Temperature adaptation in resurrected phytoplankton across the European coastal ecosystem

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The sea surface temperature and nutrient loading in European coastal waters are predicted to increase due to the ongoing global change. This has already resulted in range shifts and local extinction of phytoplankton species. We have recently shown that diatoms may also adapt to global warming by increasing their temperature optima in natural conditions. Here we resurrect resting stages of diatoms from the last 100 years from 11 different locations across Europe, from the Baltic Sea to the Mediterranean to investigate if diatoms have adapted to the historical increase in sea surface temperatures. So far we have resurrected about 10 different species of diatoms across Europe, the oldest originating from the beginning of the 1900s. Using the most probable number method we show that viable resting stages are well preserved in even century-old sediment layers across Europe. In the next phase, we will create reaction norms for a subset of these species and assess the ecological consequences of thermal adaptation. Since low nutrient concentrations have the tendency to constrain thermal adaptation we will study the nutrient affinity of adapted strains. We will also test the nutritional value of resurrected and modern diatoms in predator-prey experiments as preliminary data show that the fatty acid content of diatoms may change with thermal adaptation. This research will provide data for more accurate models predicting future ecosystem response to global warming as current models are based on static tolerance ranges not accounting for the adaptive potential of species.