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TWO SILICA SCALE-BEARING CHRYSOPHYTES FROM POLAND

JOLANTA PIĄTEK

Abstract. Two silica-scaled chrysophytes were identified from a fishpond in Szczerbaków village in the Wyżyna Małopolska upland in Poland. It is the first finding of *Mallomonas cratis* K. Harris & D. E. Bradley and the second finding of *Synura petersenii* Korshikov in Poland. The species are described and illustrated with LM and/or SEM micrographs.

Key words: Chrysophytes, Synurophyceae, *Mallomonas*, *Synura*, Poland

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INTRODUCTION

Chrysophytes, also called golden brown algae, occur mostly as single flagellate cells or colonies of flagellate cells. The form of some chrysophytes may also be amoeboid, palmelloid, filamentous or coccoid. Chrysophytes are currently classified in five classes: Chrysophyceae, Synurophyceae, Dictyochophyceae, Pelagophyceae and Phaeothamniophyceae. The systematic position of some genera of chrysophytes is still undetermined (Kristiansen & Preisig 2001).

The *Catalogue of Polish Prokaryotic and Eukaryotic Algae* (Siemińska & Wołowski 2003) enumerates 400 names (both currently accepted and synonymous) of chrysophytes cited in the Polish literature. The true number of living forms of chrysophytes occurring in Poland is unknown. In connection with my studies on chrysophyte stomatocysts, I am starting to work with living chrysophytes.

This paper reports two synurophycean species, *Mallomonas cratis* K. Harris & D. E. Bradley (1960) and *Synura petersenii* Korshikov (1929), reported from Poland for the first and second time, respectively. These species were found in water samples collected in December 2006, during unusually warm winter, in a fishpond in Szczerbaków village in the Wyżyna Małopolska upland. So far the class Synurophyceae has been represented in Poland by only two genera, *Mallomonas* (with 30 species) and *Synura* (with 6 species), reported in various phycological papers (see Siemińska & Wołowski 2003). Only some works include iconographic documentation of observed species, mostly line drawings or rarely LM micrographs. Up to now, no one in Poland has studied the living forms of chrysophytes by scanning electron microscopy (SEM) or transmission electron microscopy (TEM).

MATERIAL AND METHODS

The material was collected on 14 December 2006 from a fishpond in Szczerbaków village (50°20′20″N/20°43′40″E) *ca* 14 km S of Busko Zdrój in the Wyżyna Małopolska upland. The samples were taken with plankton nets (10 mm or 20 mm mesh). Water temperature (°C), conductivity ($\mu S \cdot cm^{-1}$) and pH were measured immediately after collection. Temperature and conductivity were measured with a CC-102 conductivity meter (Elmetron IP67), and pH with a CP-103 waterproof pH-meter (Elmetron IP67).

The chrysophytes were examined and identified using standard light and phase contrast microscopy (LM) and scanning electron microscopy (SEM). LM studies used slide preparations mounted in water and a NIKON Eclipse 600 light microscope with Nomarski phase contrast. The micrographs were taken with a NIKON Coolpix 995 camera. For SEM analysis each sample was

placed in a glass scintillation vial, covered with 30% H_2O_2 and allowed to stand for 24 h, then rinsed several times with distilled water, with a settling time of 24 h. Finally the sediment was transferred to 95% ethanol and then pipetted onto clean cover glasses, air-dried, and affixed to an aluminum stub with double-sided transparent tape. The stubs were sputter-coated with carbon using a CRESSINGTON sputter coater and viewed with a Hitachi S-4700 scanning electron microscope at a working distance of 10.9–11.5 mm. SEM micrographs were taken in the Laboratory of Field Emission Scanning Electron Microscopy and Microanalysis at the Institute of Geological Sciences of the Jagiellonian University.

Results and discussion

During collection of water samples, the temperature of water was 6.5°C, conductivity 1128 $\mu S \cdot cm^{-1}$ and pH 7.2. LM examination of samples revealed abundant colonies of *Synura petersenii*, and this identification was later confirmed by SEM studies. SEM studies also turned up one scale of *Mallomonas cratis*. This species was not observed by LM. The recorded silica-scaled chrysophytes are presented here in the taxonomical system accepted by Kristiansen and Preisig (2001).

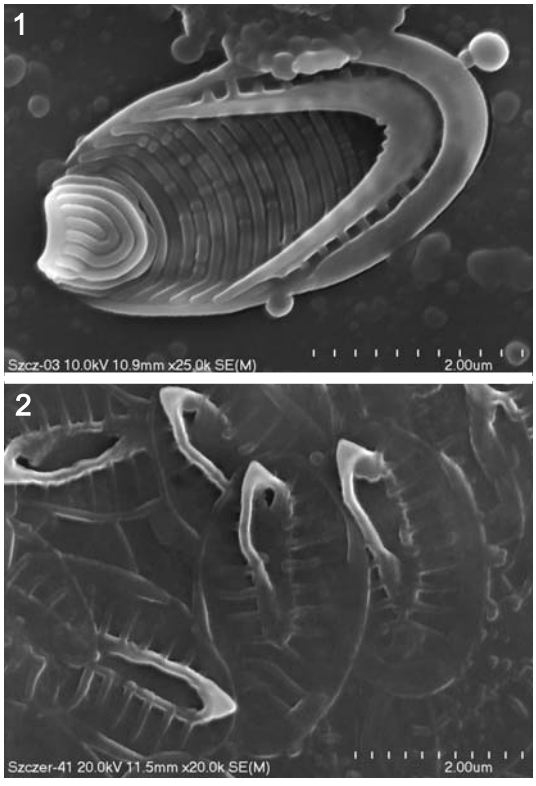
synurophyceae R. A. Andersen
SYNURALES R. A. Andersen
Mallomonadaceae Diesing

Mallomonas cratis K. Harris & D. E. Bradley 1960 Fig. 1

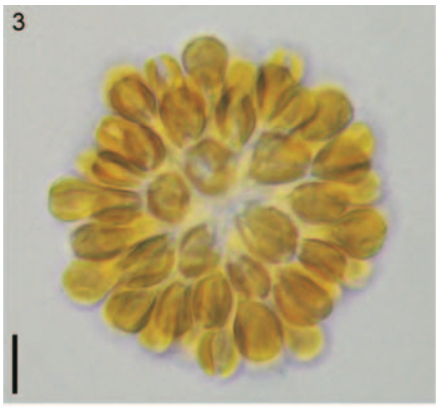
SEM description: Only a single scale was observed. The scale is tripartite, composed of dome, shield and flange, with a distinct V-rib separating the shield from the flange. The scale is elongate, 4.6 µm long and 2.3 µm broad. It has 17 curved transverse ribs on the shield and 10 ribs on the flange. The scale has no anterior submarginal ribs and the ribs in the dome are U-shaped.

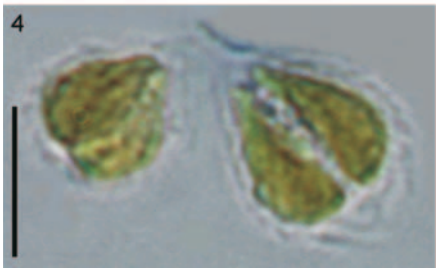
In scale structure, *Mallomonas cratis* is very similar to *M. flora* K. Harris & D. E. Bradley. Both species have elongate scales with shields and flanges provided with numerous curved transverse ribs. They differ in some important characters, however, one of which is the presence of more ribs on the shield, 14 to 18 in *M. cratis* versus 9 to 13 in *M. flora*. Another difference is that *M. cratis* lacks anterior submarginal ribs, which are present in *M. flora*. Moreover, the ribs in the dome are U-shaped in *M. cratis* but only strongly curved in *M. flora*. Finally, *M. flora* most often has a flower-like pattern on the posterior side of the shield, whereas *M. cratis* has only a couple of pores in this place (Kristiansen & Sandgren 1986).

Mallomonas cratis is a widely distributed species, recorded from eutrophic, calcareous ponds and lakes and swampy woodland pools, in water with pH 6–8 and sometimes even up to 9.1 (Hartmann & Steinberg 1989; Siver 1991). Its distribution is summarized by Kristiansen (2002). In Europe it is known from Denmark, Germany, Netherlands, Portugal, Hungary, Romania and Russia and elsewhere (according to Siver 1991). It is also known from North America, South America



Figs 1 & 2. 1 – *Mallomonas cratis* K. Harris & D. E. Bradley; 2 – *Synura petersenii* Korshikov. Scales by SEM.





Figs 3 & 4. *Synura petersenii* Korshikov, by LM. Scale bars = 10 µm.

and Australia. *Mallomonas cratis* is reported here for the first time from Poland.

SYNURACEAE Lemmerm.

Synura petersenii Korshikov 1929 Figs 2–4

LM DESCRIPTION: The colonies are spherical, 44.5–58.3 µm in diameter, and are composed of numerous cells 5.0–8.5 µm wide and 8.0–11.5 µm long.

SEM DESCRIPTION: Scales are 3.5–3.7 µm long and 2.1–2.3 µm wide, with a central ridge 2.1–2.4 µm long and 0.7 µm wide, and rim 2.4–2.5 µm long and 0.3–0.4 µm wide. Numerous unbranched ribs connect the keel with the rim.

Synura petersenii is a cosmopolitan chrysophyte with a very wide ecological amplitude, and has been found on all six continents (Kristiansen 2000). In Poland it was recorded only once from the Vistula River in the Warsaw area (Klimowicz 1981). That report gives no precise description or iconographic documentation of the observed specimens. Because the identification of *Synura* species now is based on silica scale ultrastructure observed by TEM or SEM, this record is very uncertain. The present finding of living forms of *Synura petersenii* in Szczerbaków village is the first fully documented report of the occurrence of this chrysophyte in Poland.

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