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HEMIMASTIGOPHORA

By WILHELM FOISSNER and ILSE FOISSNER

The Hemimastigophora are a small, but still growing group of heterotrophic flagellates having a unique constellation of characters. Thus, they have been classified as distinct phylum, the Hemimastigophora, by Foissner et al. (1988), containing the single family, Spironemidae Doflein. The diagonal (rotational) symmetry of the cortical plates (Fig. 1a) and the conspicuous ability of some species to perform **metaboly** (Fig. 1b) indicate a relationship with euglenids (Foissner and Foissner, 1993).

General characterization: small to medium sized (10-60 µm long), vermiform to ovoid, with slight anterior constriction producing head-like "**capitulum**". Two slightly spiraled rows of flagella, shorter or as long as body, in more or less distinct furrows located at sites where cortical plates abut. Basal bodies single, each

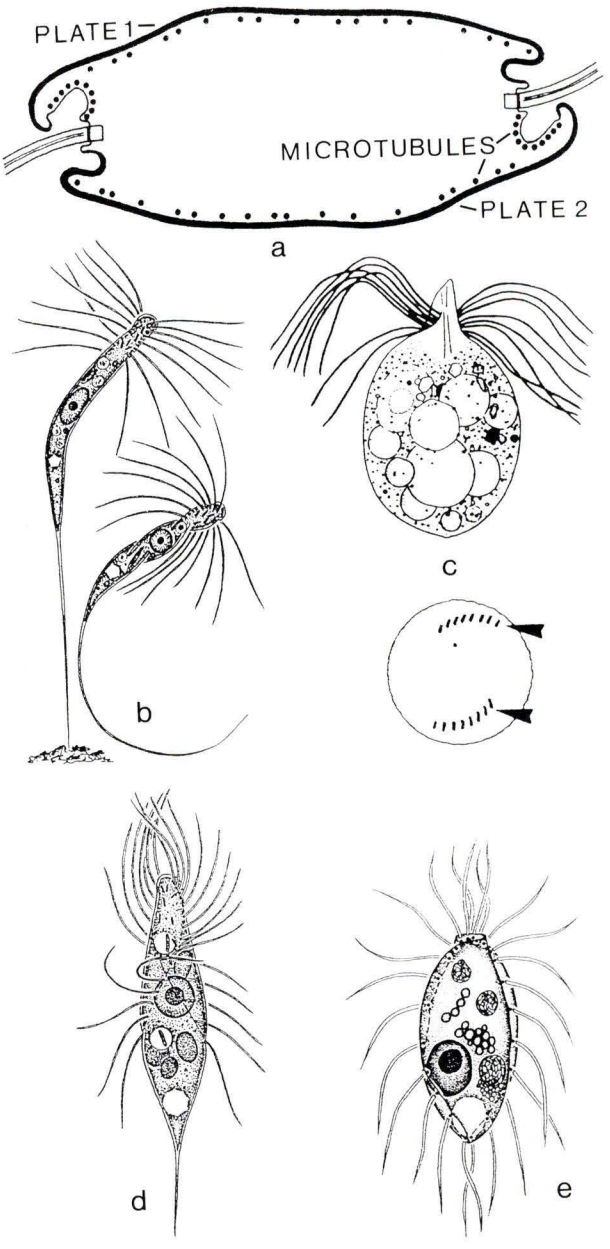

Fig. 1a-e. Hemimastigophoran flagellates. a. Schematized transverse section showing that the cortex is composed of two plicate plates having diagonal (rotational) symmetry (modified from Foissner and Foissner, 1993). b. *Spironema terricola* extended and contracted, length 40 µm (from Foissner and Foissner, 1993). c. *Paramastix conifera*, lateral and frontal view showing two flagellar rows (arrowheads), length 15 µm (from Zölffel and Skribbe, 1996). d. *Stereonema geiseri*, length 25 µm (from Foissner and Foissner, 1993). e. *Hemimastix amphikineta*, length 17 µm (from Foissner et al., 1988).

associated with a membranous sac, a short microtubule ribbon, a long microtubule ribbon, and nine filamentous arms (transitional fibers) forming a distinct basket. Cortex composed of two folded plates with diagonal (rotational) symmetry, supported by granular layer (epiplasm) in flagellated region and by microtubules either evenly spaced or in discrete groups (Fig. 1a). Single nucleus with prominent central nucleolus persisting throughout division. Contractile vacuole near posterior end of body. Mitochondrial cristae tubular to saccular. Complex, bottle-shaped **extrusomes** consisting of cylindroid posterior and rod-like anterior compartment. Food uptake at anterior end, defined oral structures, however, not recognizable. Fission in free-swimming condition, symmetrogenic. In freshwater and soil.

Four genera, as characterized in the key, with a total of eight reliable species are known; all genera, except *Paramastix*, have been confirmed by electron microscopy.

KEY TO GENERA

1. With euglenoid metaboly; flagella rows terminating in or distinctly above mid-body; body fusiform; cortex soft; freshwater and soil ..... ***Spironema***
1'. Without euglenoid metaboly; flagella rows as long as body or distinctly shorter; body fusiform or globular; cortex rigid or soft; soil or freshwater..... 2

2. Flagella rows extending whole body length; broadly fusiform and distinctly flattened; cortex rigid; soil ..... ***Hemimastix***
2'. Flagella rows terminating in or distinctly above mid-body; body fusiform or globular; cortex soft; freshwater 3

3. Flagella rows terminating in mid-body; fusiform..... ***Stereonema***
3'. Flagella rows terminating distinctly above mid-body, i.e. restricted to rounded anterior end; globular..... ***Paramastix***

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ORDER OXYMONADIDA

by GUY BRUGEROLLE and JOHN J. LEE

Oxymonads are intestinal parasitic flagellates with a cell basically comprising one **karyomastigont** composed of one nucleus, four flagella arranged in two pairs, a preaxostylar lamina, and a **paracrystalline axostyle** (several genera have two to several karyomastigonts)(Fig. 1). One or more of the anterior flagella is recurrent or adhering to the body surface. The pairs of basal bodies are separated by a **preaxostylar lamina** of a composite paracrystalline structure (Figs. 2,3,4a,b). The crystalline axostyle, originating from or near the anterior preaxostylar lamina, is composed of parallel rows of interlinked microtubules (Fig. 4c). An anterior row of microtubules or **pelta** is generally present (Fig. 2). Several species have developed an anterior expansion named holdfast (microfibrillar) and **rostellum** (microtubular) to attach to the chitinous intima of the insect host intestine (Figs. 1,3,4d,e). No cytostome, nutrition by phagocytosis and pinocytosis; several **xylophagous** species; glycogen is the reserve. They reproduce by binary fission and the mitosis is of the closed type with an intranuclear spindle (Cleveland, 1938, Hollande anb Carruette-Valentin, 1970b). Parental axostyle depolymerizes during division. Sexual