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## **GRT** STUDY OF FREELIVING FRESHWATER PROTOZOAN BIODIVERSITY IN SEASONAL AND PERENNIAL WATERBODIES AROUND WAI (Dist: SATARA), M. S. INDIA

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**Abstract:**-Studies on freshwater free living protozoa has been proved to be important in their applications as bioindicator species, biomonitoring agents in wastewater treatments and defining the climatic and paleoclimatic conditions. Biodiversity of free-living freshwater protozoa has been studied from water bodies around Wai Dist. Satara which is important part of Western Ghats of Maharashtra. Protozoan biodiversity in freshwater bodies around Wai (Dist Satara, M.S. India) was investigated. The totals of 3 classes' 96 protozoa species were identified. Of these, Mastigophora (21 species) followed by Sarcodina (36 species), the majority (39 species), belong to the Ciliophora have been recorded. Most of the protozoans were photographed under Trinocular microscope at 40X x 2MP.

**Keywords:**protozoa, biodiversity, Wai.

### **INTRODUCTION :-**

The geographical location of Wai can be stated as Latitude 17° 57' N and Longitude 73° 56' E. It is in the district Satara of State Maharashtra. It has an average elevation of 718 metres (2355 feet). Its average rainfall is 965mm /year with an average rainfall of 994 mm during last 10 years. It is surrounded by the mountainous region of the Sahyādris of Western Ghats of India. The Dhom Dam has been constructed in the vicinity of Wai about 06 km away. (Wikipedia; the encyclopaedia). The region also has a wide variety of freshwater lentic and lotic ecosystems, in which protozoa, a group of single-cell organism live. Protozoa represent a large number of species and have been used as indicators of water quality. This study investigated the diversity of protozoa species in fresh water bodies around Wai.

### **MATERIALS AND METHODS**

For the collection of freshwater free living protozoa water samples along with some waterweeds, algae, bottom ooze and flocculent matter arising out of washing waterweeds and aquatic plants brought to the laboratory and stored in wide mouthed specimen jars made of glass. Then observed for occurrence of protozoa under low and high power of compound microscope. The presence of the these testate amoebae and progressive / retrogressive changes were recorded within the month of the collection of the sample with the help of good quality compound research microscope at 10x10, 10x45 and 10x100 magnifications. For this observation and microphotography Labo (Germany make) trinocular compound microscope and Abbott digital eyepiece with USB adaptor is used. If the animalcules especially ciliates remain much active, the medium is added with a drop of solution of Methyl Cellulose, which enhances the viscosity of the medium and slower the motion. It enabled observation and photography at ease. Different protozoan species were identified by the methods described in Albert Westphal, (1976); Anderson, O.R. (1997); Andrei Tsyganov and Yuri Mazei (2006); Bhatia, B.J. (1936); Page, F.C. (1988); Kudo, R. R. (1966); Theodore Louis Jahn et al, (1979).

For present studies pond water from following sources were selected for study of protozoan diversity around Wai.

Ponds near Krishna River around Wai  
Stagnant Canal water/  
Leaked canal water bodies.

Artificial water storage tanks.  
 Perennial water bodies.  
 Seasonal ponds.

When the samples were observed and kept for further studies, their culture preparation was tried for increase in number.

**RESULTS AND DISCUSSION**

In total 96 protozoa species were identified. Of these, Mastigophora (21 species) given in Table 1, followed by Sarcodina (36 species) given in Table 2, the majority (39 species) given in Table 3, belong to the Ciliophora. Most of the protozoans were photographed under Trinocular microscope at 40X x 2MP. And are illustrated in separate plates.

**Table1. Species of protozoa in the Class: Flagellata (Cohn 1853) Or Mastigophora (Diesing 1865)**

<p><b>Phylum: Protozoa (Cohn- 1853)</b>  <b>Sub Class: Phytomastigophora (Calkins- 1909)</b>  <b>Order Chryomonadina (Stien-1878)</b>  <b>Family: Chromulinidae</b>  <i>Chrysamoeba radians</i>  <b>Order Phytomonadida (Blochmann 1895)</b>  <b>Family Volvocidae</b>  <i>Spondylomorom quaternarium</i>  <i>Eudorina elegans</i>  <b>Family: Ochromonadidae</b>  <i>Dinobryon sertularia</i>  <b>Family Syncryptidae</b>  <i>Synura uvella</i>  <b>Order Cryptomonadina (Stein 1878)</b>  <b>Family Cryptomonadidae</b>  <i>Cryptomonas ovata</i>  <i>Chilomonas paramecium</i>  <i>Pheothamnion conferviculum</i></p>	<p><b>Order: Euglenida (Blochmann 1895)</b>  <b>Family: Euglenidae</b>  <i>Euglena acus</i>  <i>Euglena spiroides</i>  <i>Euglena oxyuris</i>  <i>Euglena rubra</i>  <i>Euglena tripteris</i>  <i>Euglena anabaena</i>  <i>Phacus acuminata</i>  <i>Phacus pleuronectes</i>  <i>Phacus longicauda</i>  <i>Phacus helikoides</i>  <i>Lepocinclis ovum</i>  <b>Order: Peranemida (Blochmann 1895)</b>  <b>Family: Peraenimidae</b>  <i>Peranema trichophorum</i>  <i>Palmella stage of flagellates</i>    <i>Total 21Species</i></p>
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**Table 2. Species of protozoa in the Class Rhizopoda (Von Siebold 1845) Sarcodina collected in fresh water bodies around Wai Dist Satara, M. S. India.**

<b>Subclass Gymnamoebia</b> <b>Order Amoeba</b> <b>Family Amoebidae</b> <i>Amoeba proteus</i> <i>Amoeba radiosa</i> <i>Amoeba gorgonia</i> <i>Amoeba discoides</i> <i>Hartmanella hyaline</i> <i>Polychaos dubia</i> <i>Pelomyxa palustris</i>  <b>Family Mayorellidae</b> <i>Mayorella vespertilo</i> <i>Astramoeba radiosa</i> <i>Pelomyxa palustris</i> <i>Pelomyxa carolinensis</i> <i>Vexillifera ambulacralis</i>	<b>Family: Thecamoebidae</b> <i>Thecamoeba verrucosa</i> <i>Sappinia diploidia</i> <b>Order Testacea</b> <b>Family Arcellidae</b> <i>Arcella vulgaris</i> <i>Arcella bathystoma</i> <i>Arcella catinus</i> <i>Arcella megastoma</i> <i>Arcella mitrata</i> <i>Arcella artocrea</i> <i>Arcella gibbosa</i> <i>Arcella arenaria</i> <i>Arcella excavata</i> <b>Family Diffugiidae</b> <i>Diffugia oblonga</i> <i>Centropyxis aculeata</i>	<b>Subclass Actinopoda</b> <b>Order Heliozoidae</b> <b>Family Actinophryidae</b> <i>Actinophrys sol</i> <i>Actinosphaerium eichhorni</i> <b>Family: Centrohelida</b> <i>Astrodisculus radians</i> <i>Heterophrys myriopoda</i> <i>Lithocola globosa</i> <i>Rhaphidiophrys pallid</i> <i>Rhaphidiocystis tubifera</i> <b>Family Acanthocystidae</b> <i>Acanthocystis aculeata</i> <i>Acanthocystis turfacea</i>  36
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**Table 3. Species of protozoa in the Class Ciliata (Perty 1852) collected in fresh water bodies around Wai Dist Satara, M. S. India.**

<b>Subclass : Holotricha</b> <b>Order Gymnostomatida</b> <b>Family Holopphryidae</b> <i>Prorodon ovum</i> <i>Lacrymaria olor</i> <b>Family Colepidae</b> <i>Coleps hirtus</i> <i>Coleps octospinus</i> <b>Family Didiniidae</b> <i>Didinium nasutum</i> <b>Family Amphileptidae</b> <i>Litonotus fasciola</i> <b>Family Trachelidae</b> <i>Trachelius ovum</i> <i>Dileptus anser</i> <i>Dileptus sp.</i> <i>Loxodus rostrum</i> <b>Family Chlamyodontidae</b> <i>Chilonella cucullidus</i> <b>Family Nassulidae</b> <i>Nassula elegans</i> <b>Order Hymenostomatida</b> <b>Suborder Peniculina</b> <b>Family Parameciidae</b> <i>Paramecium caudatum</i> <i>Paramecium multimicronucleatum</i> <i>Paramecium aurelia</i> <i>Paramecium bursaria</i> <b>Subclass Spirotricha</b> <b>Order Heterotrichida</b> <b>Family Spirostomatidae</b> <i>Spirostomum intermedium</i> <i>Spirostomum minus</i>	<b>Family Stentoridae</b> <i>Stentor polyphagus</i> <i>Stentor roeseli</i> <b>Order Oligotrichida</b> <b>Family Halteridae</b> <i>Halteria grandinella</i> <b>Order Hypotrichida</b> <b>Family Oxytrichidae</b> <i>Oxytricha fallax</i> <i>Uroleptus limnetis</i> <i>Uroleptus longicaudatus</i> <i>Stylonychia mytilus</i> <i>Stylonychia pustulata</i> <i>Stylonychia notophora</i> <b>Family Euplotidae</b> <i>Euplotus patella</i> <i>Euplotus eurytomus</i> <i>Euplotus aediculatus</i> <b>Subclass Peritricha</b> <b>Order Peritrichida</b> <b>Suborder Sessilina</b> <b>Family Vorticellidae</b> <i>Vorticella campanula</i> <i>Vorticella microstoma</i> <i>Carchesium polypinum</i>  <b>Family Epistylidae</b> <i>Epistylis plicatilis</i> <i>Zoothamnium adamsi</i> <b>Family Vaginicolidae</b> <i>Vaginicola sp.</i> <b>Subclass: Suctoria</b> <i>Podophrya fixa</i> <i>Tokophrya infusionum</i> <i>Acineta lacustis</i> 39
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In this study the investigator could find protozoan species most of them are recorded in other countries like Korea and Thailand. Protozoan diversity has been studied and recorded in several other countries and the reports are very sparse from India.

In sample collections when it was kept for about a month progressive and retrogressive changes have been noted. Amoeboid forms seen in good number in the fresh sample and diminish earlier within week. Testate amoebae remain in the medium till the entire observation both alive and in form of empty tests. Actinospherium and Actinophrys if present are seen for 2-4 days and do not increase in number and diminished. Lobose amoebae dominate by number and varieties. The ciliate member of choice is mostly Paramecium caudatum. P. caudatum multiplies very fast and achieve maximum density within fortnight and then decline, Stylonchia seen in a fair number but very less if compared that with Paramecia. Euplotus patella also is a permanent member of the sample maintained in the laboratory and do not achieve much density but remain for the longer period with stable population. Litonotus, Vorticella, Coleps and Suctorians also show good number with active members and remain in sample for about 8-10 days. Suctorians and Carchecium were found in association with aquatic weeds. Dileptus, Spirostomum, Vaginicola, Halteria and Trachaelis ovum are seen once if available in sample but didn't seen multiplying or for longer duration.

While going through the live observations under microscopes, protozoans need to be chased for the viewing field. To see them alive, to see them moving by three different means was very astonishing. Some of them were seen dividing by binary fission like Paramecium, Vorticella, Stylonchia, Euplotus, Litonotus and some by conjugation like Paramecium. Two varieties of Stentor were found. They were seen free swimming and most of the time attached to the substratum, and have great extensible capacity.

Of Mastigophora common occurrence is Paramecium and Euglena varieties. Chilomonas paramecium always seen in fresh cultures in great numbers especially in rainy season in temporary stagnant water bodies. Palmella stage of reproduction in Chilomonas is also seen. Most of the flagellates listed seen in great number in freshly collected samples.

Generally it is found in several studies that ciliates dominate by number and types in every type of water body and the same was found in this study but surprisingly the number of amoeboid forms was also comparatively high and the significance of this may be understood in detail. Amoeba proteus, Chaos were dominating, Actinospherium was available in every type of water body and soil sample. In the world of biologists protozoa is having a very specific status as they have been studied for biodiversity, bioindicators, biomonitoring agents, in India the investigator could not find the reason why the study on protozoa has been lagging and why zoologists have ignored them as a tool to study all these things. It is very essential to study their prevalence with other characteristics mentioned elsewhere. Consensus classification of this vast number of species, though difficult, should be formed for easy access of information to the studying in this field.

## REFERENCES

1. Albert Westphal, (1976) "Protozoa", published by Blakie and Son Ltd.
2. Anderson, O.R. (1997) Annual abundances, diversity and growth potential of Gymnamoebae in a shallow freshwater pond. J. Euk. Microbiol. 44, 393-398.
3. Andrei Tsyganov and Yuri Mazei (2006): Morphology, biometry and ecology of Arcella gibbosa Penard 1890 (Rhizopoda, Testacealobosea), Protistology 4 (3) 279-294.
4. Bhatia, B.J. (1936) The Fauna of British India, Protozoa: Ciliophora. London: Taylor and Francis.
5. Finlay B. J. And G. F. Esteban (1998) Freshwater protozoa: biodiversity and ecological function. Biodiversity and conservation 7, 1163-1186.
6. Kudo, R. R. 1966. Protozoology. Springfield: Thomas Charles C. pp. 1174.
7. Page, F.C. (1988) A New Key to Freshwater and Soil Gymnamoebae with Instruction for Culture. Ambleside: Freshwater Biological Association.
8. Theodore Louis Jahn et al, (1979), How to Know the Protozoa, Second edition, Wim C. Brown Company Publishers, Dubuque, Iowa.
9. <http://en.wikipedia.org/wiki/Wai>, Maharashtra



*a. Euglena acus*



*b. Euglena oxyuris*



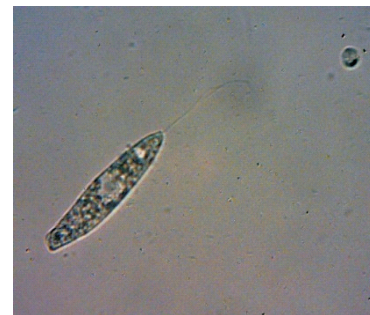
*c. Entosiphon sulcatum*



*d. Peranema trichophorum*



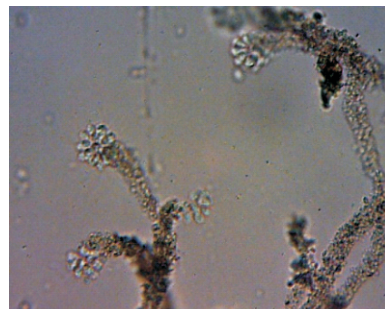
*e. Astacia longa*



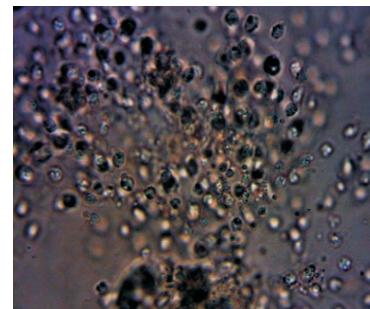
*f. Euglena spirogyra*



*g. Blastodinium sinulosum*



*h. Bicoeca socialis*



*i. Sphaeroeca*

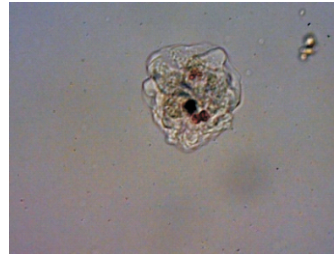


*j. Palmella stage of reproduction in flagellates*

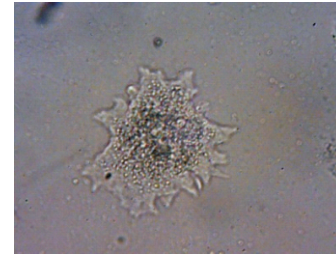




*a. Amoeba proteus*



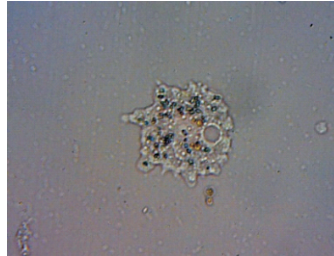
*b. Sappinia diploidea*



*c. Polychaos dubia*



*d. Chaos chaos*



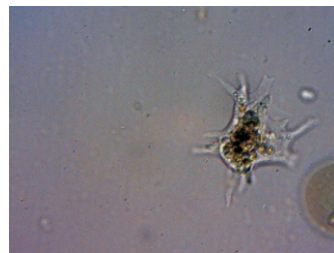
*e. Amoeba dubia*



*f. Discamoeba sp.*



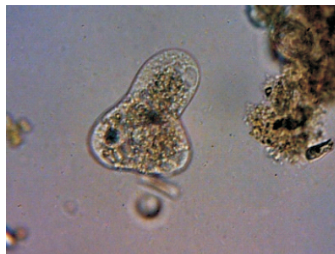
*g. Amoeba lobosa*



*h. Myorella vespertillo*



*i. Myorella vespertillo*



*j. Vahlkamphia guttula*



*k. Pelomyxa palustris*



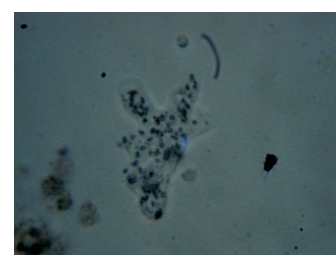
*l. Astramoeba radiosa*



*m. Thecamoeba verrucosa*

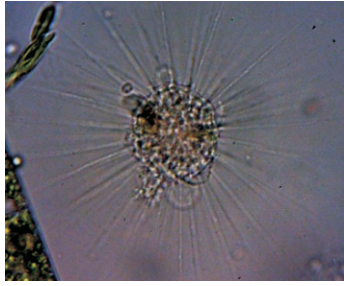


*n. Myorella bigemma*

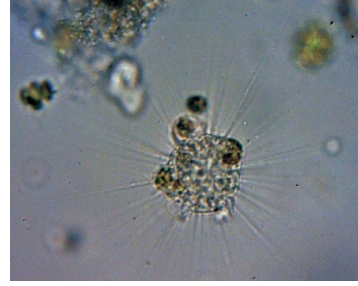


*o. Paramoeba eilhardi*

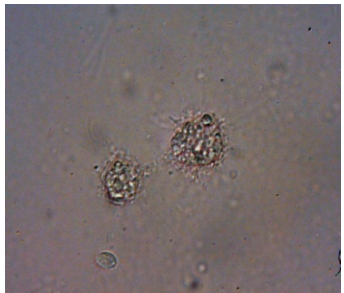




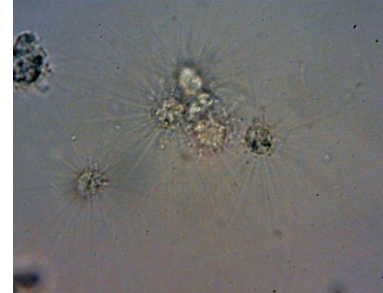
*p. Actinosphaerium eichhorni*



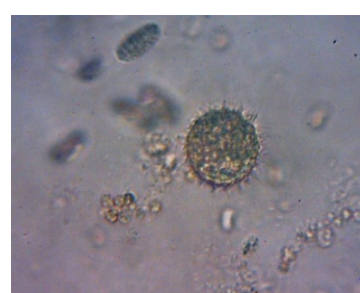
*q. Actinophrys sol*



*r. Rhapsidiophrys pallida*



*s. R. pallida dividing*



*t. Acanthocyathis saculeata*



*u. Thallacicola*



*v. Arcella vulgaris*



*w. Centropyxis aculeata*



*x. Arcella megastoma*



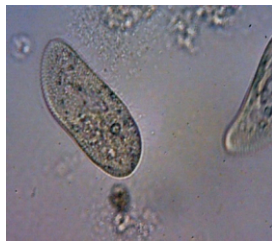
*y. Arcella gibbosa*



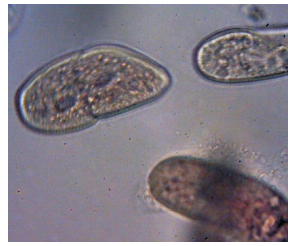
*z. Arcella artocrea*



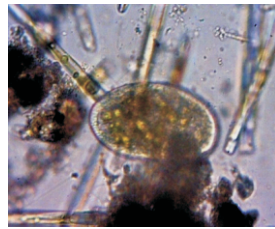
*a. Paramecium caudatum*



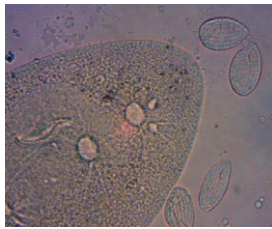
*b. P. Multinucleatum*



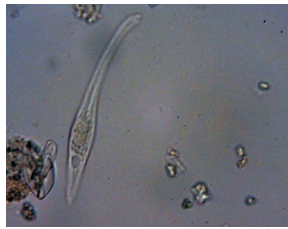
*c. Binary fission*



*d. P. bursaria*



*e. Contractile vacuole*



*f. Lacrymaria olor*



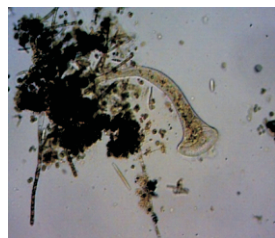
*g. Coleps hirutes*



*h. Spirostomum*



*i. Litonotus fasciola*



*j. Stentor roseli*



*k. S. polyphagus*



*l. Euplotus patella*



*m. Stylonychia mytilus*



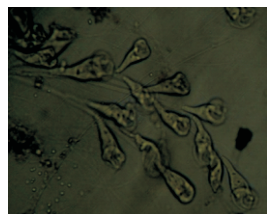
*n. Vorticella campanula*



*o. V. microstoma*

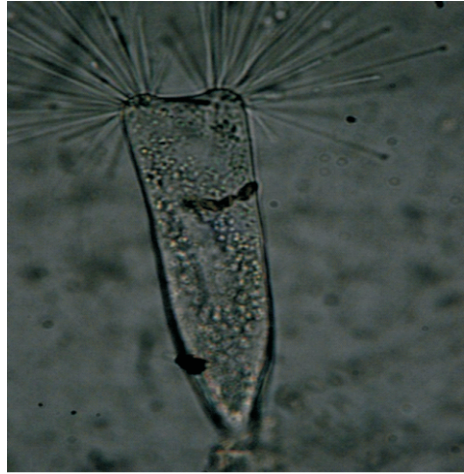


*p. Carchesium polypinum*

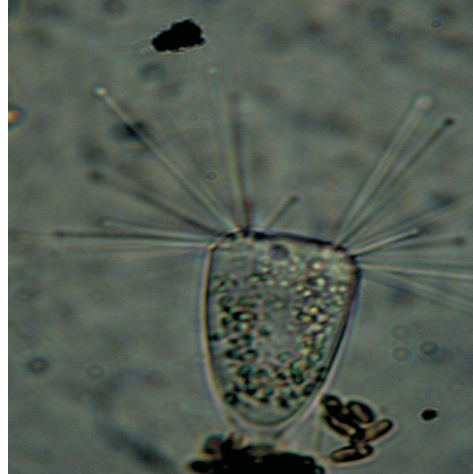


*q. Zoothamnium adamsi*





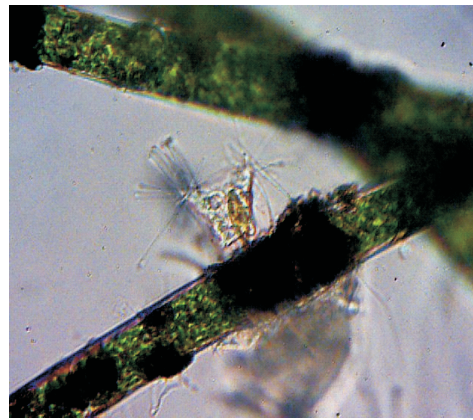
*a. Acineta sp.*



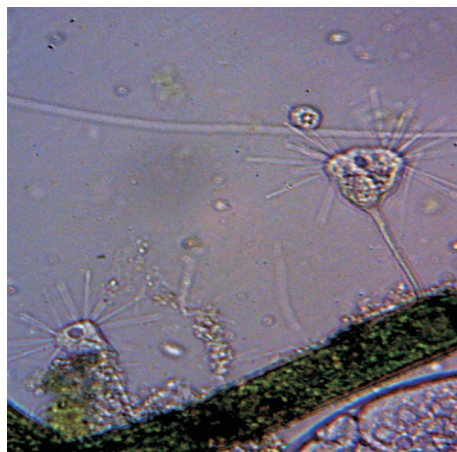
*b. Acineta sp.*



*c. Tokophrya infusioformis*



*d. Acineta lacustris*



*e. Tokophrya cyclopora*



*f. A victim of suctorian*



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