
Predator-prey interactions in a changing world: humic stress suppresses predator cue perception in copepods

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Abstract

Environmental change such as increasing inputs of humic substances (HS) into lakes (brownification) may have strong effects on predator-prey interactions. HS can alter the chemical conditions of the environment, but knowledge whether elevated HS levels may adversely affect the ability of zooplankton prey species to perceive chemical cues that indicate predation threat is lacking. We experimentally studied the impacts of acute and prolonged exposure to HS on the ability of freshwater copepods to detect predator olfactory cues. We performed olfactory trials on two calanoid copepod species (*Eudiaptomus gracilis* and *Heterocope appendiculata*) by using a two-channel choice flume and observed how individuals avoided fish kairomone containing water depending on increasing HS concentrations. Both copepod species showed a pronounced avoidance towards fish kairomone containing water. However, this avoidance decreased with increasing HS concentration, and even stronger so under prolonged HS exposure, suggesting that HS impaired the ability of copepods to perceive the chemical cues of their predators. The two species differed in their responses to HS concentration depending on exposure duration, as *H. appendiculata* was more affected under acute exposure and *E. gracilis* was more affected under prolonged exposure. However, no species-specific differences were observed in physiological stress markers (oxidative balance) after prolonged exposure across the HS concentration gradient. The observed HS-mediated reduction in perception of predator threat may increase the susceptibility of copepods to predation in nature and varying responses of prey species may lead to changes in zooplankton community composition and thus lake food web structure.

Keywords: Brownification, chemical ecology, environmental change, freshwater, zooplankton

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