Can marine life adapt to global change?

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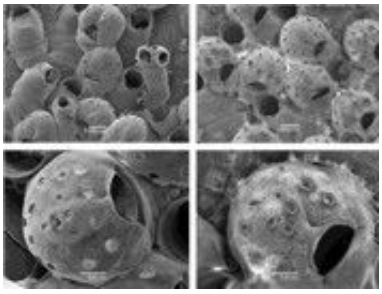

A team of researchers from the University of Plymouth, the Marine Biological Association of the UK and the Plymouth Marine Laboratory have conducted an exciting new study looking into the potential effect of climate change on marine life, and how marine animals may be able to adapt to future environmental scenarios.

Increasing anthropogenic (man-made) carbon dioxide (CO_2) emissions over the last two centuries have led to a warming of the Earth's atmosphere and a subsequent rise in sea surface temperatures.

In addition, around one third of this extra CO_2 has now entered the planet's oceans causing the seawater chemistry to change, a process called "Ocean Acidification". These effects are predicted to worsen over the next few decades.

Consequently this recent study, led by Drs Piero Calosi and John Bishop,

has looked at the potential impacts on sea life should the temperature and acidity of the oceans increase as is predicted to occur in the near and more distant future. It also investigated whether species have the genetic potential to adapt to the rapid changes currently occurring within the marine environment.

Dr. Calosi, from the Marine Biology and Ecology Research Center of the University of Plymouth, said: “Ours is the first study showing that marine animals may already possess genetic variation that will enable future adaptation, via natural selection, to falling pH and rising temperature.”

Their investigation focused on characterising growth and reproductive responses of different genetic individuals of a marine organism, to test the idea that some possess distinct responses to environmental changes.

Researcher Jennifer Pistevos said: “This is the first experiment comparing the responses of different genotypes of a marine animal to warming and ocean acidification scenarios predicted to occur in the years 2100 and 2300.”

Explaining the methodology, Dr. John Bishop, from the Marine Biological Association of the UK in Plymouth, added: “This was possible by using the bryozoan (sea mat) Celleporella hyalina, a colonial organism which grows by the addition of small male, female and feeding modules.

“Cuttings were taken from four original colonies to provide physically separate, but genetically identical, sub-colonies of each to use in the experiment.”

Overall, decreasing pH and increasing temperature caused a reduction in growth, with growth stopping all together at the highest temperature. In addition, colonies responded to decreasing pH by increasing their

reproductive investment, specifically producing more males. This was interpreted as 'reproductive bailout' in colonies threatened with imminent death, promoting the rapid acquisition of reproductive success via releasing sperm.

Further observation by scanning electron microscopy revealed surface pitting of the calcified surface of colonies that were exposed to increased acidity.

Dr. Steve Widdicombe, from the Plymouth Marine Laboratory, said: "With our study we have shown that the genetic individuals tested here possess substantially different responses in growth, reproductive investment and sex ratio to the exposure to temperature, acidity and these two factors combined."

This study is therefore relevant in understanding the likely responses of marine calcifying organisms, like the sea mat studied, to changes in ocean acidity and temperature. However, Dr. Calosi said: "Whilst it is good news that marine animals may have the potential to adapt to future global change scenarios, we still do not know how those genotypes able to persist under such scenarios will cope with subsequent environmental challenges."

More information: The study was recently published in the international journal *Oikos*. More information on the paper is available at onlinelibrary.wiley.com/doi/10 … 010.19470.x/abstract

Provided by University of Plymouth