Challenges in using chrysophyte cysts as tools in palaeoclimatological studies

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Chrysophytes, also known as the golden-brown algae (classes Chrysophyceae and Synurophyceae), often form an essential component of phytoplankton in oligotrophic northern waters. All chrysophytes are believed to produce siliceous resting stages which are often well preserved and abundant in the sediments of most lakes. These resting stages also known as stomatocysts or simply cysts have recently been used in a variety of palaeoenvironmental studies linking cyst assemblages to certain environmental variables such as temperature, pH, salinity and ice cover times.

For most of the cysts the cyst producing chrysophyte species is still unknown. Cyst identification is based on the size, shape, ornamentation and the pore morphology of the cyst. The problem however is the minuscule surface structure of the cyst which can often be detected only using a Scanning Electron Microscope (SEM). The use of a SEM is usually expensive and time-consuming but leaves an image of each cyst counted for future reference. The problem with using a SEM is the fact that, unlike with a light microscope, you cannot see through the cyst if the pore is not visible and therefore you are left with a large number of cysts which in some cases have several different identity options. The use of a light microscope is faster but cysts often have to be put into collective categories which can lead into problems in palaeoreconstructions if cysts in the same group have different environmental preferences. More problems in identification arise when cysts are corroded in the sediment or not fully developed. Since no larger scale chrysophyte cyst studies have previously been carried out in Finland (or Fennoscandia), the sediment material also contains many previously undescribed cyst morphotypes. Here we discuss the challenges of cyst identification and the use of chrysophyte cysts in paleoclimatic reconstructions based on circa 15000 SEM images of cysts in Finnish lakes.