

# Evidence

## Evaluating climatic effects on aquatic invertebrates, Phase II: review, comparisons between regions and methodological considerations

### Project summary SC070047/S1

Results from the second phase of a project looking at the potential impact of climate change on aquatic invertebrates in British rivers have been published by the Environment Agency.

Rivers are sensitive to climate change because atmospheric trends affect river temperature, and river flow depends on precipitation patterns. However, the effect of climate change on organisms living in these habitats is poorly understood.

This project, commissioned by the Environment Agency and Wessex Water, continued an analysis of chalk streams initiated in the first phase of the research, and also involved a literature review and an assessment of trends from upland and lowland rivers. The report also looks specifically at climate sensitivity of river invertebrates that represent significant prey to fish, so as to enable broad-scale predictions about changes in composition, range, phenology and abundance.

The research highlighted some differences in the ecological responses of highland and lowland streams to climatic variation. The authors suggest this variation could be the result of different sensitivities between upland stream invertebrates and chalk stream invertebrates, high winter temperature in lowland chalk sites coinciding with increased discharge and offsetting warming effects, or the quality of data from some sites masking temperature effects.

On a larger scale, changes in particular invertebrate families across England and Wales included increases over time (Ephemeroidea), substantial decreases (Cordulegasteridae), inter-annual variation without marked increase or decrease (Perlodidae, Nemouridae), and recent increases with inter-annual variation (Rhyacophila, Heptageniidae, Taeniopterygidae).

These changes in abundance, composition, distribution and functional character of invertebrates across England and Wales were more associated with temperature gain in upland streams and inter-annual discharge variations in lowland chalk streams.

From the array of investigations carried out, the report authors suggest that several lines of evidence point to emerging effects that are consistent with the impact of climate change or inter-annual climatic variation on river invertebrates.

However, the authors highlight that there are still major gaps in understanding in terms of the ecological mechanisms involved in climate change effects on river invertebrates, the consequences for river ecosystem function and invertebrate predators, adaptive responses, and factors affecting resilience to climate change effects.

The report lists a number of recommendations, including:

- Further assessment of combined temperature and discharge effects on aquatic invertebrates, and of how climate change will augment existing patterns of inter-annual variability.
- Increased support for invertebrate monitoring projects aimed at detecting climate change effects on rivers.
- Research into the mechanisms, ecological consequences and functional consequences of climate change effects on river invertebrates.
- Research into the interactions between climate change effects and other stressors on the UK river environment, such as eutrophication, abstraction and acidification.
- Research into factors affecting resistance and resilience to climate change.

This summary relates to information from project SC070047, reported in detail in the following output(s):

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