Negative effects of parasite exposure and variable thermal stress on brown trout (Salmo trutta) under future climatic and hydropower production scenarios

Roser Casas-Mulet, Juergen Geist

Aquatic Systems Biology Unit, Technische Universität Munchen

Munich, Germany

Future water temperature changes may have a profound impact on fish-parasite interactions. However, while the effect of temperature on fish, and particularly salmonids, is well-understood, its combined effects with parasitic exposure are not. In this study, we used a multi-stage experimental approach to explore the impact of increased water temperatures consistent with persistent climate change-induced warming and extreme thermal fluctuations from hydropower (thermopeaking) on brown trout alevins and fry before and during exposure to Saprolegnia parasitica. Parasite exposure had the strongest and most significant effect on survival of both host life stages. The combination of parasite exposure, thermal pre-conditioning and the ongoing thermal regime had a weak but significant influence on alevin mortality. Both parasite-exposed alevin and fry experienced increased mortality when a constant increase in temperature was combined with intermittent thermal increases. The outcomes of this experimental approach provide the basis for future studies scaling up the potential impacts of temperatures and parasite exposure that key fish species may face in the wild. They also highlight the effects of anthropogenic changes on brown trout populations, as pressures on aquatic organisms are likely to intensify in future climate scenarios with increased hydropower development and thermopeaking, particularly in the presence of pathogens.