

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

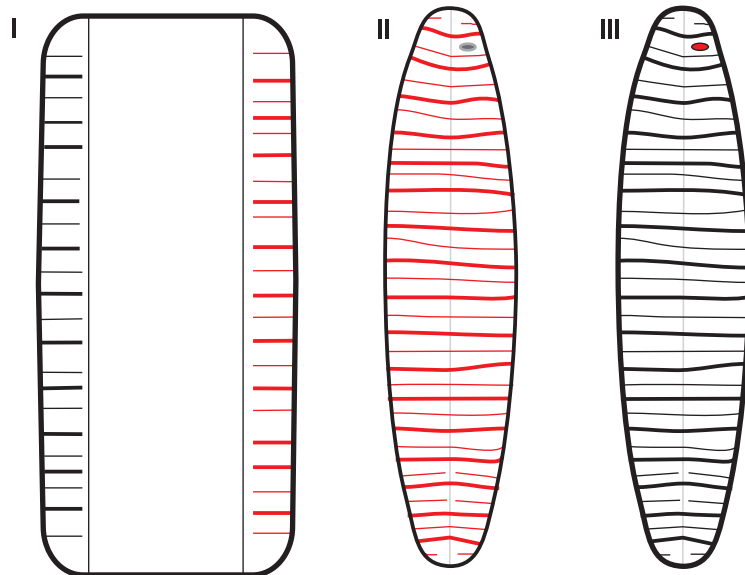
Type species: *Diatoma vulgare* Bory

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.



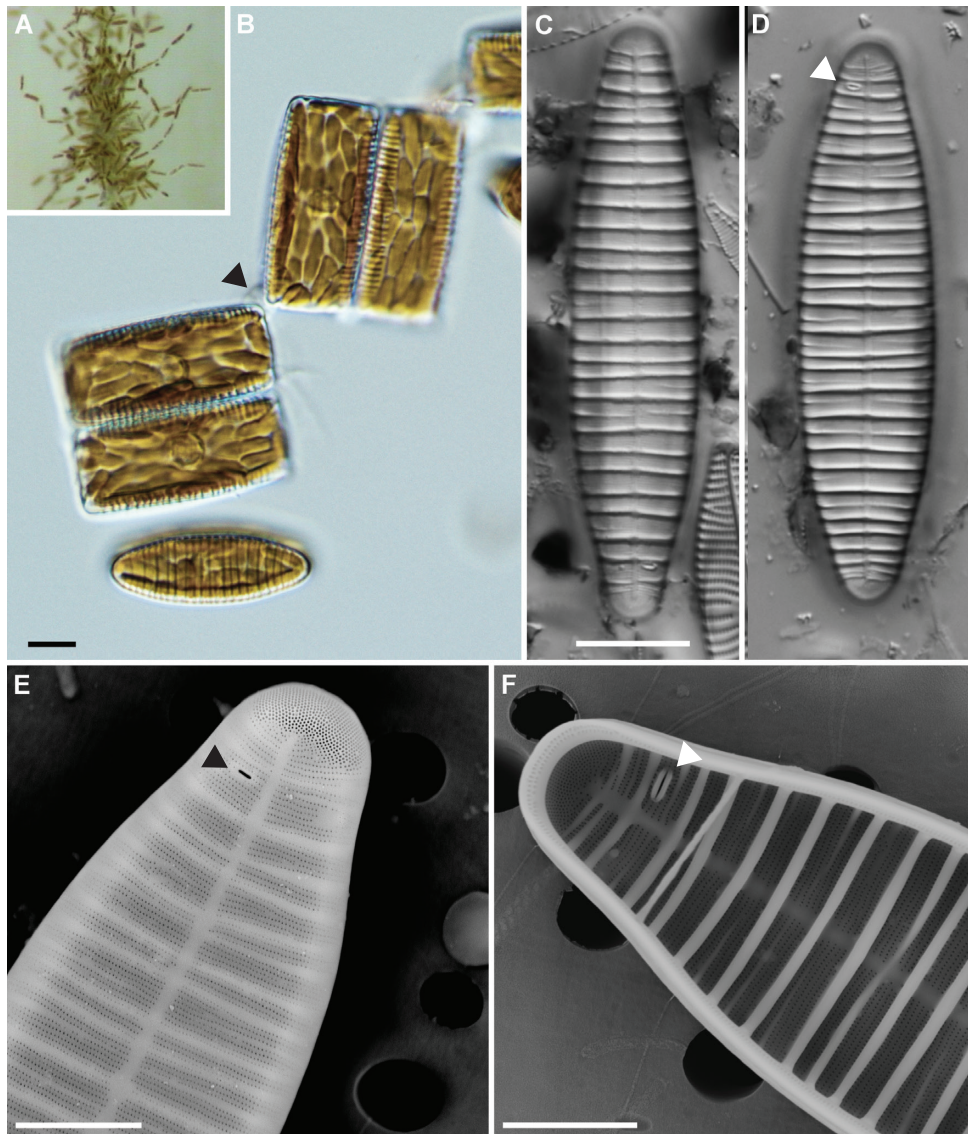


Fig. 37. *Diatoma vulgaris*. **A-D.** LM. **A.** Living cells, colonizing a filament of green algae. **B.** Living cells, girdle and valve views (bottom), note mucilage pads joining cells at the corners (arrow). **C-D.** Valve views of cleaned material, note position of rimoportula (arrow - **D**). **E-F.** 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

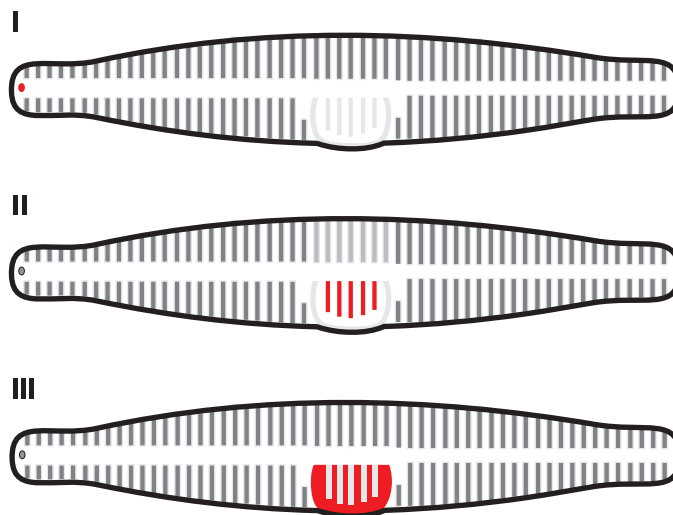
Type species: *Fragilaria pectinalis* (O.F. Müller) Lyngbye

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.



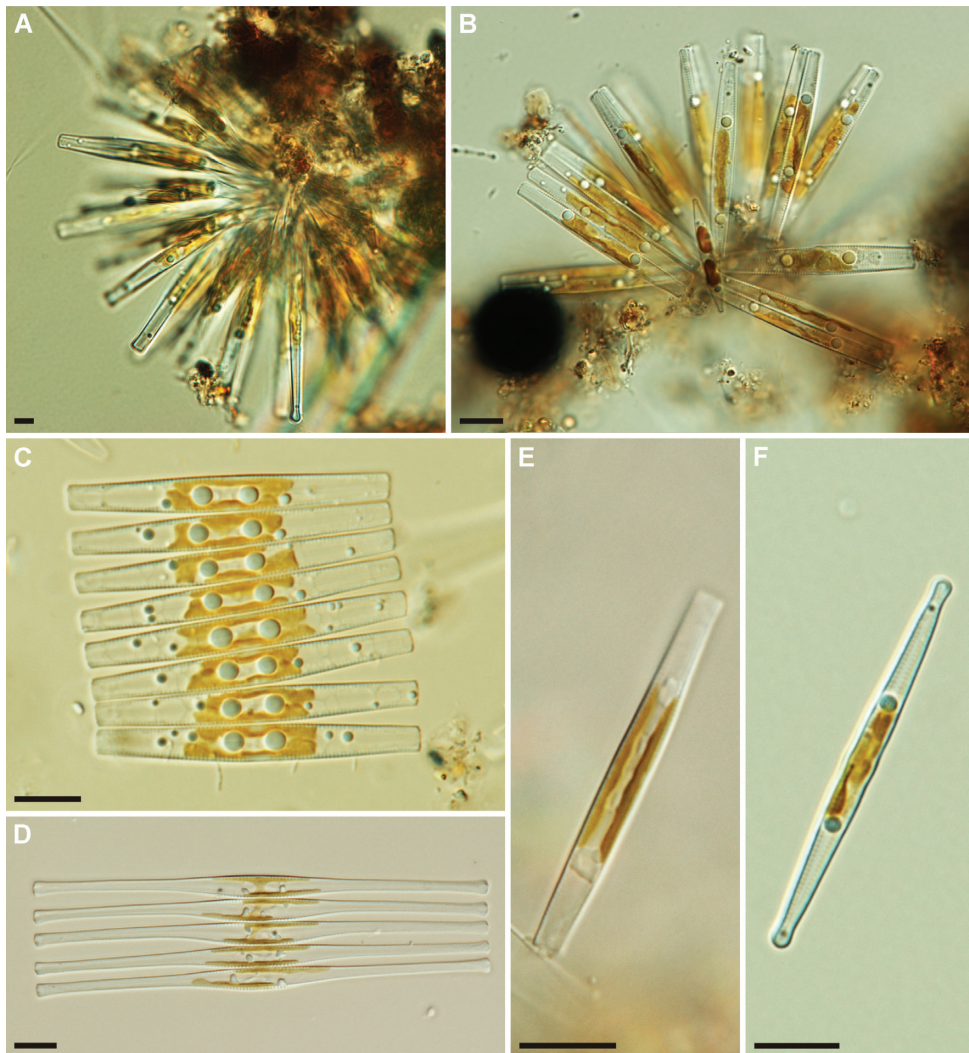


Fig. 38. *Fragilaria* spp. **A-F.** LM, living cells. **A-B.** Cells aggregated into colonies, joined at the base of the cells. **C.** Cells (girdle view) in a ribbon-like colony. **D.** *Fragilaria crotonensis* Kitton, girdle view, ribbon-like colony. **E.** Single cell, girdle view. **F.** Single cell,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

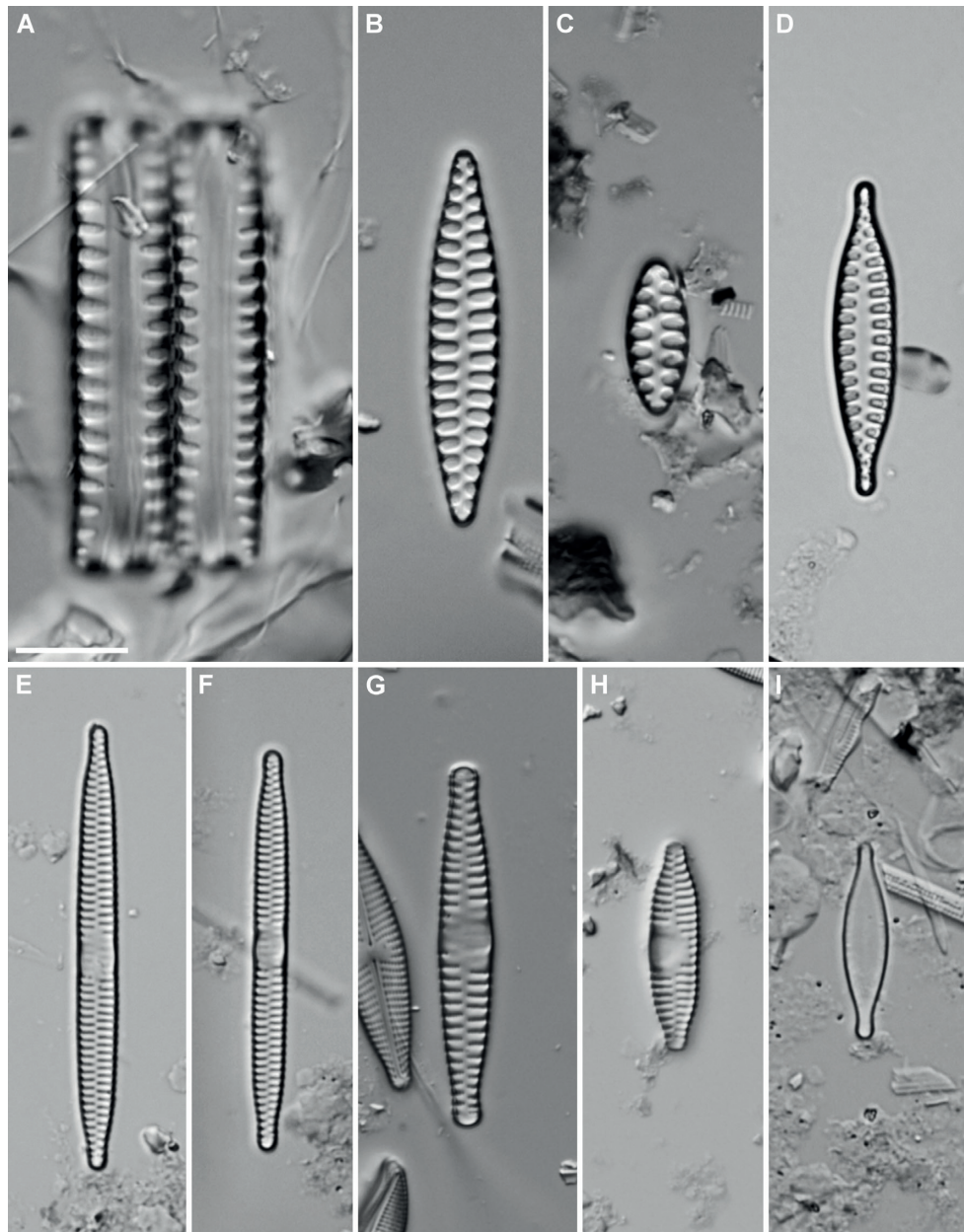


Fig. 39. *Fragilaria* spp. sensu lato. **A-I.** LM. **A.** Girdle view of two cells of *Fragilaria crassa* Metzeltin & Lange-Bertalot. **B-C.** Valve view of *F. crassa*. **D-H.** Valve views of *Fragilaria* spp. **I.** *F. densestriata* Hustedt.
Scale bar = 10 μ m (A-H).

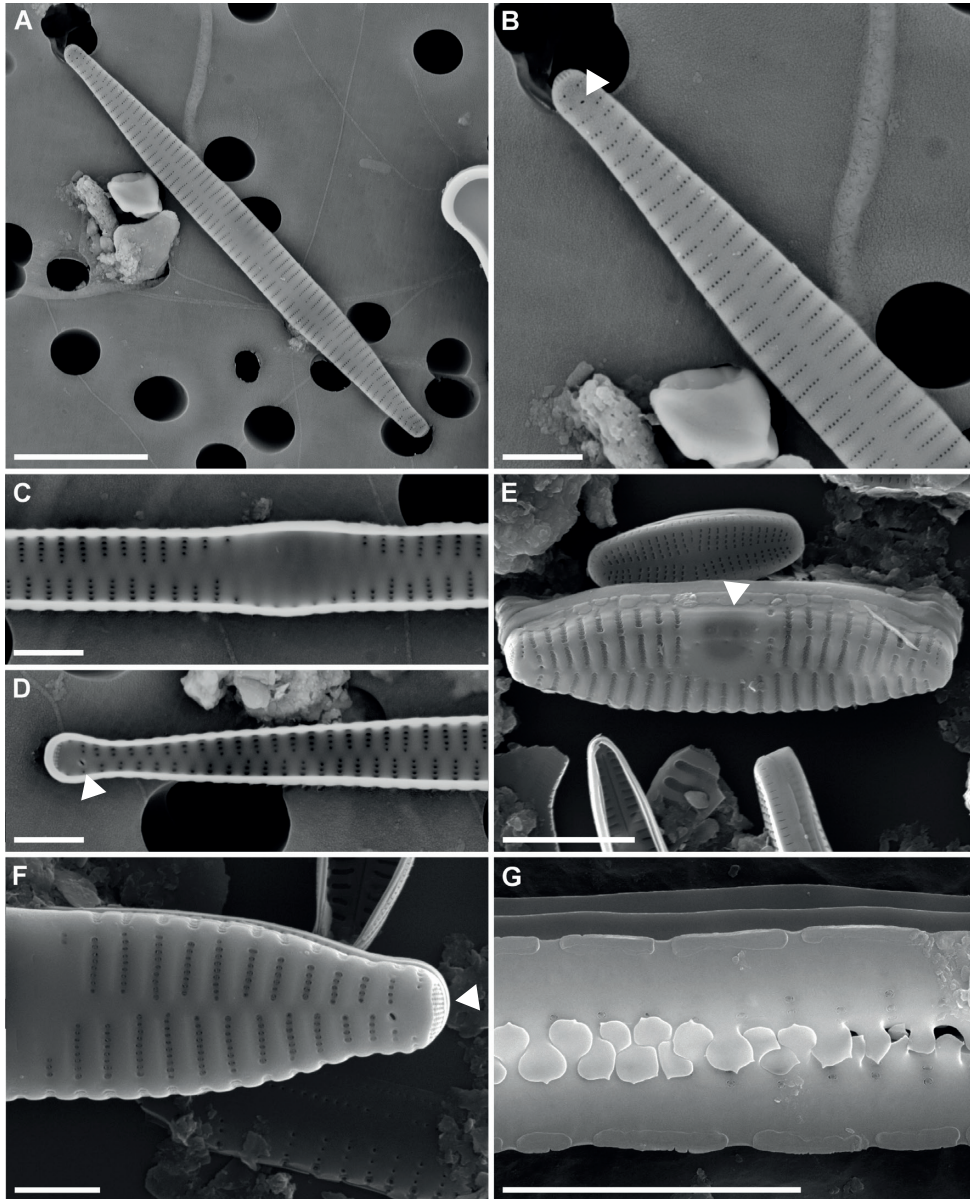


Fig. 40. *Fragilaria* spp. **A-G.** SEM. **A-B.** External view of valve, note external opening of rimoportula (arrow - **B**). **C-D.** Internal view of valves. **C.** Central area. **D.** Apex of cell, note internal opening of rimoportula (arrow). **E.** Oblique view of valve exterior, note thickened 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 μm (A), 2 μm (B-D, F), 5 μm (E, G).

Fragilariforma D.M. Williams & Round 1988

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

SYNONYM:

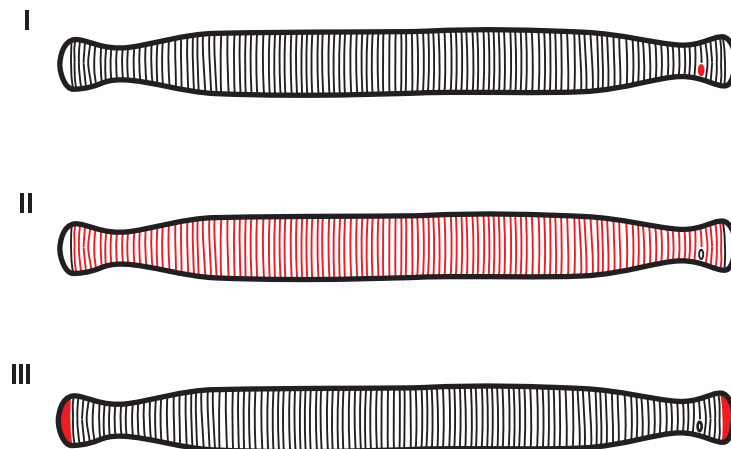
Fragilaria Lyngbye 1819 pro parte

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.



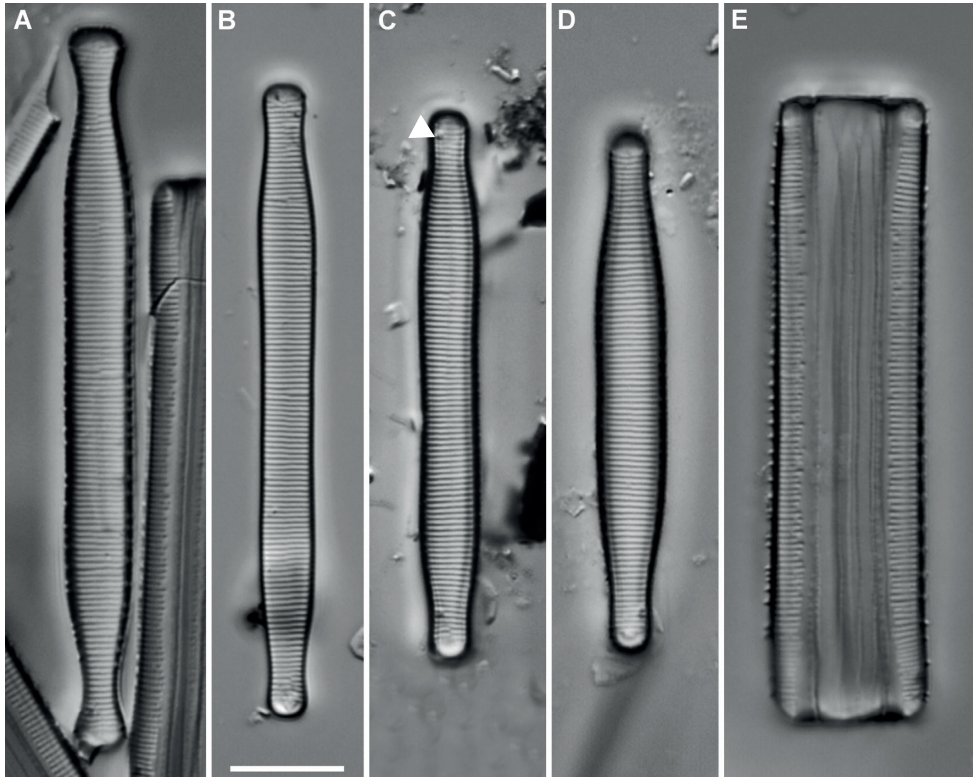


Fig. 41. *Fragilariforma strangulata* (Zanon) D.M. Williams & Round. **A-E.** LM. **A-D.** Valve views, note rimoportula (arrow - **C**). **E.** Girdle view.
Scale bar = 10 μ m.

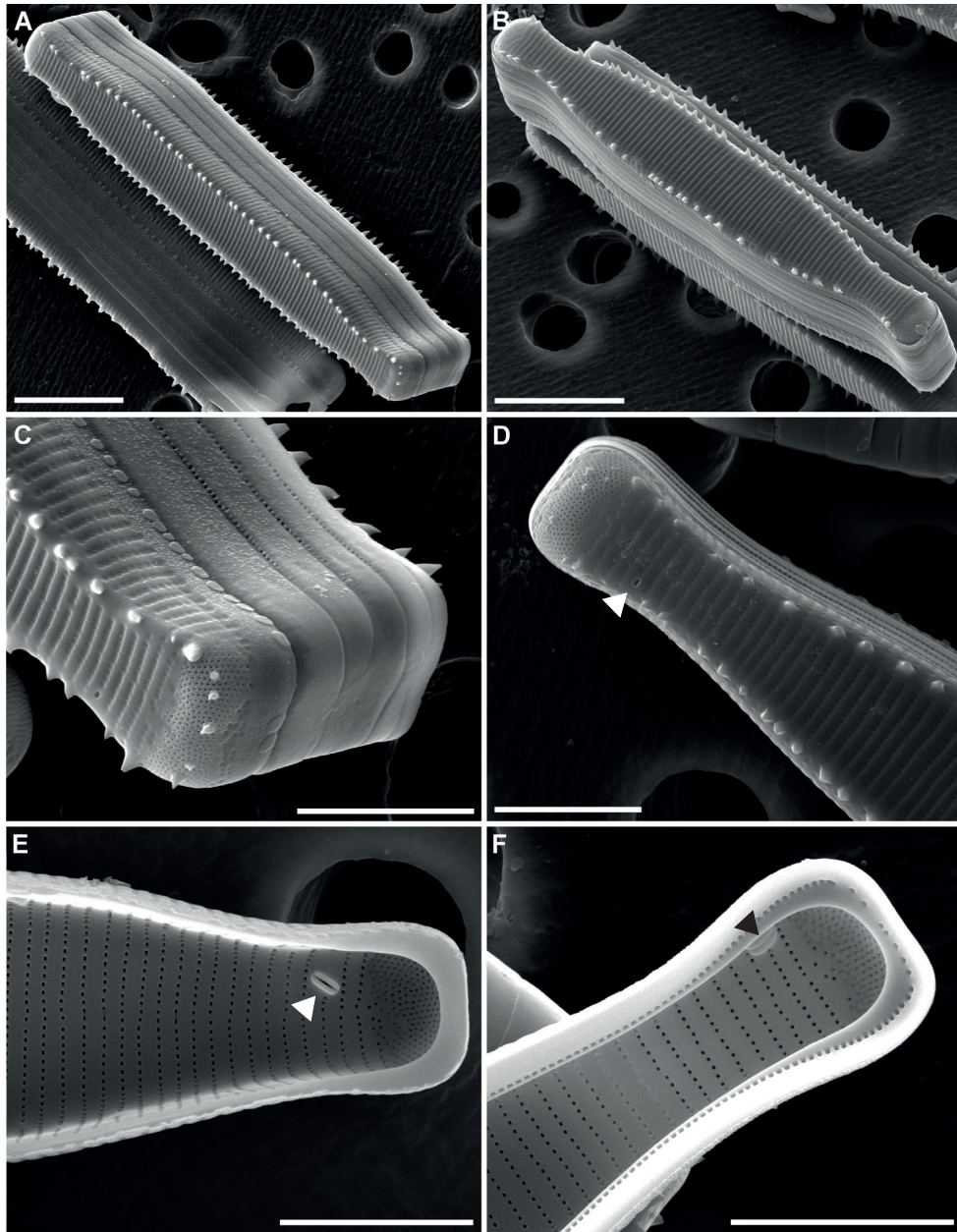


Fig. 42. *Fragilariforma strangulata*. **A-F.** SEM. **A-B.** Oblique external view of valves. **C-D.** External view of apices, showing apical pore field, note external opening of rimoportula (arrow - **D**). **E-F.** Internal view of apices showing variable position of rimoportulae (arrows).
Scale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

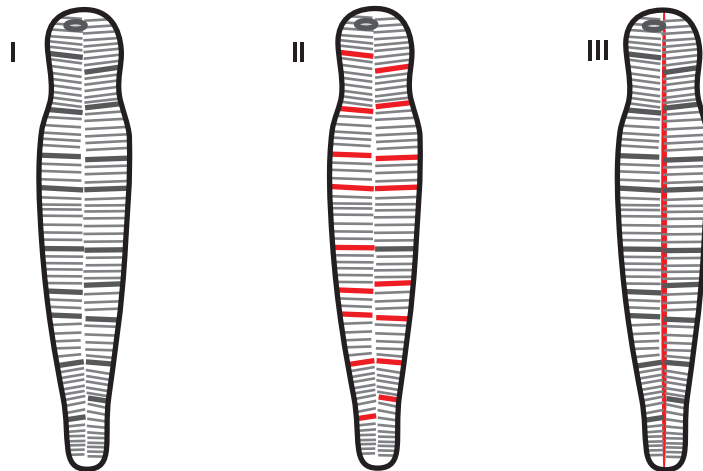




Fig. 43. *Meridion circulare* var. *constrictum*. **A-K.** LM. **A-F** Valve views, note rimoportula (arrow - **C**). **G-K.** Girdle views.
Scale bar = 10 μ m .

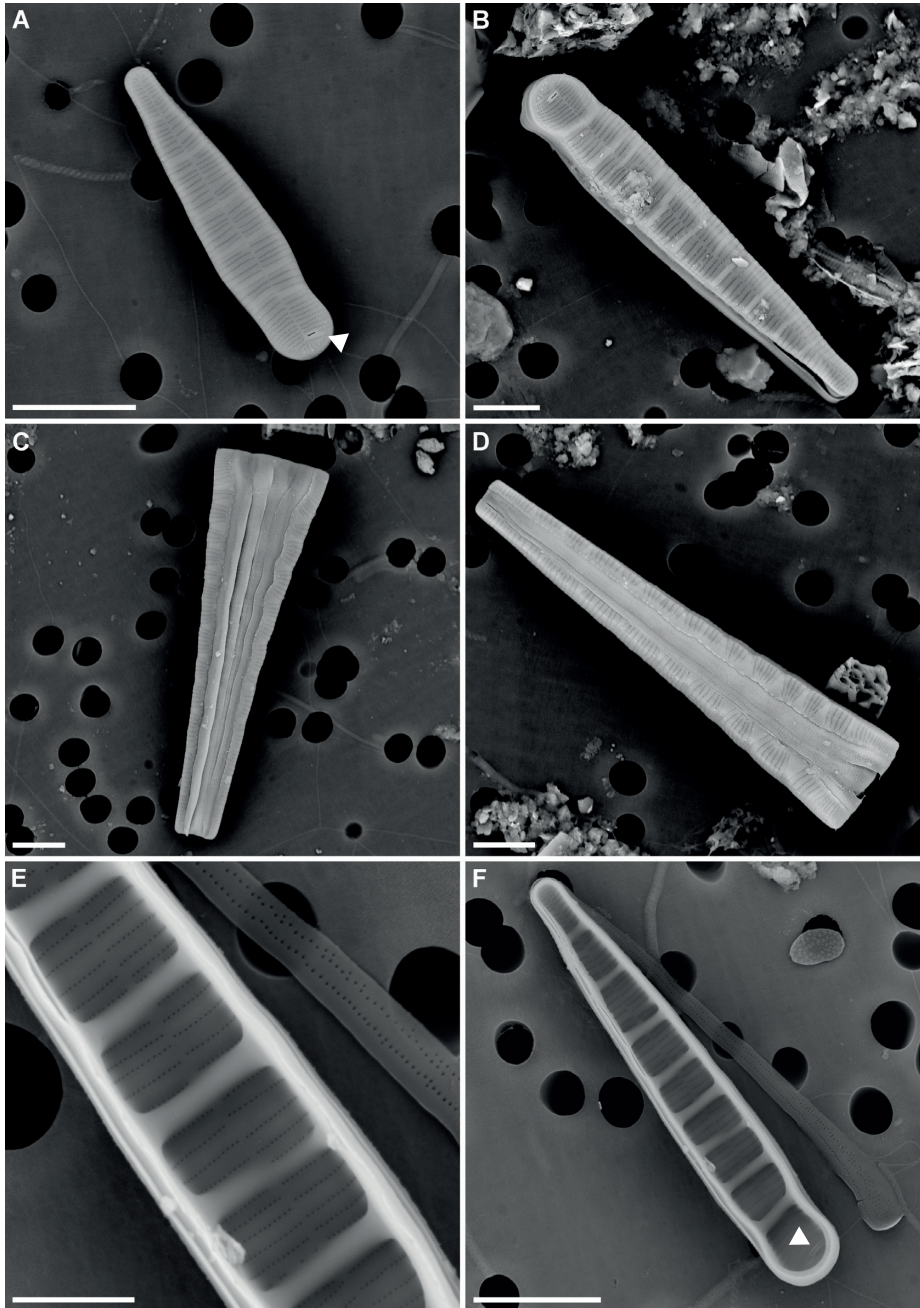


Fig. 44. *Meridion circulare* var. *constrictum*. **A-F.** SEM. **A-B.** External view of valve, note the rimoportula near the head pole apical (arrow - **A**). **C-D.** External view of girdle. **E-F.** Internal view of valve, note the internal opening of the rimoportula (arrow - **F**).

Scale bars = 10 μm (A-D), 3 μm (E), 8 μm (F).

Pseudostaurosira D.M. Williams & Round 1987

Type species: *Pseudostaurosira brevistriata* (Grunow) D.M. Williams & Round

SYNONYM:

Fragilaria Lyngbye 1819 pro parte

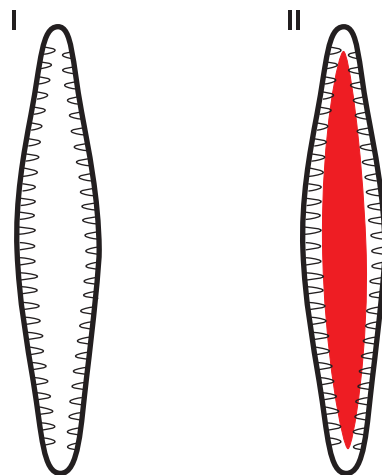
Odontella C. Agardh 1832 pro parte

Characteristics – Cells **araphid** with short parallel striae through the length of the valve, areolae fine, not easily observed under LM (Fig. 45). **Axial area** broad, lanceolate. Spines may be present on junction of the valve face and valve mantle. Apical pore field at each pole.

Plastid structure – Cells with plate-like plastids one lying under each valve face (see *Fragilaria*).

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 area.

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



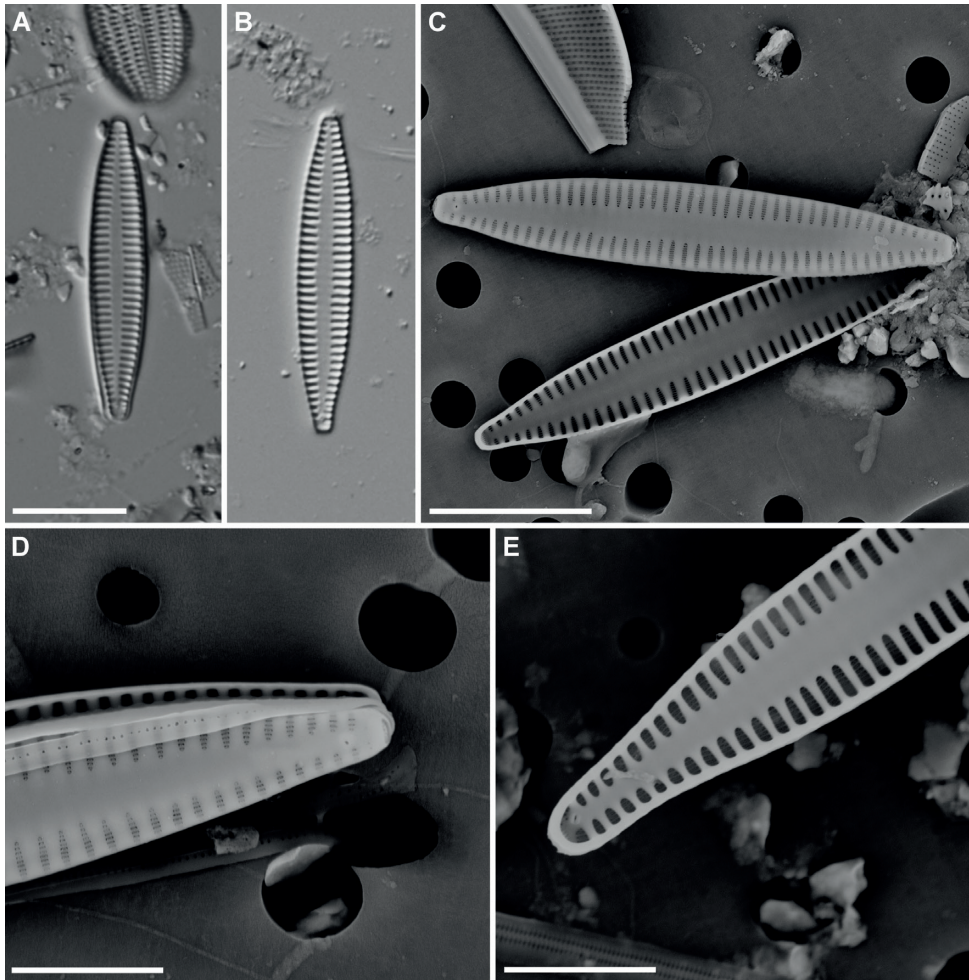


Fig. 45. *Pseudostaurosira brevistriata*. **A-B.** LM, valve view. **C-E.** SEM. **C.** External and internal view of valve. **D.** External view of valve apex. **E.** Internal view of valve apex.
Scale bars = 10 μm (A-C), 3 μm (D), 5 μm (E).

Staurosira Ehrenberg 1843

Type species: *Staurosira construens* Ehrenberg

SYNONYM:

Fragilaria Lyngbye 1819 pro parte

Characteristics – Cells **araphid**, elliptical or cruciform with robust parallel to radiate striae (II) through the length of the valve, areolae round to slightly elongate (Fig. 47: O-P), not easily observed under LM (Fig. 47: A-G, I-N). **Axial area** of variable width. Apical pore fields at one or both apices. Rimoportula absent. Spines present at the junction of the valve face and mantle. Distinguished from *Staurosirella* by the structure of the areolae (rounded).

Plastid structure – Cells with 2 plate-like plastids lying along the girdle (Fig. 46).

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 area.

Ecology – Cells colonial, linked valve face to valve face by spines forming ribbons (Fig. 46: A-B). Found in the benthos of waters with low to moderate conductivity and at a range of trophic levels.

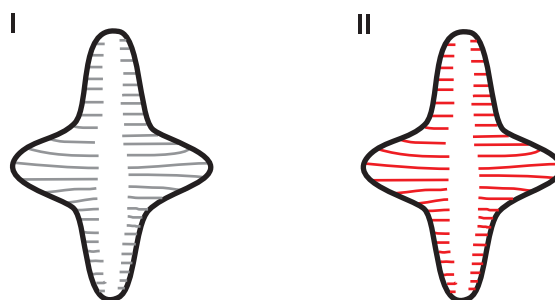




Fig. 46. *Stausosira construens*. **A-D.** LM, living cells. **A-B, D.** Cells linked valve face to valve face forming ribbon colonies. **C.** Valve view (right) and girdle view (above).
Scale bars = 10 µm.

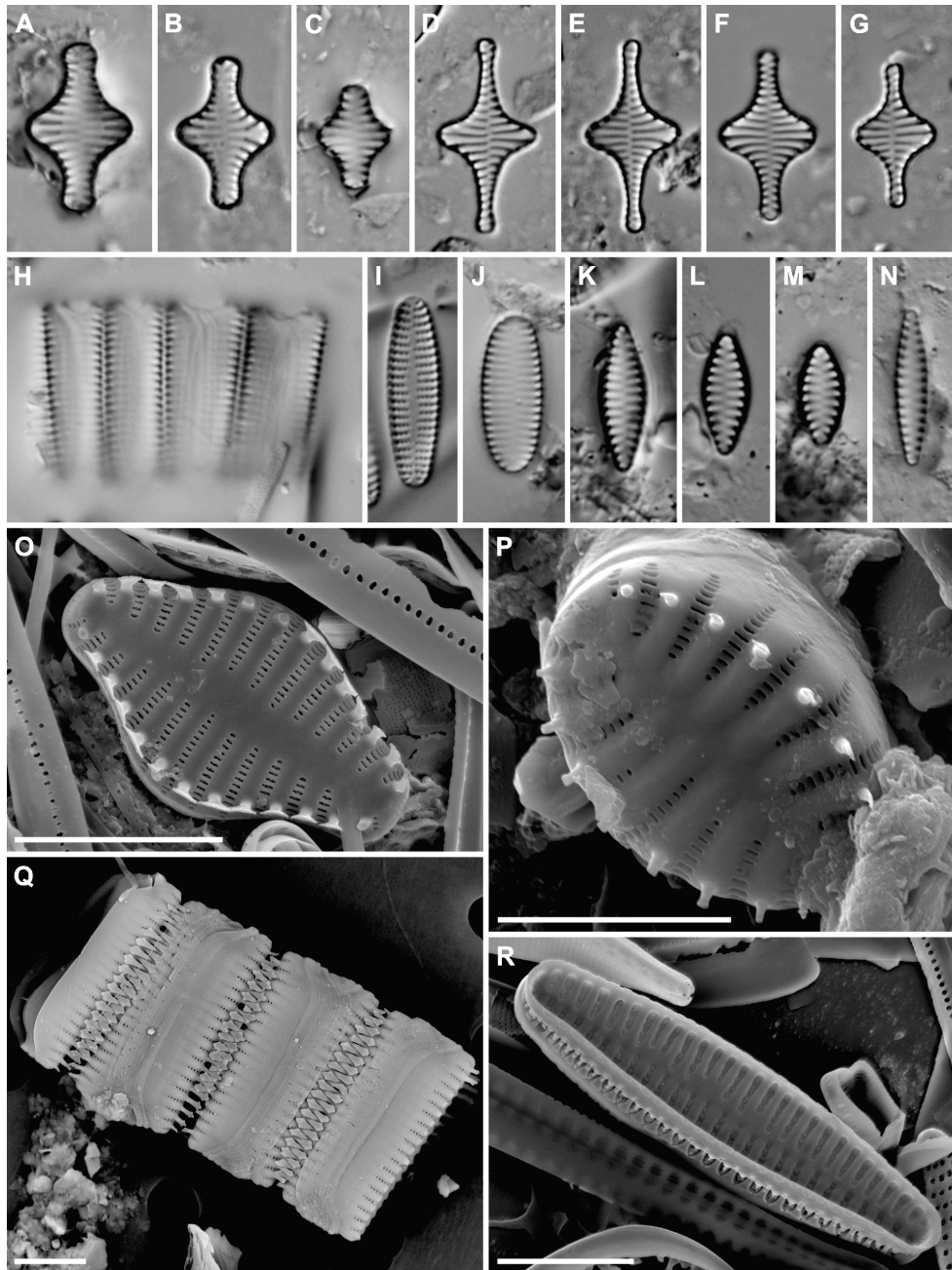


Fig. 47. *Stausosira* spp. **A-N.** LM, cleaned valves. **A-G, I-N.** Valve views. **H.** Girdle view. **O-R.** SEM. **O-P.** External view of valves, note the slightly elongated areolae.

Q. Girdle view, showing spines at junction of valve face and mantle, forming ribbon colonies. **R.** Internal view of valve.

Scale bars = 10 μ m (A-N), 5 μ m (O), 4 μ m (P-Q).

Staurosirella D.M. Williams & Round 1987Type species: *Staurosirella lapponica* (Grunow) D.M. Williams & Round

SYNONYM:

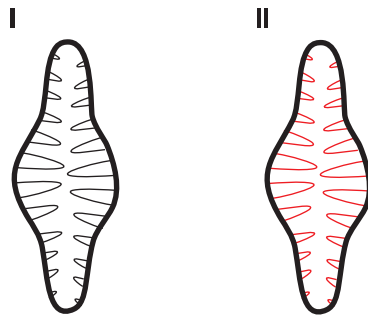
Fragilaria Lyngbye 1819 pro parte

Characteristics – Cells **araphid**, elliptical, linear or cruciform with robust parallel striae (II) through the length of the valve, areolae **lineolate** (Fig. 48: K), not easily observed under LM (Fig. 48: A-I). **Axial area** of variable width. Apical pore field at one or both apices. Rimoportula absent. Spines present at the junction of the valve face and mantle. Distinguished from *Staurosira* by the structure of the areolae (elongate).

Plastid structure – Cells with 2 plate-like plastids lying along the girdle (Fig. 48: A).

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 area.

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



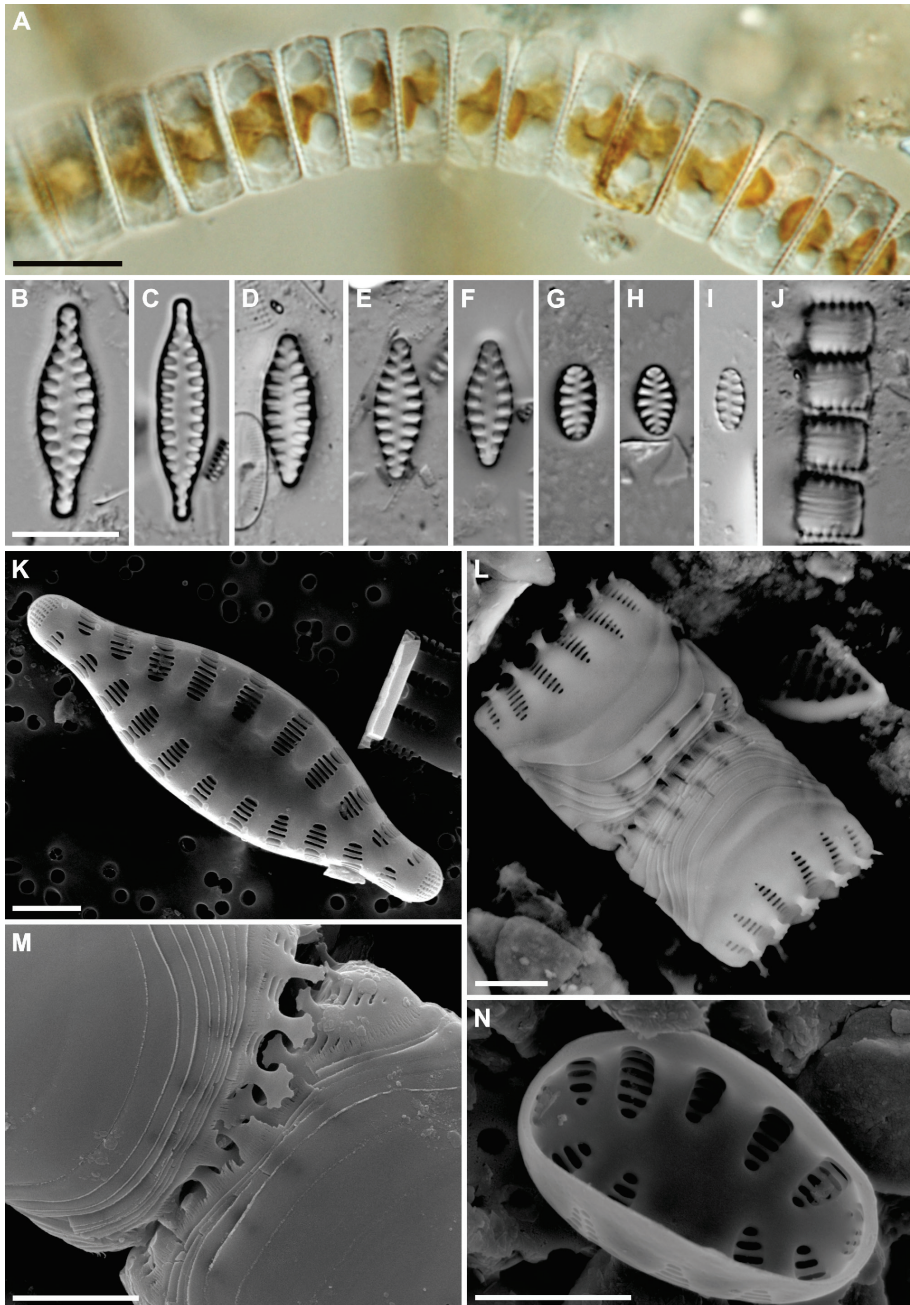


Fig. 48. *Stausosirella* spp. **A-J.** LM. **A.** Living cells. **B-J.** Cleaned valves. **B-I.** Valve views. **J.** *S. pinnata* (Ehrenberg) D.M. Williams & Round, girdle view. **K-N.** SEM. **K.** External view of valve, note the lineolate areolae. **L-M.** Girdle views, note the connecting spines. **N.** Internal view of valve. Scale bars = 10 μm (A-J), 2 μm (K-N).

Tabularia Kützing ex D.M. Williams & Round 1986

Type species: *Tabularia barbatula* (Kützing) D.M. Williams & Round

SYNONYM:

Fragilaria Lyngbye 1819 pro parte

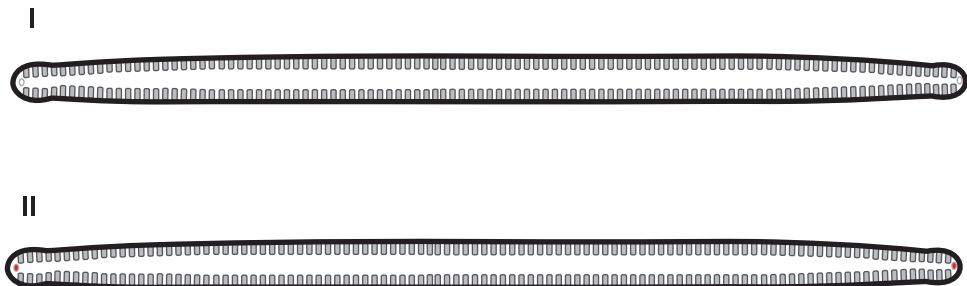
Synedra Ehrenberg 1830 pro parte

Characteristics – Cells **araphid**, linear with parallel striae through the length of the valve, areolae fine, not easily observed under LM (Fig. 49: A). **Axial area** broad. **Rimoportula** (labiate or lipped process) present at both apices (II; Fig. 49: B, D). Apical pore field at each pole.

Plastid structure – Cells with plate-like plastids one lying under each valve face (see *Fragilaria*).

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, basally attached. Found in the benthos of waters with moderate to high conductivity and at a range of trophic levels.



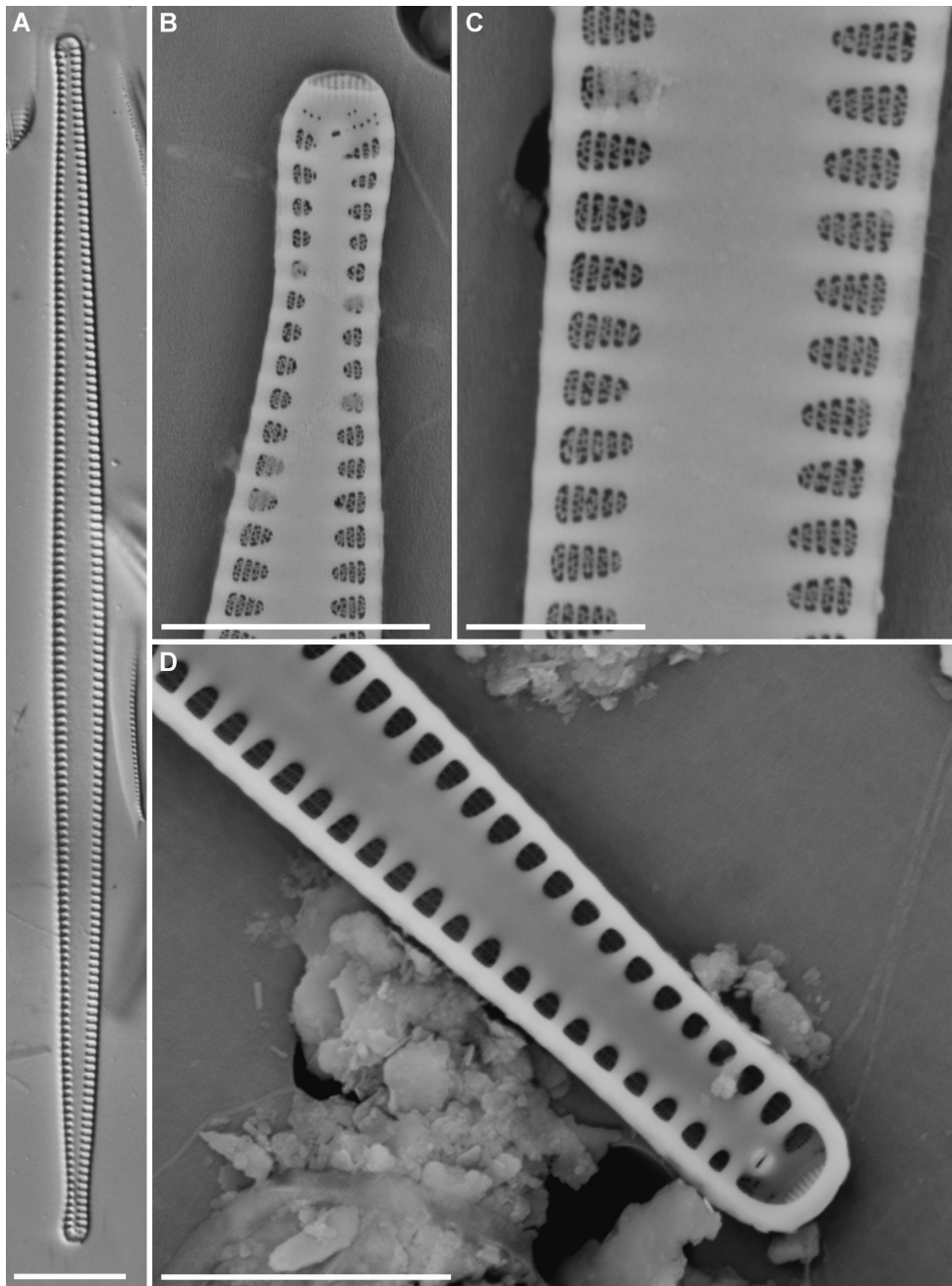


Fig. 49. *Tabularia fasciculata* (C. Agardh) D.M. Williams & Round. **A.** LM. **B-D.** SEM, internal view of valve, note position of internal opening of rimoportula. Scale bars = 10 μm (A), μm 5 μm (B, D), 2 μm (C).

Ulnaria (Kützing) Compère 2001Type species: *Ulnaria ulna* (Nitzsch) Compère

SYNONYM:

Synedra Ehrenberg 1830 pro parte

Characteristics – Cells **araphid**, often very long with parallel striae through the length of the valve, areolae fine and often not easily observed under LM (Fig. 52).

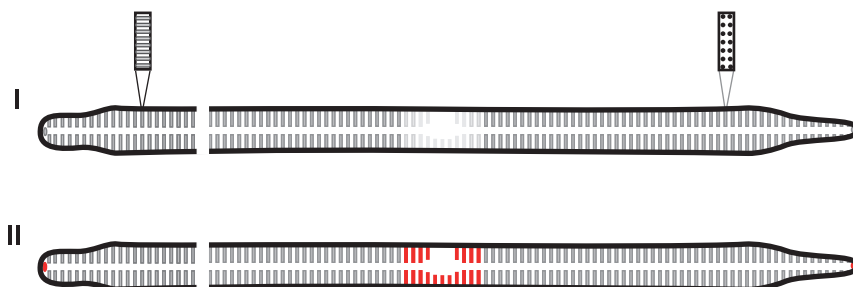
Axial area narrow but clearly discernable. Central area may be present and varies in size (Fig. 52), may reach both valve margins (Fig. 52: B) or be unilaterally expanded (Fig. 52: C-D). Ghost striae may be present (II; Fig. 52: A, D). **Rimoportula** (labiate or lipped process) present at both apices (II). Small apical spines may be present (Fig. 53: A).

Plastid structure – Cells with 2 plate-like plastids lying under the valves (Fig. 51: D).

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

Ecology – Cells planktonic or colonial, basally attached (Fig. 50). Found in the benthos of waters with low to moderate conductivities and at a range of trophic levels. Thought to be adapted to survive high flow conditions.

Notes – The genus *Synedra* sensu lato will often be encountered in older literature. This genus contained number of species common to tropical African waters (e.g. *Synedra nyansae* G.S. West, synonym *S. dorsiventralis* O. Müller). The type of *Synedra* is now considered to be *S. gaillonii* (Bory) Ehrenberg which is a marine species. Most freshwater species from *Synedra* sensu lato have now been transferred to *Ulnaria*, e.g. *Ulnaria nyansae* (G.S. West) D.M. Williams.



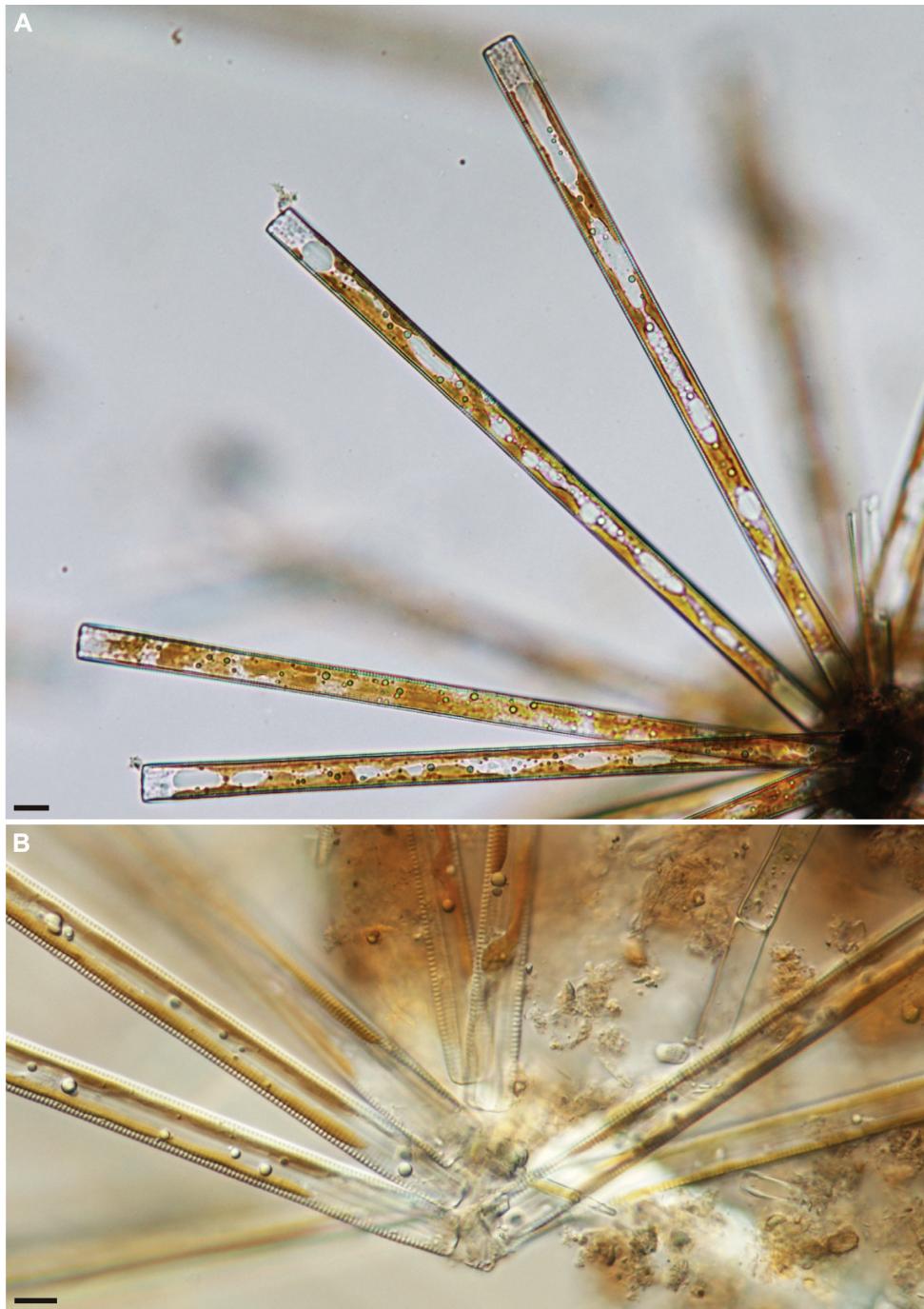


Fig. 50. *Ulnaria* spp. **A-B.** LM, living cells, girdle view, forming colony, cells basally attached. Scale bars = 10 µm.

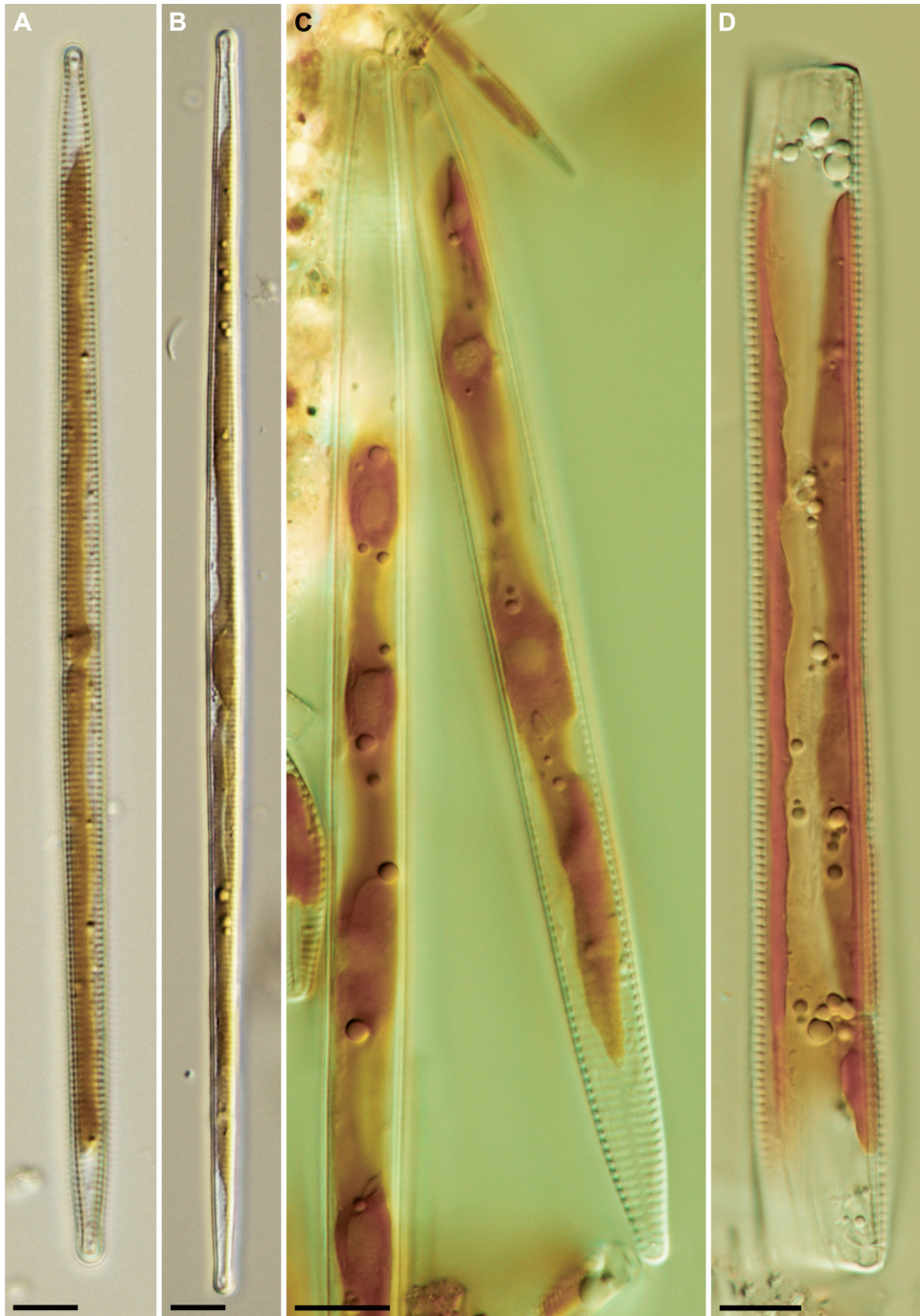


Fig. 51. *Ulnaria* spp. **A-D.** LM, living cells. **A-B.** Valve views. **C.** Valve views, forming colony, cells basally attached. **D.** Girdle view. Scale bars = 10 μ m.

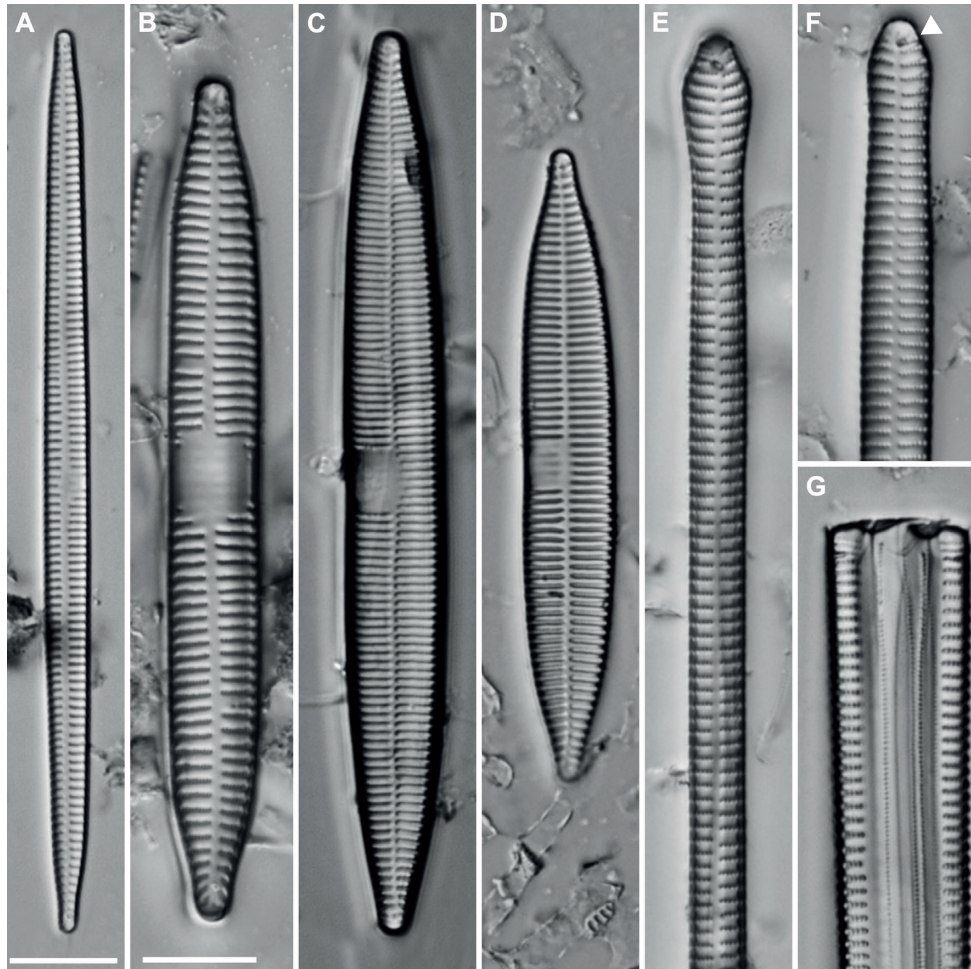


Fig. 52. *Ulnaria* spp. **A-G.** LM. **A-B.** Valve views. **C-D.** Valve views of *Ulnaria nyansae*. **E-F.** Valve views, note rimoportula (arrow - **F**). **G.** Girdle view. Scale bars = 10 μ m.