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Growth of algae affected by ocean acidification and nutrient pollution

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Ocean acidification and eutrophication may affect the growth of microscopic algae — phytoplankton — with knock-on impacts for marine food chains and fisheries, warns a new study. By growing phytoplankton under different scenarios the researchers found that phytoplankton species are affected differently according to the acidity and nutrient content of the water.

Ocean acidification is caused by rising atmospheric CO_2, mainly as a result of the burning of fossil fuels. On the other hand, human activities can also result in a drop in ocean acidity as a result of nutrient pollution, such as nitrogen fertiliser run-off from agricultural fields, which causes eutrophication.

Ocean acidification and eutrophication both have impacts on the microscopic algae called phytoplankton. These algae play an important role in marine ecosystems as they form the basis of many food chains. During periods of rapid growth, which generate algal blooms, changes in the acidity of the water can not only influence the growth of phytoplankton populations, but also those of the animals feeding on them.

In this study the researchers aimed to explore how acidification and eutrophication can affect the growth of phytoplankton populations and interaction of different types of phytoplankton.

Three different species of phytoplankton were used in the experiments (*Emiliania huxleyi*, *Thalassiosira weisflogii* and *Rhodomonas* sp.). The growth of each species was monitored over 10 days under different conditions. For example, three pH levels were used to represent present day seawater (pH 8.2), future ocean acidification (pH 7.6) and the level found in dense algal blooms (pH 8.8). In some of the experiments acidity was maintained at a fixed level and in others it was allowed to vary naturally, as a result of the species removing CO_2 from the water. The researchers also conducted experiments in which combinations of phytoplankton species were grown together.

The results showed that different species of phytoplankton reacted differently according to the acidity. For example, growth of two of the species when acidity was initially low (pH 8.8) but allowed to alter naturally, was half of that in experiments where the acidity reflected present day seawater (pH 8.2).

The authors also created simulations of how the growth of each of the species may continue over 30 days under previous, present and future atmospheric levels of CO_2, and at low, medium and high levels of nutrient content. These indicate that different scenarios will cause phytoplankton growth to alter considerably — but in variable ways.

The authors conclude that the combined effect of acidification and eutrophication has an impact on the growth and interaction of phytoplankton, which will have implications for other marine species. In particular they warn that future scenarios of acidification and eutrophication in seawater will be increasingly variable and therefore the consequences will be more difficult to predict. This may be expected to affect water quality issues, such as harmful algal blooms, and the transfer of nutrients to support fisheries.