

Monograph of the Euplotidae Ehrenberg, 1838 (Ciliophora, Spirotricha)

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<https://www.protozoology.com>

Important information

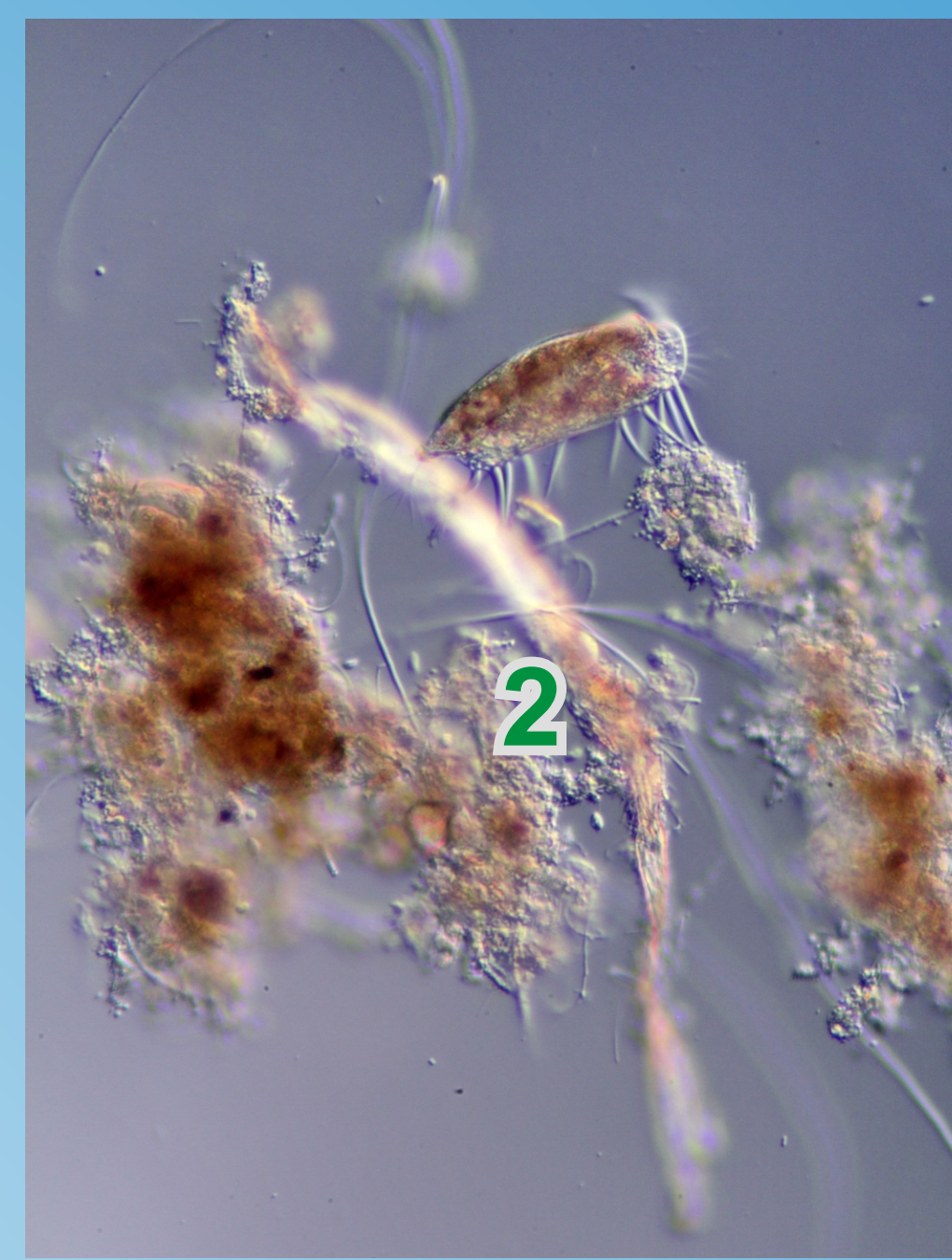
- ☺ The Euplotidae are an important subgroup of the Euplotia, one of the three major subgroups (Oligotrichia, Hypotrichia) of the spirotrichs.
- ☺ The predominantly benthic euplotids are widely distributed in marine (1) and limnetic habitats, including sewage treatment plants (2). Few species live in terrestrial habitats (3).
- ☺ The euplotids are a very uniform group compared to the hypotrichs. Most species are small or medium-sized, often distinctly sculptured, have 8–10 frontoventral cirri, 5 transverse cirri, 3 or 4 marginal and caudal cirri, and 8–10 dorsal kineties (1, 2, 3, 4).
- ☺ An important feature is the striking silverline system of the dorsal side (3d).
- ☺ The nuclear apparatus is composed of a strongly curved macronucleus and a micronucleus (3a, f). The contractile vacuole is in the posterior body portion near the right cell margin (3a).
- ☺ Until now, more than 160 species, subspecies, varieties, and forms have been described; about 100 seem to be valid.
- ☺ In recent classifications, usually four genera or subgenera are accepted, namely *Euplotes*, *Euplotoides*, *Euplotopsis*, and *Moneuplotes*; however, this morphological separation is only partly supported by gene sequence data.
- ☺ The present monograph will have the same structure like the *Monograph of the Hypotricha* by H. Berger (Monographiae Biologicae, Springer), that is, a General section where, inter alia, a detailed explanation of general and specific terms and the description of the (supposed) ground pattern are provided. The Systematic section comprises keys to genera and species; correct names of taxa (5); detailed lists of synonyms (6); a derivation of each scientific name and discussion of nomenclatural problems; a unified description of the species; a summary of all morphometric characterisations available (7); almost all illustrations ever published and many micrographs showing all important details (2, 3, 4); a very detailed ecology section, that is, all published records (8), generation time, food, biomass, etc. if available.
- ☺ Very comprehensive and exact list of references; more than 4000 papers have been published on this group.
- ☺ Two-sided systematic index to all names mentioned.
- ☺ The monograph will be published in DENISIA (Upper Austrian Museum in Linz); the PDF will be freely available (Open Access); however, a printed version will guarantee long-term availability.

☺ **Conclusion:** *The Monograph of the Euplotidae will be not only an important reference book for taxonomists dealing with this group, but also a comprehensive source of information for biologists of other disciplines, for example, ecologists, molecular biologists, physiologists.*

☺ website to project:
https://www.protozoology.com/monograph_euplotidae/index.htm



Marine *Euplotes* and the hypotrich *Epiclintes auricularis* (Adriatic Sea, Lignano, Italy) (original)



Euplotoides aediculatus (right lateral view) in activated sludge (original)

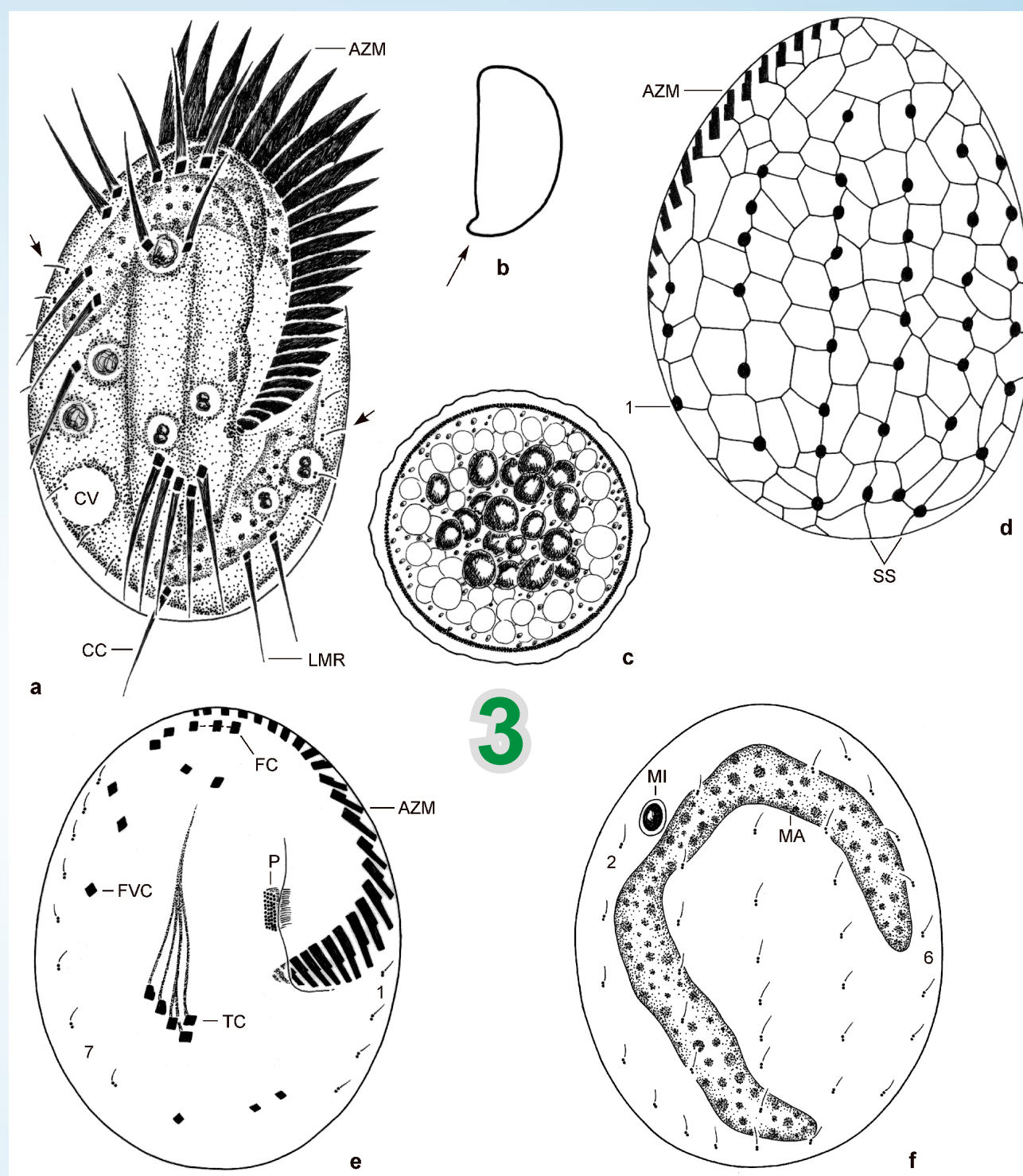
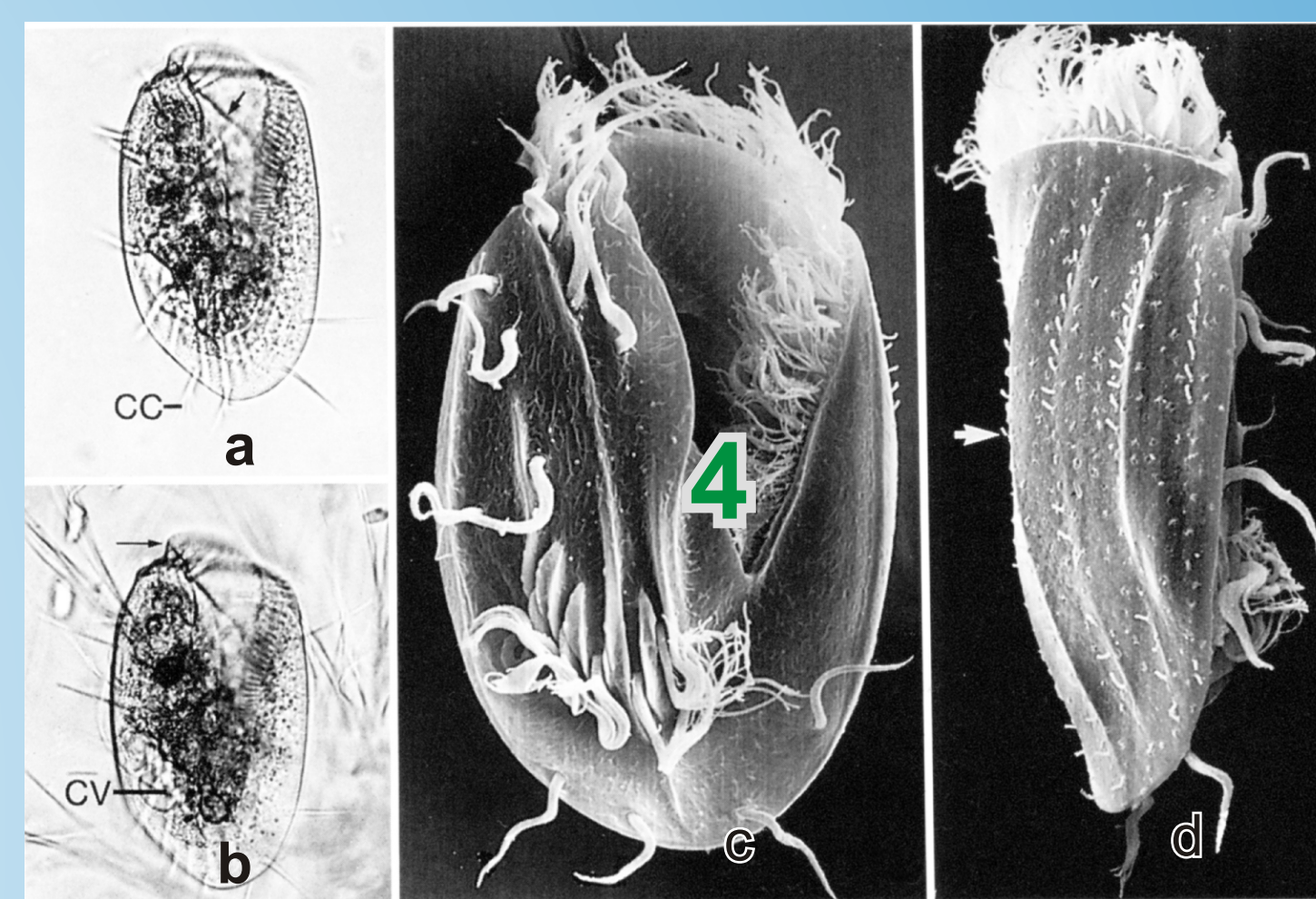


Fig. 3a–f *Euplotes corsica* (from Berger & Foissner 1989. a–c, from life; d, wet silver method; e, f, protargol). a: Ventral view of a representative specimen, 40 µm. Arrows mark dorsal kinety 1 (left side of specimen) and rightmost kinety. b: Left lateral view showing that the dorsal side protrudes slightly beyond the ventral side (arrow). c: Resting cyst, 27 µm. d: Dargyome of double-eurystomus type. e, f: Infaciliature of ventral and dorsal side and nuclear apparatus of same specimen, 36 µm. AZM = adoral zone of membranelles, CC = caudal cirrus, CV = contractile vacuole, FC = frontal cirri, FVC = rearmost frontoventral cirrus, LMR = left marginal cirri, MA = macronucleus, MI = micronucleus, P = paroral, SS = silverline system on dorsal side (dargyome), TC = transverse cirri, 1, 2, 6, 7 = dorsal kineties. Page. #####.



Euplotoides aediculatus (from Foissner, Blatterer, Berger & Köhmann 1991). Ventral views (a–c) and right lateral view (d) from life (a, b) and scanning electron micrographs (c, d).

Table ## Morphometric data on *Euplotes corsica* (col. from Berger & Foissner 1989, protargol method according to Foissner 1982 unless otherwise indicated; col2, from Borror 1968, misidentified as *Euplotes alatus*, wet silver method).

Characteristic*	species	mean	M	SD	SE	CV	Min	Max	n
Body, length	col1	35.5	35.0	3.8	0.8	10.8	29.0	42.0	21
	col2	—	—	—	—	—	—	—	—
Body, width	col1	27.6	28.0	2.6	0.6	9.4	22.0	32.0	21
	col2	—	—	—	—	—	—	—	—
Adoral zone of membranelles, length	col1	22.0	21.0	2.1	0.4	9.3	17.0	25.0	21
	col2	—	—	—	—	—	—	—	—
Paroral, length	col1	3.1	3.0	0.4	0.1	11.5	2.0	4.0	21
	col2	29.9	31.0	3.9	0.8	12.9	20.0	36.0	21
Macronucleus, width	col1	4.7	4.0	0.9	0.2	19.2	4.0	6.0	21
	col2	—	—	—	—	—	—	—	—
Micronucleus, length	col1	3.0	3.0	0.1	0.0	3.6	3.0	3.5	21
	col2	2.2	2.0	0.3	0.1	11.7	1.8	2.5	21
Distance 1 [†]	col1	8.6	8.0	2.2	0.5	25.2	6.0	12.0	21
	col2	4.0	4.0	0.0	0.0	0.0	4.0	4.0	21
Distance 2 [†]	col1	—	—	—	—	—	—	—	—
	col2	—	—	—	—	—	—	—	—
Distance between dorsal bristles [†]	col1	22.2	20.0	1.2	0.3	5.4	20.0	25.0	21
	col2	10.0	10.0	0.0	0.0	0.0	10.0	10.0	21
Frontal-ventral cirri, number	col1	—	—	—	—	—	—	—	—
	col2	10.0	—	—	—	—	—	—	—
Frontal cirri, number	col1	3.0	3.0	0.0	0.0	0.0	3.0	3.0	21
	col2	7.0	7.0	0.0	0.0	0.0	7.0	7.0	21
Ventral cirri, number	col1	5.0	5.0	0.0	0.0	0.0	5.0	5.0	21
	col2	—	—	—	—	—	—	—	—
Left marginal cirri and caudal cirri, number	col1	3.2	3.0	0.4	0.9	12.6	3.0	4.0	21
	col2	—	—	—	—	—	—	—	—
Dorsal kineties, number	col1	7.5	7.0	0.5	0.1	6.8	7.0	8.0	21
	col2	8.0	—	—	—	—	—	—	—
Dorsal kinety 5, number of basal body pairs	col1	7.5	8.0	0.9	0.2	12.3	6.0	9.0	21
	col2	—	—	—	—	—	—	—	—
Cyst, large diameter	col1*	26.7	27.5	2.5	0.7	9.2	22.0	31.0	12
	col1*	25.1	25.0	2.4	0.7	9.4	21.0	28.0	12

* All measurements in µm. CV = coefficient of variation in %, M = median, Max = maximum value, mean = arithmetic mean, Min = minimum value, n = number of individuals investigated, SD = standard deviation, SE = standard error of arithmetic mean.
[†] Distance between the anterior and the posterior point of the macronucleus.
[‡] Distance between the anterior end of the cell and the anterior end of the macronucleus.
[§] Distance between the right edge of the right and the left edge of the left frontal cirrus.
[¶] Culture material from life.
^{||} Average distance between dorsal bristles of middorsal kinety (fifth kinety from right according to Borror 1968). Whether the sample size in this feature is 10 or 20 remains obscure.
^{|||} Borror (1968) analysed the fifth kinety from right.

5 *Euplotoides patella* (Müller, 1773) Borror & Hill, 1995 (Fig. #, Table #)

1773 *Trichoda patella*¹ – Müller, Vermium Terrestrial et Fluvialium, p. 95 (original description, no illustration, no type material available).
1776 *Trichoda patella* – Müller, Zoologicae daicae prodromus, p. 209 (brief characterisation).
1786 *Kerona patella* – Müller, Animalcula Infusoria, p. 238, Tafel XXXIII, Fig. 14–18 (Fig. #a.14–18; description, first illustration, and combination with *Kerona*).
1790 *Trichoda patella* – Gmelin, Systema naturae, p. 3884 (revision).
1831 *Euplotes patella* E. – Ehrenberg, Abb. preuss. Akad. Wiss., year 1831: 118 (combination with *Euplotes*).
1838 *Euplotes patella* – Ehrenberg, Infusionsthierehen, p. 378, Tafel XLII, Fig. IX (Fig. #a.1X.; revision and redescription).
1838 *Pleocoma patella* – Dujardin, Annls Sci. nat. (Zool.), 10: 313, Planche 14, Fig. A.1–A.3 (illustrated record, see remarks, combination with *Pleocoma*).
1841 *Pleocoma patella* – Dujardin, Zoophytes, p. 435, Planche VIII, fig. 1–4 (Fig. #a.1–4; revision and description).
1850 *Euplotes patella* Ehrenberg – Dising, Systema Helminthum, p. 167 (brief review without illustrations; incorrect author).
1858 *Euplotes patella* Ehrh. – Chapuis & Lachmann, Mém. Inst. nat. géogr., 5: 170, Planche VII, Fig. 1, 2 (Fig. #a, b; redescription).
1859 *Euplotes patella* Ehrh. – Stein, Organismus der Infusionsthierehen, p. 135, Tafel IV, Fig. 6–11 (Fig. #; revision and detailed redescription from life; incorrect author).
1865 *Euplotes patella* – Quenstedt, Acta Univ. land., 2: 56, Plate II, Fig. 6 (Fig. #; illustrated record from Lund, Sweden).
1869 *Euplotes paradoxus* – Kent, Mon. microsc. J., 1: 292, Plate XII, Fig. 5 (Fig. #; original description of synonym; not type material available).
1870 *Euplotes patella* – Wrzesniowski, Z. wiss. Zool., 20: 510, Tafel XII, Fig. 19 (Fig. #; comparison with *E. eurytomus*).
1875 *Euplotes patella* Ehrh. – Fromentel, Microzoaires, p. 164 (invalid fixation of *E. patella* as type species of *Euplotes*, see nomenclature of *Euplotes*).
1882 *Euplotes patella* Ehrh. – Kent, Manual of the infusoria, p. 798, Plate XLIV, Fig. 23–25 (Fig. #; revision of ciliates).
1885 *Euplotes patella* – Maupas, Arch. Zool. exp. gén., 7: 338, Planche XIX, Fig. 16–116, Planche XX, Fig. 12–24, Planche XXI, Fig. 25–38 (Fig. #; detailed description of conjugation).
1896 *Euplotes patella* Ehrh. – Schuberg, Verh. naturh.-med. V. J. 6, 276, Fig. 1–3 (Fig. #; brief description of cell division; incorrect author).
1901 *Euplotes patella* (O.-F. Müll.) – Roux, Mém. Inst. nat. géogr., 19: 109, Planche VII, Fig. 1 (Fig. #; description from life of population from Switzerland).
1906 *Euplotes patella* Ehrh. – Edmondson, Proc. Davenport Acad. Sci., 11: 103, Plate XXIV, Fig. 173 (Fig. #; brief, simple description of Iowa population).
1925 *Euplotes patella* O. F. M. – Wetzel, Arch. Protistenk., 51: 246, Fig. Ya–d (Fig. #; some observations on fine structure).
1929 *Euplotes patella* O. F. M. – Hamburger & Buddenbrook, Nord. Plankt., 7: 100, Fig. 125a, b (Fig. #; FROM STEIN T4, 8+11; review of marine ciliates from North Sea).
1929 *Euplotes patella* – Gelei, Zool. Anz., 83: 275, Abb. 1–5 (Fig. #; some observations on fine structure).
1931 *Euplotes patella* Ehrh. – Tai, Sci. Rep. natn. Tsing Hua Univ., 1: 53, Plate XV, Fig. 2 (Fig. #; description of Chinese population; incorrect author).
1931 *Euplotes patella* Ehrh. – Jacobson, Arch. Protistenk., 75: 52, Fig. 22, 23, Tafel 5, Fig. 6 (Fig. #; description of dorsal kinety pattern and dargyome).
1932 *Euplotes (Trichoda) patella* (Müller, 1773) Ehrenberg, 1833 – Kahl, Tierwelt Dtl., 25: 639, pro parte, Fig. 124., (Fig. #; revision of ciliates).
1932 *Euplotes (Trichoda) patella forma typica* E. n. – Kahl, Tierwelt Dtl., 25: 639, pro parte, Fig. 124; (Fig. #; original description of nomenclotypic form, see nomenclature and remarks; no type material deposited; revision of ciliates).
1932 *Euplotes (Trichoda) patella forma lata* E. n. – Kahl, Tierwelt Dtl., 25: 639, pro parte, Fig. 124; (Fig. #; original description of new form, see nomenclature and remarks; no type material deposited; revision of ciliates).

¹ Müller (1773) provided the following diagnosis: Trichoda univulvis, antice & postice fectis inequalibus porrectis.
² Ehrenberg (1831a) provided the following diagnosis: Körperdurchmesser 1/18". Schild fast kreisrund, sehr breit, an den Seiten sehr durchsichtig, in der Mitte des Rückens stärker gewölbt, Körper fast viereckig, gelblich. Berlin.
³ Stein (1859) provided the following diagnosis: Körper vom gerad abgesetzigt und mit einer dreieckigen Oberfläche versehen; innerhalb des Peristoms eine besondere adalete Rinne; der schräg zugespitzte Vorderrand der Stirn überragt den rechten Theil des Peristoms; 9 Bauchwimpern; die beiden rechten Randwimpern varietet.

patella (without zoochlorellae) and *E. daidaleos* (with). Thus, the sample sites are mentioned at both species: the forma *typica* was common and partly abundant in the sapropel; in the saline sites of Oldesloe it occurred up to a salt content of 0.3%; the forma *lata* occurred usually in sapropel and mesosaprobic sites between *Utricularia*, while the forma *planctonica* was common in larger ponds near the city of Hamburg.
Asia: common in a stream on east campus of Tsing Hua University, Beijing, China (Tai 1931); at 4–19 °C mainly in littoral of Lake Baikal (Russia); very sample, high abundance during summer (water temperature 19 °C) on macrophytes (3–5 m water depth) on eastern shore of southern part of lake at stations Murino and Panjkovo (Gajewskaja 1933); pond in a suburb of Mihara City, Hiroshima Prefecture, Japan (Katashima 1974); Han River, Seoul, Korea (Shin & Kim 1988); streams, rivers, and rice-fields in Korea (Shin 1994).
America: Kenilworth Aquatic Gardens, Washington, DC, USA (Klotzel et al. 1992, p. 93, collected by B.F. Hill); freshwater(s) in Iowa, USA (Edmondson 1906); various freshwater and brackish habitats near/n Baltimore, Maryland, USA (Pierson 1943); rare (only two records in a three-year period) in the USA, namely in January in the Lake Wingra spillway (Wisconsin) and in April in the Municipal Duck Pond also in Madison (Carter 1972); mesosaprobic freshwaters in Mosque de Chapultepec, Mexico City, Mexico (López-Ochoterena 1965); on *Lemna* in Laguna Vitel, Argentina (Cela 1972).
Africa: pond beside the road near the village Kasee, western Uganda (Dragesco 1972).
Records of *Euplotoides patella* not substantiated by morphological data (there are many papers, mainly on genetics, physiology, etc., which do not contain details on the collection site):
Europe: freshwater(?) in Armenia (Zharkov 1982, p. 912); limnetic habitat in Central Alps in Carinthia, Austria (Krainer 1999, p. 668); benthic in eutrophic pasture pond near alpine road (Großglockner-Hochalpenstrasse) in Austria (Foissner 1980, p. 107; Foissner et al. 1982, p. 90, with autecological data); mesosaprobic brooks in the city of Salzburg, Austria (Hofbauer & Schindler 1976, p. 35; Hofbauer et al. 1979, p. 40); river Salzach, Salzburg, Austria (Czermin-Chudenitz 1985, p. 132; identifications made by W. Foissner); with low abundance in creek (Oichten) in Salzburg, Austria (Augustin et al. 1987, p. 75); river Antiesen and other tributaries of the River Inn in Upper Austria (Blatterer 1994, p. 158; 2008, p. 349); brook near the city of Linz and pond near the village of Gaisbach, Upper Austria (Foissner 1974, p. 25; figures not shown in paper; Petz et al. 1988, p. 82); mesosaprobic river Traun, Upper Austria (Foissner & Moog 1992, p. 101); Danube River in Austria (Humpesch & Moog 1994, p. 90, review); bog near the village of Lans (Lanser Torfmoor), Tyrol, Austria (Dalla Torre 1891, p. 207); very abundant in fouling samples from a stagnant water (Lusthauswasser) in Vienna, Austria (Vornatscher 1938, p. 334); brook (Liesingbach) in Vienna, Austria (Weninger 1974, p. 140); ponds in Styria, Austria (Krainer 1988, p. 19); rivers (Araks, Akera?) in Azerbaijan (Aliiev 1982, p. 807); water basins of north-east Azerbaijan (Aliiev 1981); plegen of rearing ponds of the Kura Experimental Sturgeon Hatchery, Azerbaijan (Aleksperov 1983, p. 332); waters of Apsheeronsk peninsula, Azerbaijan (Agamaliyev & Aliiev 1978, p. 67); reservoirs (Donro, Mingechayrian, Varvarian, Jeiranbatanian, Khachinchai) in Azerbaijan (Aleksperov 1981, p. 57; 1984, p. 19; 1984a, p. 18; 1989, p. 18; further records from Azerbaijan: Aleksperov 1986, p. 57); canals and other sites in Belgium (Bervoets 1940, p. 124, 136; Chardez 1987, p. 14); river Kamtchia, Bulgaria (Detcheva 1976, p. 301; 1982, p. 250; 1983, p. 73, with autecological data; for review of Bulgarian records, see Detcheva 1992, p. 113); river Jantra basin, Bulgaria (Detcheva 1991, p. 71); 1982a, p. 45, with autecological data); Tun-dza River, Bulgaria (Detcheva 1972, p. 263; 1975, p. 88, 90; 1982a, p. 45, with autecological data); Tun-dza River, Bulgaria (Detcheva 1986, p. 63); river Bell Lom, Bulgaria (Rusev et al. 1988, p. 40); river Vit (= Vid) and river Oosam in central northern Bulgaria (Detcheva 1975a, p. 214; 1979b, p. 364; 1983a, p. 369, 372; 1983b, p. 353, 355; 1.4–8.4 mg l⁻¹ BOD₅, and with further autecological data; Rusev et al. 1984, p. 16); river Struma, southwestern Bulgaria (Detcheva 1979a, p. 242, with autecological data); river Iskar, southeast of Sofia,

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[†] This paper contains several pre-1930 reports of various Russian workers (Fiedjew; Russki; Skodowsky; Skorikow). Since I do not have these papers, they are not considered further.