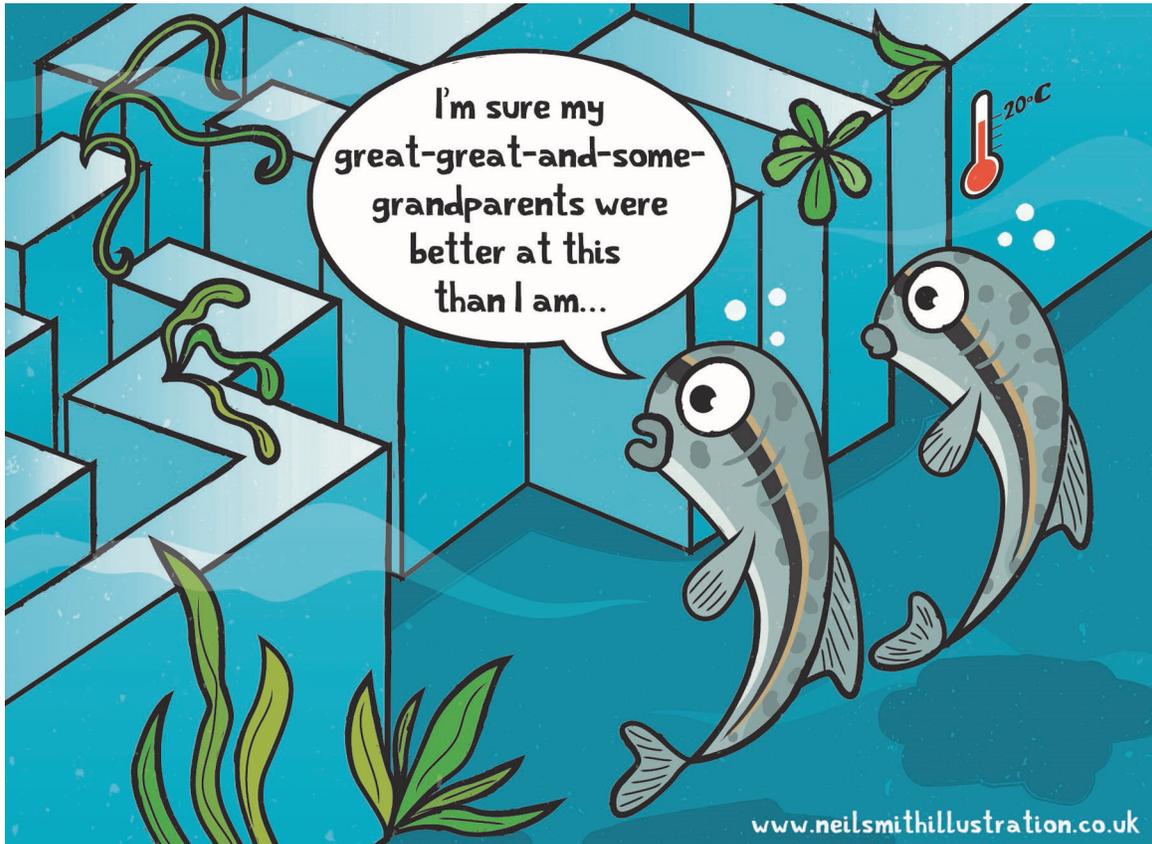


## INSIDE JEB

## Hot minnows could struggle to navigate as temperatures rise



Climate change is going to get uncomfortable for many, but for ectotherms (so-called 'cold blooded' animals), which depend on their surroundings to maintain a healthy body temperature, the consequences could be disastrous. For example, warmer temperatures raise the metabolic rate for basic life support, leaving less spare energy for animals to go about their daily activities, in addition to impacting the energy use of the brain. But no one knows how these changes might affect the ability of ectotherms to negotiate their surroundings. For example, could higher temperatures produce bold super-smart fish or timid dunderheads that struggle with the simplest task? Libor Závorka from Shaun Killen's lab at the University of Glasgow, UK, nipped to the nearby River Kelvin to catch young minnows (*Phoxinus phoxinus*) before raising them

at different temperatures (14 and 20°C) for 8 months to find out how climate change might affect their ability to navigate their surroundings.

Measuring the fish's oxygen consumption while they lazed about and after a chase in the tank (to get their heart racing) it was clear that the fish that had grown up in extreme heat (20°C) used more energy to keep their bodies ticking over. Yet, they were able to increase the amount of energy they consumed when exercising hard, so they had as much spare energy as fish currently residing at current River Kelvin temperatures (14°C) for day-to-day activities. But when the team tested the minnows' ability to home in on a bloodworm snack secluded in a simple maze, they realised that the fish that had been raised at 20°C struggled to secure their tasty reward, despite having larger

brains. The hot fish raised in conditions that could be more common in the future simply weren't as good at navigating as modern-day fish, even though their larger brains could have made them smarter.

All in all, it seems probable that minnows will be able to keep active as temperatures rise in the future, but Killen and his colleagues are concerned that they may struggle to explore their surroundings successfully, 'probably affecting fitness and ecological interactions', says Závorka.

10.1242/jeb.228593

Závorka, L., Koeck, B., Armstrong, T. A., Soğancı, M., Crespel, A. and Killen, S. S. (2020). Reduced exploration capacity despite brain volume increase in warm-acclimated common minnow. *J Exp. Biol.* **223**, jeb223453. doi:10.1242/jeb.223453

Kathryn Knight  
kathryn.knight@biologists.com