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Scaled Chrysophyceae From Lake Itasca Region

I. *Mallomonas*

DANIEL E. WUJEK,* MICHAEL M. WEIS,** ROBERT A. ANDERSEN***

ABSTRACT—By means of electron microscopy, phytoplankton samples from the Lake Itasca region were examined for the silica-scaled chrysophycean genus *Mallomonas*. Seventeen taxa were observed: 15 are new for Minnesota, of these 15, seven are also new reports for the continental United States.

The freshwater algal flora of the Lake Itasca region has been documented in a series of articles by Meyer and Brook (1968, 1969a, 1969b). Included in these floristic lists are a number of silica-scaled chrysophytes, all based on light microscopy. No electron micrographs of the scale or bristle structure of Chrysophycean material from Minnesota were known to have been published to the time of this publication; and as knowledge of the ultrastructure of the scale and bristles are essential, and in most cases necessary for correct determination, it was considered of value to publish the present electron micrographs.

This presentation is intended to be in a series of papers detailing the silica-scaled chrysophytes of Minnesota. This first part pertains to the genus *Mallomonas* Perty. It contains more described species than any other genus in the Synuraceae. *Mallomonas* species are unicellular, free-living, photosynthetic freshwater algae. Cells are covered with a siliceous layer of scales with or without spines and moveable bristles.

Preparation of Samples for Electron Microscopy

Forty-nine samples were collected in the region of Lake Itasca, Minnesota, with a plankton net during the summers of 1977 and 1980. Preparation of samples for electron microscopy used the technique for diatom cleaning in order to remove organic matter (Patrick and Reimer, 1966). Material was heated in nitric acid and a small amount of potassium dichromate. The samples were then brought to neutral through a series of decantings with distilled water. From the concentrated sample, one to two drops were air-dried on Formvar-coated grids. Electron micrographs were taken on a Philips EM 300 or a Siemens Elmiskop transmission electron microscope.

Those species marked with an asterisk are new records for Minnesota. Those marked with a double asterisk are new

also to the continental United States. Figures are numbered individually on the full-page plate.

The Species Observed

***Mallomonas aerolata* Nygaard (Fig. 1)

A rarely observed species, it has been reported only from Denmark (Asmund, 1959) and Japan (Takahashi, 1975). We observed it in both the North and South Deming Ponds.

Mallomonas caudata Iwanoff em. Kreiger (Fig. 2).

M. caudata is a very widely distributed species. We observed it from East and West Twin Lakes.

**Mallomonas cratis* Harris and Bradley (Fig. 3)

This species was collected from the Wild Rice River (Hwy. 200). It has been previously observed from the U.S., Europe and Japan.

**Mallomonas cratis* var. *asmundiae* Wujek and Van der Veer (Fig. 4)

Originally described from Holland, it has since been observed from Arkansas (Andersen, 1978) and Texas (Marquis, 1977). Representative scales were observed from Darling Pond.

**Mallomonas crassisquama* (Asmund) Fott (Fig. 5)

This taxon was first described by Asmund (1959) from material collected in Denmark. Asmund's report pointed out that this species is distributed widely in the northern latitudes. Our collections bear this out, as it was the most commonly encountered species in our collections. Our specimens were found in Long Lake, North Deming Pond, Josephine Lake, West Twin Lake and a pond at mile marker 53 on Hwy. 113 in Clearwater and the edge of Hubbard counties in Minnesota.

***Mallomonas eao* Takahashi (Fig. 6)

We found a few scales of this species in our sample from Darling Pond. In addition to Europe and Asia, this taxon has been reported from North America (Alaska) by Asmund and Takahashi (1969).

***Mallomonas grata* Takahashi (Fig. 7)

An infrequently observed species world wide, we observed scales belonging to *M. grata* from Darling Pond.

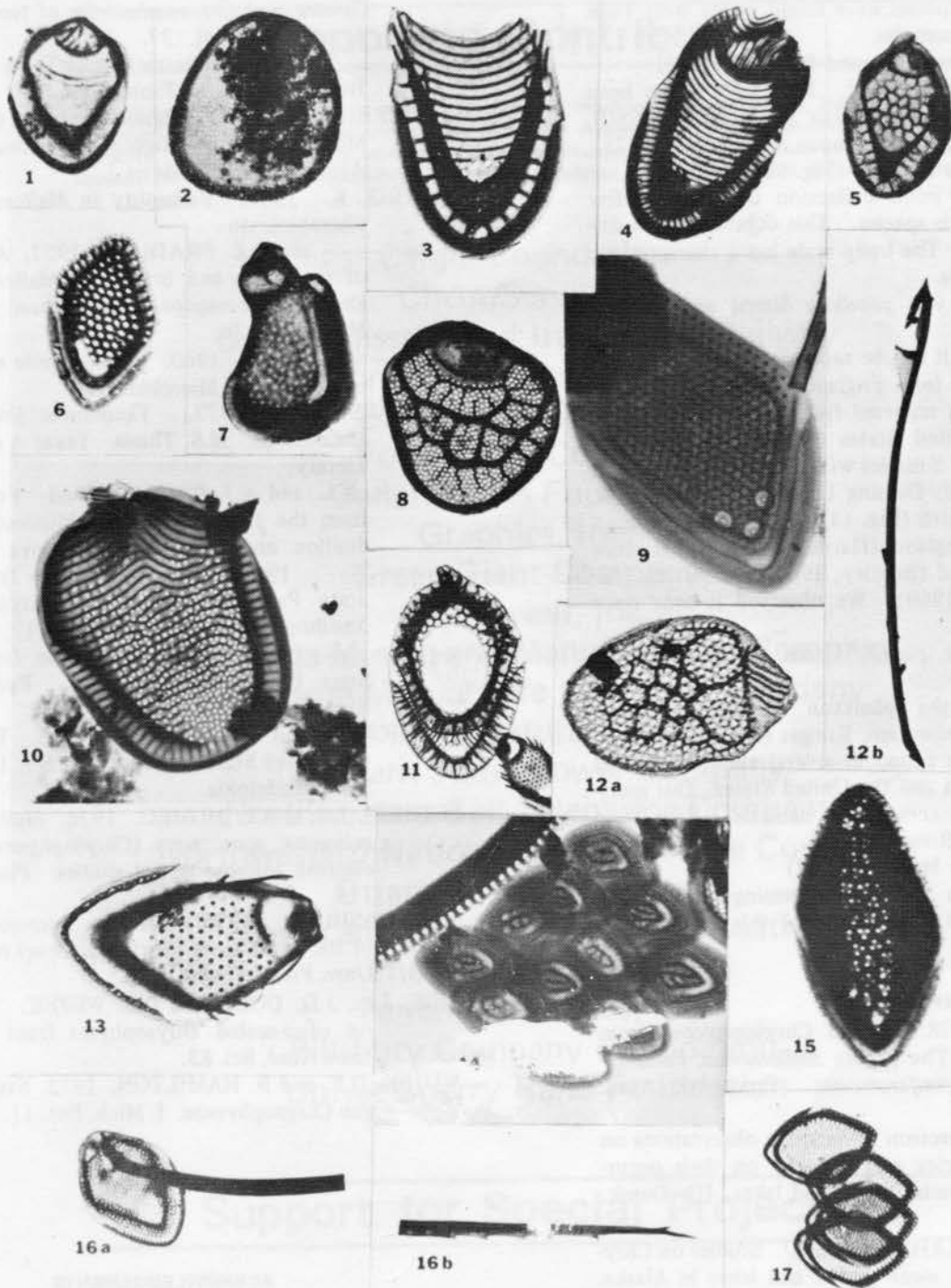
**Mallomonas glabra* (Bourrelly) Asmund (Fig. 10)

This species, originally described as a variety of *M. reginae*, has also been described as *M. transsylvanica* Peterfi and Momeu (1976). This taxon is one of the few readily

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Itasca Algae

Mallomonas species. Fig. 1. *M. aerolata*, x6,800. Fig. 2. *M. caudata*, x6,800. Fig. 3. *M. cratis*, x10,200. Fig. 4. *M. cratis* var. *asmundiae*, x6,800. Fig. 5. *M. crassisquama*, x6,800. Fig. 6. *M. eoa*, x10,

200. Fig. 7. *M. grata*, x6,800. Fig. 8. *M. heterospina*, x6,800. Fig. 9. *M. mangofera*, x18,000. Fig. 10. *M. glabra*, x10,000. Fig. 11. *M. insignis*, x6,800. Fig. 12. *M. multiunca*, a. scale, x6,800 b. helmet bristle x3,200. Fig. 13. *M.*

papillosa, x10,200. Fig. 14. *M. pillula*, x10,000. Fig. 15. *M. pumilo*, x10,200. Fig. 16. *M. tonsurata*, a. scale, x6,800 b. tip of bristle, x6,800. Fig. 17. *M. conifera*, x6,800.

recognized using light microscopy (LM). It occurred in Darling Pond. It previously was observed in the U.S. from North Carolina by Bourrelly (1957) using LM.

**Mallomonas heterospina* Lund (Fig. 8)

A widely distributed *Mallomonas* species, our micrographs closely resemble previous observations. It was found

in the Beaver Pond on Hwy. 4, Wild Rice River and the North Deming Pond, fitting well its occurrence in other highly eutrophic waters in other parts of the world.

**Mallomonas insignis* Penard (Fig. 11)

The scales are of the same ultrastructure as previously reported by various authors. First illustrated from the U.S., but not identified by Wee *et al.* (1976) from Iowa,

it has since also been reported from Arkansas (Andersen, 1978). Scales of this species were found in the West Twin Lake and Darling Pond samples.

*****Mallomonas mangofera* Harris and Bradley (Fig. 9)**

It was found in Darling Pond. Previously it has been described only from England (Harris and Bradley, 1960), Scotland (Bradley, 1966) and Japan (Takahashi, 1975).

*****Mallomonas multiunca* Asmund (Fig. 12)**

The South Deming Pond collection contained a few scales and bristles of this species. This organism has a distinctive helmet bristle. The body scale has a characteristic ribbing on the dome area.

****Mallomonas papillosa* var. *papillosa* Harris and Bradley (Fig. 13).**

A very small species, it can be recognized only by means of EM. First described from England (Harris and Bradley, 1957), it has since been reported from a number of countries, including the United States (Wujek and Hamilton, 1972; Andersen, 1978). Samples with this taxon were from the North Deming Pond, Deming Lake and Darling Pond.

*****Mallomonas pillula* Harris (Fig. 14)**

First observed in England (Harris, 1967), it has since been observed in Iceland (Bradley, 1964) and Alaska (Asmund and Takahashi, 1969). We observed it only once from Darling Pond.

****Mallomonas pumilo* var. *pumilo* Harris and Bradley (Fig. 15)**

It was found in the plankton of Darling Pond. *Mallomonas tonsurata* Teiling em. Kreiger (Fig. 16)

This species has been found in several eutrophic ponds and lakes in Europe, Asia and the United States. Our specimens were collected in comparable habitats: East Twin Lake and the Wild Rice River.

*****Mallomonas coronifera* Matv. (Fig. 17)**

Our collections from the North Deming and Darling ponds represent the first observations of this species from North America.

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