-making process.