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Title:
Effects of temperature on aquatic insect growth, survival and infectious disease

Date:
2021-11-26

Citation:
Taig, S., Holt, G., Dwyer, G. & Lester, R. (2021). Effects of temperature on aquatic insect growth, survival and infectious disease

Persistent Link:
https://hdl.handle.net/11343/291241

Title: Effects of temperature on aquatic insect growth, survival and infectious disease

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Session: General/Open forum

Preferred presentation type: Oral presentation

Author names: Sarah A. Taig, Galen Holt, Georgia K. Dwyer and Rebecca E. Lester

Abstract:

Climate change is increasing the incidence and severity of extreme events such as heatwaves, which is a possible cause for documented increases in emergent diseases. Due to damage from several factors including riparian vegetation removal and pollution, freshwater habitats are particularly susceptible to disease and climate change. One emergent disease in freshwater communities is caused by the oomycete, *Saprolegnia* spp. *Saprolegnia* infection has been observed in fish, frogs, crustaceans, and aquatic insects such as caddisflies. Caddisflies occupy freshwater streams during their egg, larval, and pupal life stages. Larvae play important functional roles in nutrient processing and are an important prey source for higher predators. *Saprolegnia* infection has been observed to cause high mortality in caddisfly eggs, most prominently in the species *Ulmerochorema rubiconum*. This study showed that temperature treatments, in the form of spikes or long-term increases, affect *Saprolegnia* infection dynamics in this caddisfly species. We found infection probability increased with both spikes and long-term increases in temperature. However, hatching times of caddisfly eggs were concurrently shortened with long-term temperature increases but not spikes. As such, we investigated the effects of these temperature treatments on the survival and maturity of hatchlings. Our results suggested that temperature spikes may pose a greater threat to caddisfly populations than sustained temperature increases. With climate change forecasts predicting an increase in heatwaves, these changes in aquatic insect growth, survival and infectious disease are likely to affect caddisfly populations, as well as ecosystems functioning.