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Hypotrich Ciliates (Protozoa: Ciliophora) of Gelingüllü Dam Lake, Yozgat-Turkey

Sırma Çapar

Hacettepe University, Department of Biology, Ankara, TURKEY

Abstract

Gelingüllü Dam Lake is located at south of Yozgat Province, in Central Anatolia Region. It is constructed on Deliceırmak stream which is a tributary of Kızılırmak River. The impoundment period began after November 1993 and the riverine ecosystems started to chance into lotic system. The following study, part of a more complex research, is a preliminary work on hypotrich ciliates found at the flooded zone of the dam lake. Collected samples were analysed with the non-flooded petri method which bases on reactivating ciliates from air dried samples. The species were identified by evaluation of morphometric measurements and counts, in vivo and after protargol impregnation technique. Illustration of the specimens were by free-hand sketchs and micrographs. Measurements were performed digitally by IM50 image manager system and Q-Win measurement program. Totally 15 hypotrich species belonging to 10 genera were identified additionally descriptions and original drawings of the identified species are given.

Key Words: Ciliate, Dam lake, Flooded zone, Protozoa

Introduction

Studies on local and global biodiversity for ciliates are rather rare, with a few notable expectations (Berger, 1999; Corliss, 1979; Foissner 1993; Foissner et. al., 1991, 1999, 2002). Although there are papers related to compilations of soil and moss ciliates, the diversity of Turkish Ciliate Fauna is completely lacking (Berger and Foissner 1987; Borror 1972; Foissner 1987a, b, 1989, 1995; 1997; 1998; 2000). However, the investigations from Turkey are very sparse. The most detailed studies were performed by Şenler *et al*. (1998), Şenler and Yıldız (1998, 1999, 2004) who worked specially on rivers, small ponds and sewage treatment plants, Çapar (1997, 2003, 2005) on free living pond ciliates and wetland ciliates and additionally by Balkıs (2004) on marine tintinnids.

Ciliated protozoa have long been observed and used as a research tool in many disciplines such as; taxonomy, biochemistry, cytology, genetics, ecology (Lynn and Small, 2000). Almost all these studies showed that ciliated protozoa are obvious components of many microhabitats, both visibly and ecologically, both benthically and planktonic food web (Fenchel, 1987; Laybourn-Parry, 1984). A scale of ecosystem functions, such as carbon fixation and nutrient cycling in a freshwater pond, appear to be governed by complex correlative interractions (Finlay et al., 1997). Much of the current interest in the role of ciliates in carbon flow hinges on their grazing activities and the part they play in microbioal food webs in aquatic environments. A large portion of the photosynthetic production in lakes is due to the small eukaryotic algea and cyanobacteria. Much of this production turns to dissolved organic matter and serves as a substrate for heterotrofic bacteria which are eaten by flagellates and finally they are eaten by ciliates (Finlay and Fenchel, 1996). Additionally ciliates together with flagellates consume the small phtotrophs which are too small for some metazoans such as copepods. All these interreactions show the impressive role of ciliates in fresh water systems.

The present study provides, for the first time, descriptions of semi-terrestrial hypotrich ciliates isolated from the flooded zone of a dam lake, including descriptions and original drawings of the identified species. The rest of the taxon such as colpodid ciliates, are presented in Çapar et al. (2006). A detailed paper including interactions will be prepared at the end of the study.

Material and Methods

Study area and sampling

Gelingüllü Dam Lake is located at south of Yozgat Province, in Central Anatolia Region with 39º36'30N-35º03'20E coordinates and the dam was constructed on Deliceirmak stream which is a tributary of Kizilirmak River (Figure 1). Samples were collected seasonally during 2004-2005 from flooded zone of the dam. For each station all the soil samples were taken by shovel in an area of about 100 m^2 and a depth of up to 10 cm, including the leaf and grass litter.

Sample processing and investigation

The samples were air-dried at room temprature and then treated with the non-flood petri dish method, as described by Foissner (1987c, 1991). By this method, the petri dish cultures were investigated for ciliate species by inspecting 2 ml of run-off on days 2, 7, 14, 21 and 28. During this time, for each species, some cells were isolated with a fine pipette and cultivated in poor cultures for staining. This provided flourishing cultures for each species seperately with many specimens.

Identification and preparation of species

All the species were carefully studied in vivo using a high power (100X and 63X) oil immersion objective and differential interference contrast microscopy. The following methods, which have been described by Foissner (1991, 1993) and Foissner et al. (2002), were used to reveal the infraciliature and various cytological details by using bright field microscopy: protargol technique.

Identification and terminology of species are according to the literatures in Corliss (1979); Corliss and Lom (1985); Foissner (1998) and Foissner et al. (2002).

Illustration of the specimens were based on free sketchs and/or micrograph prints; micrographs and measurements were performed digitally by IM50 image manager system and Q-win measurement programme.

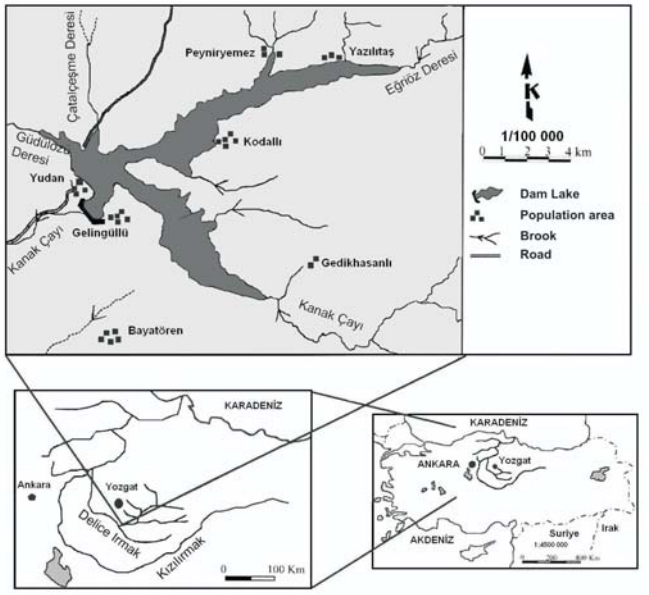

Figure 1. Sampling area.

Results and Discussion

A total of 15 hypotrich ciliates belonging to 10 genera and 2 families were identified. Their systematic definitions were carried out according to Corliss (1979), Corliss and Lom (1985), Berger (1999), Foissner (1998, 2000). The species described below were first recorded from Göksu Delta by Çapar 2005.

Subclass: Spirotricha Bütschli, 1889
Order: Hypotrichida Stein, 1859
Family: Oxytrichidae Ehrenberg, 1838

Genus: *Cyrtohymena* Foissner, 1989

1. *Cyrtohymena inquieta* (Stokes, 1887)

Body size 90-100 X 45-50 µm; margins converting posteriorly, anterior end broadly rounded. Two macronuclear nodules in middle body third, left of mid-line, 12-14 X 6-8 µm size; micronuclei about 3-4 µm diameter. Contractile vacuole near mid-body at left cell

margin with inconspicuous collecting canals. Cytoplasm colorless; cortical granules lacking (Figure 2a).

Adoral zone of membranelles about 35-40% of the body length; oral opening wide, deep and transparent. Somatic cirri 11-13 µm, transverse and caudal cirri 18-19 µm long. On ventral side 3 enlarged frontal, 1 buccal, 4 ventral, 3-4 postoral, 5 transverse cirri exist. One right and one left marginal cirral row; left marginal row commences on the posterior border of the adoral zone membranella and ends below the transverse cirri; right marginal ciliary row starts below the third frontal cirri and then joins to left marginal cirral row. Dorsal side has five kineties (Figure 2b, c).

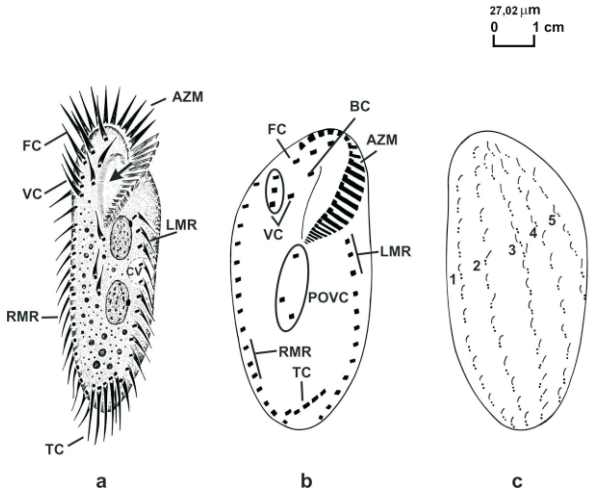

Figure 2. *Crytohymena inquieta*, in vivo (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen, **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **BC:** Buccal cirri, **FC:** Frontal cirri, **CV:** Contractile vakuole, **LMR:** Left marginal cirral row, **POVC:** Postoral ventral cirri, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-5:** Dorsal kineties, **Arrow:** Transparent buccal opening.

2. *Cyrtohymena citrina* (Berger and Foissner, 1987)

Body size 90-100 X 25-30 µm; slender, left margin slightly convex, right margin almost straight, anterior and posterior ends rounded. Macronuclear nodules 18-20 X 8-10 µm; micronuclei about 3 µm across. Contractile vakuole at left of cell margin with inconspicuous collecting canals. Cortical granules 1-1.3 µm across. Cytoplasm with shining crystals (Figure 3a).

Adoral zone of membranelles like a question mark and 25% of the body lenght; oral opening wide and deep. Somatic cirri 15 µm long. On ventral side 3 enlarged frontal, 1 buccal, 3-4 ventral, 3 postoral 5 transverse, 2 pretransverse and 3 caudal cirri exist. Left marginal cirral row J-shaped; right marginal almost straight. Dorsal side ciliature consists of 6 kineties (Figure 3b, c).

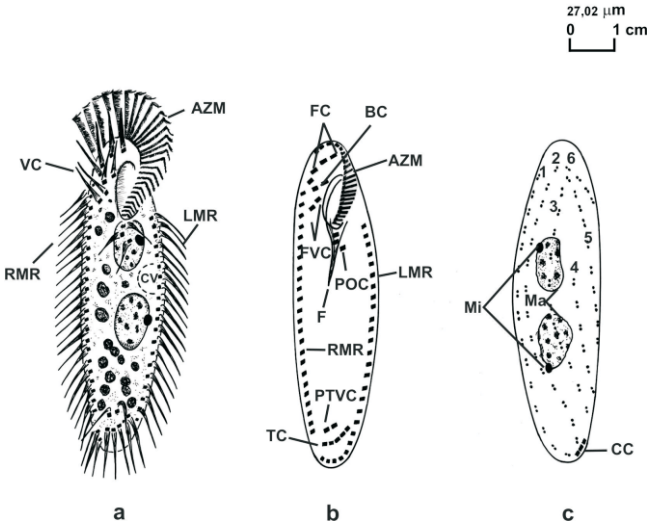

Figure 3. *Cyrtohymena citrina*, in vivo (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen with somatic ciliature, contractile vacuole, food vacoule, macro- and micronucleus, **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **F:** Pharyngeal fibres, **FC:** Frontal cirri, **LMR:** Left marginal cirral row, **Ma:** Macronucleus, **Mi:** Micronucleus, **POC:** Postoral cirri, **PTVC:** Pretransverse ventral cirri, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-6:** Dorsal kineties.

Genus: *Gonostomum* Sterki, 1878

1. *Gonostomum kuehnelti* Foissner, 1987

Body size 100-105 X 23-25 µm; outline slender to broad oval, anterior part becomes narrow to the end, cell enlarges in the mid-part and posteriorly rounded. Several macronuclear nodules locate in between buccal cirri to posterior contractile vacuole canal. Contractile vacuole 9-10 µm with two distinct collecting canal. Cortical granules 0,5-1 µm long, loosely arranged; cytoplasm

colorless (Figure 4a).

Adoral zone of membranelles with its typical shape (gonostomum type) and 25% of the body lenght; frontal, ventral and transverse cirri are larger than the rest of the cirri. On ventral side 3 frontal, 4 ventral, 1 buccal, 4 transverse, 3 caudal cirri exist. Left and right marginal rows single and meet at posterior end. Dorsal side with 3 kineties (Figure 4b, c).

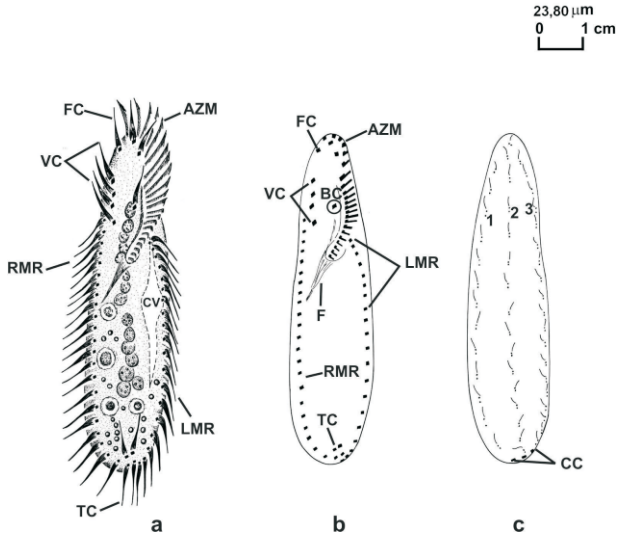

Figure 4: *Gonostomum kuehnelti*, in vivo (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen with somatic ciliature, contractile vacuole with collecting channeles, food vakoule, macro- and micronucleus, **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **BC:** Buccal cirri, **CC:** Caudal cirri, **F:** Pharyngeal fibres, **FC:** Frontal cirri, **CV:** Contractile vacuole, **LMR:** Left marginal cirral row, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-3:** Dorsal kineties.

2. *Gonostomum strenuum* (Engelmann, 1862)

Body size 70-85 X 20-25 µm; outline ovoid, width of anterior and posterior ends narrower than the buccal area. Two macronuclear nodules 12-15 X 5-8 µm, each nodule has one micronucleus. Contractile vacuole 8-9 µm, located at left side of the cell and could be seen from dorsal side. Cortical granules are difficult to discern (Figure 5a).

Adoral zone of membranelles with its typical shape (gonostomum type) and 40% of the body lenght; all cirri have the same thickness. On ventral side 3 frontal, 8-9 ventral, 1 buccal, 3 transverse, 2 pretransverse, 3 caudal cirri exist. Additionally 2 transverse cirri locate close to posterior end. One right and 1 left marginal cirral row, left row curves to posterior end. Dorsal side with 3 kineties (Figure 5b, c).

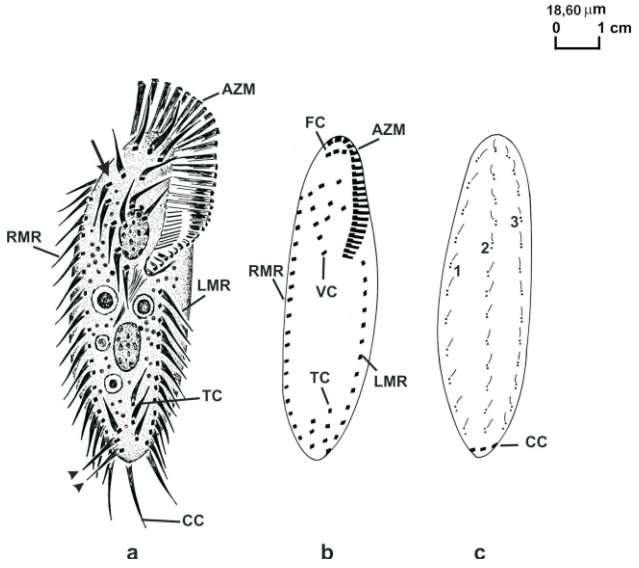

Figure 5: *Gonostomum strenuum*, in vivo (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen with ventral cirri forming a straight line (arrows), **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri**, FC:** Frontal cirri**, LMR:** Left marginal cirral row, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-3:** Dorsal kineties, **Arrow heads:** Posteriorly located two transverse cirri.

Genus: *Hemisincirra* Hemberger, 1985

1. *Hemisincirra müelleri* Foissner, 1986

Body size 90-115 X 12-14 µm; body lenght to body width ratio 8:1; body shape vermiform, left and right sides are parallel to each other, anterior end truncated, body becomes thiner at the posterior end. Chain-like, moniliform, macronucleus with 10-12 nodules located whole cell along. Cytoplasm colorless, posterior side with few crystals. Contractile vacuole left-mid of the cell. Cortex very flexible (Figure 6a).

Adoral zone of membranelles very short and divided into two parts and 13% of the body lenght. Somatic cirri 10-12 µm long; 3 frontal, 5-6 ventral cirri exist. At the posterior end left merginal cirral row combines with right marginal cirral row. Dorsal side with 1 kinety (Figure 6b, c).

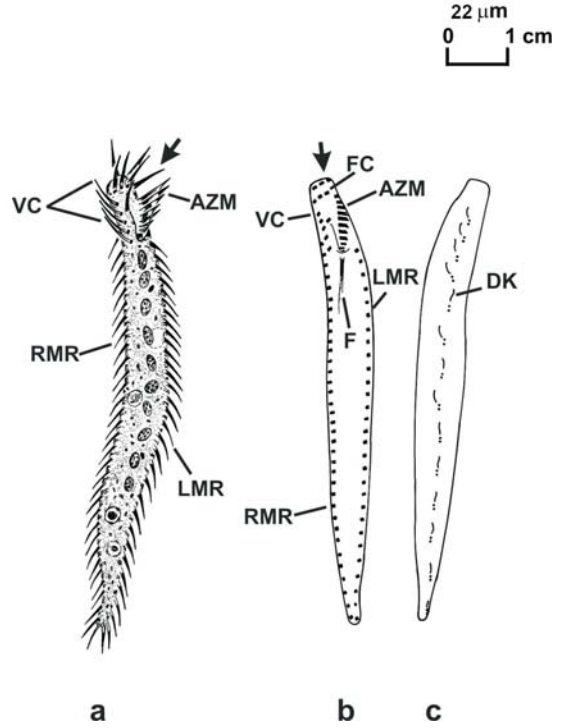

Figure 6. *Hemisincirra müelleri*, in vivo (a) and after protargol impregnation (b, c), **a)** Elongated vermiform shape of the representative specimen from ventral side, adoral zone divided into two parts and anterior end truncated (arrow head), **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **DK:** Dorsal kinety, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **RMR:** Right marginal cirral row, **VC:** Ventral cirri.

2. Hemisincirra rariseta Foissner, Agatha and Berger, 2002

Body size 190-220 X 10-13 µm; body lenght to body width ratio 15-20 : 1; body shape very thin and long, both sides of the body paralel to each other, anterior end truncated, body becomes thinner at the posterior end. Chain-like, monoliform macronucleus with 7-12 nodules located mid-body. Cytoplasm colorless; cortex very thin and time to time transparent. Contractile vacuole slightly above mid-body, 6-7 µm across (Figure 7a).

Adoral zone of membranelles inconspicuous because only 10% of the body lenght, bipartited into 3 frontal and 10-11 ventral membranelles. Somatic cirri 10-12 µm long; on ventral side 3 frontal, 5-6 ventral cirri exist. Both sides have 1 marginal row which extend to posterior body end. Dorsal side with 2 kineties (Figure 7b, c).

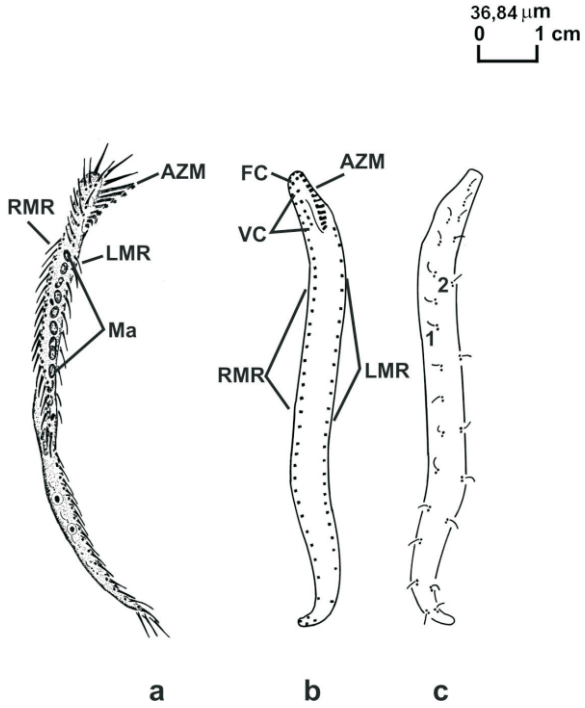

Figure 7: *Hemisincirra rariseta*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventrolateral view of a representative specimen, **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **Ma:** Macronucleus, **RMR:** Sağ marjinal sir sırası, **1-2:** Dorsal kineties.

Genus: *Hemiurosoma* Foissner, Agahta and Berger, 2002

Hemiurosoma similis Foissner, 1982

Body size 120-140 X 20-25 µm; body lenght to body width ratio 6:1; slender. Both sides of the body parallel to each other, anterior and posterior end rounded. Macronucleus 20-23 X 6-7 µm, micronucleus 3-3.5 µm across. Cytoplasm full with crystals. Food vacuoles located at posterior end and left lateral of the cell (Figure 8a).

Adoral zone of membranelles 25% of the body lenght. Frontoventral cirri form a straight line at the right side of third frontal cirrus. Transverse cirri longer than the others.

On ventral side 3 frontal, 4-5 ventral, 1 buccal, 3-4 transverse, 3 caudal cirri; one right and one left marginal cirri exist. Dorsal side with 3 kineties (Figure 8b, c).

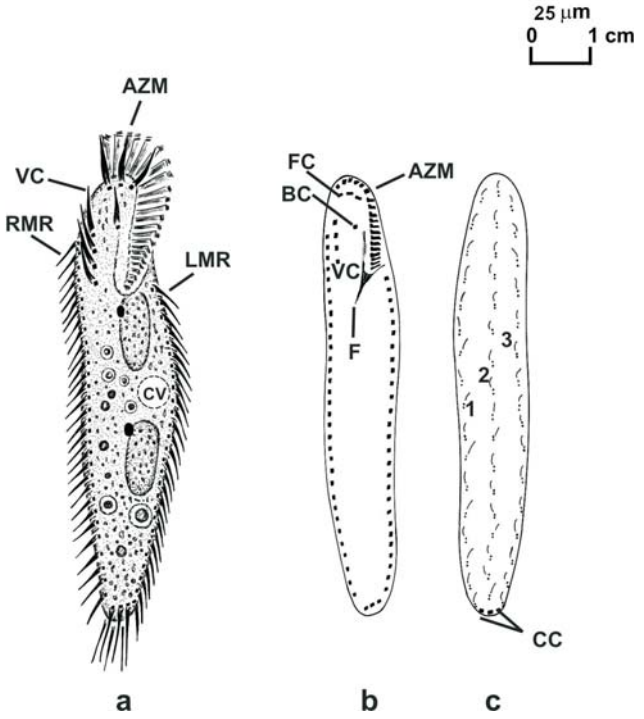

Figure 8. *Hemiurosoma similis*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen **b, c)** Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **BC:** Buccal cirri, **CC:** Caudal cirri, **F:** Pharyngeal fibres, **FC:** Frontal cirri, **CV:** Contractile vacuole, **LMR:** Left marginal cirral row, **Ma:** Macronucleus, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **1-3:** Dorsal kineties.

Genus: *Oxytricha* Bory de Sainth-Vincent and Deslongchamps, 1824

1. *Oxytricha fennica* (Reuter, 1961)

Body size 210 X 55 µm; body slender, right and left sides are parallel to each other on live specimen, anterior and posterior ends rounded. Macronuclar nodules 40 X 20 µm, almost located mid-body. Cytoplasm darker in the middle, food vacuoles 10-12 µm. Contractile vacuole single, 11-12 µm across (Figure 9a).

Adoral zone of membranelles 25% of the body lenght, 52 µm, oxytricha pattern; buccal opening narrow and deep. Somatic cirri about 25 µm; on ventral side 3 enlarged frontal, 1 buccal, 4 frontoventral, 3 postoral, 3 transverse, 1-2 pretransverse, 3 caudal cirri exist. One right and 1 left marginal cirral rows are parallel to body borders and have 17-19 cirri on each row. Dorsal side with 4 kineties (Figure 9b, c).

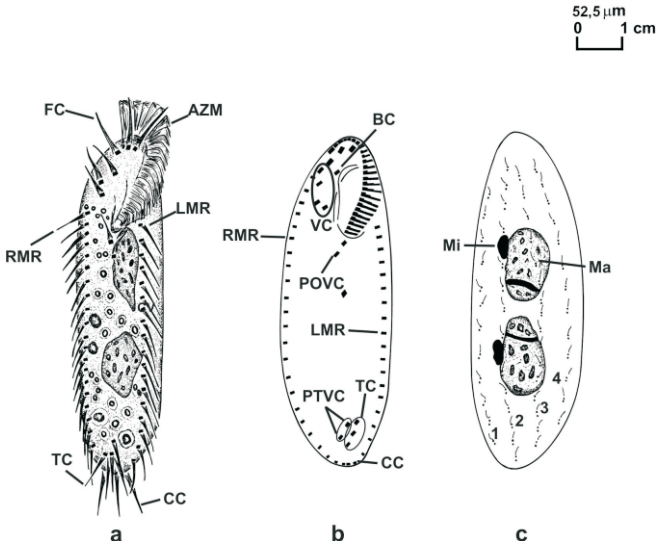

Figure 9. *Oxytricha fennica*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen, **b, c)** Infraciliature of ventral and dorsal side, **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **FC:** Frontal cirri, **LMR:** Left marginal cirral row, **Ma:** Macronucleus, **Mi:** Micronucleus, **POVC:** Postoral ventral cirri, **RMR:** Right marginal cirral row, **TC:** Transverse cirri, **1-4** Dorsal kineties.

***2. Oxytricha lanceolata* Shibuya, 1930**

Body size 130-160 µm; body elipsoidal, rounded anteriorly and posteriorly; anterior end narrower than the posterior end. Macronuclear nodules 20-30 X 10-13 µm, located mid-body; 2 micronuclei. Cortex rigid; contractile vacuole located in between macronuclear nodules. Cytoplasm with shining crystals (Figure 10a).

Adoral zone of membranelles 30% of the body lenght, composed of an avarage of 30 membranelles; buccal openning narrow and deep. Right and left marginal cirral rows single, left marginal row J shaped, usually ends with the same level of transverse cirri. Dorsal side with 6 kineties (Figure 10b, c).

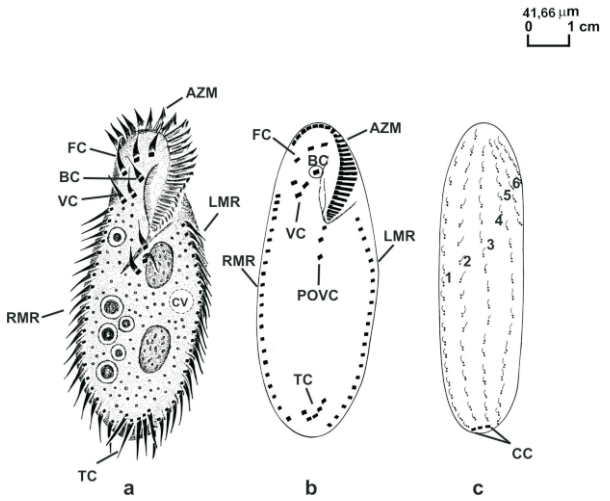

Figure 10. *Oxytricha lanceolata*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen, **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **BC:** Buccal cirri, **FC:** Frontal cirri**, CV:** Contractile vacuole, **LMR:** Left marginal cirral row, **POVC:** Postoral ventral cirri, **RMR:** Right marginal cirral row, **TC:** Transverse cirri, **VC:** Ventral cirri, **1-6** Dorsal kineties.

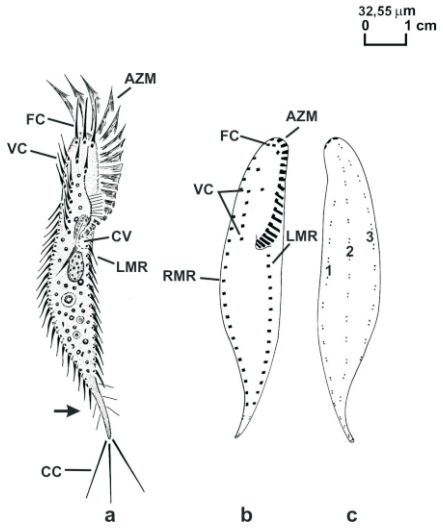

Figure 11: *Paragonostomum caudatum,* in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen, **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **1-3:** Dorsal kineties, **Arrow:** Tail-like posterior end.

Genus: *Paragonostomum* Foissner, Agatha and Berger, 2002

***Paragonostomum caudatum* Foissner, Agatha and Berger, 2002**

Body size 100-150 x 14-20 µm, body lenght to body width ratio 5:1. Body shape clavate due to the lanceolate and cylindrical tail occuping about 17-20% of body lenght in vivo. Left margin straigth; right distinctly convex and posteriorly narrowed, produce distinctive tail. Macronucleus 12-14 x 5-6 µm, centrally located slightly left of midline. Contractile vacuole underneath buccal vertex; cytoplasm colourless and possess about 1-4 µm sized lipid droplets (Figure 11a).

Adoral zone of membranelles 35-40 % of body lenght; proximal part of adoral zone and buccal cavity covered partially by a buccal lip which is consist of 7-12 cilia with 6-7 µm long. On ventral side 3 frontal, 6-7 ventral, 1 buccal, 4-5 frontoterminal cirri exist. Right and left marginal cirral rows single; dorsal side with 3 kineties (Figure 11b, c).

Genus: *Terricirra* Berger and Foissner, 1989

***Terricirra matsusakai* Berger and Foissner, 1989**

Body size 260-270 X 75-88 µm, body fusiform, both sides parallel to each other and rounded, in well feeded specimens left side convex until the end of vestibulum. Four macronuclear nodules 30-35 X 17-21 µm, located slightly left of mid-line. Cortex flexible and partially contractile; cortical granulles loosely tied, 1.5 µm across. Cytoplasm full with food vocuoles, crystals and lipid droplets (Figure 12a).

Comparatively to the body lenght adoral zone distinctly short, 24-27 membranelles occupy 24% of the cell. Somatic cirri approximately 28-30 µm long. On ventral side 3 frontal, 7 ventral, 3-5 transverse cirri exist. No caudal cirri; ventral cirri form a straight line until to the post oral region. Dorsal side with 4 kineties (Figure 12b, c).

Genus: *Urosoma* Kowalewskiego, 1882

***1. Urosoma emarginata* (Stokes, 1885)**

Body size 114-145 X 25-35 µm; elongate, anterior end

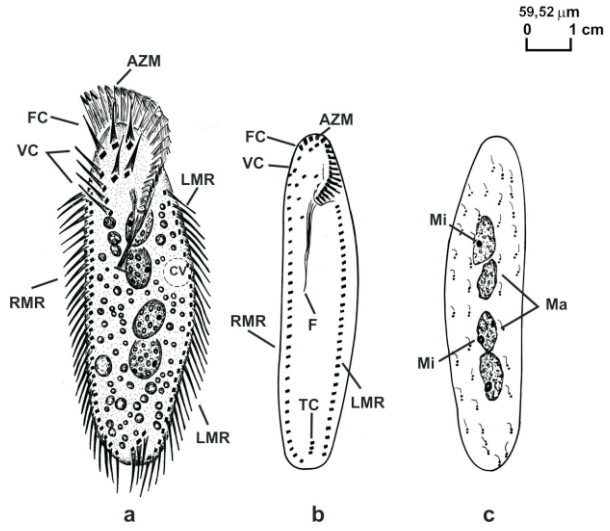

Figure 12. *Terrisirra matsusakai*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen. **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CV:** Contractile vacuole, **F:** Pharyngeal fibres, **FC:** Frontal cirri, **LMR:** Left marginal cirral row, **Ma:** Macronucleus, **Mi:** Micronucleus, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-4:** Dorsal kineties.

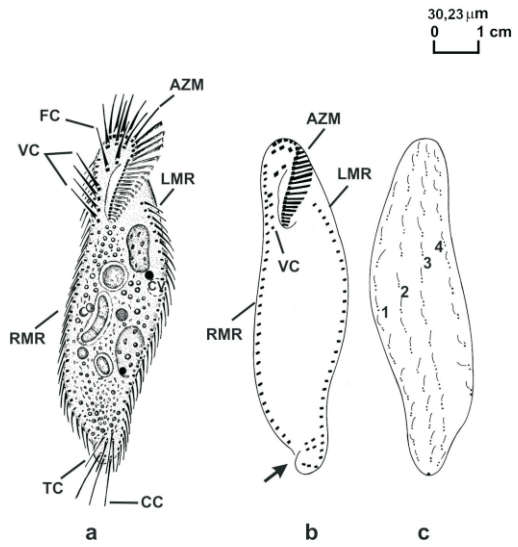

Figure 13. *Urosoma emarginata*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen, **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **CV:** Contractile vaculoe, **F:** Pharyngeal fibres, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-4:** Dorsal kineties, **Arrow:** Intended posterior end.

rounded, posterior end narrowly rounded or even pointed; right posterior margin conspicuously intended. Macronucleus 12-23 X 10-16 µm, each nodule has one micronuclei. Cortex slightly flexible; cytoplasm full with 1-3 µm sized crystals and 3-3,5 µm across granulles, so in low magnification brownish and shining; contractile vacuole left-mid of the body (Figure 13a).

Adoral zone of membranelles 25% of the body lenght, compose of about 25 membranelles. On ventral side 3 frontal, 5 ventral, 1 buccal, 4 transverse, 3 caudal cirri exist. Left and right marginal cirral rows single. Ciliature of dorsal side consist of 4 kineties (Figure 13b, c).

2. *Urosoma caudata* (Ehrenberg, 1833)

Body size 120-140 X 25-35 µm; vermiform, left lateral side straight, right lateral slightly curved; anterior end rounded, posterior end tail-like. Macronucleus 10-15 X 5-8 µm; each nodule has one micronucleus. Cytoplasm posteriorly full with crystals; cortex very flexible; contractile vacuole left-mid of the body (Figure 14a).

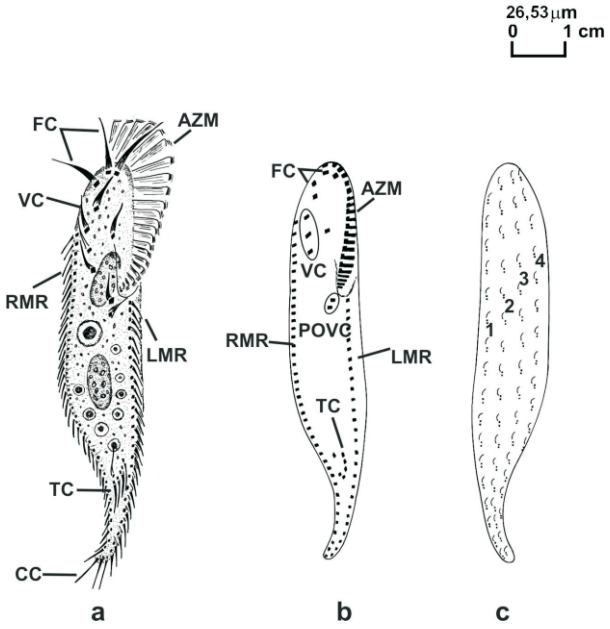

Figure 14. *Urosoma caudata*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen. **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **POVC:** Postoral ventral cirri, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-4:** Dorsal kineties.

Adoral zone 20% of the body lenght; frontoventral cirri 15 µm long and form a straight line just right of the frontal cirri. Somatic cirri about 10 µm long; on ventral side 3 frontal, 4 ventral, 1 buccal, 5 transverse, 3 caudal cirri exist. Left and right marginal cirral rows single; dorsal side with 4 kineties (Figure 14b, c).

Genus: *Sterkiella* Foissner, Blatterer, Berger and Kohmann, 1991

1. *Sterkiella histriomuscorum* Foissner, Blatterer, Berger and Kohmann, 1991

Body size 150 X 60 µm; long elipsoidal, both ends rounded, both sides parallel to each other. Macronucleus 25-30 X 15-18 µm, two micronuclei. Cytoplasm colourless, posterior portion full with 2-5 µm sized crystals and 2 µm across globules. Contractile vacuole about 15 µm, underneath the buccal end (Figure 15a).

Adoral zone 40% of the body lenght; buccal opening narrow and deep. Frontal, ventral and transverse cirri larger than the rest of the somatic cirri. On ventral side 3 frontal, 5 ventral, 3 postoral, 2 pretransverse, 5 transverse, 3 caudal cirri exist. Left and right marginal cirral rows single; dorsal side with 6 kineties (Figure 15b, c).

Family: Amphisiellidae Jankowski, 1979
Genus: Hemiamphisiella Foissner, 1988
***1.Hemiamphisiella granuliferum* (Foissner, 1987)**

Body size 200 X 50 µm; lanceolate, anterior end rounded, posterior end narrowly rounded. Macronucleus 20 X 10 µm, each nodul has 4-5 µm sized micronuclei. Cortex flexible and slightly contractile; contractile vacuole about 14 µm sized, left of the body and in between macronuclear nodules. Cytoplasm full with 2 µm across, distinct and regular cortical granules (Figure 16a).

Adoral zone 25% of body lenght, somatic cirri approximately 15 µm long and difficult to differentiate from caudal cirri. On ventral side 1 amphisiellid cirral row, 3 frontal, 1 buccal, 1 postoral, 2 caudal cirri exist. Left

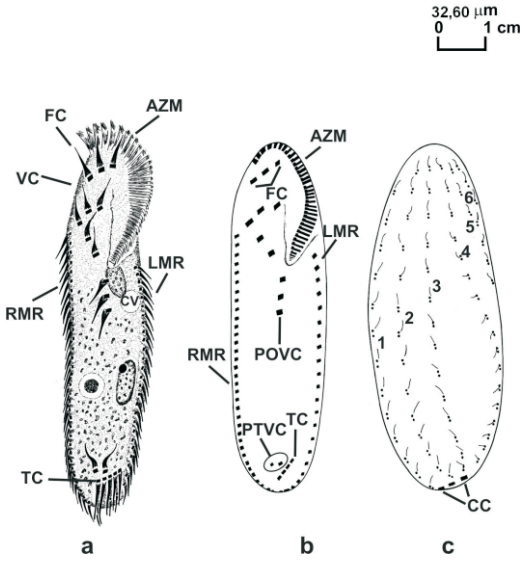

Figure 15: *Sterkiella histriomuscorum*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of a representative specimen. **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **CC:** Caudal cirri, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **POVC:** Postoral ventral cirri, **PTVC:** Pretransverse ventral cirri, **RMR:** Right marginal cirral row, **VC:** Ventral cirri, **TC:** Transverse cirri, **1-6:** Dorsal kineties.

and right marginal cirral rows single; dorsal side with 3 kineties (Figure 16b, c).

All the taxonomic investigations about ciliates are restricted because of the identification difficulties. However, until now totally 33 Hypotrich species belonging to 20 genera are recorded from the different habitats of Turkey (Şenler and Yıldız, 1998, 2004; Çapar 1997, 2005). Nine of these species are found from various freshwater ecosystems and 24 species are found in a wetland ecosystem, Göksu Delta. Taking on the hypotrich ciliates of Gelingüllü Dam Lake, the species list almost matches with the wetland ecosystem which is listed by Çapar in 2005. The main reason is the similarty of the habitat conditions due to the typical flooded zone.

In a flooded zone, the amount and the level of water usually changes irregularly. The physical, chemical and biological components of a flooded zone is a complex environment for organism. This zone which is generally composed of 50% of water and air (Brady, 1990) is a

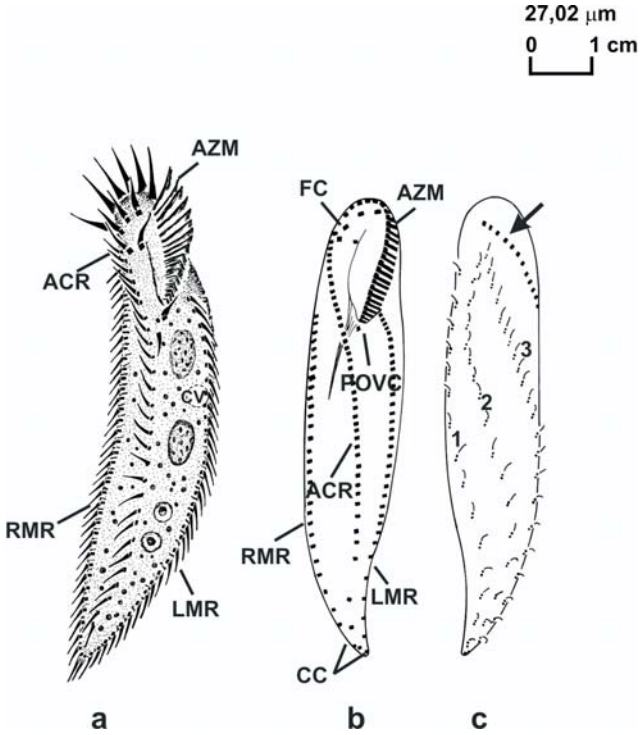

Figure 16: *Hemiamphisiella granuliferum*, in vivo, (a) and after protargol impregnation (b, c), **a)** Ventral view of the elongated representative specimen. **b, c**) Infraciliature of ventral and dorsal side. **AZM:** Adoral zone of membranelles, **ACR:** Amphsiellid cirral row, **CC:** Caudal cirri, **CV:** Contractile vacuole, **FC:** Frontal cirri**, LMR:** Left marginal cirral row, **POVC:** Postoral ventral cirri, **RMR:** Right marginal cirral row, **1-3:** Dorsal kineties, **Arrow:** Right marginal cirral row commences from the dorsal side and ends at the posterior-ventral side of the body.

A natural and special habitat for ciliates.

Hypotrichs with a dorsoventrally flattened slender and flexible body with reduced somatic ciliature, provide to penetrate between soil particules and to move along the thin water film more comfortably. These features are adaptations against restrictive effect of soil particules and provide ability to move when the water amount decrease (Cowling, 1994; Foissner, 1987a; Foissner, 1998; Hattori, 1994).

As a result, all of the hypotrich species which are found in the dam lake, Gelingüllü, are distinctive forms of a flood zone. The rest of the hypotrichs found at other ponds and riverine ecosystems are typical freshwater species, which are not contractile and do not have a flexible cortex. Such a structure makes them impossible to move in between soil particules.

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