

## INSIDE JEB

## Stressed fish don't get hot under the collar



A zebrafish (*Danio rerio*). Photo credit: Tania Mendo.

For all creatures, great and small, stress is ubiquitous and unavoidable. Because of the havoc stress can wreak on the body, and the associated changes in behaviour and physiology, stress is of particular concern to creature researchers. 'As fish biologists we want to ensure our fish are well cared for and mitigate stress as much as possible so that we can observe them behaving as naturally as possible,' says Nick Jones, from University of St Andrews, UK. So when Jones and some of his fellow researchers came across a paper by Sonia Rey and colleagues (doi:10.1098/rspb.2015.2266), which suggested that fish move into warmer areas to increase their temperature when stressed, they were intrigued. He points out that if this is the case it could be huge, because it could affect how lab animals are cared for and provide insight into stress-related

behaviour in nature. Not only that, but an increase in body temperature following stress is common in many endotherms, but otherwise hadn't been observed in ectotherms like fish and amphibians.

Jones and an international team of collaborators sought to replicate the study – with a few tweaks – which is more formidable than it sounds. 'Replication studies seem easy: just follow "the recipe" of the original methods and stick in a few extra controls, but, even still, it took a while to get it right', says Jones. The original recipe called for confining a group of 12 zebrafish (*Danio rerio*) to stress them, before releasing them and allowing the fish to swim freely into chambers that were warmer (35°C) or cooler (20°C) than the one into which they were stressed (26°C). The team's secret additional ingredient was to crowd

a second group of fish into the stress chamber and then allow them to explore chambers that were all at the same temperature (28°C). However, when the team compared the distributions of the fish that could explore the temperature gradient with the fish that had no temperature choice, they were essentially the same. It seems that the first group of fish were, in fact, not opting for a stress-relieving warm soak after all.

Jones's team was also concerned that grouping so many fish together might interfere with the abilities of the individuals to make their own decisions, particularly during times of stress – because zebrafish are highly social – so they cooked up another experiment. This time, they used smaller groups and compared the temperature choices of stressed and unstressed fish when given the option between warm and cool water. Once again, the stressed fish didn't seek out warmth. In fact, they spent less time in the warmer area than the unstressed fish did.

Jones suggests that while these findings contradict the results of the previous study, they are not entirely surprising. Ectotherms sometimes lower their body temperature when exhausted – that is, they chill out after strenuous exercise or stress instead of warming up.

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