RECENT OCCURRENCE OF MALLOMONAS INTERMEDIA KISSELEV (SYNUROPHYCEAE, CHRYSOPHYTA) IN TRANSYLVANIA, (ROMANIA), BASED ON SCANNING ELECTRON MICROSCOPY

L. Ş. PÉTERFI1, L. MOMEU2, K. T. KISS3 and É. ÁCS3

1Botany Team, Department of Taxonomy and Ecology, Babeş-Bolyai University
42 Republicii Str., 400015 Cluj-Napoca, Romania
2Ecology Team, Department of Taxonomy and Ecology, Babeş-Bolyai University
5–6 Clinicilor Str., 400006 Cluj-Napoca, Romania
3Hungarian Danube Research Station, Hungarian Academy of Sciences
2131 Göd, Jitcorka S. u. 14, Hungary

(Received 6 July, 2004)

Plankton samples collected from a yellow watered bog pool of the mesotrophic “Călățele Pădurii” peat bog (Romanian Western Mountains, Transylvania), exhibited an outstandingly rich Mallomonas population. The observations carried out by light and scanning electron microscopy revealed that the population belongs to Mallomonas intermedia Kisselev. Based on the presence of lance head bristles, distributed all over the cell armour (except few anterior collar, unilaterally serrated ones), it became evident that the population belong to the nominate variety (var. intermedia). Mallomonas intermedia var. saliceaensis formerly described from Transylvania differs by the type variety by the presence of exclusively serrated bristles. The present finding proved that Mallomonas intermedia could not be properly identified at infraspecific level solely based on the ultra structure of scales, without knowing the structure of bristles too.

Key words: silicoflagellates, Transylvania, Mallomonas intermedia var. intermedia

INTRODUCTION

Investigations on the golden-yellow flagellates (Chrysophyta) by means of electron microscopy have been carried out since the middle of the last century. The chrysophytes comprises two classes: Synurophyceae and Chrysophyceae. One of them (Synurophyceae), includes about 200 solitary or colonial monads, all of them bearing sophisticated external silica armour consisting of small scales or scales and long movable bristles attached to them. In the other class (Chrysophyceae) the silica armour is limited to some particular genera. It is now generally accepted that the identification of the taxa is almost exclusively based on the fine structural pattern of the silica scales and bristles. In spite of the fact that the fine structural patterns of the scales and bristles are...
characteristic for the taxa (species, variety), in some cases there are differences between populations belonging to the same taxa, as well as between the individuals of the same population. The scale and bristle diversity is not unusual within the same individual armour according to the position of scales and bristles (collar, body, rear scales), certainly due to genetic background. On the other hand, differences are the fine structure of scales and bristles might be caused by changes in environmental conditions (temperature, light, nutrient supply etc.).

The *Mallomonas* population herein dealt with was collected in a bog pool of the well-known “Călățele Pădurii” peat bog, repeatedly investigated for its flora and vegetation (see Momeu *et al.* 2003). It is located on the northern rim of the Romanian Western Mountains (Erdélyi-szigethegység), 20 km south from the nearest town Huedin (Bánffyhunyad), not very far from Mt. Vlădeasa (Vlegyásza-hegy), at 900 m a.s.l. Formerly a typical raised peat bog, with a surface of 12 ha, having very dry and thick peat moss layer, consisting of various *Sphagnum* species (*S. balticum*, *S. buxbaumii*, etc.), exhibited populations of genuine oligotrophic plants like *Eriophorum vaginatum*, *Andromeda polifolia*, *Rhynchospora alba*, *Carex pauciflora*, *Heleocharis carniolica* and others. Its oligotrophic peat deposit has been excavated towards the end of the last century; therefore the original raised peat bog does not exist any more. There are several broken stone and sand access roads built inside. It has been transformed into a peat deposit, virtually bare in some places, with remnants only of the original vegetation, but with large, brown watered pits, bog pools and small *Sphagnum*-regeneration hollows. The newly formed aquatic habitats are overgrown by invading *Typha*, *Carex* and *Salix* and other plant species, exhibiting a mosaic structure. These changes made possible the development of various algal communities dominated mostly by desmids and diatoms (Momeu *et al.* 2003).

In one of these, deep, yellow watered peat depressions a very rich, bloom-like *Mallomonas* population was observed and sampled, but it could not be identified at species level by light microscopy.

**MATERIAL AND METHODS**

Samples were collected in October 2002 using No. 25 plankton net and preserved in 4% formalin. The physical and chemical parameters of the habitat (temperature, pH, conductivity, salinity, oxygen) were established in the field using electronic devices (YSI 52 oxygen-meter, Consort K911, Consort P900).
Preliminary observations were carried out in a Nikon Eclipse 400 light microscope. Dry mounts were used to establish the LM structure and measurements of the silica armour elements.

The scanning electron microscopy was performed in the Hungarian Danube Research Station of Institute of Ecology and Botany of the Hungarian Academy of Sciences with HITACHI N-2600 SEM.

RESULTS AND DISCUSSIONS

The physical and chemical parameter (temperature = 12 °C; pH = 4.93; conductivity = 30.5 µs cm⁻¹; salinity = 17.1 mg l⁻¹, oxygen: 2.9 mg l⁻¹ (32.8%)) underline the previous presumption (Momeu et al. 2003) concerning the mesotrophic, slightly humic character of the bog pools.

The light microscopic observations have revealed that the bloom-like population consists of solitary monads, bearing massive silica armour and therefore belongs to the genus *Mallomonas*. The cells are elongate-ovoid to elongate-ellipsoidal (16–40/915 µm) covered by imbricate scale armour and long mobile bristles distributed all over the cell surface. The scales of tripartite type, consisting of dome, V-rib and flange, united by the basal plate. Dimensions: 3–7/3–5 µm, the collar and rear scales are somewhat smaller than the body ones. The bristles are unilaterally serrate, distal end flattened forming the so-called lance head. Based on LM observations there is not possible to identify the alga at species level.

Based on the fine structure of scales and bristles as revealed by SEM (Figs 1 and 2) it became evident that the *Mallomonas* population dealt with belongs to the type variety of *Mallomonas intermedia* Kisselev. According to the structure of scales is possible to identify the species even based on isolated scales, but to establish the varieties the fine structure of bristles is necessary.

![Figs 1–2. Ultrastructure of Mallomonas intermedia Kisselev var. intermedia. 1 = body scale, (SEM, scale: 2 µm), 2 = body bristle tip (SEM, scale: 5 µm)](image-url)
The structure of the scales of *M. intermedia* is relatively simple, the inner surface of the basal plate is smooth, its external face lacks an elaborated secondary layer (ribs, network, papillae etc.). The basal plate is thin, finely perforated, a single row of larger pores surround the outer margin of V-rib, where short, radial struts are present on the flange. The dome looks smooth, just with 1–2 short, oblique folding or 1–3 short ribs. The shield is simple, showing the perforations of basal plate and the characteristic short rib running parallel with the posterior border of the dome. The secondary thickening of the shield exhibits small pits with single pores at the bottom. The flange looks finely perforated and with smooth upturned outer rim as seen in SEM micrographs.

The bristles are similar with those previously described for var. *intermedia*. Distal ends very characteristic, flattened and folded, of lance head type, as seen clearly in SEM micrographs (Fig. 2).

According to the present LM and SEM findings the population dealt with agree in all respects (fine structure, cell, scale and bristle dimensions) with previous descriptions (Kristiansen 2002).

In spite of the fact that *Mallomonas intermedia* var. *intermedia* is considered as “common” throughout Europe, should be kept in view that records based on isolated scales, but not having the EM micrographs of bristles, are questionable. The EM investigation of bristles is absolutely necessary to distinguish the varieties, namely the type variety from that described as var. *saliceaensis* by Péterfi and Momeu (1976). The bristles of var. *saliceaensis* are exclusively unilaterally serrated with pointed tips. For the time being this variety has only been found in the type locality, 10 km southwest of the city Kolozsvár (Cluj-Napoca), near the village of Szelicse (Sâlicea), in the mesotrophic peat bog – “Tău cu Mesteceni” (“Pop tava” according to Nyárády 1941).

The type variety of *Mallomonas intermedia* is endemic in whole Europe, while var. *saliceaensis* seems to be endemic in Transylvania (Kristiansen 2002). Both varieties have been recorded in Romania.

The population dealt with dominated the plankton community (bloom-like), occurring together with mesotrophic desmids (*Bambusina brebissonii*, *Cylindrocystis brebissonii*, *Closterium lineatum*, *C. striolatum*, *C. venus*, *Cosmarium botrytis*, *C. formosulum*, *Staurodesmus glaber*, *Staurastrum punctulatum*, *Mougeotia parvula*) and other algae belonging to various groups, frequently found in peat bogs (*Desmatractum bipyramidatum*, *Actinochloris sphaerica*, *Chroococcus minutus*, *Chr. turgidus*, *Microspora pachyderma* and *Ophiocytium majus*). The occurrence of *Pediatrum simplex*, *P. angulosum*, *Peridinium cinctum*, *Phacus pyrum* and *Euglena texta* is not unusual in peat bogs visited by cattle.
CONCLUSIONS

In Transylvania both varieties of Mallomonas intermedia are present, the type variety endemic to whole Europe, and var. saliceaensis, seemingly restricted to Transylvania. Both inhabit the slightly acidic bog pools of the mesotrophic peat bogs, sometimes dominating the plankton community (bloom-like). According to the published records the type variety is widespread in Transylvania, but not frequent. It was found twice in the peat bogs near Szelicse (Sălicea) (Péterfi 1966, Péterfi and Momeu 1976) and more recently from the Rétyi Nyír (Meastecănişul de la Reci), during 1996–97 and forming rich populations (Péterfi et al. 2002). The present finding suggest that Mallomonas intermedia can not be properly identified at infraspecific level solely based on the ultrastructure of scales, without knowing the structure of bristles too.

*Acknowledgement* – Scanning studies were supported by Hungarian National Scientific Foundation (OTKA M 041686).

REFERENCES


