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A bleak future for Mediterranean coral as oceans become more acidic

Mediterranean red coral (*Corallium rubrum*), already endangered due to over-harvesting, is likely to suffer still further under increasing ocean acidification as a result of rising CO_2 emissions. Research has shown that under more acidic conditions the structural development of red coral skeletons is abnormal and growth rate is reduced.

The world's oceans are absorbing greater quantities of CO_2 as emissions of this greenhouse gas increase. As CO_2 dissolves in seawater, it makes the ocean more acidic, a phenomenon known as ocean acidification, which can have far-reaching effects. The acidity of the world's oceans has already increased since pre-industrial times, with pH, which decreases as acidity rises, dropping by 0.1. Scientists have predicted a further decrease of 0.3-0.4 units by the end of this century. This poses a major threat to marine ecosystems and the Mediterranean in particular is one of the world's most sensitive regions to increasing acidity.

In this study, researchers removed coral colonies from rocks at a depth of 35-40 metres from the Marine Protected Area of Cap de Creus in Spain. They transferred the colonies to a laboratory where, after a month to acclimatise to laboratory conditions, 48 colonies were selected and randomly distributed among six 30-litre tanks. Half of the colonies were kept in a tank at pH 8.10, simulating Mediterranean seawater under current atmospheric concentrations of CO_2 (380 parts per million (ppm). The other half were kept at pH 7.81, simulating seawater under atmospheric CO_2 levels of 800 ppm, the forecast concentration for year 2100.

The researchers sampled the colonies every three months, collecting data to measure skeleton growth rate and structural development, as well as organic matter, protein, lipids and carbohydrate composition.

After 314 days under test conditions, colonies in more acidic conditions showed a decrease in growth rate of 59% compared with those grown under current conditions. These results reinforce the findings of previous studies which have shown that acidification slows the process of calcification, impairing the growth and development of species with calcium carbonate skeletons, such as coral. At the microscopic level, the researchers also found the development of abnormal skeletal structures among the corals grown in more acidic conditions. This could have a detrimental impact, not only on capacity to store calcium carbonate for skeletal growth, but also on the ability of the coral to resist mechanical stress.

The authors warn that ocean acidification is likely to act in parallel with other environmental changes, such as an increase in temperature, which is also known to cause partial or total death of coral colonies. They highlight the need for further research to understand the interactions of multiple environmental stresses on corals.

Red coral has great economic value as it is widely used in jewellery-making. It also supports many other marine species. If local extinctions of red coral in the Mediterranean are to be prevented, management plans and conservation actions are urgently needed to mitigate the impacts of ocean acidification and other pressures.