

## STEPHANODISCUS PECULIARIS KHURS. (BACILLARIOPHYCEAE) FROM FERDYNANDÓW INTERGLACIAL

*Stephanodiscus peculiaris* Churs. (Bacillariophyceae)  
z interglaciału ferdynandowskiego

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**ABSTRACT.** In the Pleistocene sediments of the Ferdynandów profile (Eastern Poland) *Stephanodiscus peculiaris* has shown high degree of variability. The study of this taxon in scanning electron microscope provides new informations on its morphology in comparison to the earlier description from the type material of Byelorussia. Furthermore var. *ferdynandoviensis* as var. nova is distinguished: from the nominate variety it differs in larger valve diameter, higher valve mantle, the arrangement of central part of valve and more numerous rimoportulae.

**KEY WORDS:** *Bacillariophyceae*, Interglacial, *Stephanodiscus*, Taxonomy, morphology, Poland

### INTRODUCTION

On the basis of complex data the stratigraphical position of the studied material was defined as a new interglacial found in Poland (Mesopleistocene) which was called the Ferdynandów Interglacial (Janczyk-Kopikowa et al. 1981, Janczyk-Kopikowa 1987, Mojski 1982, Rzechowski 1987); it corresponds with Byelovezha Interglacial in the Pleistocene scheme of the Byelorussia (Voznachuk 1985, Khursevich & Loginova 1986, Przybyłowska-Lange 1990).

The diatom flora in the profile is abundant and very diversified. Up to 42.2% consists of *Stephanodiscus* species. Some species proved to be difficult for the light microscope identification; among them *S. peculiaris* – known, as yet only from the Byelovezha Interglacial – was found to be the most variable. After detailed examination of the taxon in the scanning electron microscope (SEM) beside the nominate variety (var. *peculiaris*) the var. *ferdynandoviensis* var. nova is described.

The SEM investigation was carried out in the Institute of Geochemistry and Geophysics of the Byelorussian Academy of Sciences in Minsk.

## MATERIAL AND METHODS

The studied profile was obtained by members of the staff of the Geological Institute at Warsaw. Samples for diatom analysis were taken mainly at 25 cm intervals. All samples were treated with 30% H<sub>2</sub>O<sub>2</sub> to bleach and destroy the organic matter. Clay and sandy samples were repeatedly washed by suspending in distilled water and decanted.

For light microscope (LM) investigation the material was mounted in Elyashev aniline-formaldehyde medium ( $d_n = 1.67$ ) and observed in Zeiss Jena Amplival microscope. For SEM examination the material was coated with gold and analyzed in Jeol-35C.

## OBSERVATIONS

*Stephanodiscus peculiaris* Khurs. var. *peculiaris* (Khursevich 1987: 356–357),  
(Pl. 1, figs 1, 2).

The study provides of new informations of the taxon morphology in comparison to the first description from Byelorussia (Khursevich 1987).

Valves are 8.3–16.8  $\mu\text{m}$  in diameter, concentrically undulated with concave or convex central area, clearly visible both in LM and SEM. The centre of the valves has scattered areolae (pores); in some specimens at the centre occur one to three isolated areolae. In the valve face the areolae (1.4–2.2, rarely 2.5 in 1  $\mu\text{m}$ ) form single radiating rows coming from the centre to 2/3 valve radius, then the rows become biseriate or rarely triseriate fascicles in the marginal zone of the valve face. They are separated by hyaline interfascicles (8–12 in 10  $\mu\text{m}$ ). Areolae are loculate; internally they have domed cribra, externally they have foramen. In most specimens cribrum is corroded (Pl. 1 figs 1–9, Pl. 2 figs 15–20). The valve mantle is low (0.9–2.0  $\mu\text{m}$  high) and is perforated with fine pores more densely packed than those of the valve face; 3–4 pores are arranged in single vertical rows. In most valves with a raised central area (scutate valves – Round 1982) occur a distinct hyaline area around the valve face/valve mantle, sometimes with isolated pores on it. In the valves with depressed central area (locunate valves) this hyaline space occurs very seldom (Pl. 2 figs 15–20).

The position, number and structure of the central fultoportulae are very variable. One to four of them are placed near the valve centre, or in one half of valve radius or even in the submarginal zone. In some specimens only one central fultoportula was found on the valve face, with two, three or four satellited pores (Pl. 3 figs 27–31). The marginal fultoportulae with three satellite pores are placed on the valve mantle beneath the spines at the end of each, or every second or third hyaline interfascicle. Below the external openings of the marginal fultoportulae there are one to two pores. One to two rimoportulae are located on the valve mantle just below the level of spines. Externally they have a tubular extension, internally they form a small hillock (Pl. 1 figs 15, 19, Pl. 2 figs 27–31). Spines or bases of spines occur at each interfascicle (Pl. 2 figs 18–20).

*S. peculiaris* var. *ferdynandoviensis* Przyb. et Khurs. var. nova

**Diagnosis.** *Valvae circulares, diam. 20–35 μm. Pars centralis valvae concava vel convexa. In valvae fronte striae radiales uniseriatae, solum ad marginem frontis fasciculi biseriati vel triseriati inveniuntur. Interfasciculi parum elevati conspiciuntur. Spinae parvae in anulo ad marginem frontis sitae. Una vel duae fuloportulae centrales cum duobus vel tribus satelliticis poris vario modo dispositae, Fuloportulae marginales cum tribus poris ad marginem unius cuiusque interfasciculi vel secundi vel tertii sunt. Duae vel quattuor rimoportulae cum tubo externo et labiis internis sub spinis limbi valvae sitae.*

**Holotype.** Slide No. 201/1, 201/2 in Museum of W. Szafer Institute of Botany, Polish Academy of Sciences, Cracow, Poland.

**Type locality.** Ferdynandów, Poland.

**Type horizon.** Ferdynandów Interglacial.

**Derivation of name.** “*ferdynandoviensis*” from the name of the locality of boring.

The valves are 20.0–32.2 μm in diameter with concave or convex central part of valves. The centre of valves is usually marked by an isolated group (up to 13) of areolae (pores). It appears to be the central rosette, surrounded by circular hyaline area. In some specimens the centre of the valve has scattered areolae (pores) which are often of different size (Pl. 3 figs 21–24, Pl. 5 figs 32–35). The valve surface is marked by single radial rows of areolae (to 3/4 of valve radius), they are becoming biseriate or rarely triseriate fascicles only near the margin of the valve (1.4–2.2 areolae in 1 μm). Punctuation of the fascicles continues onto the mantle becoming more fine. They lose fasciculate arrangement and occur in single, closely spaced rows (Pl. 3 figs 25, 26). The valve mantle (1.6–2.8 μm high) is broader than in var. *peculiaris* and consists of 3–7 pores in vertical files. The fascicles are subdivided by slightly raised hyaline interfascicles (10–12 in 10 μm). Every second, third or seldom each interfascicle extend onto the valve mantle (to 1/2 of the height of the mantle) and they bear the marginal fuloportulae. Interfascicles without openings of fuloportulae end at the junction of the valve face/valve mantle, at the level of spine insertion. A small spine or spine base occurs on every interfascicle. Two, occasionally one, central fuloportulae are usually located near the centre of the valve. It is difficult to recognize the external openings of the central fuloportulae, because on the central area of the valves usually among larger pores, smaller ones occur. Three or four, seldom two rimoportulae are located just below the level of spines insertion. Externally rimoportulae have a tubular extension (Pl. 3 figs 22–26). In most specimens with convex central area (scutate valves) a circular hyaline ring occurs around the valve face/valve mantle (Pl. 3 figs 24, 25).

Internal view of the valve show the structure and location of central fuloportulae, marginal fuloportulae and rimoportulae. Central fuloportulae are usually located near the centre: they occur in different radial rows of areolae, or in the same row. The central fuloportulae have two or three satellite pores; the marginal fuloportulae have three satellite pores (Pl. 5 figs 32–37). The rimoportulae occur irregularly: two of them may be placed very close to each other (in the next adjoining interfascicles), and third on the

opposite side (Pl. 5 fig. 32). The internal expression of the rimoportulae form a small hillock-like with slit housed. Orientation of rimoportulae is diversified (Pl. 5 figs 32–35, 37).

## DISCUSSION

The studied material of the Ferdynandów core shows a high variability in size and structure of some features of *S. peculiaris* var. *peculiaris*. In particular the specimens differ from type material (of Byelorussia) by more numerous central fuloportulae variously located at the valve face, and presence of one to two rimoportulae, whereas in type material the valves have only one fuloportula located near the centre, and a single rimoportula (Khursevich 1987).

The newly separated var. *ferdynandoviensis* is distinguished from the nominate variety on the basis of: larger valve diameter, higher valve mantle and more numerous of central fuloportulae and rimoportulae. Both varieties have the same arrangement of structural pattern on the valve face, structure of central and marginal fuloportulae, and also the structure and location of rimoportulae and spine incertion.

In the studied material var. *peculiaris* is more frequent than var. *ferdynandoviensis*. Both varieties were found in the same samples, before the phase with maximal development of other *Stephanodiscus* species. It seems that the characteristic occurrence of both varieties in the same samples indicates that the differences between them were not caused by environmental conditions.

At present *S. peculiaris* is known only from the fossil materials from White Russia and Poland.

*S. peculiaris* var. *ferdynandoviensis* has some features in common with *S. alpinus* Hustedt, there are, however, clear differences between them: *S. alpinus* has another placement and number of rimoportulae and central fuloportulae; the spines are longer and broader at the base, and they are regularly or irregularly arranged (Häkansson & Stoermer 1984, Theriot et al. 1988).

*S. peculiaris* var. *ferdynandoviensis* is also a bit similar to *S. robustus* Proshkina-Lavrenko (1962), yet it differs by finer areolation on the valve face, smaller number of costae in 10  $\mu\text{m}$ , and shorter valve mantle.

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# PLATES

## Plate 1

Figs 1–9. *Stephanodiscus peculiaris* var. *peculiaris* (LM). Figs 10–14. *S. peculiaris* var. *ferdynandoviensis*: Fig. 10. Focus on central part of a valve; Fig. 11. The same specimen as in fig. 10, focus on marginal part of a valve; Fig. 12. Detail of a valve margin. Figs 1–11, and 13–14 x 2000; fig. 12 x 3000

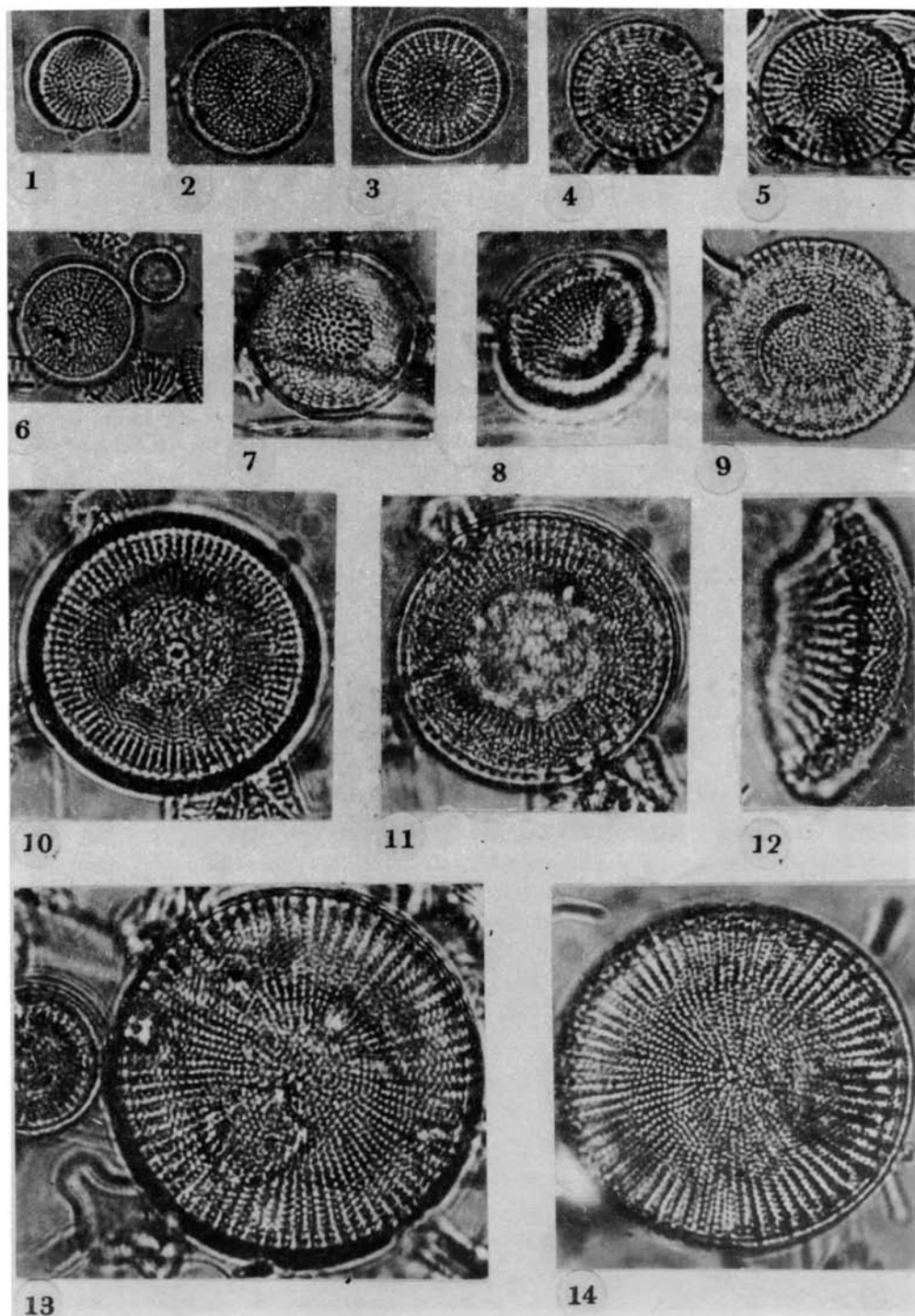


Plate 2

Figs 15–20. *Stephanodiscus peculiaris* var. *peculiaris*: External view of the valves (SEM): Fig. 15. Complete frustule, small convex specimen, showing openings of marginal fultoportulae (“MF”) and rimoportula (“Rp”); Fig. 16. Partially corroded convex valve with the hyaline area around the margin of the valve face; Fig. 18. Concave valve. Figs 19–20. Convex valves, showing regular occurrence of spines and marginal fultoportulae openings, scale bars = 1  $\mu\text{m}$



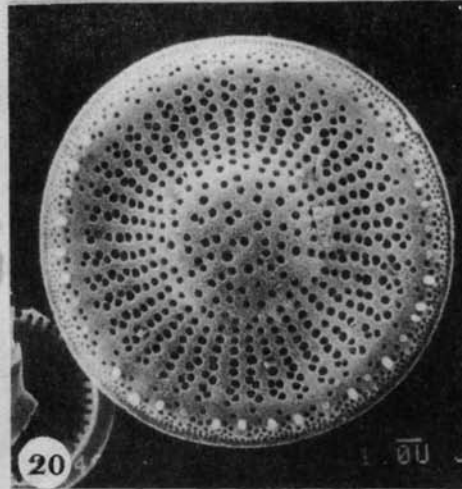
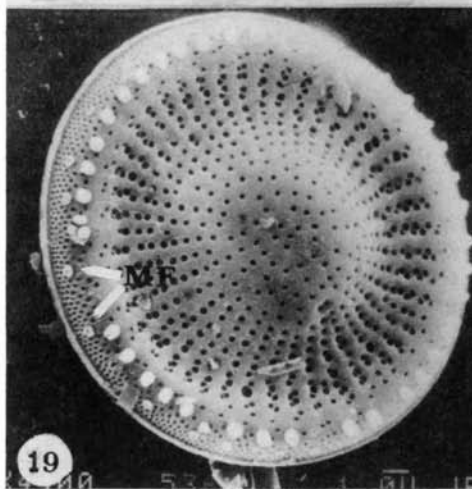
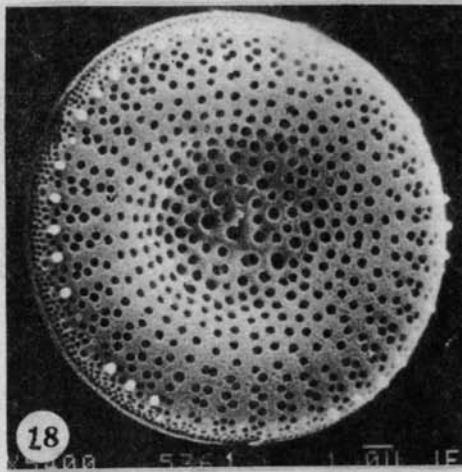
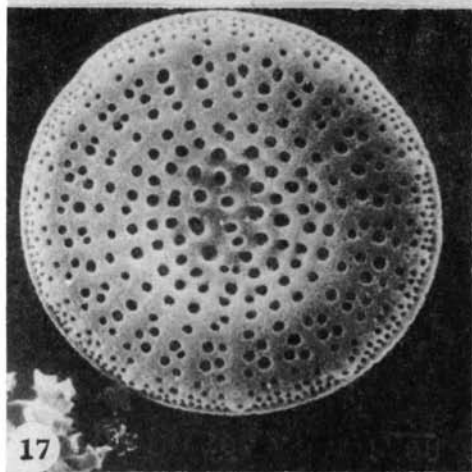
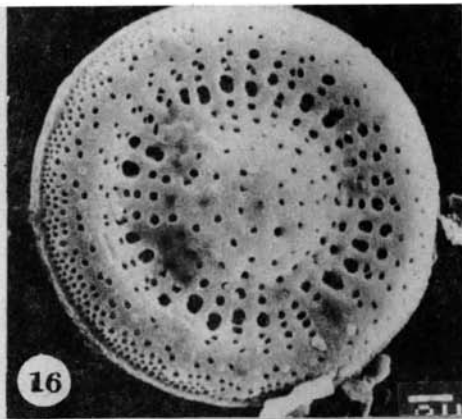
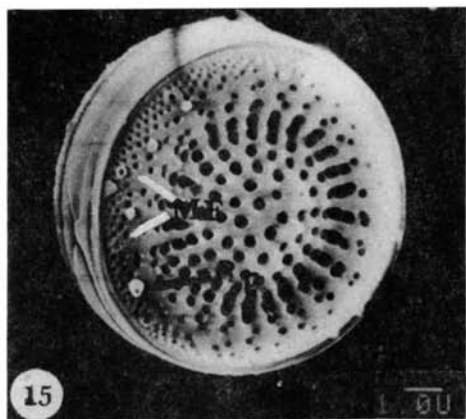


Plate 3

Figs 21–26. *Stephanodiscus peculiaris* var. *ferdynandoviensis*. External view of the valves (SEM): Fig. 21. Valve with irregularly placed areolae at the centre, small spines or bases of broken spines on every interfascicles, external openings of marginal fultoportulae and rimoportula; Fig. 22. Frustule in valve view showing the structure of interfascicles and central rosette; Fig. 23. Concave valve with irregularly placed areolae at the centre; Fig. 24. Convex valve with central rosette, hyaline area at the margin of the valve face and high valve mantle; Fig. 25. The same specimen as in fig. 22. Detail of valve mantle with external openings of fultoportulae; Fig. 26. The same specimen as in fig. 21. Detail of broken valve mantle showing external expression of rimoportula. Figs 21–24, scale bars = 10  $\mu\text{m}$ ; figs 25–26, scale bars = 1  $\mu\text{m}$

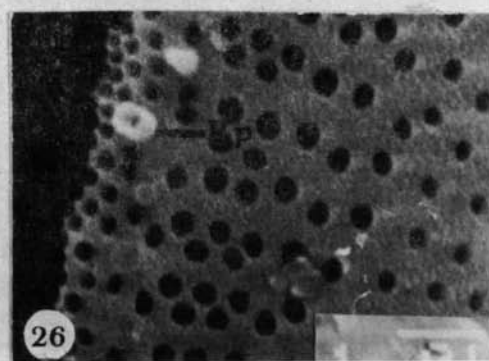
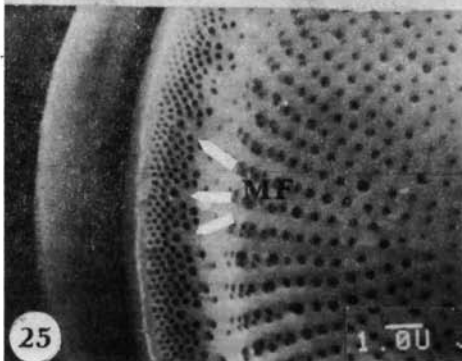
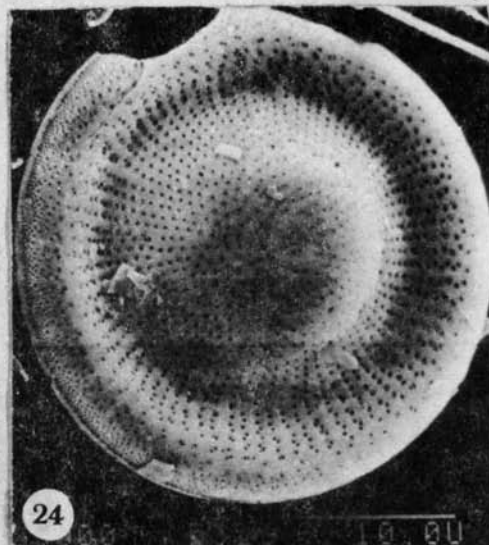
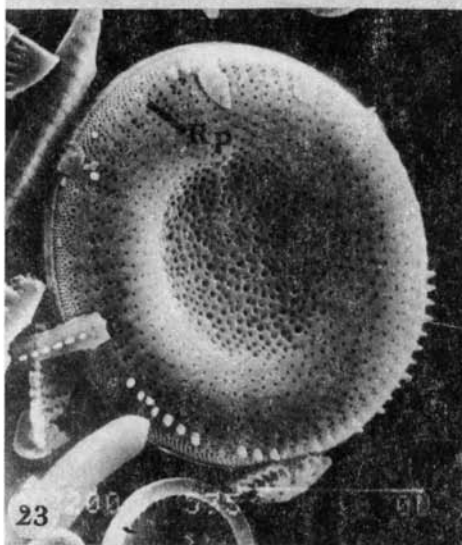
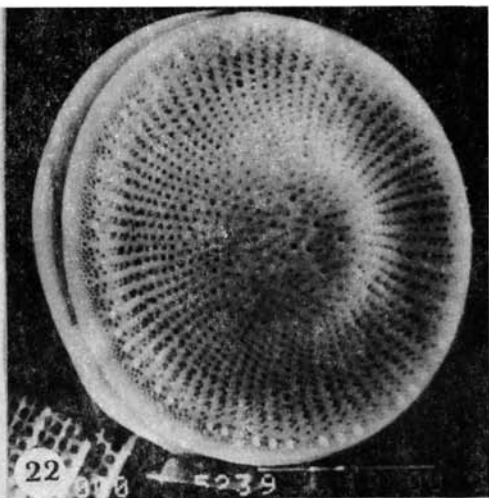
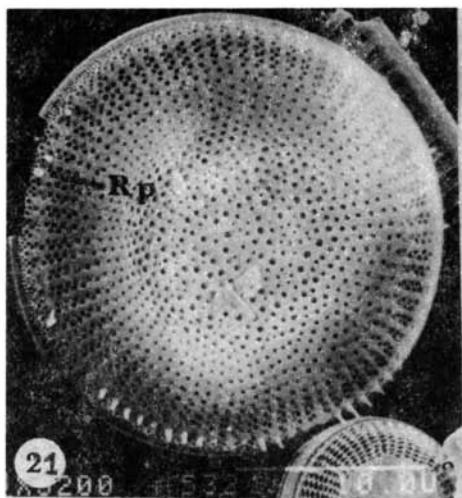
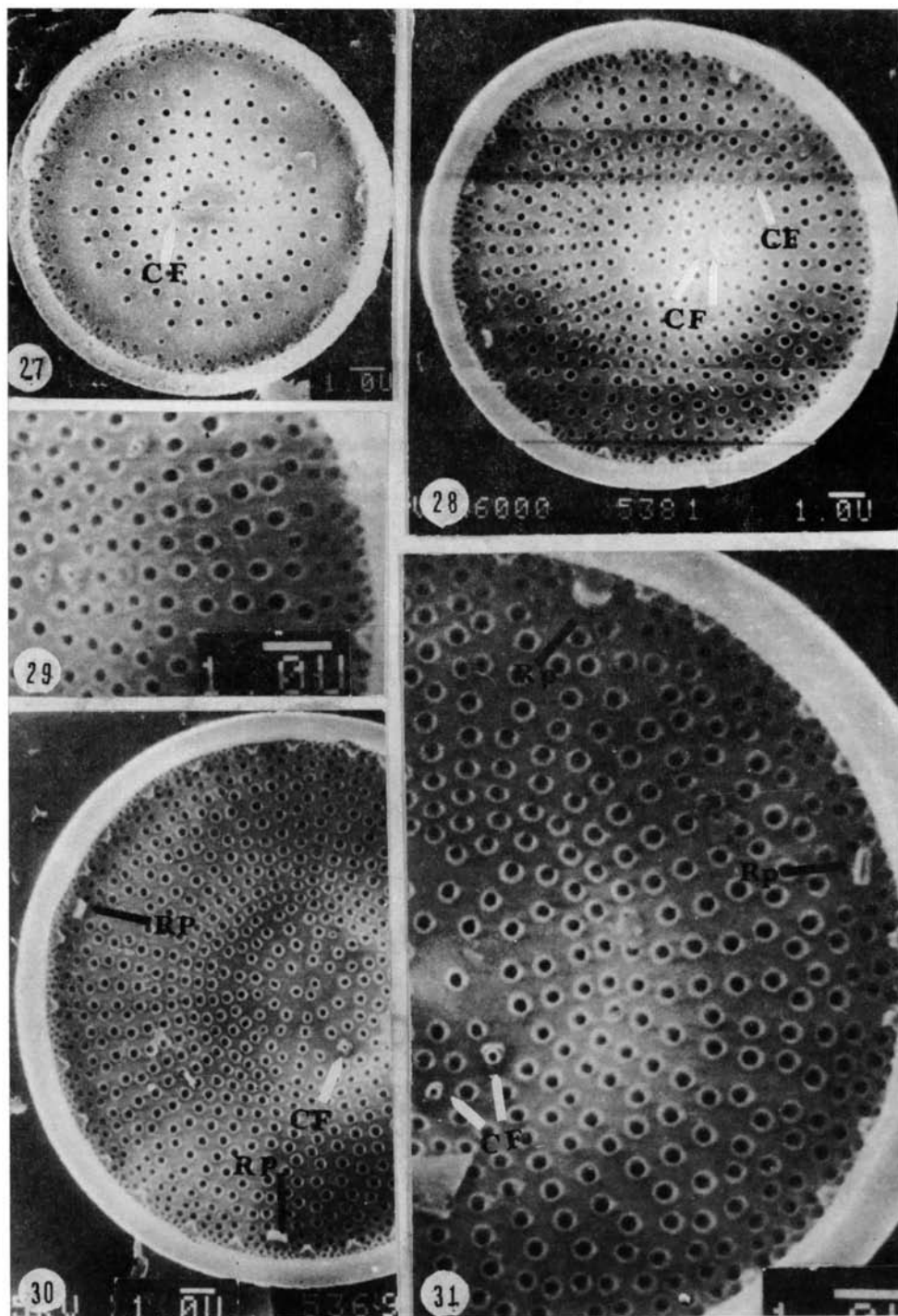


Plate 4

Figs 27–31. *Stephanodiscus peculiaris* var. *peculiaris*. Internal view of the valves (SEM): Fig. 27. A small, partially corroded valve with single central fultoportula (“CF”) having three satellited pores; Fig. 28. Valve with single rimoportula and three central fultoportulae with two and three satellited pores; Fig. The same specimen as in fig. 28: Detail of valve centre showing the position and structure of central fultoportulae; Figs 30, 31. Part of valves showing the structure and position of central and marginal fultoportulae, and rimoportulae, scale bars = 1  $\mu\text{m}$



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Plate 5

Figs 32–37. *Stephanodiscus peculiaris* var. *ferdynandoviensis*. Internal view of the valves (SEM):  
Figs 32–35. Whole valves showing position of central and marginal fultoportulae, and rimoportulae;  
Fig. 36. Detail of partially corroded valve showing location and structure of central fultoportulae;  
Fig. 37. The same specimen as in fig. 35: Detail of valve mantle showing location and structure of  
marginal fultoportulae and rimoportula. Figs 32–35. scale bars = 10  $\mu\text{m}$ ; figs 36, 37, scale bars = 1  $\mu\text{m}$

