ON THE RECRUITMENT OF O-GROUP PLAICE IN THE NORTH SEA

by

J. J. ZIJLSTRA and J. IJ. WITTE

(Netherlands Institute for Sea Research, Postbox 59, 1790 AB Den Burg, Texel, The Netherlands)

SUMMARY

(i) Variability in North Sea plaice recruitment seems to be generated mainly during the egg stage. (ii) Density-dependent mortality processes, if they apply, are likely to operate in the early post-larval stage in the nurseries. However, the data do not exclude the possibility that such processes are lacking or insignificant in juvenile plaice. (iii) An inverse relationship between length and abundance, observed in O-group plaice, appears to be generated by temperature-dependent processes in the egg stage, affecting the rate of egg development and egg mortality. (iv) Recruitment fluctuations in North Sea plaice are probably mainly generated by between-year temperature differences experienced during the egg stage. Variations in egg production by the adult stock might also affect recruitment, but in the range of stock sizes considered the effect seems less important.

INTRODUCTION

The relation between parent stock size and the abundance of resulting offspring (recruitment) in commercially exploited fish populations has been a major topic in fisheries biology, because reduced spawning stock size as a consequence of fishing might adversely affect recruitment and therefore the equilibrium yield of the population. Observations on the stock-recruitment relationship of many exploited fish populations so far failed to demonstrate a clear dependence, except at very low stock levels as for instance recently observed in some NE-Atlantic herring stocks (e.g. ULLTANG, 1980).

The data usually suggest recruitment to be independent of adult stock size over the wide range of stock densities normally encountered (Beverton & Holt, 1957) or even to decline at very high adult stock levels (Ricker, 1954). These relations imply the presence of density-dependent mortality factors operating at some time between the egg stage and the age of recruitment. A proper analysis of such density-dependent processes, however, is hampered by the simultaneous effect of factors, operating independently of abundance and generating large between-year fluctuations in recruitment. As a result, a density-dependent mortality rate at some stage in the early life history has
Fig. 1. Spawning areas and periods of peak spawning of the plaice in the North Sea, as indicated by the distribution of eggs (contour lines), according to SIMPSON, 1959. Hatched areas in coastal regions indicate the main nurseries.

been generally accepted in models, describing stock-recruitment relations, although information on the actual processes involved is largely circumstantial (e.g. Bannister et al., 1974).

The concept of recruitment being independent of stock-size, which implies that density-dependent mortality factors operate during some early life stage, has been largely developed on the basis of data from the North Sea plaice fishery (e.g. Beverton & Holt, 1957;