Species of the Torquata Group of *Mallomonas*

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SUMMARY

A new species of the torquata group of the genus *Mallomonas* is described by light and electron microscopes. A list is given of those members of the torquata group which have been published with illustrations obtained with the use of light and electron microscopes. A few of the torquata group which have been published only with light microscope illustrations are listed and discussed. It is considered that no clear decision about their nomenclature can be reached without an electron micrograph of the scales.

OBSERVATIONS

Mallomonas allantoides sp. nov. (Fig. 3 to 6; Pl. 1, fig. 1 to 5)

Holotype (Pl. 1, fig. 1)

Latin diagnosis. Cellula ferme valde elongata, evidente flectens, aliquando formam commutans in momenta temporis aliquantum. Flagellum breve. Squamae in factinones tres divisae: circa quinque squamae collaris, permultae squamae corporis et squamae postremae paucae. Squamae collaris erectes, triquetrae alliquanto procerae, latus sinistrum paulum concavum, latus dextrum convexum, cupola forte constituta, cuspidata, nonnumquam setam brevem ferens. Scutum signatum squamarum corporis simile, margo recurvata, lata in latere convexo et basi scuti, finem faciens prope basim lateris concavi, sed continuata ad cupolam appendice scuti. Squamae corporis rhomboidales, productae transverse, cupola invalida, margo recurvata, praesens in latera due cupolae opposita. Scutum ora crassa et superficie crassitudinibus reticulatis inscriptum, macula una quaeque in tres aut quattuor divide. Squamae postremae minores, squamae ultimae minimae, aliquae squamarum postremarum reticulo inscriptae. Squamae ultimae ferme spinas attenuatas ferentes, non scripta ferme. Cellula 13 ad 47 μm . longa, 5 ad 9 μm . lata, squamae collaris et corporis $2.5 \times 4 \mu\text{m}$. Cystum 12 ad 15 μm . in arta cellula materna. Setae 6 ad 8 μm . longa, spina 3 ad 9 μm . longa.

English diagnosis. Cell normally much elongated, distinctly flexible, sometimes changing its shape in minutes. Flagellum short. Scales comprising three groups: about five collar scales; numerous body scales; a few rear scales. Collar scales erect, triangular, rather long; left side slightly concave, right side convex, dome strongly developed, pointed, sometimes bearing short bristle. Shield marked as shields of body scales. Flange recurved, broad on convex side and base of shield, ending near base of concave side but joined to dome by appendage. Body scales rhomboidal, transversely elongated, dome feebly developed, flange recurved, developed on two sides opposite dome, shield with thickened edge and surface marked with reticulate thickenings, each mesh divided into three or four. Rear scales smaller, last scales smallest, some rear scales with

reticulate marks. Last scales usually unmarked but bearing tapering spines. Cell 13 to 47 μm . long, 5 to 9 μm . wide, collar and body scales $2.5 \times 4 \mu\text{m}$. Cyst 12 to 15 μm . in diameter in close fitting mother cell. Bristles 6 to 8 μm . long, spines 3 to 9 μm . long.

Occurrence. The species is rare in the Reading district (Berkshire, England) and I have found it in only two localities. The type locality was a roadside pond now filled-in; the other pond was on gravel and surrounded by trees and rhododendrons. Both ponds are on what appeared to be poor land. The specific epithet *allantoides* means sausage-like, to suggest the organism's shape.

Fig. 1 to 6. 1, *Mallomonas doignonii* perfect form. 2, *M. doignonii*, imperfect form. 3, *M. allantoides*, encysted. Fig. 4 to 6, *M. allantoides*, perfect forms showing changes of shape.

DISCUSSION

Mallomonas allantoides is of interest in being the most flexible *Mallomonas* species that I have seen. It has a long slender cell which does not change much in width until it approaches encystment. Then the armour stretches until it is nearly spherical, enclosing a spherical cyst.

There are only two other species of the torquata group of the genus *Mallomonas* bearing spines which have been examined with both light and electron microscopes. These are *M. doignonii* Bourrelly, 1951; Harris & Bradley, 1957; and *M. eoa* Takahashi, 1963. Of these species *M. allantoides* has the longest cell and its cell has unusual flexibility; *M. eoa* has the longest rear spines, while *M. doignonii* is much the same length as *M. eoa* but has much shorter spines; *M. doignonii* also has a marked rigidity in its armour which is difficult to break up, at least in its perfect form. The three species may be distinguished at once by the electron micrograph of the scales. The *M.*

doignonii scale has thickened striations, usually vertical; *M. allantoides* scale gives the impression of having one network superimposed upon another which is less well marked; *M. eoa* has a single close network of circular holes. *M. doignonii* Bourrelly 1951 is the same as that figured by Harris & Bradley (1957) as *M. coronata*, Pl. I, fig. 7, and discussed in Harris & Bradley (1960).

An imperfect form of *M. allantoides* (Pl. I, fig. 2) has some well-developed rear spines, but as is usual in a dried specimen at this stage, the armour has collapsed and partly disintegrated. Fig. 1 is a perfect form of *M. doignonii* and Fig. 2 an imperfect form of it which although short and with fewer body scales has fully developed rear spines.

Species of the torquata group which have been studied with both light and electron microscope

Species with rear spines over 1 μ m. long:

M. doignonii Bourrelly 1951, Harris & Bradley 1957, 1960;

M. eoa Takahashi, 1963; this includes *M. clavus* Bradley, 1964;

M. allantoides, present paper.

Species without rear spines but often showing rear points less than 1 μ m. long:

M. pumilio var. *schwemmlei* Glenk, 1956; electron-microscope illustrations, Fott & Ettl, 1959, see below;

M. pumilio Harris & Bradley, 1957, 1960;

M. pumilio var. *silvicola* Harris & Bradley, 1960;

M. pumilio many unnamed varieties, this periodical;

M. phasma Harris & Bradley, 1960;

M. mangofera Harris & Bradley, 1960;

M. grata Takahashi, 1963.

M. pumilio var. *schwemmlei* was first described with the light microscope by Glenk (1956) as *Mallomonas schwemmlei*. Its electron micrograph was then published, together with a good light micrograph showing its general habit, by Fott & Ettl (1959). This was before it was fully realized that the rear point was a rigid part of the scale and not capable of change into a spine. I have therefore renamed it *M. pumilio* var. *schwemmlei*.

There are three species of *Mallomonas* of the torquata group with rear spines that have been described since 1940 but with the light microscope only. They all have a certain similarity, and bearing in mind the variation in shape which may occur in one species and the variation in interpretation of very small objects, I believe that an electron micrograph of the scale is the only way to compare them.

These three species are:

M. coronifera Matvienko, 1941. Ukrainian material;

M. lefeuvrieri Villeret, 1954. French material;

M. coronifera Perman & Vinnikova, 1955. Czech material.

There is a species with a small cell and no spines, *M. potsdamiensis* Bethge, 1954. We have information with the light microscope only but it deserves electron microscope study.

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EXPLANATION OF PLATE

Mallomonas allantoides

- Fig. 1. Whole perfect cell. $\times 4000$. Direct electron micrograph.
- Fig. 2. Whole imperfect cell. $\times 4000$. Replica.
- Fig. 3. Collar scale. $\times 10,000$.
- Fig. 4. Body scale. $\times 10,000$.
- Fig. 5. Rear scales, two with spines. $\times 10,000$.

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