Ocean acidification – no enemy to anemones

Many are deeply concerned about how ocean acidification will affect marine life. But if some organisms will be badly hit, the work of David Suggett and Jason Hall-Spencer suggests others will flourish.

Ocean acidification (OA) is the process by which the pH of the oceans falls as they absorb more carbon dioxide (CO_2) from the atmosphere – the lower a solution's pH, the more acidic it is. Substantial declines in ocean pH are predicted for this century as anthropogenic emissions continue to raise atmospheric CO_2 levels; therefore, intensive international efforts, including the NERC-funded OA programme, are trying to unravel how OA will affect marine ecosystems.

Unsurprisingly, calcifying corals have been a major focus of these endeavours. Corals are the foundation for the high productivity and biodiversity associated with reef ecosystems, which in turn support the livelihood of millions of people worldwide.

Research has shown that corals and other calcifying organisms – ones which produce outer shells or skeletons of soluble calcium carbonate – will be corroded by ocean acidification (see p18). However, new research led by the Universities of Essex and Plymouth has shown non-calcifying relatives of corals can thrive under ocean acidification conditions.

We examined what happened to these creatures with increasing proximity to a natural CO_2 vent site on the seabed near the Italian island of Vulcano, where CO_2 (and pH) conditions are similar to those predicted for much of the world's oceans in 50-100 years.

> **“ALTHOUGH CALCIFIED ORGANISMS DISSOLVE AWAY, SEA ANEMONES GROW LARGER AND MUCH MORE ABUNDANT WITH INCREASING CO_2 AVAILABILITY.**

Our observations, recently published in *Global Change Biology*, reveal that while whole calcified organisms dissolve away, sea anemones grow larger and much more abundant the more CO_2 there is. This is, at least in part, because CO_2 appears to increase the productivity of the symbiotic algae that live in cooperation with the anemones. In effect the CO_2 provides the anemones with more energy to grow.

Elevated CO_2 is not the only factor that seems to favour the dominance of sea anemones. Localized eutrophication (addition of excess nutrients, often due to run off from farms) and blast fishing can also result in 'blooms' of anemones as well as soft corals. So local environmental pressures, as well as climate change, appear to favour this group of organisms.

Sea anemones perform essential and unique ecological roles in temperate and tropical ecosystems. So we need to understand just how widely our current observations of anemones under high CO_2 conditions apply. Will all anemone-algal symbiont combinations respond in the same way? Will other non-calcifying relatives of corals, such as jellyfish and soft corals, also thrive in a high-CO_2 world? What are the wider ecological and biogeochemical ramifications of these changes?

Ultimately, calcification will inevitably be more difficult for corals – that is, more energetically costly – as ocean CO_2 concentrations continue to rise. We now need to identify just how well non-calcifying corals and their close relatives can take advantage of the space left behind.

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MORE INFORMATION

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