POSTER PRESENTATION

Effects of elevated dissolved aluminum on respiration and organic matter production by stream detritivores , Tipulid craneflies and Limnophilid caddisflies

Kelly Johnson, Aaron Coons, Anna Green, and Brice Nihiser

Presenter: Aaron Coons, undergraduate student

Department of Biological Sciences, Ohio University, Athens OH 45701.

Johnsok3@ohio.edu, 740--593-0276

ABSTRACT:

In acid mine impaired streams, dissolved aluminum is often elevated to concentrations that can be toxic to aquatic life. The sublethal effects of dissolved aluminum on key ecological groups have not been thoroughly investigated. Cranefly (Tipidulidae) and caddisfly (Limnephildae) larvae are tolerant of short (2 – 3 days) exposure to acidity (pH 4.0) and high aluminum (60 mg/L). These macroinvertebrates are important leaf shredders in small wadeable streams. We investigated the sub-lethal effects of aluminum on feeding activity and respiration to see whether they might alter patterns of nutrient and energy flow into the food web. Wild-caught larvae were exposed in the laboratory to a range of aluminum concentrations (0 to 60 mg/L) in acidified water (pH 4.0) and the effects on respiration and feeding activity (measured as fine particulate matter (FPOM) production) was measured. Respiration rates of individual animals were measured for 20-30 minutes in water jacketed, closed respiration chambers after 48-72 hours of exposure to 0, 3, 15, 30, and 60 mg/L aluminum. In feeding trials, craneflies and caddisflies were fed stream-conditioned leaves for 72 hours at 0, 0.3, 1, 3, and 9 mg/L of aluminum at pH 4.0. At the end of the trial, total FPOM was collected by filtering. Tipulid craneflies tolerated high aluminum concentrations and there was no effect on respiration or FPOM production. Limnophilid caddisflies were more sensitive, and exhibited impaired respiration rates with increasing dissolved aluminum ($P= 0.0458$). However, there was no effect on caddisfly FPOM production. These results highlight the differences in sensitivities of individual taxa to elevated aluminum, but provide no evidence that short term exposure to aluminum directly impairs either species' ecological role as leaf shredders. Longer exposures to aluminum may produce different results and still affect leaf breakdown rates by altering microbial activity and rates of leaf conditioning.