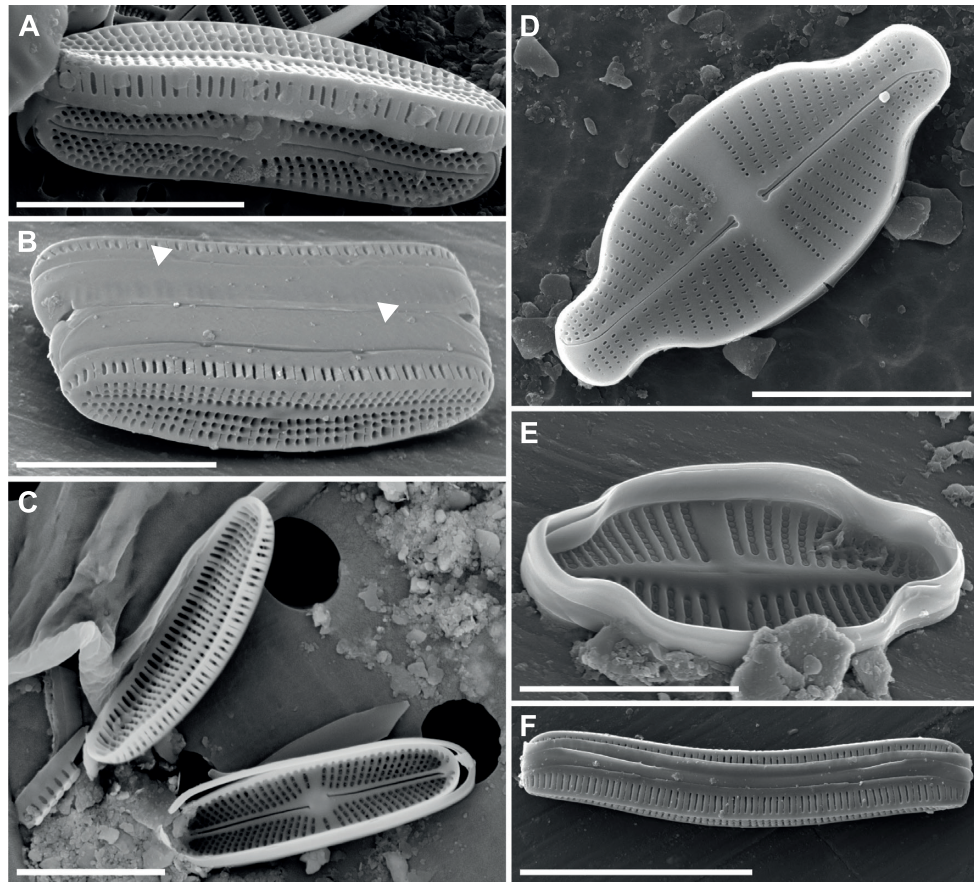




**Fig. 103.** *Achnanthes* spp. **A-I.** LM. **A-B.** Living cells with mucilage stalks (arrows). Living cell, girdle view. **C-D.** Living cells of *Achnanthes exiguum* (Grunow) Czarnecki. **E.** Living cell, valve view, note lipid droplets (arrow). **F-I.** Cleaned material of *Achnanthes* spp. **F-G.** *Achnanthes taiaense* (J.R. Carter & Deny) J.C.Taylor, E. Morales & Ector. Scale bars = 10 μm (A-H).



**Fig. 104.** *Achnanthes* spp. **A-F.** SEM. **A-B.** Exterior view of valve, oblique view. **B.** Exterior view, detail of the valvocopulae (arrows). **C.** Internal views of valve of RLV and RV. **D.** External view of valve of *Achnanthes exiguum*. **E.** Internal view of valve of *A. exiguum*. **F.** Girdle view. Scale bars = 5  $\mu\text{m}$  (A-E), 10  $\mu\text{m}$  (F).

***Planothidium*** Round & Bukhtiyarova 1996Type species: *Planothidium lanceolatum* (Brébisson ex Kützing) Lange-Bertalot

SYNONYM:

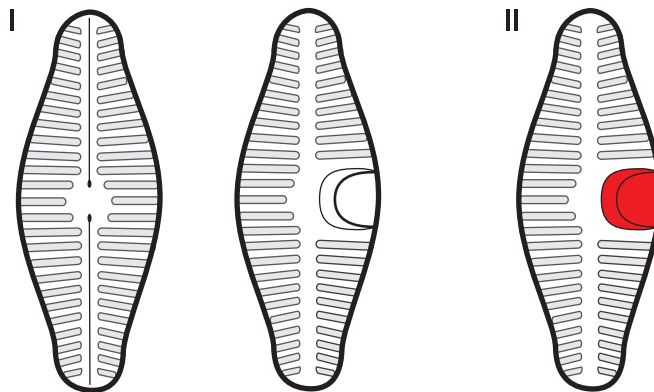
*Achnanthes* Bory 1822 pro parte

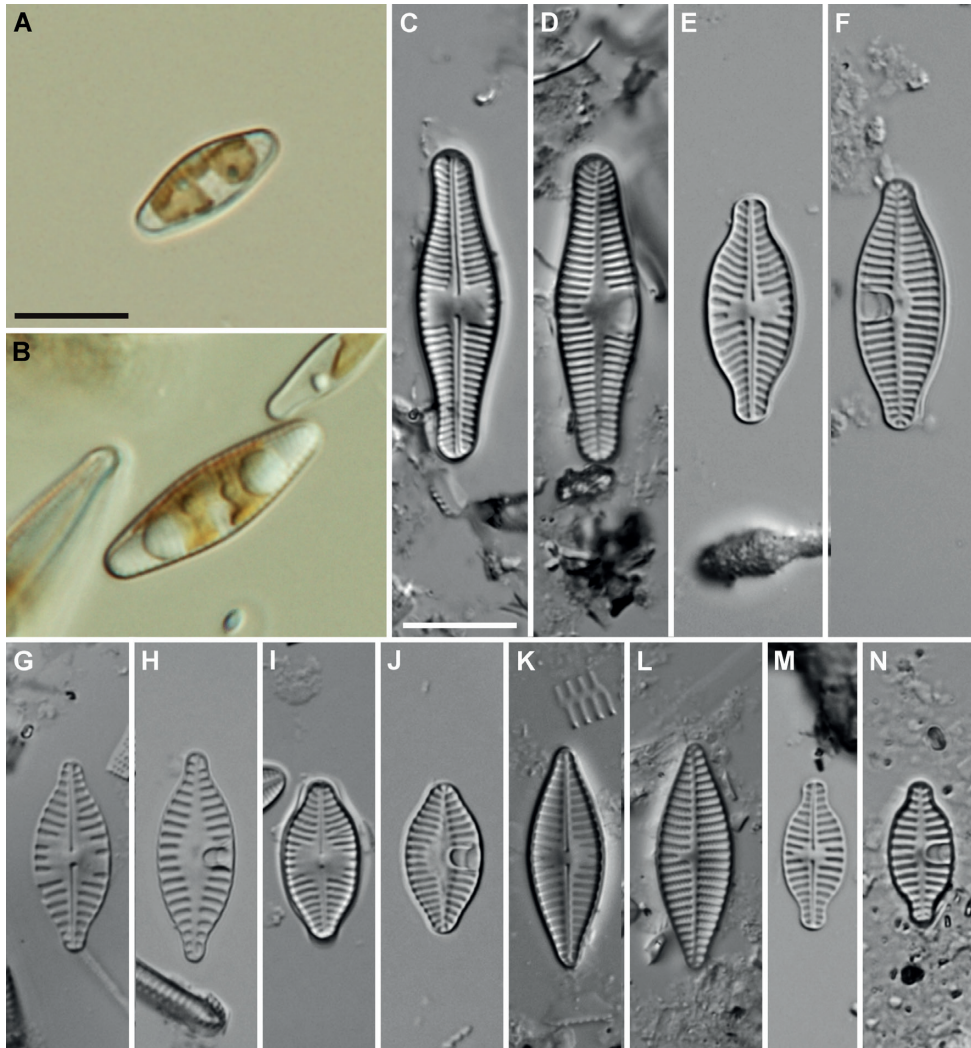
**Characteristics** – Cells **heterovalvar**, **monoraphid**, elliptical with rounded, broadly rounded or sub-capitate apices. Curved in girdle view (one valve slightly convex, the other slightly concave). Striae robust and clearly discernable under LM (Fig. 105: C-N), composed of 2 rows of very small round areolae, visible only under SEM (Fig. 106: A-D). Raphe straight and simple (Fig. 105: C, E, G, K, M) with expanded central endings. Rapheless valve (RLV) has a narrow axial area and may possess a **silica hood** (also known as a “horseshoe structure”) or other unilateral silica thickening on the interior of the valve (II).

**Plastid structure** – Single plate-like plastid lying under the RLV valve extending under the girdle (Fig. 105: A-B).

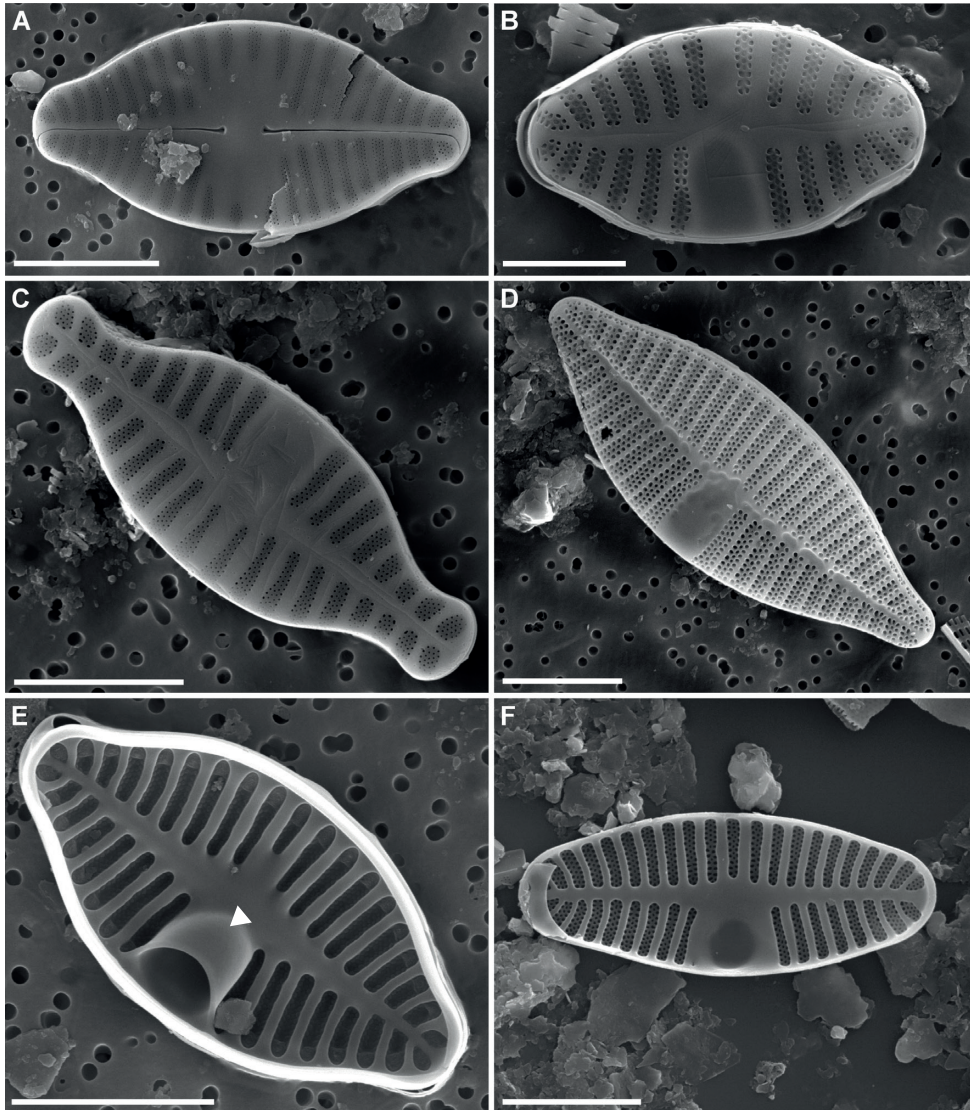
**Identification of species** – Species can be identified by cell size, cell shape, shape of the apices, structure and density of the striae as well as structure of the central and axial areas, the shape and curvature of the central raphe endings as well as structure and positioning of the silica thickenings of the RLV.

**Ecology** – Cells solitary, attached (**adnate**) by the raphe valve face to the substrata. Found in the benthos of mesotrophic to hypereutrophic waters with moderate to high conductivities.





**Fig. 105.** *Planothidium* spp. **A-N.** LM. **A-B.** Living cells. **C-N.** Cleaned valves. **C, E, G, I, M.** *Planothidium* spp., raphe valves. **D, F, H, J, N.** *Planothidium* spp., rapheless valve, note “horseshoe structure” of silica hood. **K.** *Planothidium delicatulum* (Kützing) Round & Bukhtiyarova, raphe valve. **L.** *Planothidium delicatulum*, rapheless valve.  
Scale bar = 10  $\mu$ m (A-N).



**Fig. 106.** *Planothidium* spp. **A-F.** SEM. **A.** External view of raphe valve. **B-C.** External view of rapheless valves. **D.** *Planothidium delicatulum*, external view of rapheless valve. **E-F.** Internal view of rapheless valves, note “horseshoe structure” of silica hood (arrow - **E**).  
Scale bars = 2  $\mu$ m (A-F).

***Cavinula*** D.G. Mann & Stickle 1990

Type species: *Cavinula cocconeiformis* (W. Gregory ex Greville) D.G. Mann & Stickle

SYNONYM:

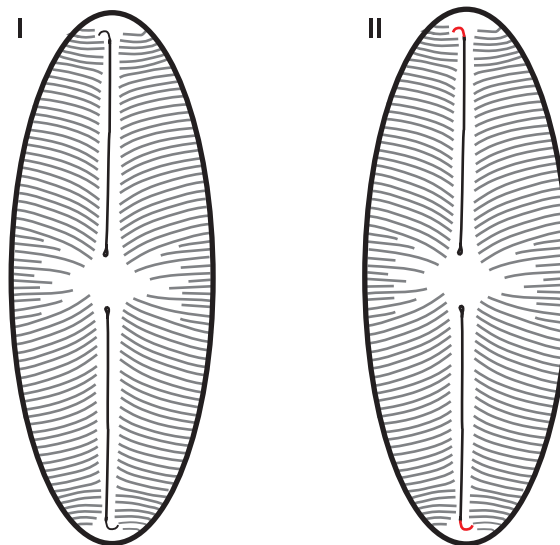
*Navicula* Bory 1822 pro parte

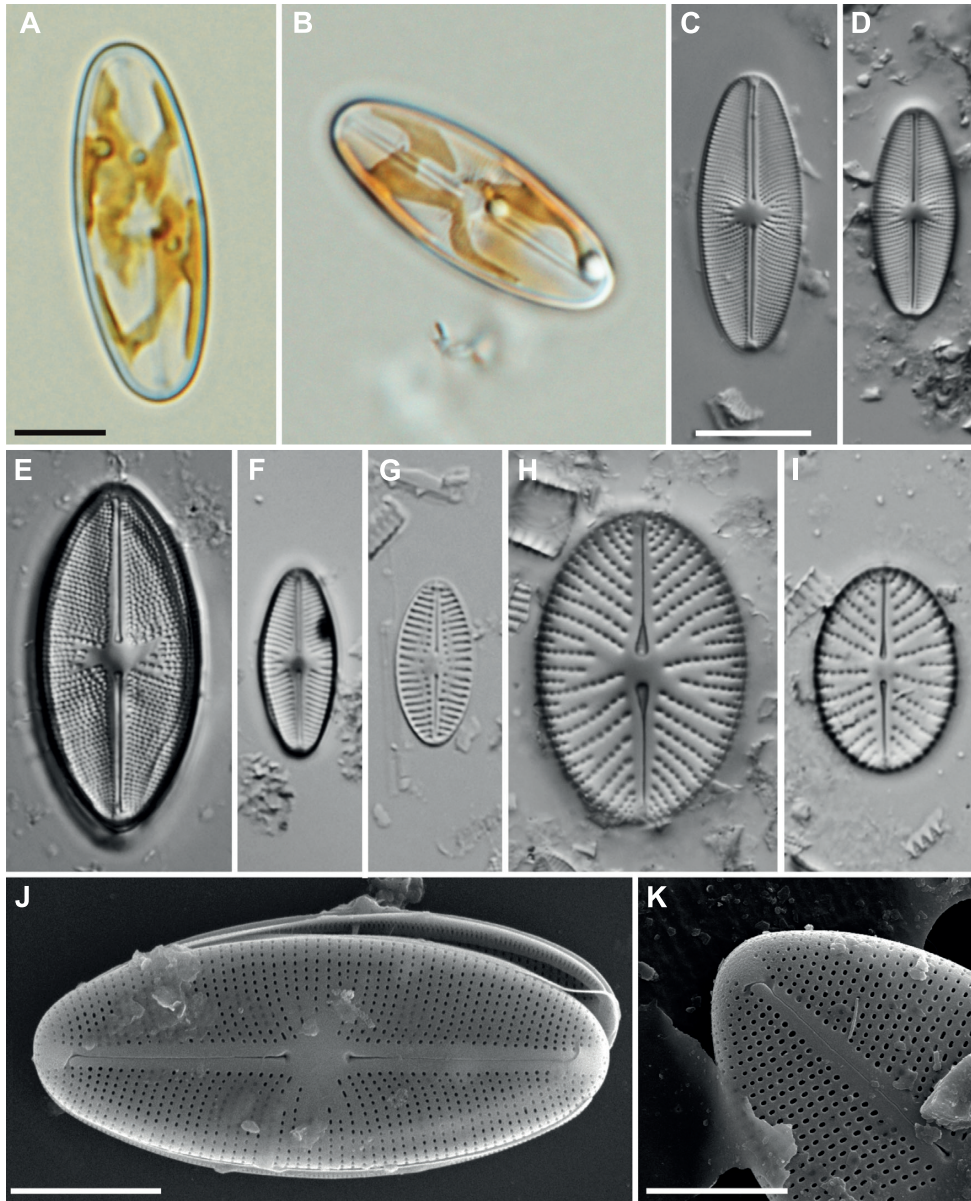
**Characteristics** – Cells **biraphid** with radiate striae, areolae may be small and difficult to observe under LM (Fig. 107: C, D) or large and very clearly distinguishable (Fig. 107: E, H-I). In general, the terminal raphe fissures endings do not extend onto the valve mantle and are usually curved in opposite directions (II).

**Plastid structure** – Cells with one or two H-shaped plastids often with many lobes (Fig. 107:A-B).

**Identification of species** – Species in this genus are distinguished based on cell size and shape as well as striae pattern, density and the structure of the areolae.

**Ecology** – Cells solitary and motile. Found in the benthos of oligotrophic waters and extending to moist sub-aerial habitats. Some species may be found in water with higher conductivities.





**Fig. 107.** *Cavinula* spp. **A-I.** LM. **A-B.** Living cells of *Cavinula davisiae* Bahls, note highly lobed plastid structure. **C-D.** Cleaned cells of *C. davisiae*. **E, F, H.** Various tropical African taxa. **G.** *Cavinula lilandae* Cocquyt, de Haan & J.C. Taylor. **I.** *C. scutelloides* (W. Smith) Lange-Bertalot. **J-K.** SEM, external view of valve of *C. davisiae* showing complete valve (**J**) and detail of terminal raphe ending (**K**). Scale bars = 10  $\mu$ m (A-J), 5  $\mu$ m (K).

## ***Diadesmis* Kützing 1844**

Type species: *Diadesmis confervacea* Kützing

SYNONYM:

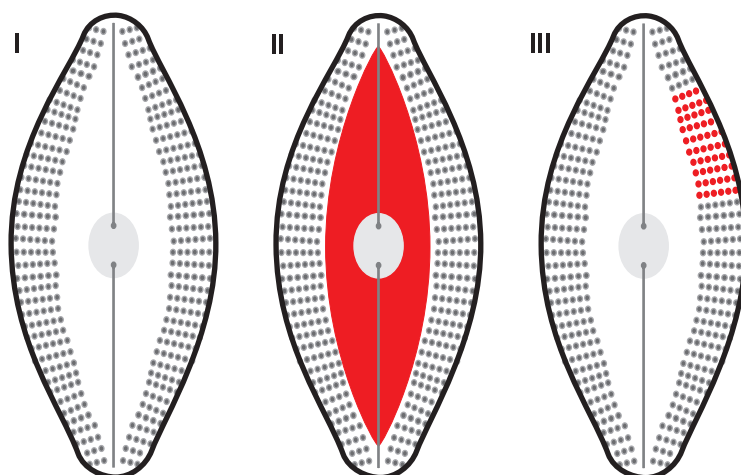
*Navicula* Bory 1822 pro parte

**Characteristics** – Cells **biraphid**, with broad **axial area** (II). Striae easily discernable composed of relatively widely spaced round areolae (III). Raphe with straight central and terminal endings. Cells often observed in girdle view as the individual cells form chains which may often not be separated during cleaning (Fig. 108: A, I, J). The valve mantle has a single row of large and distinctly visible elongate areolae (Fig. 108: A, I, J). Cells may have connective spines at the junction of the valve face and mantle which are not easily visible under LM.

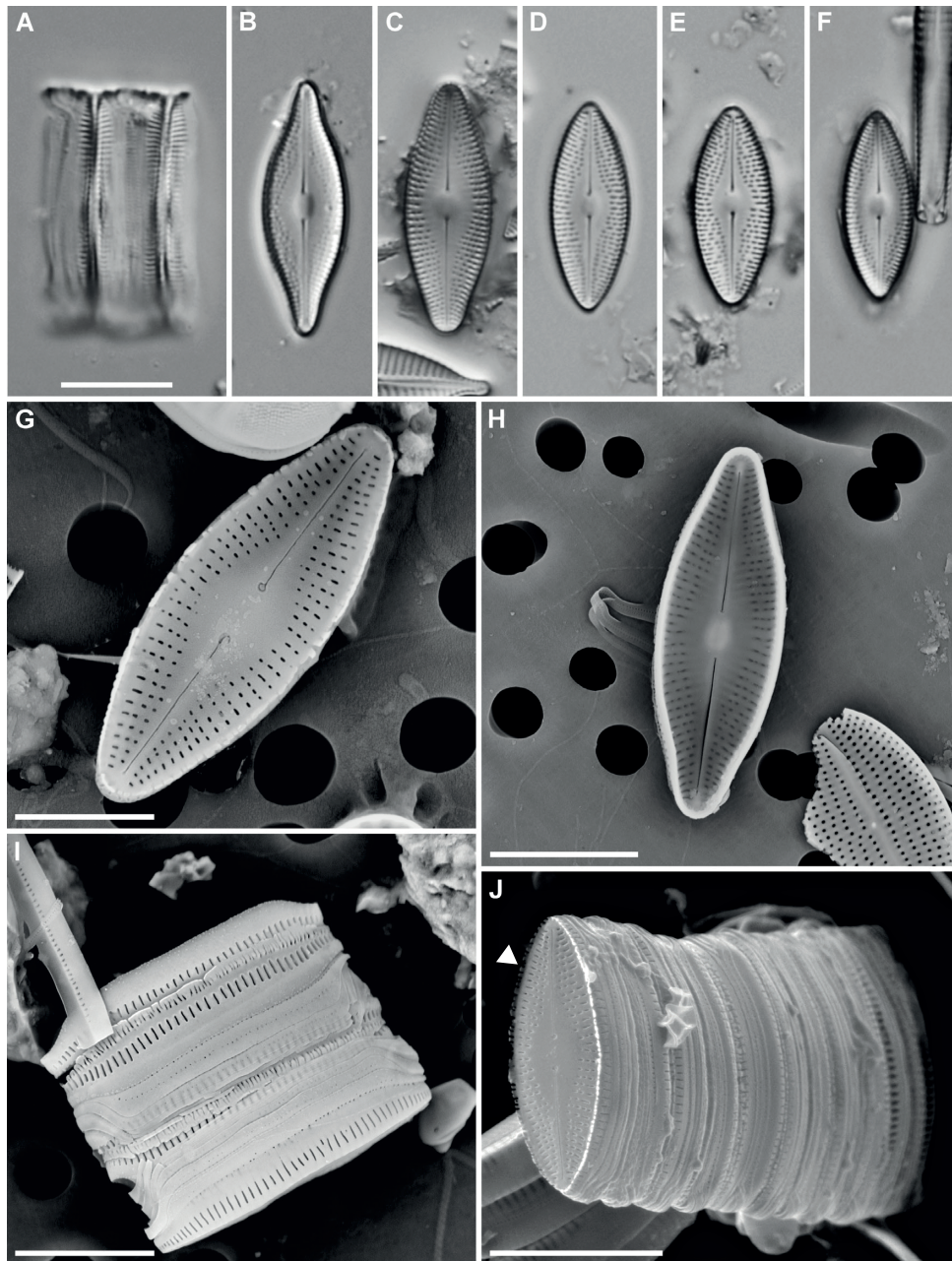
**Plastid structure** – Cells with a single lobed plastid.

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

**Ecology** – Cells always linked face to face to form ribbon-like colonies. Found in the benthos of eutrophic waters with moderate conductivity.







**Fig. 108.** *Diadesmis* spp. **A-F.** LM. **A.** Girdle view of *Diadesmis confervacea*. **B.** *Diadesmis* sp. **C-F.** Valve view *D. confervacea*. **G-J.** SEM. **G.** External view of valve. **H.** Internal view of valve. **I.** Girdle view of two frustules. **J.** Oblique view of a chain of frustules, note broad axial area and marginal spine-like structures (arrow).

Scale bars = 10  $\mu$ m (A-F, J), 5  $\mu$ m (G), 8  $\mu$ m (H-I).

***Humidophila*** R.L. Lowe, Kociolek, J.R. Johansen, Van de Vijver, Lange-Bertalot & Kopalová 2014

Type species: *Humidophila undulata* R.L. Lowe, Kociolek & J.R. Johansen

SYNONYM:

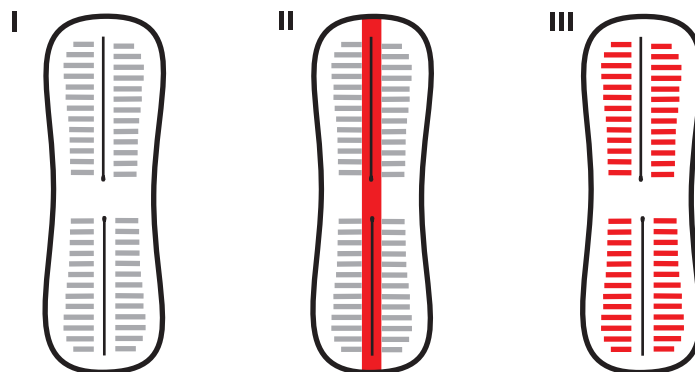
*Diadesmis* Kützing 1844 pro parte

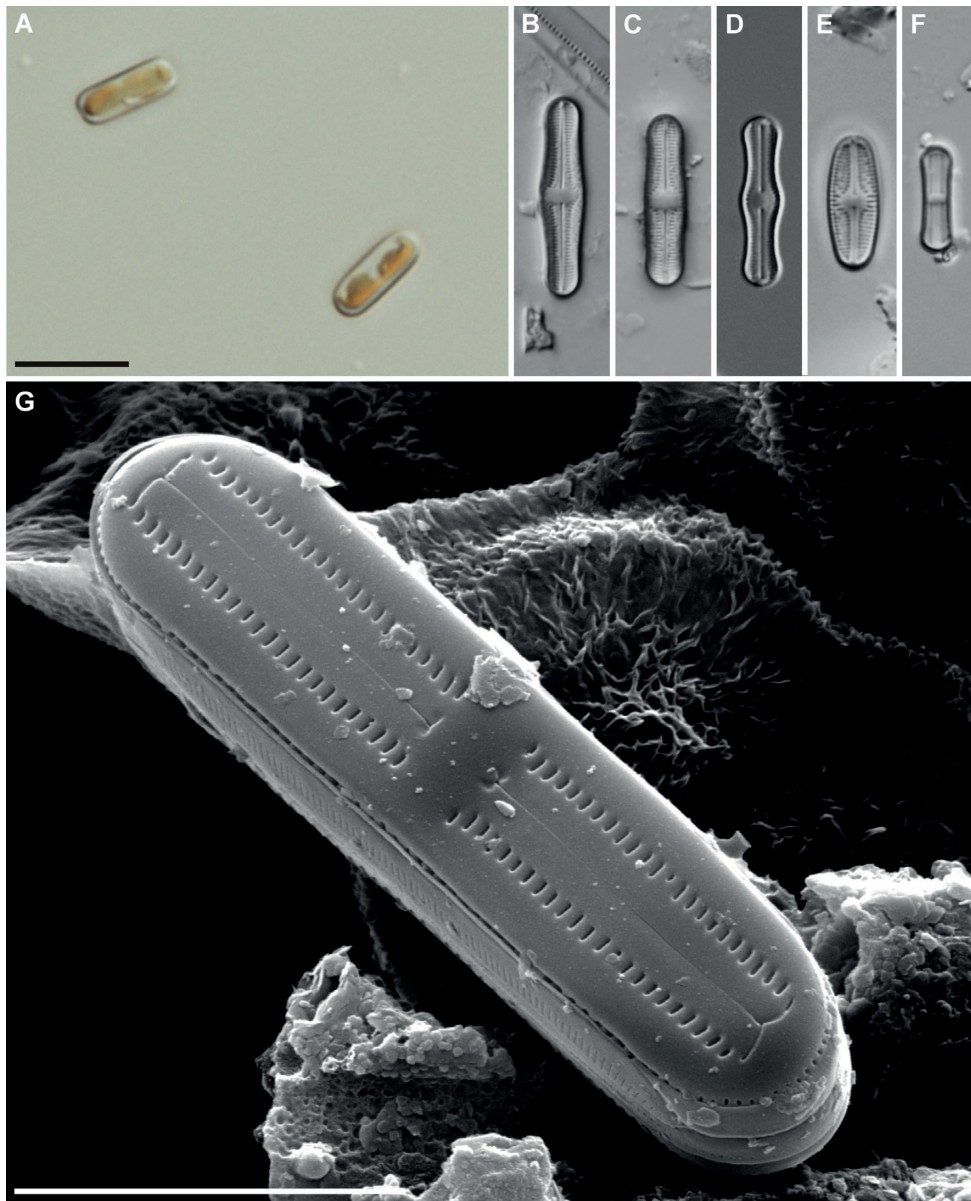
**Characteristics** – Cells **biraphid**, usually small in size, with narrow **axial area** (II). Striae composed of few elongate areolae (often only 1-2) (III, Fig. 109: G). The mantle has a single row of large and distinctly visible areolae (Fig. 109: G). The raphe endings are straight both in the centre of the cell and at the apices and do not extend onto the margin.

**Plastid structure** – Cells with a single lobed plastid (Fig. 109: A).

**Identification of species** – Species can be identified by cell size, cell shape, shape of the apices and structure and density of the striae as well as the number of areolae in each stria.

**Ecology** – Cells solitary and motile. Found in the benthos of acidic oligotrophic waters, most common in moist sub-aerial habitats such as mosses and damp rocks. Washed into streams by anthropogenic activities such as mining, deforestation, road building etc.





**Fig. 109.** *Humidophila* spp. **A-F.** LM. **A.** Living cells, girdle view (left), valve view (right). **B-F.** Cleaned material, valve views. **G.** SEM. Oblique external view of valve, note single areolae comprising the striae.  
Scale bars = 10  $\mu\text{m}$  (A-F), 5  $\mu\text{m}$  (G).

***Luticola*** D.G. Mann 1990

Type species: *Luticola mutica* (Kützing) D.G. Mann

SYNONYM:

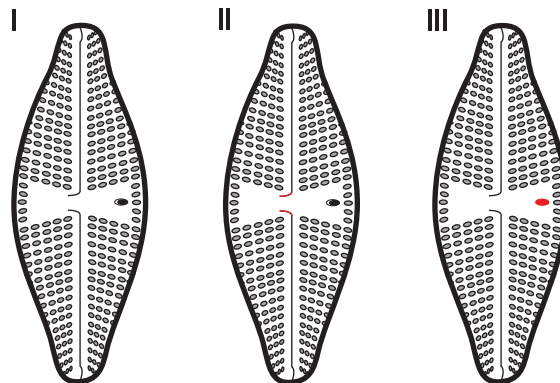
*Navicula* Bory 1822 pro parte

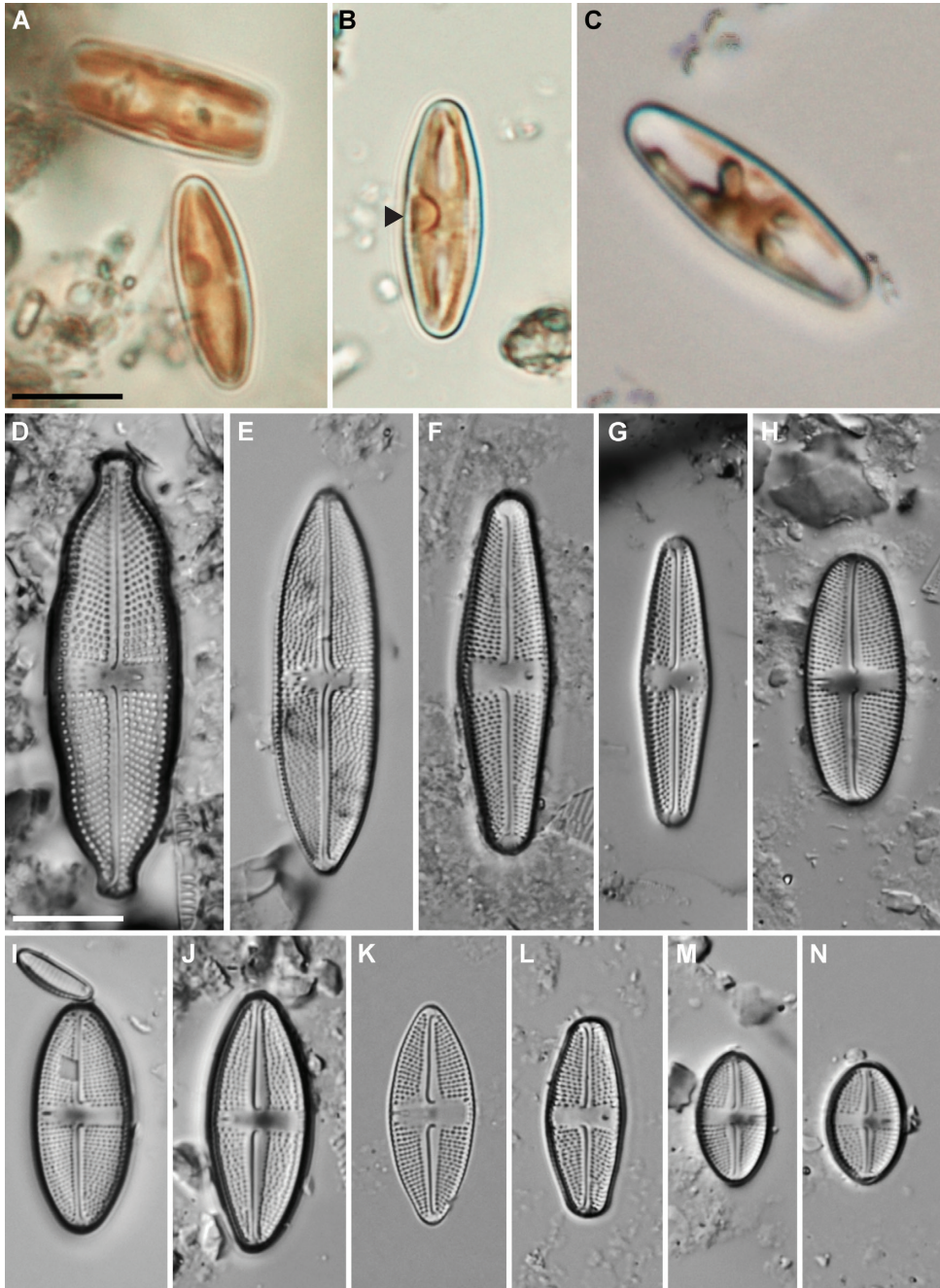
**Characteristics** – Cells **biraphid**, small, elliptical to linear elliptical with broadly rounded or capitate apices. Valve margins may undulate. Striae parallel or radiate mid-valve becoming radiate towards the apices, composed of single rows of large areolae easily discernible under LM. Raphe straight and simple (Fig. 110: D-N). with central endings either hooked or bent in the same direction (II) opposite the side with the stigma. Central area variable in shape and extent with single isolated stigma (III; Fig. 110: D-N; Fig. 111: A-F).

**Plastid structure** – Single plastid with a central pyrenoid (Fig. 110: A-B), lying with its centre along one side of the girdle, 2 lobes extending under each valve face, indented longitudinally under the raphe (Fig. 110: C).

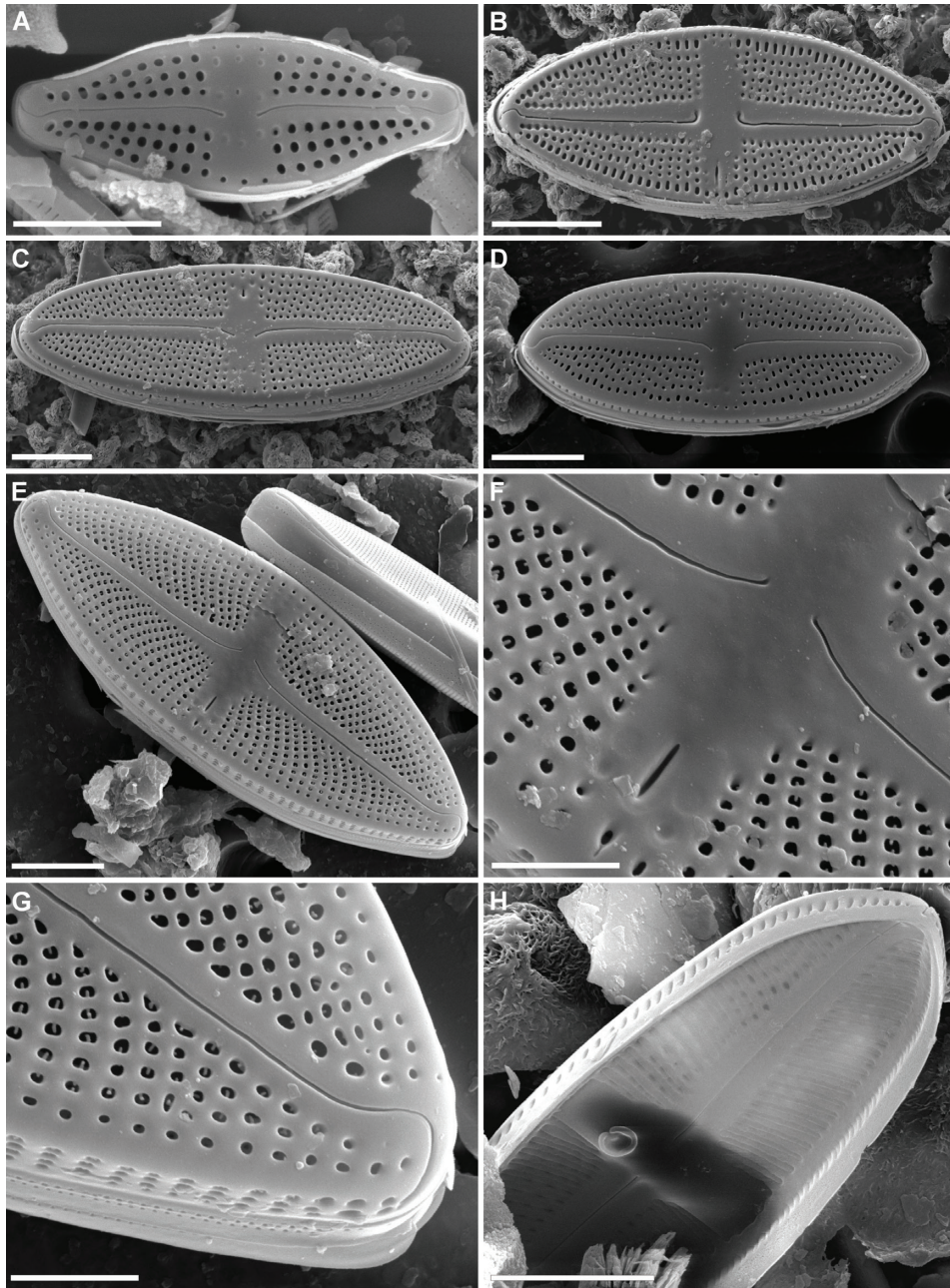
**Identification of species** – Species can be identified by cell size, cell shape, shape of the apices, structure and density of the striae as well as structure of the central area and the shape and curvature of the central raphe endings.

**Ecology** – Cells solitary, free living and motile. Found mostly in terrestrial and sub-aerial habitats, may be washed into rivers and streams.





**Fig. 110.** *Luticola* spp. **A-N.** LM. **A-C.** Living cells, note the central pyrenoid (arrow - **B**). **D-N.** Cleaned valves.  
Scale bars = 10  $\mu$ m (**A-N**).



**Fig. 111.** *Luticola* spp. **A-H.** SEM. **A-E.** External view of valves. **F.** External view of valve, detail of bent central raphe endings and stigma. **G.** External view of valve, detail of apex and hooked terminal raphe ending. **H.** Internal view of valve, detail of stigma.

Scale bars = 5 µm (A-E, H), 2 µm (F-G).

***Amphipleura* Kützing 1844**

Type species: *Amphipleura pellucida* (Kützing) Kützing

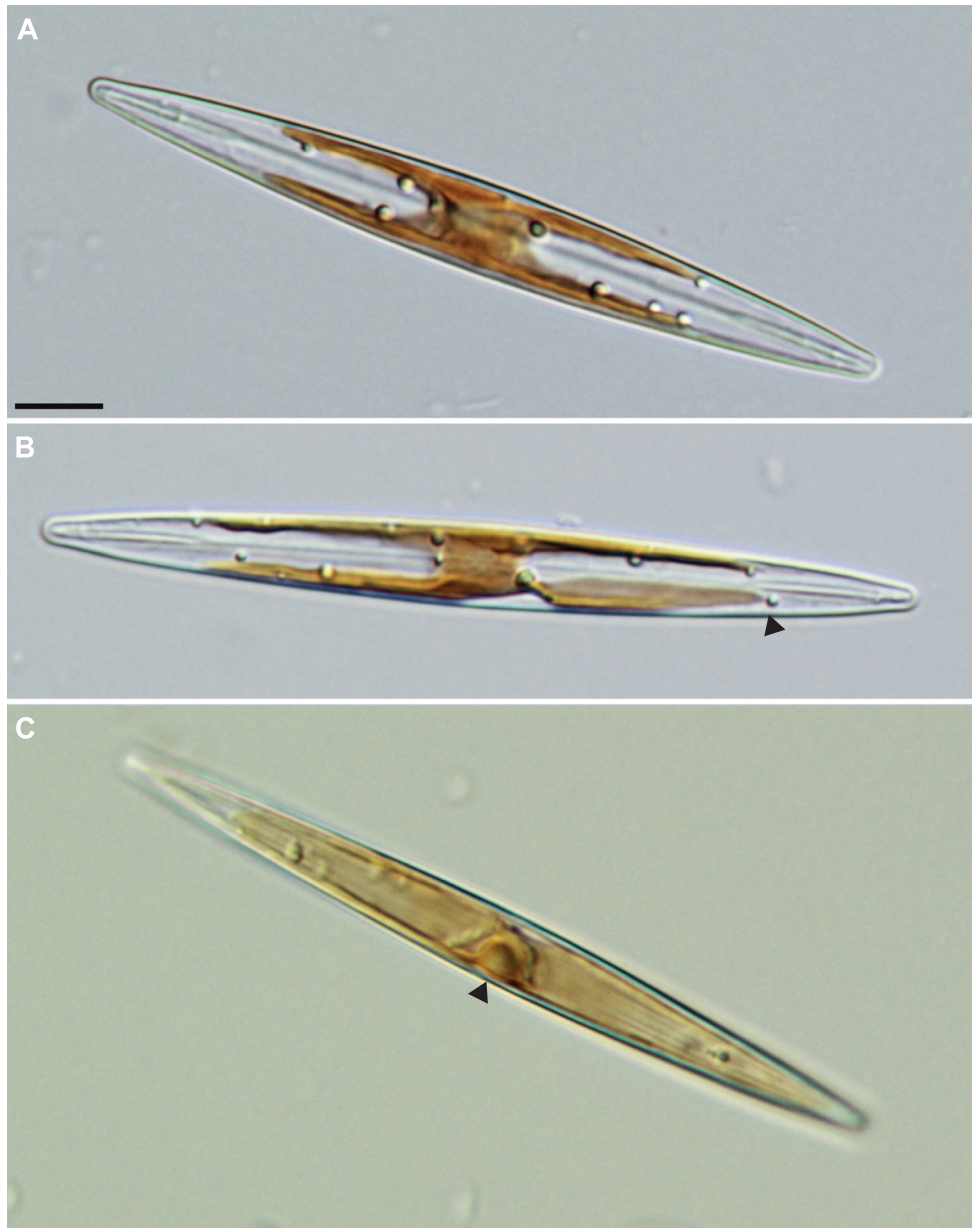
**Characteristics** – Cells **biraphid**, large and long. Striae are very difficult to resolve in LM. The raphe is very short and present only near the apices (Fig. 113: A-D). The raphe branches are not visible under LM and are located between ribs which in LM resemble the eye of a needle (I). These ribs fuse into a single structure (**median rib**) running the length of cell (II).

**Plastid structure** – Single plastid with 2 lobes (H-shaped, Fig. 112: A-B). Large pyrenoid in the center of the cell (C), several lipid droplets scattered through the cell.

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

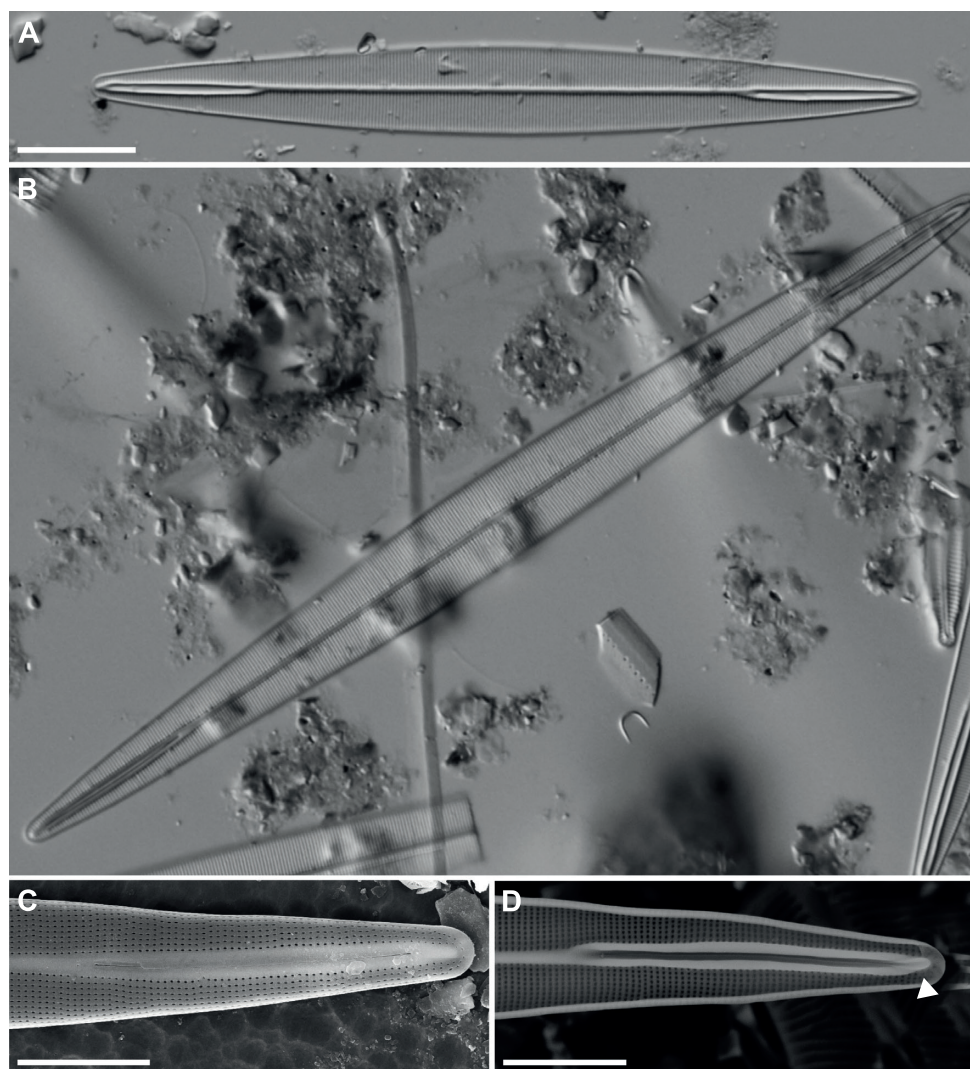
**Ecology** – Cells solitary, free living in the benthos. Occurs in oligo- to mesotrophic waters.





**Fig. 112.** *Amphipleura pellucida*. **A-C.** LM. **A-B.** Living cells, valve view, note lipid droplets (arrow - **B**). **C.** Living cell, girdle view, note large central pyrenoid (arrow).  
Scale bar = 10  $\mu$ m.





**Fig. 113.** *Amphipleura pellucida*. **A-B.** LM, cleaned material, valve view. **C-D.** SEM. **C.** External view of valve showing shortened raphe slit. **D.** Internal view of valve view showing thickened central rib, axial ribs parallel to the raphe, and the helictoglossa (arrow).

Scale bars = 10 µm (A-B), 5 µm (C-D).

## ***Frustulia*** Rabenhorst 1853

Type species: *Frustulia saxonica* Rabenhorst

**Characteristics** – Cells **biraphid**, ranging in size. Margins may undulate or have a constriction mid-valve. Raphe between two clearly visible thickened ribs (III). Raphe terminates near the apices in characteristic **porte-crayon endings**, visible both in LM (II; Fig. 115: A) and under SEM (Fig. 116: F). Striae composed of very small areolae arranged into both transapical and longitudinal striae.

**Plastid structure** – Two plate-like plastids each containing a central pyrenoid (Fig. 114).

**Identification of species** – Species can be identified by cell size, cell shape, undulations of the valve margin, shape of the apices, structure and density of the striae as well as structure of the axial and central area including whether the silica ribs are continuous or interrupted in the central area (Fig. 115).

**Ecology** – Cells solitary, free living and motile or colonial living in mucilage tubes (Fig. 114: D). Found in the benthos of acidic oligotrophic waters with low conductivities.

