

Factors affecting the dispersal of coarse fish

Science Summary SC030215

Environment Agency-funded researchers have utilised state-of the art telemetry systems to investigate what happens to coarse fish in floods and high flows in rivers, and to track the movements of fish from the Environment Agency's hatcheries when they are stocked into rivers recovering from pollution.

Many lowland rivers in England and Wales have been physically separated from their natural floodplains by the construction of floodbanks (levees) to prevent flooding and enable development for agriculture, infrastructure industry and housing. Nevertheless, floodbanks are frequently overtopped during larger flood events and inundation occurs despite them.

This disconnection of rivers from their floodplains and accompanying reduction of complex channel patterns to single channels potentially has serious consequences for fish and other biota, access for biota to different habitats is restricted and overall habitat quality becomes degraded.

However, recently introduced European legislation, specifically the Water Framework Directive, now requires fish habitats to be improved and for rivers to be rehabilitated.

This project has shown that reconnection of rivers to their natural floodplains or to semi-natural floodplain waterbodies, and re-stocking in appropriate circumstances with farm-reared fish are both important techniques in achievement of Good Ecological Status in lowland UK rivers.

The project included an extensive literature review the importance of floods for fish populations in lowland rivers which indicated that separation of rivers from their floodplains has potential detrimental consequences for fish communities. Access for fish of all life-stages to floodplain water bodies is beneficial for

reproduction, feeding and refuge from adverse conditions including high flows and floods. If fish are not able to reach floodplain water bodies then spawning, feeding and nursery habitats are reduced and juvenile fish especially are displaced downstream to areas from which they are unable to return, often downstream of impassable man-made barriers to migration. When floodbanks overtop, can enter the floodplain but become stranded there when river water levels recede. However the review also highlighted a paucity of information on UK lowland rivers which differ in important respects from continental ones.

Field studies by the project team examined the effects of floods and high flow events on the dynamics of young fish in the River Ouse in Yorkshire. This involved collecting young fish from the main river channel, backwaters and areas of water isolated from the main river channel behind levees and use of high-definition imaging sonar to monitor the winter-time movements of adult fish between the Yorkshire Ouse and a connected marina.

Other work investigated fish populations in the River Trent, where some rehabilitation measures have already been undertaken, creating a number of man-made floodplain waterbodies with varying degrees of connectivity to the main river.

The fate and behaviour of stocked, hatchery reared cyprinids was studied on the River Roding in Essex which is recovering from a major pollution and fish kill in 2003. Three different monitoring techniques (mark-recapture, telemetry and radio-tracking) were used to obtain detailed spatial and temporal information on the movement of both stocked and wild cyprinid fish (dace, roach and chub). The study also looked at the influence of environmental variables such as temperature and flow on these movements. In order to validate the use of these techniques in this project, a supporting study tested the effectiveness of different marking and

tagging methods for use on small cyprinid fish, with particular emphasis on retention, mortality and growth rates.

The project confirmed the importance of floodplains to the health and biodiversity of fish populations in lowland rivers, in England and Wales, especially in terms of the refuge they provide from floods and high flows. The researchers found that floodplains, both natural and man-made, are utilised by a wide range of coarse fish species, especially when the floodplains have varying degrees of connectivity to the main river. But the researchers also found that large numbers of young fish became trapped in the temporary waterbodies formed when flood water breached levees, especially after summer floods.

The detailed tracking of fish movement in the River Roding revealed that stocked fish added to the river initially moved greater distances than wild fish, possibly to explore their new environment. However, these movements diminished over time, with up to 70% of both wild and stocked fish remaining in the 10km sampling region of the river after a five-month winter period with numerous high flow events. This suggests that stocked fish do tend to remain close to the location where they were introduced and that stocking is therefore an effective way to enhance the fish populations in specific river stretches.

Based on these findings, the researchers made a number of recommendations. These included: establishing backwater areas and man-made floodplain waterbodies to provide fish with refuge from high flow events; building levees as far back as possible from the river and designing them with ditches and channels to allow any water that breaches them to return to the river; and conducting further detailed studies into the movement of fishes between rivers and floodplains.

This summary relates to information from Science Project SC030215, reported in detail in the following output(s):-

Science Report: SC030215

Title: Factors affecting the dispersal of coarse fish

Product code: SCHO0808BOMD-E-P

ISBN: 978-1-84432-933-5

August 2008

Internal Status: Released to all regions

External Status: Publicly available

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This project was funded by the Environment Agency's Science Group, which provides scientific knowledge, tools and techniques to enable us to protect and manage the environment as effectively as possible.

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