



Some Protozoan Species Inhabiting the East Bank Sediment of River Tigris in Baghdad City

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Abstract

There are no researches in Iraq concerned identification and ecology of protozoa in sediment. The present study has been dealt with free-living protozoa community of the Tigris river bank sediment in Baghdad city. Variable species of vegetation (reeds and wild grasses) were observed to grow at both sides of the river.

For the present study three sites were chosen at the east side of river Tigris. Monthly samples were collected from the sediment of each site over a period from January to October 2012. Total of 22 taxa were found, 12 of ciliates, 5 of each flagellates and sarcodines in the sediment samples. The highest numbers of protozoan 15 taxa were recorded from each of the sites 1&3 and little less taxa (13) were found in site 2. Among ciliates community *Cyclidium* sp. and *Uronema marinum* were found constantly in all investigated sites, meanwhile *Cinetochilum* sp. and *Stylonychia* sp. were belonged to accessory taxa. Among the testacies community *Actinophrys sol* was the only accessory species in all investigated sites. In general the soil at all sites was predominately by ciliates, meanwhile all flagellates species were absence in site 2.

Keyword: sediment, protozoa, River Tigris, free-living protozoa.

بعض انواع الابتدائيات المستوطنة في رواسب الضفة الشرقية لنهر دجلة في مدينة بغداد

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الخلاصة:

لم يسبق أن اجريت دراسات في مجال تصنيف و بيئة ابتدائيات الرواسب النهرية في العراق، البحث الحالي يتناول دراسة مجاميع الابتدائيات الحرة المعيشة في رواسب ضفاف نهر دجلة في مدينة بغداد، حيث لوحظ نمو مختلف أنواع النباتات (ألقصب و ألحشائش) على جانبي النهر.

في هذه الدراسة تم اختيار ثلاثة مواقع من نهر دجلة، حيث تم جمع العينات شهرياً من رواسب كل موقع خلال الفترة (من كانون الثاني و لغاية تشرين الاول 2012) ، تم ايجاد 22 مرتبة تصنيفية من الابتدائيات ، منها 12 من الهدبيات و 5 لكل من السوطيات و اللحميات ، أعلى عدد من المراتب التصنيفية للابتدائيات كان 15 مرتبة تصنيفية وقد تم تسجيله في كل من المواقع 1 و 3 ، وأدنى قليلاً من ذلك العدد والذي كان 13 مرتبة تصنيفية سُجِّلَ من الموقع 2. في مجاميع الهدبيات كان *Cyclidium* sp. و *Uronema marinum* من الانواع الدائمة الظهور في حين كان

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من الانواع عَرَضِيَّة الظهور أما في مجاميع اللحميات كان *Stylonychia* sp. و *Cinetochilum* sp. النوع الوحيد عَرَضِي الظهور في جميع المواقع المدروسة، وعموما الهُدبيات دائمة الظهور في كل المواقع المدروسة في حين لم يتم تسجيل اي نوع من السوطيات في الموقع 2.

Introduction

Protozoa are single-cell organisms within the Kingdom Protista. They are microscopic in size, free-living found in fresh water, salt water and damp soil, while others are parasitic, symbiotic and commensals. Most of the free-living protozoa feed on bacteria while some are capable of photosynthesis and other can absorb dissolved organic substances [1].

Soil protozoa play an important role in mineralization nutrient making them available for use by plant and other soil organisms [2,3]. Another role protozoa plays in regulating bacterial populations [4], and they are involved in decomposition and soil aggregation [5].

The world literature includes much information regarding soil protozoa (e.g. [6-11]). There are no works (researches) in Iraq, concerned with identification and ecology of protozoa in the sediment. The present study is the first deals with sediment protozoa in Iraq; the aim of the study was to determine the occurrence and taxonomic composition of free-living protozoa in the sediment of Tigris river bank in Baghdad city.

The study area and Methodology:

The present study deals with free-living protozoa community of the sediment at the Tigris river bank in Baghdad city which is located in the Mesopotamia alluvial plain between latitudes $33^{\circ} 14' - 33^{\circ} 25' N$ and longitudes $44^{\circ} 31' - 44^{\circ} 17' E$. Variable species of vegetation (reeds and wild grasses) were observed to grow at both sides of the river. For the present study three sites were chosen at the east side of river Tigris figure-1.

Three samples were collected monthly from the sediment of each site over a period from January to October 2012. Sediment sample was taken by dipping a small plastic cup in the sediment to a depth of 10 cm. the plastic cup was labeled closed immediately to avoid dryness and brought to the laboratory with a minimum delay. Five grams from sample were weighed out into a small petridish, and then placed in a small beaker, 10 milliliters of distilled water added and mixed well with a spatula, small suspension was poured into sterilized test tube and centrifuged at 1500 rpm for ten minutes [12].

One milliliter of sediment suspension from each sample was examined. Free-living protozoa were isolated by dropper, one drop of natural suspension was placed on clean microscopic slid, covered with cover slip and examined in living condition [13] under light compound microscope at a magnification of (X10- X40). Sometimes methyl cellulose (methocel) solution was used for slowing down the movement of fast moving protozoans to study their internal structures in situ. Lugol's solution was added as killing agent and for detecting peripheral organelles [14]. The shape, structure, movement organelles and measurement of each specimen were recorded for classification. All the examined specimens were photographed. The identification of protozoa was conducted according to [1,15].

The frequency of occurrence of the recorded species was calculated as the percentage of collected samples in which the species occurred. All the species found were classified in to three groups as follows: ciliates, flagellates and sarcodines.



Figure 1-The map of Iraq shows the locality of sampling area (S1: At Bab Al-Muadham near by the Medical City Hospital, S2: At Al-Rosafy area near (Al-Qushla tower) and S3: At Al-Jadriyah area near Al –Jadriyah Bridge) at east bank of River Tigris.

Results and discussion:

During the present study total of 22 taxa, 12 of ciliates, 5 of each flagellates and sarcodines were found in the sediment samples. The highest numbers of protozoan taxa (15) were recorded from site 1 & 3 and little less taxa (13) were found in site 2 table-1.

Among ciliates community *Cyclidium* sp. and *Uronema marinum* were very constant species in all investigated sites, meanwhile *Cinetochilum* sp. and *Stylonychia* sp. were belonged to accessory taxa.

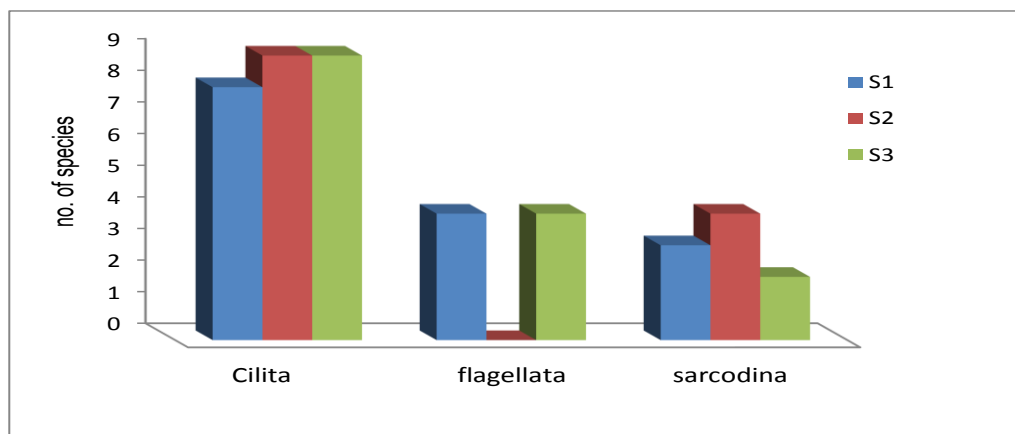
Among the testacines community *Actinophrys sol* was the only accessory species in all investigated sites. With regards to the taxa composition at the three investigated sites, two observations can be pointed out. The first is, the sediment at all sites was predominated by ciliates, secondly the absence of flagellates taxa from site 2 figure-2. Many species of ciliates and testate amoebae seem to be unique to the soil environments [16].

Number of species recorded in this study was much lower than expected, for example Foissner *et al.* [17] in 2005 recorded 233 species of ciliates from Austrian forest, Esteban *et al.* [18] in 2006 found 365 protozoan species in (1 ha) of the soil of grass land in Scotland. The lower numbers of species were found in this study could be referred to the small size of sample, limited investigated area and also to the type of sediment. Wilkinson and Mitchell [19] in 2010 reported that the higher numbers of both individuals and taxa can be expected in water and soil with higher proportions of organic matter.

Rønn *et al.* [20] in 2012 pointed out that most soil protists are fundamentally aquatic creatures visiting a terrestrial world. This could be another reason affecting the occurrence of protozoa taxa in the soil.

Table 1-List of protozoan taxa found in the sediment at the investigated sites during the study period (from January to October 2012) with their frequency %.**Note:**, Constant species > 50%, Accessory species 25-50%, Accidental specie < 25%.

Protozoans taxa	S1	S2	S3	F %
Ciliata				
<i>Pleuronema marinum</i> Dujardin,1836	+	-	+	10
<i>Pleuronema setigerum</i> Calkins, 1903	+	+	+	23.333
<i>Cyclidium</i> sp. Müller, 1773	+	+	+	143.333
<i>Uronema marinum</i> Dujardin,1841	+	+	+	53.333
<i>Cinetochilum</i> sp. Perty,1849	+	+	+	33.333
<i>Stylonychia</i> sp. Ehrenberg,1830	+	+	+	40
<i>Aspidisca</i> sp. Ehrenberg,1830	-	+	+	10
<i>Oxytricha</i> sp. Bory,1825	-	+	+	16.666
<i>Strombidium</i> sp. Claperède & Lachmann 1859	-	+	-	3.333
<i>Colpoda maupasi</i> Enriques, 1908	-	+	-	3.333
<i>Euplotes</i> sp. Ehrenberg,1830	+	-	-	6.666
<i>Parablepharisma</i> sp. Kahl	+	-	+	16.666
Flagellata				
<i>Euglena ehrinbergii</i> Klebs, 1883	+	-	+	13.333
<i>Euglena acus</i> Ehrenberg,1830	+	-	+	10
<i>Euglena sociabilis</i> Dangeard, 1901	+	-	-	3.333
<i>Peranema trichophorum</i> Ehrenberg,1838	-	-	+	3.333
<i>Bodo</i> sp. Ehrenberg,1830	+	-	+	6.666
Sarcodina				
<i>Amoeba radiosa</i> Ehrenberg	+	+	+	13.333
<i>Actinophrys sol</i> Ehrenberg,1830	+	+	+	36.666
<i>Pseudochlamys patella</i> Claperède & Lachmann	+	-	-	3.333
<i>Diffflugia</i> sp. Leclerc,1815	-	+	-	3.333
<i>Rosculus</i> sp. Hawes,1963	-	+	-	3.333

**Figure 2**- Composition of protozoan taxa in S1, S2 & S3 during the study period from January to February 2012 in the sediment**Description and photographs of the recorded species during the study period (from January to October 2012):*****Aspidisca* Ehrenberg, 1830**

Genus: Ovoid, firm; dorsal side convex, ventral side flattened; dorsal surface ridged; adoral zone reduced or rudimentary; macronucleus U-shaped or in two rounded parts. No marginal or caudal cirri; common genus, 30-45µm long, as shown in figure-3.



Figure 3- *Aspidisca* sp.

Cinetochilum Perty, 1849

Genus: Small (45µm diameter) discoid ciliate, flattened dorso-ventrally. Apical pole rounded, terminal pole slightly truncate. Oral aperture displaced to the lower right quadrant of the ventral surface. The somatic kineties are horseshoe-shaped, centered on the oral aperture and in some cases are borne upon distinctive edges which give the edges of the cell a granulated appearance. There are several caudal cilia present. Contractile vacuole sub-terminal. Spherical macronucleus centrally located with an adjacent micronucleus, as shown in figure-4.



Figure 4- *Cinetochilum* sp.

Colpoda Müller, 1773

Genus: Body reniform; dorsoventrally flattened; right body edge convex, left concave; somatic groove originates on the dorsal surface, travels around the left side to the entrance of the vestibulum on the ventral surface. Oral cavity is not tubular, 40-60 µm long, as shown in figure-5.



Figure 5- *Colpoda* sp.

Cyclidium Müller, 1786

Genus: little ciliate that moves in a jumping fashion (stops for a few second then jumps). Ovoid body with flattened anterior cap; long peristome with large undulatory membrane extended in feeding. No somatic cilia at the anterior apex. One of the caudal cilia is longer than the others, contractile vacuole posterior. Small 30-40 µm long, as shown in figure-6.



Figure 6- *Cyclidium* sp. Staining with Luglu's solution

Euplotes Ehrenberg, 1830

Genus: Body ovoid, inflexible, peristome broadly, dorsoventrally flattened; dorsal surface may be equipped with some ornamentation; three groups of cirri (frontoventral, transverse & caudal), macronucleus C-shaped, "3"-shaped, or horsehoe-shaped, 135 μ m long, as shown in figure-7.

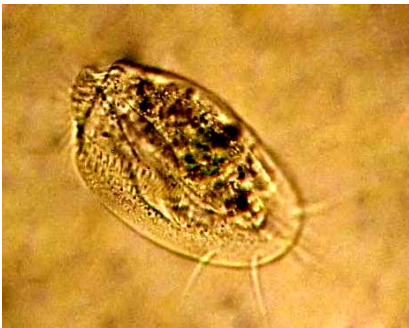


Figure 7- *Euplotes* sp.

Parablepharisma Kahl.

Genus: Elongate, ovoid, peristome-bearing anterior half narrowed neck-like and pointed, non contractile. In front of cytostome a two-layered undulating membrane on right edge, contractile vacuole and cytophyge terminal, rose-colored, 180-210 μ m long, as has shown in figure-8&9.



Figure 8- *Parablepharisma* sp.



Figure 9- *Parablepharisma* sp. Staining with Luglu's solution

Oxytricha Bory, 1825

Genus: Ellipsoid; flexible; ventral surface flattened; dorsal surface convex; 8 frontal, 5 ventral, 5 transverse, short caudal cirri. Oral cavity not wide; macronuclei oval; marginal cirri confluent at rear; body laterally flexible, 60-75 μ m long, as shown in figure-10.



Figure 10- *Oxytricha* sp.

Pleuronema setigerum Calkins, 1903

Description: Cumber shaped, flattened, ventral surface slightly concave, about 25 ciliary rows, About 40 μm long, as shown in figure-11.



Figure 11- *Pleuronema setigerum*

Pleuronema marinum Dujardin, 1836

Description: Elongate ovoid, trichocysts distinct, caudal cilia medium long, about 50 ciliary rows. About 50 μm long, as shown in figure-12.

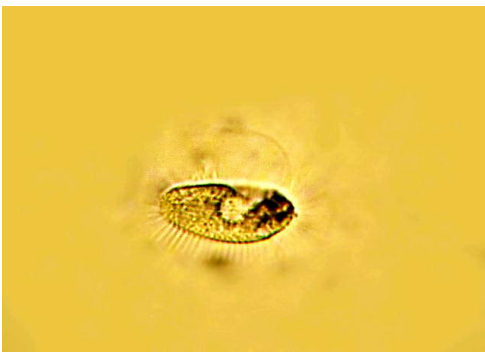


Figure 12- *Pleuronema marinum*

Strombidium Claparède & Lachmann, 1859

Genus: Paratene makes nearly closed circle around body. Ovoid to spherical; adoral zone very conspicuous two to four conspicuous sickle-form frontal membranellae, a dorsal membranellae extend down cytopharynx; no body bristles or cirri. Body conical, ovoid or elongate posteriorly; somatic cilia absent About 50 μm long, as shown in figure-13.



Figure 13- *Strombidium* sp.

Stylonychia Ehrenberg

Genus : Ovoid to reniform; not flexible; Ventral surface flat, dorsal surface convex; eight frontals; five ventrals; five anals; marginals; three caudals; with short dorsal bristles; 120µm long, fresh or salt water, as shown in figure-14.



Figure 14- *Stylonychia* sp.

Uronema marinum Dujardin, 1841

Description: Ovoid, pyriform or elongate, has only one caudal cilium. Macronucleus spherical; a single contractile vacuole posterior, 30 µm long, as shown in figure-15.



Figure 15- *Uronema marinum* Staining with Luglu's solution

Bodo Ehrenberg

Genus: Small, ovoid, but plastic; cytostome anterior; encystment common. Cytostome at the tip of a short rostrum which is ventral or tateral to the flagellar pocket, 30 µm long, as shown in figure-16.



Figure 16- *Bodo* sp.

Euglena acus Ehrenberg, 1830

Description: body long spindle or cylinder, with a sharply pointed posterior end; numerous discoid chloroplasts; several paramylon (paramylum) bodies; nucleus central; stigma distinct, flagellum short, about one-fourth the body length, 90-120 μ m long, as shown in figure-17.



Figure 17- *Euglena acus*

Euglena ehrenbergii Klebs 1883

Description: Cylindrical and flattened; posterior end rounded; plastic, often twisted; numerous small discoid chloroplasts; stigma conspicuous, flagellum about one-half the body length or less. One of the larger species; paramylon (paramylum) as one or two long rods, 135-210 μ m long, as shown in figure-18.



Figure 18- *Euglena ehrenbergii*

Euglena sociabilis Dangeard

Description: Cylindrical; delicate pellicle; highly plastic; numerous elongate chromatophores; paramylum bodies discoid; flagellum slightly longer than body, 60 μ m long, as shown in figure-19



Figure 19- *Euglena sociabilis*

Peranema trichophorum Ehrenberg, 1838

Description: Cell sac-shaped, often slightly twisted and metabolic. The posterior end of the flagella pocket slightly curved to the right. Flagella canal with a slit-like opening that extends from the apex backwards. A longitudinal groove extends from the slit to the posterior end, and the recurrent flagellum lies within this groove. The anterior end of the cell is pointed, the posterior end is truncated occasionally with an irregularity marking the posterior termination of the longitudinal groove. The anterior flagellum has the same length as the cell or it is slightly longer, cell glides in close contact with the substrate, 60µm long, as shown in figure-20.



Figure 20- *Peranema trichophorum*

Actinophrys sol Ehrenberg, 1830

Description: Spherical; ectoplasm vacuolated, endoplasm granulated with numerous small vacuoles; a large central nucleus; solitary but may be colonial when young; among plants in still fresh water. Usually with one contractile vacuole which rises and pushes out the surface as a rounded globule before bursting. Pseudopodia extending from all parts of the body, with axial filaments arising from the membrane of the single nucleus, diameter 30-45µm, as shown in figure-21. Habitat pond water among aquatic plants, very common.

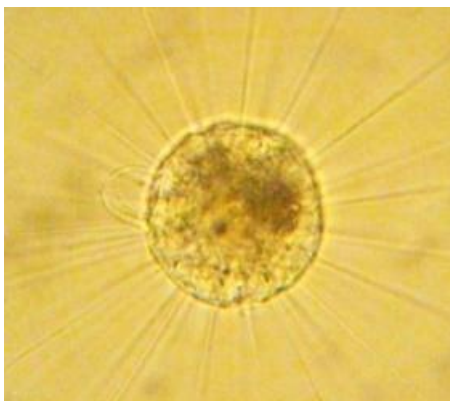


Figure 21- *Actinophrys sol*

Amoeba radiosa Ehrenberg, 1830

Description: Small, usually inactive; globular or oval in outline; with 3-10 radiating slender pseudopodia which vary in length and degree of rigidity; when pseudopods are withdrawn, in general

appearance; pseudopods straight, curved or spirally coiled, cell diameter 30-45 μm long, as shown in figure-22.



Figure 22- *Amoeba radiosa*

Diffugia LeClerc, 1815

Genus: test variable in shape, but generally circular in cross-section; composed of cemented quartz-sand, diatoms, and other foreign bodies, aperture terminal; often with zoochlorellae; cytoplasmic body almost fills the test; a single nucleus, many contractile vacuoles; pseudopodia cylindrical, simple or branching; end rounded or pointed, length of shell 120-240 μm , as shown in figure-23.



Figure 23- *Diffugia* sp.

Rosculus Hawes, 1963

Genus: Small amoeba with rapidly changing form, sometimes spatulate or flabellate; hyaline zone usually with smoothly irregular edge, 45-120 μm long, as shown in figure-24.



Figure 24- *Rosculus* sp.

Pseudochlamys patella Claparede and Lachmann

Description: Young test hyaline, older one rigid and brown; often rolled up like a scroll; a short finger-like pseudopodium between folds; 40-45 µm in diameter, as shown in figure-25.

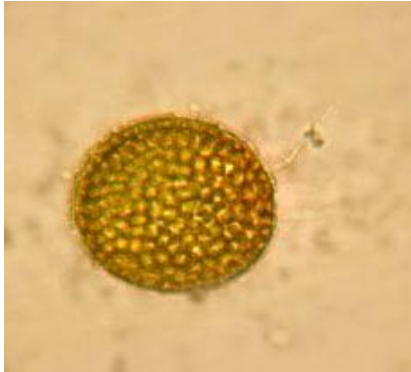


Figure 25- *Pseudochlamys patella*

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