The present paper deals with the fine structure of four centric diatoms, viz., *Hemidiscus hardmannianus* (Grev.) Mann, *Stephanopyxis palmeriana* (Grev.) Grunn, *Skeletonema costatum* (Grev.) Cleve, and *Coscinodiscus concinnus* W. Smith. These diatoms were collected from Cape Comorin (Venkataraman, 1959) and from the estuarine regions of the river Hoogly by Mr. N. Dutta. The materials were cleaned as described earlier (Venkataraman and Mehta, 1960) and observed under a Philips Electron-microscope (Mehta, under publication).

*Hemidiscus hardmannianus* (Grev.) Mann (Figs. 1–8).

**L.M.S.*** Valves semicircular with straight ventral margin (Fig. 2). Ends are obtuse and the central portion is large and hyaline. The areolation is fine and radiating from the centre, about 10–12 in 10 μ. Spinulae are seen around the margin with hyaline ribs arising from them and running to the centre.

**E.M.S.**** Under the electron microscope, the valve resolves itself into a lattice of hexagons with two distinct membranes (Figs. 1, 5 and 6). The inner membrane (IM) is supported by a series of hexagons. From each angle of the hexagon, three curved bars (B) project out, on which rests the outer sieve membrane (SM) (Figs. 5 and 6). It seems that there are no lateral walls and these projecting bars forming a tripod-like structure are the only supporting structures between the two membranes. The inner membrane has a single large central opening (CO) in each hexagon. The outer membrane has 4–8 groups of sieve pores (SP) per hexagon (Figs. 6 and 8). Around the margin there are spinulae (S) from which arise hyaline ribs (Fig. 4). The girdle wall is perforated by a series of simple pores arranged radially (Fig. 7). In its fine structure, this diatom resembles *Biddulphia mobliensis* Bailey (Cassie and Bertand, 1960), although Okuno described simple areolae with round sieve pores in this form (Okuno, 1949).

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**Fig. 1. Diagrammatic representation of an oblique view of the areolae of *Hemidiscus hardmannianus*.**

- B, bars; CO, central opening; IM, inner membrane; SM, sieve membrane; SP, sieve pores.
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Figs. 2-8. *Hemidiscus hardmannianus*. Fig. 2, valve view. Figs. 3, 4, part of the valve showing 'hyaline rib lines' (note the spinulae in Fig. 4). Figs. 5, 6, portions of the valve viewed obliquely. Fig. 7, portion of the girdle. Fig. 8, portion of the valve viewed vertically (note the groups of sieve pores) (Fig. 2, lucida picture, scale: 10 μ). Figs. 3-8, electron-micrographs, scale: 1 μ. B, bars; CO, central opening; IM, inner membrane; SM, sieve membrane; SP, sieve pores; S, spinulae.
Stephanopyxis palmeriana (Grev.) Grunn (Fig. 14).

E.M.S. The fine structure of this diatom has been studied by Desikachary and Bahadur (1954) and Okuno (1955), but the girdle structure was not figured by them. The girdle in this diatom resembles that of Stephanopyxis orbicularis (Cassie and Bertand, 1960). The girdle wall is single layered and perforated by a series of simple pores. The radial arrangement of the pores is interrupted by nonperforated bands (Fig. 14), which simulate the appearance of the intercalary bands in Rhizosolenia.

Skeletonema costatum (Grev.) Cleve (Figs. 9-13).

L.M.S. Frustules lens-shaped with rounded ends, and joined by spines by silicification. The space between the cells is longer than the cells. The cells are 11.8-16.3 \( \mu \) in diameter. No visible structure could be observed on the valve under the optical microscope.

E.M.S. The wall structure of this diatom, commonly known as ‘pervalvar punctiert-gestreift’ (Hustedt, 1930) has been studied by Kolbe (1948) and Desikachary and Bahadur (1954). The valve shows clear areolae formation as reported by Kolbe (1948) and Desikachary and Bahadur (1954) and the areolae are of the fully open type with secondary areolae with poroid membrane (Figs. 12 and 13). The spines are hollow and nonperforated (Figs. 9-11) and are firmly joined by silicification (Fig. 9). It was doubted whether the secondary areolae formed a separate layer or not (Desikachary and Bahadur, 1954). Fig. 12 shows the complete secondary areolae from inside with the bases of the spines all around. This shows that they form an independent layer, which is closely attached to the outer primary one. It thus confirms that in Skeletonema costatum, the secondary areolae are formed as an independent layer closely adpressed to the primary layer by silicification and not as a more closing membrane (Desikachary and Bahadur, 1954).

Coscinodiscus concinnus W. Smith (Figs. 15-21).

L.M.S. The frustules are large, drum-shaped, 200-420 \( \mu \) in diameter. Valve surface is slightly convex and in the centre sometimes slightly depressed. Areolation is slender with well differentiated rosette of large meshes, the surrounding areolae becoming suddenly smaller, about 9-12 in 10 \( \mu \) at the centre and 12 in 10 \( \mu \) near the margin; central rosette distinct, radial; secondary series regular, hyaline ribs running to the centre from distinct spinulae near the margin; two small asymmetrical processes clearly discernible.

E.M.S. The areolae on the valve are regularly hexagonal in pattern and are open to the inside, each side of the loculus being 0.4-0.6 \( \mu \) long. Each loculus is provided with an outer sieve membrane, an inner closing membrane and lateral membranes. The sieve membrane possesses many polygonal sieve pores (SP) with somewhat irregular margins. The sieve pores are 9-12 in 1 \( \mu \) and more or less in concentric rows. The inner closing membrane has a round central opening (CO). The lateral membrane is six-sided and the neighbouring loculi communicate with each other by means of passage pores (PP) on the lateral membrane (Figs. 17 and 19). The girdle loculi are arranged in longitudinal and oblique rows (Fig. 20). The loculi are with outer and inner openings, the outer opening lacking the closing sieve membrane (Okuno, 1955). The present observations confirm those of Okuno (1955). In C. elegans and C. pseudonitidulus the sieve membrane is non-porous (Okuno, 1953) and 1954).

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Figs. 9-14. *Skeletonema costatum*. Figs. 9-11, spines. Fig. 12, secondary areolar layer viewed from inside. Fig. 13, secondary areolae with poroid membranes. Fig. 14, *Stephanopyxis palmeriana*, girdle view (scale: 1 µ).
Figs. 15–21. *Coscinodiscus concinnus*. Fig. 15, margin of the valve. Figs. 16–18, portions of the valve. Fig. 19, part of the valve near the central area showing the 'hyaline lines'. Fig. 20, portion of girdle viewed obliquely from inside. Fig. 21, central rosette (scale: 1 µm). C, central rosette; CO, central opening; PP, passage pores; SP, sieve pores.
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