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VALVE ULTRASTRUCTURE OF SOME CONFUSING FRAGILARIACEAE

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The study of diatom taxonomy most frequently uses light microscopy to distinguish the silicous cell wall components of different species. The structures that give a characteristic appearance in the light microscope are usually patterns that reflect the ultrastructure of the cell wall that cannot be resolved adequately with this technique. Scanning electron microscopy provides a more complete concept of diatom valve structure, especially for diatoms that are less than 10 µm in length. While examining a collection of epipelic diatoms from Lake Kathrine, Michigan, during 1979 and 1980, a number of small Fragilariaceae were encountered which could not be easily identified with the light microscope. These diatoms were cleaned in nitric acid, washed in distilled water, dried on aluminum stubs, and coated with 12 nm gold-paladium before examination. Distinct differences were found in the structure of the striae in a group of diatoms that are similar in shape and size.

Fragilaria elliptica Schumann (Fig. 1) has striae composed of lineate puncta that become orbicular on the valve mantle. Fragilaria brevistriata var. elliptica Héribaud (Fig. 2) has striae composed of a single punctum. Opephora martyii Héribaud (Fig. 3) has striae with puncta that are entirely lineate. An unknown species of Fragilaria (Fig. 4) has striae that are clavate in shape and composed of numerous puncta, a pattern entirely new to the literature. The elliptical members of the Fragilariaceae described are smaller than 10 µm and the details of the striae cannot be resolved with the light microscope. Fragilaria elliptica (Fig. 1), identified by Haworth (1975) has striae that appear thin, leaving a narrow central area. With F. brevistriata var. elliptica (Fig. 2) described by Héribaud (1903), the individual puncta appear as refractile points and the central area is wide. In Opephora martyii (Fig. 3), also described by Héribaud (1902), the striae appear thick and the central area is narrow. The unknown Fragilaria species appears similar to Opephora martyii under the light microscope. All of the organisms described are difficult to distinguish with the light microscope, making the correct assignment of these diatoms to species tedious and often inaccurate.

Haworth, E. 1975. A scanning electron microscope study of some different frustule forms of the genus Fragilaria found in Scottish late-glacial sediments. Br. Phycol. J. 10:73-80.

Héribaud, J. 1902, 1903. Les Diatomees d'Auvergne. Libraire des Sciences Naturelles; (1902) premier mémoire, p. 1-79. (1903) deuxieme mémoire, p. 1-55.

Figure 1. Fragilaria elliptica Schumann

Figure 2. Fragilaria brevistriata var. elliptica Héribaud

Figure 3. Opephora martyii Héribaud

Figure 4. Fragilaria sp.

Bars equal 1 µm in all figures.