

Studies on Genera *Mallomonas*, *Synura*, and Other Plankton
in Fresh-water with the Electron Microscope. IV.
On two new species of *Mallomonas* found in ditches
at Tsuruoka in the North-East of Japan.

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There are many studies on *Mallomonas*: Asmund (1955, 1959, 1961), Bourrelly (1957, 1961), Deflandre (1932), Fott (1955, 1959), Harris (1953, 1958), Harris & Bradley (1957, 1958, 1960), Smith (1950), Teiling (1946) and Takahashi (1959-1961). The present writer has carried out the studies on seasonal succession of *Mallomonas* and some other plankton in three ditches at Tsuruoka Park in the North-East of Japan, and found two new species of *Mallomonas* belonging to "*Torquatae*" (Harris, 1960). And he explains the results of his examinations on these species with optical and electron microscope.

The writer wishes to express his sincere thanks to Prof. Dr. Noboru ABE for the kind guidances in all his studies, and his gratitude is also due to Dr. Katharine HARRIS, University of Reading, for her suggestions and kindness for the identification of species.

Mallomonas eoa n. sp. (Plates I-III, Figures 1-13)

Cell fusiform; anterior end with collar of about five forward pointing scales bearing curved long bristle; rear end with two to four straight spines. Chromatophore two. Body scales rhomboidal, with thickened rim, posterior body scales asymmetric. Collar scales elongated, with dome, asymmetric, one side slightly concave. Dome relatively small, partially ornamented with round mesh pattern. Shield ornamented with mesh pattern with round pores arranging in crossing rows. Flange folded at proximal half, possesses minute papillae in two rows on distal half. Bristle smooth and taper. Rear end spine smooth, projects from distal end of ovoidal scale without mesh pattern. Cyst unknown.

Dimensions; Cell $16-31\mu \times 4.5-9\mu$, collar scale $3-4\mu$ long \times half as broad, body scale $1.4-3\mu \times 1-2.4\mu$, bristle $6-14\mu$, rear end scale with spine $1.4-2\mu \times 1-1.4\mu$, spine $2.8-17\mu$.

Occurrence; November to February in ditches at Tsuruoka Park.

The type was found in the third ditch at Tsuruoka Park.

The present species is very much like *Mallomonas coronifera* and *Mallomonas doignonii* under the optical microscope (Fott, (1959), Figs. 12-14 : Bourrelly, (1957), Pl. V, Fig. 2), but it is distinguished clearly from these species in the structure of scales which observed by means of the electron microscope (Fott, (1959), Tab. X[VII] : Harris, (1957), Pl. II, Fig. 1).

The following are what the writer brought the fine structure of scale to light by using replicas,

The crossing rib near the dome shown in the direct electron micrograph is a bordered ridge between the inner plate and dome of scale, and it is not seen on the outer surface of scale (Figs. 4, 13). The outer plate of shield is elongated toward distal end, and becomes the outer surface of the dome.

Minute perforations arranged evenly on the inner surface of scales (Fig. 7).

Rear end scales with a straight spine have not the mesh pattern and perforations. And the spine, projecting from the distal end of scale, has two winglets which enlarged from the outer plate of scale at the basal portion of it as is shown in figures 10 to 12.

Direct electron micrographs of the present species in fixed materials from paddy field are figured and explained in previous paper of the present writer as *Mallomonas* sp. No. 20 (Takahashi, 1960).

***Mallomonas grata* n. sp.** (Plates [V-VII], Figures 14-26)

Cell ovoid; anterior end with collar of five forward pointing scales bearing curved short bristle; rear end rounded, with minute projections. Chromatophore single, H-shaped. Body scales rounded rhomboidal, slightly asymmetric, with a minute projection at distal end. Collar scales elongated oval, with dome, asymmetric, one side strongly convex, the other side slightly concave. All scales possess V-rib and folded flange. Shield with papillae and large rounded depressions (1 to 7) and with a window at basale portion of V-rib. Bristle smooth, thick and curved, with a triangular foot, pointed acutely at distal end. Cyst unknown.

Dimensions; Cell 7.4-13 μ x 4-7 μ , collar scale 2.3-4.3 μ x 2-2.4 μ , body scale 2-4 μ long x half as broad, bristle 5 μ .

Occurrence; September to December in ditches at Tsuruoka Park, maximum occurrence in September.

The type was found in ditches at Tsuruoka Park.

The scales are thick, so that the fine structure does not appear clearly in the direct electron micrograph, but the following are what the writer brought the fine structure of scale to light by using replicas. The outer side of the dome is relatively flat, with several elongated papillae in a row at distal end (Fig. 14), and in the inner side of scales, the dome is divided from the shield by crossing ridge, the base of dome is rectangular. (Figs. 20, 21), but on the other hand the former is observed like a cristated edge, the latter as a crossing dark line between the dome and shield in direct electron micrographs (Fig. 17). The inner surface of shield is plane, and several micropores perforate at the window (Fig. 20). The foot of bristle inserts into the inner side of the dome through a pore which is opened towards the concave side of scale (Fig. 22).

Depressions on the body scale are arranged in two rows between the one depression at distal end and a window, or arranged longitudinally in a row (Figs. 17, 22), but those of body scales at posterior portion of cell are connected together and become one elongated depression with several series of transversally arranged papillae (Figs. 25, 26).

Note; Harris who arranged species of *Mallomonas* in a new scheme of classification

extending her previous proposal, says, "The proposed scheme of classification was developed as a result of the high resolving power of the electron microscope which enabled us to interpret features which can be faintly seen with the optical microscope." (Harris, 1960), and says again "The fine detail of the scales and bristles of *Mallomonas* revealed by the electron microscope are of great importance in the classification and identification of the species." (Harris, 1957). From the results of his examination on *Mallomonas* species up to this time, the present writer quite agrees with her opinion.

Summary

Two new species of *Mallomonas* found in ditches at Tsuruoka in the North-East of Japan.

And named as follows,

Mallomonas eoa

Mallomonas grata

The two species belong to "*Torquatae*" (Harris, 1960).

Characteristics of the two species are described and figured in this paper, and their electron microscopical structure also explained.

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摘 要

Mallomonas, *Symura* 属及び他の淡水産プランクトンの電子顕微鏡による研究 IV.

鶴岡市公園堀より採集された *Mallomonas* 属の2新種について

高 橋 永 治

鶴岡市公園を囲む3つの堀のプランクトンの消長を観察して来たが、*Mallomonas* 属、*Torquata* 群に属する2種の新種を見出したので命名し記載した。又2新種のもつ微細構造を電子顕微鏡を用いて明らかにしたので、その結果について記述した。

Mallomonas eoa n. sp. (Plates I-III, Figures 1-13)

細胞は紡錘形、前端にカラーを持ち、後端には2~4本の真直な棘を持つ。色素体は2個、鱗片は網状構造を持つ、カラー鱗片はドームを持ち一本の剛棘を持つ。

大きさ：細胞は $16-31\mu \times 4.5-9\mu$ 、鱗片は $1.4-4\mu \times 1-2.4\mu$ 、11月から翌年2月中まで出現する。

光学顕微鏡による観察では、*Mallomonas coronifera*, *Mallomonas doignonii* とよく似るが、電子顕微鏡による観察では、鱗片の構造が全く異なり、明かに区別される。

Mallomonas grata n. sp. (Plates IV-VII, Figures 14-26)

細胞は卵円形、前端に約5本の剛棘のあるカラーを持ち、後端は丸い。色素体は1個で、H字状。鱗片は小さい突起と1~7個の大きい凹孔を持つ。カラー鱗片はドーム(基部は長方形)を持ち一本の剛棘を持つ。

大きさ：細胞は $7.4-13\mu \times 4-7\mu$ 、鱗片は $2-4.3\mu \times 1-2.4\mu$ 、9月から12月の間出現する。

光学顕微鏡及び電子顕微鏡による観察の結果此の種は *Mallomonas* 属の他の種と全く異なる。

鱗片の構造はレプリカを用いることによつてのみ明らかにされる。

Explanation of plates

(all figures of electron micrographs without scale are enlarged $\times 15,000$)

Plate I. *Mallomonas eoa*

- Fig. 1. Mature cell, showing two parietal chromatophore and contractile vacuoles.
- Fig. 1a. Collar and body scales, and a rear end spine, $\times 2,000$.
- Fig. 2. Dark field image of mature cell.
- Fig. 3. Scattered scales of one individual.

Plate II. *Mallomonas eoa*

- Fig. 4. Direct electron micrograph of a collar scale.
- Fig. 5. Direct electron micrograph of a body scale.
- Fig. 6. Replica of the outer side of body scales.
- Fig. 7. Inner side of shadowed body scales.
- Fig. 8. Shadowed posterior body scales.

Plate III. *Mallomonas eoa*

- Fig. 9. Shadowed bristle and body scales.
- Fig. 10. Inner side of shadowed rear end scale with spine.
- Fig. 11. Outer side of shadowed rear end scale with spine.

Fig. 12. Replica of the inner side at basal portion of rear end spine.

Fig. 13. Replica of the outer surface of a dome.

Plate IV. *Mallomonas grata*

Fig. 14. Replica of mature cell.

Fig. 15. Mature cell, showing H-shaped chromatophore.

Fig. 16. Direct electron micrograph of mature cell.

Plate V. *Mallomonas grata*

Fig. 17. Direct electron micrograph of collar scale and body scale.

Fig. 18. Direct electron micrograph of body scale.

Fig. 19. Direct electron micrograph of a bristle and a dome.

Plate VI. *Mallomonas grata*

Fig. 20. Replica of a bristle and the inner side of collar scales.

Fig. 21. Replica of the outer side of a collar scale and the inner side of a dome.

Fig. 22. Replica of the outer side of body scales.

Plate VII. *Mallomonas grata*

Fig. 23. Replica of the inner side of a dome inserting a foot of bristle.

Fig. 24. Replica of the inner side of body scales.

Fig. 25. Shadowed body scales at posterior portion.

Fig. 26. Replica of body scales with a elongated depression.

Plate
I

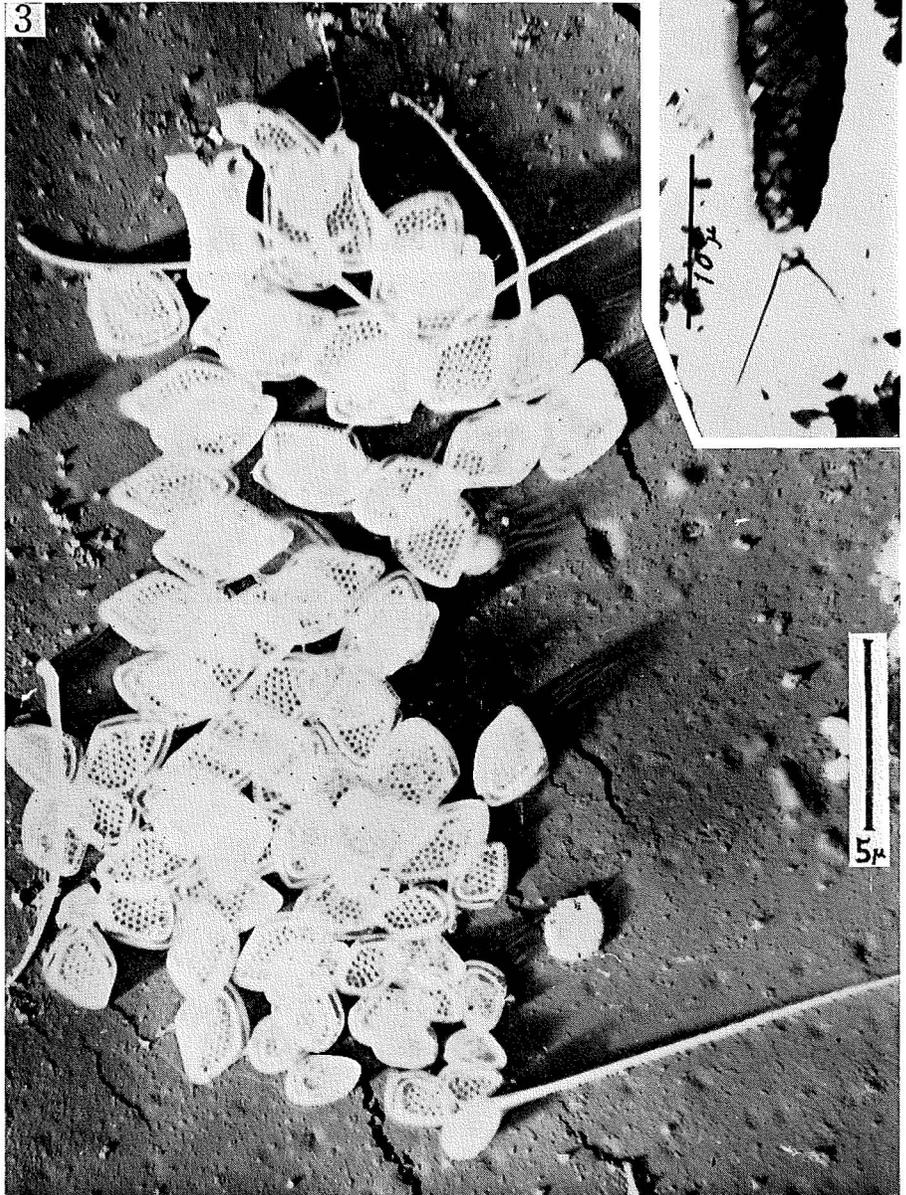
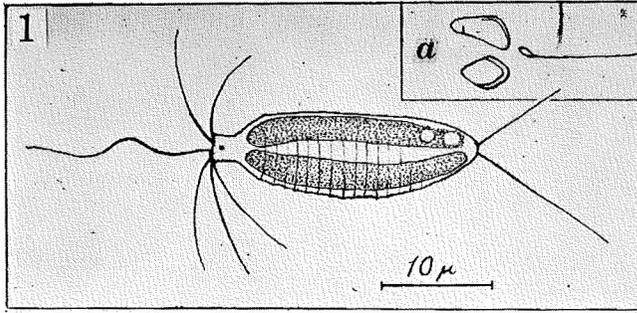


Plate
II

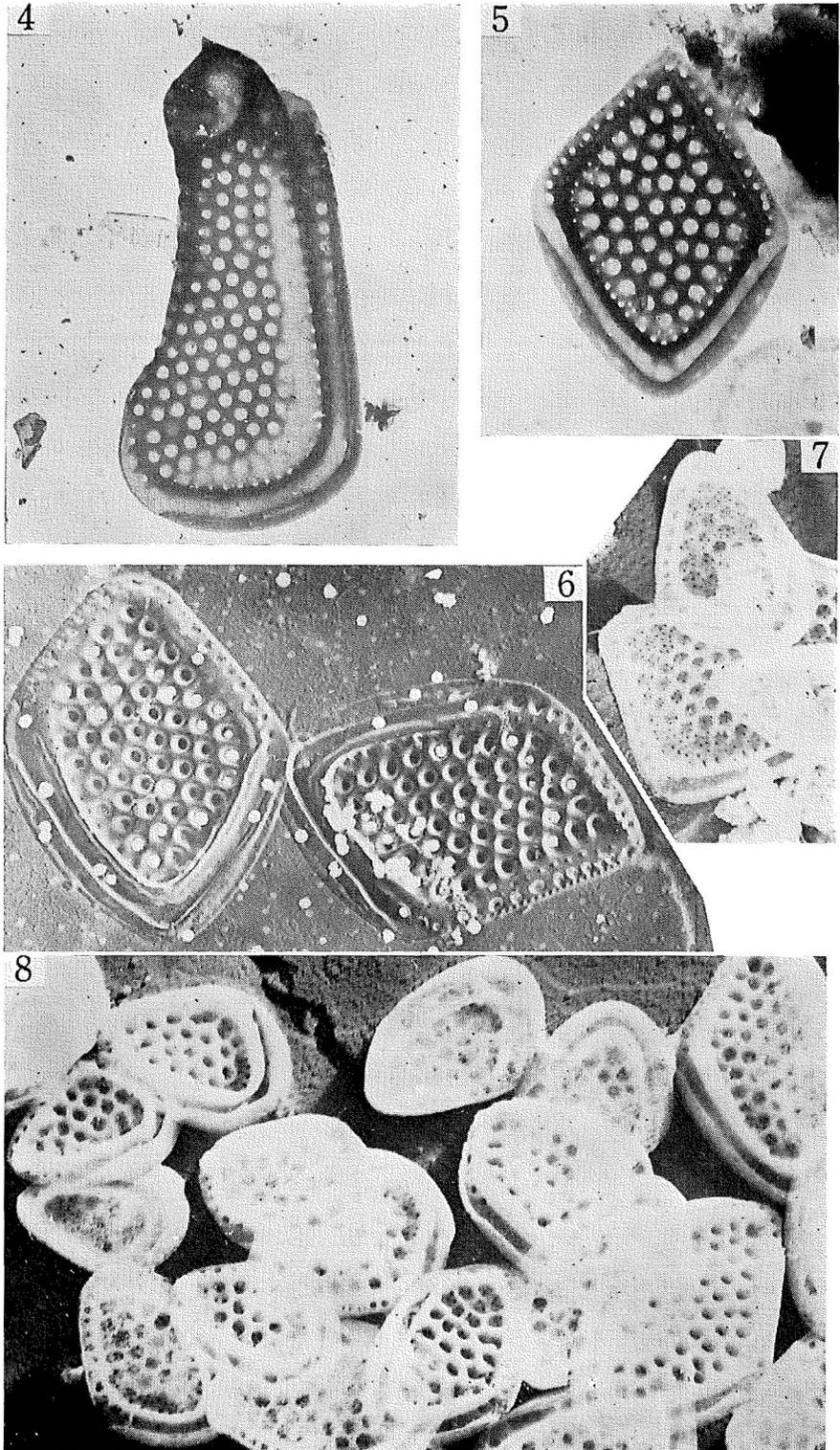


Plate
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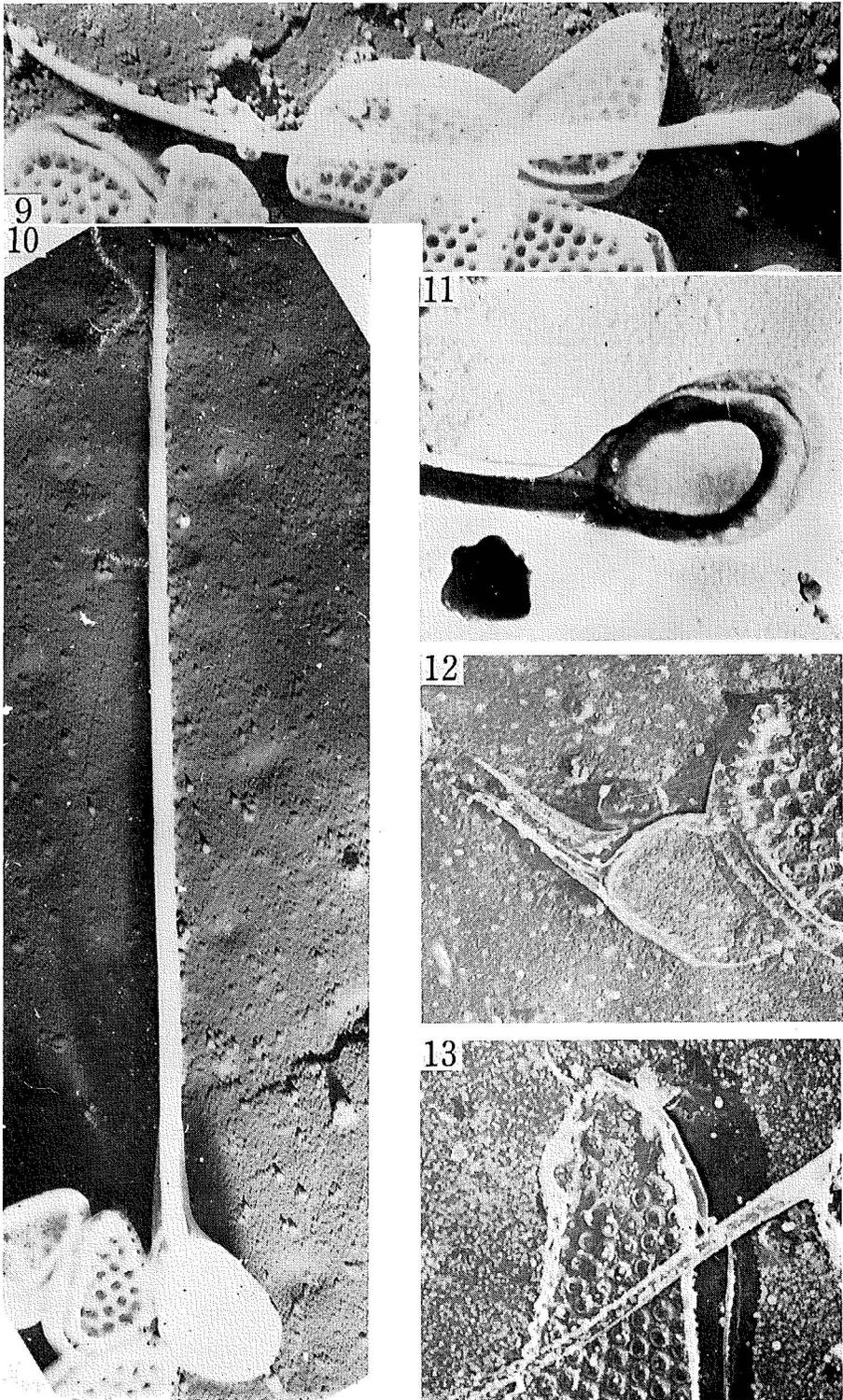


Plate
IV

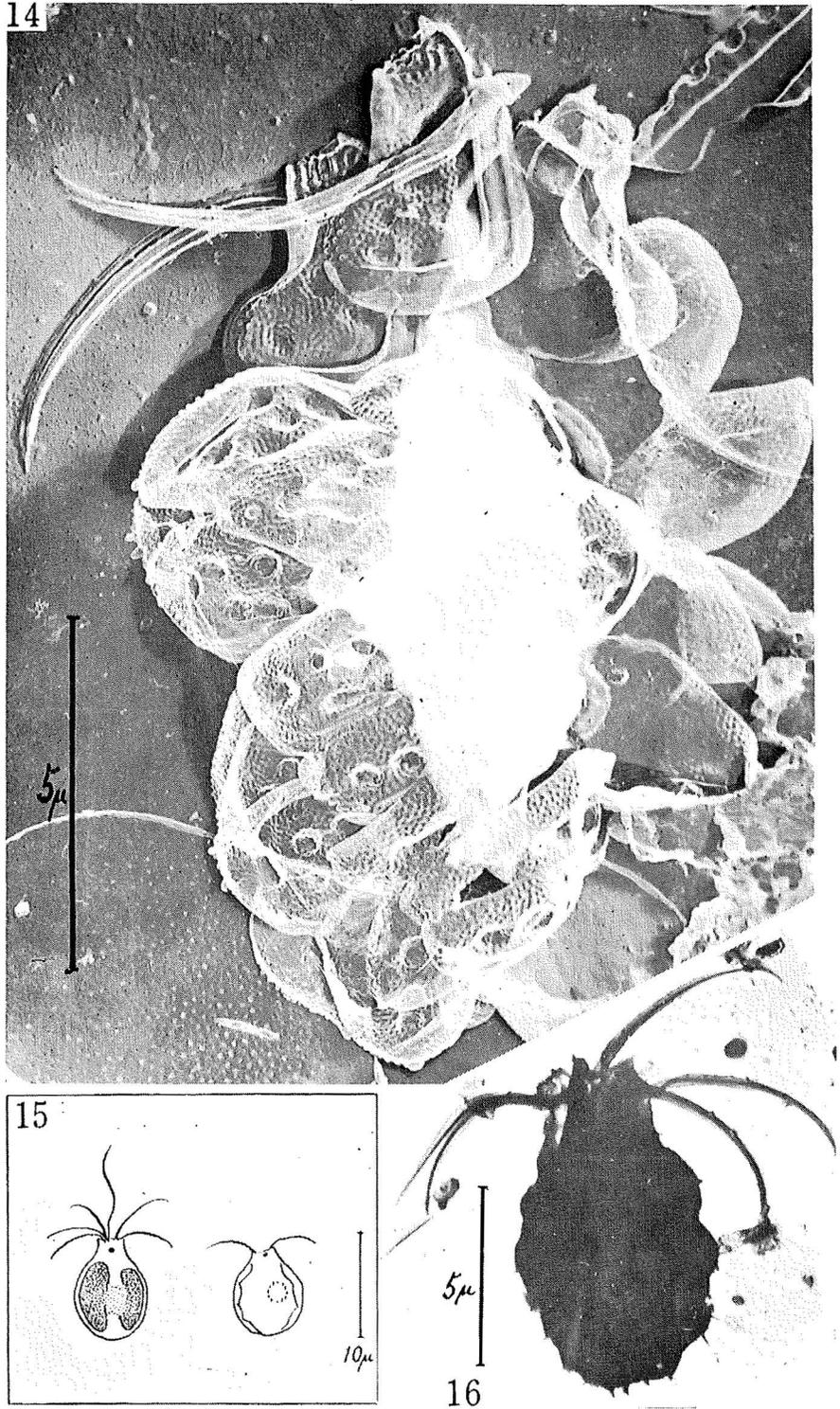
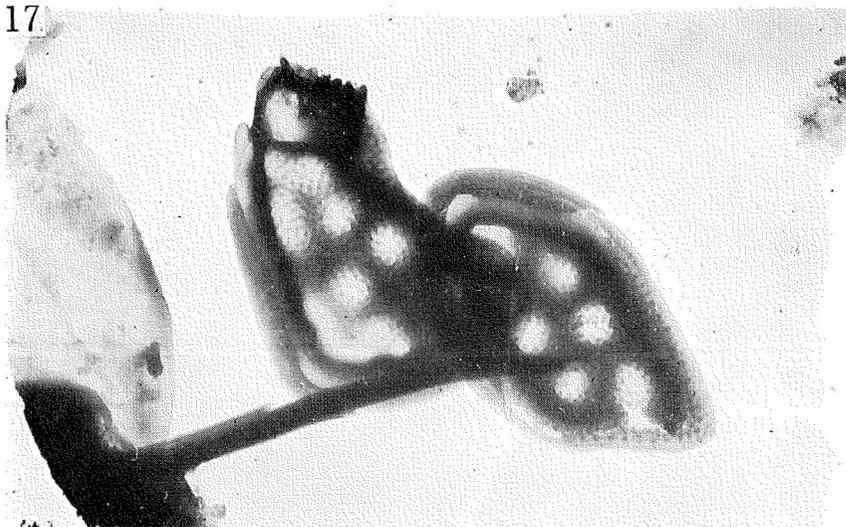


Plate
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18



19

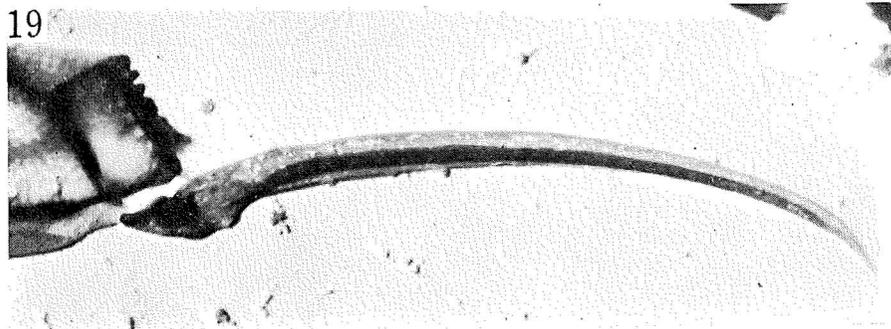


Plate
VI

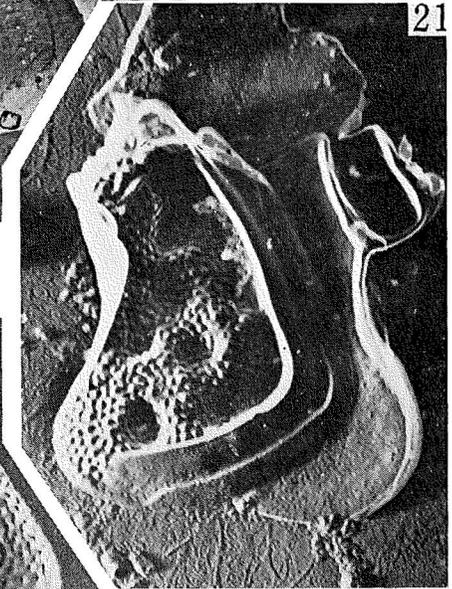


Plate
VII

