

MALLOMONAS ACAROIDES PERTY EMEND. IVANOV BLOOM IN THE CÂLCESCU SUBALPINE LAKE OF THE PARÂNG MOUNTAINS, ROMANIA

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Abstract: *Mallomonas acaroides* Perty emend. Ivanov bloom in the Câlcescu subalpine lake of the Parâng Mountains, Romania. Plankton samples collected in autumn 1992 from the glacial Câlcescu Lake, located at an altitude of 1924 m in the Parâng Mountains, Southern Carpathians, revealed an unexpected bloom of *Mallomonas acaroides* var. *acaroides*. According to TEM observations the population was very uniform, exhibited individuals with elongated, ellipsoidal to almost cylindrical cells bearing all over their surface outstandingly long, slender bristles, with helmet shaped tips. Bristles lacking helmet shaped tips, with gradually tapering distal ends and recurved proximal teeth were also present, but very rare. Most individuals possessed very thin, poorly silicified, imbricated scales, mostly without or with rudimentary meshwork on the shield. This is the first record of such *Mallomonas* bloom in a Romanian alpine lake, very similar with that documented by Kristiansen [4] in a Bulgarian mountain lake.

Introduction

There are more than 130 permanent glacial lakes in the Southern Carpathians, distributed mainly in three main massifs: the Făgăraș, the Parâng and the Retezat Mountains. Most of these glacial lakes are situated at about 1900-2100 m a. s. l. The Câlcescu Lake is located in a large glacial valley at the northern side of the Parâng Mountains, at 1924 m a. s. l., near the origin of the Lotru River, just above the upper edge of the *Pinus mugo* belt. The lake is surrounded by the Pietrele and Mohanu Peaks and by the Rusu and the Păpusa Slopes. It is over 3 hectares and has an average depth of 3.66 m (the deepest point = 9.33 m). According to Pișota [8] the temperature of the lake water at its surface varies between 12 and 13 °C, being only 10 °C at 6 m depth. The transparency of the water is about 5.3 m in sunny days. Total residuum of water is 19.11 mg⁻¹ at 105 °C, total hardness = 0.42 ° (German), alkalinity = 0.15 ml HCl n. l⁻¹. The lake water had the following chemical composition: HCO₃¹⁻ = 6.1 mg. l⁻¹; Cl¹⁻ = 5.35 mg. l⁻¹; Ca²⁺ = 2.00 mg. l⁻¹; Mg²⁺ = 0.60 mg. l⁻¹; oxygen = 9.86 - 10.6 mg. l⁻¹ and carbon dioxide = 2.74 mg. l⁻¹.

According to Oltean [6] the benthos of the lake exhibits mainly epilithic algae, mostly diatoms, including some very interesting acidophilous, alpine forms (*Navicula subtilissima*), but lack mosses and vascular vegetation. The lake phytoplankton had not yet been documented.

Material and Methods

Netplankton samples (No. 25) were collected at the end of September 1992 from the shore of the lake and preserved in 4% formalin on the spot. In the laboratory small amount of the sediment was repeatedly rinsed with distilled water, dried on cover glasses and mounted on glass slides for light microscopic observations. To perform electron microscopic (TEM) observations, the phytoplankton deposit previously rinsed in distilled water was dropped directly on formvar-coated grids, dried and examined by means of the BS 500 TESLA transmission electron microscope of the Institute of Biological Research (Electron Microscopy Laboratory of the "Babeş-Bolyai" University).

Results and Discussion

LM observations revealed a very peculiar and unexpected bloom, possibly of *Mallomonas acaroides*. Some accessory species identified in LM were *Synechococcus aeruginosus*, *Chroococcus turgidus*, *Fragilaria crotonensis*, *Melosira italica* subsp. *subarctica*, *Pinnularia burkii*, *Stephanodiscus hantzschii*, *Botryococcus braunii*, *Arthrodesmus incus*, *Staurastrum polymorphum*, *S. polytrichum*, *Xanthidium cristatum*, and *Petalomonas mediocanellata*. They have probably been washed into the lake from the surrounding boggy areas or from the benthos of the shore.

Subsequent TEM examination of the samples confirmed our preliminary presumption and proved that the *Mallomonas* population according to Asmund [1] and Fott [3] belongs indeed to *M. acaroides* Perty emend. Ivanov, namely to its type variety (Figs. 1 A-F).

Mallomonas acaroides is a common, highly tolerant form, with wide ecological amplitude and worldwide distribution, mostly occurring in eutrophic habitats forming sometimes very rich populations. It also exhibits high morphological variability, but the validity of the described infra-specific taxa [1, 3] is rather doubtful. Therefore, some of the authors like Asmund and Kristiamnen [2] postulated that the varieties earlier described like vars. *echinospora* (Nygaard) Fott, *galeata* Harris & Bradley and *striatula* Asmund are within the variation range of var. *acaroides*. In our opinion such treatment of these taxa oversimplifies the taxonomy of *M. acaroides*. Some of the populations have distinct micro-morphological pattern and special ecological preferences. Most investigations documented that the variations in the architecture of scales and bristles exhibit a wide range of variations even in the frame of the same local populations or even in

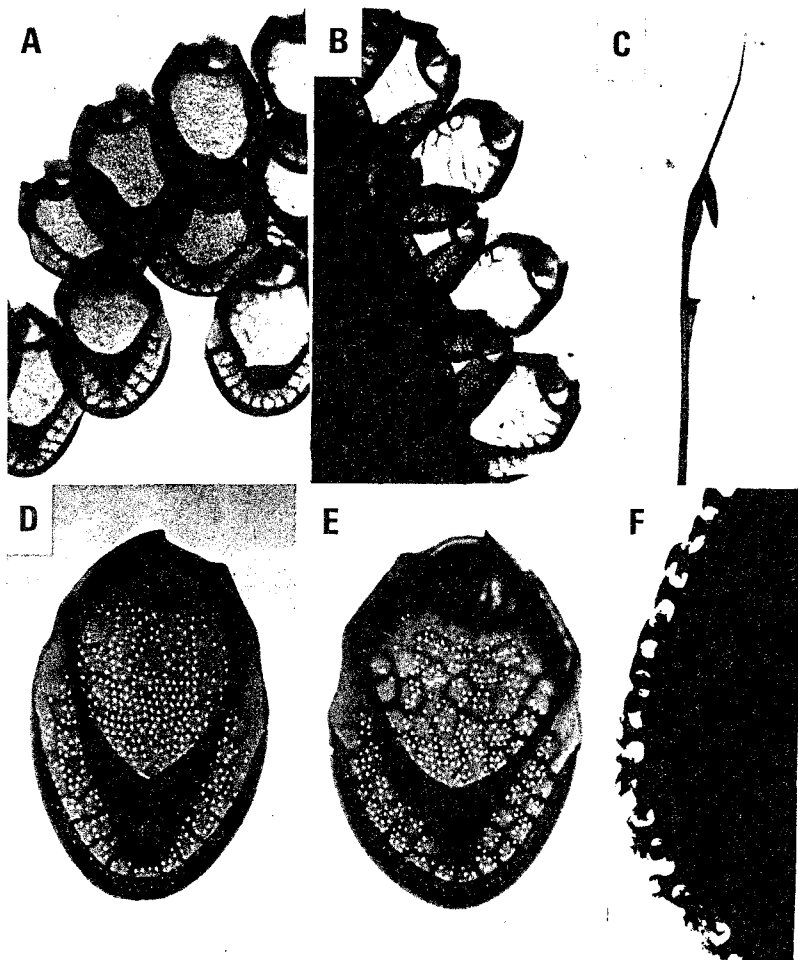


Fig. 1 A-F. Direct electron micrographs of *Mallomonas acaroides* var. *acaroides*. A, B: Group of scales with and without secondary, reticulate meshwork. C: Helmet-shaped tip of bristle. D, E: Isolated body scales with and without meshwork on the shield. F: Part of stomatocyst showing the peculiar splayed spines. A-C, F: X 5,650; D, E: X 11,500.

single cells. However, one should note that it might occur in uniform populations too, like the one recorded herein.

Mallomonas acaroides has earlier been recorded forming a water bloom in a Bulgarian mountain lake [4], our record being the second subalpine mass occurrence of the species at least in Eastern Europe. *Mallomonas acaroides* var. *acaroides* was previously recorded in Romania occurring singly in the soft-water Bucura Lake, the Retezat Mountains [7].

The population herein dealt with is quite outstanding. The cells are ovoid to elongate ellipsoidal, almost cylindrical covered all over with bristles. All bristles are very long, fine, slightly bent, smooth and slender, with the peculiar helmet-shaped distal structure ending in a thin, \pm long distal spine (Fig. 1C). The proximal portion of the shaft may be provided with a few recurved teeth. Bristles with simple, uniformly tapering, pointed ends are very rare. They may equally be provided in their proximal portion with few, recurved teeth. No typical serrated bristles could be observe, which are so characteristic for populations occurring in shallow eutrophic ponds and lakes [7]. The scales are typical (Figs. 1 A, C), mostly without or sometimes with faintly elaborated reticular secondary layer on the shield. In few cells a rather marked meshwork could be detected with more or less polygonal meshes on the shield or on both shield and flange (Figs. 1 B, E).

Stomatocysts are broadly ellipsoidal with densely spaced splayed spines (Fig. 1F). The spines has a "cylindrical middle section and a flattened apex with a ring of finger-like projections" [9].

The appearance of the cell bearing long slender bristles denotes true planktonic condition in the Călcescu Lake. The thin scales are probably due to the low mineral content of the lake water.

This population in some respect resembles *Mallomonas acaroides* var. *muskokana* Nicholls [5], but readily differs in lacking the ornamentation pattern of the dome and the tooth on the side opposite of the helmet opening.

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ÎNFLORIRE DE *MALLOMONAS ACAROIDES* PERTY EMEND. IVANOV ÎN LACUL ALPIN CÂLCESCU DIN MUNȚII PARÂNG, ROMÂNIA

(Rezumat)

Eșantioanele planctonice colectate în septembrie 1992 din Lacul Câlcescu, care practic se confundă cu obârșia Lotrului, situat la limita superioară a jnepenișului (alt. 1924 m s. m.), în circuitul glaciara străjuit de vârfurile Pietrele și Mohanu, la poalele povârnișurilor Rusu și Păpușa, au arătat existența unei înfloriri interesante de *Mallomonas*. Pe baza observațiilor efectuate cu ajutorul microscopului electronic de transmisie specia a fost identificată drept *M. acaroides* var. *acaroides*. Comunitatea planctonică a fost aproape exclusiv alcătuită din indivizii speciei dominante, exceptând celule izolate de *Synechococcus aeruginosus*, *Chroococcus turgidus*, *Fragilaria crotonensis*, *Melosira italica* subsp. *subarctica*, *Pinnularia burkii*, *Stephanodiscus hantzschii*, *Botryococcus braunii*, *Arthrodesmus incus*, *Staurastrum polymorphum*, *S. polytrichum*, *Xanthidium cristatum*, and *Petalomonas mediocanellata* care au fost probabil antrenate în apa lacului de pe povârnișurile înmlăștinite abrupte. Populația de *M. acaroides* var. *acaroides* a fost foarte uniformă, alcătuită din indivizi adaptați la viața planctonică, purtând sete silicioase deosebit de lungi și delicate. Scvamele care au format armura silicioasă a celulelor au fost tipice, deosebit de delicate, de regulă cu scutul lipsit de ornamentații reticulate. Doar puține exemplare aveau o suprastructură reticulată bine dezvoltată. Lucrarea de față semnalează pentru prima dată o înflorire de *Mallomonas* într-un lac glaciara, asemănător cu cel descris din Bulgaria [4].