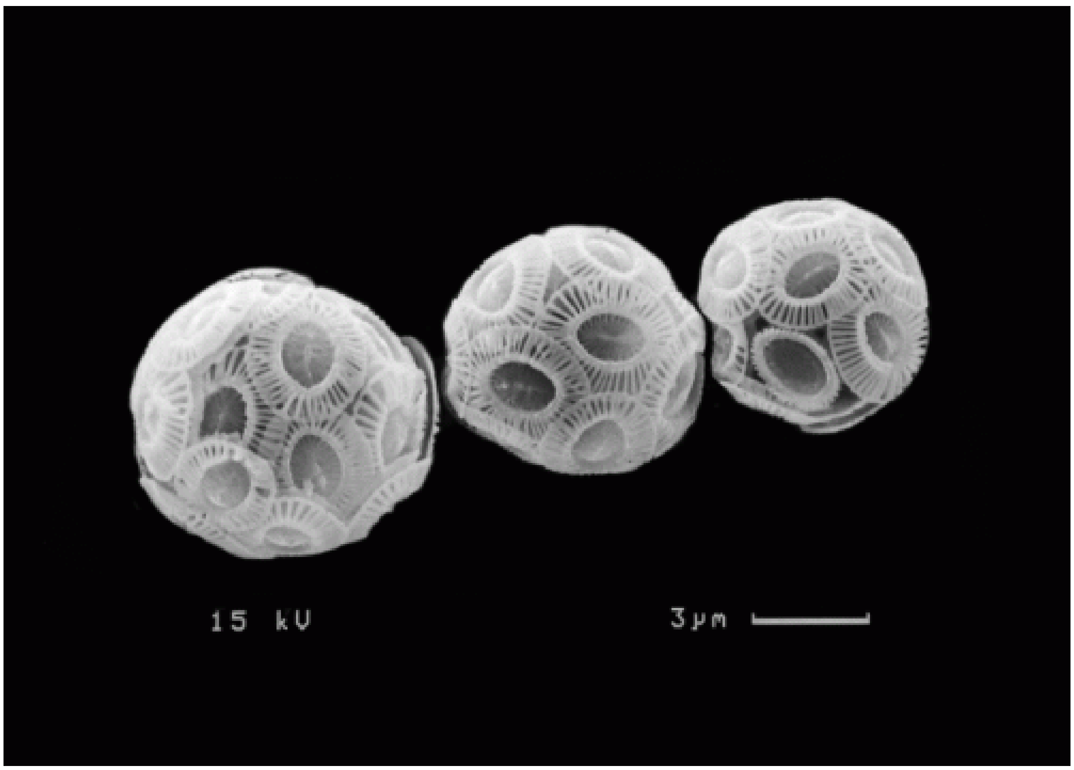
Researchers find one type of algae able to adapt to warming oceans

September 15 2014, by Bob Yirka

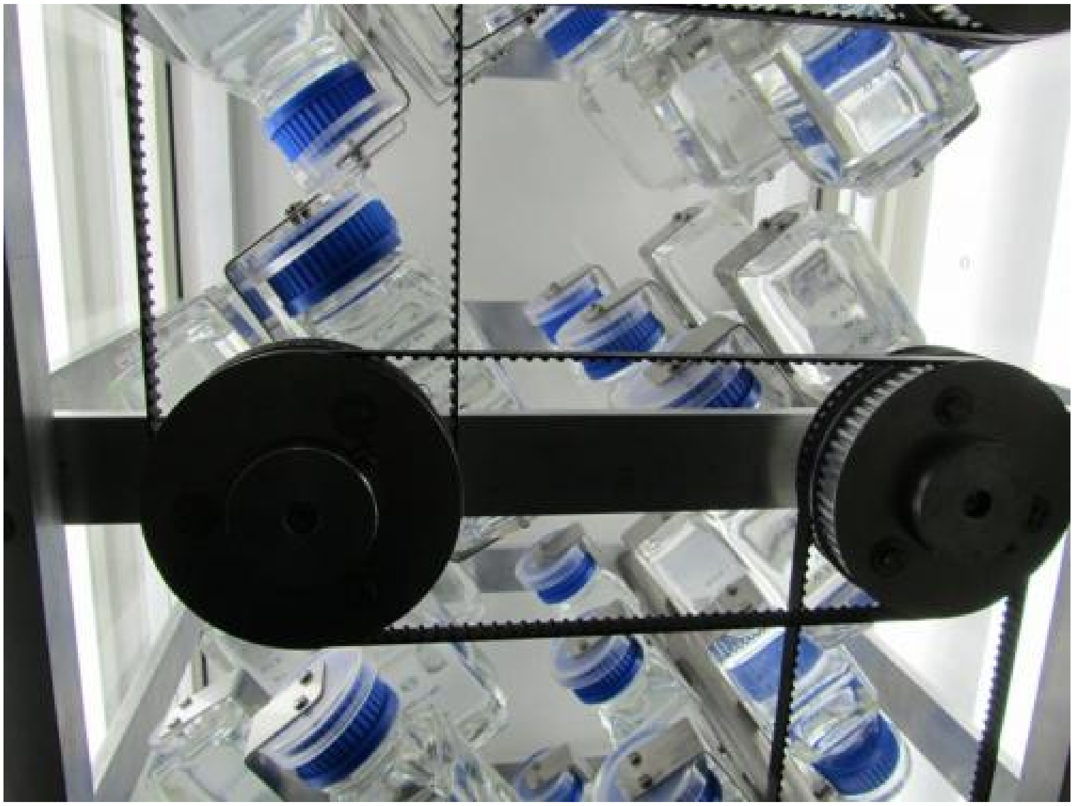


A scanning electron micrograph of three Emiliania huxleyi cells. Credit: Dr. Kai T Lohbeck (GEOMAR)

(Phys.org) —A team of German biology researchers has found that at least one type of algae appears able to adapt to rising ocean temperatures and the accompanying increased acidification. In their paper published in the journal *Nature Climate Change*, the team describes how they subjected algae specimens to warmer and/or more acidic water over a year's time and the changes in the algae that came about as a result.

In general, scientists don't expect many species to evolve to meet the challenge of a warming planet—the temperature rise is happening faster than most species could adapt to it, thus little work has been done to see which if any might be able to do so. In this new effort the team in Germany studied the tiny marine algae *Emiliania huxleyi—a* type of phytoplankton that grows in groups into large floating masses that serve as food to a wide variety of fish and other sea creatures. They were chosen because of their fast reproduction rate—up to 500 generations in a single year, or more than one a day, on average. This of course makes them more likely to be able to evolve to meet a rapidly changing environment.

The researchers started with many samples of the algae as they now exist, keeping them in flasks in their lab. As time passed, some were transferred to flasks containing warmer and/or more acidic water. Those that survived were put into even warmer or more acidic water. This continued for a year during which time the algae evolved to survive in their rapidly changing environment—which eventually included water temperatures as high as 80°F, representing the worst-case scenario for water ocean water temperature increases over the next century or so. The team reports that the individual algae became smaller, but they also grew faster, suggesting they might form even bigger or denser real world plumes.



A row of culture flasks in which algae, for example Emilinia huxleyi are cultivated in the laboratory. Credit: Dr. Kai T Lohbeck (GEOMAR)

The researchers acknowledge that their experiments were carried out in a rather sterile environment, sans predators, viruses and other dangers to their survival, thus the results are preliminary at best. But still, they do indicate that some species might survive the impending changes to the ocean, and some might even thrive, even as many, many others are likely to disappear because they aren't able to evolve as quickly.

Flasks in their custom-built climate cabinet. Credit: Dr. Kai T Lohbeck (GEOMAR)

More information: Adaptation of a globally important coccolithophore to ocean warming and acidification, *Nature Climate Change* (2014) DOI: 10.1038/nclimate2379

Abstract
Although ocean warming and acidification are recognized as two major anthropogenic perturbations of today's oceans we know very little about how marine phytoplankton may respond via evolutionary change. We tested for adaptation to ocean warming in combination with ocean acidification in the globally important phytoplankton species Emiliania

huxleyi. Temperature adaptation occurred independently of ocean acidification levels. Growth rates were up to 16% higher in populations adapted for one year to warming when assayed at their upper thermal tolerance limit. Particulate inorganic (PIC) and organic (POC) carbon production was restored to values under present-day ocean conditions, owing to adaptive evolution, and were 101% and 55% higher under combined warming and acidification, respectively, than in non-adapted controls. Cells also evolved to a smaller size while they recovered their initial PIC:POC ratio even under elevated CO2. The observed changes in coccolithophore growth, calcite and biomass production, cell size and elemental composition demonstrate the importance of evolutionary processes for phytoplankton performance in a future ocean.

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