Environment Agency

Evidence

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# Cumulative effects of hydropower schemes on fish migration and populations Project summary SC120078

Hydropower schemes are regulated on a scheme-by-scheme basis. However, as the number of hydropower schemes within a catchment increases, there is a greater chance that any adverse effects may cumulatively become significant. The Environment Agency asked the environmental consultancy APEM to undertake a study to see whether it was possible to assess the cumulative effects of multiple hydropower schemes on migratory fish species, such as salmon, in English rivers and whether these effects were significant.

A literature review showed that multiple hydropower schemes have the potential to increase impacts, but most of the studies found were on overseas sites much larger than those typical in England.

This study involved the development of a spreadsheet-based model with 'elements' taking account of the scheme effects including mitigations, spatial variations in salmon populations and impacts on fish life-cycles. The main ways in which fish could be affected were losses via mechanical damage through contact with screens or turbines, changes in their ability to migrate up or downstream, and reduction in the extent or quality of habitat for freshwater resident life-stages.

Various scenarios with between 1 and 6 hydropower schemes were tested in the model using hypothetical data based on the River Coquet. Input data in the various scenarios generally assumed that any new schemes would meet Environment Agency guidelines for a range of parameters associated with scheme design, but also looked at the effects of schemes not meeting the guidelines as well as older schemes that had not yet been brought up to standard. One scenario also looked at the value of using local knowledge or specific studies of a new barrier to modify input figures and improve the accuracy of the model.

In the scenarios investigated, the cumulative effects of several schemes ranged from +18% to -12% of the numbers of expected returning adult fish. This variation in effect was highly dependent on the passability of existing barriers, and the location ofthe scheme on the river with downstream-sited schemes having the potential to cause larger positive or negative effects.

Positive effects were always driven by the inclusion of improved fish passage at individual schemes.

The study looked at the strengths and weaknesses of the model and suggested further developments – in particular ways in which the accuracy and sensitivity of the model could be improved, and its applicability to migratory species other than salmon. The model, as it is, provides potential for catchment-scale cumulative effects to be explored to assist with strategic planning around hydropower. It could also be developed and used in the evaluation of non-hydropower scheme impacts such as angling or poor hydromorphological conditions and to explore the effects of habitat improvement works such as weir removal.

The study results will be useful to staff in the Environment Agency and other bodies concerned with the planning, management and regulation of hydropower schemes. It will also be of value to people involved in wider aspects of river management and planning who need to consider the cumulative effects of schemes or measures on migratory fish.

This summary relates to information from project SC120078, reported in detail in the following output(s):

**Report:** SC120078/R1
**Title:** Cumulative effects of hydropower schemes on fish migration and populations

**January 2015**

**Internal Status:** Released to all regions
**External Status:** Publicly available
**Project manager:** Stephanie Cole, Evidence Directorate
**Research Contractor:** Dr David Fraser, APEM Ltd

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

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