<table>
<thead>
<tr>
<th>Title</th>
<th>Electron Micrographic Study on the Marine Diatoms, especially Skeletonema costatum (GREV.) CLEVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
<td>Iizuka, Shoji; Irie, Haruhiko</td>
</tr>
<tr>
<td>Citation</td>
<td>長崎大学水産学部研究報告, v.15, pp.92-99; 1963</td>
</tr>
<tr>
<td>Issue Date</td>
<td>1963-12</td>
</tr>
<tr>
<td>URL</td>
<td><a href="http://hdl.handle.net/10069/31623">http://hdl.handle.net/10069/31623</a></td>
</tr>
</tbody>
</table>

NAOSITE: Nagasaki University’s Academic Output SITE
http://naosite.lb.nagasaki-u.ac.jp
Electron Micrographic Study on the Marine Diatoms, 
especially *Skeletonema costatum* (Grev.) Cleve

Shoji IIZUKA and Haruhiko IRIE

**Introduction**

The electron micrographic studies on marine diatoms have been done by many authors, *Skeletonema costatum* having been reported as a part of such studies by Desikachary and Bahadur (1954), Kolbe (1948) and Helmcke and Krieger (1953, '54). Therefore, no monograph of this species has been published. Taking this into consideration, photographs of this species were selected from the authors' numerous electron micrographs and summarized in the present paper.

The authors would like to express their sincere thanks to Drs. Aoki and Naito (Department of Bacteriology, Nagasaki University School of Medicine) for their ready consent to let us use their electron microscope. The authors extend their thanks to Mr. Suehatsu for his good technique in preparing and photographing materials. The authors are also grateful to Drs. Okuno (Botanical Laboratory, Faculty of Textile Fibers, Kyoto University of Industrial Arts and Textile Fibers) and Takano (Tokai Regional Fisheries Research Laboratory) for their kind advices.

**Material and method**

In most photographing, disorganization of materials was not done, but crude or formalin fixed materials were used directly. After elimination of salts from materials, one drop of it was placed on an electron microscope mesh coated by collodion membrane, which was strengthened by carbon, and dried.

**Explanation of Electron micrographs of *Skeletonema costatum***

**Figs. 1 & 2.**

Materials : Natural *Skeletonema costatum*

Explanation : In girdle view, there are numerous ring-like intercalary bands; the end terminating with a collar-shape (Fig. 1); without areolation; but with numerous fine pores distributed on the bands (Fig. 2); pore size being about $0.026-0.033 \mu$ and $0.03 \mu$ on the average; height of overlapping portion of connecting band of epivalve and hypovalve being about $3 \mu$ in a cell $6 \mu$ wide and $5.7 \mu$ in a cell $8.6 \mu$ wide, respectively.
Figs. 3 & 4.

Materials: Natural *Skeletonema costatum*

Explanation: Sculpturings of valve surface are radiate; areolation and central area being present; numerous fine pores are distributed on sieve membrane in areola (*Plate I*), the pore size being much smaller than those on intercalary bands (*Plate II*).

Fig. 5.

Materials: Natural *Skeletonema costatum*

Explanation: Intercellular spines are hollow; the basis being situated around the margin of valve mantles; opposite spines, which elongated from each valve mantle, being glued in the middle of intercellular space.

Figs. 6 & 7.

Materials: Cultured *Skeletonema costatum*

Explanation: Daughter cell, just after division, being encased in a mother cell, has no intercalary bands yet (*Fig. 6*); but new intercalary bands will be formed soon after. After the forming the old bands fall off piece by piece; *Fig. 7* showing such process.

Figs. 8 & 9.

Materials: Natural *Skeletonema costatum*

Explanation: Materials, collected in bottom water of Sasebo Bay, are the empty cells which died naturally after blooming; the frustule being destroyed at the parts such as glued portion of intercellular spines (*Fig. 8*) and joint-line between valve mantle and girdle (*Fig. 9*); the structure of valves being stout, but girdle very delicate.

Fig. 10.

Material: Cultured *Skeletonema costatum*

Explanation: In the old cultured medium, which was not refreshed, abnormal cells often appeared; *Fig. 10* showing dwarf *Skeletonema* in such medium; the frustule and intercellular spines being abnormal; cell width about 5.7 μ and 3.4 μ in max. and min. parts, respectively; appendant process, which protrudes laterally,
being analogous to intercellular spines.

The following brief informations were obtained from above observations.

(1) Construction of the fine pores on a frustule was different according to their different positions; the function of the valve pores being analogous to poroid or sieve pore; but the girdle pore being on a single structure of the bands and their number and size being more numerous and larger as compared with those on the valve. Therefore, it is considered that the whole area occupied by the pores is much larger in girdle than in valve; Plate II. showing structural difference of such two kinds of pores; function of each pore being probably different.

(2) A cell frustule was always destroyed by mechanical and chemical actions at regular portions; the weakest structure against such actions being at a joint-line between valve and girdle (see Figs. 3, 5 and 9), where intercalary band forming organs is situated; and the next being glueing portions (see Fig. 8); the remains being generally stout and, even overlapping portion of epivalve and hypo-valve, being no exception; therefore, such fragments of frustule as shown in Figs. 3 and 5 often occurred under electron microscope; in the field, a long chain of Skeletonema being also cut off at the joint-line.

Appendix: Electron micrographs of Chaetoceros sp.

Fig. 11.

Material: Natural Chaetoceros sp.

Explanation: Fine structure of seta of Chaetoceros sp. (probably Chaetoceros peruvianus); diameter of seta was about 3.2 μ. Interval between each spine was about 4.7 μ.

Fig. 12.

Material: Natural Chaetoceros sp.

Explanation: Enlarged seta of same species as shown in Fig 12; its diameter of pores on the seta, about 0.05 μ, being larger as compared with the girdle pore of Skeletonema costatum.

Fig. 13.

Material: Natural Chaetoceros sp.

Explanation: Squarish transversal section of the seta of same species as shown in Figs. 12 and 13.
Fig. 14.

Material: Natural Chaetoceros sp.

Explanation: Basis of the seta of Chaetoceros sp., probably the same species as shown above. Conspicuous fine pores are distributed on the margin and valve surface.

Fine structure of valve mantle of Chaetoceros has no areolation, but in place of it has some fine pores scattering on the mantle. Other numerous fine pores are distributed on the structure of the seta and the seta has been covered by such fine pores. The presence of them may probably play an unknown but important role. The seta, which elongated from the cell body, will play certainly another physiological role besides floating adaptation, the fact being hitherto overlooked. The authors presume the seta to be an important organ for the up-take of nutrients.

References


Explanation of plates

Plate I. Electron micrograph showing areolation of valve mantle of Skeletonema costatum. Photograph was enlarged from Fig. 4. (x 30,550)

Plate II. Electron micrograph showing valve surface, valve mantle with intercellular spines and burst girdle band of Skeletonema costatum. Photograph was enlarged from Fig. 3. (x 18,000)

Plate III. Figs. 1~6.

Plate IV. Figs. 7~14.
S. IIZUKA and H. IRIE: Electron micrographic study on the marine diatoms, especially *Skeletonema costatum* (Grev.) Cleve
S. IZUKA and H. IRIE: "Electron micrographic study on the marine diatoms, especially *Skeletonema costatum* (Grev.) Cleve"
S. Iizuka and H Irie: Electron micrographic study on the marine diatoms, especially *Skeletonema costatum* (Gray) Cleve
S. IIZUKA and H. IRIBE: Electron micrographic study on the marine diatoms, especially *Skeletonema costatum* (Grev.) DLEVE