Bleached anemones found to stress fish living in them

April 11 2018, by Bob Yirka

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A team of researchers with the University of Glasgow in Scotland and Centre de Recherches Insulaires et Observatoire de l'Environnement, French Polynesia, has found that orange-fin anemonefish (aka clownfish) living among bleached anemones exhibit signs of stress—namely a higher-than-normal metabolic rate. In their paper published in *Proceedings of the Royal Society B*, the group describes their

study of the fish and what it shows about the impact of global warming.

Prior research has shown that as ocean temperatures rise due to global warming, mass bleaching of anemones and corals in the tropics is occurring. Under normal conditions, algae living inside anemones cause the anemones to look green. But as the water warms, the algae die, leaving anemones to show their true white color. This does not cause the anemones to die, however, which means they remain in place, allowing fish that hide among them to continue as before. But the researchers wondered whether the lack of green was causing problems for the fish that are not readily apparent. To find out, they collected samples of anemones and clownfish and studied them in the lab.

The study was straightforward: The researchers put green-colored anemones in one tank of water and bleached anemones in another. They added normal healthy clownfish to both tanks and left them to live together for two weeks. At that point, the fish were removed to a nearly sterile tank of water into which the researchers pumped oxygen, allowing them to measure how much of the oxygen the fish used. Because there was nothing to eat or see, the fish remained motionless, which allowed the researchers to take a measurement of their basal metabolism rate.

The researchers report that the metabolism of the fish living with the bleached anemones ran higher than for those living in the still green anemones. This, they note, indicates that the fish are stressed, which likely means they are less able to live normally. And that, they further note, suggests they likely swim and eat less, and perhaps reproduce less. This, they conclude, is evidence of the destructive impact that global warming is having on the planet.

More information: Tommy Norin et al. Anemone bleaching increases the metabolic demands of symbiont anemonefish, *Proceedings of the Royal Society B: Biological Sciences* (2018). DOI:

10.1098/rspb.2018.0282

Abstract

Increased ocean temperatures are causing mass bleaching of anemones and corals in the tropics worldwide. While such heat-induced loss of algal symbionts (zooxanthellae) directly affects anemones and corals physiologically, this damage may also cascade on to other animal symbionts. Metabolic rate is an integrative physiological trait shown to relate to various aspects of organismal performance, behaviour and locomotor capacity, and also shows plasticity during exposure to acute and chronic stressors. As climate warming is expected to affect the physiology, behaviour and life history of animals, including ectotherms such as fish, we measured if residing in bleached versus unbleached sea anemones (Heteractis magnifica) affected the standard (i.e. baseline) metabolic rate and behaviour (activity) of juvenile orange-fin anemonefish (Amphiprion chrysopterus). Metabolic rate was estimated from rates of oxygen uptake , and the standard metabolic rate of anemonefish from bleached anemones was significantly higher by 8.2% compared with that of fish residing in unbleached anemones, possibly due to increased stress levels. Activity levels did not differ between fish from bleached and unbleached anemones. As reflects the minimum cost of living, the increased metabolic demands may contribute to the negative impacts of bleaching on important anemonefish life history and fitness traits observed previously (e.g. reduced spawning frequency and lower fecundity).