CHAIRPERSON'S INTRODUCTION

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There are two fundamental biological problems that fisheries scientists have to address in providing advice for the management of fisheries - they are growth overfishing and recruitment overfishing. Other studies e.g. growth, reproduction, larval mortality, environmental effect on recruits, catchability, all provide information which could ultimately be used for yield-per-recruit and stock-recruitment assessments to help address these two problems.

This session will examine the role of population dynamics in the fisheries management of invertebrates and how it is used to detect these two key problems. Two speakers, Jeremy Prince (abalone) and Lindsay Joll (scallop), will use molluscs as examples in the invertebrate case studies. The other speakers, Geoff Gordon (prawns) and Norm Hall (rock lobster) will discuss crustacean fisheries. Reference will be made to both yield-per-recruit and stock-recruitment problems.

Most of the theory in population dynamics for fisheries management was developed with finfish species in mind (Ricker 1975; Beverton and Holt 1957; Gulland 1983; Cushing 1971 and 1973; Nikolskii 1969). However these techniques are not always directly applicable to invertebrate populations.

Although the landed weight of shellfish in the world is only about 15% of the weight of demersal and small pelagic fish, their contribution by value is about 35% because of their high unit value (Caddy 1989). In Australia their contribution by weight and value is much higher with most of the major fisheries being invertebrate fisheries e.g. rock lobsters, prawns, scallops, abalone, pearl oysters.

What are the special modifications which need to be taken into account when undertaking stock assessments for invertebrates? These modifications include growth by moulting, the difficulty in ageing for crustaceans, sedentary nature of some species such as scallops and abalone, irregular recruitment e.g. scallops, high unit value, variable catchability, sex differentiation and development of male-only fisheries, density dependent growth and survival.

Some of the special needs of the population dynamics of invertebrates have started to be examined at workshops and in publications e.g. Thomas (1979), Jamieson and Bourne (1986), Caddy (1989). More recently, the ICES Symposium on Shellfish Life Histories and Shellfishery Models in Canada in 1990 also examined the stock assessment of invertebrates.

Fogarty and Murawski (1986) consider modifications to two broad classes of fishery assessment models, surplus production and dynamic pool models. Fogarty (1989) examines the methods which have been used to forecast yield and abundance of exploited invertebrates.

The study of stock-recruitment relationships (SRRs) is an area which has been particu-

larly neglected for invertebrates at a symposium on Fish Stocks and Recruitment in 1970. Hancock (1973) noted the lack of SRRs for invertebrates compared to the extensive work that had been undertaken in this field for fish studies. In 1981 at a penaeid shrimp workshop, Gulland (1984) commented that the SRR had received 'remarkably little attention'. Caddy (1986) stated that there were still relatively few SRRs for crustaceans, despite an ever increasing pace of research. At the ICES Symposium in 1990, L. Botsford (unpubl.) reviewed the progress of SRRs for invertebrates and concluded that some advances had been made, although the progress was slow. Pollock (1991) was still commenting on lack of SRRs for crustaceans.

The progress on SRRs for invertebrates which has occurred in the last twenty years includes: Morgan *et al.* (1982) and Caputi *et al.* (1994) on the western rock lobster; Fogarty and Idoine (1986) for *Homarus americanus*; Penn and Caputi (1986), Tang *et al.* (1989) and Garcia (1991) for prawns; Botsford and Wickham (1978) and Lipcius and Van Engel (1990) for crabs; McGarvey *et al.* (1993) and Joll and Caputi (in press) for scallops.

The need for spawning stock and recruitment time series is probably more urgent now than ever before. In Australia there is a general move to quantitative performance indicators for Government organisations and the research and management of fisheries is no exception. While typical indicators may be the catch and catch per unit effort, the level of reduction of the spawning stock is probably a better index of the health of a fishery. In the United States, the spawner per recruit is increasingly being used as a measure of the status of a fishery (Sissenwine and Marchesseault 1985). These developments make it imperative that time series of stock and recruitment are developed for all the major fisheries in Australia.

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