Variation in Aquatic Macroinvertebrate Responses to Predation and Temperature: Mechanisms of Trophic Interactions

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Abstract. Trophic cascades remain a central theme of ecological theory, how climate change will alter the mechanisms controlling such interactions remains unexplored, specifically for ectotherms. In most alpine streams, algae are consumed by macroinvertebrate grazers, some of which are vulnerable to predation. Stonefly predators have been documented to influence the distribution and abundance of benthic invertebrates and indirectly affect algal production by modifying grazer behavior. Density mediated interactions (DMI) occur when community composition is primarily influenced by changes in herbivore population density due to consumption by predators. When behavioral changes, such as anti-predatory behavior or alteration in time budgets lead to fluctuations in prey density, trait-mediated interactions (TMI) become important. It is the combination of both TMI and DMI that are involved in mediating macroinvertebrate communities and thus total algal production in streams. Mechanisms controlling trophic cascades may be altered under variable thermal regimes. Temperature directly affects macroinvertebrate metabolism, altering their physiology. Temperature thus creates a context-dependent gradient upon which species interactions occur. Using artificial stream mesocosms we measured algal consumption by grazers under varied predator treatments, along a thermal gradient. In this study we show the mechanisms controlling trophic cascades can be altered under a simulated climate. Alterations in physiology leads to changes in community interactions and an increase in the variation of algal consumption by grazers.