Original Article

Study Of Freeliving Freshwater Protozoan Biodiversity In Seasonal And Perennial Waterbodies Around Wai (Dist: Satara), M. S. India

¹Bakare R. V. and ²Nalawade S. P.

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



¹Bakare R. V. and ²Nalawade S. P.

From ¹Department of Zoology, Kisan Veer Mahavidyalaya, Wai . (M.S.) ²Department of Zoology, Yashawantrao Chavan Institute of Science, Satara. (M.S).

The Article Is Published On May 2014 Issue & Available At www.scienceparks.in

DOI:10.9780/23218045/1202013/49



Tsyganov and Yuri Mazei (2006); Bhatia, B.J. (1936); Page, F.C. (1988); Kudo, R. R. (1966); Theodore Louis Jahn etal, (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 $40X \ge 2MP$. And are illustrated in separate plates.

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

Phylum: Protozoa (Cohn- 1853)	Order: Euglenida (Blochmann 1895)	
Sub Class: Phytomastigophora (Calkins- 1909)	Family: Euglenidae	
Order Chrysomonadina (Stien-1878)		
Family: Chromulinidae	Euglena acus	
Chrysamoeba radians	Euglena spiroides	
Order Phytomonadida (Blochmann 1895)	Euglena oxyuris	
Family Volvocidae	Euglena rubra	
Spondylomorum quaternarium	Euglena tripteris	
Eudorina elegans	Euglena anabaena	
Family: Ochromonadidae	Phacus acuminata	
Dinobryon sertularia	Phacus pleuronectes	
Family Syncryptidae	Phacus longicauda	
Synura uvella	Phacus helikoides	
Order Cryptomonadina (Stein 1878)	Lepocinclis ovum	
Family Cryptomonadidae	Order: Peranemida (Blochmann 1895)	
Cryptomonas ovata	Family: Peraenimidae	
Chilomonas paramecium	Peranema trichophorum	
Pheothamnion conferviculum	Palmella stage of flagellates	
	Total 21Species	

Table 2. Species of protozoa in the Class Rhizopoda (Von Siebold 1845) Sarcodinacollected in fresh water bodies around Wai Dist Satara,M. S. India.

Subclass Gymnamoebia	Family: Thecamoebidae	Subclass Actinopoda
Order Amoeba	Thecamoeba verrucosa	Order Heliozoidae
Family Amoebidae	Sappinia diploidia	Family Actinophryidae
Amoeba proteus	Order Testacea	Actinophrys sol
4moeba radiosa	Family Arcellidae	Actinosphaerium eichhorni
Amoeba gorgonia	Arcella vulgaris	Family: Centrohelida
Amoeba discoides	Arcella bathystoma	Astrodisculus radians
Hartmanella hyaline	Arcella catinus	Heterophrys myriopoda
Polychaos dubia	Arcella megastoma	Lithocola globosa
Pelomyxa palustris	Arcella mitrata	Rhaphidiophrys pallid
	Arcella artocrea	Rhaphidiocystis tubifera
Family Mayorellidae	Arcella gibbosa	Family Acanthocystidae
Mayorella vespertilo	Arcella arenaria	Acanthocystis aculeata
Astramoeba radiosa	Arcella excavata	Acanthocystis turfacea
Pelomyxa palustris	Family Difflugiidae	
Pelomyxa carolinensis	Difflugia oblonga	
Vexillifera ambulacralis	Centropyxis aculeata	
		36

Table 3. Species of protozoa in the Class Ciliata (Perty 1852) collected in fresh waterbodies around Wai Dist Satara,M. S. India.

Subclass : Holotrichia	Family Stentoridae
Order Gymnostomatida	Stentor polyphagus
Family Holopphryidae	Stentor roeseli
Prorodon ovum	Order Oligotrichida
Lacrymaria olor	Family Halteriidae
Family Colepidae	Halteria grandinella
Coleps hirtus	Order Hypotrichida
Coleps octospinus	Family Oxytrichidae
Family Didiniidae	Oxytricha fallax
Didinium nasutum	Uroleptus limnetis
Family Amphileptidae	Uroleptus longicaudatus
Litonotus fasciola	Stylonychia mytilus
Family Tracheliidae	Stylonychia pustulata
Trachelius ovum	Stylonychia notophora
Dileptus anser	Family Euplotidae
Dileptus sp.	Euplotus patella
Loxodus rostrum	Euplotes eurystomus
Family Chlamydodontidae	Euplotes aediculatus
Chilodonella cucullulus	Subclass Peritricha
Family Nassulidae	Order Peritrichida
Nassula elegans	Suborder Sessilina
Order Hymenostomatida	Family Vorticellidae
Suborder Peniculina	Vorticella campanula
Family Parameciidae	Vorticella microstoma
Paramecium caudatum	Carchesium polypinum
Paramecium multimicronucleatum	
Paramecium aurelia	Family Epistylidae
Paramecium bursaria	Epistylis plicatilis
Subclass Spirotricha	Zoothamnium adamsi
Order Heterotrichida	Family Vaginicolidae
Family Spirostomatidae	Vaginicola sp.
Spirostomum intermedium	Subclass: Suctoria
Spirostomum minus	Podophrya fixa
	Tokophrya infusionum
	Acineta lacustis
	39

In this study the investigator could find protozoan species most of them are recorded in other countries like Korea and Thiland. 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. *Actinospheriumand Actinophrys* if present are seen for 2-4 days and do not increase in number and diminished. Lobose amoebae dominate by number and verities. 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. *Suctorins* 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 *Parenema* 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 Charies C. pp. 1174.

7.Page, F.C. (1988) A New Key to Freshwater and Soil Gymnamoebae with Instruction for Culture. Ambleside: Freshwater Biological Asociation.

8. Theodore Louis Jahn etal, (1979), How to Know the Protozoa, Second edition, Wim C. Brown Company Publishers, Dubuque, Lowa.

9.http://en.wikipedia.org/wiki/Wai, Maharashtra

1. Microphotographs of some Flagellates



a. Euglena acus



b. Euglena oxyuris

50

0



c. Entosiphon sulcatum



d. Peranema trichophorum e. Astacia longa

af



f. Euglena spirogyra



g. Blastodinium sinulosum h.Bicoeca socialis



i. Sphaeroeca



j. Palmella stage of reproduction in flagellates

Vol-1, Issue-41, 1st May 2014

Study Of Freeliving Freshwater Protozoan Biodiversity In Seasonal And Perennial Waterbodies Around Wai (Dist: Satara), M. S. India

2. Microphotographs of some Rhizopods



a. Amoeba proteus



d. Chaos chaos



g. Amoeba lobosa



j. Vahlkamphia guttula



m. Thecamoeba verrucosa



b. Sappinia diploidea



e.Amoeba dubia



h. Myorella vespertillo



k. Pelomyxa palustris



n. Myorella bigemma



c. Polychaos dubia



f. Discamoeba sp.



i. Myorella vespertillo



l. Astramoeba radiosa



o. Paramoeba eilhardi



p. Actinosphaerium eichhorni



r. Rhaphidiophrys pallida



u. Thallacicola



x. Arcella megastoma



s. R. pallida dividing



v. Arcella vulgaris



y. Arcella gibbosa



q. Actinophrys sol

t. Acanthocyatis saculeata



w. Centropyxis aculeata



z. Arcella artocrea

5. Microphotographs of some Ciliates



a. Paramecium caudatum b. P. Multinucleatum







g. Coleps hirutes





h. Spirostomum



f. Lacrymaria olor



i. Litonotus fasciola



j. Stentor roseli

m. Stylonychia mytilus



k. S. polyphagus







Page No-8

p. Carchesium polypinum q. Zoothamnium adamsi



l. Euplotus patella



5. Microphotographs of some Suctorians



a. Acineta sp.



b. Acineta sp.



c. Tocophrya infusionum



d. Acineta lacustris



e. Tokophrya cyclopum



f. A victim of suctorian