FISHERIES RESEARCH AND DEVELOPMENT CORPORATION

- FINAL REPORT -

PROJECT NUMBER: 93/209

PROJECT TITLE: National Fisheries Technical Workshop Series

SUB-TITLE: Population Dynamics for Fisheries Management

PROJECT OBJECTIVES:

1. To promote the opportunity during the Australian Society for Fish Biology annual conference for the national fisheries research expertise to focus on a technical area or subject of current or perceived national or regional fisheries significance. Such area or subject to be identified by the membership of the Society or by the Corporation as appropriate.

2. To support where appropriate visiting fisheries scientists of acknowledged expertise in the workshop subject area to offer a national or international perspective.

3. To assist in the publication of workshop proceedings as a benchmark document of current knowledge in the workshop subject area.

4. As a result, to identify and define research questions of national fisheries significance.

5. The proposed workshop - "Population Dynamics for Fisheries Management" - will focus on what are the processes leading to the development of management advice.

THE EXTENT TO WHICH THEY WERE ACHIEVED:

The workshop "Population Dynamics for Fisheries Management" was hosted by the Western Australian Department of Fisheries and would rank with the largest and most well attended of the Society's workshop series. The workshop, which was held on Tuesday-Wednesday, 24-25 August, 1993 was aimed at identifying the role of fishery modelling in fishery management, whether the fish or the ecosystem is really the target of such endeavour, what is really necessary in a data sense and then how such modelling activity can be converted to

management advice - what is the process, the risk and the uncertainty. Anticipated outcomes of the workshop were to identify where gaps in knowledge were and to discuss the translation of population dynamics outcomes to management advice, to focus fishery scientists on this expanding area of management interest and management needs and perhaps to allow the development of a national network of fishery population dynamicists and progress the process of such scientific advice to managers.

Funding for the workshop and administrative resources was provided by the Fishing Industry Research and Development Corporation and the Australian Fisheries Management Authority through the Fisheries Resources Research Fund. The workshop was coordinated by Dr Don Hancock (formerly Research Director with the Western Australia Department of Fisheries) and publication of the Proceedings is being coordinated through the Bureau of Rural Sciences.

There is probably no more important topic in current fishery management than that of stock dynamics and assessment. A number of our most important fisheries have recently suffered severe reductions in spawning stock biomass, the Commonwealth has embraced a management strategy of output controls that rely totally on an understanding of stock size and sustainability whilst the State and Federal Governments have ratified a policy of natural resources management that is ecologically sustainable, implicit in which is an understanding of status of stocks. Such dramatic changes in management philosophy have not been matched by advances in Australian fishery scientists' understanding the dynamics of our fishery stocks. Indeed there are currently few active fish population dynamicists in Australia. Thus the organising committee considered it both timely and of national significance, to bring together active practitioners, scientists with both a need and an interest in furthering their understanding of fish population dynamics and fishery managers who need to understand the dynamics of fish stocks in order to formulate management strategies. The workshop was thus seen as likely to have immediate and direct significance in the management of Australia's commercially important fisheries in terms of reviewing the application of fishery models in our fisheries, in understanding the needs of management in the provision of stock advice and in the expansion of the current, limited population science network.

Norm Hall of the Western Australian Department of Fisheries, one of Australia's leading fishery modellers, convened the meeting and was a principal organiser. The organising committee invited Dr Chris Francis, a leading scientist from the Ministry of Agriculture and Fisheries in Wellington, New Zealand to present a keynote address and to offer insights into developments in New Zealand which would be of benefit to Australian Fisheries.

Dr Francis gave an overview of the New Zealand experience with Individual Transferable Quota and explained some of the problems encountered with the management process. Of particular interest was the amount of inertia that could evolve in the system when the Total Allowable Catch needs downward adjustment. The need for clearly stated management objectives and industry involvement in process discussions was also highlighted. In addition, Dr Francis provided valuable insight throughout the discussions of the various sessions and in his summing up of the workshop.

The program was organised around several themes each chaired by a scientist with particular expertise. Thus Dr Jeremy Prince (The Role of Population Models in Managing Fisheries), Dr Anthony Smith (Modelling - The Fish or the Ecosystem), Dr David Smith (Data Requirements - How Much Do You Need To Know?), Dr Nick Caputi (Case Studies I - Invertebrates), Mr Rob Lewis (Case Studies II - Fish), Mr Richard Tilzey (Management Advice - The Process, The Risk and The Uncertainty), Dr Jim Penn (Discussion of First Day) and Dr

Derek Staples (General Discussion) ensured the workshop was a success and that major topics of concern were discussed. The basic structure included panel sessions which highlighted major points followed by more general discussion by workshop participants.

The keynote address highlighted the difficulties faced by both the scientist in arriving at stock assessments and in framing advice given the uncertainties and underlying assumptions implicit in fishery models, and the fishery manager facing the often conflicting pressures of industry and Government. It was particularly interesting in comparing the processes of advice delivery in New Zealand and Australia. Comprehensive peer review of fishery models was seen as a strength and the increasing sophistication and technical competence of the New Zealand fishing industry in grappling with stock assessments was seen as an inevitable consequence of an output control strategy. The challenge was to make this interaction cooperative rather than adversarial.

Dr Allen's historical development of fisheries modelling provided an insight through the evolution of computing power. He also pointed out that two of the largest "adaptive management" experiments were World Wars I and II, though hopefully we will not have to resort to world conflict to learn how our fisheries need to be managed. Rick Fletcher described the process of fishery modelling with WA pilchards and in fact had used the modelling process to identify data needs. Phillip Sluczanowski explained how such models can also be useful in educating people about the dynamics of particular stocks. He likened it to an accounting procedure where scientists, managers and fishermen interact and the accountants (scientists) have to present the firm's (fishery) financial position (state of stocks). Other participants considered most fisheries models to be really predator/prey models, with the behaviour of the predators (fishermen) equally as important as those of the prey (fish).

There was a particularly interesting exchange among participants on how to monitor stocks. Chris Francis pointed out that in New Zealand, they are not using trawl surveys as exclusively as they used to, particularly not for estimates of absolute bias since they don't know what effective area of sea floor the trawls sweep. So that they extensively use trawl survey estimates as relative estimates of bias so that, in other words, you are not interested in one survey, you are interested in changes from survey to survey. Of course such routine surveys are also useful for collecting size, frequency, spawning and other routine biological data.

The topic of ecosystem management was also discussed, and in particular "rules of thumb" for managing ecosystems. Politicians aside, ecosystem management is a motherhood phrase - most would hold it up as a necessary and desirable objective. Chris Francis considered that the value of ecosystem models in New Zealand and Australia rested with the means of identifying what are the important interactions. It is not until there are huge amounts of data that you can do the sorts of things that you can actually use them to manage fisheries. So that in his view, when you talk about managing ecosystems you don't do that through modelling you do that more by saying "Are these fisheries having too much of an effect on say seagrass beds which are also important for other things?". If so, we need to cut the fishery back or impose a closure or whatever. In other words, qualitative rather than quantitative management of the ecosystem.

The need for data and what is needed was also topical. Neil Klaer observed that for a number of commercially important species in Australia, stock assessments were dependant on catch per unit effort abundance indices from commercial logbook data. In most of these fisheries, the gear used, the methods applied or the grounds fished, have changed through time and these changes need to be accounted for in the analyses of catch rates. Such effort standardisation procedures are an essential component of data treatment. Data needs for various suites of models were debated with vigour.

The workshop also focussed on a number of "case studies". For invertebrates, abalone (Jeremy Prince), scallops (Lindsay Joll), eastern king prawns (Geoff Gordon) and rock lobster (Norm Hall) were considered in detail. In the case of fish, gemfish (Kevin Rowling), gummy shark (Terry Walker), barramundi (Roland Griffin) and the importance of stream flow and spawning of a range of species (John Harris) were considered.

The final session of the workshop linked the process of population dynamics (research) with the provision of advice (to management), a most important linkage. A much-voiced concern was that of the need to improve communication between researchers, managers and industry. Ian Somers provided an insight as to the interactions between scientists and industry in the Northern Prawn Fishery. He highlighted the joint industry/scientist workshops, a stable and mature industry and an increased industry participation as elements of a successful recipe for interaction.

Management Strategy Evaluation was defined by Anthony Smith as assessing the consequences of a range of management strategies and presenting such analyses in a way which clearly reveals all of the trade-offs in performance across a range of management objectives. Such a process of course is dependant also on a clear understanding of the likely social, economic and political consequences, some of which are difficult to predict. The population dynamicist or the modelling group should deal with a range of sources of uncertainty. Model specification, process noise, observation, biases, lack of contrast and management implementation are all potential error sources.

Certainly there was hope expressed during the course of the two days, that scientists are no longer seen as necessary but generally useless appendages to the main game of fishery management. The interest in output management strategies that are more "data hungry" than more traditional input management means that increasingly a partnership of scientist/manager/ industry is necessary for the successful management of fish stocks. The outcomes of the workshop are currently being prepared for publication with most contributions in advanced stages of editing and the Proceedings will be available during 1994. This document includes expanded panel contributions and a full account of the many discussions, and is intended to represent the "State of the Art" of our knowledge. It will therefore be a significant reference for Australian fish scientists, managers and industry. It will be of considerable use as a uniquely Australian statement for fish population dynamics research and its application to the management of our fisheries.

RESEARCH RESULTS AND BENEFITS:

The Population Dynamics Workshop was an outstanding success, both from the degree of participation by fish population dynamicists, other fishery scientists with an interest in the subject and managers as well as the outcomes. For the first time, Australian fishery scientists confronted the problems of turning stock assessments into management advice in an open forum. Also, for the first time, those researchers were able to discuss common technical problems and develop a national network. Most significantly for Australian fish science, the Australian Society for Fish Biology has formed a Stock Assessment/Population Dynamics Committee (chaired by Dr Derek Staples of the Bureau of Rural Sciences) to develop a national network of expert fishery scientists. It is envisaged that such a group may be able to jointly work up an assessment on a selected fishery on an annual or biennial basis.

Perhaps the greatest benefit was the possibility for scientists from different agencies to meet and discuss mutual technical problems and, in a dispassionate way, consider the process of advice delivery. A strong view was that there should not be distinctions between modellers, biologists and managers, that it really is a multi-disciplinary approach with input from industry and that there is a necessity not to see boundaries around so-called "modellers" which prevent participation in the process.

Finally, the importance of data was highlighted. We really do need to have some time series of data, otherwise it is very hard to judge where you are at present and whether or not the models are working. The gemfish time series in NSW FRI is ample demonstration of the value of time series. The alternative to time series of good data is that of adaptive management. The New Zealand experience in trying to change TAC's, and similar experiences in Australia, would suggest such adaptive management is difficult in practise.

DIFFICULTIES ENCOUNTERED:

In order to organise such workshops, considerable time must be devoted by participating scientists - time which is subtracted from their normal research or management functions. This is a considerable cost to the home institutions, but must be weighed against the benefits of holding such meetings. A key component of the success of the workshop series however, has been the organisation and dedication of Dr Don Hancock, the coordinator. Without his involvement, program preparation and follow-up, the smooth running of the workshop and the professional publication of proceedings would not be possible.

The publication of the Proceedings is the most difficult aspect of the project but it is one that the Society has continued to undertake since we believe it is important to have a physical output from such meetings. Such an output prevents workshops being forgotten quickly, ensures a higher standard of both preparation and presentation and provides an important reference source for Australian fishery scientists, managers and the fishing industry. Thus the Society is keen to continue publication of workshops with the excellent technical assistance of Mr Greg Berry of the Bureau of Resource Sciences. We believe that the professionalism and quality of the end product are well worth the effort.

RECOMMENDATIONS FOR FUTURE RESEARCH:

There were a number of suggestions for future workshops and high on the list were:-

(i) recreational fishing with an emphasis on catch estimation; and
(ii) definition of the effects of fishing.

The former is the topic for the 1994 workshop to be held in Canberra.

The Society would like to remind the Corporation that workshop topics reflect members' views on areas or subjects of current or perceived national fisheries significance. The Society recognises the Corporation's charter to promote research activities that will benefit the fishing industry and consequently has endeavoured to identify topics that are both applied and of direct significance to research and management of Australia's fisheries. However should the

Corporation identify a subject area or topic to be of particular strategic importance, the Society would be pleased to develop a proposal for further consideration.

APPLICATION OF RESULTS TO INDUSTRY:

The Australian fishing industry will benefit from this workshop in that the Proceedings will provide a State of the Art summary of population dynamics and the process of providing management advice based on that knowledge which will serve to focus attention on this important subject. As the fishery management decisions taken by managers become more and more focussed on the need for stock sustainability, pressure on scientists to provide assessments and estimates of risks associated with those assessments will increase. There is thus an urgent need for the process of this advice giving is well defined. This workshop has highlighted this need and will assist in the adoption throughout the different fishery management advisory structures in Australia.

Of more immediate benefit has been the opportunity for Australia's fish population dynamicists and other fish scientists to meet and establish a national network. The exposure to developments in New Zealand through Dr Chris Francis has been of considerable benefit in developing an Australian perspective. At an individual level, exchange of technical information and software has been significant. Australian fisheries science is facing enormous challenges and probably the most daunting is that of providing real time advice in the management of some of our output-controlled fisheries.

LIST OF SCIENTIFIC PAPERS OR PUBLICATIONS RESULTING FROM PROJECT:

Proceedings of workshops will be forwarded to the Board of Corporation as soon as they are published. Summaries are to be published in "Australian Fisheries". Copies will be available to industry representatives on request.