Phytotaxa 170 (3): 169–186
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.170.3.3

Late Quaternary Chrysophycean stomatocysts in a Southern Carpathian mountain lake, including the description of new forms (Romania)

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Abstract

In this study we present results of a low-resolution chrysophyte stomatocyst analysis that followed a high-resolution diatom analysis of a mountain lake sediment sequence from the Retezat Mountains, in the south Carpathians (Romania). The stomatocyst assemblages of the previously distinguished ten diatom assemblage zones of Lake Gales were studied with the aim to describe stomatocyst composition and create a taxonomical basis for detailed stratigraphical analysis in the future. We report 83 stomatocyst forms, and 7 of them are formally described here as new for science. An abrupt shift in cyst as well as diatom assemblages were recorded around 9200 cal yr BP during the 15,000 years long history of the Lake Gales. This Lake Gales event could be linked to the 9.3-ka widespread significant climatic anomaly, which was triggered by a melt water pulse into the North Atlantic.

Key words: Chrysophycean stomatocysts, climatic anomaly, diatoms, new morphotypes, 9.3 event, Retezat Mountains, Southern Carpathians

Introduction

Chrysophytes are a diverse group of freshwater algae consisting of over 1000 described species (Duff *et al.* 1995). 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 are also known as stomatocysts or simply cysts. The number of described morphotypes is over 800 according to our overview of the available literature and database (see the list of References). Cysts are more resistant to dissolution than chrysophyte scales and spines, preserve well in sediments; they have high paleolimnological potential in environmental reconstruction (e.g. Duff *et al.* 1995, Vorobyova *et al.* 1996, Kamenik *et al.* 2001, Pla 2001, Wilkinson *et al.* 2001, Kamenik & Schmidt 2005a, Pla & Catalan 2005, Huber *et al.* 2009). Stomatocyst assemblages provide a sensitive biotic proxy of pH and salinity (Facher & Schmidt 1996, Pla *et al.* 2003, Pla & Anderson 2005), and particularly they have been used to reconstruct cold-season climate variability (e.g. Huber *et al.* 2009, de Jong & Kamenik 2011, Pla-Rabes & Catalan 2011, de Jong *et al*. 2013). Most biological proxies (e.g. chironomids, plant macrofossils, pollen) are biased towards the growing season (e.g. Tóth *et al.* 2012; Magyari *et al.* 2012, 2013), while chrysophycean stomatocysts are proven to be a useful and unique proxy for assessing the ice cover changes, lake mixing (Kamenik & Schmidt 2005a) and seasonality that is linked to lake stratification patterns (Pla-Rabes & Catalan 2011).

The greatest drawback in paleolimnological studies has been the lack of taxonomic certainty, since for most cysts neither the taxonomic affinity nor the degree of structural variation has been known (e.g. Wilkinson & Smol 1998). From the middle of 1980s intensive studies have been conducted focusing on discovery and detailed description of chrysophycean cyst floras of Arctic and Subantarctic lakes (Duff *et al.* 1995, van de Vijver & Beyens 1997a, 1997b, Pla & Anderson, 2005) and mountain regions (e.g. Facher & Schmidt 1996, Pla 2001, Cabała & Piatek 2004, Cabała

Accepted by Patrick Kociolek: 22 Apr. 2014; published: 26 May 2014

This study provided the first step in the chrysophycean based paleoenvironmental reconstruction of the South Carpathian Mountains. However, there is clearly a need for further work on both modern (e.g. define the cysts autoecology) and fossil chrysophyte cyst assemblages from the Carpathians for better understanding of the recent and past changes.

Acknowledgements

We would like to express our thanks to Pat Kociolek for his support, and the anonym reviewer for valuable and important corrections and advices for improving this work. We acknowledge the support of the Hungarian Scientific Fund (OTKA 83999 and NF 101362). This is a Hungarian Academy of Sciences—Hungarian Natural History Museum Paleo Contribution No. 192. ÉSP was supported by TÁMOP-4.2.4.A/2-11/1-2012-0001 'National Excellence Program - PhD student personal support system convergence program' CSK worked within 'A2-MZPD-12-0296' in the framework of TÁMOP-4.2.4.A/2-11/1-2012-0001 key project which is realized with the support of the Hungarian Government and the European Union with the co funding of the European Social Fund.

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