RE-STOCKING AND ENHANCEMENT OF CLAWED LOBSTER STOCKS: A REVIEW

BY

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ABSTRACT

Since the late 19th century homarid lobsters have been cultured under hatchery conditions, and hatchery-reared *Homarus americanus* and *H. gammarus* have been released into the wild on many occasions in North America and Europe, respectively. The success of such re-stocking programmes could not be evaluated, however, due to lack of a suitable tagging method to discriminate between hatchery-reared lobsters and natural stock. This paper reviews the early attempts at re-stocking, and then describes in some detail more recent experiments that make use of coded microwire tags. The recent results show that hatchery-reared animals can survive to recruit to a fishery, but despite this initial success, there remain important biological questions on whether re-stocking programmes are likely to provide sustainable benefits to fisheries and whether released animals actually enhance or simply displace natural stocks. The success of future re-stocking programmes will be easier to evaluate if biological and economic objectives are more tightly defined at the planning stage.

INTRODUCTION

Conventional fisheries management measures, such as minimum size increases, or reductions in catch or in fishing effort, can promote ‘enhancement’ of stocks by reducing fishing mortality, by increasing survival or by increasing the number of egg-bearing females in the stock. In this review,
however, we focus on programmes which re-stock the wild population by adding hatchery-reared animals at various phases of the life history, or which augment breeding stock directly using refuges or transplantation, or which attempt to add to stocks by creating new habitat. We use the term 'enhancement' generically to cover all these options for improving stocks, with the added implication that stock has increased as a result. We use the term 're-stocking' for the specific activity of adding hatchery animals to depleted natural stocks, and mean the programme of re-stocking, irrespective of whether or not there is a resulting benefit.

The idea of lobster re-stocking has intuitive appeal. It seems to have attracted attention since the latter half of last century (e.g., De Maude, 1858; Ryder, 1886; Chadwick, 1904) and continues to do so. Part of the appeal probably comes from the intrinsic attractiveness of lobsters as animals, coupled with the continuing widespread public desire to compensate for the effects of exploitation by 'putting something back'. Fishermen also wish to do this, but in addition probably hope to boost stocks and income without having to adopt restrictive management measures which limit their activities. On the other hand, ecologists familiar with the concept of density dependent mortality and stock-recruitment theory are likely to be somewhat sceptical, especially as the various approaches to homarid stock enhancement previously attempted in several different countries have not seemed to produce clear cut results (Conan, 1986).

In this paper we briefly review historical approaches to re-stocking, and then concentrate on describing the positive developments emanating from a series of recent large scale experiments with Homarus gammarus (Linnaeus, 1758) in Europe, in which the survival of hatchery-reared lobsters has been monitored (e.g., Bannister & Howard, 1991; Bannister et al., in press). We ask whether the seeming lack of success in historical studies is the result of inherent biological or life history factors, or reflects experimental inadequacies whose removal may open the way to better results. Finally we assess the implications of recent results for assessing the biological and economic success of future re-stocking programmes. It is interesting that recent experiments are based on a greater awareness of lobster ecology, particularly regarding the early benthic phase (Howard, 1988; Cobb & Wahle, in press), and are therefore potentially relevant to studies of recruitment processes in the natural population.

THE FISHERIES BACKGROUND

Stocks of both the American (Homarus americanus H. Milne Edwards, 1837) and the European (Homarus gammarus) lobster have supported substantial coastal trap fisheries for well over a century. Even before the turn of the century, some fisheries were changing substantially under the influence of exploitation, as in eastern Canada, where from 1880 to 1920 total landings of H. americanus declined progressively from 45,000 tonnes to 15,000 tonnes, before fluctuating