

Abstract

Litter decomposition in running water sometimes proceeds faster in small, cool tributaries than in warm, wide rivers because stenothermal, leaf-shredding invertebrates are more abundant in the cool streams. Evidence from eastern Canada suggests that the cold-stenothermal stonefly *Leuctra* has a disproportionate influence on rapid mass loss in upstream reaches of soft-water river systems, but is not replaced by an effective, warm-water shredder downstream. To test the generality of this observation, we compared litter decomposition rates in upstream (second or third order) and downstream (fourth or fifth order) reaches of a medium size river system in Nova Scotia (Canada) and three river systems in Nordland (Norway). In all river systems, mass loss of nitrogen-rich speckled alder (*Alnus incana*) leaves and nitrogen-poor red maple (*Acer rubrum*) leaves proceeded faster at the upstream site only if water temperature there was significantly cooler than downstream. Decomposition rates in all systems were strongly correlated with abundance of *Leuctra*, and to a lesser extent the caddisfly *Lepidostoma*. The distribution of *Leuctra* seems to be driven primarily by water temperature, with a strong peak of abundance at 14°C, but may also be influenced by competition from other shredding species.