

Glimpses 2022



Complexity of Microbial Dynam

- Dynamic environments with constantly changing variables
 - Rapid turnover of nutrients
 - Complex microbial food webs, many of which have not yet been adequately studied or described
 - Patchiness (e.g., ocean and lake sediments, salt marshes, wetlands)
 - Toxicity (runoff, chemical dumping, sewage, landfill leachates, etc.)

Rumen protozoa are ciliate predators

- $10^4 - 10^6$ / ml
- Up to 50% of total rumen microbial biomass
- 25 genera identified (12 represent 99.9%)
- Engulf ~24% of the total ruminal bacteria per day (Hespell et al., 1997)

Chairpersons

Prof Sukanaya Lal & Prof Sharanjit Kaur

Rumen ciliates are predators

Holospira undulata, symbiont of the micronucleus of *Paramecium caudatum*

Trichorickettsia mobilis, symbiont of the macronucleus of *Paramecium caudatum*

SOME PARAMETIUM BACTERIAL SYMBIONTS ARE:

- EASILY RECOGNISABLE
- FREQUENTLY FOUND
- STABLE IN THE LAB FOR YEARS



Euplotes pheromones have been isolated from seven species (highlighted in red) with varied positions in the Euplotes phylogenetic tree:

E. petzi, *E. raikovi* and *E. nobilii*, in which pheromones (secreted in relatively large amounts) have been analyzed also for their NMR and crystallographic structures.

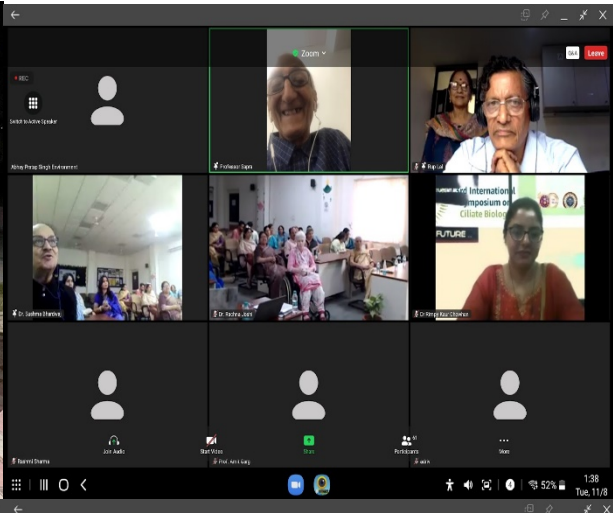
E. octocarinatus, *E. aediculatus*, *E. crassus* and *E. facardii*, in which pheromones (secreted in tiny amounts) are known only for their primary amino acid sequences.

Table 3: Correlation between physicochemical parameters of five sites

Parameter	TW	pH	EC	TDS	Salinity	resistivity	ORP	DO	WH	Nitrite	Nitrate	Ammonia
TW	1											
pH	0.622*	1										
EC	0.826*	0.201	1									
TDS	0.583*	0.116	0.996**	1								
Salinity	0.574*	0.098	0.995**	1.000**	1							
Resistivity	-0.347**	-0.643**	-0.781**	-0.736**	-0.725**	1						
ORP	0.816**	0.572*	0.881**	0.807**	0.822**	0.908**	1					
DO	-0.710**	-0.633**	-0.885**	-0.823**	-0.813**	0.930**	-0.916**	1				
WH	0.561*	0.286	0.925**	0.988**	0.965**	-0.495**	0.909**	-0.819**	1			
Nitrite	0.384	0.531*	0.065	-0.019	-0.036	-0.433	0.464	-0.491	0.271	1		
Nitrate	0.110	0.061	-0.487	-0.490	-0.495	0.035	-0.450	-0.332	-0.729**	-0.172	1	
Ammonia	0.351	-0.233	0.902**	0.936**	0.942**	-0.494	0.905**	-0.592*	0.363*	-0.359	-0.456	1

Values are Pearson correlation coefficients, *correlation is significant at p < 0.05 level and **correlation are significant at p < 0.01 level. TW = temperature (inside water), DO = dissolved oxygen, EC = electrical conductivity, TDS = total dissolved solids, WH = water hardness.

Temperature was positively correlates with pH, conductivity, TDS, salinity, hardness, while negatively correlates with resistivity and DO.



NGTax description of *Euplotes vanteenwohkei* sp. nov.

Table 2. Morphological comparison between *Euplotes vanteenwohkei* sp. nov. and selected representatives of the genus *E. trilineatus*.

Character	<i>E. vanteenwohkei</i>	<i>E. trilineatus</i>
Body size (in vitro) (µm)	40-58 × 15-38	35-50 × 15-40
Body shape	Elongated ellipsoidal; posterior end rounded	Elongated ellipsoidal; posterior end pointed
Pectinose (% of body length)	63	75
Number, type of dorsal structures	3, prominent furrows	3, prominent furrows
Number of macronuclei in AZM	22-29	25-36
Digestion type	Double-cystosome	Double-cystosome
Number of dorsolateral kinetids	7-8	7
Number of cilia/donors in oral-dorsal row	13-14	7-10
Number of FVC	10	10
Number of FC	5	5
Number of CC	2	2
Number of MC	2	2
Habitat	Freshwater	Marine
Reference	This study	Caron 1972

CILIATES (CILIOPHORA, PROTISTA) AND THEIR SYMBIONTS. Ecological point of view.

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India 2022

Key to Species and Ciliate Communities

External contaminants: Nanoparticles (NPs) - Silver nanoparticles (AgNPs)

NPs are particles with at least one dimension between 1 and 100 nm.

- The surface volume ratio increase with the decrease of the size. The smaller the particle, the greater the proportion of atoms that lay close to or at the surface, this means higher reactivity of the particle.

- NPs are used for different purposes in improving human health, due to this size effect they are able to penetrate physiological barriers, to travel throughout the body and interact with subcellular structures. But they are also harmful to the environment.
- AgNPs are used as biocides in various consumer products and dispersed in the environment, potentially affecting some non-target organisms.

Sampling and in vitro culturing of ciliates

- Collection of water and soil samples from the selected sites.
- Stock cultures were maintained in room temperature.
- Periodically observed.
- Clean cultures were rinsed and maintained at 22-23°C
- Medium: - *Paramecium*'s medium [Ca(NO₃)₂·4H₂O, KCl, MgSO₄·7H₂O, NaHPO₄·2H₂O] (Chapman-Ludlow, 1958)
- Broiled cabbage pieces added to support growth of bacteria that act as food source.

Identification of ciliates

- Live cell observation (stereoscopic, phase contrast and differential interference contrast microscope)
- Protargol staining (Froissner, 2014)
- Wet silver nitrate method (Chitambar and Loeffler, 1930)
- Feulgen staining (Chitambar and Dey, 1959; Feulgen, 1914)
- Scanning electron microscopy (Froissner, 2014)
- Photography of live and stained cells.
- Slide submissions at Zoological Survey of India (ZSI), Kolkata, India.

Molecular methods

- SSU rRNA gene, ITS1-5.8S-ITS2 region, COI gene

Phylogenetic analyses

- Maximum likelihood method (ML) and Bayesian inference (BI) methods
- Kimura two-parameter distance method (Kimura, 1980).

Secondary structure prediction of ITS2 region

Micropipette

Poster 1.1.2.pdf - Adobe Acrobat Reader (64-bit)

50,000 species of deciliated protozoans present world-wide among which only 11,000 are parasitic in India. A total of 1002 species of parasitic protozoans have been reported. The present study compares the phylum-wise distribution of species richness of the parasitic protozoans, their abundance in Indian states and union territories, their habitat preference and nature of host (vertebrate or invertebrate) frequently associated with. The study revealed *Phylum Apicomplexa* was the most abundant contributing 403 species and 40% of the total Indian parasitic protozoans, and it was predominant in mostly freshwater and marine habitat. 763 species preferred vertebrate host while 299 species preferred invertebrate host. *Phylum Apicomplexa* was most abundant in vertebrate host and ascertained host with 262 and 114 parasitic species respectively. Our study comprehended that phylum Apicomplexa is more prevalent among both vertebrate and invertebrate host. *Phylum Apicomplexa* is more predominant in the Indian states West Bengal with 5%, followed by Andhra Pradesh and Odisha with 25% and 20% respectively. This study reviews the diversity and distribution of parasitic protozoans from India with emphasis on their host and habitat preference.

Fig. 3. Percentage composition of parasitic protozoan species identified across various Indian states and UT.

Abstract

Protozoa is one of the major taxonomic groups that has members who are parasitic in nature. There are about 50,000 species of deciliated protozoans present world-wide among which only 11,000 are parasitic. In India, a total of 1002 species of parasitic protozoans have been reported. The present study compares the phylum-wise distribution of species richness of the parasitic protozoans, their abundance in Indian states and union territories, their habitat preference and nature of host (vertebrate or invertebrate) frequently associated with. The study revealed *Phylum Apicomplexa* was the most abundant contributing 403 species and 40% of the total Indian parasitic protozoans, and it was predominant in mostly freshwater and marine habitat. 763 species preferred vertebrate host while 299 species preferred invertebrate host. *Phylum Apicomplexa* was most abundant in vertebrate host and ascertained host with 262 and 114 parasitic species respectively. Our study comprehended that phylum Apicomplexa is more prevalent among both vertebrate and invertebrate host. *Phylum Apicomplexa* is more predominant in the Indian states West Bengal with 5%, followed by Andhra Pradesh and Odisha with 25% and 20% respectively. This study reviews the diversity and distribution of parasitic protozoans from India with emphasis on their host and habitat preference.

Fig. 3. Percentage composition of parasitic protozoan species identified across various Indian states and UT.

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