Environmental stochasticity impacts the link between resource acquisition behaviour and physiological needs in an endangered fish species

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Résumé

Despite being concomitant to climate change, the ecological, behavioural and physiological implications of thermal stochasticity on organisms remain largely unexplored. In particular, the sensitivity of foraging behavioural strategies to temperature could have large consequences across communities *via* trophic interactions. In this context, we investigated the effect of thermal stochasticity on an endangered freshwater fish, the Rhône apron (*Zingel asper*). Fish (n=92) were acclimated to constant temperatures (13∘C, 18∘C or 23∘C) or experienced a stochastic profile centered on 18∘C but randomly oscillating between 13∘C and 23∘C. We predicted a decline in foraging activity associated with increased energetic cost. We assessed this response by measuring functional response, spontaneous activity as the level of spatial occupation in the presence of preys, and standard metabolic rate (SMR) resulting from physiological stress due to disruption of the acclimation process. Under stable temperatures conditions, predation decreased with rising temperature, conversely to energetic expenditure. Under stochastic conditions, feeding competitiveness exhibited a marked decline but metabolic costs matched with those of the group acclimated to 18∘C. Differences in metabolic or foraging responses between thermal treatments were not reflected in fish activity levels. These findings highlight the relevance of assessing the multiscale effects of environmental variability in studying climate change. Furthermore, at ecosystems scale, the alteration of foraging behaviour suggests important consequences of stochasticity on trophic networks. At the organism's level, responses being not mirrored point out that stress might alter the commonly presumed mechanistic link between underlying physiological needs and resource acquisition, therefore questioning the persistence of species in the era of global change. Finally, the complexity of the responses to such stress raises questions about a potential mismatch of thermal optima across different biological traits.

Mots-Clés: thermal stochasticity, foraging, metabolic rate, ectotherm, freshwater fish

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