Technical summary

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Factors Affecting Coarse Fish Recruitment – Phase 2

R&D Technical Summary W2-048/TS

Levels of coarse fish recruitment can vary greatly between waters and between years. This in turn affects the performance of the fishery supported. A better understanding of the factors affecting coarse fish recruitment should enable the Environment Agency to identify variations in fishery performance related to natural or artificial changes and possibilities for management of individual fisheries. It is also relevant to understanding the likely effects of long term and broad scale environmental changes, such as climate change and eutrophication.

This R&D project followed on from a series of studies on coarse fish populations in rivers that were amalgamated and published in 2001 in R&D Publication 18. 18. A notable conclusion from these studies is that coarse fish recruitment in rivers can vary markedly and the levels of recruitment to the adult populations are usually determined at an early stage of life. Temperature and fry growth were identified as being of likely importance.

The Environment Agency and its predecessors collected large quantities of data on coarse fish stocks in rivers over recent years, but little analysis had been made specifically in relation to factors affecting coarse fish recruitment. This phase of the project consisted of identification and assessment of the data held by the Environment Agency for its likely utility for assessing factors affecting coarse fish recruitment then detailed examination of suitable data sets.

One difficulty that had to be overcome before detailed analysis could begin, was a method for quantifying the variations in levels of recruitment from the survey data. A new method was used, based on extrapolation of numbers in the year of spawning from catches of age groups and calculated mortality rates. This is suitable for general adoption by Environment Agency fisheries scientists for the study of variations in coarse fish recruitment.

Although it was intended to examine factors affecting coarse fish recruitment for roach, dace, chub, bream and barbel, few data sets suitable for analysis were found. The greatest number of suitable data sets was found for roach; none was found for barbel. Analytical problems were caused by errors in age determinations.

Periods of strong and weak recruitment were identified for each species and river examined. All species displayed good recruitment of the 1975-1976 year classes in most rivers. The patterns of temporal and spatial recruitment of each species have been less consistent since then, only roach showing a relatively consistent predictable pattern.

Higher than average ambient water temperature in the first year of life appeared to be a major factor in the production of strong cohorts of adult cyprinid fish. However, high temperature did not necessarily yield strong year classes. Furthermore, years in which a strong year-class was prevalent in one species did not necessarily result in strong year-classes in other coexisting species, suggesting other biotic and abiotic factors are important in regulating recruitment success.

The relationships between water temperature, river discharge, the position of the Gulf Stream, and 0-group fish growth and year class strength (YCS) were examined for roach, bream, chub and dace in the Yorkshire River Ouse and River Thames.

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Mean length of 0-group fish at the end of the summer was positively correlated with water temperature and negatively correlated with river discharge. YCS was positively correlated with mean 0-group fish length at the end of the summer and with the latitude of the North Wall of the Gulf Stream. YCS of roach was negatively correlated with discharge in the period from June to September inclusive. River discharge may be the key factor in determining realisation of the potential YCS derived from water temperature.

Recommendations are made for further research and for changes to the Agency's fisheries monitoring programme in relation to 0 group fish and age determination sampling and processes of analysis. Improvements to the provision of water temperature data are required to enable further detailed analyses of factors affecting coarse fish recruitment.

The R&D Technical Report examines some factors affecting coarse fish recruitment in rivers in England and Wales from analysis of Environment Agency fishery survey data. The information is for use by Environment Agency staff and others involved in the understanding and monitoring of variation in recruitment of fish populations. The findings will be further developed in Phase 3 of the project. All original data collected for the analyses are held by the Coarse Fisheries Science Group.

This R&D Technical Summary relates to information from Project W2-048 contained in the following output:
R&D Technical Report W2-048: Factors Affecting Coarse Fish Recruitment: Phase II - Examination and Analysis of Existing Environment Agency Data

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