Proceedings, Third International Coral Reef Symposium
Rosenstiel School of Marine and Atmospheric Science
University of Miami
Miami, Florida 33149, U.S.A.
May 1977

A TAXONOMIC SURVEY OF THE DIATOMS ASSOCIATED WITH FLORIDA KEYS CORAL REEFS

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ABSTRACT

Coral, coral sand, and scrapings from surfaces of Thalassia testudinum from Western Sambo Reef, Sombrero Reef, and Molasses Reef in the Florida Keys were cleaned of all organic and carbonate material in order to examine the diatoms found in each of these habitats. Observation with scanning electron microscopy and light microscopy showed that each of these habitats has a unique and diverse diatom flora. The coral was characterized by species of Campylodiscus, Podocystis, and Triceratium; the coral sand by Amphora and Diploneis, and the Thalassia by Mastogloia.

KEY WORDS: Diatoms, Coral Reefs, Florida Keys, Phytoplankton, Coral Sand, Thalassia testudinum, Taxonomy, Scanning Electron Microscopy

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Introduction

Of the numerous studies of tropical diatom floras (1-6) none have been undertaken of the diatoms which might be directly associated with coral reef communities. Evidence for the presence of diatom communities on coral reefs has long existed in the recorded changes in the species composition of plankton samples from oceanic to tychopelagic as coral reef areas were approached (7,8). Such compositional changes were attributed to diatoms which had been washed from inside the reefs rather than to diatoms which had been associated with the reefs themselves. Diatom populations have also been overlooked in ecological and energy flow studies of coral reef communities (9,10). Yet, in a study of the microbial ecology of regenerative reef sediments an estimated 100-200 species of diatoms were seen and as many as 1.18×10^6 diatom cells per gram of dry coral sand were recorded (11). This paper presents a taxonomic survey of the diatoms of coral reefs of the Florida Keys and contrasts these communities with those of the immediately adjacent coral sands and the nearby beds of Thalassia testudinum (turtle grass).

Materials and Methods

Coral, coral sand, and Thalassia testudinum were collected in August of 1975 from Western Sambo Reef off Key West, Sombrero Reef off of Marathon Key, and Molasses Reef off of Key Largo. The coral was collected along transects which crossed the reef at right angles to the spur and groove pattern. The coral was selected to give a representation of the coral population of the reef at the particular point of sampling and therefore includes several taxa of both living and dead corals. The coral, coral sand, and material scraped from the surface of the Thalassia were first cleaned of all carbonate matter by placing them in a solution of HCl followed by several thorough washings with distilled water. The material which remained was cleaned of organic matter with sulphuric acid/potassium permanganate/oxalic acid (12). Light microscopic preparations were made by drying the cleaned material onto coverslips and mounting the coverslips, material side down, in Hyrax (R.I. 1.71). For scanning electron microscopy a few drops of cleaned material were suspended in distilled water and filtered onto Nucleopore filters (1 micrometer pores). The dried filters were affixed to the SEM stubs with double sided tape and coated with 5-10 nm of gold/palladium (60/40). These preparations were viewed with a Cambridge Stereoscan S4-10 at 5-30 kV. Taxonomic determinations were made from both light and SEM observations. Detailed explanation of sampling, work up, and statistical analysis of the data is given elsewhere in this volume (13).

Results

Counts to species of 1500 diatoms per habitat per station were made and the counts were combined from each station by habitat. The counts of 4500 diatoms per habitat yielded the following data:

	Coral	Sand	Thalassia
Genera	47	31	33
Species	331	292	207
Gn > 1%	13	8	10
Total*	90.25%	84.83%	95.85%
Sp > 1%	21	29	23
Total*	46.89%	59.00%	75.28%

*Total is the sum of the percentages of all genera/species which comprised 1% or more of the population.

The species characteristic of each habitat are:

Coral

Amphora granulata Gregory
Campylodiscus cordatus Hagelstein
" intermedius Grunow
" Lorenzianus Grunow
" Ralfsii Wm. Smith
Diploneis crabo Ehrenberg
" vacillans (A. Schmidt) Cleve
Grammatophora oceanica var. macilenta Wm. Smith
Navicula directa (Wm. Smith) Ralfs
Nitzschia clarissima Peragallo
Paralia sulcata f. coronata (Ehrenberg) Grunow
" " f. radiata Grunow
Podocystis adriatica (Kützing) Ralfs
Synedra laevigata var. hyalina Grunow
" pulchella Kützing
" undulata Gregory
Triceratium dubium Brightwell
" junctum Schmidt
" junctum var. fossilis Tempère
" orbiculatum Shadbolt
" pentacrinus (Ehrenberg) Wallich

Sand

Achnanthes Hauckiana Grunow
" longipes Agardh
Amphora delicatissima Krasske
" Graeffii (Grunow) Cleve
" laevis var. laevissima (Gregory) Cleve
" proteus var. contigua Cleve
" turgida var. wisei Salah
Coscinodiscus nitidus Gregory
" scintillans Greville
Cymatoneis circumvallata Cleve
" sulcata (Greville) Cleve
Diploneis fusca var. aestiva (Donkin) Hustedt
" ovalis (Hilse) Cleve
" Smithii (Brebisson) Cleve
" " var. pumila (Grunow) Hustedt
Navicula gelida Grunow
Nitzschia divergens Hustedt
" Jelinecki Grunow
" sphaerophora A. Cleve-Euler
Stauroneis elata Hustedt

Thalassia

Auricula complexa (Gregory) Cleve
Licmophora gracilis (Ehrenberg) Grunow
Mastogloia corsicana Grunow
" cribrosa Grunow
" crucicula (Grunow) Cleve
" erythraea Grunow
" exigua Lewis
" rigida Hustedt
Rhopalodia musculus Kützing
Striatella unipunctata (Lyngbye) Agardh
Synedrosphenia cuneata Grunow

Only the major works used for taxonomy are cited (14-23).

Discussion

From these data it can be seen that a unique and diverse diatom assemblage exists on the coral reefs of the Florida Keys. The diatoms which characterize each habitat were selected by virtue of either their relative dominance in a particular habitat or their uniqueness to a particular habitat. The coral is characterized by species of Campylodiscus, Podocystis, and Triceratium. In the case of Triceratium relatively few individuals were found in any one sample; they were found only in the coral samples. The coral sand is characterized by Amphora and a variety of species of Diploneis. Thalassia surfaces are characterized by their array of different Mastogloia.

In studying these coral reef diatoms the scanning electron microscope has proven to be an invaluable tool. The instrument has provided a means by which very small (<5μ) diatoms and the fine structure of the diatom frustule can be clearly observed. However, by its nature the SEM is not well suited for counting large samples of diatoms. Occasionally the SEM provided too much information, showing distinct differences not detectable with the light microscope. Representative diatoms of each habitat are given in the figures (Coral figs. 1-6, Sand figs. 7-12, Thalassia figs. 13-18; all magnification markers are 5μ).

ACKNOWLEDGEMENTS

The authors with to thank Judy Bradford for typing this manuscript.

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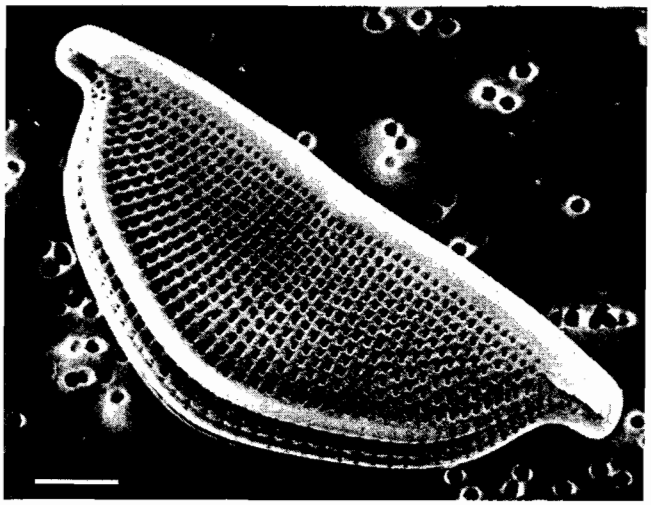

Figure 1. Amphora costata Wm. Smith

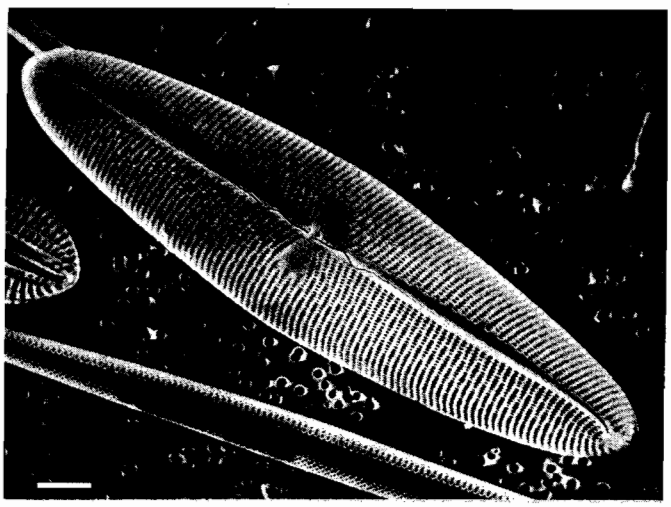

Figure 2. Trachyneis aspera Ehrenberg

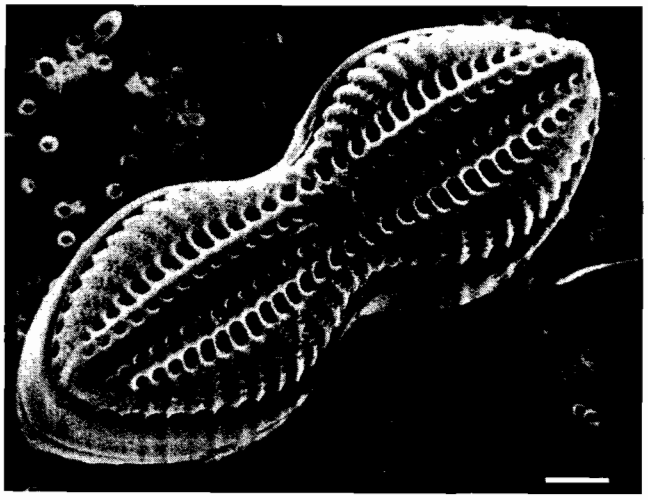

Figure 3. Diploneis crabo Ehrenberg

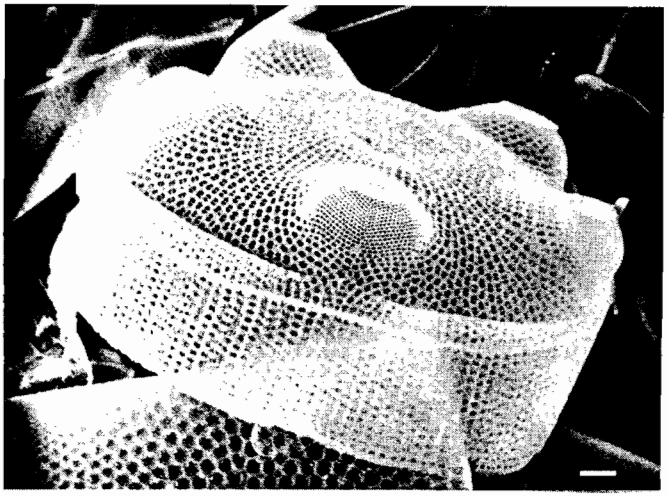

Figure 4. Triceratium orbiculata Shadbolt

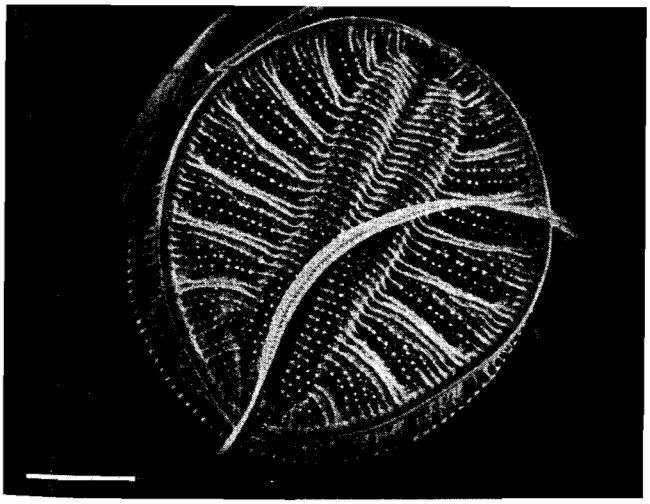

Figure 5. Surirella comis A. Schmidt

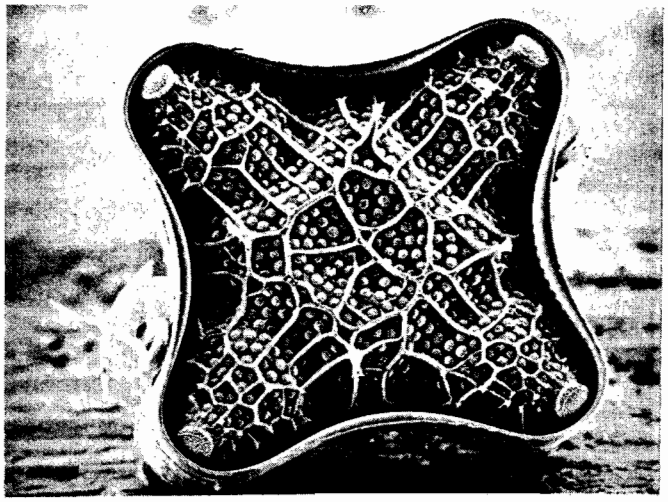

Figure 6. Triceratium junctum A. Schmidt

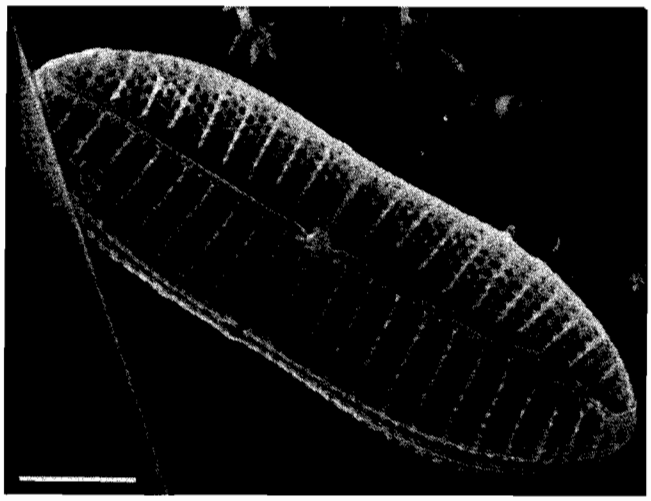

Figure 7. Achnanthes longipes Agardh

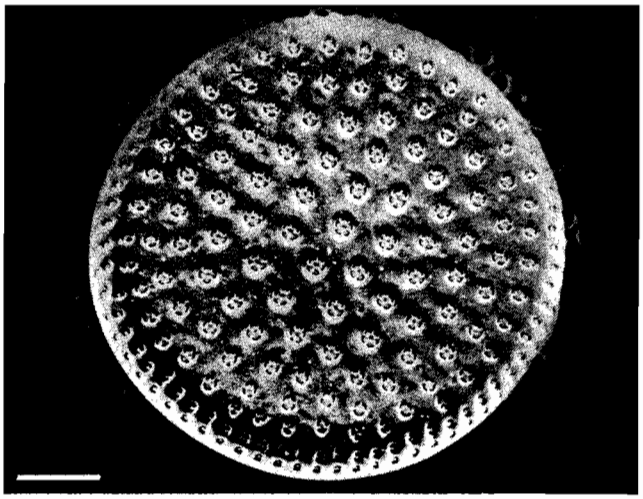

Figure 8. Cosciondiscus nitidus Gregory

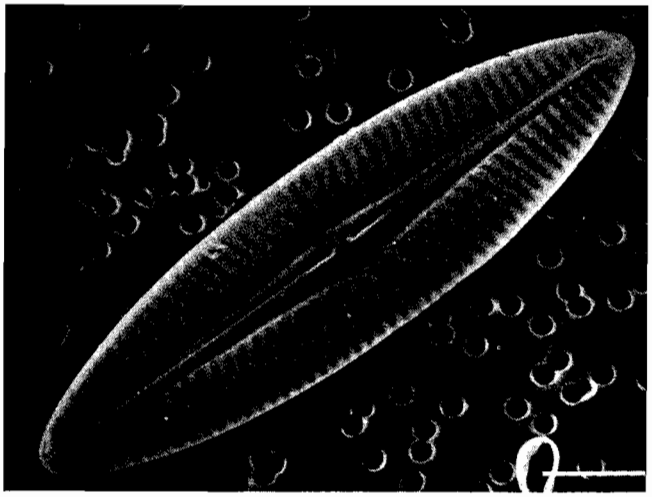

Figure 9. Navicula gelida Grunow

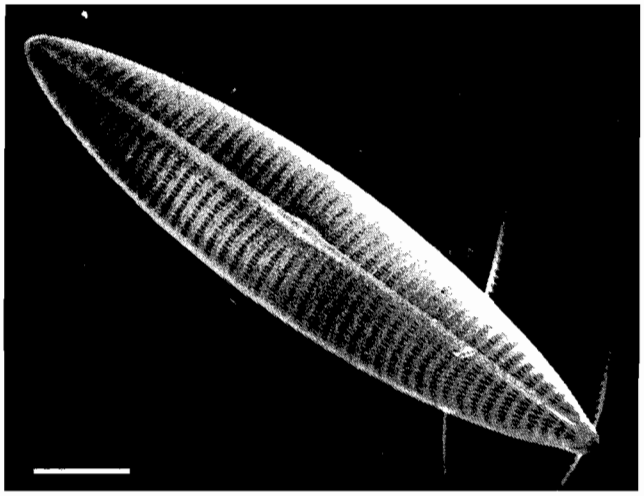

Figure 10. Navicula directa var. lata Östrup

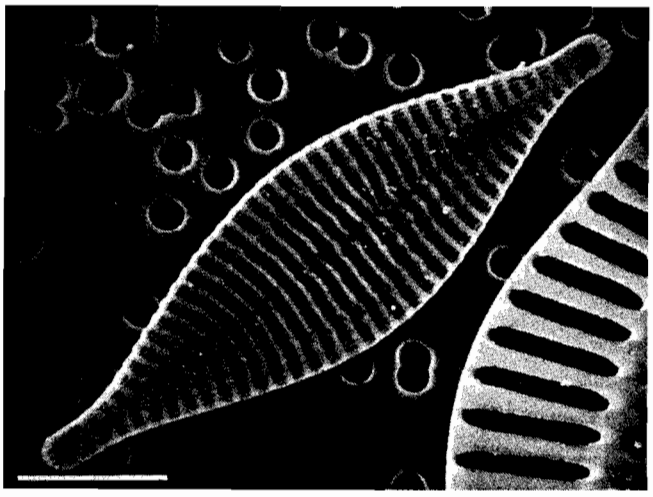

Figure 11. Synedra tabulata var. fasiculata (Agardh) Kützing

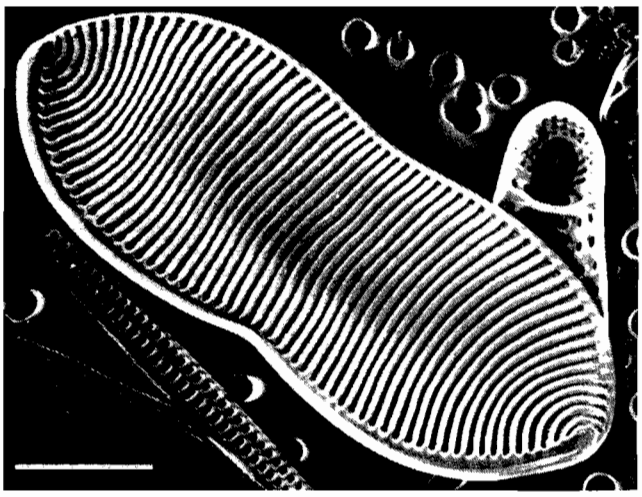

Figure 12. Nitzschia divergens Hustedt

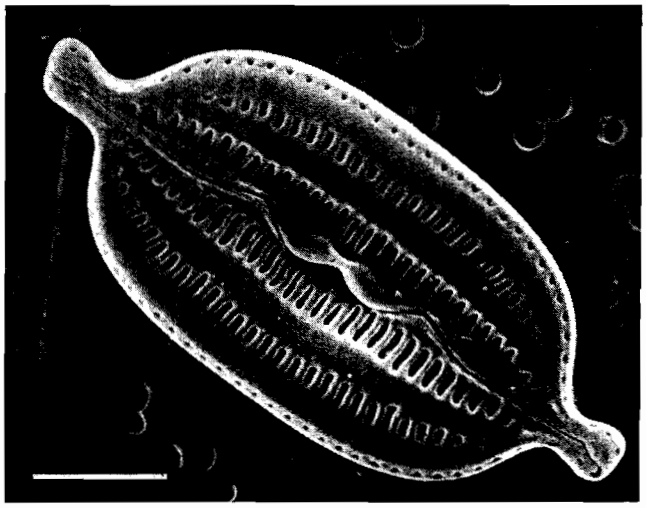

Figure 13. Mastogloia corsicana Grunow

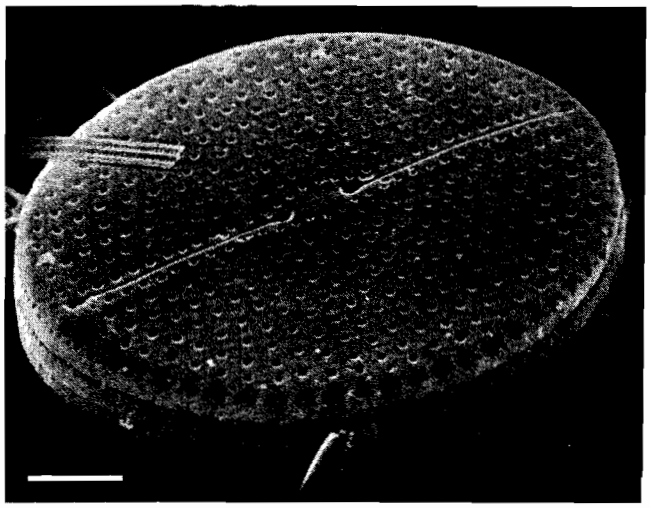

Figure 14. Mastogloia cribrosa Grunow

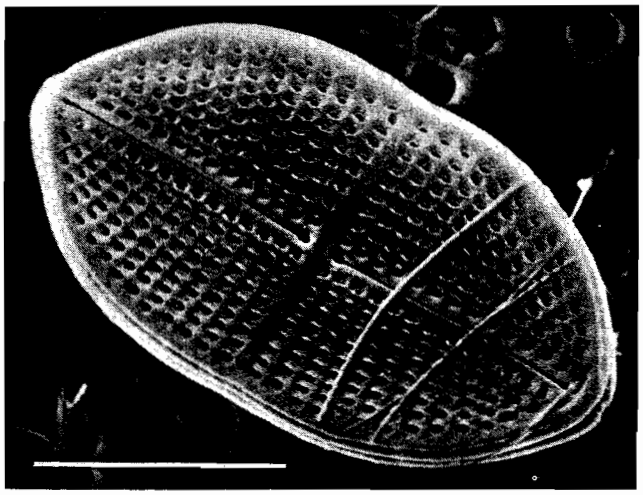

Figure 15. Mastogloia crucicula (Grunow) Cleve

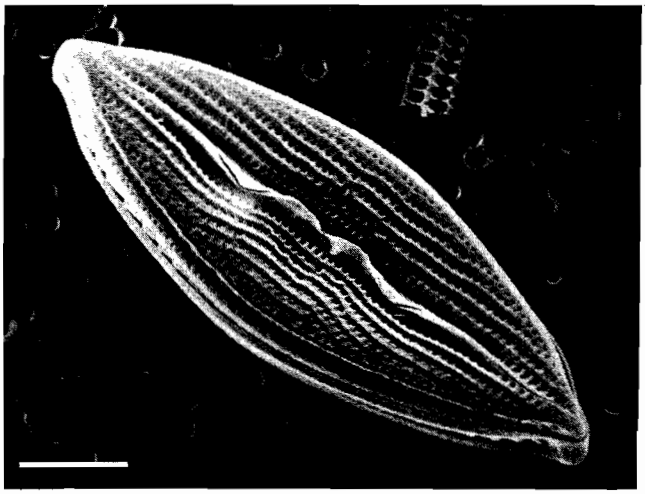

Figure 16. Mastogloia erythraea Grunow

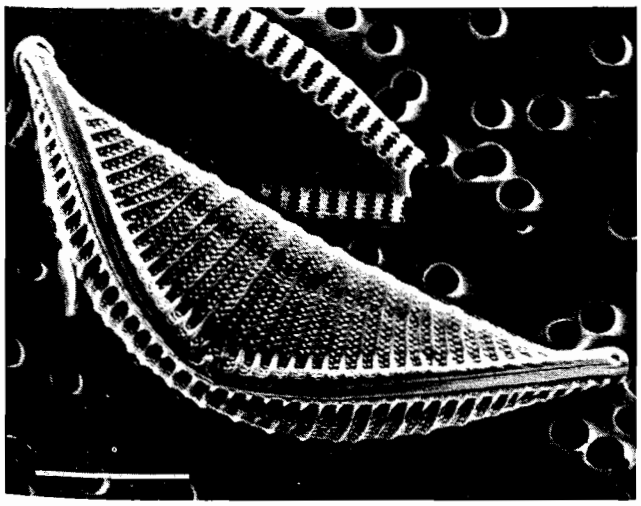

Figure 17. Rhopalodia musculus Kützing

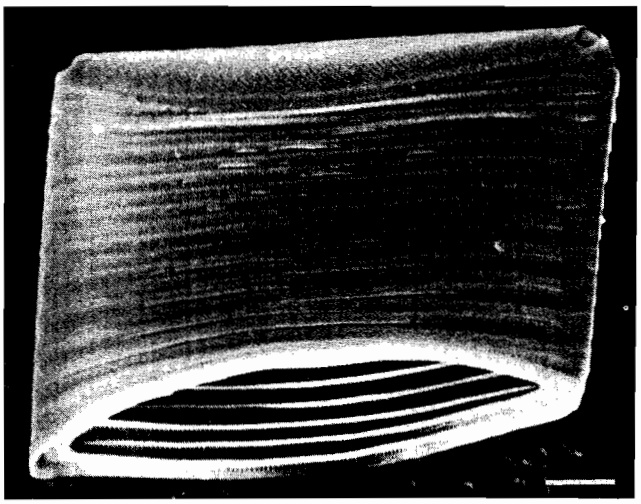

Figure 18. Striatella unipunctata Agardh