

Salmon migration and river flow.

Results of salmon radio tracking studies on six rivers in South West England

Fisheries staff need to be able to provide a constructive input to water resources management issues. Therefore it is important that the river flow requirements of salmon are understood. This will enable appropriate protective conditions to be rationally applied to abstraction licences and other aspects of water resources schemes.

This project brings together and presents the results of radio tracking studies on six rivers in South West England. The rivers involved were the Hampshire Avon, the Exe, the Tamar, Tavy, Taw and Torridge. These studies were related to water resources schemes and the results have not been widely available in a comparable format until now.

The presentation and analysis of results in a similar format for the six rivers allows examination of the patterns of salmon movements in relation to flow, comparison between rivers and derivation of general relationships. The rivers range from a high base-flow groundwater fed river (Avon) to small spate rivers (Torridge, Tavy). The catchments include various water resource management issues such as abstraction, impoundments, regulation releases, hydro-electric power schemes, inter-river transfers and winter pumped-storage schemes.

The development of both field and data analysis methodologies is described, with full details of a powerful analytical technique which involves the derivation of a migration index for salmon. The migration index is used to compare the flows for salmon movement between rivers, and at different locations within river systems. It also allows the identification of fish passage problems and the flows at which they occur.

Spreadsheet models for salmon migration are developed for the Avon and the Tamar. Such models can be used to estimate the effect of any change in flow regime on the pattern and numbers of fish entering and ascending the river.

The impact of existing licensed public water supply abstractions on each river is examined, and possible approaches to amelioration are considered.

The implications of the findings with respect to general guidelines for planning future water resource schemes are discussed. From the analysis of the impact of existing schemes on the study rivers it is clear that there is scope for major Public Water Supply abstractions to have impacts that range from negligible to significant. Ameliorative options considered include prescribed flows, protected flow “windows”, protection of certain flow events (“spate sparing”), location of abstractions, and diurnal and tidal modulation of take.

The tracking studies also provided a range of information of general fisheries management interest including patterns of recaptures in other rivers, the extent to which river stocks mix in estuaries, tagged fish caught by anglers, and tagged fish recaptured in subsequent years.

One of the main general conclusions is that in all six rivers, many of the salmon delayed in entering freshwater by low flows never subsequently enter the river and probably die. In a drought year half or more of the total run of salmon can be lost in this way.

Guidelines are given for the planning and execution of future salmon radio tracking studies, and consideration is given to the relative and complementary value of fish counters.

The results from six rivers in South West England are used to develop a tentative relationship between salmon migration flows and river size. If the results from tracking and other salmon migration studies are to be extrapolated to other rivers, development of a predictive model is necessary. It is recommended that further work should be undertaken to analyse appropriate national data on salmon migration in relation to river flow, and attempt to develop a predictive model using the migration index approach developed in this project.

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