

***Melosira* C. Agardh 1824**

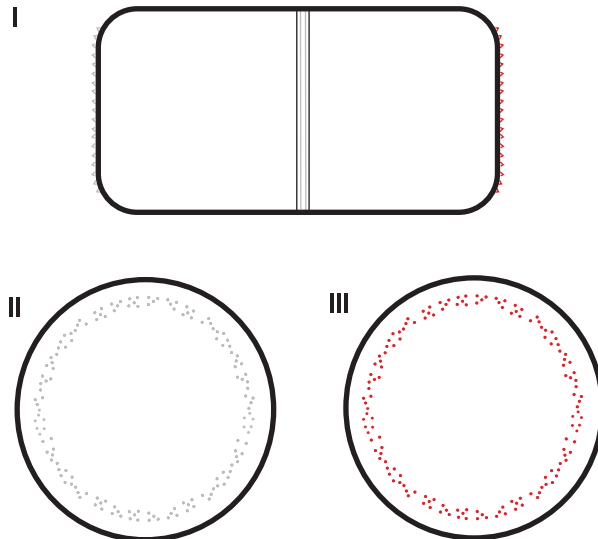
Type species: *Melosira nummuloides* C. Agardh

Characteristics – Cells **centric**, valve mantle is rather deep, cells often observed in girdle view (I). Areolae very small, scattered over the valve face only visible with SEM. **Rimoportulae** small (Fig. 26: C-D, F), scattered over valve face, usually not possible to resolve using LM. Valve face bears a large number of scattered silica granules which can be seen both under LM and SEM (Fig. 25: E-F; Fig. 26:A-B). When seen in valve view under LM a ring of very small spines can be observed around the periphery of the cell close to the valve margin (III; Fig. 25: E-F; Fig. 26: A-B).

Plastid structure – Cells with small plate-like plastids that may be lobed or circular, found around the periphery of the cell (Fig. 25: A-B).

Identification of species – Up till now only one species known from tropical African freshwaters: *Melosira varians* C. Agardh.

Ecology – Cells joined face-to-face by mucilage pads forming long chain like-colonies with the terminal cell attached to the substrate by the same means. Found in the benthos, and may be re-suspended in the plankton, of eutrophic waters with moderate to high conductivities.



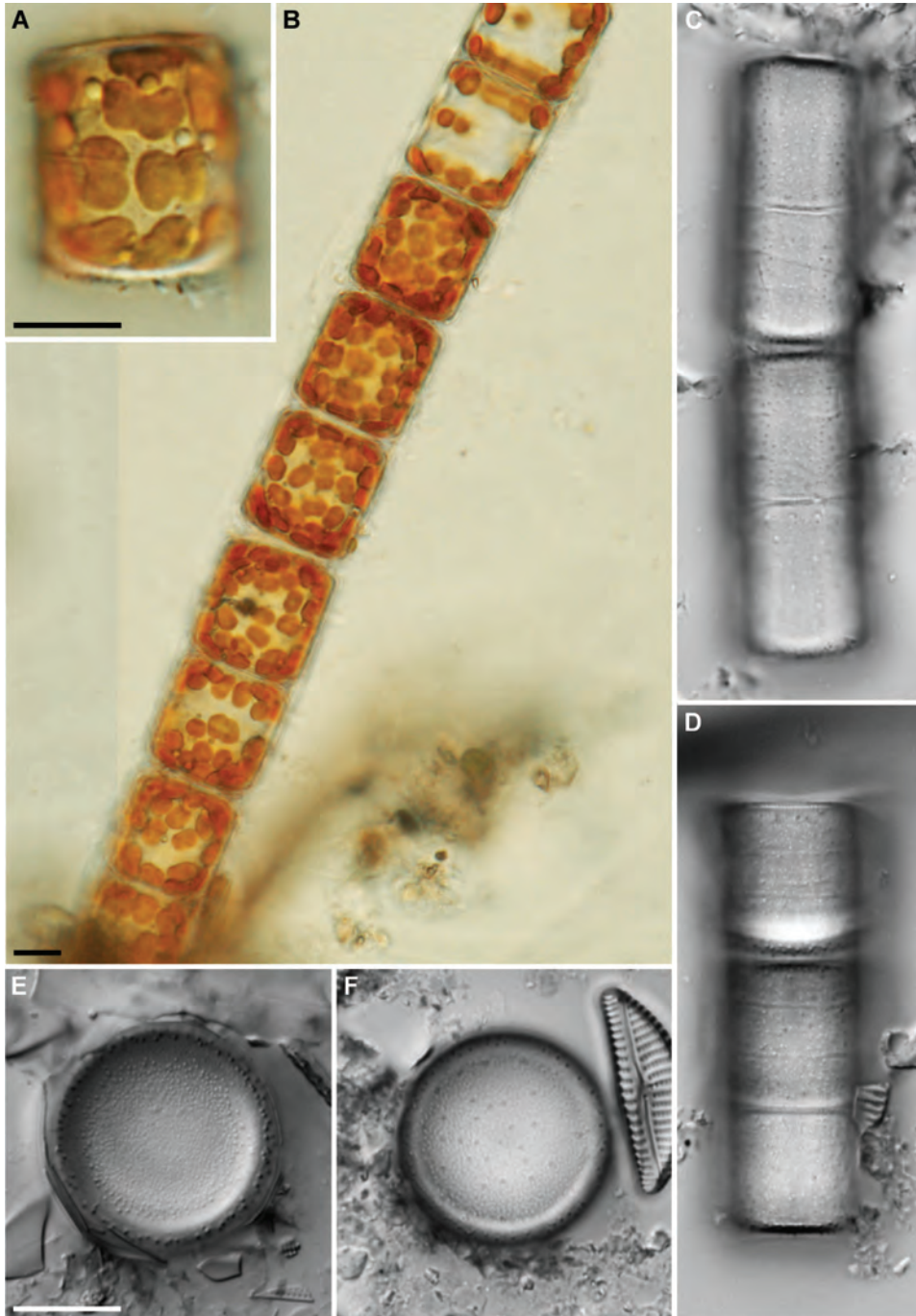


Fig. 25. *Melosira varians*. **A-F.** LM. **A-B.** Living cells, firdle view. **C-F.** Cleaned cells. **C-D.** girdle view. **E-F.** Valve view. Scale bars = 10 μ m.

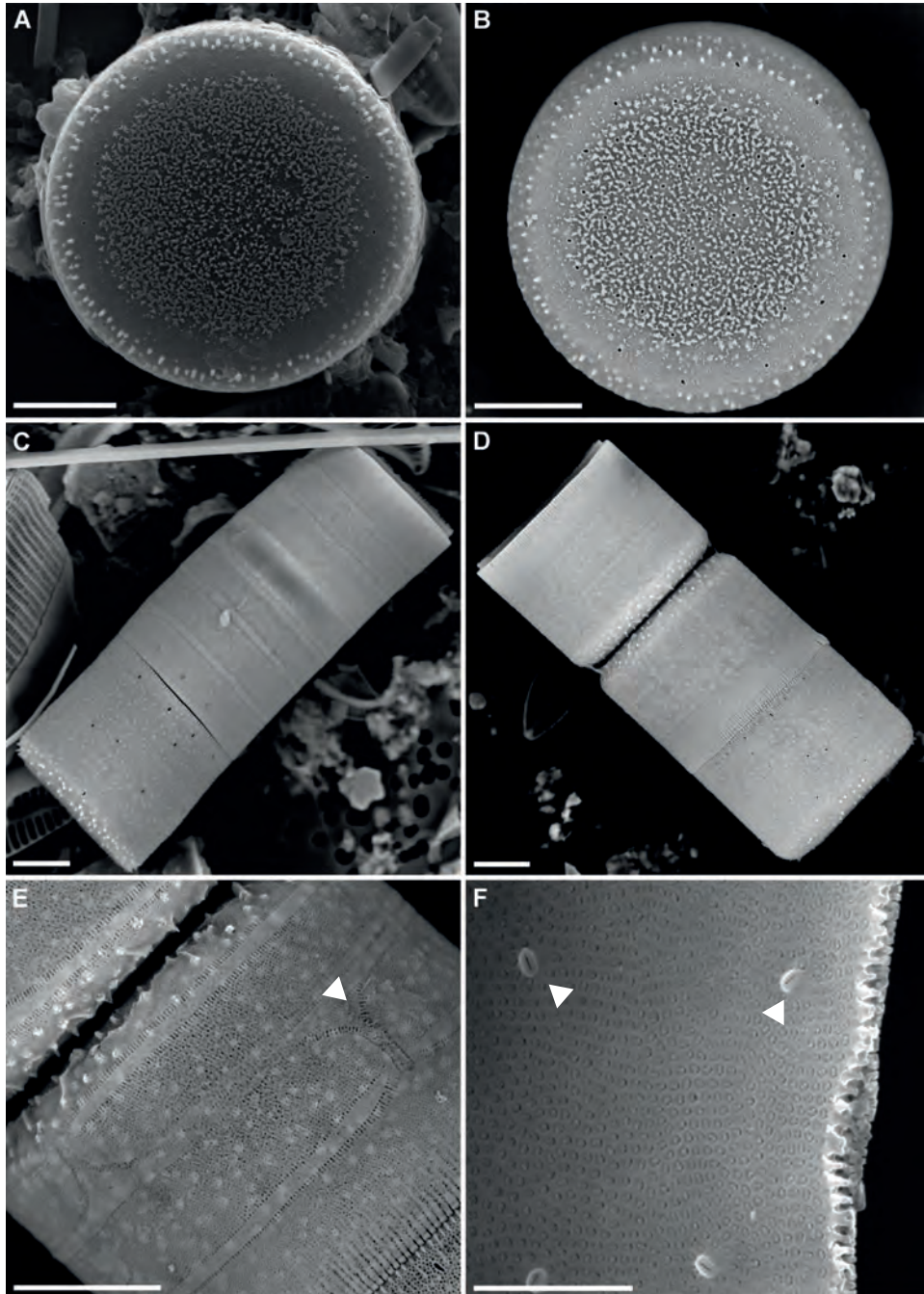


Fig. 26. *Melosira varians*. **A-F.** SEM. **A-B.** External view of valves. **C-D.** Girdle views. **E.** Detail of girdle bands, note ligula (arrow). **F.** Internal view of valve, note rimoportulae (arrows).

Scale bars = 10 μm (A-D), 5 μm (E), 2 μm (F).

***Aulacoseira* Thwaites 1848**

Type species: *Aulacoseira crenulata* (Ehrenberg) Thwaites

SYNONYM:

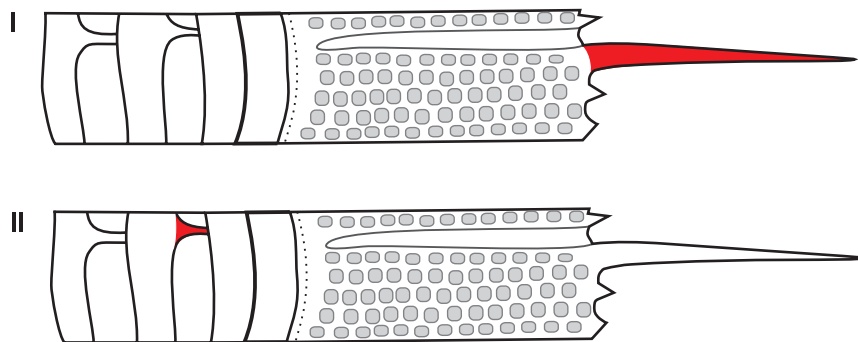
Melosira C. Agardh 1824 pro parte

Characteristics – A **centric** diatom genus with the **valve mantle** most often deeper than the diameter of the **valve face**, for this reason cells are mostly seen in girdle view. Areolae usually large and easily discernable in LM but may be rather small in some cases (e.g. *Aulacoseira herzogii* (Lemmermann) Simonsen; Fig. 27: I). Spines are present including long linking spines (I). Girdle composed of both open and closed bands, a **ligula** or tongue-like structure is present (II, Fig. 28: E).

Plastid structure – Many small disc-like plastids (Fig. 27: B-C).

Identification of species – Depth of the valve mantle is very important together with the orientation and dimensions of the striae and type and length of spines present (e.g. *Aulacoseira granulata* (Ehrenberg) Simonsen has long and short linking spines while *Aulacoseira ambigua* (Grunow) Simonsen only has short linking spines and *Aulacoseira herzogii* only has long spines).

Ecology – Cells colonial forming chains, planktonic in a wide range of water qualities. The increased surface area of these chain-like colonies helps to prevent sinking through the water column.



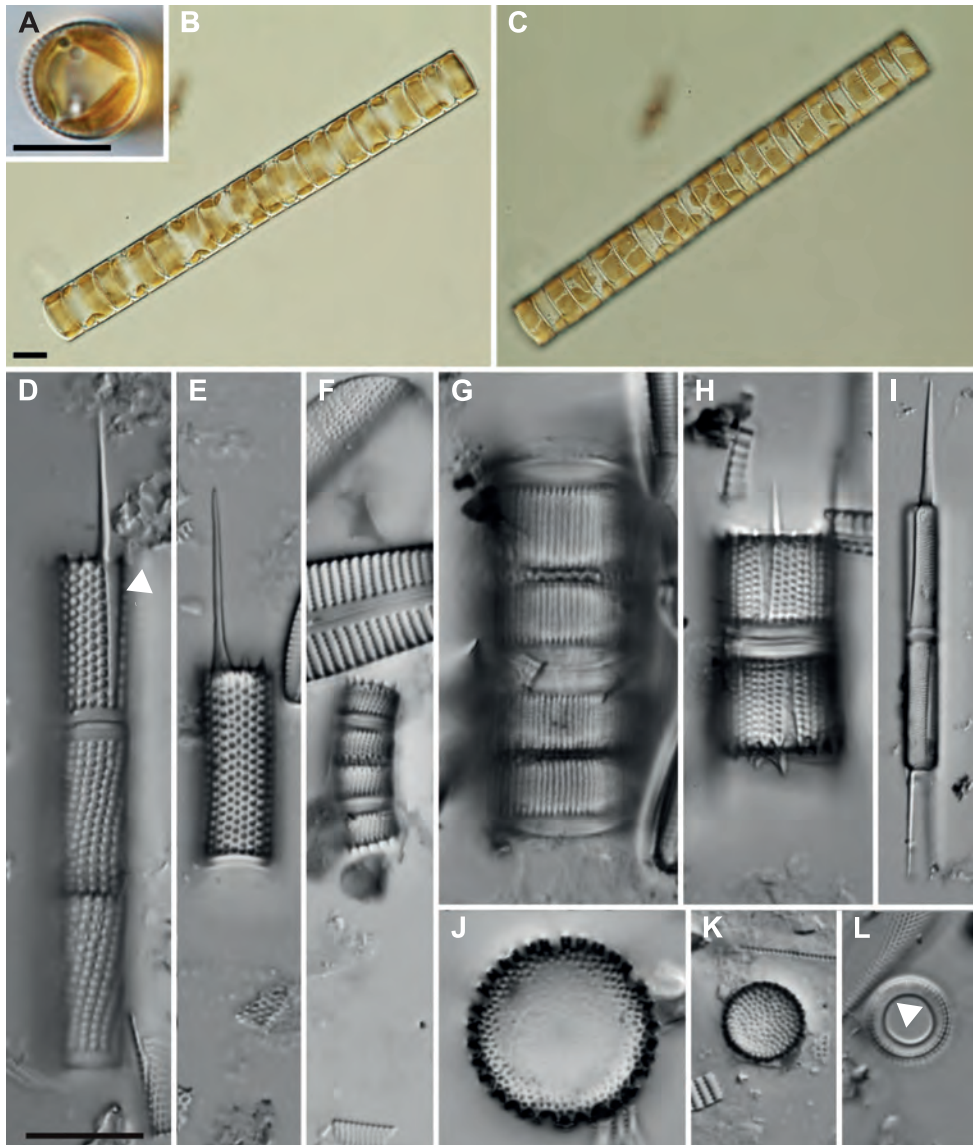


Fig. 27. *Aulacoseira* spp. **A-L.** LM. **A.** Living cell of *Aulacoseira ambigua*, valve view, note position of plastids - appressed to valve mantle. **B-C.** Living cells of *A. ambigua* forming a filamentous colony or chain, different foci of the same filament. **D-E.** Girdle view of *A. granulata*, note long linking spines and associated groove in the mantle (arrow). **F.** Girdle view of *A. subarctica* (O. Müller) E.Y. Haworth. **G.** Girdle view of *Aulacoseira* sp. **H.** Girdle view of *A. muzzanensis* (F. Meister) Krammer, note relatively shorter linking spines as compared with *A. granulata*. **I.** Girdle view of *A. herzogii*. **J-L.** Valve views of various *Aulacoseira* species showing distribution of areolae on valve face and position of the ringleiste (arrow). Scale bars = 10 µm (A-H).

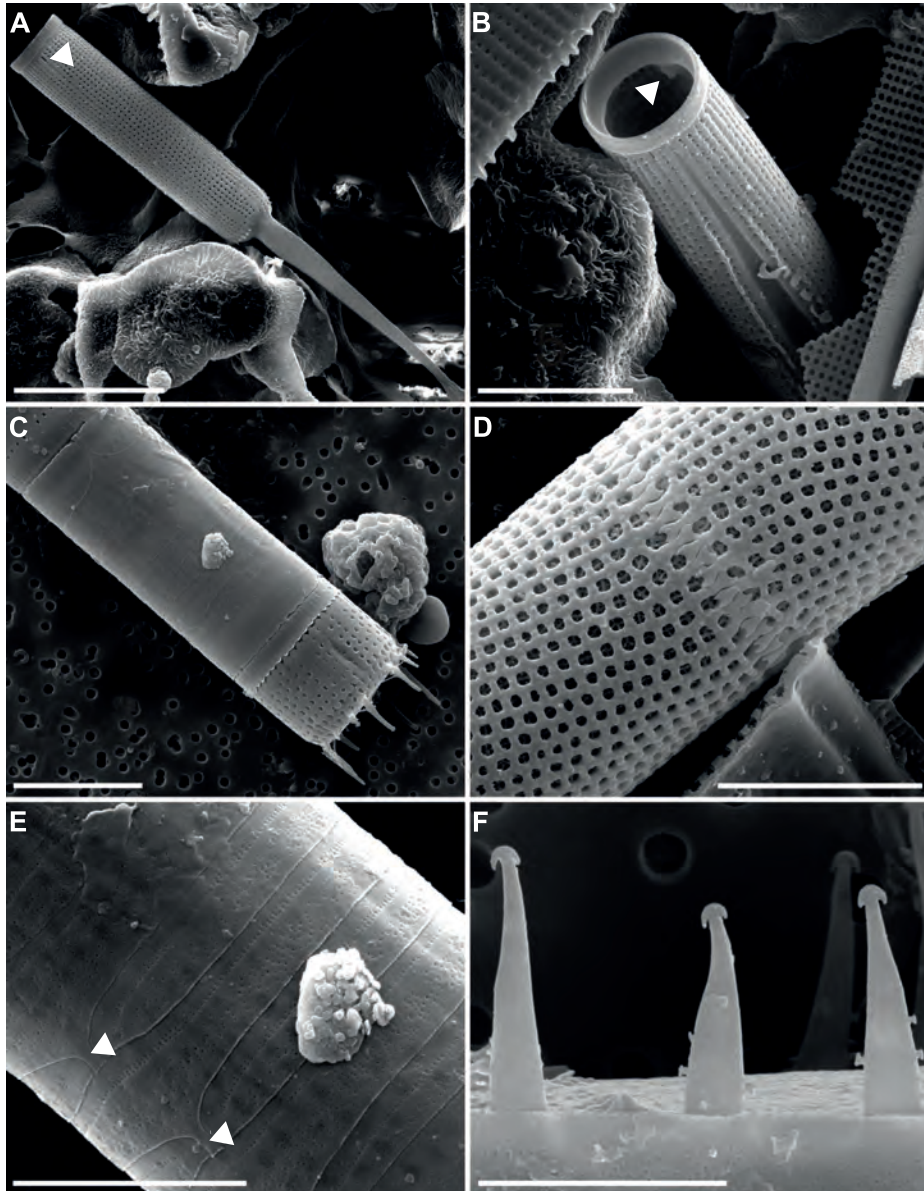


Fig. 28. *Aulacoseira* spp. **A-F.** SEM. **A.** Girdle view of *Aulacoseira herzogii*, note external opening of the rimoportula (arrow). **B.** Oblique view of *A. herzogii* showing groove in the valve mantle occupied by the linking spine, note internal opening of the rimoportula (arrow). **C.** Girdle view of *Aulacoseira* sp. showing valve mantle and associated copulae. **D.** Girdle view of *A. ambigua* showing the structure of the areolae and the short linking spines. **E.** Detail of the structure of the copulae of *Aulacoseira* sp., note the ligulae (arrows). **F.** Detail of the complex structure of the linking spines of *Aulacoseira* sp.
 Scale bars = 10 μ m (A), 5 μ m (B-D), 3 μ m (E), 2 μ m (F).

Orthoseira Thwaites 1848

Type species: *Orthoseira americana* (Kützing) S.A. Spaulding & Kociolek

SYNONYM:

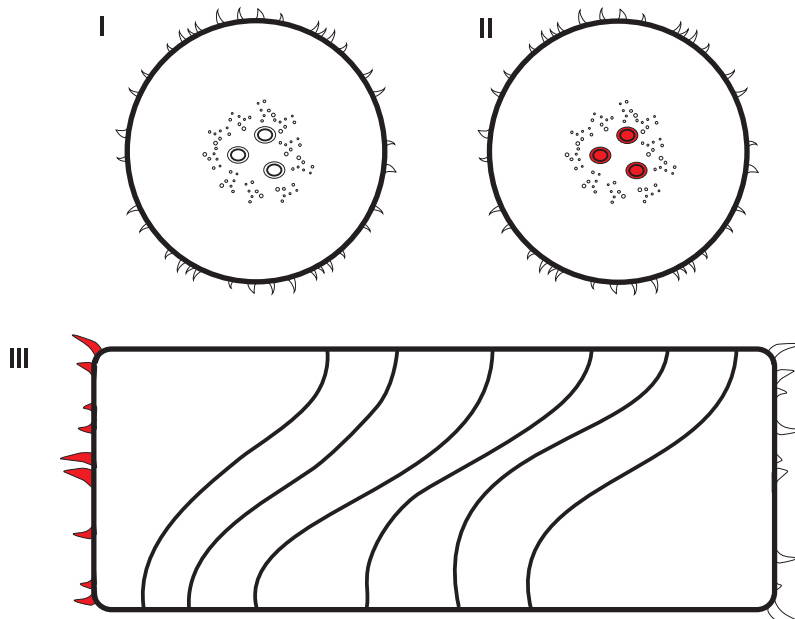
Melosira C. Agardh 1824 pro parte

Characteristics – Cells **centric**, valve mantle is rather deep, cells often observed in girdle view. Girdle composed of multiple bands (**copulae**) (Fig. 30: C, H; Fig. 31: D). Valve face bears unique structures in the centre (II; **carinoportulae**). A ring of spines is found around the periphery of the cell close to the junction of the valve face and mantle (III; Fig. 30: A; Fig. 31: B-C) but may be difficult to observe using LM (Fig. 30 B-F).

Plastid structure – Cells with many small discoid plastids (Fig. 29), found in the peripheral cytoplasm (Fig. 29: A, C) as well as clustered in the cytoplasm surrounding the nucleus (Fig. 29: B).

Identification of species – Based on SEM.

Ecology – Cells linked by spines to form short chains. Generally found in sub-aerial habitats, sometimes washed into rivers, streams and lakes.



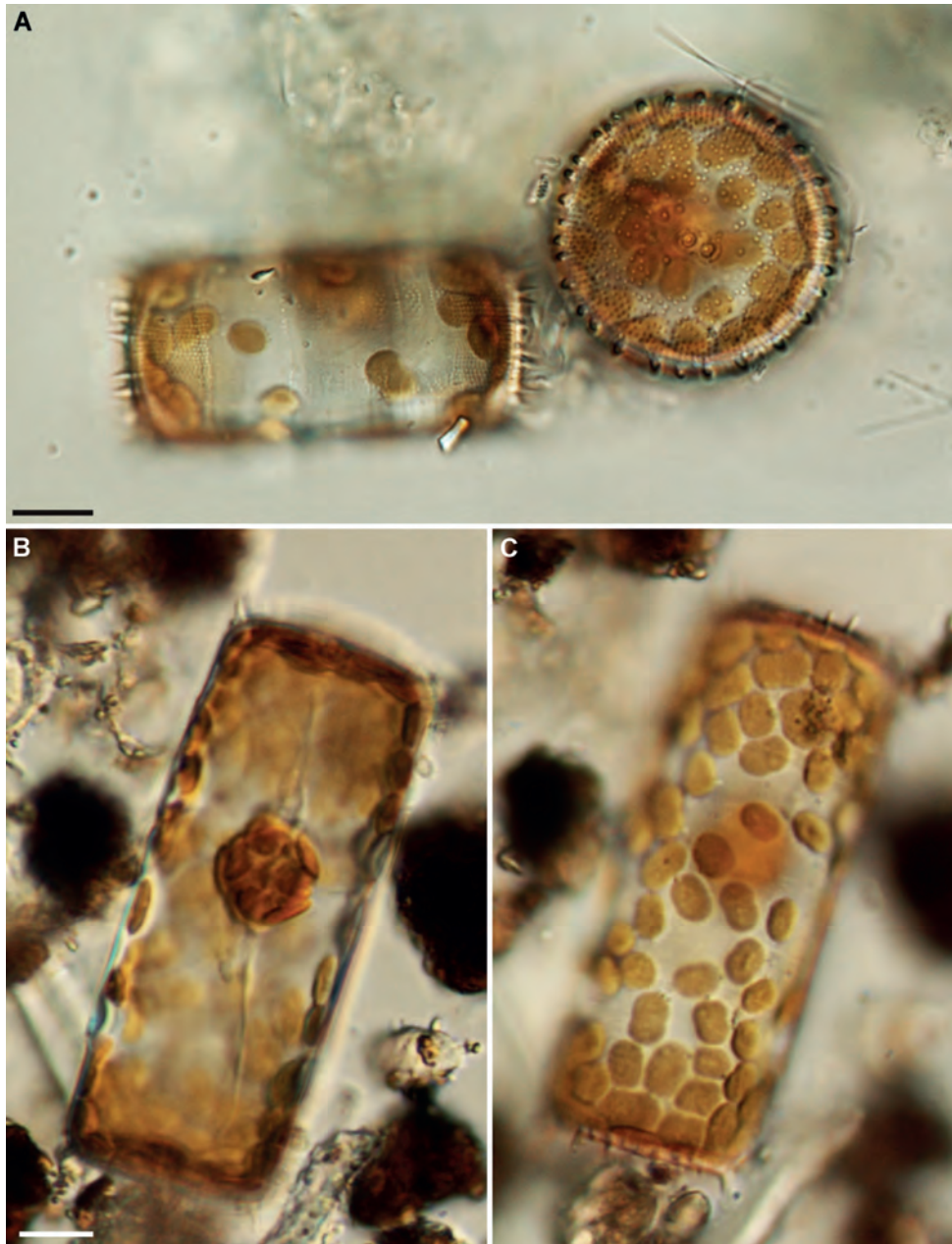


Fig. 29. *Orthoseira* sp. **A-C.** LM, Living cells. **A.** Valve view and girdle view. **B-C.** Girdle view of the same cell at different foci. Scale bars = 10 μ m.

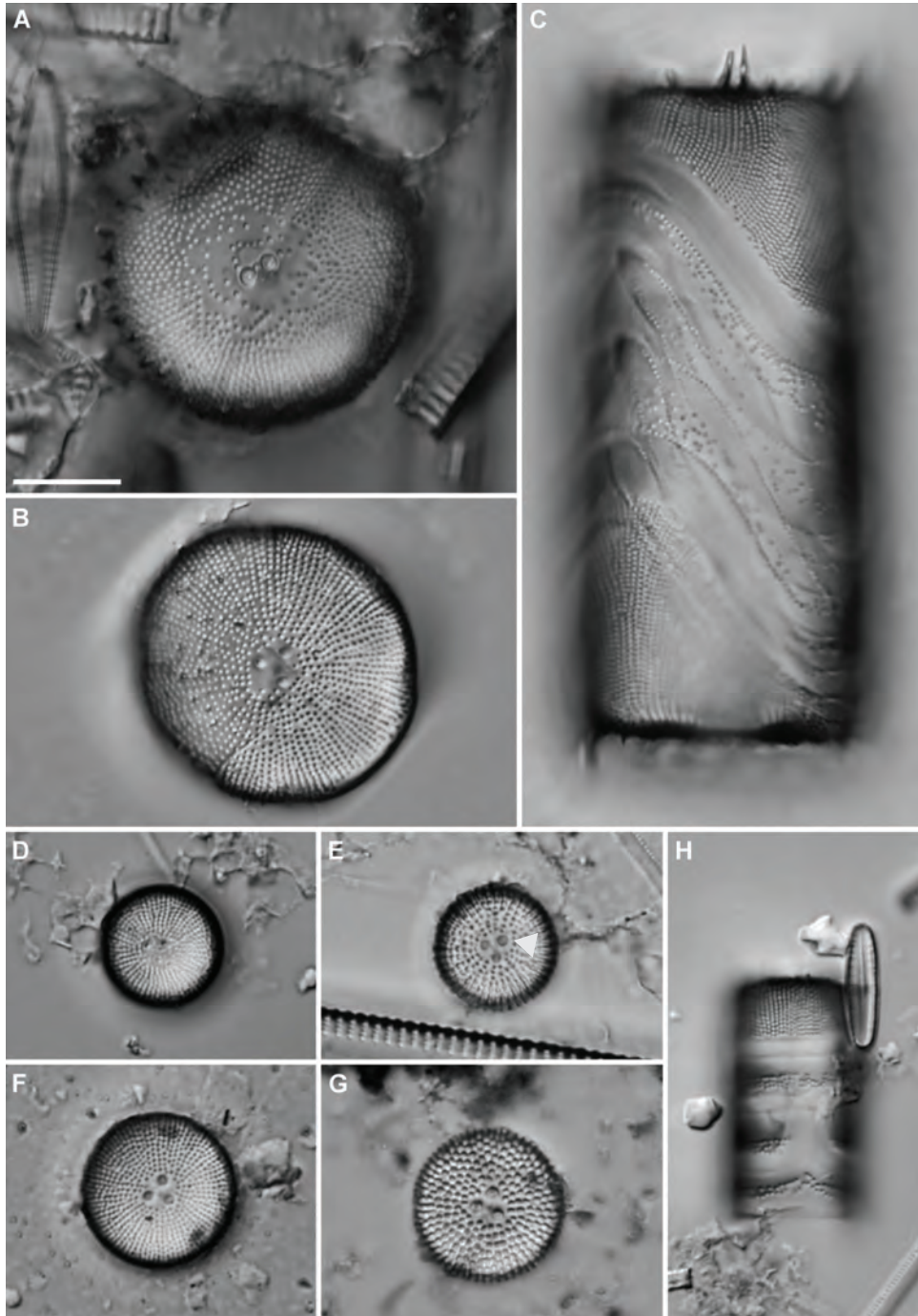


Fig. 30. *Orthoseira* spp. **A-H.** LM, cleaned material. **A-B, D-G.** Valve views, note the carinoportulae (arrow - **E**). **C, H.** Girdle views.
Scale bar = 10 μ m.

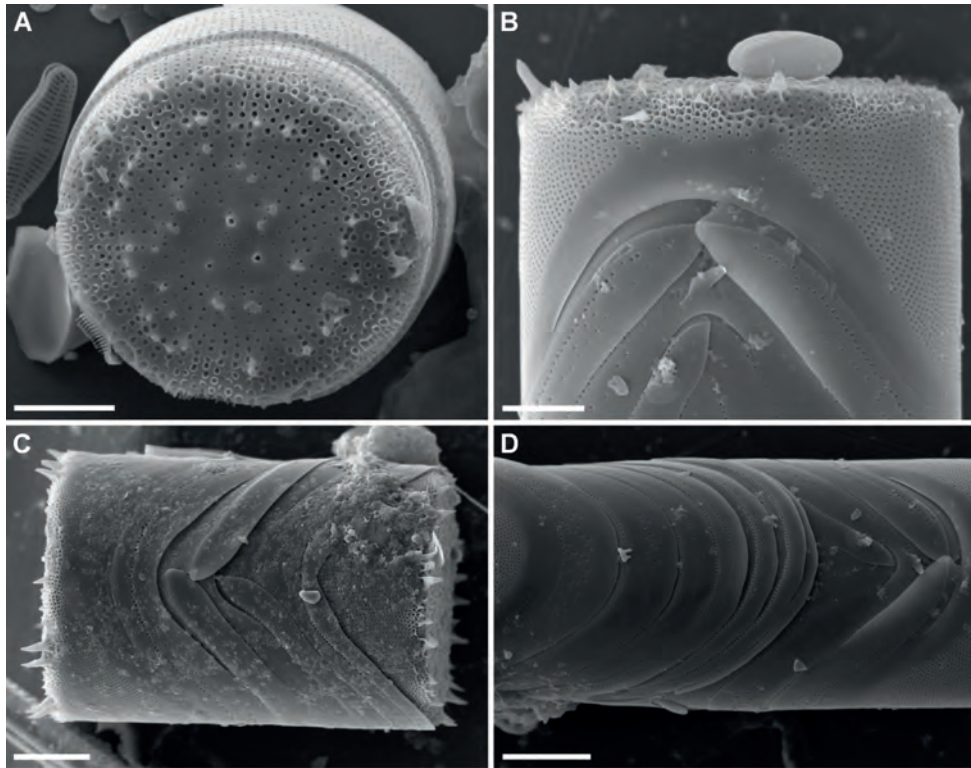


Fig. 31. *Orthoseira* spp. **A-D.** SEM. **A.** External view of valve. **B-C.** Girdle views, note the spines at the junction of the valve face and mantle. **D.** Detail of the girdle bands.

Scale bars = 10 μm (A, C-D), 5 μm (B).

Pleurosira (Meneghini) Trevisan 1848

Type species: *Pleurosira thermalis* Meneghini

SYNONYM:

Melosira C. Agardh 1824 pro parte

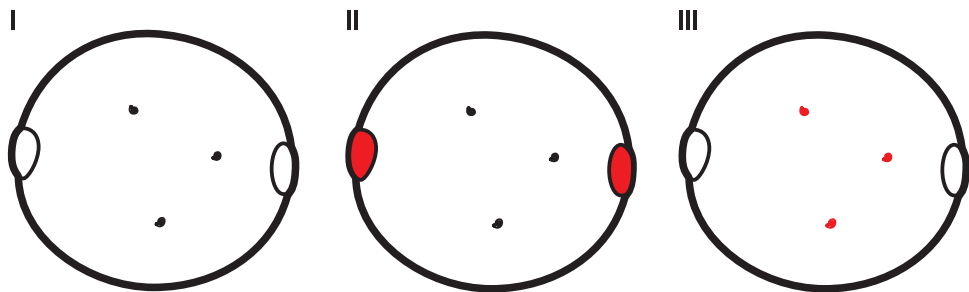
Biddulphia Gray 1821 pro parte

Characteristics – Cells **centric**, oval (**orbicular**) in shape. Valve bears a number of **ocelli** (usually 2) on the valve margin (II). Areolae round, discernable under LM. Short spines and silica granules scattered over the valve face and the valve mantle (III) but may be difficult to observe using LM (Fig. 32: E). A number (1-5) of **rimoportulae** are scattered across the valve face (III; Fig. 32: A-D, E).

Plastid structure – Many small discoid plastids.

Identification of species – Up till now only one species known from tropical Africa: *Pleurosira laevis* (Ehrenberg) Compère.

Ecology – Cells exude mucilage from **ocelli** forming zig-zag chains. Typical of tropical waters with high conductivity and anthropogenically impacted habitats.



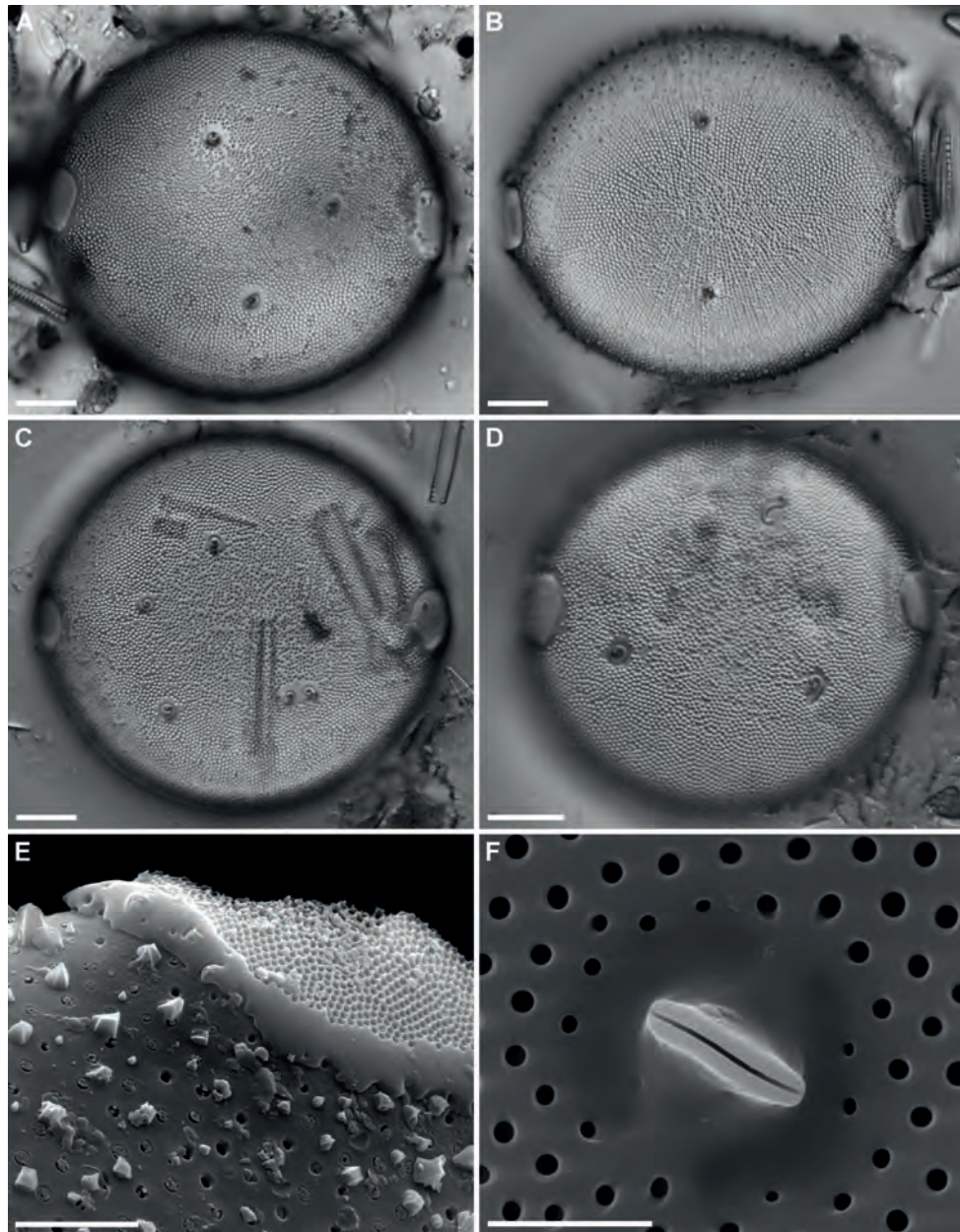


Fig. 32. *Pleurosira laevis*. **A-D.** LM, valve views, note the ocelli. **E-F.** SEM. **E.** External view of valve, detail of an ocellus. **F.** Internal view of valve, detail of a rimoportula. Scale bars = 10 μm (A-D), 2 μm (E-F).

Urosolenia Round & R.M. Crawford 1990

Type species: *Urosolenia eriensis* (H.L. Smith) Round & R.M. Crawford

SYNONYM:

Rhizosolenia Brightwell 1858 pro parte

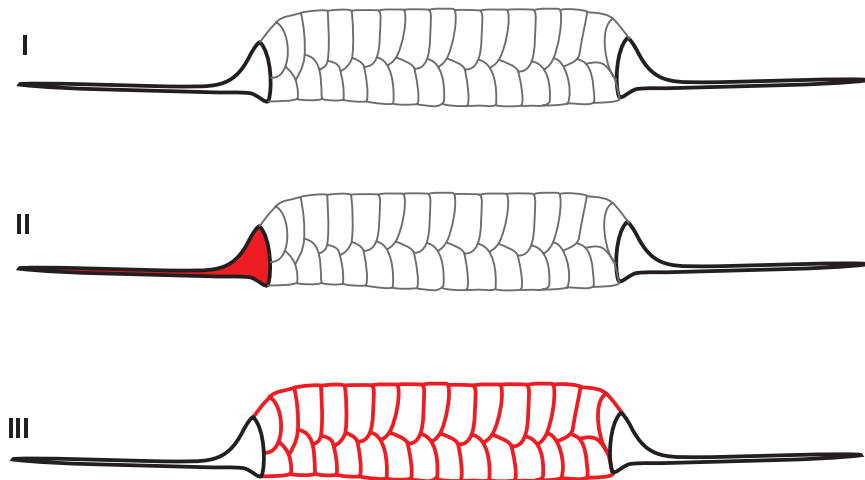
Characteristics – A **centric** diatom genus. Cells **cylindrical** with a small valve and elongate spine (II) on each valve. Frustule very lightly silicified, and the spines may be the only structure remaining after treatment and cleaning of the sample. The valves are joined by scale-like girdle bands (III, Fig. 33: E) (**copulae**), these copulae are rarely discernable under LM.

Plastid structure – Cells with numerous discoid plastids.

Identification of species – Species can be identified by cell size, cell shape and width and the structure of the valve.

Note: Many important cell characteristics can only be observed using SEM.

Ecology -- Cells solitary, planktonic. Found in oligotrophic waters with low to moderate conductivities.



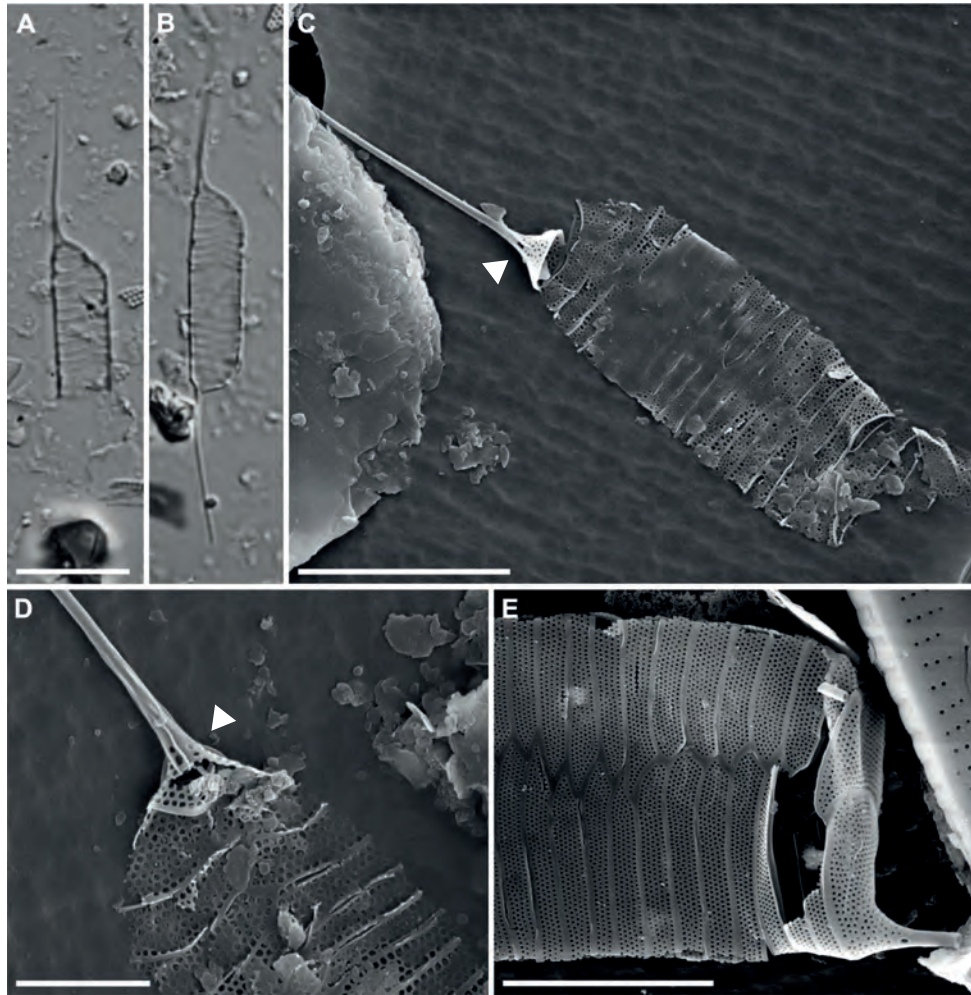


Fig. 33. *Urosolenia* spp. **A-B.** LM, girdle view. **C-E.** SEM. **C-D.** Girdle bands and valve with elongated spine (arrows). **E.** Detail of the scale like girdle bands. Scale bars = 10 µm (A-B), 5 µm (C,E), 2 µm (D).

Asterionella Hassall 1850

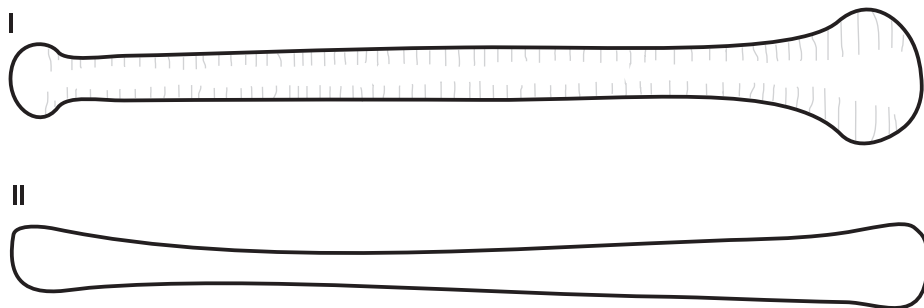
Type species: *Asterionella formosa* Hassall

Characteristics – Cells **araphid**, typically 'bone-shaped' (**heteropolar**) in valve view (I; Fig. 35: A-D) with a larger and smaller pole. Often observed in girdle view (II; Fig. 35: E-G) where one pole is also expanded. Striae are difficult to observe under LM. Spines are present at the junction of the valve face and valve mantle (Fig. 35: F, I). Rimoportulae only visible in SEM (Fig. 35: H).

Plastid structure – Many small plate-like plastids (Fig. 34: A-B).

Identification of species – Up till now only one species occurs commonly in the freshwaters of the tropics: *Asterionella formosa*.

Ecology – Cells colonial, planktonic, suspended in the water column of meso-to eutrophic lakes and impoundments and large rivers. Cells of *Asterionella formosa* secrete mucilage from the pore field of the larger pole and join to form star-like or stellate colonies (Fig. 34: A, C). The increased surface area of these colonies helps to prevent sinking through the water column.



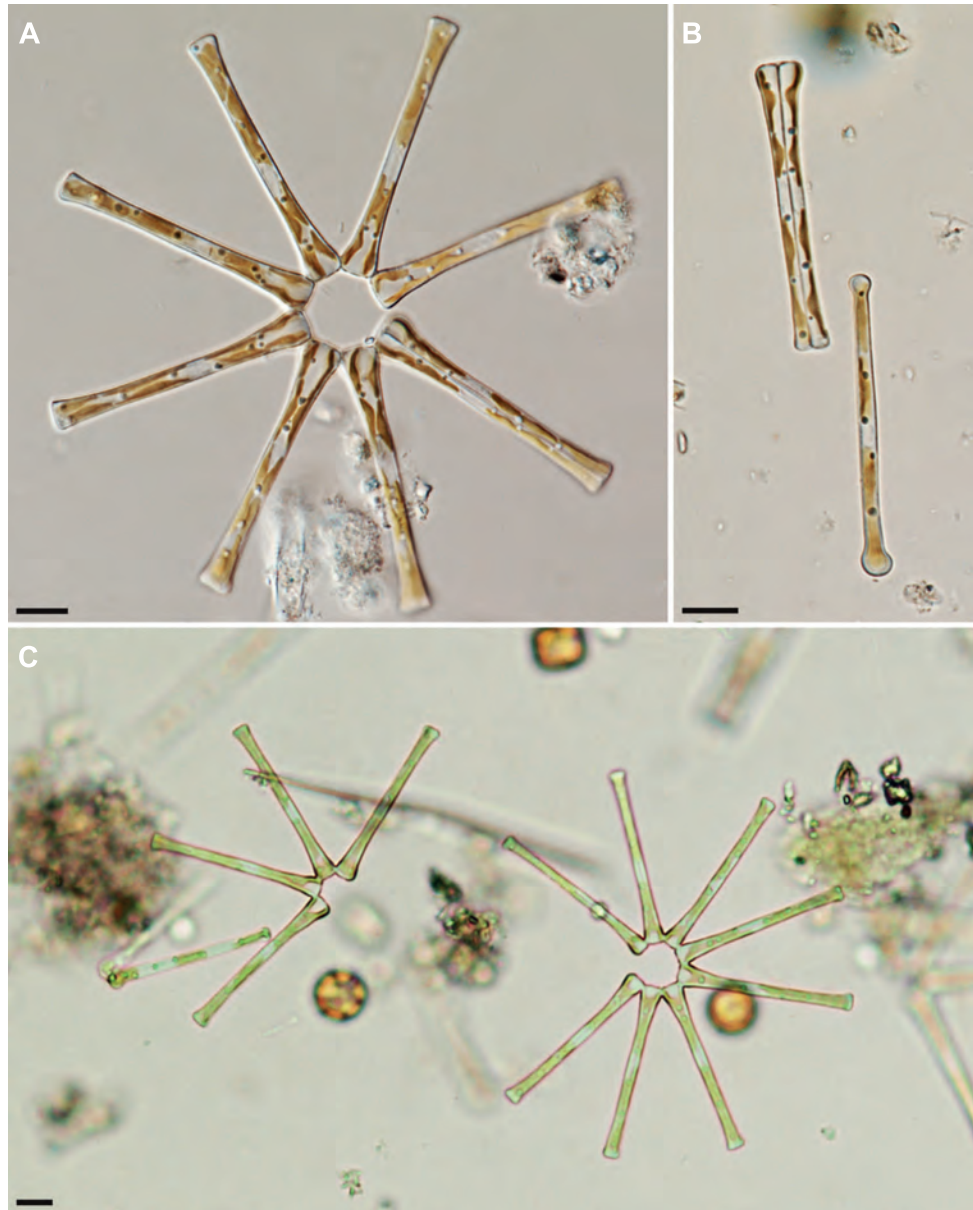


Fig. 34. *Asterionella formosa*. **A-C.** LM. **A.** Living cells, forming typical stellate colony. **B.** Living cells, girdle view, immediately post cell division (left), valve view, note typical 'bone-shape' (right). **C.** Partially formed stellate colonies. Scale bars = 10 μm (A-C).

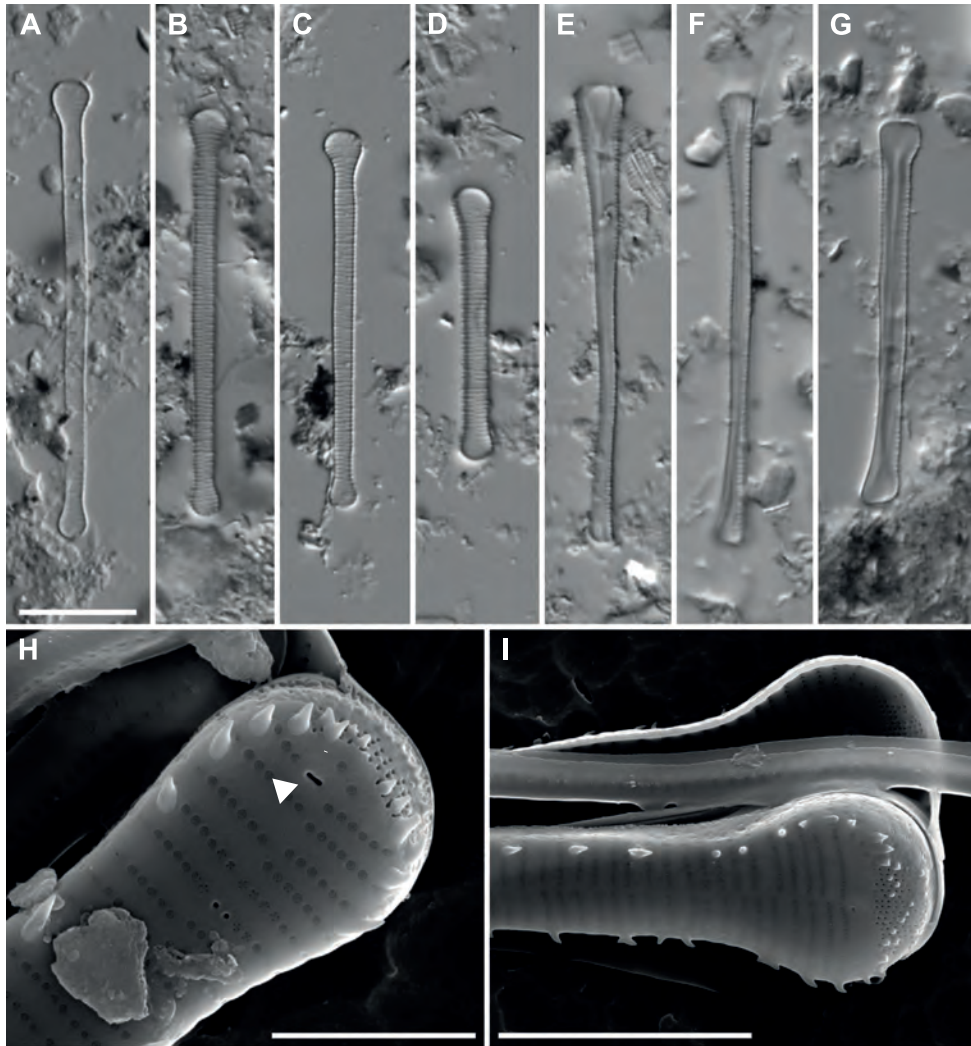


Fig. 35. *Asterionella formosa*. **A-G.** LM. **A-D.** Valve view, note very fine striae and barely visible marginal spines. **H-I.** SEM, cell apices, note apical pore fields, marginal spines and external opening of the rimoportula (arrow).
Scale bars = 10 μ m (A-G), 2 μ m (H), 5 μ m (I).

Ctenophora Grunow ex D.M. Williams & Round 1986

Type species: *Ctenophora pulchella* (Ralfs ex Kützing) D.M. Williams & Round

SYNONYM:

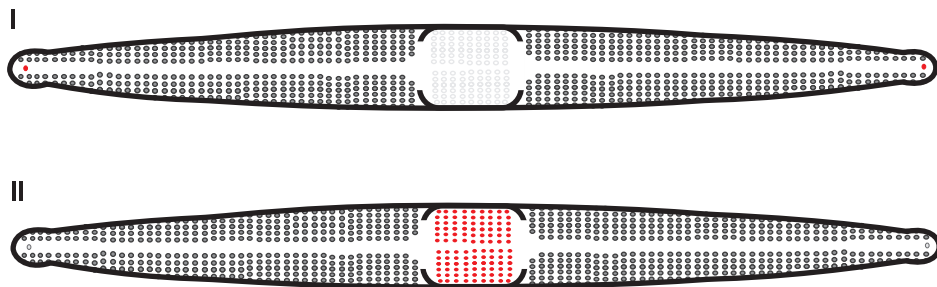
Synedra Ehrenberg 1830 pro parte

Characteristics – Cells **araphid** with parallel striae through the length of the valve, areolae regularly arranged, large and easily observed under LM (Fig. 36: C,D). Areolae with complex structure (Fig. 36: E, F). **Axial area** broad. Central area large (a thickened **fascia**) with **ghost striae** (II, Fig. 36: F, H). **Rimoportula** (labiate or lipped process) present at both apices (I, Fig. 36: E, G).

Plastid structure – Cells with plate-like plastids one lying under each valve face (Fig. 36: A, B).

Identification of species – Up till now only one species known from tropical Africa: *Ctenophora pulchella*.

Ecology – Cells solitary and attached. Found in the benthos of waters with moderate to high conductivity.



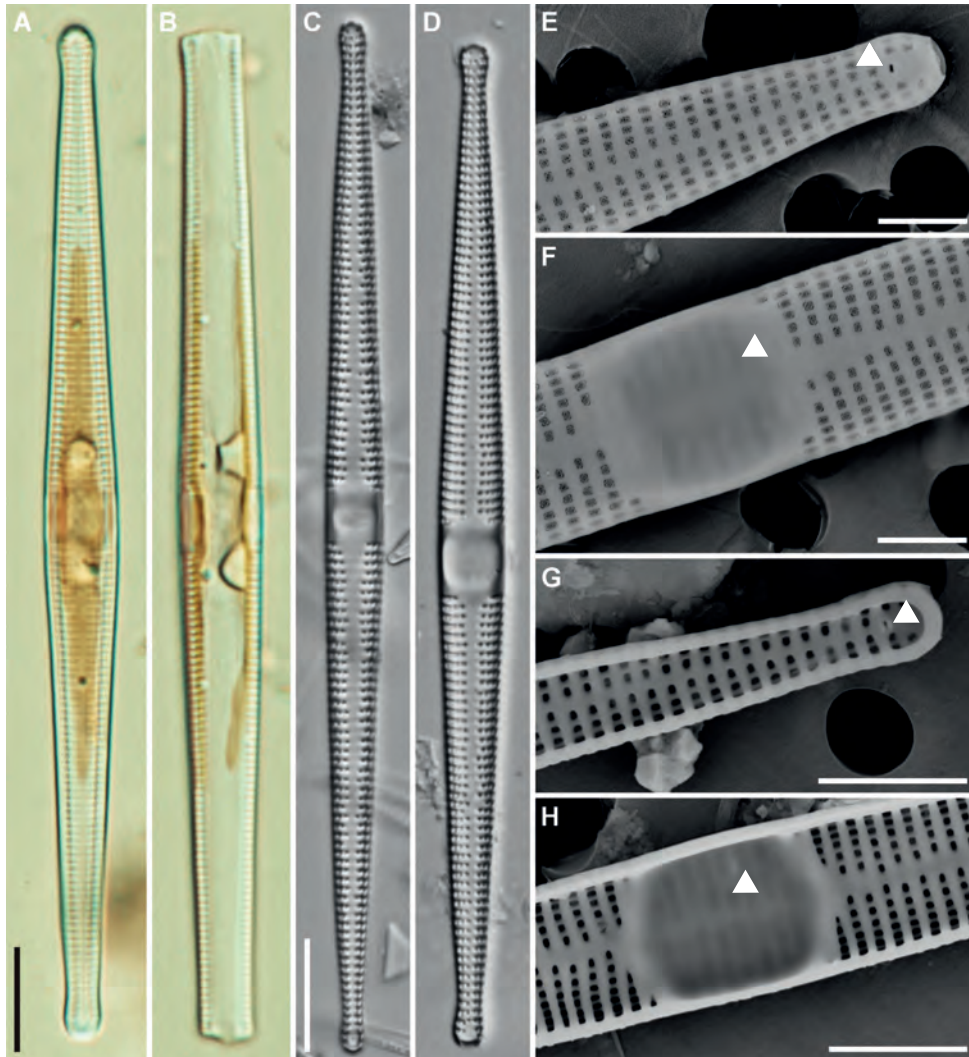


Fig. 36. *Ctenophora pulchella*. **A-D.** LM. **A.** Living cell, valve view. **B.** Living cell, girdle view. **C-D.** Cleaned material, valve view. **E-H.** SEM. **E.** External view of valve, cell apex, note external opening of rimoportula (arrow). **F.** External view of valve, central area, note ghost striae (arrow). **G.** Internal view of valve, cell apex, note internal opening of rimoportula (arrow). **H.** Internal view of valve, central area, note ghost striae (arrow).

Scale bars = 10 μm (A-D), 3 μm (E-F), 5 μm (G-H).

Diatoma Bory 1824

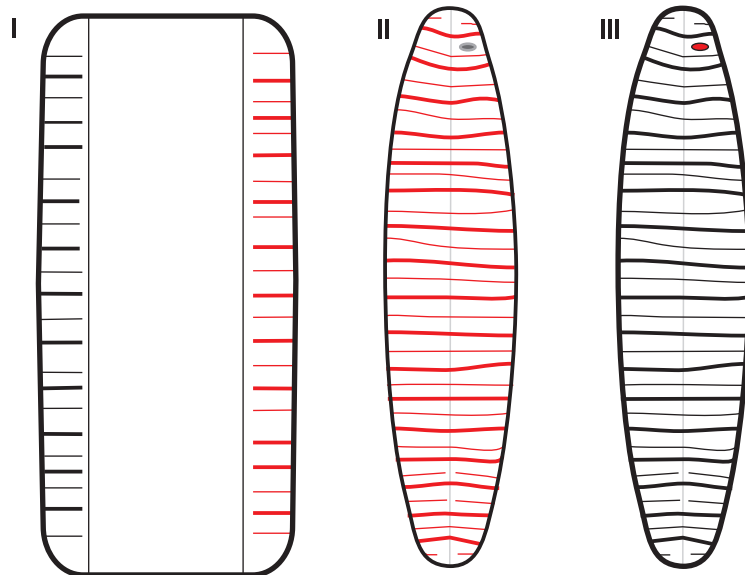
Type species: *Diatoma vulgare* Bory

Characteristics – Cells **isopolar**, **araphid** with a narrow axial area. Striae composed of very small areolae, difficult to discern in LM. The valve has robust costae which stretch from margin to margin (II, Fig. 37: C, D, F). Costae also visible in girdle view (I, Fig. 37: B). A single rimoportula, sometimes visible in LM, is present near one of the apices (III). **Apical pore fields** at each apex.

Plastid structure – Cells with many small granular plastids (Fig. 37: B).

Identification of species – Up till now only one species known from tropical Africa: *Diatoma vulgare*.

Ecology – Cells single or in pairs, attached by the corners and non-motile forming colonies. Colonies zig-zag shaped (Fig. 37: B) as cells join corner to corner by a **mucilage pad** exuded from the **apical pore field**. Occur *en-masse* in eutrophic waters forming dense colonies visible to the human eye.



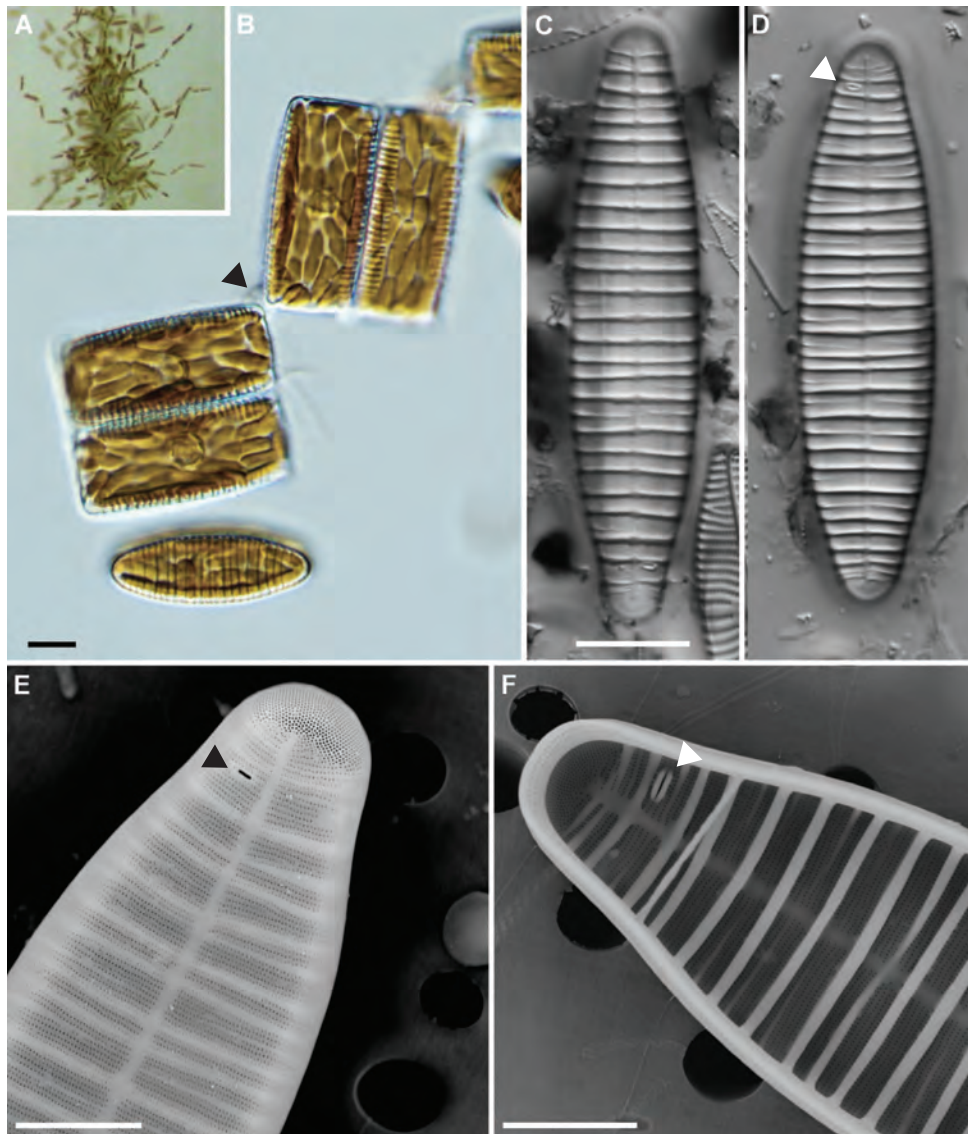


Fig. 37. *Diatoma vulgaris*. **A-D.** LM. **A.** Living cells, colonizing a filament of green algae. **B.** Living cells, girdle and valve views (bottom), note mucilage pads joining cells at the corners (arrow). **C-D.** Valve views of cleaned material, note position of rimoportula (arrow - **D**). **E-F.** SEM. **E.** External view of valve showing external opening of rimoportula (arrow) and apical pore field. **F.** Internal view of valve showing the transapical costae and the internal opening of the rimoportula (arrow).

Scale bars = 10 μm (A-D), 5 μm (E-F).

Fragilaria Lyngbye 1819

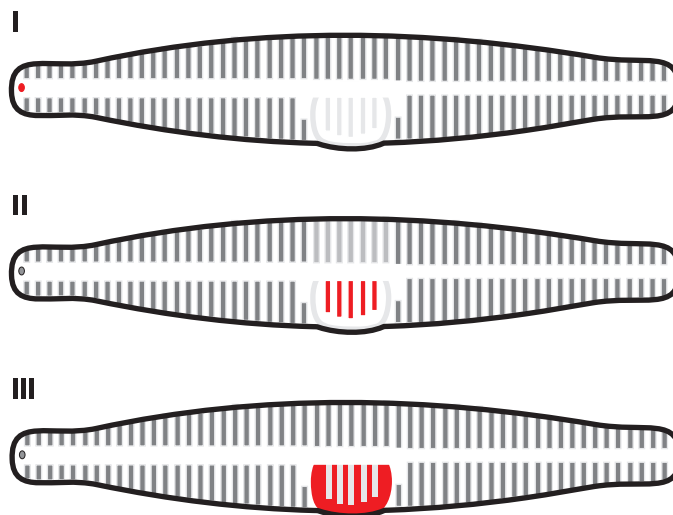
Type species: *Fragilaria pectinalis* (O.F. Müller) Lyngbye

Characteristics – Cells **araphid** with parallel striae through the length of the valve, areolae fine, not easily observed under LM (Fig. 39: A-I). **Axial area** narrow (Fig. 39: E-H) to broad (Fig. 39: D, I). Central area large (a thickened **fascia**; I) with **ghost striae** present (II, Fig. 39: E, F), reaches both valve margins (II, Fig. 39: E, F) or unilaterally expanded (III, Fig. 39: H). **Rimoportula** (labiate or lipped process) (I, Fig. 40: B) present at one apex. Spines at the junction of the valve face and valve mantle.

Plastid structure – Cells with plate-like plastids one lying under each valve face (Fig. 38: A-F).

Identification of species – Species can be identified by cell size, cell shape, structure and density of the striae as well as structure and extent of the axial and central area.

Ecology – Cells colonial, valve face to valve face forming ribbons or basally attached. Found in the benthos of waters with low to moderate conductivity and at a range of trophic levels.



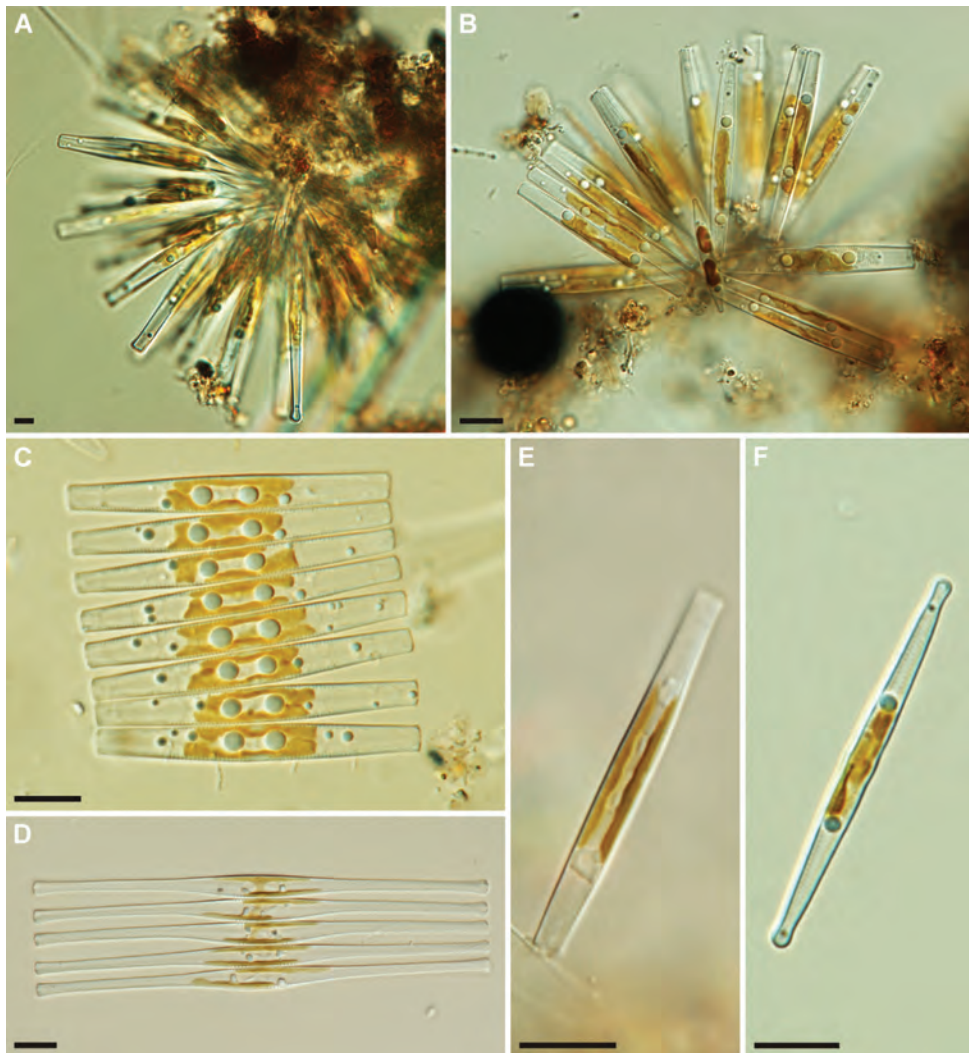


Fig. 38. *Fragilaria* spp. **A-F.** LM, living cells. **A-B.** Cells aggregated into colonies, joined at the base of the cells. **C.** Cells (girdle view) in a ribbon-like colony. **D.** *Fragilaria crotonensis* Kitton, girdle view, ribbon-like colony. **E.** Single cell, girdle view. **F.** Single cell, valve view.
Scale bars = 10 μm (A-F).

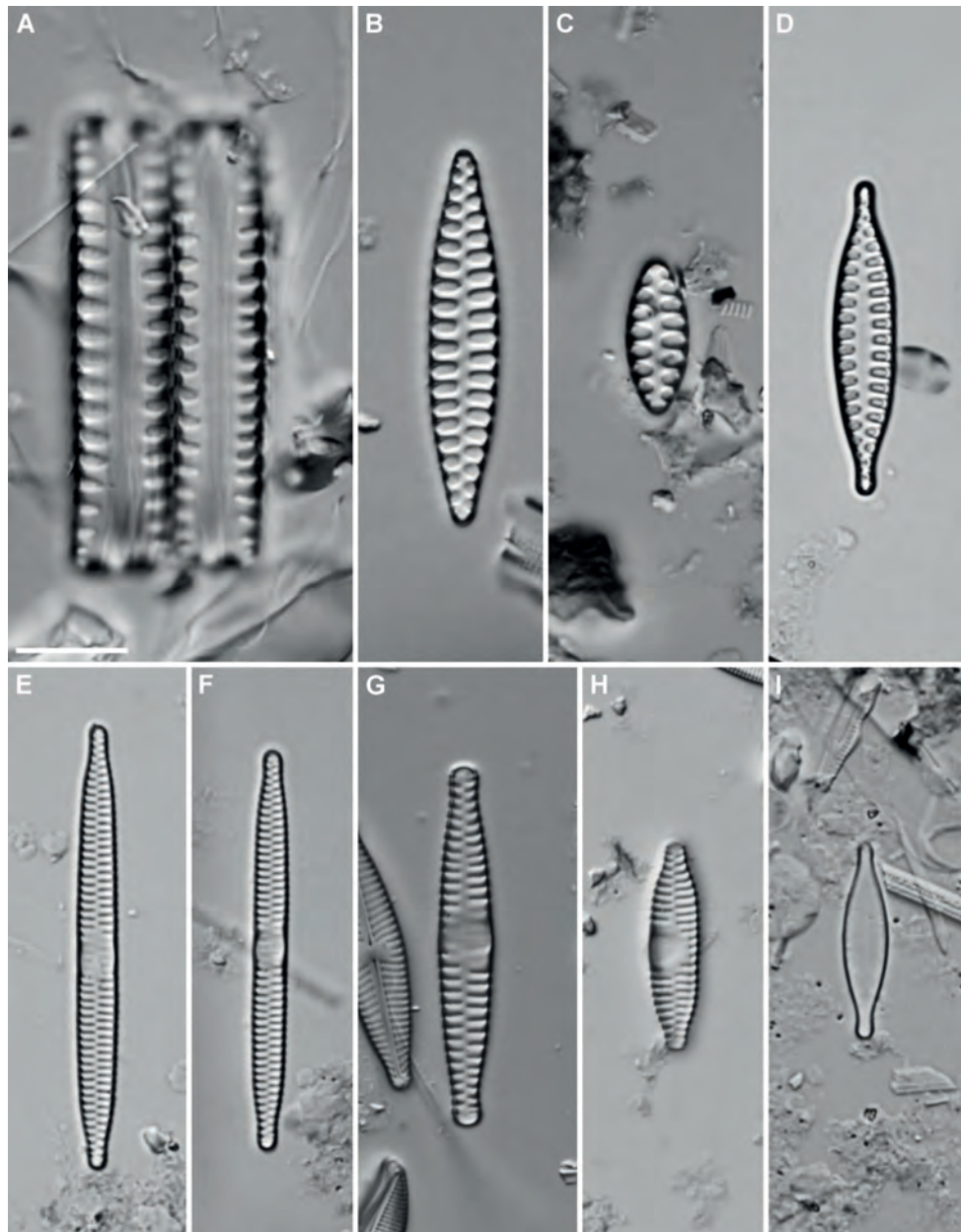


Fig. 39. *Fragilaria* spp. sensu lato. **A-I.** LM. **A.** Girdle view of two cells of *Fragilaria crassa* Metzeltin & Lange-Bertalot. **B-C.** Valve view of *F. crassa*. **D-H.** Valve views of *Fragilaria* spp. **I.** *F. densestriata* Hustedt.
Scale bar = 10 μ m (A-H).

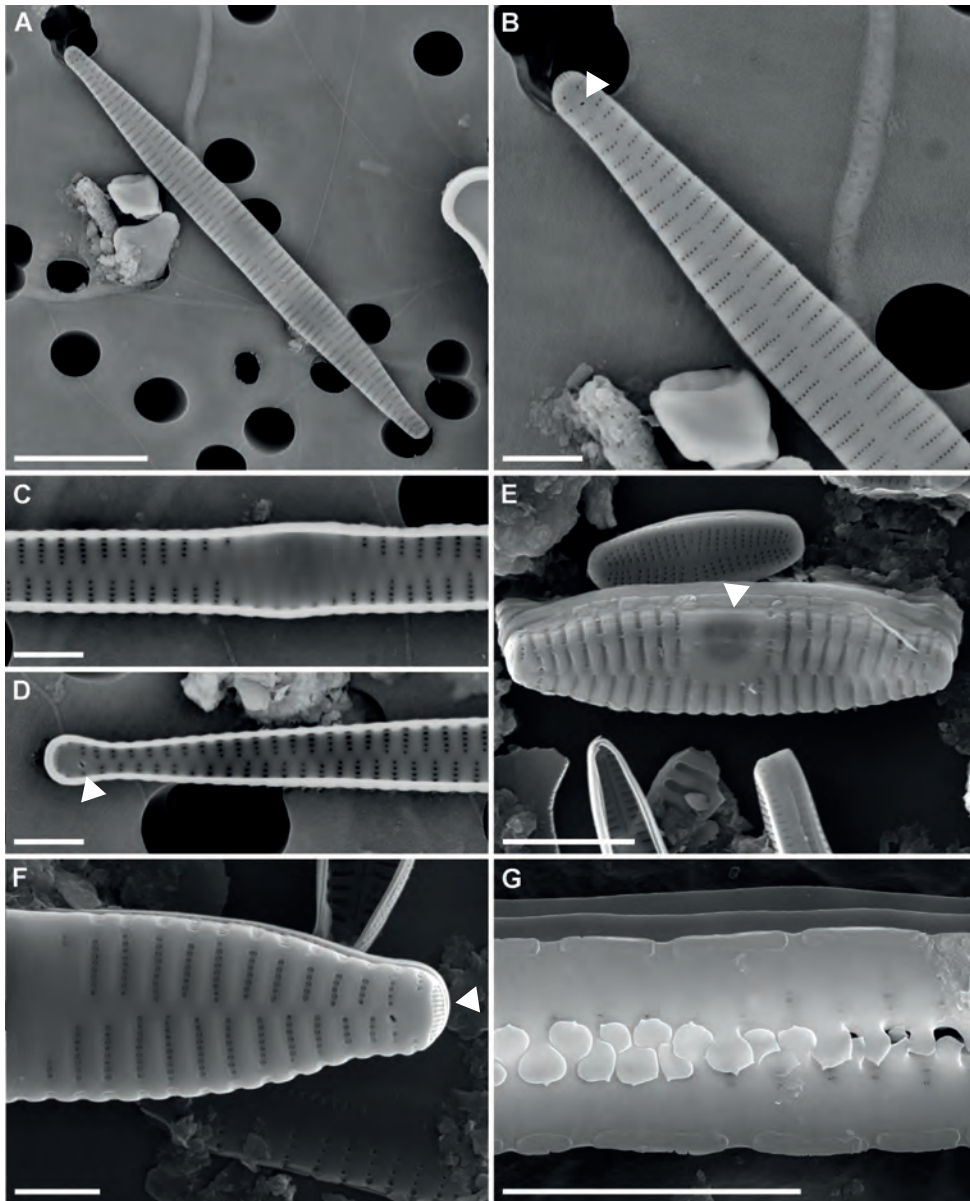


Fig. 40. *Fragilaria* spp. **A-G.** SEM. **A-B.** External view of valve, note external opening of rimoportula (arrow - **B**). **C-D.** Internal view of valves. **C.** Central area. **D.** Apex of cell, note internal opening of rimoportula (arrow). **E.** Oblique view of valve exterior, note thickened fascia (arrow). **F.** External view of cell apex, note apical pore field (arrow). **G.** Girdle view of two valves joined by interlinking spines. Scale bars = 8 μ m (**A**), 2 μ m (**B-D**, **F**), 5 μ m (**E**, **G**).

Fragilariforma D.M. Williams & Round 1988

Type species: *Fragilariforma virescens* (Ralfs) D.M. Williams & Round

SYNONYM:

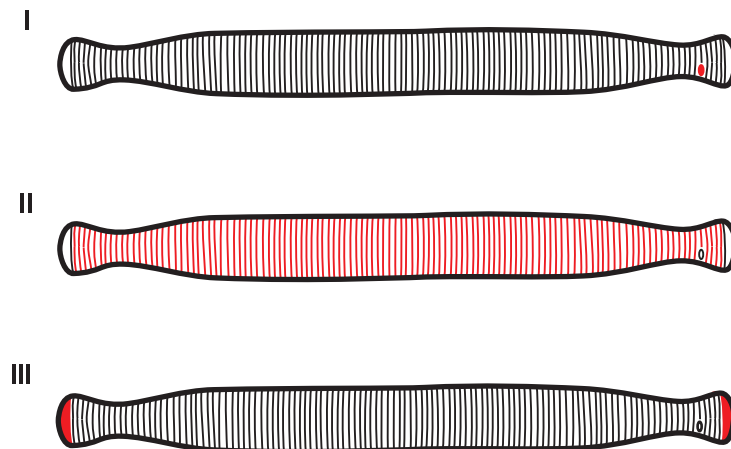
Fragilaria Lyngbye 1819 pro parte

Characteristics – Cells **araphid** with parallel striae through the length of the valve (I), areolae fine, not easily observed under LM (Fig. 41). **Rimoportula** (labiate or lipped process) present at one apex (I), difficult to observe under LM. Apical pore fields present at both apices, appearing as unornamented areas under LM (III). **Axial area** very narrow, not possible to observe with LM. Spines at the junction of the valve face and valve mantle (Fig. 42: A-B).

Plastid structure – Unknown from African material.

Identification of species – Up till now only one species known from tropical Africa: *Fragilariforma strangulata* (Zanon) D.M. Williams & Round.

Ecology – Cells joined valve face to valve face forming ribbon-like colonies. Found in the benthos of acidic, oligotrophic waters with low conductivity.



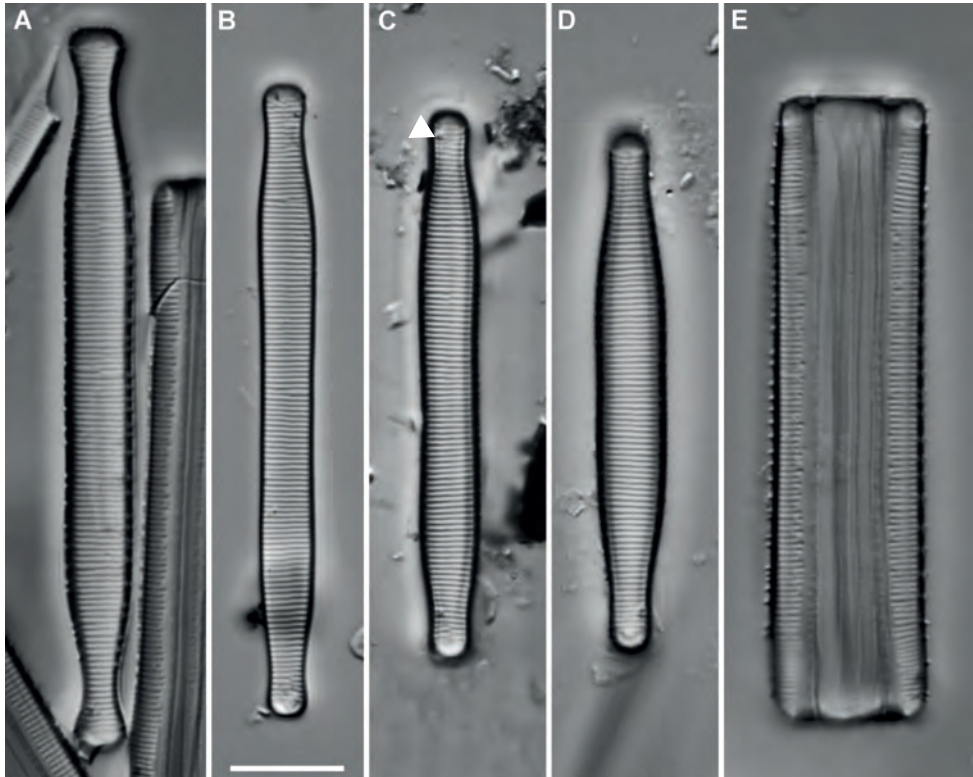


Fig. 41. *Fragilariforma strangulata* (Zanon) D.M. Williams & Round. **A-E.** LM. **A-D.** Valve views, note rimoportula (arrow - **C**). **E.** Girdle view.
Scale bar = 10 μ m.

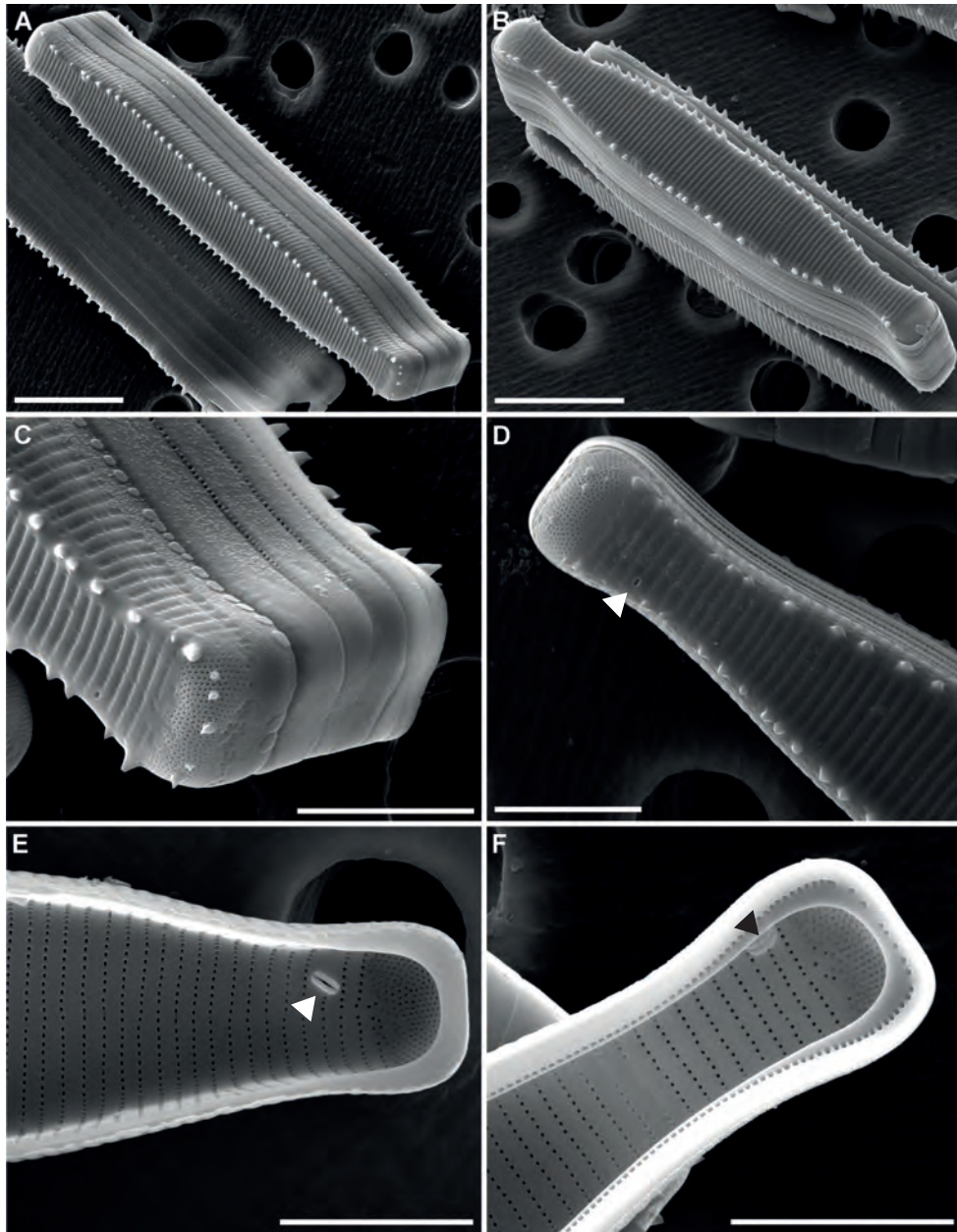


Fig. 42. *Fragilariforma strangulata*. **A-F.** SEM. **A-B.** Oblique external view of valves. **C-D.** External view of apices, showing apical pore field, note external opening of rimoportula (arrow - **D**). **E-F.** Internal view of apices showing variable position of rimoportulae (arrows). Scale bar = 10 μm (**A-B**), 5 μm (**C-F**).

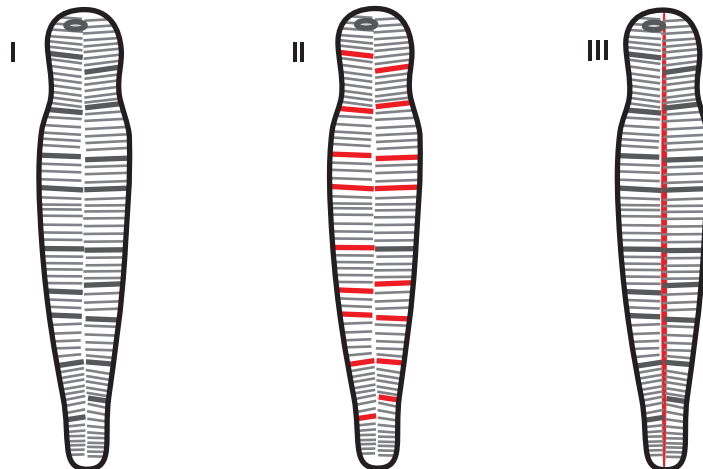
Meridion C. Agardh 1824Type species: *Meridion vernale* C. Agardh

Characteristics – Cells **araphid**, **heteropolar** with broadly rounded head pole and narrower foot pole, wedge shaped in girdle view. Valve margin may be constricted just below the head pole. Valve face crossed by transapical striae and costae (II) interrupted in the centre by a narrow axial area (III). Striae are fine, located between the costae and not easily discernible under LM (Fig. 43: A-F). Single **rimoportula** present near the head pole (Fig. 44: A-B).

Plastid structure – Many discoid plastids lying under the valve face.

Identification of species – Up till now only one species known from tropical Africa: *Meridion circulare* (Greville) C. Agardh and *M. circulare* var. *constrictum* (Ralfs) Van Heurck.

Ecology – Cells solitary, or united by the valve faces forming fan-shaped colonies. Found in the benthos of acidic, oligotrophic waters with low conductivities.



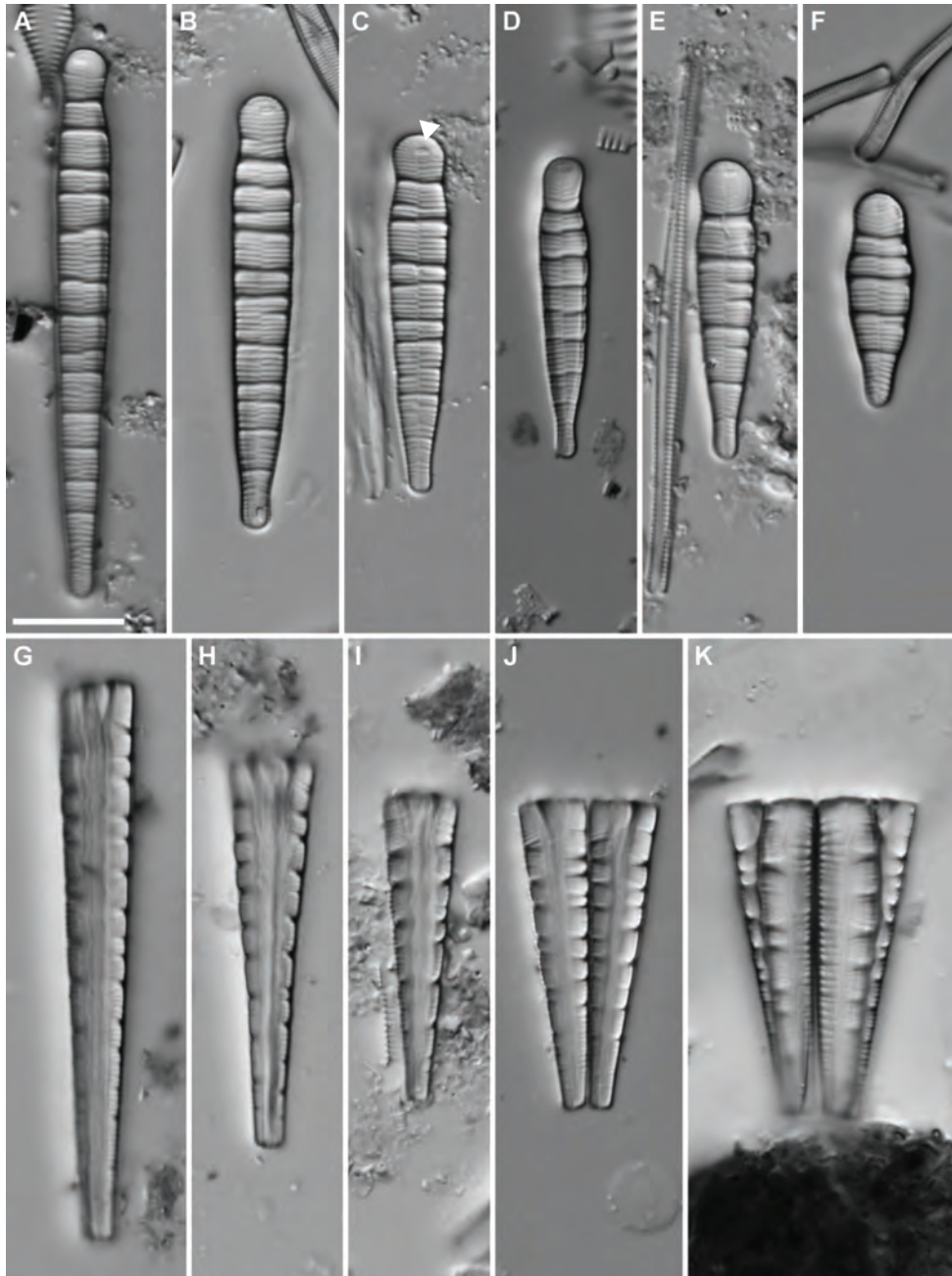


Fig. 43. *Meridion circulare* var. *constrictum*. **A-K.** LM. **A-F** Valve views, note rimoportula (arrow - **C**). **G-K.** Girdle views.
Scale bar = 10 μ m .