International study provides new insights into river health

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(Phys.org) -- A new international study of leaf-litter decomposition in streams aims to narrow the gap between existing methods of monitoring nutrient pollution in stream ecosystems.

Nutrient pollution of running waters is a global problem, and one that is particularly pronounced in Europe's heavily modified cultural landscape. Its impacts on ecosystem functioning, especially at large scales, remain poorly understood.

Dr Guy Woodward from Queen Mary's School of Biological and

Chemical Sciences has led part of a unique international study carried out in 100 streams across Europe, which aimed to investigate nutrient pollution's effects on leaf-litter decomposition, a key ecosystem process in running waters.

Writing in the journal *Science*, Dr Woodward and his colleagues found that leaf-litter decomposition was fastest in streams with intermediate concentrations of nutrients. Rates of decomposition were much slower in the cleanest streams and also in those exposed to high levels of pollution.

Because leaf-litter is the main food resource at the base of many stream food webs, its processing has profound effects that ripple through the ecosystem, including influencing the transfer of energy and production of biomass at the higher trophic levels (e.g. fishes).

For decades, stream ecologists and managers have relied primarily on studies of what lives in a stream (a structural approach), rather than what those organisms do (a functional approach), to assess the responses of natural systems to environmental conditions.

Dr Woodward explains: "Our results demonstrate that decomposition rates are sensitive to nutrient pollution and can complement existing monitoring approaches, which are based primarily on structural rather than functional measures. Most European streams lie in the mid-range of nutrient concentrations, where traditional measures of assessing pollution impacts are often least sensitive but where decomposition rates can range from very low to very high."

The consortium characterised the litter-feeding invertebrates in 10 per cent of the 100 streams to explore the links between structural and functional approaches and found that species' identity, abundance and size explained most of the variation in decomposition rates.

Dr Woodward adds “Combining structural and functional measures in this way can provide us with a new and more complete picture of how human activity is affecting the health of our running waters, strengthening our ability to manage our valuable but increasingly under-pressure water resources.”

Provided by Queen Mary, University of London