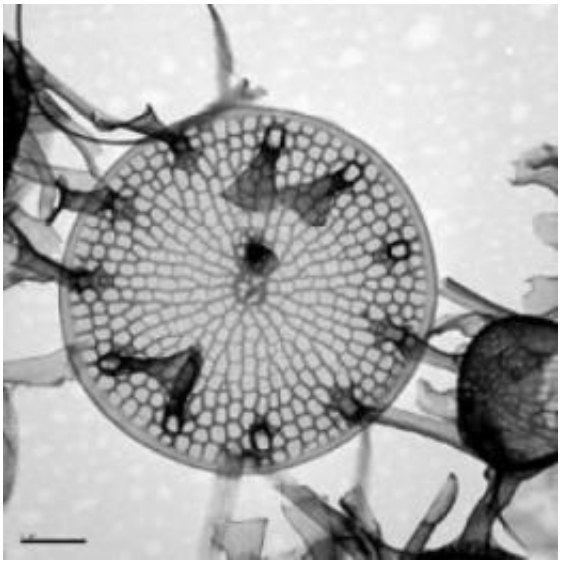
Reviving 100-year-old resting spores of diatoms

March 1 2011



The diatom *Skeletonema marinoi* is a common species in the spring bloom. Here magnified 10,000 times by electron microscopy. Credit: Anna Godhe

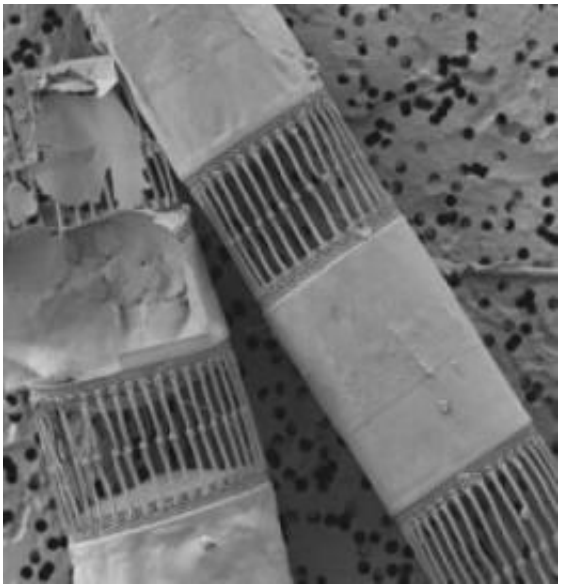
Diatoms account for a large proportion of the phytoplankton found in the water, and live both in the open sea and in freshwater lakes. By reviving 100-year-old spores that had laid buried and inactive in bottom sediment, researchers at the University of Gothenburg, Sweden, have shown that diatoms are also genetically stable and survival artists.

Recent research has shown that diatoms exhibit great genetic differences and that they occur in discrete populations, which means that they

multiply sexually to a greater extent than previously believed. What makes diatoms special is that if the environment they live in becomes too inhospitable they form resting spores, which gather in sediment at the bottom of the sea. When conditions improve, the spores can be revived.

The study concerned is based on a sample of sediment from a highly eutrophic Danish fjord on the east coast of Jutland, Mariager Fjord, whose anoxic bottoms and bottom sediments today do not show any signs of life. After dating the different layers of a sediment core, the researchers took small pieces of sediment from various depths and transferred them to an environment favourable to diatoms. This enabled them to revive resting spores.

"We revived hundreds of genetic individuals of diatoms and induced them to start dividing again and to form cloned cultures. The oldest are more than 100 years old, the youngest quite fresh. We then identified the revived individuals genetically," says Anna Godhe of the Department of Marine Ecology at the University of Gothenburg.



Skeletonema is a common bloom-forming diatom. Magnified 10,000 times by electron microscocopy. This picture adorns the cover of the printed version of PNAS # 10/ 2011. Credit: Lars Edler and Gustaaf Hallegraff

40 000 generations of diatoms

As diatoms normally divide once a day, this means that for a diatom a period of 100 years is equivalent to 40 000 generations. In human terms, this means genetic material equivalent to around 800 000 years.

"We found certain differences between the algae that went into a state of rest at the start of the 20th century compared with those that formed resting spores when the eutrophication was at its worst and the freshest ones of all, but the individuals are for the most part very homogeneous throughout the sediment core, that's to say 40 000 generations of diatoms."

No traces of genetic impact over 100 years

"The most exciting thing of all in the whole study is that there are no traces at all of genetic impact from the open sea population on the diatoms in Mariager Fjord during the 100 years we have studied, despite a constant influx of diatoms from the Kattegatt with the surface water. Not one out of all the millions upon millions of diatoms that have found their way into the fjord from the Kattegatt has become established and continued to grow in the fjord.

The researchers believe that this is due to the fact that the algae that live inside the fjord are so superbly well adapted to the fjord environment and that there are so many of them (millions per litre of water, thousands per gram of sediment) that colonisers from outside are rapidly out-

competed.

More information: The article Hundred years of genetic structure in a sediment revived diatom population has been published in the scientific journal *Proceedings of the National Academy of Sciences* of the United States of America (*PNAS*).

Provided by University of Gothenburg