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PROTOZOA FAUNA OF SUNDARBAN MANGROVE ECOSYSTEM

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INTRODUCTION

In the course of several faunistic surveys for the period from 1979 to 1984 and 1989-90 protozoa fauna belonging diversified groups have been collected from different parts of Sundarban mangrove ecosystem. These collections as well as those reported earlier in the literature are being dealt with in the present communication. Altogether 104 species of the subkingdom Protozoa belonging to four different phyla *viz.*, Sarcomastigophora, Apicomplexa, Myxozoa and Ciliophora have been reported from this region. A complete systematic list along with a note on the composition of species is presented in the paper as per revised classification of the society of Protozoologists (see Levine *et al.*, 1980). The diagnostic characters and key to the species of these protozoa have not been incorporated in this account since majority of the species were adequately dealth with in the protozoa fauna of West Bengal (Das *et al.*, 1993).

The first report of protozoa from Sundarban mangrove region may be credited to Annandale in 1907 when he recorded two species of ciliates from the brackish-water ponds of Port Canning, a place still having sparsely distributed mangrove. Subsequently, Pearse (1932) reported a gregarine from the intestine of an estuarine Crab, *Metaplax dentipes*, also from Port Canning. Incidentally this is the only species of gregarine reported so far from Sundarban. Ray and Dasgupta (1936, 1937) recorded a coccidian parasite from the intestine of Indian cobra from Sundarban. Tripathi (1952) encountered a myxosporidan parasite, *Spheromyxa theraponi* from fish *Therapon jarbua* from Port Canning. Shetty *et al.*, (1961) and Gopalkrishnan (1971) reported a number of free living flagellates, rhizopods and ciliates from the planktonic samples of Hooghly-Matla estuary. However, specific identity of many of those protozoa were not ascertained by them. Mandal, A. K. (1965, 1976, 1978, 1984 and in press) and his associates (1964, 1965, 1984) published several new species of coccidian parasites and haemoflagellates from fishes and birds of this region. Choudhury and Nandi (1973) described two new species of Myxozoa from an estuarine gobiid fish, *Boleophthalmus boddaerti*. Tiwari (1978) recorded 5 species of termite flagellates from Sagar Island. Mandal, D. and Choudhury (1981, 1982, 1984, 1985, 1986a, b, c, 1988) studied the intestinal parasites of wild mammals of Sundarban Tiger Reserve and also

reported on the occurrence of two species of piroplasms in the blood of the rat, *Rattus rattus arboreus* and the bat *Scotophilus kuhli kuhli.*

Nandi *et. al.* (1984) reported a few species of avian haemoproteids from Sagar Island. Ray and Sarkar (1985) recorded a species of coccidian parasite in wild boar, *Sus scrofa.* Ghosh and Choudhury (1986, 1987) and Basu *et al.*, (in press) have reported/isolated few species of amoebae from the soil of Sagar Island. D. S. T. report (1987) of the Department of Marine Science, University of Calcutta incorporated investigations on mangrove Protista and appended a list of species of flagellates, rhizopods, foraminiferans, sporozoans and ciliates. Jamadar and Choudhury (1988) contributed much to our knowledge of the entocommenasal ciliates of marine and estuarine molluscs. However, it is worth mentioning that Mandal and Choudhury (1981-1988) made valuable contribution on the parasitofauna of wild animals of Sundarban mangrove forest.

Materials and Methods

During the course of investigation both freeliving as well as parasitic protozoans were collected and studied. Mangrove habitat herein considered as areas with at least sparsely distributed mangroves which include Canning, Kakdwip, Namkhana and Sagar Island. The zones III and V of the Hooghly-Matla estuary as mentioned in the study of planktons by Gopalakrishnan (1971) have also been taken into consideration.

Water samples, faecal sample, blood and host samples were collected and examined under the microscope following Mandal *et al.* (1990) and Das *et al.* (1993).

SYSTEMATIC LIST OF PROTOZOA FAUNA FROM SUNDARBAN MANGROVE ECOSYSTEM

Species	*Locality*	*Remarks*
	Subkingdom : Protozoa	
	Phylum : Sarcomastigophora	
	Subphylum : Mastigophora	
	Class : Phytomastigophorea	
	Order : Dinoflagellida	
	Family : Noctilucidae	
	Genus : **Notiluca** Suriray	
1. *N. miliaris* Suriray	Hooghly-Matla estuary	Freeliving, occurring in estuarine and coastal waters

Species	*Locality*	*Remarks*
	Family : PERIDINIIDAE	
	Genus : **Peridinium** Ehrenberg	
2. *P.* spp.	Hooghly-Matla estuary	Freeliving, reported from estuaries
	Genus : **Ceratium** Schrank	
3. *C. hirundinella*	Hooghly-Matla estuary	Freeliving, occurring in estuarine waters
4. *C. tripos* Nitzsch	Hooghly-Matla estuary	Freeliving, occurring in estuaries.
	Order : EUGLENIDA Suborder : EUGLENINA Family : EUGLENIDAE	
	Genus : **Euglena** Ehrenberg	
5. *E.* sp.	Hooghly estuary	Freeliving, occurring as estuarine plankton
	Genus : *Phacus* Dujardin	
6. *P.* sp.	Hooghly-Matla estuary	Freeliving in estuarine planktonic samples
	Family : ASTASIIDAE	
	Genus : **Copromonas** Dobell	
7. *C. ruminantum* Woodcock	Bhagabatpur, Sundarban	Parasitic occurring in faecal sample of *Sus scrofa*
	Class : ZOOMASTIGOPHOREA Order : KINETOPLASTIDA Family : TRYPANOSOMATIDAE	
	Genus : **Trypanosoma** Gruby	
8. *T. anabasi* Mandal	Canning	In blood of *Anabas testudineus*
9. *T. bengalensis* Mandal	Canning	In blood of *Mystus bleekeri*
10. *T. cancili* Mandal	Raidighi	In blood of *Xenentodon cancila*

	Species	*Locality*	*Remarks*
11.	*T. gobida* Mandal	Canning	In blood of *Glossogobius giuris*
12.	*T. striati* Mandal	Canning	In blood of *Channa striatus*
		Order : TRICHOMONADIDA	
		Family : MONOCERCOMONADIDAE	
		Genus : **Monocercomonas** Grassi	
13.	*M. ruminantium* (Braune)	Sundarban forest	In faecal sample of spotted deer, *Axis axis*
		Family : TRICHOMONADIDAE	
		Genus : **Tetratrichomonas** Hibler, Hammond, Caskey, Johnson and Fitzgeruld	
14.	*T. butteryi* (Hibler *et. al.*)	Sundarban forest	In faecal sample of wild boars, *Sus scrofa*
		Order : HYPERMASTIGIDA	
		Family : HOLOMASTIGOTOIDAE	
		Genus : **Holomastigotoides** Grassi and Foa	
15.	*H. bengalensis* Chakravarty and Banerjee	Bamankhali, Sagar Island	In gut contents of *Coptotermes heimi*
16.	*H. hartmanni* Koidznmi	Gangasagar, Sagar Island	In gut contents of *Coptotermes heimi*
17.	*H. ogivalis* de Mello	Sapkhali, Sagar Island	In gut contents of *Heterotermes indicola*
		Family : SPIROTRICHONYMPHIDAE	
		Genus : **Pseudotrichonympha** Grassi and Foa	
18.	*P. cardiformis* Karandikar and Vittal	Sapkhali, Sagar Island	In gut contents of *Heterotermes indicola*
19.	*P. subapicalis* Karandikar and Vittal	Mamankhali, Sagar Island	In gut contents of *Coptotermes heimi*

Species	*Locality*	*Remarks*
	Subphylum : SARCODINA	
	Class : LOBOSEA	
	Subclass : GYMNAMOEBIA	
	Order : AMOEBIDA	
	Suborder : TUBULINA	
	Family : ENDAMOEBIDAE	
	Genus : **Entamoeba** Casagrandi and Barbagallo	
20. *E. cervis* Mandal and Choudhury	Sundarban Tiger Reserve	In faecal sample of Spotted deer, *Axis axis* and Rhesus monkey, *Macaca mulatta*
21. *E. chattoni* Swellengrebal	Sundarban forest	In faecal sample of Rhesus monkey, *Macaca mulatta*
2 *E. chiropteris* Mandal and Choudhury	Sajnakhali, Sundarban Tiger Reserve	In faecal sample of *Scotophilus kuhli kuhli*
23. *E. coli* (Grassi)	Sundarban forest	Faecal sample of Rhesus monkey, *Macaca mulatta*
24. *E. histolytica* Schaudinn	Sundarban forests	In faecal sample of Rhesus monkey, *Macaca mulatta*
25. *E. muris* (Grassi)	Sundarban Tiger Reserve	In faecal sample of *Rattus rattus arboreus*
26. *E. suis* Hartman	Sundarban Tiger Reserve	In faecal sample of wild boar, *Sus scrofa scrofa*
	Genus : **Dientamoeba** Jepps and Dobell	
27. *D. fragilis* Jepps and Dobell	Sundarban forest	In faecal sample of Rhesus monkey, *Macaca mulatta*
28. *I. butschlii* (Prowazek)	Sundarban forest	In faecal sample of Rhesus monkey, *Macaca mulatta* and Wild boar, *Sus scrofa scrofa*
	Suborder : THECINA	
	Family : THECAMOEBIDAE	
	Genus : **Thecamoeba** Formental	
29. *T.* spp.	Mangrove zone	Freeliving forms in soil

Species	*Locality*	*Remarks*
	Genus : **Platyamoeba** Page	
30. *P.* spp.	Mangrove zone	Freeliving forms in soil
	Genus : **Vannella** Bovee	
31. *V.* spp.	Mangrove zone	Freeliving forms in soil
	Suborder : FLABELLINA	
	Family : FLABELLULIDAE	
	Genus : **Flabellula** Schaeffer	
32. *F.* sp.	Mangrove zone	Freeliving forms in soil
	Suborder : CONOPODINA	
	Family : PARAMOEBIDAE	
	Genus : **Mayorella** Schaeffer	
33. *M.* sp.	Mangrove zone	Freeliving forms in soil
	Suborder : ACANTHOOPODINA	
	Family : ACANTHAMOBIDAE	
	Genus : **Acanthamoeba** Volkonsky	
34. *A. astronyxis* (Ray and Hayes)	Sagar Island	Freeliving, inhabiting soils of intertidal zone
35. *A. palestinensis* (Reich)	Sagar Island	Freeliving, soil inhabiting forms
36. *A. culbertsoni* (Singh and Das)	Sagar Island and Kakdwip	Freeliving, inhabiting soils of intertidal zone
37. *A. rhysodes* (Singh)	Sagar Island	Freeliving in intertidal soils.
38. *A.* sp.	Mangrove zone	Freeliving forms in soil
	Order : SCHIZOPYRENIDA	
	Family : VAHLKAMPFIIDAE	
	Genus : **Naegleria** Alexieff	
39. *N. thortoni* (Singh)	Sagar Island	Freeliving, occurring in grassy fields
	Subclass : TESTACEALOBOSIA	
	Order : ARCELLINIDA	
	Family : ARCELLIDAE	
	Genus : **Arcella** Ehrenberg	
40. *A.* spp.	Hooghly-Matla estuary	Freeliving in planktonic samples

Species	*Locality*	*Remarks*
Family : DIFFLUGIIDAE		
Genus : **Centropyxis** Stein		
41. *C.* spp.	Hooghly-Matla estuary	Freeliving in planktonic samples
Class : GRANULORETICULOSEA		
Order : FORAMINIFERIDA		
Family : CALCARINIDAE		
Genus : **Calcarina** d' Orbigny		
42. *C. calcar* Parker and Jones	Sundarban	Freeliving forms
43. *C.* sp.	Sundarban	Freeliving forms
Suborder : MILIOLINA		
Family : MILIOLIDAE		
Genus : **Quinqueloculina** d' Orbigny		
44. *Q.* sp.	Sundarban	Freeliving forma
Suborder : ROTALIINA		
Family : NONIONIDAE		
Genus : **Elphidium** Montfort		
45. *E.* sp.	Sundarban	Freeliving forms
Phylum : APICOMPLEXA		
Class : SPOROZOEA		
Subclass : GREGARINIA		
Order : EUGREGARINIDA		
Suborder : SEPTATINA		
Family : CEPHALOIDOPHORIDAE		
Genus : **Cephaloidophora** Mawrodiadi		
46. *C. metaplaxi* (= *Steinina metaplaxi*)	Port Canning	Intestine of crab *Metaplax dentipes*
Subclass : COCCIDIA		
Order : EUCOCCIDIIDA		
Suborder : ADELINA		
Family : HAEMOGREGARINIDAE		
Genus : **Haemogregarina** Danilewsky		
47. *H. colisa* Mandal, Ray, Sarkar and Kahali	Canning	In blood of fish *Colisa fasciatus*

Species	*Locality*	*Remarks*
Suborder : EIMERIINA Family : EIMERIIDAE Genus : **Eimeria** Schneider		
48. *E. harpodoni* Setna and Bana	Port Canning	In intestine of fish, *Harpadon nehereus*
49. *E. southwelli* Halwani	Sundarban	In intestine of shark, *Scoliodon sorrakowah*
50. *E. zygaenae* Mandal and and Chakravarty	Sundarban	In small intestine of shark, *Zygaena blochii*
51. *E. najae* Ray and Dasgupta	Sundarban	In small intestine of snake, *Naja naja*
52. *E. charadrii* Mandal	Narayantala	In small intestine of bird, *Charadrius asiaticus*
53. *E. gallinagoi* Mandal	Basanti	In small intestine of bird *Gallinago gallinago*
54. *E. numeni* Mandal	Namkhana	Intestine of bird *Numenius arquata*
55. *E. roscoviensis pluvialtna* Mandal	Namkhana	In small intestine of bird *Pluvialis appricaria*
56. *E. vanelli* Mandal	Basanti	In small intestine of *Vanellus malabaricus*
57. *E. ahsata* Honess	Basanti	In faecal sample of goat, *Capra hircus*
58. *E. arloingi* (Marotel)	Basanti	In faecal sample of *Capra hircus*
59. *E. cervis* Mandal and Choudhury	Sundarban Tiger Reserve	In faecal sample of spotted deer, *Axis axis*
60. *E. neodeblicki* Vetterling	Sundarban forest	In faecal sample of wild boar, *Sus scrofa*
Genus : **Isospora** Schneider		
61. *I. emberizae* Mandal and Chakravarty	Sundarban	In small intestine of *Emberiza bruniceps*
62. *I. sundarbanensis* Ray and Sarkar	Sajnakhali	In faecal sample of *Sus scrofa*

Species	*Locality*	*Remarks*
Suborder : HAEMOSPORINA		
Family : HAEMOPROTEIDAE		
Genus : **Haemoproteus** Kruse		
63. *H. columbae* Kruse	Kakdwip	In blood of *Columba livia intermedia*
64. *H. oryzivorae* Anschütz	Sagar Island	In blood of *Turdoides striatus*
65. *H. pastoris* de Mello	Sagar Island	In blood of *Sturnus malabaricus*
66. *H.* sp.	Sagar Island	In blood of *Acrocephalus dumetorum*
Subclass : PIROPLASMIA		
Order : PIROPLASMIDA		
Family : BABESIIDAE		
Genus : **Babesia** Starcovici		
67. *B. muris* (Fantham)	Sundarban Tiger Reserve	In blood of rat, *Rattus rattus arboreus*
68. *B. vesperuginis*	Sundarban Tiger Reserve	In blood of bat, *Scotophilus kuhli kuhli*
Family : HAEMOHORMIDAE		
Genus : **Haemohormidium** Henry (=**Babesiosoma**)		
69. *H.* sp.	Canning market	In blood of fish *Muraenesox* sp.
Phylum : MYXOZOA		
Class : MYXOSPOREA		
Order : BIVALVULIDA		
Suborder : BIPOLARINA		
Family : MYXIDIIDAE		
Genus : **Myxidium** Bütschli		
70. *M. boddaerti* Choudhury and Nandi	Port Canning, Kakdwip	In gut contents of *Boleophthalmus boddaerti*
71. *M. lieberkuhni* Butschli	Port Canning, Kakdwip	In gall bladder of *Boleophthalmus boddaerti*

Species	*Locality*	*Remarks*
Genus : **Sphaeromyxa** Thelohan		
72. *S. theraponi* Tripathi	Port Canning	In gall bladder of *Therapon jarbua*
Suborder : EURYSPORINA		
Family : CERATOMYXIDAE		
Genus : **Ceratomyxa** Thelohan		
73. *C. sagarica* Choudhury and Nandi	Port Canning	In gall bladder of fish *Boleophthalmus boddaerti*
Phylum : CILIOPHORA		
Class : KINETOFRAGMINOPHOREA		
Subclass : GYMNOSTOMATIA		
Order : PROSTOMATIDA		
Suborder : HAPTORINA		
Family : TRACHELIIDAE		
Genus : **Dileptus** Dujardin		
74. *D. americanus* Kahl	Rajat jubilee	Alga-mud-scum sample, new record from West Bengal
Subclass : VESTIBULIFERIA		
Order : TRICHOSTOMATIDA		
Suborder : TRICHOSTOMATINA		
Family : PLAGIOPYLIDAE		
Genus : **Plagiopyla** Stein		
75. *P. nasuta* Stein	Kalas	Freeliving, occurring in algal sample of freshwater pond
	Datta river	Floating fungal sample
Family : BALANTIDIIDAE		
Genus : **Balantidium** Claparede and Lachmann		
76. *B. coli* (Malmsten)	Sundarban forest	In faecal sample of *Sus scrofa*
77. *B.* sp.	Sundarban forest	In faecal sample of *Sus scrofa*

Species	*Locality*	*Remarks*
Subclass : HYPOSTOMATIA		
Superorder : NASULIDEA		
Order : NASSULIDA		
Suborder : MICROTHORACINA		
Family : MICROTHORACIDAE		
Genus : : **Drepanomonas** Fresenius		
78. *D. revoluta* Penard	Gosaba	Mud-scum sample
Superorder : PHYLLOPHARYNGIDEA		
Order : CYRTOPHORIDA		
Suborder : CHLAMYDODONTINA		
Family : CHLAMYDODONTIDAE		
Genus : **Chlamydomonas** Ehrenberg		
79. *C. mnenosyne* Ehrenberg	Datta river	Freeliving in floating fungal sample
	Gosaba	Mud-scum sample, new record from West Bengal
Family : CHILODONELLIDAE		
Genus : **Chilodonella** Strand		
80. *C. cucullulus* (Müller)	Kalas	Freeliving, in algal sample of sweet water pond.
	Gosaba	Mud-scum sample
Superorder : RHYNCHODEA		
Order : RHYNCHODIDA		
Family : ANCISTROCOMIDAE		
Genus : **Ancistrocoma** Chatton and Lwoff		
81. *A. pelseneeri* Chatton and Lwoff	Hooghly estuary	Inhabiting gills and labial palps of *Mactra luzonica*
Genus : **Raabella** Chatton and Lwoff		
82. *R. helensis* Chatton and Lwoff	Hooghly estuary	Inhabiting gills of *Modiolus striatulus*

Species	*Locality*	*Remarks*
Class : OLIGOHYMENOPHOREA		
Subclass : HYMENOSTOMATIA		
Order : HYMENOSTOMATIDA		
SUBORDER : PENICULINA		
Family : PARAMECIIDAE		
Genus : **Paramecium** Hill		
83. *P. caudatum* Ehrenberg	Kalas	Freeliving in fresh water pond algal sample
Family : FRONTONIIDAE		
Genus : **Frontonia** Ehrenberg		
84. *F. leucas* (Ehrenberg)	Gosaba	Freeliving in mud-scum sample
Ordet : SCUTICOCILIATIDA		
Suborder : PLEURONEMATINA		
Family : CYCLDIIDAE		
Incertae sedis		
Genus : **Cristigera** Roux		
85. *C. susmai* Jamadar and Choudhury	Sagar Island	Inhabiting gills and labial palps of *Crassostrea cucullata*
Suborder : THIGMOTRICHINA		
Family : ANCISTRIDAE		
Genus : *Ancistrumina* Raabe		
86. *A. barbata* (Issel)	Sagar Island	Occurring in the mantle cavity and buccal mass of *Cerithidea obtusa*
87. *A. obtusae* Jamadar and Choudhury	Sagar Island	Occurring in the buccal cavity of *Cerithidea obtusa.*
Genus : **Boveria** Stevene		
88. *B. teredinidi* Nelson	Hooghly estuary	Infaunating the labial palps and gills of *Mactra luzonica*
Genus : **Fenchelia** Raabe		
89. *F. kapili* Jamadar and Choudhury	South-west coast of Sagar Island	Occurring abundantly in the ctenidium and scanty in the mantle cavity of *Cerithidea obtusa*

Species	*Locality*	*Remarks*
90. *F. sagarica* Jamadar and Choudhury	South-west coast of Sagar Island	Infaunating abundantly in the mantle cavity of *Cerithidea obtusa*
Genus : **Protophrya** Kofoid		
91. *P. indica* Jamadar and Choudhury	Sagar Island	Occurring abundantly in the mantle cavity and buccal mass of *Littorina melanostoma*
Subclass : PERITRICHIA		
Order : PERITRICHIDA		
Suborder : SESSILINA		
Family : VORTICELLIDAE		
Genus : **Carchesium** Ehrenberg		
92. *C. polypinum* (Linnaeus)	Port Canning	Sedentary, freeliving in brackishwater ponds
93. *C.* sp.	Kakdwip	Sedentary, attached to eggs of *Liza parsia*
Genus : **Vorticella** Linnaeus		
94. *V.* sp.	Matla estuary	Freeliving forms
Genus : **Zoothamnium** Bory		
95. *Z.* sp.	Rajat jubilee	Alga and mud-scum sample
Family : SCYPHIDIIDAE		
Genus : **Scyphidia** Dujardin		
96. *S. bengalensis* Jamadar Choudhury	Mandirtala mudflat, Sagar Island	Occurring abundantly in the mantle cavity and buccal mass of gastropod molluscs *Cerithidia cingulata*
97. *S. ubiquita* Horshfield	Sagar Island	Occurring abundantly in the mantle cavity and buccal mass of gastropod molluscs, *Littorina melanostoma* and *L. scabra*
Class : POLYHYMENOPHOREA		
Subclass : SPIROTRICHIA		
ORDER : HETEROTRICHIDA		
Suborder : COLIPHORINA		
Genus : **Folliculina** Lamarck		
98. *F. ampula* (Müller)	Port Canning	Occurring in brackishwater ponds

Species	*Locality*	*Remarks*
	Order : OLIGOTRICHIDA	
	Suborder : TINTINNINA	
	Family : TINTINNIDIIDAE	
	Genus : **Tintinnidium** Stein	
99. *T.* sp.	Hooghly-Matla estuary	Freeliving in planktonic sample
	Order : HYPOTRICHIDA	
	Suborder : SPORADOTRICHINA	
	Family : OXYTRICHIDAE	
	Genus : **Oxytricha** Bory	
100. *O. fallax* Stein	Datta river	Freeliving, occurring in ffoating mangrove fungal mass (culture)
	Kalas	Fresh water algal sample
	Family : EUPLOTIDAE	
	Genus : **Euplotes** Ehrenberg	
101. *E. gracilis* Kahl	Gosaba	Freeliving in mangrove mud scum sample (culture)
102. *E. patella* (Muller)	Datta River	Free living in fregh water pond
103. *E.* sp.	Kalas	Freeliving in fresh water pond
	Rajat jubilee	Association with floating mangrove fungal mass
	Gosaba	Mud-scum sample
	Genus : **Diophrys** Dujardin	
104. *D. appendiculata* (Ehrenberg)	Rajat jubilee	Freeliving in floating fungal sample ; New record from West Bengal

DISCUSSION

A total of 104 protozoan species from Sundarban mangrove ecosystem have so far been recorded. These protozoans belong to four major phyla *viz.*, Sarcomastigophora (45 spp.), Apicomplexa (24 spp.), Myxozoa (4 spp.) and Ciliophora (31 spp.)

Table 1. Composition of Protozoa fauna of Sundarban mangrove region in relation to South 24-Parganas district and West Bengal State.

Group	No. of species (family) occurring in		
	West Bengal	South 24-Parganas	Sundarban
Phylum Sarcomastigophora			
Subphylum Mastigophora	120 (23)	52 (16)	19 (9)
Subphylum Sarcodina	95 (18)	46 (11)	26 (10)
Subphlyum Opalinata	6 (1)	1 (1)	–
Phylum Apicomplexa	357 (30)	31 (9)	24 (6)
Phylum Microspora	5 (2)	--	–
Phylum Myxozoa	93 (4)	6 (4)	4 (2)
Phylum Ciliophora	295 (69)	44 (29)	31 (17)
	Total=971 (147)	180 (70)	104 (44)

(Table-1). The phylum Sarcomastigophora includes 19 species of the subphylum Mastigophora and 26 species of Sarcodina. The members of the subphylum Opalinata which are bound to be present in the gut of anuran amphibians have not yet been reported from this region. Dinoflagellates and foraminiferans are the two important groups of marine/estuarine Sarcomastigophora which are still under explored in this region. Among the members of the phylum Apicomplexa gregarines are the least studied group. Only one species of gregarine, *Cephaloidophora metaplaxi* has been reported so far from Sundarban. The phylum Myxozoa whose members are well known fish parasites is represented by four species only. The phylum Ciliophora was represented earlier mostly by entocommensal ciliatss of shell fishes while several species of freeliving ciliates have been recorded during the present investigation from water and soil samples of mangrove region.

Out of 104 protozoan species, 41 species represent freeliving forms, 68 species parasitic forms and 5 species as symbionts (Table 2). The symbiotic species include

Table 2. Distribution of freeliving, parasitic and symbiotic protozoa of Sundarban in relation to South 24-Pargans district and West Bengal State.

Group	No. of species (family) occurring in		
	West Bengal	South 24-Parganas	Sundarban
Freeliving Protozoa	248 (76)	77 (38)	41 (27)
Parasitic Protoza	596 (63)	84 (28)	68 (15)
Symbiotic Protozoa	127 (8)	19 (5)	5 (2)
	Total=971 (147)	180 (71)	104 (44)

termite flagellates only, reported by Tiwari (1978) from Sagar Island. No study of ruminant ciliates have so far been made from wild deer population or from any domesticated ruminant mammal of Sundarban. A comparison of the protozoan species occurring in the mangrove ecosytem of Sundarban region and those of South 24-Parganas district as well as West Bengal is presented in Table 1 & 2 (*see* Das *et al.*, 1993 ; West Bengal State Fauna Series : Protozoa). It indicates that this region is not well explored in so far as protozoa fauna are concerned.

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