HOPE FOR CORALS – SWAPPING ALGAE IMPROVES TOLERANCE TO GLOBAL WARMING

Corals are under severe threat from climate change as higher temperatures cause them to lose the algae that provide them with energy. But salvation may come in the form of a newly discovered ability of corals to swap their algal partners with strains that can take the heat.

Among all of the world's animals, the two which have built the largest settlements could not be more different. The champions, humans, are intelligent and mobile, rapidly adapting to new conditions with technology and ever-changing strategies. In contrast, the runners-up, corals, seem unchanging and immobile, spending their lives ensconced in their impressive but stationary reefs. But it now seems that corals may have to adapt quickly in the face of looming extinction, ironically, brought about by humans.

Corals are hugely successful animals. Their reefs have endured across millions of years and today, they cover an area of 280,000 square kilometres, larger than the entire United Kingdom. Their success depends on a partnership with a group of algae called zooxanthellae. Over a million of these lodgers can live in a single cubic centimetre of coral, and they provide their landlords with both colour and energy through photosynthesis.

Despite their benefits, the algae are expensive to maintain. During periods of environmental stress, the corals eject them to make ends meet, losing their colour in the process. These ‘bleached’ corals (*below*) are free to regain their partners at easier times, but if conditions don’t improve, they die.

This is the doom that they now face as global warming threatens to send oceanic temperatures soaring to record levels. The existence of the corals and the biological riches they support is under severe threat. But new research from by Ray Berkelmans and colleagues at the Australian Institute of Marine Science shows that some corals may be able to buy themselves some extra time by swapping their algal partners.

There are 8 different lineages of zooxanthellae (labelled A to H) and it is becoming increasingly clear that how a coral reacts to its environment depends on which of these groups it harbours. In particular, corals with group D algae seem to be particularly good at dealing with high temperatures, and this might prove to be their salvation.

Berkelmans tested this idea by transplanting 22 colonies of the stony coral (Acropora millipora) from a cool inshore reef on the eastern coast of Australia, to a warmer bay about 400 miles away. The colonies contained group C algae, and within half a year, they had all bleached and seven had died. But a few months later, about half of them had recovered and regained their colour. Every single survivor had replaced their partners with those from group D.

Further experiments revealed that the corals' ability to tolerate temperature was based almost entirely on their choice of partners, with their own biochemistry had no detectable effect. In this partnership, the algae proved to be the weakest link. The key difference between the various groups lies in the membranes of their chloroplasts – their in-house photosynthesis factories. Those that can take the heat have membranes that are stable across a larger range of temperatures.

It isn't clear from this study alone whether the ability to evict less hardy tenants is widespread among coral species, or even among other populations of stony coral. Even if it is, it may not be enough. Berkelmans found that corals that made the swap could tolerate temperatures about 1-1.5°C higher. With the temperatures of the world's oceans set to increase beyond that, the corals are living on borrowed time.

We can only hope that this newly discovered ability of corals to rapidly adapt to environmental change gives us enough time to curb carbon emissions and halt climate change.

Source: https://notexactlyrocketscience.wordpress.com/2006/10/12/hope-for-corals-swapping-algae-improves-tolerance-to-global-warming/