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Faunal Diversity of Zooplankton in Freshwater Wetlands of Southeastern W. B.

R. A. KHAN

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INTRODUCTION

The importance of zooplankton, a heterogeneous assemblage of microscopic animals, in the trophic dynamics of freshwater ecosystems has long been recognized as these organisms, not only regulate the aquatic productivity, by occupying almost middle position in food chain, but also indicate environmental status in a given time. In addition, their diversity has assumed added importance during recent years due to the ability of certain species to indicate the deterioration in the quality of water caused by pollution/ eutrophication. Owing to this, they have attracted the attention of a large number of workers throughout the world and sufficient literature exists on various aspects of their taxonomy, diversity, biology, community structure and dynamics in temperate waters. However, from tropical waters, particularly in India, not much attention has been given by aquatic biologists to their faunal diversity and species composition. Barring a few, most of the earlier studies dealing with limnology of some lakes and ponds, refer only to general variation in total zooplankton numbers without giving due attention to proper identification of the species constituting the community. Many a times several species of a group were taken together for the analysis of spatial or temporal variations or the impact of water quality deterioration, which failed to give information on the actual process or impact. It is abundantly clear that any study on the community ecology, without properly identifying various components of the community may not give relevant information.

The main hindrance for the proper identification of freshwater zooplankton taxa by general aquatic ecologists is the non-availability of any concise and consolidated taxonomic literature on commonly occurring taxa. The available literature are scattered and deal with considerable taxonomic details, including a large number of taxa which are rare and not of much ecological significance. Realising the importance of the problem and paucity of a concise and consolidated literature, a detailed programme of work was initiated a decade ago to work out the species diversity, community structure and density of zooplankton in some freshwater wetlands of southeastern West Bengal. This region is one of the most important regions of the country as far as inland waters are concerned. Excepting natural mountain lakes, there is an abundance of almost all types of wetlands including floodplain wetland (oxbow lake), man-made urban lakes, natural marshy wetlands, pisciculture ponds, multipurpose ponds and over and above highly specialized sewage -fed fish culture ponds. The present paper summarizes the results of the studies carried out on the faunal diversity of zooplankton in a large number of wetlands of the region belonging to almost all types.

MATERIAL AND METHODS

The studies on the zooplankton diversity and density were carried out for a period of over one-decade (1991-2001) in a large number of wetlands of southeastern West Bengal. This region, which covers the districts of North 24 Parganas, Calcutta, South 24 Parganas, Hugly, Haora and Mednipur of West Bengal State, is located on either side of the major River Ganga near or on Sunderban delta and is full of almost all types of the wetlands.

Keeping in view the vastly different nature of the wetlands, these were grouped under following six broad types :

Type –I. Oxbow lakes (beels and baors).

Type –II. Natural wetlands (jheels).

Type –III. Fish culture ponds (bheries).

Type –IV. Sewage-fed fish culture ponds.

Type –V. Multipurpose village ponds (pukur).

Type –VI. Urban recreational man-made lakes/ ponds.

A total of 20 representative Wetlands belonging to almost all types were surveyed which are listed in Table 1.

Qualitative zooplankton samples were collected with the help of a plankton net made of bolting cloth No 25 (Mesh size approx. 56m) from different zones of the wetlands. For the collections from littoral zones, sweeps were made in all directions with the help of a long pole. For the collection from open waters, net was thrown to maximum possible distance from the shore and towed gradually avoiding littoral macrophytes. Net was also towed from the boat for some distance in open water as and when feasible. Similarly, vertical hauls were made from open waters by dropping the net with anchor from the boat to the bottom and pulling rapidly. For quantitative samples, 50 lit. of water was filtered through the net, both from littoral and open water zones. Samples were carefully transferred to a small enamel tray. The inside of the net was washed so as to collect any sticking plankter. Few drops of formalin were put to narcotize the animals and when they became motionless and settled down, the supernatant water was discarded slowly and concentrated samples were collected. All samples were preserved in 4% formaldehyde solution. Preserved zooplankton samples were examined under a binocular microscope with different magnifications. Detailed taxonomic identification was carried out following Edmondson (1959), Pennak (1978), Michael and Sharma (1988), Sehgal (1983), Battish (1992), Roy (1999) and Sharma (1999a).

Table 1. Details of wetlands studied

SI No	Name	Location	Approx. area (acres)	Source	Nature	Remarks
WETLAND TYPE I- OXBOW LAKE (Baors/beels)						
1.	Gopalpur Baor	North 24 Parganas Bongaon	160	Ichchamati River	Moderately Alkaline	Heavily infested with macrophytes of all types. Littoral zone with abundant decaying vegetation's. Cooperative fishing
2.	Sosadanga Baor	do	120	do	- do	Heavily infested with macrophytes of all types. Littoral zone with moderate decaying. vegetation's Unorganized fishing.
3	Dumur Baor	- do	350	do	- do-	Moderately infested with macrophytes. Littoral decaying vegetation in patches. Cooperative fishing
4.	Beledanga Baor	- do	165	do	do-	-do-
WETLAND TYPE II. NATURAL WETLANDS (Jheels)						
5.	Barti beel	Barrackpore	800	Rainwater Drainage	alkaline	Moderately infested with macrophytes. Littoral decaying vegetation in patches. Eichhornea sp. in abundance. Cooperative fishing

SI No	Name	Location	Approx. area (acres)	Source	Nature	Remarks
6.	Badu beel	North 24 Parganas Madhyamgram	20	do -	- do -	-do-
7.	Santragachi jheel	Haora	10	do	Highly alkaline	Heavily infested with macrophytes. Littoral decaying vegetation covers almost the entire wetlands. *Eichhornea* sp. in abundance. No organised fishing.
8.	Kashipur Hugla jheel	Hugli	15	do	-do-	Moderately infested with macrophytes. *Eichhornea* sp. in abundance
9.	Dankuni wetland	Hugli	25	do -	-do-	Moderately to heavily infested with macrophytes indifferent zones. *Eichhornea* sp. in abundance
WETLAND TYPE III LARGE FISH CULTURE PONDS (*Bheri*)						
10	Kalikapur bheri	S 24 Pgs Kalikapur	100	- do -	Moderately alkaline	Sparsely infested with macrophytes. Extensive fish culture. Periodical release of fingerlings and harvesting of common carps and exotic carps. Manual weed control.
11	Bagnan Bheri	Howrah Bagnan		do -	Highly alkaline	-do-
12	Baranagar	N 24 Pgs		-do-	Moderately alkaline	Moderately infested with macrophytes, intensity varies from region to region. Seasonal fishing,

SI No	Name	Location	Approx. area (acres)	Source	Nature	Remarks
WETLAND TYPE IV- SEWAGE-FED FISH CULTURE POND						
13.	Bantala (East Calcutta Wetlands)	South24 Parganas Bantala	5	Rainwater/ Sewage of Kolkota	Highly organic Load, AlK	High organic load due to input of sewage. Very thin littoral strands of macrophytes. *Eichhornea* sp. present Intensive fishing, weed control.
14.	Bantala Pond –II	-do-	3	-do-	-do-	-do-
15.	Brace Bridge pond (West Calcutta wetlands)	South 24 Parganas, Budge Budge	3	-do-	-do-	-do-
WETLAND TYPE V- MULTIPURPOSE SMALL (Village/ PONDS (Pukur)						
16.	Canning pond	S 24 Pgs Canning	1.2	Rainwater	Highly eutrophic	High organic load due to disposal of kitchen refuse and other organic matter. Sparsely infested with submerged as well as floating macrophytes. *Eichhornea* sp. present in small patches. Emergent vegetation moderate. No. Organised fishing but used extensively for bathing, Washing and other domestic purposes.

SI No	Name	Location	Approx. area (acres)	Source	Nature	Remarks
17	Domjur pond	Haora	1.5	-do-	do-	-do-
18.	Kharagpur	Mednipur	1.5	-do-	-do-	-do-
WETLAND TYPE VI URBAN RECREATI ONAL (MAN MADE) LAKES *(Lake Sarobar)*						
18.	Kharagpur	Mednipur	1.5	-do-	-do-	-do-
19.	Rabindra Sarovar	Calcutta eutrophic	76	Rainwater	Moderately	Moderately infested with macrophytes. *Ceratophyllum* sp. dominate. Decaying vegetation at some places. No fishing. Visited by a large number of people daily.
20.	Subhas Sarovar	-do-	18	-do-	-do-	Moderately infested with macro phytes. Seasonal sport fishing

For quantitative analysis of relative abundance and density, identification and enumeration were done simultaneously on a Sedgwick Rafter counter by taking 1-ml subsample and then raising to total volume of water filtered. The quantitative studies were carried out in one wetland (Table 1) of each type, which are Beri Gopalpur (Type I), Barti Beel (Type II), Kalikapur bheri (Type III), Bantala pond-1 (Type IV), Canning pond (Type V) and Rabindra Sarovar (Type-VI). The Mean annual numerical density of total zooplankton is computed as number per liter and relative composition of major groups are expressed in terms of percentage to total density.

The species diversity of zooplankton in the selected wetlands was assessed by Margalef's Species richness index (d) as modified by Brower and Zar (1977)

$$D = \frac{S - 1}{\log_e N}$$ S = no. of species, N = no. of individuals

The similarity analysis between the wetlands studied was carried out by computing Sorensen's Coefficient of Community (CC)

CC (Coefficient of community) = 2C/A+B (Sorensen, 1948)

Where A = number of species in sample A, B= no. of species in sample B and C = no. of species common to both samples

Some important parameters of water quality were also analysed, following APHA (1991)

RESULTS

1. Physico-Chemical Characteristics of Water Quality

Table 2 gives the range of values of some important physico-chemical parameters of water quality in different wetland types. There were not many differences in the range of water temperature between different wetland types and the mean minimum and mean maximum values ranged between 21.0 °C – 23.0 °C and 31.0 °C- 33.0 °C respectively. Neither increase nor decrease in the water temperature was severe during any time of the year. The Sechi disc transparency differed considerably between the wetlands. Highest transparency was noticed in Type-I and Type II, in macrophyte free zones. Lowest values were recorded from Type V. All the wetland types were highly alkaline as pH values were always above 7.5. Not much significant differences in the pH range between different wetland types were noticed. PH of fish culture ponds (Type III and IV) were comparatively higher than others. Both bheries (fish culture ponds, Types III and IV) were characterised by high specific conductivity. The dissolved oxygen contents and total alkalinity were moderate to high in all wetlands. Water of all wetlands was sufficiently hard as hardness values ranged between 125 and 260 mg/l. Highest values of chloride ion was noticed in Type V (Village pond).

2. Diversity

The zooplankton community was mainly comprised of 3 groups, viz. Rotifera, Crustacea: Cladocera and Crustacea : Copepoda. The occurrence of species in the different wetland types is shown in Table 3.

Table 2. General Physico-chemical characteristics of Wetland Types (Combined range of values)

	Wetland					
	Type-I Oxbow wetlands (baors/ beels)	Type- II Natural wetlands (Beels/ jheels	Type-III Fish culture ponds (Bheries)	Type-IV Sewage-fed Fish culture ponds (Sewage bheries	Type-V Multipur- Pose village pond (pukur)	Type-VI Urban recreational (man made) lakes
Water Temperature (°C)	22.0- 32.4	21.75-33.0	22.5 – 32.5	21.75-32.22	1.0- 31.0	23.0-32.8
Secchi Disc Transparency (cm)	65-125	78-110	50-85	50 -60	45-55	70 -95
pH	7.5 8.2	7.8-8.6	7.9- 8.5	8.0 8.6	7.8 8.3	7.8 8.7
specific conductivity umhos/cm	330-465	410-505	650- 980	975 -1370	450-810	328-719
Dissolved Oxygen (mg/l)	5.2-8.8	5.0- 9.0	4.8- 8.2	4.5-8.5	5.0 7.8	4.60-7.1
Total alkalinity (mg/l)	125-172	155-195	190-275	175-265	155 225	246-366
Chloride (mg/l)	17-38	27-48	75 130	90 175	105 -175	28-50
Total Hardness (mg/l) (CaCO3)	125-180	150-190	185- 235	200 260.	190 260	175-230

ROTIFERA

Rotifera, also called Rotatoira or wheel animalcules, include a group of pseudoceoelomate microscopic animals. These are characterised by the possession of a wheel organ called corona which is either a funnel-shaped structure or a ciliated area at the anterior end and a specialized pharynx called mastax. These are one of the oldest group of animals having world wide distribution and occur in an endless variety of aquatic and semiaquatic habitats including the limnetic and deepest regions of largest lakes and smallest puddles (Pennak, 1978). They are the integral components of the freshwater zooplankton communities of both lotic and lentic water bodies and contribute significantly to food chain. Their rapid turnover rate is of considerable importance in the trophic dynamics of the aquatic ecosystems.

Table 3. Occurrence and abundance of Zooplankton species in different of wetlands
+ present - absent

Group/Species	Wetland types							
	Length range μ-rotifers mm-others	Total No. of species in the group (all wetlands)	Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose village ponds	Typt-VI Urban recreational lakes
ROTIFERA *(No. of species)*		43	37	31	20	16	25	23
Subclass EUROTATORIA								
Superorder MONOGONATHA								
Order: PLOIMIDA								
Family BRACHIONIDAE								
1. *Brachionus angularis* Gosse	81-104		+	+	+	+	+	+
2. *Brachionus bidentata* Anderson	162-198		+	+			+	
3. *Brachionus calcyflorus* Pallas	350-370		+	+		+	+	+
4. *Brachionus caudatus* (Fadeev)	190-203		+	+	+	+	+	+
5. *Brachionus fulcatus* Zacaharias	190-340		+	+				+
6. *Brachionus forficula* Wierzejski	90-115		+	+	+		+	
7. *Brachionus patulus* (Muller)	180-200		+		+			-
8. *Brachionus quadridentatus* Hermann	225-235		+	+				+
9. *Brachionus rubens* Ehrenberg	155-205			+	+	+	+	+

Group/Species	Wetland types							
	Length range μ-rotifers mm-others	Total No. of species in the group (all wetlands)	Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose villarge ponds	Typt-VI Urban recreational lakes
10. *Keratrella procurva* (Thorpe)	125-135		+	+	+			
11. *Ketatrella quadrata* (Muller)	180-205						+	+
12. *Keratrella tropica* (Apstein)	110-166		+	+	+	+	+	+
13. *Anuraeopsis fissa* Gosse	70-92		+		+			
Family EUCHLANIDAE								
14. *Euchlanis dilatata* Ehrenberg	120-135		+	+				
Family MYTILINIDAE								
15. *Mytilina ventralis* (Ehrenberg)	162-200*		+	+				
Family TRICHOTRIDAE								
16. *Trichotria tetractis* (Ehrenberg)	118-145*		+					+
Family COLURELLIDAE								
17. *Lapadella acuminata* (Ehrenberg)	80-100*		+			+	+	
18. *Lapadella ovalis* (Muller)	80-115*		+	+	+		+	
19. *Lapadella patella* (Muller)	68-95*		+	+			+	+
20. *Lapadella triptera* Ehrenberg	47-58*		-	+		+		+

Group/Species	Wetland types							
	Length range μ-rotifers mm–others	Total No. of species in the group (all wetlands)	Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose villarge ponds	Typt-VI Urban recreational lakes
Family LECANIDAE								
21. *Lecane (L.) aculeata* (Jakubski)	50-73⁰		+	+	+	+		
22. *Lecane (L.) crepida* Harring	70-75⁰		+				+	+
23. *Lecane (L.) curvicornis* (Murray)	130-135⁰		+	+	+		+	
24. *Lecane (L.) hornemanni* (Ehrenberg)	55-75⁰			+	+	+		+
25. *Lecane (L.) leonitina* (Turner)	120-153⁰		+	+			+	
26. *Lecane (L.) ludwegi* (Eckstein)	100-115⁰		+		+	+	+	+
27. *Lecane (L.) Luna* (Muller)	98-108⁰		+	+		+	+	+
28. *Lecane (L.) nana* (Murrey)	44-55⁰		+	+	+		+	+
29. Lecane *(L.) papuana* (Murray)	95-110⁰		+					+
30. *Lecane (L.) ungulata* (Gosse)	170-200⁰		+	+		+		+
31. *Lecane (Monostla) bulla* (Gosse)	114-127⁰		+	+	+		+	
32. *Lecane (M.) closterocerca* (Schmarda)	54-61⁰				+	+		
33. *Lecane (M.) furcata* (Murray)	50-55⁰		+	+	+		+	+
34. *Lecane (M.) hamata* (Stokes)	70-74⁰		+	+			+	
35. *Lecane (M.) lunaris* (Ehrenberg)	97-108⁰		+		+	+	+	
36. *Lecane (M.) quadridentata* (Ehrenberg)	100-106⁰		+	+				+

Group/Species	Wetland types							
	Length range μ-rotifers mm–others	Total No. of species in the group (all wetlands)	Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose villarge ponds	Typt-VI Urban recreational lakes
Family TRICHOCERCIDAE								
37. *Trichocerca (Trichocerca) Rattuus* Muller	125-150		+	+				
38. *Trichocerca (Diurella) similis (Wierzejski)*	135-140		+					
Family ASPLANCHNIDA								
39. *Asplanchna brightwelli*	500-600		+	+			+	+
Family SYNCHAETIDAE								
40. *Polyarthra vulgaris* Carlin	90-128		+	+	+	+	+	
Family GASTROPODIDAE								
41. *Ascomorpha ovalis* (Bergendal)	100-112		+	+				
Order GNESIOTROCHA								
Family TESTUDINELLIDAE								
42. *Testudinella patina* (Hermann)	135-170*		+				+	
Family FILINIDAE								
43. *Filinia longisesta* (Ehrenberg)	130-175		+	+	+	+	+	+

Group/Species	Length range μ-rotifers mm–others	Total No. of species in the group (all wetlands)	Wetland types: Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose villarge ponds	Typt-VI Urban recreational lakes
CLADOCERA *(No. of species)*		36	25	24	18	12	18	23
Family SIDIDAE								
44. *Sida crystallina* (Muller)	0.95-1.55		+		+			+
45. *Pseudosida bidentata* Herick	0.90-1.25		+	+	+			+
46. *Lantonopsis australis* Sars	1.15-1.55		+	+				+
47. *Diaphanosoma sarsi* Richard	0.80-1.10		+	+				+
48. *Diaphanosoma excissum* Sars	0.65-0.90		+		+	+	+	
Family DAPHNIIDA								
49. *Ceriodaphnia cornuta* Sars	0.45-0.65			+	+	+	+	+
50. *Daphnia cephalata* (King)	1.70-2.50		+					
51. *Daphnia carinata* King	2.90-4.00		+	+				+
52. *Daphnia. lumhiltzi* Sars	1.75-2.50		+	+				
53. *Scapholeberis kingi* Sars	0.52-0.80		+		+	+		+
54. *Simocephalus vetulus* (Muller)	1.50-3.00			+				
55. *Simocephalus exspinosus* (Koch)	1.20-2.00		+				+	+
Family MIONIDAE								
56. *Moina micrura* Kurz	0.75-1.15		+	+	+	+	+	+
57. *Moinodaphnia macleayi* (King)	0.58-0.91				+	+		+

Group/Species	Wetland types							
	Length range μ-rotifers mm-others	Total No. of species in the group (all wetlands)	Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose villargeponds	Typt-VI Urban recreational lakes
Family BOSMINIDAE								
58. *Bosmina longirostris* (Muller)	0.56-0.62		+	+	+		+	+
Family MACROTHRICIDAE								
59. *Macrothrix spinosa* King	0.41-0.55			+			+	
60. *Macrothrix goeldii* Richard	0.42-0.45		+		+	+		+
61. *Echinisca triserialis* (Brady)	0.48-0.61		+	+			+	-
Family CHYDORIDAE								
Subfamily Chydorinae								
62. *Pleuroxus similis* Vavra	0.32-0.42		+	+	+	+		-
63. *Alonella exisa* (Fischer)	0.35-0.45		+		+			+
64. *Chydorus sphaericus* (Muller)	0.29-0.38			+	+	+	+	+
65. *Chydorus barroisi* (Richard)	0.30-0.38		+	+				
66. *Dunhevedia crassa* King	0.45-0.50				+		+	+
67. *Pseudochydorus globosus* (Baird)	0.78-0.82			+	-		+	
Subfamily Aloninae								
68. *Alona quadrangularis* (Muller)	0.78-0.90		+	+	-	+	+	+
69. *Alona rectangula* Sars	0.30-0.55		-	-	+	-	+	+

Group/Species	Wetland types							
	Length range μ-rotifers mm–others	Total No. of species in the group (all wetlands)	Type-I Oxbow Wetlands	Type-II Natural Wetlands	Type-III Fish culture ponds	Type-IV Sewagefed fish culture ponds	Type-V Multipurpose villarge ponds	Typt-VI Urban recreational lakes
70. *Alona davidi davidi* Richard	0.31-0.45			+	+		+	+
71. *Alona pulchella* King	0.47-0.50		+	+			-	-
72. *Acropus harpae* (Baird)	0.40-0.51		+	+	+		+	+
73. *Comptocercus rectirostris* Schoedler	0.68-0.80		+	+			+	+
74. *Leydigia acanthocercoides* (Fischer)	0.72-0.83		+				+	
75. *Biapertura affinis* (Leydig)	0.62-0.75							+
76. *Biapertura karua* (King)	0.30-0.37		+	+	+	+		+
77. *Notoalona globulosa* (Daday)	0.30-0.36		+		+	+		
78. *Oxyurella singalensis* (Daddy)	0.75-0.80		+	+			+	+
79. *Kurzia longirostris* (Daddy)	0.45-0.54			+		+	+	
COPEPODA								
Suborder CALANOIDA *(No.of species)*		5	4	5	3	1	5	4
Family DIPTOMIDAE								
80. *Heliodiaptomus cinctus* (Gurney)	0.95-1.40 ♀		+	+	+		+	
81. *Heliodiaptomus contortus* (Gurney)	0.92-1.25 ♀		+	+	+	+	+	+
82. *Heliodiaptomus viduus* (Gurney)	1.75-2.25 ♀			+			+	+

Group/Species	Wetland types							
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83. *Neodiaptomus strigilipes* Gurney	1.05-1.20 ♀		+	+	+		+	+
84. *Phyllodiaptomus blanci* (Gueme & Richard)	1.60-1.70 ♀		+	+			+	+
Suborder CYCLOPOIDA *(No. of sp.)*		5	5	5	3	2	4	4
Family CYCLOPIDAE								
85. *Mesoccyclops Leuckarti* (Claus,)	0.95-1.30 ♀		+	+	+	+	+	+
86. *Mesoccyclops hyalinus* (Rehberg)	0.90-1.05 ♀		+	+	+	+	+	+
87. *Microccyclops varicans* (Sars)	0.75-0.90 ♀		+	+	+		+	+
88. *Paracyclops fimbriatus* Claus	0.75-0.90 ♀		+	+				
89. *Trophocyclops prascinus* (Fischer)	0.70-0.95 ♀		+	+			+	+
Total Number of Species		89	71	65	44	31	52	54

* Lorical Length, ⁰ Dorsal plate length, ♀ length of female.

N.B. In addition to above, a few species of rotifers recorded recently from oxbow wetlands, are under study

The systematic account of the recorded species follows.

Since their discovery by Leeuwenhoek (1703), rotifers have attracted considerable attention, both from taxonomists and aquatic biologist. Notable contribution on their taxonomy is from the works of Voigt (1957), Edmondson (1959), Bartos (1959), Rudescu (1960), De Beauchamp (1965), Kutikova (1970), Koaste (1970), Ruttner-Kolisko (1974) and Pontin (1978)

In India, taxonomic studies on the rotifers made their beginning with the work of Anderson (1889) who worked out some collections from Calcutta and identified several species. Since then a number of workers (Edmondson and Hutchinson, 1934; Sewell, 1934, 1935; Chacko and Krishnamurthy, 1954; Arora, 1962, 1963 1965, 1966a, 1966b; Wulfert, 1966; Naidu, 1967; Nayar, 1967, 1968; Vasist and Gupta, 1967; Vasist and Battish 1971a, 1971 b, 1971c; Dhanapati, 1974, 1975, 1976; Das and Akhtar, 1976 and Sharma, 1978b, 1978c, 1979a, 1979b, 1983, 1999a) contributed significantly to the knowledge of rotifer fauna. These contributions revealed the existence of nearly 310 species in the country. Inspite of this, the planktonic rotifers from different regions of the country have yet not been properly worked out and most of the workers of general plankton ecology report only a few species either from a particular water body or from the region.

From West Bengal, besides the earlier contribution of Anderson (1889) and Sewell (1934, 1935), Sharma in a series of papers (loc. cit.) have worked out the rotifer fauna of the region in considerable details.

The rotifer fauna of the wetlands studied belonged to 43 species under 12 families. Out of this, 8 families were represented by single species and one family by two species. Rest species belonged to 3 families *viz.* Brachionidae, Colurellidae and Lecanidae. The classification and key characters are based on Koste (1978) and Sharma (1999a).

SYSTEMATIC LIST OF RECORDED TAXA

Subclass EUROTATORIA
Superorder MONOGONATHA
Order PLOIMIDA
Family BRACHIONIDAE

1. *Brachionus angularis* Gosse
2. *B. bidentata* Anderson
3. *B. calcyflorus* Pallas
4. *B. caudatus* (Fadeev)

5. *B. fulcatus* Zacaharias
6. *B. forficula* Wierzejski
7. *B. patulus* Muller
8. *B. quadridentatus* Hermann
9. *B. rubens* Ehrenberg
10. *Keratrella procurva* (Thorpe)
11. *K. quadrata* (Muller)
12. *K. tropica* (Apstein)
13. *Anuraeopsis fissa* Gosse

Family EUCHLANIDAE

14. *Euchlanis dilatata* Ehrenberg

Family MYTILINIDAE

15. *Mytilina ventralis* (Ehrenberg)

Family TRICHOTRIDAE

16. *Trichotria tetractis* (Ehrenberg)

Family COLURELLIDAE

17. *Lapadella acuminata* (Ehrenberg)
18. *L. ovalis* (Muller)
19. *L. patella* (Muller)
20. *L. triptera* Ehrenberg

Family LECANIDAE

21 *Lecane(L.) aculeata* (Jakubski)
22. *L.(L.). crepida* Harring.
23. *L.(L.) Curvicornis* (Murray)
24. *L.(L.). hornemanni* (Ehrenberg)
25. *L.(L.) leonitina* (Turner)
26. *L.(L.) ludwegi* (Eckstein)
27. L.*(L.) Luna* (Muller)
28. *L.(L.) nana* (Murrey)
29. *L.(L.) papuana* (Murray)
30. *L.(L.) ungulata* (Gosse)
31 *L. (Monostyla) bulla* (Gosse)

32. *L.(M.) closterocerca* (Schmarda)
33. *L.(M.) furcata* (Murray)
34. *L.(M.) hamata* (Stokes)
35. *L.(M.) lunaris* (Ehrenberg)
36. *L.(M.) quadridentata* (Ehrenberg)

Family TRICHOCERCIDAE

37. *Trichocerca (Trichocerca) rattus* (Muller)
38. *Trichocerca (Diurella) similis* (Wierzejski)

Family ASPLANCHNIDAE

49. *Asplanchna brightwelli* Gosse

Family SYNCHAETIDAE

40. *Polyarthra vulgaris* Carlin

Family GASTROPODIDAE

41. *Ascomorpha ovalis* (Bergendal)

Order GNESIOTROCHA
Family TESTUDINELLIDAE

42. *Testudinella patina* (Hermann)

Family FILINIDAE

43. *Filinia longisesta* (Ehrenberg)

SYSTEMATIC ACCOUNT

Subclass EUROTATORIA Bartos, 1959

Bisexual, ovary with vitellarium, reproduction parthenogenetic. This subclass was represented by only one superoder, Monogononata in the present studies.

Superoder MONOGONONATA Wesenberg-Lund, 1889

This superorder is characterised by the presence of unpaired ovaries and non-ramate mastax. It was represented by two orders, Ploimida and Gnesiotrocha.

Key to the superorder MONOGONOMATA

1. Trophi varied, foot without cilia ..... Order PLOIMIDA
2. Trophi malleoramate, foot with cilia ..... Order GNESIOTROCHA

Order PLOIMIDA Delage 1897

Variable body shapes, loricate and illoricate forms, corona - diverse type. Trophi-caudate, forcipate, incaudate, malleate or virgate. Foot with both paired and unpaired toes, without cilia. Free living and free swimming forms. The order is represented by 11 families in southeastern West Bengal.

Key to families of order PLOIMIDA

1. Corona of highly developed type, with little ciliation posterior to mouth, buccal field highly modified, as a triangular Area anterior to mouth, bordered on each side by a line of enlarged fused cilia (*Brachionus* or *Euchlanis* type) 2

- Corona Primitive type, with a thin course of cilia around. The head sometimes broken by gaps small buccal area. (*Notommata* or *Asplanchna*-type). 7

2. Trophi malleate, not modified for suction 3

   Trophi malleate, modified for suction, foot short 2 segmented, ... Family Lecanidae

3. Head with small retractile shield, Corona with lateral Lamellae ..... Family Colurellidae

   Head without shield, Corona without lateral lamellae 4

4. No longitudinal sulcus on dorsal surface of lorica 5

   Loica with longitudinal dorsal sulcus and with spines ..... Family Mytilinidae

5. Only trunk covered with lorica. 6

   Head, trunk and foot with well demarcated lorica , dorsal surface of lorica without spine, heavy dorsal spines on first joint of foot ..... Family Trichotridae

6. Dorsal and ventral plate of lorica fused at the edges. ..... Family Brachionidae

- Dorsal and ventral plates of lorica joined laterally by a thin membrance, lorica strong, with single lareral circus ..... Family Euchlanidae

7. Corona *Notommata* type, trophi virgate ..... Family Notommatidae*

- Corona *Asplanchna* type. Trophi incudate, ... 8

8. Trophi virgate 9

- Trophi incaudate, large body without lorica, no intestine ..... Family Asplanchnidae

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* Not recorded during present study

9. Corona symetrical 10

- Corona asymmetrical, foot present with equal or unequal bristle like toes ..... Family Trichocercidae

10. ..... Corona as a small ring. Stomach with blind extension ..... Family Gastropodidae\

- Corona reduced to small zone around mouth. Stomach without any blind extension ..... Family Synchaetidae

Key to the families of Order GNESIOTROCHA

1. Lorica distinct, with a prominent foot opening, retractable annulated foot ..... Family Testudinellidae

- Body illoricate, foot absent, body with 3 long Cuticular setae ..... Family Filiniidae

Family BRACHONIDAE Wesenberg-Lund 1899

Key to recorded genera of family BRACHIONIDAE.

1. Foot present, annulated and retractile within lorica ..... Genus *Brachionus*

- Foot absent 2

2. Lorica with distinct occipital spines. Dorsum with varying pattern ..... Genus *Keratella*

- Lorica without occipital spines. Dorsum without any pattern ..... Genus *Anuraeopsis*
Anuraeopsis fissa

Genus ***Brachionus*** Pallas, 1766

Key to recorded species of genus *Brachionus*

1. Prominent spines on anterior ventral margin ..... *Brachionus patulus*

- Anterior ventral margin without prominent spines 2

2. Six occipital spines 3

- Occipitals spines fewer than six 6

3. Lateral occipital spine longest 4

- Lateral occipitals spine not longest 5

4. Basal plate present. Posterior spines wide apart ..... *Brachionus bidentata*

   Basal plate absent Posterior spines close together..... *Brachionus caudatus*

5. Intermediate occipital spines longest .....*Brachionus falcatus*

- Median occipital spines longest, occipital spines saw toothed .... *Brachionus rubens*

6. With 2 occipitals spines ..... *Brachionus angularis*

- With 4 occipitals spines 7

7. Lorica globular, not separated into dorsal and ventral plates..... ..... *Brachionus calcyflorus*

- Lorica compressed, separated into distinct dorsal and ventral plates. 8

8. Posterior spines wide apart at base ..... *Brachionus forficula*

- Posterior spines close together at base ..... *Brachionus diversicornis*

1. ***Brachionus angularis*** Gosse
(Fig. 1)

1851. *Brachionus angularis* Gosse, *Abhandl.Akad. Wiss Berlin*, p. 203.

1999. *Brachionus angularis* Gosse: Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p.354.

Characters : Lorica stippled, compressed dorsoventrally, anterior end with two small projections, posterior end without any projection. Anterior occipital margin with two median spines, posterior spines lacking. Foot-opening large.

Size range : length- 81-114μ , width 68-75μ

Distribution : India : Andhra Pradesh, Assam, Delhi, Haryana, J& K, Maharashtra, Madhya Pradesh, Orissa, Punjab, Tripura and West Bengal. Elsewhere : Cosmopolitan.

2. ***Brachionus bidentata*** Anderson
(Fig. 2)

1889. *Brachionus bidentata* Anderson, *Abhandl.Akad. Wiss Berlin* : 352,

1999. *Brachionus bidentata* Anderson : Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p 354.

Characters : Lorica firm, stippled and moderately elongated with definite pattern of plaques. Dorsal and ventral plates joined together for more than half of the length of lorica and then diverge to unite with another plate. Six occipital spines on anterior margin, laterals and medians longer than intermediates. Posterior spines nearly parallel on the sides. Foot-opening with a foot sheath.

This is a polymorphic species and several subspecies occur in the region. No attempt has been made during present investigations to separate subspecies/forms.

Size range : 162-198μ, width: 94-103μ

Distribution : India: Andhra Pradesh, Haryana, Orissa, Punjab, Tripura and West Bengal. Elsewhere: Tropics and Subtropics.

3. ***Brachionus calyciflorus*** Pallas
(Fig. 3)

1766. *Brachionus calyciflorus* Pallas, *Hagae Comitum*, p.93.

1999. *Brachionus calyciflorus* Pallas : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p.356.

Characters : Lorica flexible, almost oval, not separated into dorsal and ventral plates; occipital spines four, broad-based and of varying lengths, usually medians longer than laterals, posterior and posterolateral spines with variable lengths, sometimes absent.

This is a polymorphic species and occurs in several forms. No attempt has been made during present investigations to separate subspecies/forms.

Size range : Length- 350-370μ, width -180-235μ.

Distribution : India : Andhra Pradesh, Assam, Madhya Pradesh, Meghalaya, Orissa, Punjab, Tripura and West Bengal. Elsewhere : Cosmopolitan.

4. ***Brachionus caudatus*** Barrois & Daday
(Fig. 4)

1894 *Brachionus caudatus* Barrois & Daday, *Revue Biol. Du Nord de la France*, **61**, p. 232.

1999. *Brachionus caudatus* Barrois & Daday : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p.358.

Characters : Lorica firm, moderately compressed, heavily stippled with a pattern of cuticular ridges, Six occipital spines, laterals longer than and medians, posterior long, well developed.

It is another variable species of genus *Brachionus* .No attempt has been made during present investigations to separate subspecies/forms.

Size range : Length- 190-203μ, width 130-140μ

Distribution : India : Haryana, Orissa, Punjab, Tripura and West Bengal. Elsewhere: Tropics and subtropics

5. ***Brachionus falcatus*** Zacharias
(Fig. 5)

1898. *Brachionus falcatus* Zacharias. *Forschungsber. Biol. Stn. Zu Plon*, **6**, p. 45.

1999. *Brachionus falcatus* Zacharias : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p.361.

Characters : Lorica firm, lightly stippled, compressed dorsoventrally with distinct dorsal and ventral plates, occipital margin with six spines; intermediate spines curved ventrally, considerably larger than laterals and medians; laterals and medians of almost equal length. Posterior spines long, inwardly curved and widely separated basally.

Measurements : Total length : 190-340μ, width : 97-118μ.

Distribution : India : Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, Meghalaya, Orissa, Punjab, Rajasthan, Tripura and West Bengal. Elsewhere : Pantropical and Subpantropical.

6. ***Brachionus forficula*** Wierzejski
(Fig. 6)

1891. *Brachionus forficula* Wierzejski, *Bull. Soc.zool. France*, **16**, p. 51.

1999. *Brachionus forficula* Wierzejski: Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 361.

Characters : Lorica firm, stippled, moderately compressed dorso-ventrally. Occipital margins with four spines, rounded at tips; laterals always longer than medians. posterior spines long, bent inwardly and separated at their bases, each with a swelling on inner side near the base.

This is also a polymorphic species. No attempt was made during the present investigations to separate subspecies/forms.

Size range : Length- 90-115μ, width- 82-100μ.

Distribution : India : Andhra Pradesh, Gujarat, Orissa, Punjab, Tripura and West Bengal. Elsewhere : Pantropical and subpantropical

7. ***Brachionus patulus*** (O.F. Muller)
(Fig. 7)

1786. *Brachionus patulus* Muller, *Havanae* : p. 361.

1999. *Brachionus patulus patulus* (Muller) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p.362.

Characters : Lorica infexible, compressed dorsoventrally, somewhat rectangular; dorsum with cuticular ridges. Occipital and mental margins with stout blunt spines. Posterior spines also short and stout. Short unequal spines near Foot-opening

Measurements : Total length : 180-200μ; maximum width : 130-140μ.

Distribution : India : Andhra Pradesh, Gujarat, J&K, Kerala, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura and West Bengal. Elsewhere : Cosmopolitan.

8. ***Brachionus quadridentatus*** Hermann
(Fig. 8)

1783. *Brachionus quadridentatus* Hermann, *Naturforscher Halle*, **19**, p.47.

1999. *Brachionus quadridentatus quadridentatus* Hermann : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 364.

Characters : Lorica inflexible, stippled, moderately compressed dorsoventrally. Occipital margin with six occipital spines, median longest and outwardly curved, laterals longer than intermediates. Postero-lateral spines of varying length, ventro-posterior spines prolonged to form a sheath around foot.

Size range : Total length: 225-235μ; maximum width : 132-142μ.

Distribution : India : Andhra Pradesh Assam, J&K, Kerala, Orissa, Madhya Pradesh, Punjab Rajasthan, Tripura and West Bengal. Elsewhere : Tropics and subtropics.

9. ***Brachionus rubens*** Ehrenberg
(Fig. 9)

1838. *Brachionus rubens* Ehrenberg, *Leipzig* : 513.

1999. *Brachionus rubens* Ehrenberg : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p.365.

Characters : Lorica oval, firm, stippled, smooth, compressed dorsoventrally, anterior end broad with two small ridges on dorsal side. Occipital margins with six spines; medians longest, intermediates longer than laterals and with peculiar asymmetric shape, each spine with a narrow anterior part, then rounding outwards and forming a broad base. Four inner occipital spines with short ridges,; posterior spine absent.

Size range : Total length : 155-205μ; maximum width: 118-145μ.

Distribution : India: Assam, Haryana, Orissa, Punjab, Rajasthan, Tripura and West Bengal. Elsewhere : Cosmopolitan.

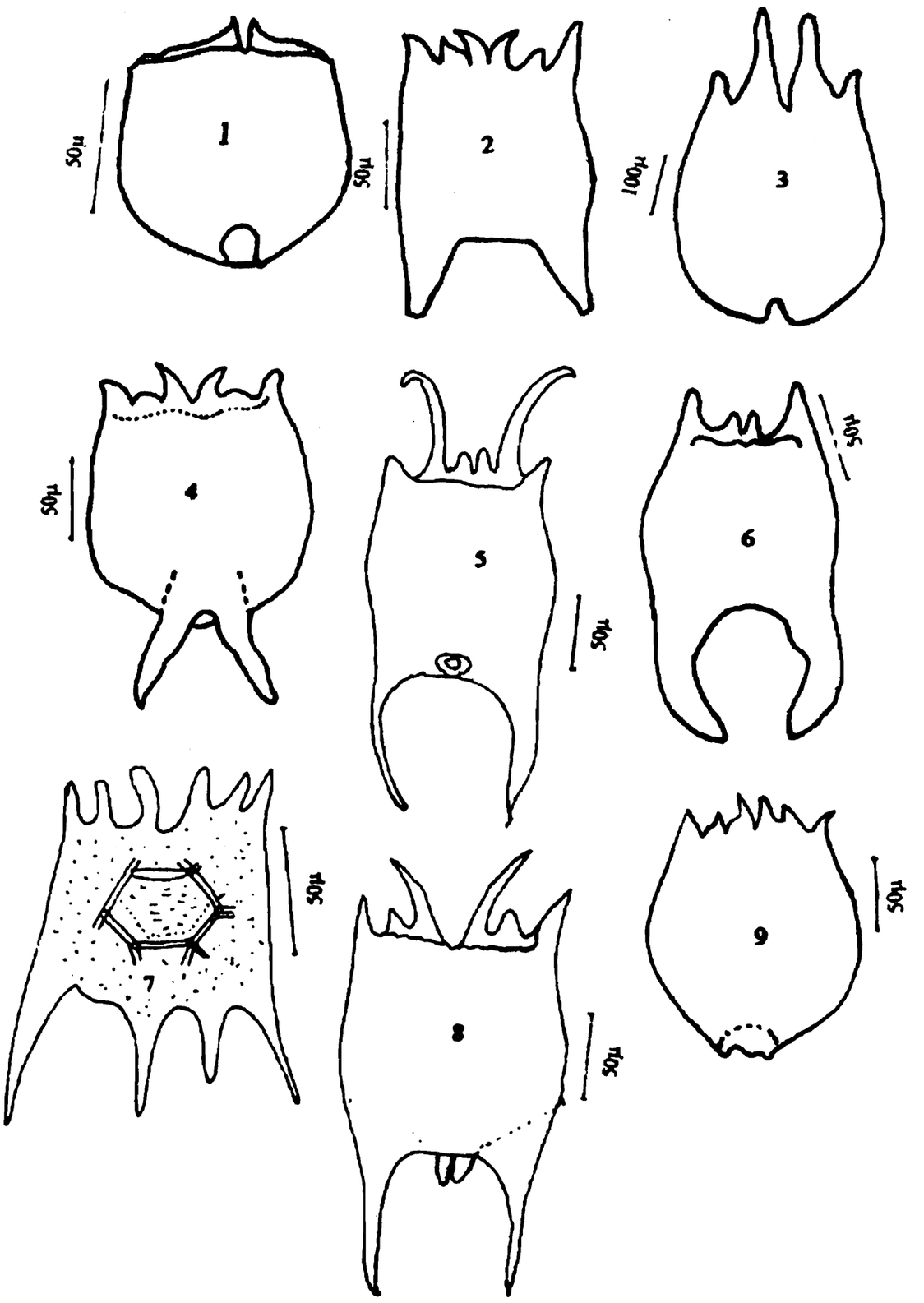

Fig. 1. *Brachionus angularis* Gosse, **2.** *Brachionus bidentata* Anderson, **3.** *Brachionus calcyflorus* Pallas, **4.** *Brachionus caudatus* (Fadeev), **5.** *Brachionus fulcarus* Zacaharias, **6.** *Brachionus forficula* Wierzejski, **7.** *Brachionus patulus* (O. F, Muller), **8.** *Brachionus quadridentatus* Hermann, **9.** *Brachionus rubens* Ehrenberg,

Genus ***Keratella*** Bory de St. Vincent, 1822

Key to recorded species of genus *Keratella*

1. Posterior median plaque pentagonal and terminating in a median line ..... *Keratella procurva*

- Posterior median plaque hexagonal and not terminating into a median line 2

2. Posterior spines distinctly unequal ..... *Keratella tropica*

- Posterior spines almost equal in length ..... *Keratella quadrata*

10. ***Keratella procurva*** (Thorpe)
(Fig. 10)

1891. *Anurea Procurva* Thorpe, *J. Roy. Micr. Soc*, p. 305.

1953. *Keratella procurva* (Thorpe) : Berzins. *Hydrabulosie*, **4** : 453-459.

1999. *Keratella procurva* (Thorpe) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 369.

Characters : Lorica elongated, composed of dorsal and ventral plates. Dorsal plate with three median plaques; posterior most plaque pentagonal and terminating in a short median line extending upto posterior margin of lorica. Six anterior occipital spines; median longest and curved ventrally, laterals shortest, posterior spines small and of almost equal length.

Size range : Length : 125-135μ, width : 54-84μ.

Distribution : India : J&K, Kerala, Orissa and West Bengal. Elsewhere : Pantropical and pansubtropical.

11. ***Keratella quadrata*** (O.F. Muller)
(Fig. 11)

1786. *Brachionus quadratus* Muller, *Havniae*, p. 354.

1913. *Keratella quadrata* (Muller) : Harring, *Bull. U.S. Nat. Museum*, **81**, p.57.

1999. *Keratella quadrata* (Muller) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 368.

Characters : Lorica almost rectangular, composed of dorsal and ventral plates. Dorsal plate with three median hexagonal plaques behind anterior median area; lateral plaques;

arranged symmetrically on either side of median plaques. Six anterior occipital spines; medians longest and curved. Posterior spines elongated, separated widely at their bases.

Size range : Length- 180-205μ, width- 72-82μ.

Distribution : India : Assam, J&K, Kerala, Tamil Nadu and West Bengal. Elsewhere : Cosmopolitan.

12. ***Keratella tropica*** (Apstein)
(Fig. 12)

1907. *Anurea valga f. tropica* Apstein, *Zool. Jb. Abt. Syst.* **25**, p. 210.

1955. *Keratella tropica* (Apstein) : Berzins, *Ark. Zool. Ser.* 2, **8**, p. 554.

1999. *Keratella tropica* (Apstein) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p.369.

Characters : Lorica elongate and oval composed of dorsal and ventral plates. Dorsal plate with three hexagonal plaques and a small (squarish) area between the last median plaque and the posterior margin. Six anterior occipital spines; medians longest, pointed and curved outwardly, intermediates shortest. Right posterior spines longer than left.

Size range : Length-110-166μ; maximum width : 72-86μ.

Distribution : India : Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, J&K, Kerala, Madhya Pradesh, Orissa, Punjab, Rajasthan, Tripura and West Bengal. Elsewhere : widely distributed in Tropics and subtropics.

Genus ***Anuraeopsis*** Lauterborn, 1900

13. ***Anuraeopsis fissa*** (Gosse)
(Fig. 13)

1851. *Anurea fissa* Gosse, *Abhandl. Akad. Wiss Berlin* p. 202.

1999. *Anuraeopsis fissa* (Gosse) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 370.

Characters : Lorica flexible, stippled and thin, more or less cylindrical, obtusely pointed posteriorly. Dorsal plate without any markings. Ventral plate slightly projecting laterally beyond the dorsal plate in the anterior region. Anterio dorsal margin with a shallow notch in the middle.

Size range : Length-70-92μ, width-45-60μ.

Distribution : India : Assam, Gujarat, Haryana, Kerala, Orissa, Punjab, Rajasthan, Tripura and West Bengal. Elsewhere : Cosmopolitan.

Family : EUCHALANIDAE Bartos 1959

Genus : ***Euchalanis*** Ehrenberg, 1832

14. ***Euchlanis dilatata*** Ehrenberg
(Fig. 14)

1832. *Euchlanis dilatata* Ehrenberg, *Abhandl. Akad. Wiss Berlin*, p. 131.

1999. *Euchlanis dilatata* : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 374.

Characters : Lorica transparent, flexible, vase-like, broad posteriorly and narrow anteriorly. Dorsal plate wide arched, Ventral plate flat, both plates joined by flexible cuticular membrane. Anterodorsal margin with a sharp notch in the middle, posterodorsal margins with a shallow notch. Caudal sense organs with two long hair.

Size range : Length dorsal plate; 160-190μ; length ventral plate : 145-155μ; width dorsal plate : 120-135μ; width ventral plate: 100-110μ

Distribution : India : Assam, Gujarat, J&K, Meghalaya, Orissa, Punjab, West Bengal. Elsewhere : Cosmopolitan.

Family MYTILINIDAE Bartos, 1959.

Genus ***Mytilina*** Bory de St. Vincent, 1826

15. ***Mytilina ventralis*** (Ehrenberg)
(Fig. 15)

1832. *Salpina ventralis* Ehrenberg, *Abhandl. Akad. Wiss Berlin* p. 133.

1913. *Mytilina ventralis* (Ehrenberg) : Harring, *Bull. U. S. Nat. Museum*, **46** p.75.

1999. *Mytilina ventralis* (Ehrenberg) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 376.

Characters : Lorica firm, heavily stippled anteriorly, laterlly flattend and almost barrel shaped. Dorsoventral plate with pointed spines both anteriorly and posteriorly. Both, posterodorsal and posteroventral spines short and variable in length. Foot with two well developed toes.

Size range : Lorica length : 162-200μ, maximum width : 72-94μ.

Distribution : Andhra Pradesh, Assam, Gujarat, J&K, Kerala, Madhya Pradesh, Orissa, Punjab, Rajasthan and West Bengal. Elsewhere : Cosmopolitan.

Family TRICHOTRIDAE Bartos, 1959

Genus *Trichotria* Bory de St. Vincent, 1827

16. *Trichotria tetractis* (Ehrenberg)
(Fig. 16)

1830. *Dinocharis tetractis* Ehrenberg, Berlin, p. 47.

1913. *Trichotria tetractis* (Ehrenberg) : Harring, *Bull. U. S. Nat. Museum*, **46**. p. 106.

1999. *Trichotria tetractis* (Ehrenberg) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11** : p. 106.

Characters : Clearly defined and strongly loricate head, trunk and foot. Lorica heavily stippled and longer than its width. Anterodorsal corners with small spines. Dorsum with distinct pattern of carinal plates and ridges. Second foot-segment longest. Toes long with pointed tips.

Measurements : Lorica length : 118-145μ; maximum width : 74-90μ.

Distribution : India Andhra Pradesh, Assam, Orissa, Gujarat, J&K, Kerala, Madhya Pradesh, Punjab, Tamil Nadu, West Bengal. Elsewhere : Cosmopolitan.

Family COLURELLIDAE Bartos, 1959

Genus *Lepadella (Lepadella)* Bory de St. Vincent, 1826

Key to recorded species of genus *Lepadella (Lepadella)*

1 Posterior end of lorica with a spine ..... *Lepadella acuminata*

Posterior end of lorica without any spine 2

2. Lorica with a distinct dorsal keel, small, pear-shaped ..... *Lepadella triptera*

Lorica without a dorsal keel, ... 3

3. Lorica compressed in cross-section ..... *Lepadella ovalis*

- Lorica not compressed in cross-section ..... *Lepadella patella*

17. *Lepadella (Lepadella) acuminata* (Ehrenberg)
(Fig. 17)

1834. *Metopidia acuminata* Ehrenberg, Folio Berlin p. 210.

1913. *Lepadella acuminata* (Ehrenberg) : Harring, *Bull. U. S. Nat. Museum*, **46**. p.63.

1999. *Lepadella (Lepadella) acuminata* : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, 384.

Characters : Lorica almost oval in outline, moderately compressed dorsoventrally; Dorsal plate convex and ventral plate nearly flat with anterior dorsal and ventral sinus. Posterior end of lorica produced into a pointed spine of variable length. Foot-groove oval, toes pointed.

Measurements : Lorica length : 80-100μ; maximum width : 55-68μ.

Distribution : India : Arunachal Pradesh, Assam Meghalaya, West Bengal. Elsewhere : Cosmopolitan.

18. ***Lepadella (Lepadella) ovalis*** (O.F. Muller)
(Fig. 18)

1786. *Brachionus ovalis* Muller, Havniae, p. 345.

1913. *Lepadella ovalis* (Muller) : Harring, *Bull. U. S. Nat. Museum*, **46**, p.45.

1999. *Lepadella (Lepadella) ovalis* (Muller) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, 385.

Characters : Lorica more or less circular in outline and compressed dorsoventrally. Dorsal plate convex and ventral plate nearly flat. Anterodorsal margins somewhat straight, anteroventral margins with V shaped notch. Toes relatively short and acutely pointed.

Measurments : Lorica length : 80-115μ; maximum width : 72-85μ.

Distribution : India : Arunachal Pradesh, Assam, J&K, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Tripura, West Bengal. Elsewhere : Cosmopolitan.

19. ***Lepadella (Lepadella) patella*** (O.F. Muller)
(Fig. 19)

1786. *Brachionus patella* Muller, Havniae, p. 341.

1826. *Lepadella patella* (Muller) : Bory de St. Vincent, Paris : I-XI +1, p. 86.

1999. *Lepadella (Lepadella) patella* (Muller) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 387.

Characters : Lorica oval in outline, dorsal plate strongly arched. Antero dorsalmargins straight and antero ventral margins with V–shaped notch. Foot-groove U-shaped; toes short, equal and acutely pointed.

Measurements : Lorica length : 68-95μ; maximum width : 55-70μ.

Distribution : India : Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura Orissa, Rajasthan, Gujarat, Punjab, J&K. West-Bengal; Elsewhere : Cosmopolitan.

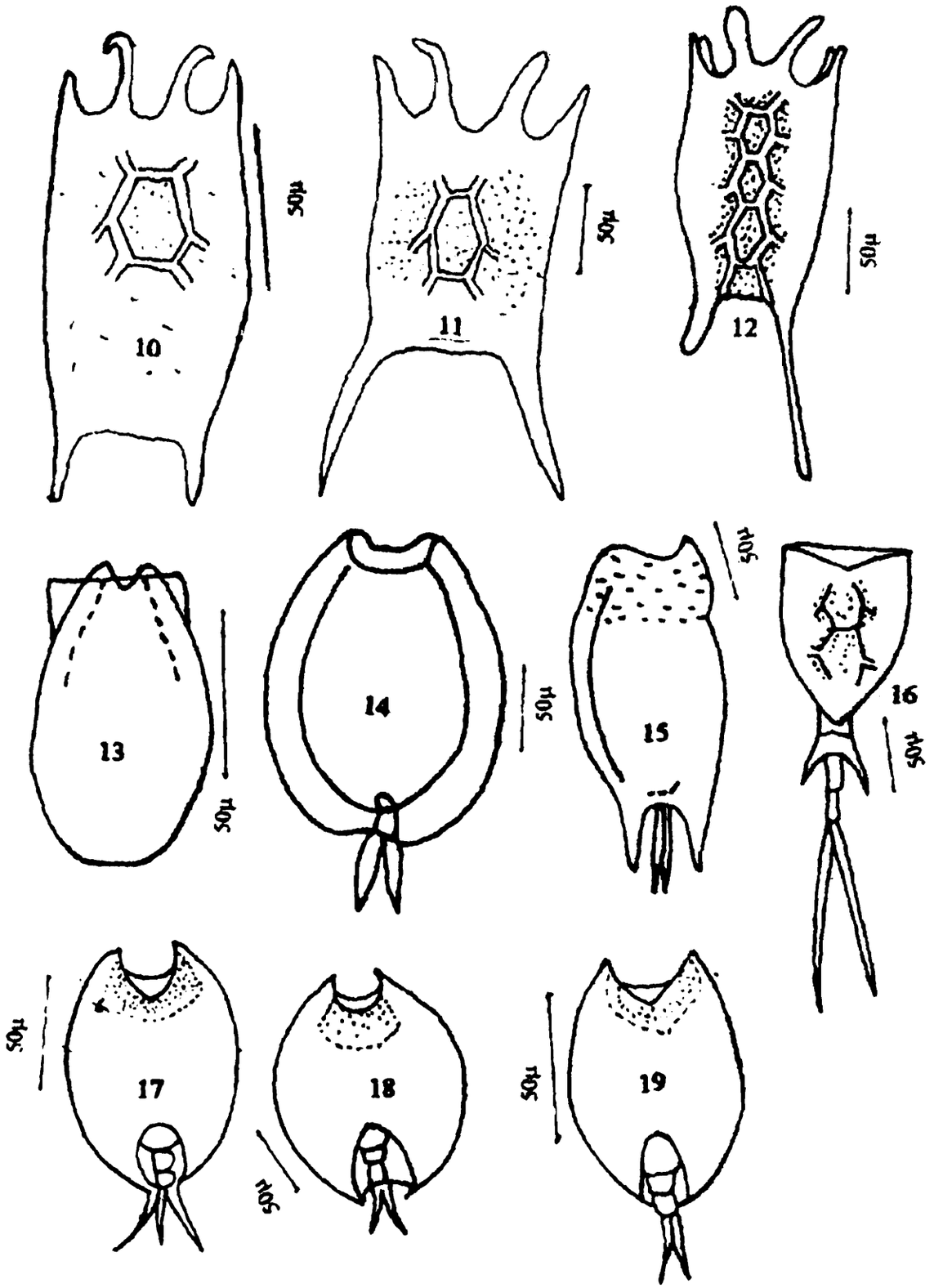

Fig. 10. *Keratrella procurva* (Thorpe), **11.** *Keratrella quadrata* (O. F. Muller), **12.** *Keratrella tropica* (Apstein), **13.** *Anuraeopsis fissa* Gosse, **14.** *Euchlanis dilatata* Ehrenberg, **15.** *Mytilina ventralis* (Ehrenberg), **16.** *Trichotria tetractis* (Ehrenberg), **17.** *Lapadella acuminata* (Ehrenberg), **18.** *Lapadella ovalis* (Muller), **19.** *Lapadella patella* (Muller),

20. ***Lepadella (Lepadella) triptera*** Ehrenberg, 1830
(Fig. 20)

1830. *Lepadella triptera* Ehrenberg, Berlin p. 74, 83.

1999. *Lepadella (Lepadella) triptera* : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 388.

Characters : Lorica small and somewhat pear-shaped in outline. Dorsal plate with a high, sharp median keel. Anterior end of dorsal plate with a shallow notch, ventral sinus almost U-shaped. Posterior end of lorica obtusely pointed. Toes short and pointed.

Measurements : Lorica length : 47-58μ; maximum width : 35-45μ.

Distribution : India : Assam, J&K, Meghalaya, Punjab, Tamil Nadu, West Bengal. Elsewhere : Cosmopolitan.

Family LECANIDAE Bartos 1959

Genus ***Lecane*** Nitzsch 1827

Key to subgenera of genus *Lecane*

1. Single Toe ..... *Lecane (Monostyla)*
2. Two separate toes ..... *Lecane (Lecane)*

Key to species of *Lecane (Lecane)* Nitzch 1827

1. Lorica with antero-lateral spines 2
- Lorica without antero-lateral spines 11
2. Toes with claws 4
- Toes without claws 3
3. Posterior end of ventral plate produced into a triangular spine .... *Lecane ludwigi*
- Posterior end of ventral plate not produced as triangular spine .. *lecane leontina*
4. Antero-lateral angle with distinct corner 5
- Antero-lateral angle with spines. 6
5. Antero-ventral margin undulating with a shallow median sinus .... *Lecane papuana*
- Antero-ventral margin slightly concave, lorica relatively broader ..... *Lecane Luna*
6. Lorica bigger in size, claws long ..... *Lecane ungulata*

Lorica comparatively smaller, claws small 7

7. Lorica oblong and parallal sided, dorsal plate narrower than ventral plate ..... *Lecane crepida*

- Lorica niether elongated nor parellal-sided 9

9. Anterior margin straight or coincident 10

- Anterior margin not straight or coincident. Anterior dorsal margin without fold. ..... *Lecane curvicornis*

10. Lorica compressed. Second foot–joint projecting beyond lorica ..... *Lecane aculeata*

- Lorica gibbous posteriorly. Second foot joints not projecting ..... *Lecane flexilis*

11. Lorica gibbous, posterior segment large. Toes outcurved..... *Lecane hornemanni*

Lorica relatively compressed. Posterior segment small Toes straight ..... *Lecane nana*

21. ***Lecane (lecane) aculeata*** (Jakubski)
(Fig. 21)

1912. *Distyla aculeata* Jakubski, Havniae, p. 543.

1932. *Lecane aculeata* (Jakubski) : Wiszniewski, *Arch. Hydrobiol. Rybactwa, Suwalki*, **6**, p.48.

1999. *Lecane (lecane)aculeata* (Jakubski) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 395.

Characters : Lorica composed of dorsal and ventral plates, oval and elongated in shape with straight anterior margins. Dorsal plate with distinct surface markings. Ventral plate narrower than dorsal with large spines at its external edges. Posterior segment broader and semicircular. Toes parallel sided and with distinct claws.

Measurements : Length dorsal plate : 50-73μ; length ventral plate : 55-60μ; width dorsal plate : 43- 49μ;width ventral plate : 40-44μ.

Distribution : India : Meghalaya, West Bengal. Elsewhere : Tropics and subtropics.

22. ***Lecane (Lecane) crepida*** Harring
(Fig. 22)

1900. *Distyla gissensis* Jennings, *Bull. U.S. Fish Comm. Washigton*, **19**, p. 91.

1914. *Lecane crepida* Harring, *Proc. U.S. Nat. Museum*, **47**, p.535.

1999. Lecane (Lecane) crepida Harring Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p.396.

Characters : Lorica elongated, composed of dorsal and ventral plates. Dorsal plate convex with three pairs of divergent ridge-like markings on the surface. Ventral plate broader than dorsal with a transverse fold in front of foot. Ventral margin with two stout anterior spines at its external angles. Toes long and slender, claws pointed.

Measurements : Length dorsal plate : 70-75μ; length ventral plate; 75-80μ; width dorsal plate; 36- 40μ; width ventral plate; 43-50μ.

Distribution : India : (South 24-Parganas, Barddhaman, Medinipur and Bankura); Assam, Gujarat Meghalaya, Punjab, Tamil Nadu, West Bengal. Elsewhere : Tropics and subtropics.

23. *Lecane (lecane) curvicornis* (Murray)
(Fig. 23)

1913. *Cathypna curvicornis* Murray, *J. Roy. Micr. Soc.* p. 346.

1914. *Lecane curvicornis* (Murray) : Harring, *Proc. U.S. Nat. Museum*, **47** : 537.

1999. *Lecane (lecane) curvicornis* (Murray) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 397.

Characters : Lorica pyriform, dorsal plate narrower than ventral plate, without any surface markings. Ventral plate with a transverse fold in its posterior region. Anterior margins coincident and with broad V-shaped sinus and prominent spines. Posterior segment small, rounded, tricuspidate. Toes long and straight. Claws small, each with a basal spicule.

Measurements : Length dorsal plate : 130-135μ; length ventral plate : 148-155μ; width dorsal plate : 130-140μ; width ventral plate : 110-120μ.

Distribution : India : Andhra Pradesh, Madhya Pradesh, West Bengal. Elsewhere: Tropics and subtropics.

24. *Lecane (Lecane) hornemanni* (Ehrenberg)
(Fig. 24)

1834. *Euchlanis hornemanni* Ehrenberg, *Folio Berlin* p. 206, 220.

1914. *Lecane hornemanni* (Ehrenberg) : Harring, *Bull. U.S. Nat. Museum*, **47**. p. 43.

1999. *Lecane hornemanni* (Ehrenberg) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 400.

Characters : Lorica broadly ovate; composed of dorsal and ventral plates; anterior margins slightly convex and without any spines at external angles. Dorsal plate semicircular and broader than ventral plate. Toes stout and tapering gradually to acute points.

Measurements : Length dorsal plate : 55-75μ; length ventral plate : 60-90μ; width dorsal plate : 63- 80μ width ventral plate : 54-63μ.

Distribution : India : Andhra Pradesh, Gujarat, J&K, Tamil Nadu, West Bengal. Elsewhere : Tropics and subtropics.

25. ***Lecane (Lecane) leontina*** (Turner)
(Fig. 25)

1892. *Cathypna leontina* Turner, Basel, p. 61.

1913. *Lecane leontina* (Turner) : Harring, *Bull. U.S. Nat. Museum*, **46**, p. 61.

1999. *Lecane (Lecane) leontina* (Turner) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 401.

Characters : Lorica oblong-ovate; composed of dorsal and ventral plates; Ventral plate broader than dorsal with triangular spines at anterior ridges. Posterior segment extending over foot as a tail-like projection. Toes long, parallel-sided; claws pointed; each with a basal spicule.

Measurements : Length dorsal plate : 120-153μ; length ventral plate : 145-175μ; width dorsal plate : 103-115μ; width ventral plate : 108-125μ.

Distribution : India : Assam, Andhra Pradesh, Arunachal Pradesh, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Tripura, West Bengal. Elsewhere : Tropics and subtropics.

26. ***Lecane (Lecane) ludwigi*** (Eckstein)
(Fig. 26)

1883. *Distyla ludwigii* Eckstein, *Z. wiss. zool*, **39**, p. 383.

1913. *Lecane ludwigi* (Eckstein) : Harring, *Bull. U. S. Nat. Museum*, **46**, p.61.

1999. *Lecane (Lecane) ludwigi* : Sharma, *State Fauna Ser. zool. Surv, India. Fauna of West Bengal*, **11**, p. 68.

Characters : Lorica oval; composed of dorsal and ventral plates. Ventral plate narrower than dorsal plate. Anterior margins coincident, slightly concave and with prominent spines at external angles of ventral margin. Posterior segment with long triangular spines. Toes long.

Measurements : Length dorsal plate : 100-115μ; length ventral plate : 118-140μ width dorsal plate : 62-72μ; width ventral plate : 58-63μ.

Distribution : India : Orissa, Andhra Pradesh and Punjab, West Bengal. Elsewhere : Cosmopolitan

27. ***Lecane (Lecane) luna luna*** (O.F. Muller)
(Fig. 27)

1776. *Cercaria luna* Muller, Havniae:, p. 280.

1913. *Lecane luna* (Muller) : Harring, *Bull. U. S. Nat. Museum*, **46**, p.61.

1999. *Lecane (Lecane) luna luna* (Muller) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 402.

Characters : Lorica subcircular, dorsal plate broader than ventral plate, ventral plate almost ovate, both plates with lunate anterior notch. Toes stout, parallel-sided, swollen at their bases and ending into distinct claws; each claw with a distinct basal spicule.

Measurement : Length dorsal plate : 108-125μ; length ventral plate : 120-135μ; width dorsal plate : 98-108μ; width ventral plate : 95-102μ.

Distribution : Arunachal Pradesh, Assam, Gujarat J&K, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Tripura, West Bengal. Elsewhere : Cosmopolitan.

28. ***Lecane (Lecane) nana*** (Murray)
(Fig. 28)

1913. *Cathypna nana* Murray, *J. Roy. Micr. Soc*, p. 353.

1914. *Lecane nana* (Murray) : Harring, *Bull. U.S. Nat. Museum*, **47**, p. 536.

1999. *Lecane (Lecane) nana* (Murray) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 403.

Characters : Lorica small and nearly subcircular; Ventral plate narrower than dorsal plate, parallel anteriorly and tapering posteriorly. Anterior margins coincident, slightly convex, external angles produced into distinct edges, Toes slender with curved and pointed tips.

Measurements : Length dorsal plate : 44-54μ; length ventral plate : 45-60μ; width dorsal plate 43-55μ; width ventral plate : 40-50μ.

Distribution : India : Gujarat, Rajasthan, West Bengal. Elsewhere : Cosmopolitan.

29. ***Lecane (Lecane) papuana*** (Murray)
(Fig. 29)

1913. *Cathypna papuana* Murray, *J. Roy. Micr. Soc* : 551.

1914. *Lecane papuana* (Murray) : Harring, *Bull. U. S. Nat. Museum*, **47**, p. 534.

1999. *Lecane (Lecane) papuana* (Murray) : Sharma, *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p.405.

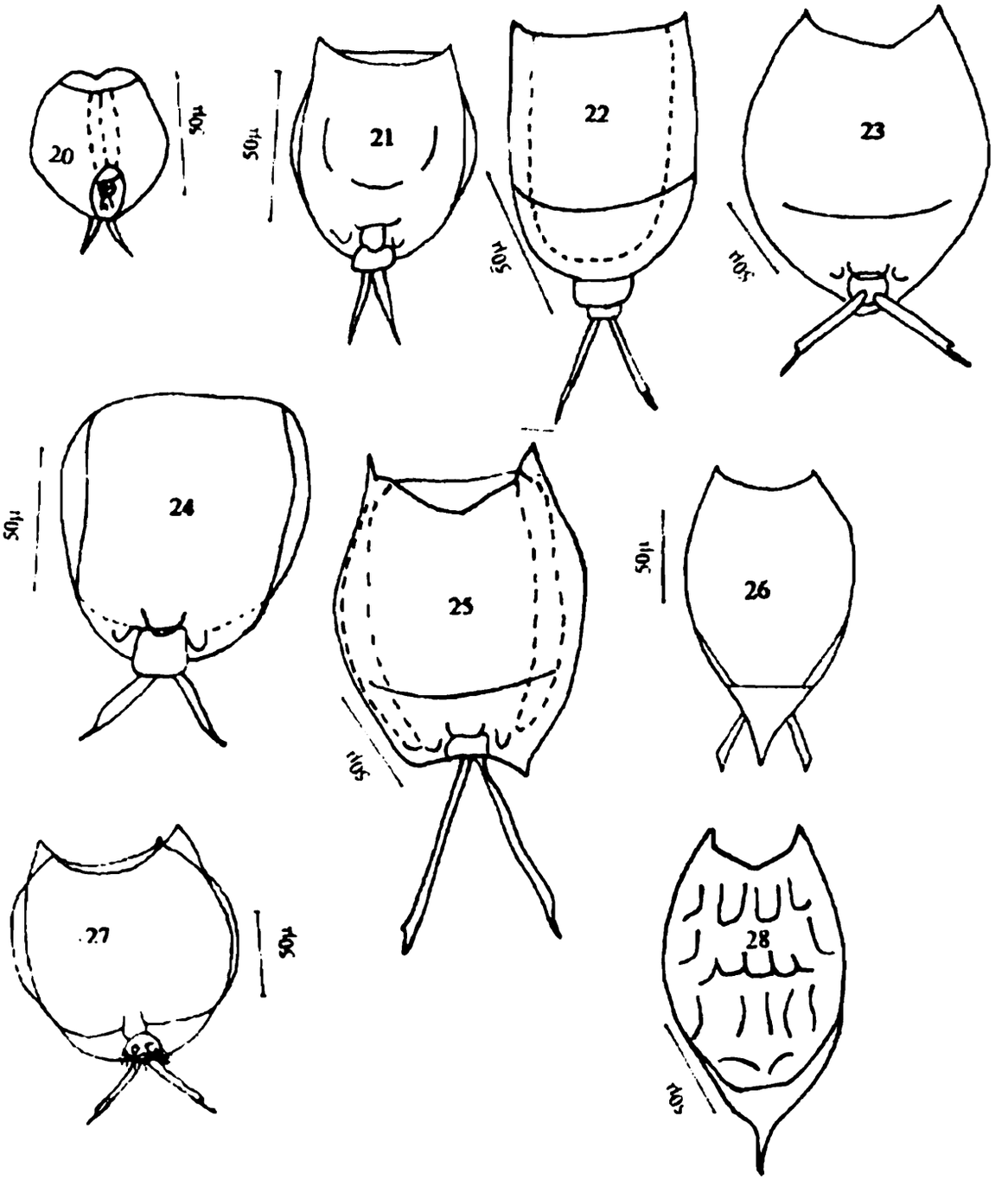

Fig. 20. *Lapadella triptera* Ehrenberg, **21.** *Lecane (L.) aculeata* (jakubski), **22.** *(L.) crepida* Harring, **23.** *Lecane (L.) Curvicornis* (Murray), **24.** *Lecane (L.) hornemanni* (Ehrenberg), **25.** *Lecane (L.) leonitina*(Turner), **26.** *Lecane (L.) ludwegi*(Eckstein), **27.** *Lecane (L.) Luna* (O. F. Muller), **28.** *Lecane (L.) nana* (Murrey),

Characters : Lorica broadly oval; Ventral plate slightly narrower than dorsal plate. Anterior dorsal margin straight, anterior ventral margin with a V-shaped sinus. Posterior segment small and rounded. Toes moderately long; claws small; each with a distinct basal spicule.

Measurements : Length dorsal plate : 95-110μ; length ventral plate : 10-122μ; width dorsal plate : 90-100μ; width ventral plate : 85-90μ.

Distribution : India : J&K, Mizoram, Tamil Nadu, West Bengal. Elsewhere : Tropics and subtropics.

30. *Lecane (Lecane) ungulata* (Gosse)
(Fig. 30)

1887. *Cathypna ungulata* Gosse, *J. Roy. Micr. Soc.* : 361.

1913. *Lecane ungulata* (Gosse) : Harring, *Bull. U. S. Nat. Museum*, **46**, p.62.

1999. *Lecane (Lecane) ungulata* (Gosse) : Sharma, *State Fauna Ser. zool. Surv, India, Fauna of West Bengal*, **11**, p. 407.

Characters : Lorica large, broadly ovate; dorsal plate narrower than ventral plate. Anterior margins almost straight and with distinct triangular cuspidate spines at external angles. Toes parallel-sided and with long stout claws; each claw with a prominent basal spicule.

Measurements : Length dorsal plate 170-200μ; length ventral plate : 215-235μ; width dorsal plate : 144-162μ; width ventral plate : 165-180μ.

Distribution : India : Andhra Pradesh, Assam, Gujarat Mizoram, Meghalaya, Nagaland, Orissa, Punjab, West Bengal. Elsewhere : Cosmopolitan.

Subgenus *Lecane* (*Monostyla*) Bartos, 1959

Key to species and subspecies of *Lecane (Monostyla)*

1. Anterior dorsal margin with median curved spines ..... *L.(M.) quadridentata*
- Anterior dorsal margin without median curved spines 2
2. Toe with claws 3
- Toe without any claw 5
3. Claws with basal spicules, toe with two claws ..... *L.(M.) furcata*
- Claws without basal spicules 4
4. Anterior dorsal margin with shallow sinus and ventral margin with deep U-shaped sinus ..... *Lecane (M.) Bulla*

Anterior dorsal and ventral Margins slightly concave Lorica broader. .... *L.(M.) lunaris*

5. Antero-lateral angles with distinct corners and anterior margin slightly concave ... . *L.(M.) closterocerca*

Antero-lateral angles with distinct spines and anterior margin not concave. Anterior dorsal and ventral sinus shallow. ..... *L.(M.) hamata*

31. ***Lecane (Monostyla) bulla*** (Gosse)
(Fig. 31)

1851. *Monostyla bulla* Gosse, *Ann. Mag. Nat. Hiat., ser* 2, **8,** p. 200.

1966. *Lecane (Monostyla) bulla* (Gosse) : Wulfert. *Limnologica*, **4**, p.70.

1999. *Lecane (Monostyla) bulla* (Gosse) : Sharma : *State Fauna Ser. zool. Surv. India. Fauna of West Bengal*, **11**, p. 411.

Characters : Lorica firm, elongated-ovate; not compressed dorsoventrally; dorsal and ventral plates separted by flexible membrane; ventral plate equally broad or slightly narrower than dorsal. Aanterodorsal margin straight with a shallow sinus, anterior ventral margin with a deep U-shaped notch. Toe long and terminating into a long and pointed claw with distinct basal spicules; claw with a distinct median line but not divided.

Measurements : Length dorsal plate : 114-127μ; length ventral plate 120-137μ; width dorsal plate : 87-97μ; width ventral plate : 81-90μ.

Distribution : India : Andhra Pradesh, Arunachal Pradesh, Assam, Gujarat, J&K, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, West Bengal. Elsewhere : Cosmopolitan.

32. ***Lecane (Monostyla) closterocerca*** (Schmarda)
(Fig. 32)

1859. *Monostyla closterocerca* Schmarda, *Leipzig*, 1, p. 59.

1957. *Lecane(Monostyla) closterocerca*(Schmarda) : *Voigt,Berlin-Nikolasse,I.Textbd.Tafelbr.*, p.57.

1999. Lecane (*Monostyla) closterocerca* (Schmarda) : Sharma : *State Fauna Ser. zool. Surv. India Fauna of West Bengal*, **11**, 412.

Characters : Lorica subcircular, slight difference between length and width; ventral plate broadly oval and narrower than dorsal plate, dorsal plate nearly circular. Anterior margins slightly concave, external angles rounded or produced into small corners. Toe parallel-sided for half of its length and tapering slender, acute pointed.

Measurements : Length dorsal plate : 54-61μ; length ventral plate : 56-68μ; width dorsal plate; 50-61μ; width ventral plate : 44-56μ.

Distribution : India : Arunachal Pradesh, Assam, Gujarat, J&K, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, West Bengal. Elsewhere : Cosmopolitan.

33. *Lecane (Monostyla) furcata* (Murray)
(Fig. 33)

1913. *Monostyla furcata* Murray, *J. Roy. Micr. Soc*, p.358.

1957. *Lecane (Monostyla) furcata* (Murray) : Voigt, *Berlin-Nikolassee*.1, p.237.

1999. *Lecane (Monostyla) furcata* (Murray) : :Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 412.

Characters : Lorica broadly oval, Ventral plate parallel-sided and narrower than dorsal plate. Anteior margins straight, without any surface markings. Toe short and stout; terminating into two widely separated and acute pointed claws.

Measurements : Length dorsal plate : 50-55μ; length ventral plate; 54-58μ; width dorsal plate; 47-52μ, width ventral plate : 40-45μ.

Distribution : India : Assam, Meghalaya, Mizoram, West Bengal. Elsewhere : Cosmopolitan.

34. *Lecane (Monostyla) hamata* (Stokes)
(Fig. 34)

1896. *Monostyla hamata* Stokes, *Ann. Mag. Nat. Hist. Sere* **6**, p.21.

1957. *Lecane (Monostyla) hamata* (Stokes) : Voigt, Berlin-Nikolassee.1, p.236.

1999. *Lecane (Monostyla) hamata* (Stokes) : Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, 414.

Characters : Lorica elongate-oval. Anterodorsal margin with a shallow lunate noncavity; anteroventral margin with V-shaped shallow notch and with acute angled distinct cusps at its external angles. Toe parallel-sided for about half of its length and then tapering to an acutely pointed tip.

Measurements : Length dorsal plate 70-74μ; length ventral plate : 77-82μ; width dorsal plate : 56-58μ; width ventral plate : 45-50μ.

Distribution : India : India : Assam, Gujarat, J&K, Mizoram, Meghalaya, Orissa, Punjab Rajasthan,Tamil Nadu, Tripura, West Bengal. Elsewhere Cosmopolitan.

35. *Lecane (Monostyla) lunaris* (Ehrenberg)
(Fig. 35)

1832. *Lepadella lunaris* Ehrenberg, *Abhandl.Akad. Wiss Berlin*, p.127.

1957. *Lecane (Monostyla) lunaris* (Ehrenberg) : Voigt, *Berlin-Nikolassee*.1. p. 235.

1999. *Lecane (Monostyla) lunaris lunaris* (Ehrenberg) : Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 415.

Characters Lorica broadly ovate; dorsal plate semicircular, ventral plate broadly oval and narrower than dorsal plate. Anterior margins not coincident, each with a shallow lunate sinus. Toe long, parallel-sided; claw pointed, with a median furrow and two basal spicules.

Measurements : Length dorsal plate : 97-108μ; length ventral plate : 107-114μ; width dorsal plate : 85-95μ; width ventral plate : 76-85μ.

Distribution : India : Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Gujarat J&K, Tripura, West Bengal. Elsewhere : Cosmopolitan.

36. *Lecane (Monostyla) quadridentata* (Ehrenberg)
(Fig. 36)

1832. *Monostyla quadridentata* Ehrenberg, *Abhandl.Akad. Wiss Berlin*, p. 130.

1957. *Lecane (Monostyla) quadridentata* (Ehrenberg) : Voigt, *Berlin-Nikolassee*.1, p. 229.

1999. *Lecane (Monostyla) quadridentata* (Ehrenberg) : Sharma *State Fauna Ser. zool. Surv India, Fauna of West Bengal*, **11**, p. 416.

Characters : Lorica ovate to pyriform. dorsal plate narrower than ventral plate. Anterior dorsal margin with two outcurved spines, ventral margin with a V-shaped notch; minute frontal spines at external angles. Toe long. parallel-sided; claw pointed and with two basal spicules.

Measurements : Length dorsal plate : 100-106μ; length ventral plate : 108-136μ; width dorsal plate : 77-94μ; width ventral plate : 74-92μ.

Distribution : India : Andhra Pradesh, Assam, Haryana, Madhya Pradesh, Manipur, Mizoram, Meghalaya, Nagaland, Orissa, Punjab, Rajasthan, and J&K, West Bengal. Elsewhere : Cosmopolitan.

Family TRICHOCERCIDAE Remane 1953

Genus *Trichocerca* (Lamarck, 1801)

Key to the Subgenera of *Trichocerca*

1 Right toe atleast one third of left toe ..... *Trichocerca (Diurella)*

2. Right toe greatly reduced ..... *Trichocerca (Trichocerca)*

37. ***Trichocerca (Trichocerca) rattus*** (O.F. Muller)
(Fig. 37)

1776. *Trichoda ratus* Muller, *Havniae* : p 281.

1913. *Trichocerca rattus* (Muller) : Harring, *Bull. U.S. Nat. Museum*, **46**, p. 101.

1999. *Trichocerca (Trichocerca) rattus* : Sharma *State Fauna Ser. zool. SurV. India. Fauna of West Bengal*, **11**, p. 427.

Characters : Body asymmetrical, spindle-shaped and with a broad dorsal keel extending upto half of the body length. Anterodorsal and anteroventral spines present. Lateral antennae situated in the anterior portion of the body. Left toe smaller than body; right toe greatly reduced.

Measurements : Body length : 125-150μ; left toe : 117-121μ

Distribution : India : Gujarat, Punjab, West Bengal. Elsewhere : Cosmopolitan.

38. ***Trichocerca (Diurella) similis*** (Wierzejski)
(Fig. 38)

1893. *Coelopus similis* Wierzejski, *Bull. Internat. Acad.Sci., Cracovie*, p. 406.

1957. *Trichocerca (Diurella) similis* (Wierzejski) : Voigt, *Berlin-Nikolassee*. 1, p.323.

1999. *Trichocerca (Diurella) similis* (Wierzejski) : Sharma *State Fauna Ser. zool. Surv. India. Fauna of West Bengal*, **11**, p.424.

Characters : Body with thin lorica; elongated and broad anteriorly; anterodorsal and anteroventral spines presnt. Dorsal keel extending upto about 1/3 the body length. Foot two segmented; first, foot-segment overlapped by the projecting posterior end of lorica. Toes short and unequal with spines at the base. Trophi virgate, asymmetrical; left uncus with two distinct parallel combs.

Measurements : Body length : 135-145μ; left toe : 54-65μ; right toe : 29-40μ.

Distribution : India : Gujarat, West Bengal. Elsewhere : Cosmopolitan.

Family ASPLANCHNIDAE Harring and Myers 1926

Genus ***Asplanchna*** Gosse, 1850

39. ***Asplanchna brightwelli*** Gosse
(Fig. 39)

1850. *Asplanchna brightwelli* Gosse, *Ann. Mag. Nat. Hist.*, ser **2, 6,** p. 23.

1999. *Asplanchna brightwelli* Gosse : Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 428.

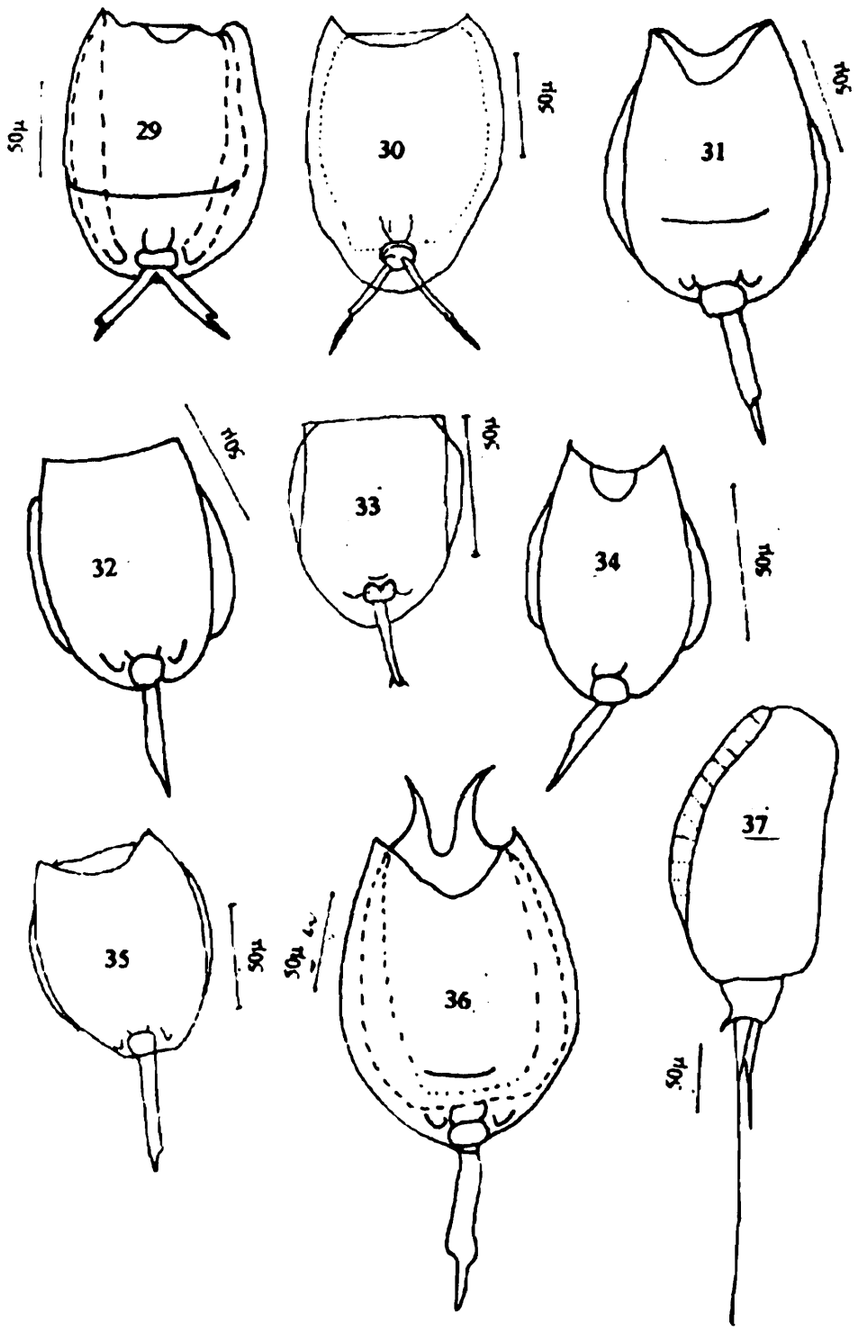

Fig. 29. *Lecane (L.) papuana* (Murray), **30.** *Lecane (L.) ungulata* (Gosse), **31.** *Lecane (Monostla) bulla* (Gosse), **32.** *Lecane (M.) closterocerca*(Schmarda), **33.** *Lecane (M.) furcata* (Murray), **34.** *Lecane (M.) hamata* (Stokes), **35.** *Lecane (M.) lunaris* (Ehrenberg), **36.** *Lecane (M.) quadridentata* (Ehrenberg.), 37. *Trichocerca (Trichocerca) rattus* (O. F. Muller),

Characters : Body large transparent, thin, sacciform, greatly contractile without lorica. Corona reduced to a thin course of cilia around the head, enclosing a rage apical area. Body cavity large, stomach lying well away from body wall. Intestine absent, trophi incaudate. Vitellarium horse shoe-shaped. Viviparous.

Measurements : Total length : 400-630μ.; maximum width 214-338μ.

Distribution : India : Andhra Pradesh, Assam, J&K, Orissa, Punjab, West Bengal. Elsewhere : Cosmopolitan.

Family SYNCHAETIDAE Remane,1933

Genus ***Polyarthra*** Ehrenberg, 1834

40. ***Polyarthra vulgaris*** Carlin
(Fig. 40)

1943. *Polyarthra vulgaris* Carlin, *Medd. Lunds. Univ. Limnol. Inst.* 5 p. 82.

1999. *Polyarthra vulgaris* Carlin, : Sharma *State Fauna Ser. zool. Surv. India. Fauna of West Bengal.* **11**, p. 429.

Characters : Body more or less cylindrical with flattened cuticular feather-like appendages attached in four groups to dorsolateral and ventrolateral surfaces near anterior end. Apical field with two ciliated antennae. Lateral antennae located in the posterior third part of the body. Vitellarium with eight nuclei.

Measurements : Body length : 90-128μ; maximum width 54-75μ.

Distribution : India : Assam, Orissa, Punjab, West Bengal. Elsewhere Cosmopolitan.

Family GASTROPODIDAE Remane 1933

Genus ***Ascomorpha*** Perty, 1850

41. ***Ascomorpha ovalis*** (Bergendal)
(Fig. 41)

1892. *Anapus ovalis* Bergendal, *Acta Univ. Lundensis*, **28**, p. 1.

1943. *Ascomorpha ovalis* (Bergendal) : Carlin, Medd. Lunds. Univ. Limnol. Inst. **5**, p. 34.

1999. *Ascomorpha ovalis* (Bergendal) : Sharma *State Fauna Ser. zool. Surv. India. Fauna of West Bengal*, **11**, p. 433.

Characters : Body oval, dorsoventrally compressed, lorica thin, formed by stiffend cuticle. Dorsal and ventral plates joined laterally by a thin membrane. Corona with a single ring of cilia. Apical field with a sickle shaped pulp. Single accretion body. Mastax modified for suction, trophi virgate.

Measurements : Total length : 100-112μ, body width : 80-85μ.

Distribution India : West Bengal. Elsewhere : Europe, North and South America, Indonesia, Japan.

Order GNESIOTROCHA De Meauchamp 1965.

Key to the families of Order Gnesiotrocha

Body loricate, lorica with distict foot opening ..... Family TESTUDINELLIDAE

Body illoricate, foot absent ..... Family FILINIDAE

Family TESTUDINELLIDAE Bartos, 1959

Genus ***Testudinella*** Bory de St. Vinecvent, 1826

42. ***Testudinella patina*** (Hermann)
(Fig. 42)

1783. *Brachionus patina* Hermann, *Naturforscher Halle*, 19, p. 48.

1913. *Testudinella patina* (Hermann) : Harring, *Bull. U.S. Nat. Museum*, **46**, p. 100.

1999. *Testudinella patina* (Hermann) : Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p. 439.

Characters : Lorica thins, transparent, flexible, circular and greatly flattened dorsoventrally. Dorsal and ventral plates fused laterally, without spines. Corona with marginal cilia projecting through gap of lorica. Lateral antennae situated anterior to middle region of lorica. Foot opening in the middle of ventral side; Foot annulated, greatly retractile, without spur or spines, ventrally projecting and with a terminal ciliated cap.

Measurements : Lorica length : 135-170μ; maximum width : 135-150μ.

Distribution : India : Andhra Pradesh, Assam, Orissa, Gujarat, J&K., Punjab and West Bengal. Elsewhere : Cosmopolitan.

Family FILINIDAE Bartos, 1959

Genus ***Filinia*** Bory de St. Vinecvent, 1826

43. ***Filinia longiseta*** (Ehrenberg)
(Fig. 43)

1834. *Triarthra longiseta* Ehrenberg, *Folio Berlin*, p. 222.

1999. *Filinia longiseta* (Ehrenberg) : Sharma *State Fauna Ser. zool. Surv. India, Fauna of West Bengal*, **11**, p.441.

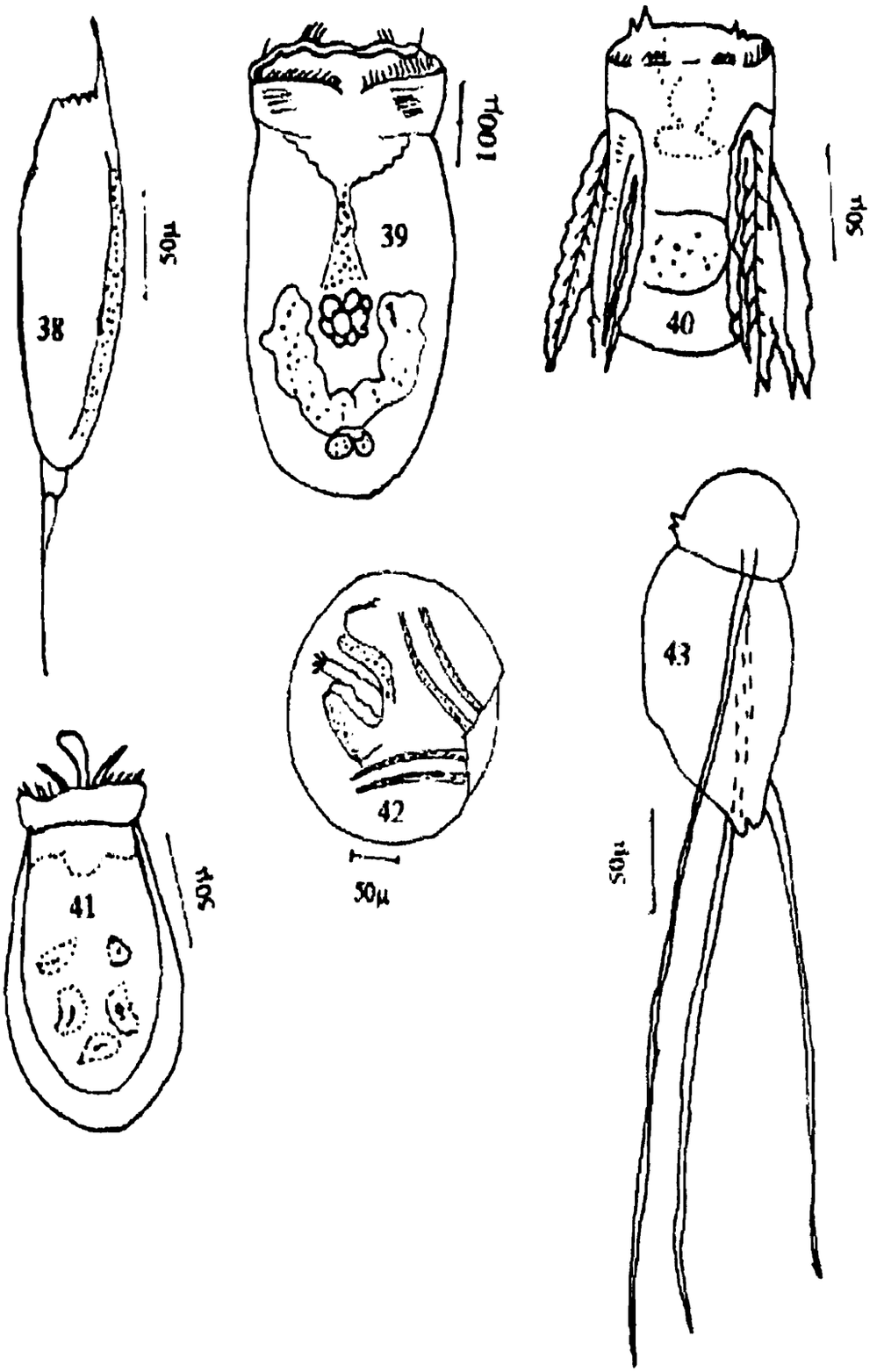

Fig. 38. *Trichocerca (Diurella) similis*(Wierzejski), **39.** *Asplanchna brightwelli* Gosse, **40.** *Polyarthra vulgaris* Carlin, **41.** *Ascomorpha ovalis* (Bergendal), **42.** *Testudinelia patina* (Hermann), **43.** *Filinia longisesta* (Ehrenberg)

Characters : Body thin, without lorica, barrel-shaped and with two long equal, movable antero-lateral spines and one immobile posterior spine. Anterior setae usually folded ventrally. Posterior seta inserted almost one fourth body length away from caudal end. Corona in the form of circumapical girdles. Foot absent.

Measurements : Body length : 130-155μ; maximum width 87-103μ. antero-lateral spine: 270-300μ; posterior setae : 135-170μ.

Distribution Assam, Haryana, Madhya Pradesh, Gujarat, Orissa, Punjab, Rajasthan, and West Bengal. Elsewhere : Cosmopolitan.

CRUSTACEA

CLADOCERA

The order Cladocera belongs to subclass Branchiopoda of Class Crustacea and constitutes substantially to planktonic composition of any freshwater body. Commonly known as waterfleas, they occur in almost all types of freshwaters. They are characterised by a distinct head and a body covered by a fold of cuticle, which extends backwards and downwards from the dorsal side of the head and constitutes the carapace, which has a general bivalved appearance but is actually a single folded piece that gaps ventrally. The shape of the shell differs considerably from species to species. In lateral view, it may be oval, circular, elongated or angular. The body generally has surface reticulations, striations and other type of markings. In certain groups, the posterior end is extended into a spinule or spine. The ventral edge of the valve generally bears setae. The head is a compact structure and unlike valves, does not open ventrally. The junction of the head and body is sometimes marked by a depression, the cervical notch or sinus. They have a well developed and very conspicuous compound eye and a ocellus, which lies posterior or ventral to the compound eye. While the first antennae (antennule) are generally inconspicuous and unsegmented, the second antennae are very large and inserted laterally. The second antennae consist of a stout basal segment, a segmented dorsal ramus and a segmented ventral ramus. The two rami bear variable number of plumose setae. The beak or rostrum is a well defined projection of head in front or between the antennules. Anterior to compound eyes, lies vertex of the head. The carapace encloses 5 or 6 pairs of thoracic leaf-like legs which may be modified in some groups. The true abdomen is suppressed, but the posterior part of the body ends in a large postabdomen. This bears 2 long abdominal setae, two terminal claws and a series of marginal denticles.

A review of the literature revealed a good amount of work on cladocera in different parts of the world. (Baird, 1850; Brady, 1886; Birge,1879, 1918; Lilijbarg, 1900; Richard, 1894; Sars, 1903a, 1903b; Gurney, 1906, 1907; Brooks, 1959). Notable contributions on the cladoceran taxonomy from the country are those of Baird (1860), Gurney (1906, 1907), Arora (1931), Sewell (1935, 1936), Brehm (1936, 1953), Brehm and Woltereck (1939), Biswas (1966, 1971), Nair (1971), Battish (1981, 1983), Michael and Sharma (1988) and Venkataraman (1999).

The cladoceran fauna of West Bengal has been dealt by only a few workers (Gurney (1906, 1907; Sewell, 1935; Sharma, 1978a; Venkataraman 1999). Venkataraman (*loc. cit.*) has recorded 53 species from the state.

During present investigations only 36 commonly occurring species were recorded from the 6 types of wetlands

CLASSIFIED LIST OF RECORDED TAXA

Family SIDIDAE

1. *Sida crystallina* (O.F.Muller)
2. *Pseudosida bidentata* Herick
3. *Lantonopsis australis* Sars
4. *Diaphanosoma sarsi* Richard
5. *Diaphanosoma. excissum* Sars

Family DAPHNIIDAE

6. *Ceriodaphnia cornuta* Sars
7. *Daphnia cephalata* (King)
8. *Daphnia carinata* King
9. *Daphnia lumhiltzi* Sars
10. *Scapholeberis kingi* Sars
11. *Simocephalus vetulus* (Muller)
12. *Simocephalus exspinosus* (Koch)

Family MIONIDAE

13. *Moina micrura* Kurz
14. *Moinodaphnia macleayi* (King)

Family BOSMINIDAE

15. *Bosmina longirostris* (O.F.Muller)

Family MACROTHRICIDAE

16. *Macrothrix spinosa* King
17. *Macrothrix goeldii* Richard
18. *Echinisca triserialis* (Brady)

Family CHYDORIDAE
Subfamily CHYDORINAE

19. *Pleuroxus similis* Vavra
20. *Alonella exisa* (Fischer)
21 *Chydorus sphaericus* (O.F.Muller)
22. *Chydorus barroisi* (Richard)
23. *Dunhevedia crassa* King
24. *Pseudochydorus globosus* (Baird)

Subfamily ALONINAE

25. *Alona quadrangularis* (O.F. Muller)
26. *Alona rectangula* Sars
27. *Alona davidi davidi* Richard
28. *Alona pulchella* King
29. *Acroperus harpae* (Baird)
30. *Comptocercus rectirostris* Schoedler
31 *Leydigia acanthocercoides* (Fischer)
32. *Biapertura affinis* (Leydig)
33. *Biapertura karua* (King)
34. *Notoalona globulosa* (Daday)
35. *Oxyurella singalensis* (Daddy)
36. *Kurzia longirostris* (Daddy)

Key to the Recorded Families

1. Six pairs of legs, identical ..... Sididae
   Five or six pairs of legs., unidentical 2
2. Antennules fused with rostrum, rostrum snout-like ..... Bosminidae
   Antennules not fused with rostrum 3
3. Dorsal ramus of antenna 3-segmented, ventral ramus 4-segmented 4
   Both ramii 3-segmented ..... Chydoridae
4. Antennules short and immobile ..... Daphniidae
   Antennules long and mobile 5
5. Antennules on ventral side of head ..... Moinidae
   Antennules on anterior side of head ..... Macrothricidae

Family SIDIDAE Baird, 1850.

The members of this family are characterized by their carapace without a gelatinous mantle, absence of sinus, movable large antennules, biramous antennae, flattened ramii, 2 to 3-segmented dorsal ramus with numerous setae, 3 -segmented, ventral ramus with only terminal setae, 6 pairs of identical flattened legs, presence of valves on body and legs and absence of ocelli.

Key to the recorded genera of Sididae

1. Dorsal ramus of antenna 3-segmented ..... *Sida*
   Sida crystallina
- Dorsal ramus of antenna 2-segmented 2
2. No anal spines on Postabdomen ..... *Diaphanosoma*
- Postabdomen with anal spines 3
3. Rostrum present ..... *Pseudosida*
   Pseudosida bidentata
- Rostrum absent ..... *Latonopsis*
   Latonopsis australis

Genus *Sida* Straus, 1820.

44. *Sida crystallina* (O.F. Muller, 1776)
(Fig. 44)

1776. *Sida crystallina* O.F. Muller, *Zoologiae Danicae prodromus seu Animalium Daniae et Norvgiae indigenarum characteres, nomina et synonyms imprinis popularium Havniae*: 1-273.

1895. *Sida crystallina* : Richard, Revision des cladocera. *Ann. Sci. natur.zool.*, **18** : p. 337.

1988. *Sida crystallina* : Michael and Sharma, *Fauna of India and adjascent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 36.

Characters : Body oblong with somewhat transparent carapace. Head very large and distinctly separated from the body by a cervical depression. Rostrum small and pointed, eyes small, placed in the ventral region of head. Antennules short with short flagellum. Posterior margin of valves straight with spines. Post-abdomen with about 14-15 anal spines in a row; claw with four long basal spines and with a row of setae distal to the basal spines.

Lengh range : 0.95-1.55 mm.

Distribution : Assam, Jammu and Kashmir, Tripura, West Bengal. Elsewhere : Holarctic and Neotropical.

Remarks : A rare species, recorded from Type VI (Urban lakes) only.

Genus ***Pseudisida*** Herrick, 1984.

45. ***Pseudosida bidentata*** Herrick
(Fig. 45)

1884. *Pseudosida bidentata* Herrick, *Coel and Nat.Hist. Survey Minnesota, Ann. Rep.*, : p.20.

1988. *Pseudosida bidentata* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 38.

Characters : Body elongated or oval; head short and depressed; rostrum present; eyes small and placed near to anteroventral corner. Antennules unsegmented and attached to the ventral side of rostrum. Postabdomen with 10 groups of lateral spinules. Claw with three basal spines.

Length range : 0.90-1.25 mm

Distribution : India : Assam, Rajasthan, Tamil Nadu, West Bengal. Elsewhere : South East Asia, South Africa and South America.

Genus ***Latonopsis*** Sars 1888

46. ***Latonopsis australis*** Sars
(Fig. 46)

1888. *Latonopsis australis* Sars, *Forth. Vidensk. Selsk. Christiania*, **8** : p.6.

1988. *Latonopsis australis* : Michael and Sharma, *Fauna of India and adjacent countries* : Indian Cladocera. Zoological Survey of India, Calcutta : 38.

Characters Body elongated, with long setae on ventral margin of valves; head large, without rostrum, antennules unsegmented and located on ventral side, ocellus very minute, eyes large, placed in the middle or dorsal part of head. Postabdomen broad, with about 7 marginal spines on each side. Claw large, with two slightly curved basal spines and with a few denticles on concave margin.

Length range : 1 15-1.55 mm.

Distribution : Andhra Pradesh, Maharashtra, Rajasthan, Tamil Nadu, West Bengal. Elsewhere : Australia, oriental regions.

Genus ***Diaphanosoma*** Fischer

Key to the recorded species

a) Shell duplicature rounded at distal end ..... *Diaphanosoma sarsi*

b) Shell duplicature joining ventral margin at about 90 degree .... *Diaphanosoma.exisum*

47. ***Diaphanosoma sarsi*** Richard
(Fig. 47)

1894. *Diaphanosoma sarsi* Richard, *Ann. Mus. Civico. Stor. Nat. Genova*, **14** : 365.

1988. *Diaphanosoma sarsi* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 44.

Characters Carapace almost oblong, with rectangular posterodorsal corner. Posteroventral corner with a series of small denticles (12-20). Dorsal margin more arched, ventral margin almost straight. Head large without rostrum, eye very large and situated near anterior margin of head.Anitnnae short, reaching only upto 3/4th of carapace. Postabdomen narrow with setae on lateral side. No anal spines. Claw with three basal spines

Length range : 0.80-1.10 mm.

Distribution : Bihar; Meghalaya; Rajasthan and West Bengal. Elsewhere : pantropical.

48. ***Diaphanosoma excisum*** Sars
(Fig. 48)

1885. *Diaphanosoma excisum* Sars, *Norske.Vidensk. Selsk. Forhandl. Christina*, **8** : 13-18.

1988. *Diaphanosoma excisum* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 44.

Characters : Carapace oblong, narrowing posteriorly, posteriodorsal corner of valves nearly ending at right angle, posterioventral corner almost rounded with 6-8 denticles. Head large, without rostrum and almost rounded anteriorly. Eyes moderate in size, located in frontal portion of head. Antennae short, not reaching posterior margin of valves. Postabdomen narow with fine setules. Claws with three long basal spine.

Length range : 0.65- 0.90 mm.

Distribution : Bihar, Rajasthan, West Bengal. Elsewhere : Tropics and sub-tropics.

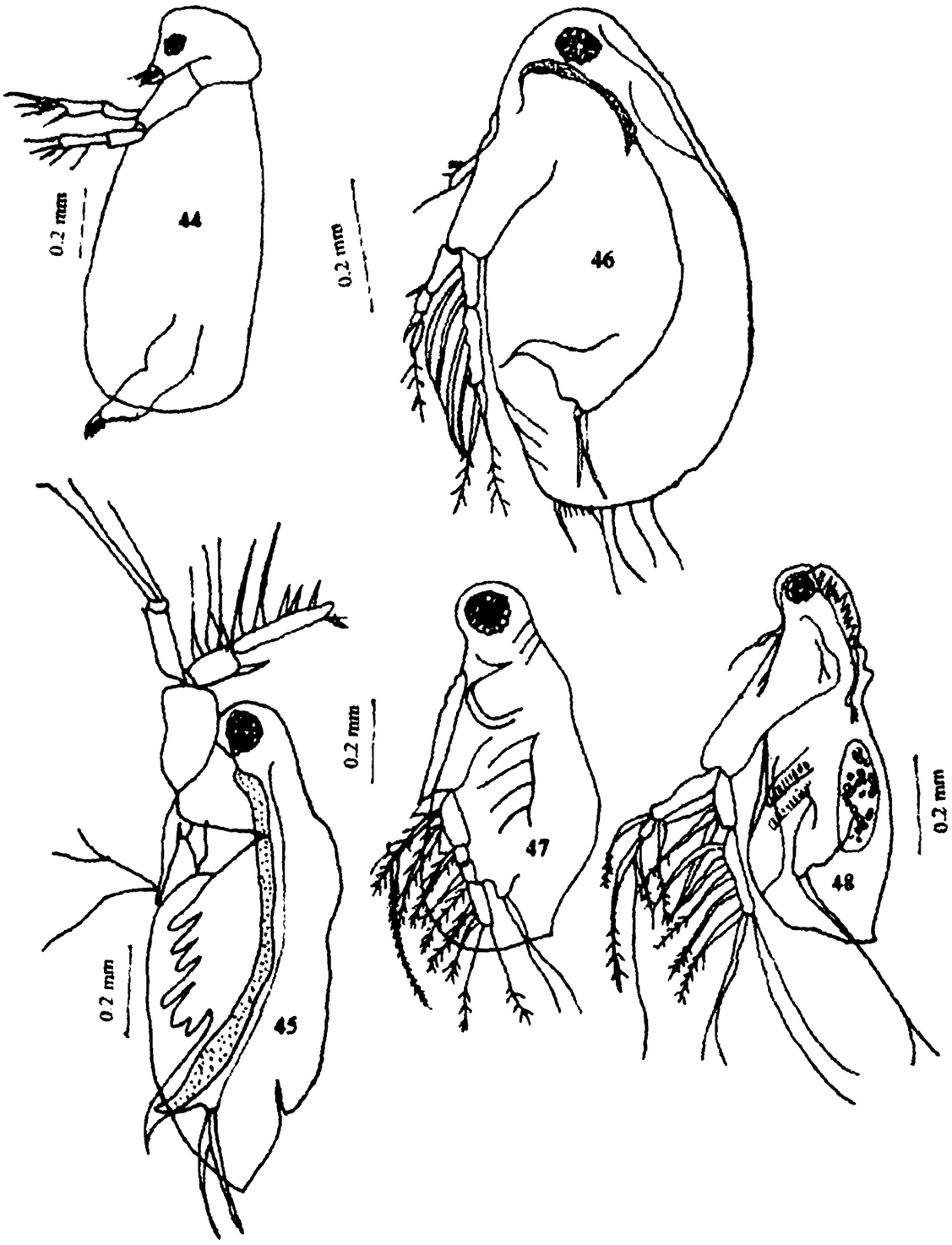

Fig. 44. *Side crystallina* (O. F. Muller), **45.** *Pseudosida bidentata* Herick, **46.** *Lantonopsis australis* Sars, **47.** *Diaphanosoma sarsi* Richard, **48.** *Diaphanosoma. excissum* Sars,

Family DAPHNIDAE

Key to the recorded genera and species

1. Rostrum present 2
- Rostrum absent ..... *Ceriodaphnia*
Ceriodaphnia cornuta

2. Without any cervical sinus ..... *Daphnia*
- Cervical sinus present 3

3. Valves obscurely reticulated and with some striae .....
.....*Scapholeberis*
Scapholeberis kingi
- Valves transversely striated ..... *Simocephalus*

Genus ***Ceriodaphnia*** Dana, 1853

49. ***Ceriodaphnia cornuta*** Sars
(Fig. 49)

1885. *Ceriodaphnia cornuta* Sars, *Norske.Vidensk. Selsk. Forhandl. Christiana*, **8** : p. 26-28.

1988. *Ceriodaphnia cornuta*: Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 51.

Characters : Body, broadly oval in outline; produced posteriorly into a short projection. Head small, depressed and separated from body by a distinct ocular depression. Eyes large, ocellus small. Antennules small, not extending to tip of rostrum; Postabdomen moderately broad, with 5-6 annal spines. Claw short, stout and finely setulate along concave surface.

Length range : 0.45-0.65 mm.

Distribution : Bihar, Kerala, Meghalaya, Rajasthan, West Bengal. Elsewhere : Cosmotropical, also recorded from China and Japan.

Genus ***Daphnia*** O.F.Muller, 1785

Key to the recorded species

a) Anterior side of the head produced into a spine, carapace broadly oval, narrowed posteriorly with a long posterior spine ..... *Daphnia lumholtzi*

b) Anterior side of head rounded, carapace elliptical in shape ..... *Daphnia similis*

c) Anterior side of head semicircular, Carapace oblong and reticulated .....
.....*Daphnia carinata*

50. ***Daphnia carinata*** King
(Fig. 50)

1853. *Daphnia carinata forma*, King. *Pap. Proc. R. Soc. Van Diemans Land*, **2** : 246.

1988. *Daphnia carinata forma* : Michael and Sharma, *Fauna of India and adjascent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 59.

Characters : Body oblong and reticulated, dorsal margin evenly arched; posterior spine elongated. Head large, almost semicircular anteriorly. Rostrum recurved; antennules very small and attached to rostrum; ocellus small; eyes large, situated near the antroventral margin of head. Abdominal processes three, Postabdomen conically tapering distally with 10-13 anal spines. Claws short, stout and curved.

Length range 1 7-2.25 mm.

Distribution : Bihar, Gujarat, H. P, Karnataka, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal. Elsewhere Australia, Africa, Indonesia and Sri Lanka.

51 ***Daphnia cephalata*** (King)
(Fig. 51)

1853. *Daphnia cephalata var. cephalata* King, *Pap. Proc. R. Soc. Van Diemans Land*, 2, p. 254.

1988. *Daphnia cephalata var. cephalata*: Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 62.

Characters : Carapace almost oblong; ventral carapace margin broadly oval. Posterior spine long and turned upwards. Head produced dorsally into an expansion (helmet) above heart. Rostrum acute, often well away from ventrolateral carapace margin. Antennular mounds very small, at some distance from rostrum. Eye moderately Large; ocellus minute. First abdominal process nearly twice as long as second, sparsely covered with setules; other oricesses more pubescent. Postabdomen tapering distally; with 11-14 anal spines. Claw curved; with three combs. having 11, 14 and 28 teeth respectively.

Length : 2.9- 4.0 mm.

Distribution : India – Tamil Nadu. Elsewhere : W. Australia, Sri Lanka, Argentina.

52. ***Daphnia lumholtzi*** Sars
(Fig. 52)

1885. *Daphnia lumholtzi* Sars, *Norske.Vidensk. Selsk. Forhandl. Christiana*, **8** : 26-28.

1988. *Daphnia lumholtzi* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 65.

Characters : Body somewhat oval with a very long posterior spine, dorsal and alsmost half of the ventral margins and peosterior spine with several elongated and distant spinules. Head produced dorsally into a pointed helmet. Rostrum small. Eye moderately Large; ocellus minute. Postabdomen tapering distally; with 11-14 anal spines. Claw curved; with three combs.

Length range : 1.75-2.50 mm.

Distribution : Andhra Pradesh, Gujarat, Haryana, Madhya Pradesh, Meghalya, Punjab, West Bengal. Elsewhere : Australia, Africa, Asia.

Genus ***Scapholeberis*** Schoedler

53. ***Scapholeberis Kingi*** Sars
(Fig. 53)

1903. *Scapholeberis kingi Sars, Arch. Math. Nat.*, 25 : 8.

1988. *Scapholeberis kingi* Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta:* p.73.

Characters : Body oval-quadrangular in outline. Posteroventral corner of the valves with short spines, Ventral margin almost straight and ciliated. Head small and somewhat flattened. Rostrum short, blunt and projected ventrally. Eye large; ocellus relatively small and situated near the tip of rostrum. Antennules short, almost immovable; located behind the rostrum; postabdomen broad, rounded at the posterior end with 5-6 anal spines. Claw moderately long, stout and curved dorsally with setae on its concave margin.

Length rang : 0.52- 0. 80 mm.

Distribution : India : Assam, J & K., Meghalaya, Rajasthan, Tamil Nadu, West Bengal. Elsewhere : Africa, Australia, China, Germany, Indonesia, North America, Sri Lanka, Thailand.

Genus ***Simocephalus*** Schoedler 1858

Key to recorded species

a) Postabdominal claws with proximal Pecten, ocellus almost round .... *Simocephalus expinosus*

b) Postabdominal claws without proximal pecten, ocellus elongated..... ..... *Simocephalus vetulus*

54. *Simocephalus vetulus* (O.F. Muller)
(Fig. 54)

1776. *Daphnia vetula* O.F. Muller, *Havniae* : 199.

1858. *Simocephalus vetulus* Schoedler, *Jahrb.Louisenst. Realschule, Berlin* : 18.

1988. *Simocephalus vetulus* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 75.

Characters : Body broadly rounded and extended posteriorly without a posterior spine. Posterodorsal corner with blunt angle. Dorsal margin strongly arched with denticles on its posterior region. Head small, rounded in front. Eye moderate in size; ocellus large and elongated. Postabdomen broad with 10 curved anal spines. Claw long, curved and denticulate.

Length range (adults) : 1.5-3.0 mm.

Distribution : India : Bihar, J & K, Karnataka, Punjab, Rajasthan, Uttanchal, West Bengal. Elsewhere : Cosmopolitan.

55. *Simocephalus exspinosus* (Koch)
(Fig. 55)

1841. *Daphnia exspinosa* Koch,*Rosenberg. Hefts*. **8** : 35.

1858. *Simocephalus exspinosus* : Schoedler, *Jaharb. Louisenst.Realschule*. : 20.

1988. *Simocephalus exspinosus* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 78.

Characters : Body oval or sub-rhomboidal, slightly expanded posteriorly. Dorsal margin almost straight, but curved abrupt near the posterior protuberance; distinct denticles on its posterior part. Head small and triangular; rostrum small. Eye small; ocellus small and rhomboidal. Postabdomen broad; 10-12 anal spines. Claw long, with a distinct pecten at its base and with setae on its concave margin.

Length range : 1.2 – 2.0 mm.

Distribution : India Meghalaya, West Bengal. Elsewhere : Cosmopolitan.

Family MOINIDAE

Key to the recorded genera and species

Body thick and heavy, without setulus; ocellus absent, claw with a distinct pecten .. .. *Moina*

Moina micrura

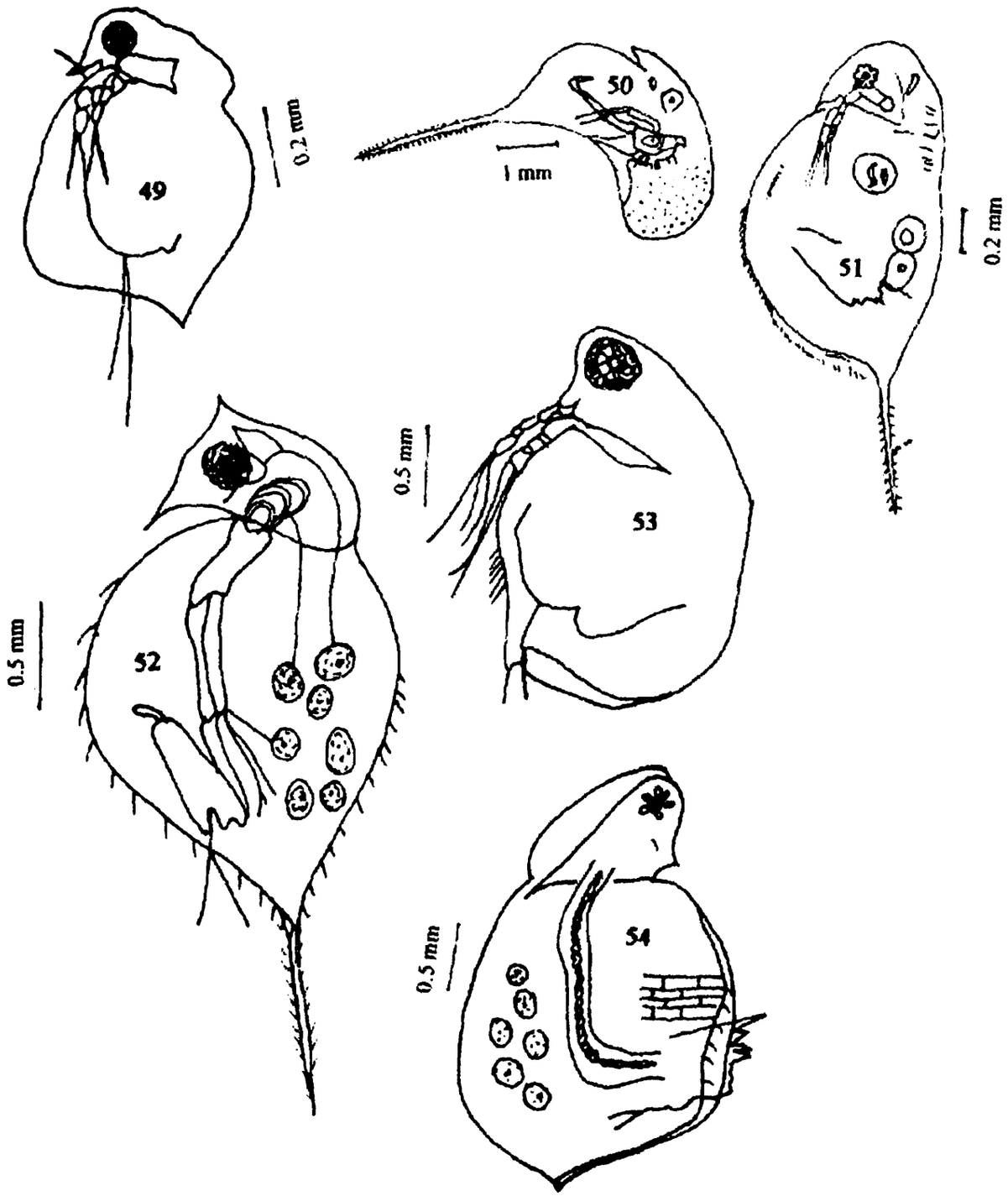

Fig. 49. *Ceriodaphnia cornuta* Sars, **50.** *Daphnia cephalata* (King), **51.** *Daphnia carinata* King, **52.** *Daphnia. lumhiltzi* Sars, **53.** *Scapholeberis kingi* Sars, **54.** *Simocephalus verulus* (O. F. Muller)

Body laterally compressed; ocellus situated above the point of origin of antennules ..... *Moinodaphnia*

Moinodaphnia macleayi

Genus ***Moina*** Baird, 1850.

Moina micrura Kurz
(Fig. 56)

1820. *Monoculus rectirostris* Jurine, Paris. 134-145.

1874. *Moina micrura* Kurz, *Sitzber. K. Acad. Wiss. Wein. Math. Nat.* 69 : 13-15.

1988. *Moina micrura* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 86.

Characters : Head large, rounded and with well developed cervical depression. Eye large, ocellus absent. No setules either on head of valves. Antennules movable, large, thin and with a long basal seta. Postabdomen short, slender with 6-8 ciliated lateral spine. Dorsal margin of postabdomen with groups of short setae. Claw long and curved with a distinct pecten.

Length range : 0.75-1.15 mm.

Distribution : India : Bihar Karnataka, Rajasthan, Tamil Nadu West Bengal. Elsewhere : Africa, France, Philippines, Syria, CIS.

Genus ***Moinodaphnia*** Herrick, 1887

57. ***Moinodaphnia macleayi*** (King)
(Fig. 57)

1853. *Moina macleayii* King, *Pap. Proc. R. Soc. Van Diemans Land*, 2 : 251-252.

1988. *Moina macleayii* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 94.

Characters : Body compressed, head small, rounded with slight cervical depression. Eye large; ocellus small, situated near the antennules. Antennules long thin and movable, originating from the ventral margin just behind eye. Minute spinules on the ventral margin of valves, no spine at the junction of dorsal and ventral margins. Abdominal process large, horse-shoe shaped. Postabdomen with an elongated distal end, with 7-11 feathered teeth and one bident tooth. Claw with fine setae on concave margin.

Length range : 0.58-0.91 mm.

Distribution : India : South India, West Bengal. Elsewhere : Widely distributed in tropics.

Family BOSMINIDAE

Genus ***Bosmina*** Baird, 1945

58. ***Bosmina longirostris*** (O.F. Muller)
(Fig. 58)

1776. *Lynceus longirostris* O.F. Muller, Havniae : 76.

1862. *Bosmina longirostris* : Sars, *Forhandl. Vidensk. Selask. Christiana* : 144-167.

1988. *Bosmina longirostris* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 97.

Characters : Body almost oval, posterodorsal corner angular, posteroventral corner with backwardly directed spines. Head and eye large. A small sensory hair situated near the eye. Antennules parallel to each other and curved. Post-abdomen almost quadrate. Claw with spinules and pecten.

Length range : 0.56-0. 62 mm.

Distribution : India : J&K, Meghalaya, West Bengal. Elsewhere : Cosmopolitan.

Family MACROTHRICIDAE

Key to the genera and species

1. Antennule widening distally. Exopodite of leg IV with three bristles ..... *Macrothrix*

- Antennule not widening distally. Exopodite of leg IV with two bristles ..... *Echinisca*
Echinisca triserialis

Genus ***Macrothrix*** Baird, 1843

Key to the recorded species

a) Minute serration on the dorsal margin of head and body ..... *Macrothrix goeldii*

b) No serration on then dorsal margin of head and body ..... *Macrothrix spinosa*

59. ***Macrothrix goeldi*** Richard
(Fig. 59)

1897. *Macrothrix goeldi* Richard, *Mem. Soc. Zool. France.*, **10** : 287-289.

1988. *Macrothrix goeldi* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 104.

Characters : Body almost oval in outline, dorsal margin evenly arched and minutely serrated; ventral margin arched anteriorly with a few long setae. Head subtriangular and almost evenly arched. Antennules, with row of bristles at distal end and anterior margin with 6 notches. Ocellus small, situated nearer to the base of antennules than to eye. Postabdomen with small notch on dorsal margin and sharp teeth and groups of bristles in anal region. Claw with setae on concave margin.

Length range : 0.42-0.55 mm.

Distribution : India : Rajasthan, West Bengal. Elsewhere : Chile, Nigeria, Uganda.

60. ***Macrothrix spinosa*** King
(Fig. 60)

1853. *Macrothrix spinosa* King, *Pap. Proc. R. Soc. Van Diemans Land*, **2** : 256.

1988. *Macrothrix spinosa* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 102.

Characters : Body rounded oval, dorsal margin evenly arched and minutely serrated; ventral margin subangulated in middle and obliquely ascending posteriorly; posterior end with well marked short prutuberance. Head moderately large and subtriangular. Antennules enlarged at apex. Eyes large, ocellus small, situated very close to the base of antennules. Postabdomen short, bilobed and with a row of small anal denticles along dorsal edge. Claw very short with setae on concave margin.

Length range : 0.41-0.55 mm.

Distribution : India: Rajasthan, Manipur, West Bengal. Elsewhere : Cosmopoliton.

Genus ***Echinisca*** Lievin, 1848

61. ***Echinisca triserialis*** (Brady)
(Fig. 61)

1886. *Macrothrix triserialis* Brady, *Intellectual Observer*, **12** : 295.

1976. *Echinisca triserialis* : Smirnov, *USSR Acad. Sci. Zool. Institute Nova. Ser. No.* **101**. *Leningrad* : 109-110.

1988. *Echinisca triserialis* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 109.

Characters : Body almost oval, dorsal margin slightly arched with serration in posterior region, ventral margin strongly arched, with serration and bristles. Head large with a prominent ridge. Eye large, ocellus small and situated close to the tip of rostrum. Antennules slender and long. Post-abdomen bilobed, anal spines on both lobes and lateral setae in transverse rows. Claw short, serrated and curved.

Length range : 0.48-0.61mm.

Distribution : India : Bihar, Kerala Rajasthan, West Bengal. Elsewhere: Cosmotropical

Family CHYDORIDAE

Key to the recorded subfamilies

2. Two separate main head pores situated in median line of head shield, two small pores situated between the main Pores ..... Subfamily Chydorinae
- Two or three united main pores situated in median line of head shield, two small pores situated lateral to main pores ..... Subfamily Aloninae

Key to the recorded genera and species of subfamily Chydorinae

1. Valves with setae on the entire posteroventral margin 2
- Valves with setae on anterior half of ventral marginm and on inner side of ventral margin of posterior half 3
2. Rostrum long ..... *Pleuroxus*
Pleuroxus similis
- Rostrum short and blunt ..... *Alonella*
Alonella exisa
3. Labrum with plate-shaped process 4
- Labrum without plate-shaped process ..... *Pseudochy dorus*
Pseudochydorus globosus
4. Body oval, postabdomen rounded, anus situated on its functional posterior side ... . *Dunhevedia*
Dunhevedia crassa
- Body spherical, postabdomen long, anus situated on its functionally ventral side .. .. *Chydorus*

Genus ***Pleuroxus*** Baird 1892

62. ***Pleuroxus similis*** Vavra
(Fig. 62)

1900. *Pleuroxus similis* Vavra, *Hamburger Magalhaensische Sammelreise*, **2** *Hamburg* : 23-24.

1988. *Pleuroxus similis* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 127.

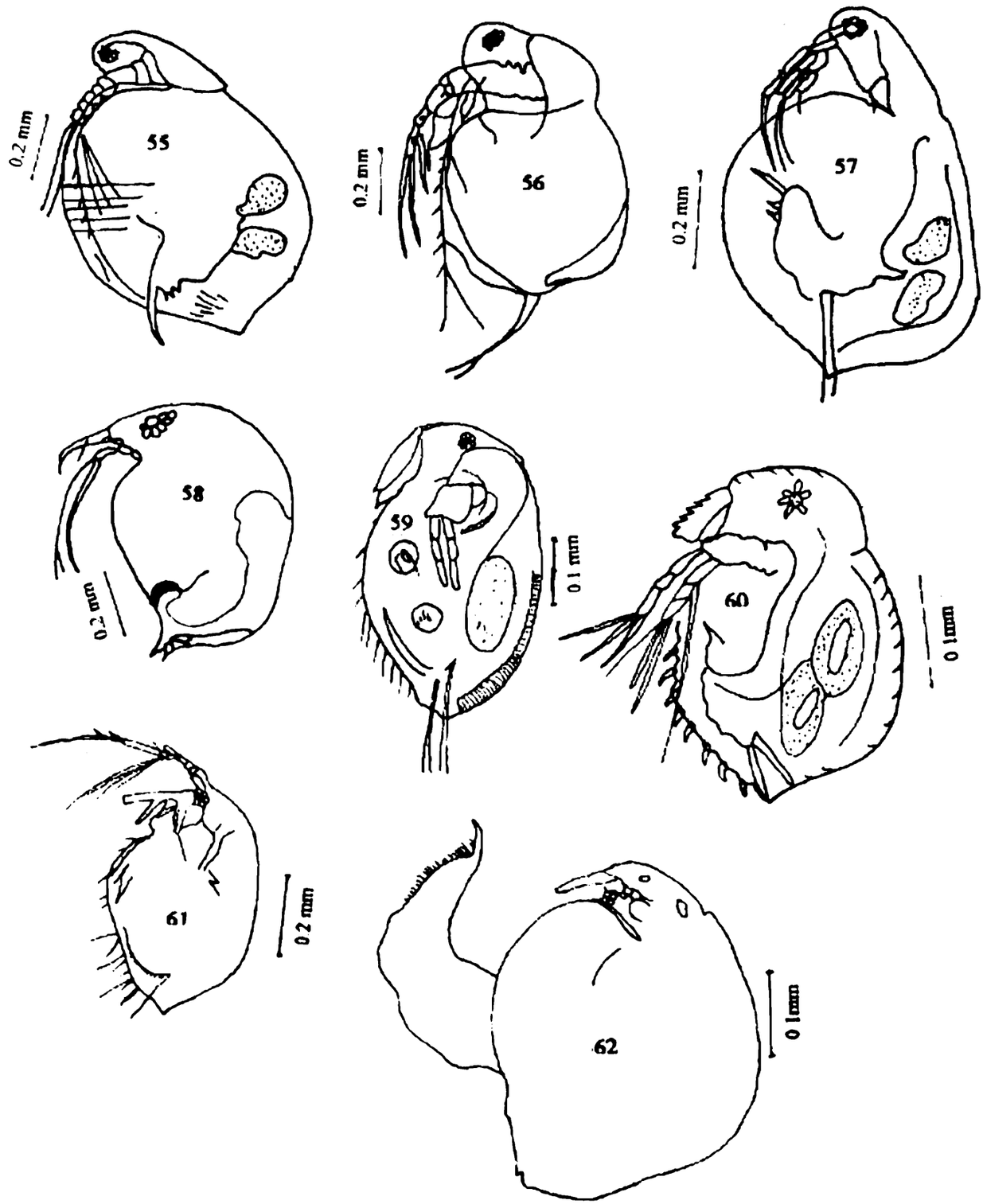

Fig. 55. *Simocephalus exspinosus* (Koch), **56.** *Moina micrura* Kurz, **57.** *Moinodaphnia macleayi* (King) **58.** *Bosmina longirostris* (O. F. Muller), **59.** *Macrothrix spinosa* King, **60.** *Macrothrix goeldii* Richard, **61.** *Echinisca triserialis* (Brady), **62.** *Pleuroxus similis* Vavra,

Characters : Body with uniformly curved dorsal margin, posteroventral corner with 1-3 denticles, valves without any ornamental marking ventral margin with feathered setae. Rostrum long, pointed downwards, antennules small, labrum with convex anterior margin. Post-abdomen elongated, tapering distally with 10-13 anal spines. Claw with two basal spines.

Length range : 0.35-0.42 mm.

Distribution : India : J&K, Meghalaya, West Bengal. Elsewhere : Australia, China, South East Asia, South America.

Genus ***Alonella*** Saris 1862

63. ***Alonella exisa*** (Fischer)
(Fig. 63)

1854. *Lynceus exisus* Fisher, *Bull. Soc.Imp. Nat. Mosc.*, **27** : 428-429.

1901. *Alonella exisa* : Lilljeborg, *Nova Acta Reg. Soc. Sci., Upasla,* Ser. III, **19**, VI : 510-513.

1988. *Alonella exisa* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 135.

Characters : Body oval; dorsal margin of valves arched, posterior straight, posterodorsal corner with one denticles,. Valves with reticulation of parallel lines forming a honeycomb-like pattern. Rostrum blunt and curved downwards. Labrum with convex anterior margin and blunt apex. Postabdomen with 9-10 anal spines. Claw with two basal spine.

Length range : 0.35-0.45 mm.

Distribution : India : J&K, Madhya Pradesh, Tripura.

Genus ***Chydorus*** Leach, 1816

Key to the recorded species

Plate of labrum with denticles ..... *Chydorus barrosi*

Plate of labrum without denticles but with pointed apex ..... *Chydorus sphaericus*

64. ***Chydorus sphaericus*** (O.F. Muller)
(Fig. 64)

1776. *Lynceus sphaericus* O.F. Muller, *Havniae* : 119.

1901. *Chydorus sphaericus* : Lillijeborg, *Nova Areg. Soc. Sci. Upasla Ser. III*, **19** : 561-567.

1988. *Chydorus sphaericus* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 139.

Characters : Body almost spherical, length slightly greater than height; posterodorsal corner of valves distinct. Posteroventral corner rounded, without denticles. Valves with pentagonal or hexagonal reticulations. Rostrum pointed, head shield rounded posteriorily. Plate of labrum with smooth, convex anterior margin. Ocellus nearer to eye than to apex of rostrum. Postabdomen short, with 7-10 anal denticles. Claw with two basal spines. Endite of Leg 1 with 3 setae, two of them of about equal length, the third hook-shaped.

Length range : 0.29-38 mm.

Distribution : Indina : Tamil Nadu, Bihar J&K, Nilgiri Hills, Meghalaya. Elsewhere : Cosmopolitan.

65. ***Chydorus barroisi*** Richard
(Fig. 65)

1894. *Pleuroxus barroisi* Richard, *Revue Biol. Nord. France.* **6** : 375-377.

1895. *Chydorus barroisi* : Sars. *Vidensk. Selsk. Skrifteri. Math. Naturv. Klasse* : 25-28.

1988. *Chydorus barroisi* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 149.

Characters : Body almost elliptical, maximum height in middle. Dorsal and ventral margins similarly convexed. Posterodorsal corner of valves rounded. Posteroventral corner with denticle. Rostrum with apical notch. antennules short. Labrum with 3-5 denticles on anterior margin. Ocellus smaller than eye, situated halfway between eye and apex of rostrum. Postabdomen short, with 8- 9 unequal anal spines. Claw with two basal spines.

Length range : O.30-0.38 mm.

Distribution : India : Gujerat, West Bengal. Elsewhere : Cosmotropical.

Genus ***Dunhevedia*** King, 1853

66. ***Dunhevedia crassa*** *crassa* King
(Fig. 66)

1853. *Dunhevedia crassa* King, *Pap. Proc. R. Soc. Van Diemans Land*, 2 : 261.

1971. *Dunhevedia crassa crassa* : Smirnov. *USSR Acad Sci. Cool Institute Nova. Ser.No.*101. *Leningrad* : 320-322.

1988. *Dunhevedia crassa crassa* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 157.

Characters : Body covered dorsally, maximum height slightly before the middle. Posteroventral corner of valve with one denticle. Ventral margins of valve with feathered

setae. Antennules terminating slightly before the tip of blunt rostrum; labrum rounded with pointed apex and without denticles. Ocellus situated nearer to eye than to apex of rostrum. Postabdomen oval, with 15-18 anal spines and numerous lateral groups of setae. Claw with one basal spine.

Length range : 0.45-0.50 mm.

Distribution : India:Gujarat, Rajasthan, West Bengal. Elsewhere : Holarctic region, Ethiopian, Indo-Malayan and Australian regions. Also Southern part of European USSR.

Genus ***Pseudochydorus*** Fryer, 1968

67. ***Pseudochydorus globosus*** Baird
(Fig. 67)

1843. *Chydorus globosus* Baird, *Ann. Mag. Nat. Hist.*, **68** : 90.

1988. *Pseudochydorus globosus* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 164.

Characters : Body outline almost spherical, slightly longer than high; posteroventral corner of valves rounded, without denticles. Valves with a pattern of polygons. Rostrum pointed and ventrally directed. Head shield with rounded posterior margin; Antennules not reaching apex of rostrum. Setae on antennae: 0-0-3/1-1-3; spines 0-0-1/0-0-1. Ocellus smaller than eye and situated nearer to eye than to apex of rostrum. Postabdomen produced in examined specimens. Anal spines about 20, decreasing in size proximally. Groups of lateral setae present. Anal margins with setae. Claw with two basal spines and row of setae on concave margin.

Length range : 0.78- 0.82 mm.

Distribution : India; Meghalaya, West Bengal. Elsewhere : Holarctic, Ethiopian, Indo-Malayan and Australian regions, also from European USSR.

Subfamily ALONINAE

Key to the recorded genera

1. Three main head pores 2
- One or two main head pores 6
2. Lateral setae on postabdomen large ..... *Leydigia*
Leydigia acanthocercoides
- Lateral setae on postabdomen not large 3
3. Postabdomen long and narrow 4

- Postabdomen of varying form but not narrow or very long ..... *Alona*

4. Postabdomen tapering distally 5

- Postabdomen straight, with parallel dorsal and ventral margin ..... *Acroperus*
Acroperus harpae

5. Rostrum projecting ..... *Kurzia*
Kurzia longirostris

- Rostrum not projecting ..... *Camptocercus*
Camptocercus rectirostris

6. One main head pore ..... *Notoalona*
Notoalona globulosa

Two main head pores 7

7. Main head pores connected narrowly ..... *Biapertura*

Main head pores separate ..... *Oxyurella*
Oxyurella singalensis

Genus ***Alona*** Baird, 1843

Key to the recorded species

1. Plate of labrum with rounded apex, main head pores connected 2

- Plate of labrum with pointed apex, main head pores not connected .....
..... *Alona pulchella*

2. Postabdomen tapering distally 3

- Postabdomen widening distally ..... *Alona.quadrangularis*

3. Anal spines in 10 groups ..... *Alona davidi*

Anal spines in 7 groups ..... *Alona rectangula*

68. ***Alona quadrangularis*** (O.F. Muller)
(Fig. 68)

1776. *Lynceus quadrangularis* O.F. Muller, *Havniae* : 72-73.

1850. *Alona quadrangularis* : *Baird, Roy. Soc. London* : 131-132.

1988. *Alona quadrangularis* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 170.

Characters : Body almost rectangular with maximum height near posterior end. Posterodorsal and posteroventral corners of valves rounded, posterior margin with row of spinules on inner side. Valves with a pattern of longitudinal lines crossing transverse lines, forming cells. Labrum with convex anterior margin. Ocellus slightly smaller than eye. Postabdomen, with 13-15 anal spines and groups of lateral setae. Claw with a basal spine.

Length range : 0.78-0.90 mm.

Distribution : India : South India and West Bengal. Elsewhere : Holarctic, Ethiopian, Indo-Malayan and Neotropical regions.

69. ***Alona rectangula rectangula*** Sars
(Fig. 69)

1862. *Alona rectangula rectangula* Sars. *Forhandl. Vidensk Selask, Cristiania* (1861) : 144-167.

1971. *Alona rectangula rectangula* : Smirnov, *USSR Acad Sci. Cool Institute Nova. Ser. No.* **101**. *Leningrad* : 347-350.

1988. *Alona rectangula rectangula* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 171.

Characters : Postdorsal and posteroventral corners of valves rounded, without denticles. Valves with 12 longitudinal lines without pits. Three main connected head pores. Antennules almost reaching apex of rostrum. Setae on antennae. Spines on proximal segment of expodite, on second segment of endopodite and on both distal segments. Plate of labrum rounded. Ocellus slightly smaller than eye. Postabdomen with 7 anal spines with setae. Claw with basal spine and setae.

Length range : 0.30-0.55 mm.

Distribution : India : West Bengal. Elsewhere : New Zealand, USSR.

70. ***Alona davidi davidi*** Richard
(Fig. 70)

1895. *Alona davidi* Richard, *Mem.Soc.Zool. France*, 7 : 237-243

1971. *Alona davidi davidi* : Smirnov *USSR Acad Sci. Cool Institute Nova. Ser. No.***101**. *Leningrad* : 369-370.

1988. *Alona davidi davidi* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 175.

Characters : Body almost oval, maximum height slightly before midddle.Posteriodorsal and osteroventral corners of valves rounded. Volves with a pattern of polygon. Rostrum blunt. Ocellus smaller than eye, plate of labrum rounded. Postabdomen with lateral

setae, widest in middle, tapering distally with prominet preanal and postanal corners. 25 anal spines. Claws with setae on concave margin.

Length range : 0. 31-0.45 mm.

Distribution : India : West Bengal. Elsewhere : Ethiopian & Australian regions, Argentina.

71. ***Alona pulchella*** King
(Fig. 71)

1853. *Alona pulchella* King, *Pap. Proc. R. Soc. Van Diemans Land*, **2** : 260.

1988. *Alona pulchella* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 182.

Characters : Body almost oval, posterodorsal and posteroventral corner of valves rounded. Valves generally punctate or with reticulation. Three main head pores, not connected to one another. Rostrum blunt. Antennules not reaching apex of rostrum. Labrum with convex anterior margin and slightly pointed apex. Ocellus situated halfway between eye and apex of rostrum. Postabdomen with almost straight dorsal and ventral margins; lateral setae in groups, distal seta longest in each groups. Preanal corner distinct but not projecting. Claws with basal spine.

Length range : 0.47- 0.59 mm.

Distribution : India : Gujarat, West Bengal. Elsewhere : Cosmotropical.

Genus ***Acroperus*** Baird, 1843.

72. ***Acroperus harpae*** (Baird)
(Fig. 72)

1820. *Monoculus striatus* Jurine. Paris : 154-156.

1901. *Acroperus harpae* : Lillijeborg, *Nova Areg. Soc. Sci. Upasla Ser.* III, **19** : 418-425.

1988. *Acroperus harpae* : Michael and Sharma, *Fauna of India and adjacent countries : Indian Cladocera. Zoological Survey of India, Calcutta* : 189.

Characters : Body almost oval. Posterodorsal corner of valves slightly lower than highest point of dorsal margin,. Posteroventral corner of valves with 2-5 denticles. Three connected main head pores. Antennules not reaching apex of rostrum. Proximal segment of exopodite of antennae and both distal segments with spines. Proximal segment of endopodite with a long spine; second segment with short seta. Labrum triangular, with convex anterior margin and blunt apex. Post-abdomen with very small anal spines. Claws with basal spine and setae on proximal margin.

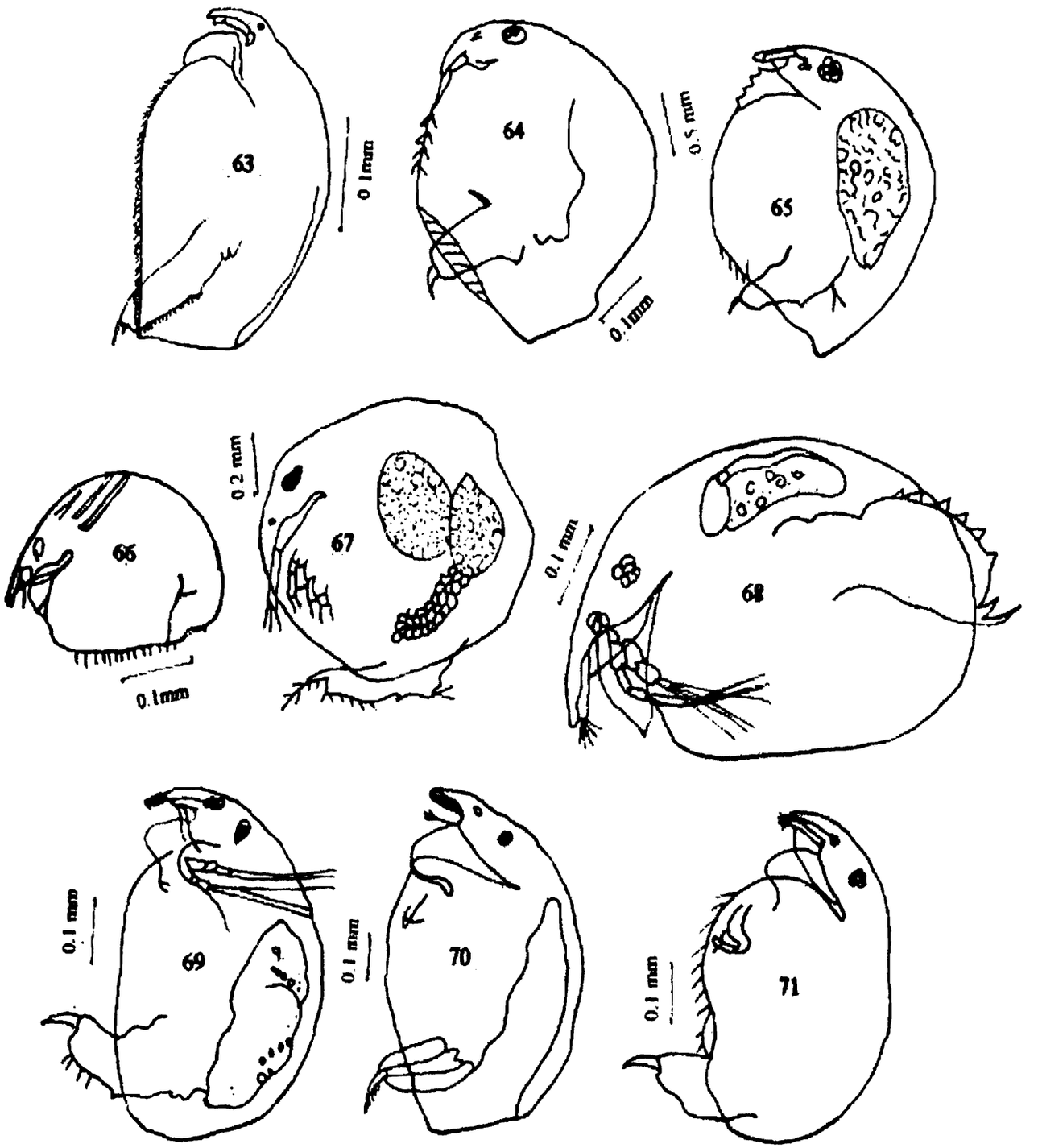

Fig. 63. *Alonella exisa* (Fischer), **64.** *Chydorus sphaericus* (O. F. Muller), **65.** *Chydorus barroisi* (Richard), **66.** *Dunhevedia crassa* King **67.** *Pseudochydorus globosus* (Baird), **68.** *Alona quadrangularis* (O. F. Muller), **69.** *Alona rectangula* Sars, **70.** *Alona davidi davidi* Richard, **71.** *Alona pulchella* King

Length range : 0.40-0.51 mm.

Distribution : India : J&K, West Bengal. Elsewhere : Cosmopolitan.

Genus ***Comptocercus*** Baird 1843

73. ***Camptocercus rectirostris*** Schoedler
(Fig. 73)

1862. *Camptocercus rectirostris* Schoedler, *Jahrb. Dorotheenstadt. Realschule, Berlin* : 25.

1988. *Camptocercus rectirostris* Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 189.

Characters : Body oval; maximum height in front of middle. Posterodorsal corner of valves rounded; posteroventral, corner with 3-5 denticles. Valves marked with curved stripes. Rostrum pointed and directed anteriorly. Labrum with rounded apex. Ocellus smaller than eye, situated nearer to eye than to apex of rostrum. Postabdomen long with 15-17 anal denticles, Claw long, with a long basal spine and row of setae.

Length range : 0.68-80 mm.

Distribution : India : Gujarat, J&K, Meghalaya, West Bengal. Elsewhere : Holarctic, Ethiopian, Indo-Malayan, New Zealand and European USSR.

Genus ***Leydigia*** Kurz 1875

74. ***Leydigia acanthocercoides*** (Fischer)
(Fig. 74)

1854 *Lynceus acanthocercoides* Fischer, *Bull. Soc. Imp. Nat. Mose.*, **27** : 431-433.

1988 *Leydigia acanthocercoides* Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 200.

Characters : Body roughly oblong and compressed. Valves with longitudinal lines, Three connected main head pores. Rostrum short, blunt, directed anteriorly. Labrum with setae on anterior margin. Ocellus smaller than eye, situated closer to eye than rostrum tip. Post-abdomen broadly rounded. Lateral part of anus with several rows of setae. Anal spines very small. Claws without basal spine.

Length range : 0.72-83 mm.

Distribution : India : Gujarat, Rajasthan, West Bengal. Elsewhere : Holactic Ethiopian, Indo-Malayan, Neotropical and European USSR.

Genus ***Biapertura*** Smirnov, 1971

Key to recorded species

1. Posteroventral corner of valve with denticles ..... *Biapertura karua*
- Poseroventral corner of valves without denticles ..... *Biapertura affinis*

75. ***Biapertura affinis*** (Leydig, 1860)
(Fig. 75)

1860. *Lynceus affinis* Leydig, *Tubingen* : 223.

1971. *Biapertura affinis* : Smirnov *USSR Acad. Sci. Cool Institute Nova. Ser.* No. **101**. *Leningrad* : 369-370.

1988. *Biapertura affinis* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 205.

Characters : Body oblong, maximum height in middle region. Posteroventral corner of valves with row of groups of setae. Valves with hexagonal markings. Two main head pores, with narrow connection between them. Antennules not reaching apex of rostrum. Labrum with convex anterior margin. Ocellus smaller than eye, situated nearer to eye than to apex of rostrum. Post-abdomen uniformly wide with 12-16 anal spines.

Length range : 0.62- 0.75 mm.

Distribution : India : Gujarat, J&K and West Bengal. Elsewhere : USSR, Central Asia, South East Asia.

76. ***Biapertura karua*** (King, 1853)
(Fig. 76)

1853. *Alona karua* King, *Pap. Proc. R. Soc. Van Diemans Land*, **2** : 246-260.

1971. *Blaxrtura karua* : Smcrnov, USSR Aead. Sci. zool. Institute Nova Ser. No. **101**, Leningrad : 539.

1988. *Biapertura karua* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 207.

Characters : Body oval, maximum height slightly before middle. Posteroventral corner of valves with 3-4 denticles. Valves with polygon-like markings. Two connected main head pores. Antennules almost reaching apex of rostrum. Ocellus smaller than eye and situated nearer to eye than to apex of rostrum. Postabdomen broadly rounded with 7-8 small anal spines. Claw with very small basal spine.

Length range : 0.30- 37 mm.

Distribution : India : Meghalaya, Tamil Nadu, West Bengal. Elsewhere Cosmopolitan.

Genus *Notoalona* Rajapaksa & Fernando 1987

77. *Notoalona globulosa* (Daday, 1898)
(Fig. 77)

1898. *Alona globulosa* Daday, *Termes. Fuzetek* : p. 37-38.

1987. *Notoalona globulosa* : Rajapaksa and Fernando, *Hydrobiologia*, **144** : 131-153.

Characters : Body oval and rounded. Posteroventral corner rounded and without denticles. Valves with striations. Rostrum blunt. A single head pore. Antennules not reaching apex of rostrum. Labrum margin anteroventrally serrated with pointed apex,. Ocellus smaller than eye and situated slightly nearer to eye than to apex of rostrum. Post-abdomen broadest near anus, with distinct preanal corner. Anal spines very small. Claw with a single basal spine.

Length range : 0.30-0.36 mm.

Distribution India : West Bengal. Elsewhere : Indo-Malayan, Neotropical and Nearctic regions.

Genus *Oxyurella* Dybowski & Grochowski, 1894.

78. *Oxyurella singalensis* (Daday)
(Fig. 78)

1898. *Alonopsis singalensis* Daday, *termes. Fuzetek*, **21** : 43-45.

1957. *Oxyurella singalensis* : Fryer, *Arch. Hydrobiol.*, **53** : 223-239.

1988. *Oxyurella singalensis* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 207.

Characters : Body rounded. Valves with dots and with lines parallel to ventral margin. Rostrum blunt. Two separate head pores. Antennules reaching apex of rostrum. Labrum with blunt apex,. Ocellus smaller than eye and situated nearer to eye than to apex of rostrum. Labrum rounded. Post-abdomen slightly narrowing distally with small 10-12 anal spines, confined to dorsal end. Claw with a single basal spine

Length range : 0.75-0.88 mm.

Distribution : India : Rajasthan, Tamil Nadu, West Bengal. Elsewhere : South East Asia and Ethiopian region.

Genus *Kurzia* Dybowski & Grochowski, 1894

79. *Kurzia longirostris* (Daday)
(Fig. 79)

1898. *Alona longirostris* Daday, *Termis. Fuzetek.*, **21** : 34.

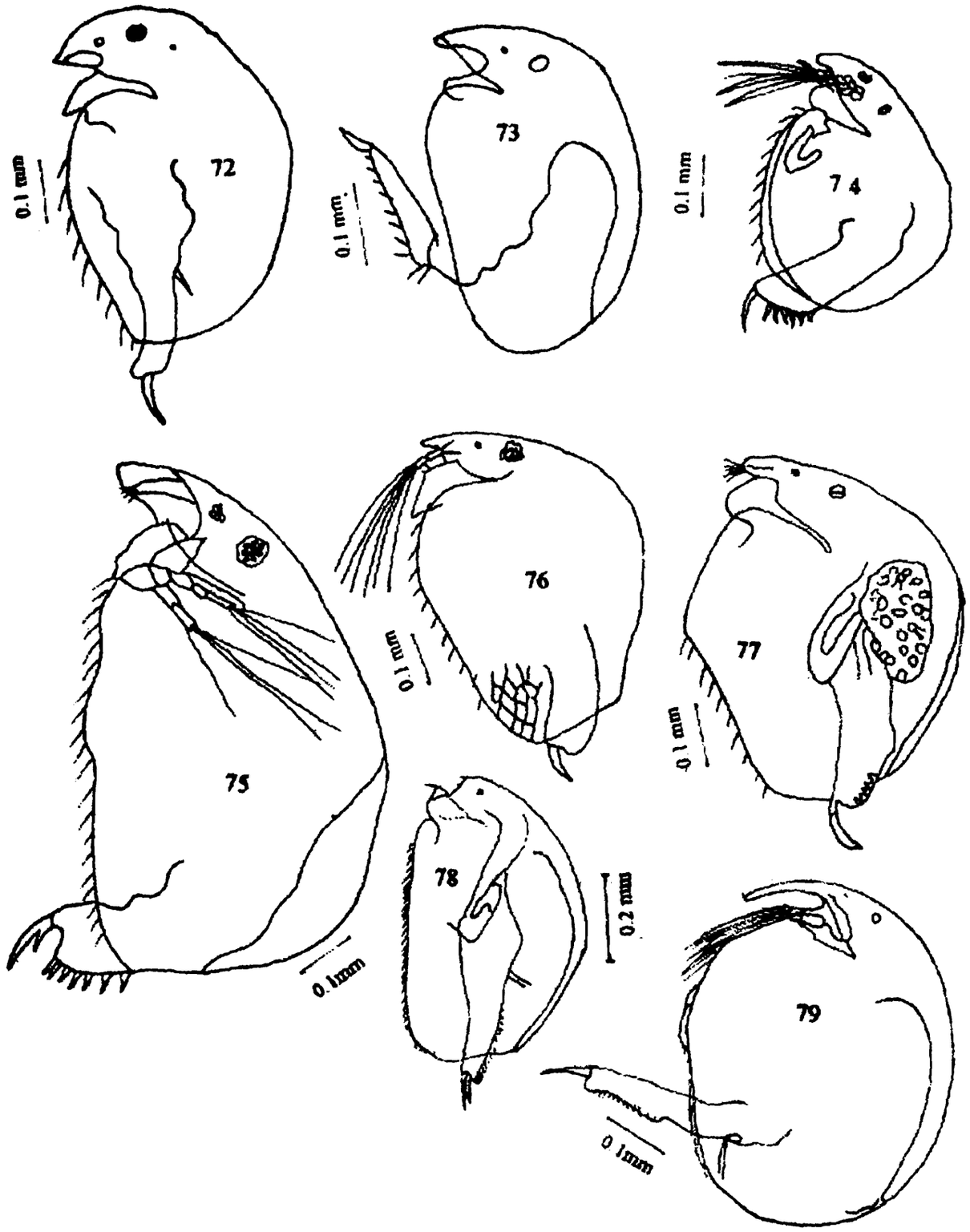

Fig. 72. *Acropus harpae* (Baird), **73.** *Comptocercus rectirostris* Schoedler, **74.** *Leydigia acanthocercoides* (Fischer), **75.** *Biapertura affinis* (Leydig), **76.** *Biapertura karua* (King), **77.** *Notoalona globulosa* (Daday), **78.** *Oxyurella singalensis* (Daddy), **79.** *Kurzia longirostris* (Daddy)

1957. *Kurzia longirostris* : Harding, *Explor. Hydrobiol. Lac. Tanganyika Result. Scientifique.*, **3** : 73.

1988. *Kurzia longirostris* : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian Cladocera. Zoological Survey of India, Calcutta* : 217.

Characters : Body oval. Posterodorsal and posteroventral corners of valves rounded, without longitudinal lines. Three main head pores, connected. Rostrum long, antennules reaching middle of rostrum. Labrum with pointed apex. Ocellus smaller than eye and situated almost halfway between eye and rostrum. Labrum rounded, post-abdomen slightly narrowing distally with small 18-21 anal spines, confined to dorsal end. Claw with a single basal spine.

Length range : 0.45-0.54 mm.

Distribution : India : Andhra, Rajasthan, Tamil Nadu, West Bengal. Elsewhere : Cosmo-tropical.

COPEPODA

Copepods are the most important planktonic constituent and form an essential link in the aquatic food chain of both marine and freshwaters. They constitute more than 50% of the planktonic density in majority of freshwaters of the the world. Out of 6 orders of the Sub Class Copepoda, the free living planktonic forms belong to the orders Calanoida and Cylopoida. These are minute crustaceans, having elongated and segmented body, divisible into a broad appendage bearing anterior part, the metasome an a narrower posterior part, the urosome, separated by a major articulation. The first antennae are generally longer and uniramous. The first thoracic segment is fused with head and bears a pair of maxillipeds and each of five subsequent thoracic segments bears one pair of biramous swimming legs, with fifth leg reduced or modified. Egg sacs are attached to body, near the articulation of urosome and metasome, medainally placed singles or laterally placed pairs.

Inspite of their great importance, our knowledge on the taxonomy of freshwater Calanoida and Cyclopoida of the country is still very inadequate and is mostly limited to some earlier works (Gurney, 1906, 1907; Sewell, 1934, 1935; Keifer,1939; Brehm, 1950, 1953). Later on, Sehgal (1967, 1983), Pillai (1971), Rajendran (1973) and Battish (1984, 1992), working in different regions of the country, reported the occurrence of some copepod species, most of which were already reported by earlier workers. Uptill now nearly 50 valid species of Calanoida and 32 species of Cyclopoida have been reported to occur in the country. Besides, several genera / species of doubtful occurrence have also been reported (Battish, 1992). However, barring a few very common ones, most of the species were either reported only once from their type locality or at the most by one or two latter workers.

During present investigation too, the diversity of copepods in the freshwaters of south eastern West Bengal was not rich and represented by only a few species. Altogether 10 commonly occurring species were recorded, 5 of calanoids and 5 of cyclopoids.

CLASSIFED LIST OF RECORDED TAXA

Suborder CALANOIDA

Family DIPTOMIDAE

1. *Heliodiaptomus cinctus* (Gurney)
2. *Heliodiaptomus contortus* (Gurney)
3. *Heliodiaptomus viduus* (Gurney)
4. *Neodiaptomus strigilipes* (Gurney)
5. *Phyllodiaptomus blanci* (Gueme & Richard)

Suborder CYCLOPOIDA

Family CYCLOPIDAE

6. *Mesocyclops hyalinus* (Rehberg)
7. *Mesocyclops Leuckarti* (Claus)
8. *Microcylops varicans* (Sars)
9. *Paracyclops fimbriatus* Claus
10. *Trophocyclops prascinus* (Fischer)

SYSTEMSATIC ACCOUNT

Key to orders and families of Subclass COPEPODA

Marked constriction between somite of 5th leg and genital segments. Urosome ♀ 2-, 3 or 4- segmented, urosome ♂ 5 - segmented, caudal setae equal in length; 1 egg sac one, carried medially; spermatophore elongate. First antennae very long, reach to near end of metasome to near end of caudal seata; in ♀ 23 to 25 segments; ♂ left similar to ♀, ♂ right geniculate. Fifth leg similar to other legs, symmetrical in females, asymmetrical in males, endopod present and modified, basal portion two-segmented, ♂ right leg ending in a claw endopodite of first leg 2–segmented ..... Order CALANOIDA
..... Family DIAPTOMIDAE

Marked constriction between somite of 4th leg and 5th segments. Urosome ♀ 4-seg mented, urosome ♂ 5-segmented; caudal setae unequal in length; 2 egg sac carried laterally; spermatophore kidney-shaped. First antennae not very long, reach from proximal third of cephalic segment to end of metasome; in ♀ 6-17 segments; ♂ both left and

right geniculate. Fifth leg not like other legs, reduced, vestigial, without endopod, basal segments not enlarged on inner margin. ..... Order CYCLOPOIDA
..... Family CYCLOPIDAE

Order CALANOIDA

Family DIAPTOMIDAE

Key to the recorded genera and species

1 Third exopod segment (claw) of right fifth leg narrow, cylindrical and curved inside with fine serration on inner margin from distal region in male .....
..... *Phyllodiaptomus*
Phyllodiaptomus blanci

Third exopod segment (claw) of right fifth Leg of male twice wider at its first half than its second half and the two halves are marked by an oblique ridge with serration only on part of inner margin from distal region in male 2

2. Sinuate claw of fifth leg has fine hairs on both sides in female ... *Heliodiaptomus*

Sinuate claw of fifth leg has highly conical and chitinised denticles on both sides in female ..... *Neodiaptomus*
Neodiaptomus strigilipes

Genus ***Heliodiaptomus*** Kiefer

Key to the recorded species of *Heliodiaptomus*

1 Second exopod segment (claw) of fifth leg in female not denticulate but serrated on its both margins ..... *Heliodiaptomus cinctus*

Second exopod segment (claw) of fifth leg in female denticulate on its both margins
..... 2

2. Third exopod segment (claw) of right fifth leg in male normal in shape.....
..... *Heliodiaptomus viduus*

Third exopod segment (claw) of right fifth Leg in male re-curved and peculiarly twisted, with serration ..... *Heliodiaptomus contortus*

80. ***Heliodiaptomus cinctus*** (Gurney)
(Fig. 80)

1907. *Diaptomus cinctus* Gurney. *Rec. Indian Mus.*, **1** : 29.

Characters : Female-Body moderately long, head with a constriction. Thorax nearly two and half times longer than abdomen, Margin of last thoracic segment armed with

a pair of small spines. Urosoma three segmented. Genital segment largest and provided with a stout spine on either side. Antennule long, reaching much beyond furcal rami. Caudal rami symmetrical with six caudal setae. Fifth leg somewhat symmetrical in form, right with additional tooth-like processes on second exopod.

Male – Body moderately slender in form with anterior proximity rounded off at tip. Last thoracic segment extended into asymmetrical wings, right wing more produced than the left. Urosome five-segmented. Caudal rami symmetrical bearing six setae. Right antennule modified for grasping organ. Fifth left leg shorter than right

Length range : ♂ : 0.85-1.01 mm, ♀ : 0.95-1.40 mm.

Distribution : India : Andhra Pradesh, Bihar, Kerala, Orissa, West Bengal. Elsewhere : Burma, Sri Lanka.

Remarks : The species was recorded in fair numbers from oxbow lakes and natural wetlands.

81. ***Heliodiaptomus contortus*** (Gurney)
(Fig. 81)

1907. *Diaptomus contortus* Gurney. *Rec. Indian Mus.*, **1** : 28.

Characters : Female–Body moderately slender. cephalothorax nearly three time longer than urosome. Urosome consists of three segments, genital segment nearly twice larger than the other two segments. Caudal rami symmetrical with six equal caudal setae. Anterior antennae consists of twenty five segments. Fifth leg well developed and symmetrical. Third exopod segment forms claw which knobbed at its base and has a knotch externally from which two unequal setae arise. Inner margin of claw set with fine hairs.

Male– Body moderately slender, cephalothorax nearly two times longer than abdomen. Posterior corner of last thoracic segment armed with two strong spines. Caudal rami symmetrical. Right anterior antennae modified as grasping organ. Fifth leg asymmetrical. Right larger than left and. Third exopod segment which forms long stout and re-curved claw originates from terminal portion of second exopod segment. Half of inner margin of twisted claw striated consists of two basipod, three exopod and one endopod segments. Third exopod segment of left fifth leg forms a chela–like structure with a strong spine at its base.

Length range : ♂ 0.80-0.95 mm, ♀ : 0.92-1.25 mm.

Distribution : India : Andhra Pradesh, Assam, Bihar , Goa; Kerala, Maharashtra, Orissa; Tamil Nadu, West Bengal. Elsewhere : Not known.

Remarks : This species was of very common occurrence in all wetland types.

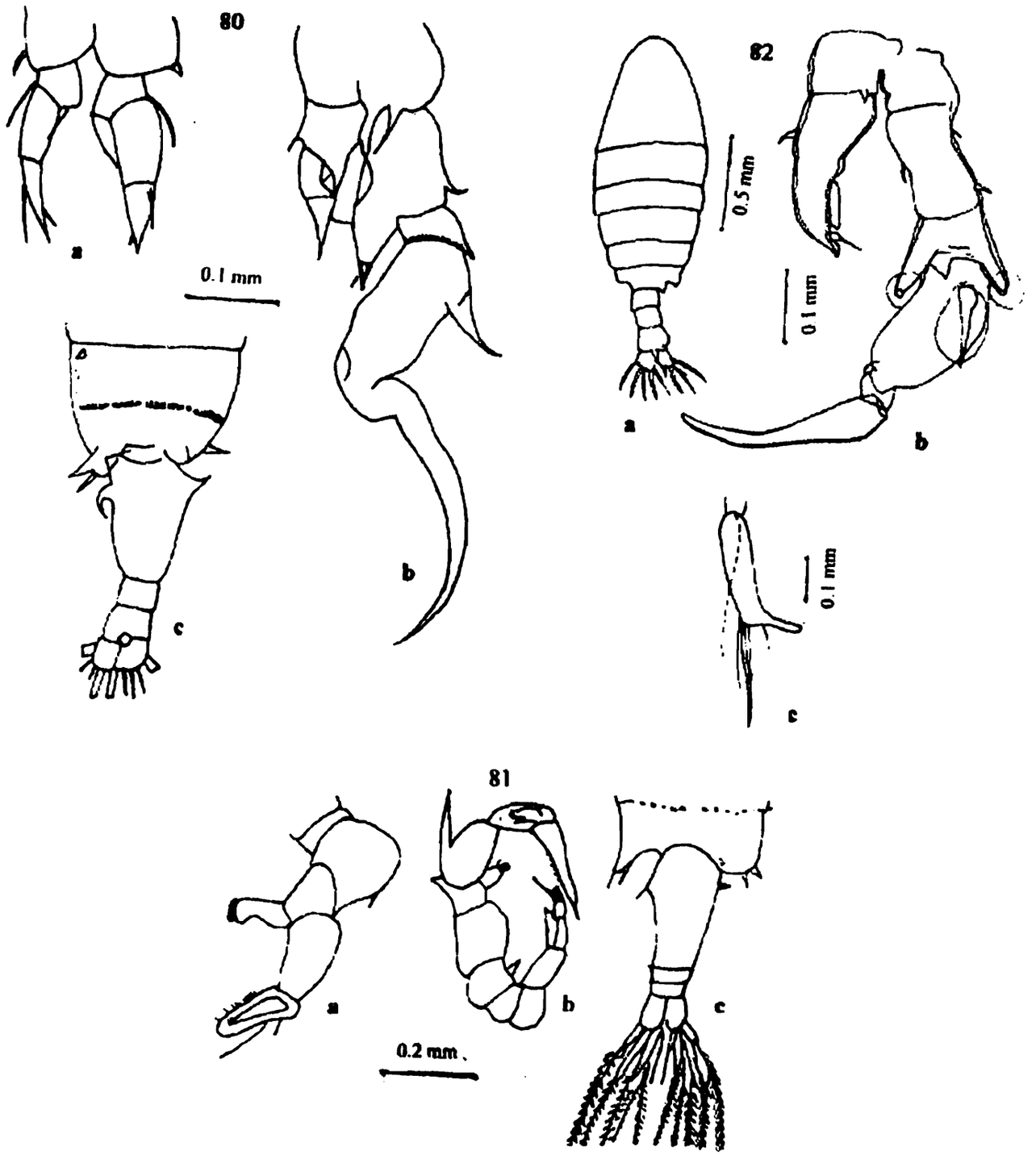

Fig. 80. *Heliodiaptomus cinctus* (Gurney), a) Female 5th leg, b) Male 5th leg, c) Female thoracic and adominal segments, **81.** *Heliodiaptomus contortus* (Gurney) a) Female 5th leg, b) Male 5th leg, c) Female thoracic and adominal segments, **82.** *Heliodiaptonus viduus* (Gurney), a) Male dorsal view, b) Male 5th leg, c) Male hyaline process of antepenultimate segment of Gerifantenna

82. ***Heliodiaptomus viduus*** (Gurney)
(Fig. 82)

1916. *Diaptomus viduus* Gurney. *Proc. Zool. Soc. Lond.*, **1** : 336.

Characters : Female – Body moderately long and slender. Cephalothorax broad posteriorly, tapering anteriorly, nearly three and a half times longer than urosome (including caudal rami). Urosome consists of three segments, genital segment considerably larger than the other two. Caudal rami symmetrical. First antennule consists of twenty-five segments, reaching upto end of fourth abdominal segments Fifth leg symmetrical. Third exopod segment forms claw and bears a set of fine hairs on inner half of margin. Outer margin of claw naked.

Male- Shape of body similar to that of female. Urosome consists of five segments. Caudal rami symmetrical, bearing six setae. Left antennule same as in female. Right antennule modified as grasping organ, antepenultimate segment having a hyaline process and a short outwardly turned hook. Fifth leg asymmetrical. Second exopod segment terminally bears long and curved claw. More than half of inner margin of claw striated. Endopod of left fifth leg similar to that of right leg but little thinner and wavy margins.

Length range : ♂ : 1.60- 1.90 mm, ♀ 1.75-2.25 mm.

Distribution : India : Andaman & Nicobar; Andhra Pradesh; Delhi; Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab; Tamil Nadu; West Bengal. Elsewhere : Sri Lanka.

Remarks : This was the largest calanoid species occurring abundantly in all wetland types.

Genus ***Neodiaptomus*** Kiefer, 1932.

83. ***Neodiaptomus Strigilipes*** (Gurney)
(Fig. 83)

1907. *Diaptomus Strigilipes* Gurney, *Rec. Indian. Mus.*, **1** : 30.

1973. *Neodiaptomus Strigilipes* : Rajendran, *J. Madurai Univ.* (Suppl. 1) : 126.

Characters : Female : Body robust, urosome 3-segmented, genital segment largest, second smallest. Caudal rami symmetrical, each with six equal seta. Anterior antennae 25 segmented. Fifth leg symmetrical. Second exopod segment of Right 5th leg forms claws which is knobbed at its base; inner margin of claw with chitinised denticles, outer smooth. Terminal segment forms a large conical or leaf–like process.

Male : Body slender, thinner than female. Urosome 5-segmented; less than half of cephalosome. Cuadal rami symmetrical, each with six equal seta. Anterior antennae 25 -segmented .Fifth leg with two basipod, three exopod and one endopod segment; asymmetrical, right larger the left. Second exopod of right fifth leg with a stout and

curved claw, half of inner margin of claw from distal end with serration. Endopod narrow, cylindrical with a row of fine hairs; proximal half of inner margin little swollen. Left 5th leg very short; second exopod segment about half of first segment and fringed with a row of minute bristles on inner margin.

Length Range : ♂ : 1.25- 1.45 mm, ♀ 1.05-1.20 mm.

Distribution : India : Andhra Pradesh, Karnataka, Tamil Nadu, West Bengal. Elsewhere : China, Nepal, Sri Lanka.

Remarks : Not a very common species occurred occasionally in small numbers in all types except type IV. Sewage fed fish culture pond.

Genus ***Phyllodiaptomus*** Kiefer, 1936

84. ***Phyllodiaptomus blanci*** (de Guerne & Richard)
(Fig. 84)

1896. *Diaptomus blanci de* Guerne & Richard. *Bull. Soc. Zool. Fr.* **21** : 53.

Characters : Female : Cephalothorax broad posteriorly, tapering anteriorly; metasomal wings asymetrical with hyaline spines, left more prominent than the right. Urosome 3-

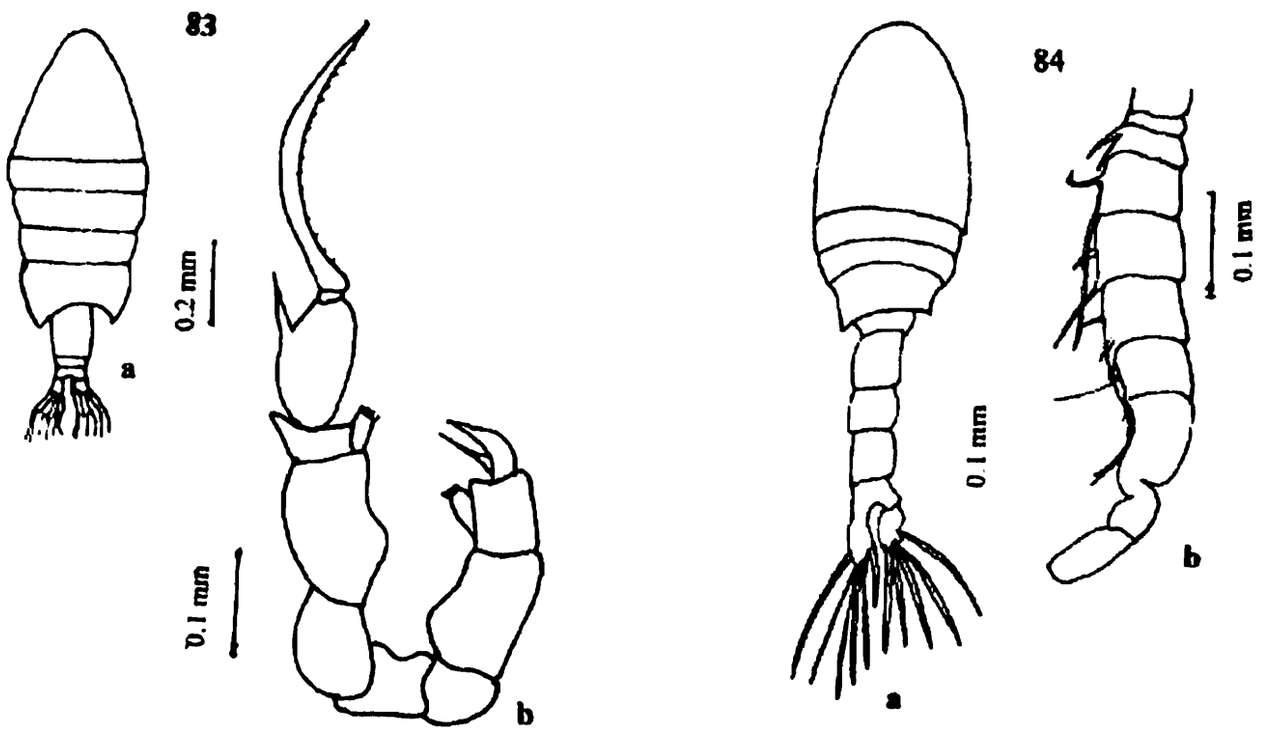

Fig. 83. *Neodiaptomus striligipes* (Pope & Richard)

Fig. 84. *Phyllodiaptomus blanci* (Gueme & Richard)

a-♀ dorsal view

b-♂ *Greifantennal* segment

segmented. Fifth leg well developed and symmetrical, right second exopod segment with a claw, claw with fine hairs on inner margin, third exopod much reduced with two very small setae and an inner long seta. Second exopod segment of right fifth leg forms claw and knobbed at its base and has a notch outside from which two unequal setae arise. Inner margin of claw set with fine hairs.

Male : Body slender, cephalothrax broad posteriorly, slightly tapering anteriorly. Metasomal wings asymmetrical, left more pronounced, with hyaline spines. Urosome consists of five segments. Caudal rami symmetrical, caudal setae long. First antennule long, consists of twenty-five segments, right one greatly modified-18th and 19th segments strongly specialised. Fifth leg largely asymmetrical, left shorter than right; third exopod segment of right forms a slightly curved claw, three forth of inner margin of claw with fine serrations. Endopod large and thick, extending into the middle of second exopod.

Length Range : ♂ : 1.42-1.65 mm, ♀ 1.60-1.70 mm.

Distribution : India : Bihar, Madhya Pradesh, Orissa, Punjab, Tamil Nadu, West Bengal. Elsewhere : Central Asia, Turkestan, Mesopotamia.

Remarks : Occurred occasionally in Type I and Type II wetlands. An uncommon species.

Order CYCLOPOIDA

Family CYCLOPIDAE

1. Fifth leg one-segmented and its basal segment fused with fifth metasomal segment ..... *Microcyclops*
   Microcyclops varicans

- Fifth leg two-segmented and its basal segment not fused with fifth metasomal segment 2

2. First antennule 17–segmented ,genital segment elongated but very little dilated anteriorly ..... *Mesocyclops*

- First antennule 12 or less segmented, genital segment not elongated but very much dilated anteriorly. 3

3. First antennule short, nine–segmented ..... *Paracyclops*
   Paracyclops fimbriatus

- First antennule twelve–segmented ..... *Tropocyclops*
   Tropocyclops prascinus

Genus *Mesocyclops* Sars, 1914

Key to the recorded species

Last segment of antennule with a serrated or notched hyaline plate .... *Mesocyclops leuckarti*

Last segment of antennule with with smooth hyaline membrane .... *Mesocyclops hyalinus*

85. ***Mesocyclope leuckarti*** (Claus)
(Fig. 85)

1923. *Cyclops leuckarti* Brehm. *Intern. Rev. Hydrobiol. Leipzig*, **11** : 329.

Characters : Female : Body slender, cephalothorax oval, much broader than abdomen with five divisions of prosome and four divisions of urosome. Genital segment long, narrow and largest and nearly equal in length of succeeding three segments of urosome. Furcal rami as long as last two abdominal segments. Caudal rami symmetrical, short, nearly 3 time as long as wide. Each ramus bears six caudal setae All rami of four legs are three jointed. Fifth leg two segmented, basal segment with one seta and distal segment with two spine. Anterior antennule 17–segmented, reaching slightly beyond metasoma, last segment with a serrated or notched hyaline plate.

Length Range : ♂ : 0.80-0.92 mm, ♀ 0.95-1.30 mm.

Distribution : India : Andhra Pradesh; Jammu & Kashmir, Karnataka, Orissa, Punjab, Tamil Nadu, Utter Pradesh, West Bengal. Elsewhere : Africa; South America.

Remarks : The most abundant zooplankter species occurring in all wetland types forming substantial portion of the zooplankton density.

86. ***Mesocyclops hyalinus*** (Rehberg)
(Fig. 86)

1880. *Cyclops hyalinus*, Rehberg, *Abh. Ver. Bremen*, vi : 542.

Characters : Female : Body stout and compact, cephalothorax oval, much broader than abdomen with five divisions of prosome and four divisions of urosome. Genital segment long, narrow and largest and nearly equal in length of succeeding three segments of urosome Furcal rami as long as last two abdominal segments, caudal rami nearly 3 times as long as wide, inner margin bare. Antennule 17- segmented, reaching slightly beyond the metasoma, last two segments longer than the previous three, last segment with smooth hyaline membrane. Inner spine on terminal segment of fifth leg apical or subapical in position. Inner terminal spine of endopod of 4th leg longer than outer

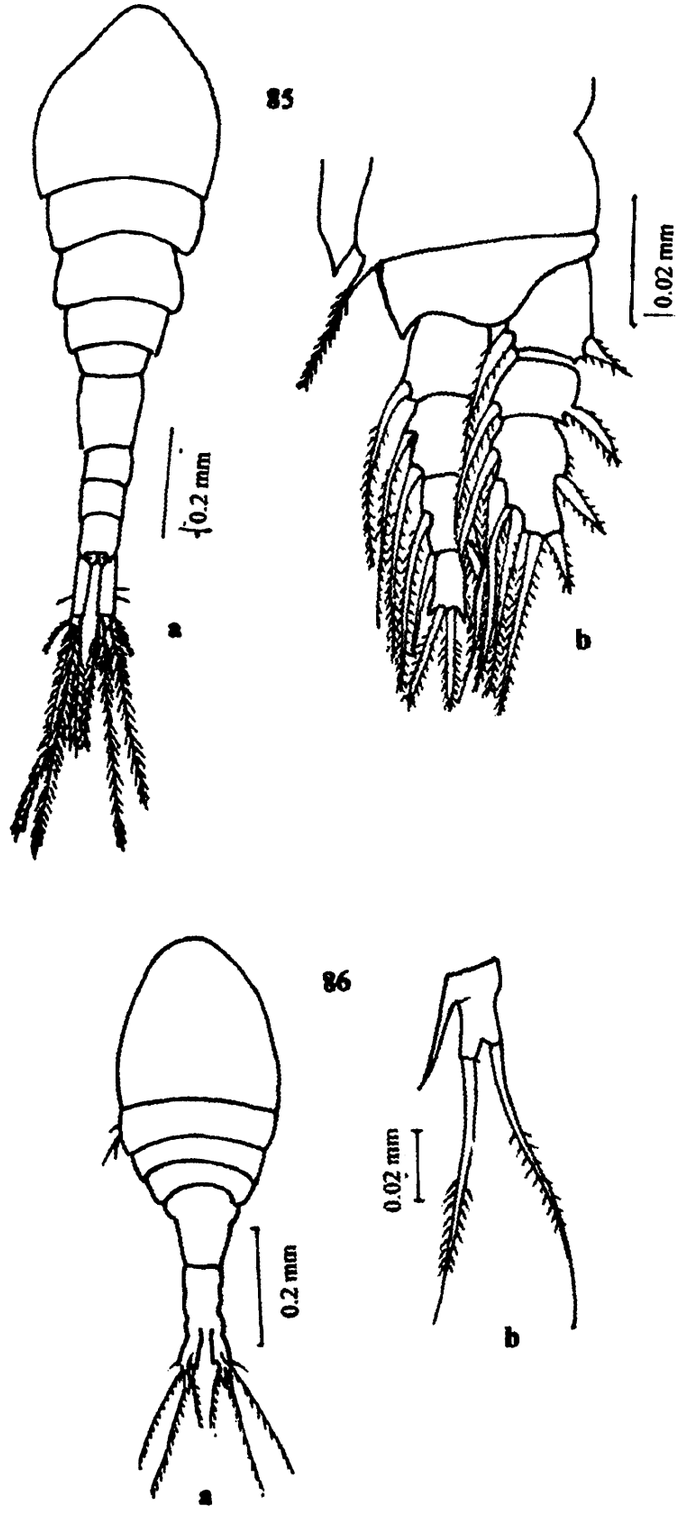

Fig. 85. *Mesoccyclops Leuckarti* (Claus,) a) female dorsal view, b) 5th leg.

Fig. 86. *Mesoccyclops hyalinus* (Rehberg), a) female dorsal view, b) 5th leg.

terminal spine but shorter than terminal segments.

Length Range : ♂ : 0.80-0.90 mm, ♀ 0.90-1.05 mm.

Distribution : Andhra Pradesh, J&K, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal.

Remarks : This species also occurs in all wetland types but its density is significantly lower than *M. leuckarti.*

Genus ***Microcyclops*** Claus, 1893

87. ***Microcyclops varicans*** (Sars)

(Fig. 87.)

1918. *Cyclops varicans* Sars. *Crustacea of Norway*, **6** : 54.

Characters : Female : Body moderately developed, metasome oval. cephalic segment large and rounded anteriorly. Last thoracic segment studded with lateral setae on either sides. Urosome five–segmented. Genital segment as wide as long. Caudal rami symmetrical and nearly equal in length of last two segments of urosome combined. Anterior antennule twelve segmented and smaller in length, hardly reaching to second thoracic segment. Legs 1-4 with rami of 2 segments each; 5th leg of one segment bearing an apical seta.

Male : Body slender, elongated, metasome ova, cephalic segment evenly rounded anteriorly and little longer than rest of metasome. Urosomal segment less than half of metasomal segment. Genital segment little swollen. Caudal rami longer than last two segments combined and nearly five times as long as wide. First antennule twice hinged at fifth and tenth segments. Basal segment of fifth leg always fused with body. A sixth pair of legs present at posterior corners of genital segment.

Length Range : ♂ : 0.55-0.65 mm, ♀ 0.75-0.90 mm.

Distribution : India; Andhra Pradesh, Punjab, Uttar Pradesh, West Bengal; Elsewhere : Cosmopoliton.

Remarks : The species occurred occasionally in small number in all wetland types but never formed any substantial portion of total copepod density

Genus ***Paracyclops*** Claus, 1893

88. ***Paracyclops fimbriatus*** (Fischer)

(Fig. 88)

1853. *Cyclops fimbriatus* Fischer. *Bull. Soc. Imp. Nat. Moscow*, **26** (1) : 94.

Characters : Female : Body moderately built, flattened dorsoventrally, anterior end oval. Metasome elliptical, cephalic segment larger than rest of metasome. Anterior antennule short, nine–segmented and nearly half in length of prosome and densely setose. Urosome

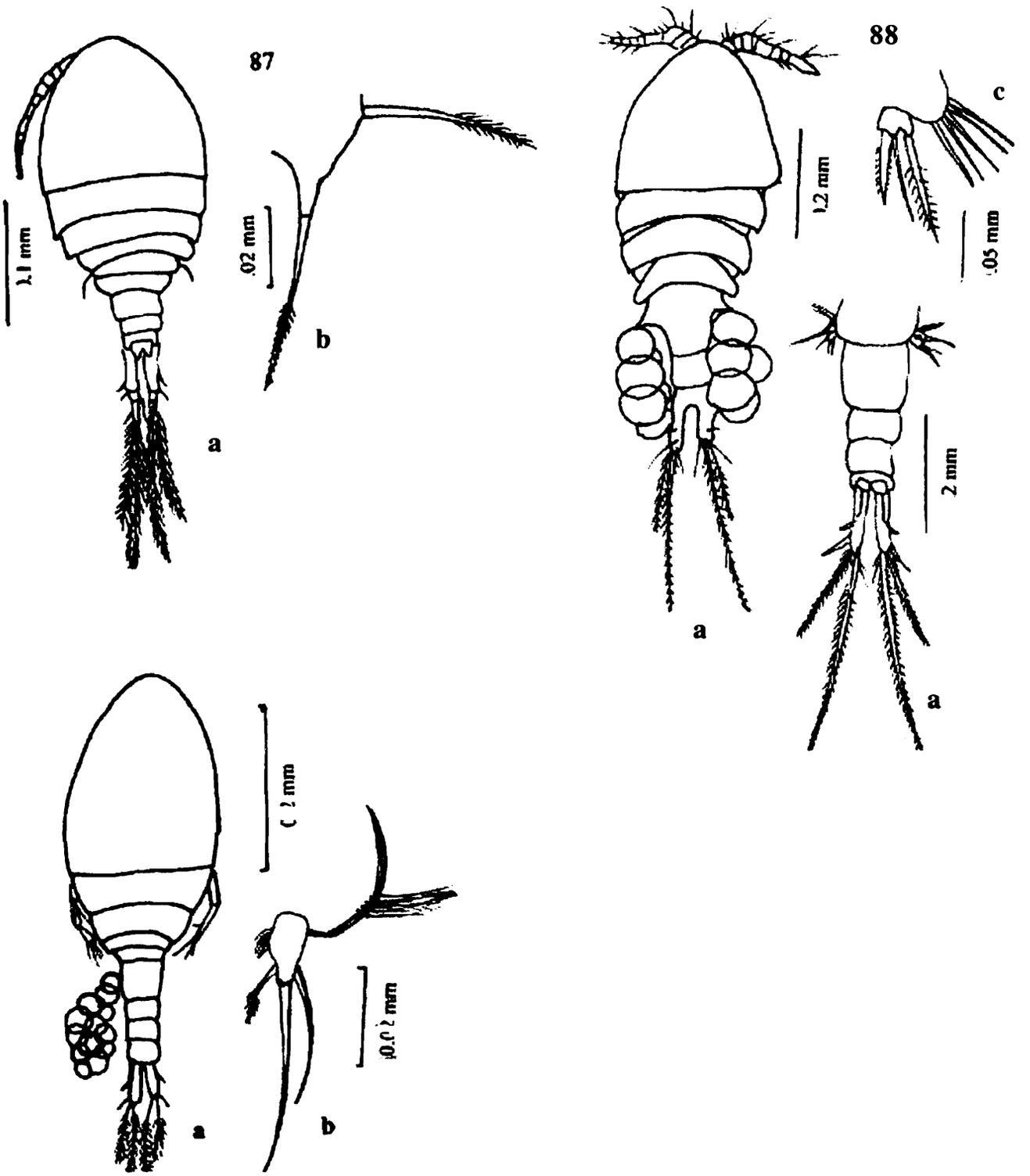

Fig. 87. *Microccyclops varicans* (Sars), a) female dorsal view, b) 5th leg.

Fig. 88. *Paracyclops fimbriatus* (Claus), a) female dorsal view, b) 5th leg.

Fig. 89. *Trophocyclops prascinus* (Fischer) a) female dorsal view, b) 5th leg.

five–segmented. Genital segment somewhat dilated antriorly. Caudal rami 4-5 times longer than wide, nearly equal in length of last three segments of urosome combined. Fifth pair of legs two–segmented, spine at inner edge very short.

Male : Body smaller than female. Anterior antennule nine–segmented and geniculate. Urosome five–segmented and nearly little more than half of metasome. Five pair of legs present. Sixth pair originates from posterior corner of genital segment.

Measurements : ♂ : 0.65-0.75 mm, ♀ : 0.75-0.90 mm.

Distribution : India : Andhra Pradesh; West Bengal. Elsewhere : Cosmopolitan.

Remarks : An uncommon species recorded only from natural wetlands.

Genus ***Tropocyclops*** Kiefer, 1927

89. ***Tropocyclops prascinus*** (Fischer)
(Fig. 89)

1860. *Cyclops prascinus* Fischer, *Abh. math. phy. classe. kon. Akad. Wiss. Munich*, **8** : 652.

Characters : Female : Body short, stumpy, opaque and somewhat brownish in colour. Metasome elliptical and twice longer than wide. Urosomal segments less than half in length than metasome. Last thoracic segment with a patch of hair on posterolateral side.Caudal rami short and slightly divergent, nearly 3 times longer than wide without any bristles on inner margin, each ramus with apical seta. First antennule reaching near the end of third metasomal segment. 5th leg trilobate and inner spine little shorter than outer and sparsely denticulate.

Male : Body smaller than female, cephalic segment shorter and rounded anteriorly. Urosome 5–segmented, more than half in length than metasomal segments. Caudal rami symmetrical. First antennule twice gemocilate. 5th leg trilobed; inner spine thinner and slender longer than outer.

Length Range : ♂ : 0.50-0.68 mm, ♀ : 0.70-0.95 mm.

Distribution : India : Andhra Pradesh; West Bengal. Elsewhere : Cosmopolitan.

Remarks : It was of rare occurrence and was recorded from natural wetlands and village ponds.

Variation in Species Diversity Between Wetlands

A total of 89 species of zooplankton belonging to three groups were recorded during the period of investigations. Highest number of species (71) was recorded from Type-I

wetlands, which comnprised the floodplain oxbow lakes. This was followed by Type-II, natural wetlands (jheels) which horboured 65 species. The fish culture ponds (Type-III) with 44 species and sewage fed fish culture ponds with only 32 species exhibited lower diversities (Table 4, Fig.1). The ratio of the contribution of different zooplanktonic groups in different wetlands in terms of number of species was almost similar to total zooplanton.

Table 4. Total number of species of different groups recorded from wetlands Types-I to VI during the period of investigations (pooled data).

Zooplankton	Total	Type-I	Type-II	Type-III	Type-IV	Type-V.	Type-VI
Group	No. of species (*Combined*)	Oxbow wetlands	Natural wetlands	Fish culture ponds	Sewage-fed fish culture ponds ponds	Multiprur pose village	Urban re-creational lakes
Rotifera	43	37	31	20	16	25	23
Cladocera	36	25	24	18	12	18	23
Calanoida	5	4	5	3	1	5	4
Cyclopoida	5	5	5	3	2	4	3
TOTAL	89	71	65	44	31	52	53

Total and Relative Densities

The numerical density of total zooplankton and relative densities of different groups in one wetland of each type is shown in Table 5. The densitity varied between 495 units/l (Type-IV Sewage fed fish culture pond) to 1440 (Type-V, multipurpose village pond.). The density was comparatively moderate in Type–I, oxbow lake and Type-II, Natural wetland, and sufficiently high in Type-VI, urban recreational lake (Table 5). The relative densities of different groups varied considerably between different wetlands. While copepods dominated in Oxbow lakes, natural wetland, urban recreational lakes and village pond, their densities were considerably lower in the two fish culture ponds, which were dominated by rotifers. Cladoceran occupied middle position in all wetlands (Table 5).

Numerically Abundant Species

Out of the total number of species recorded from different wetlands, only a few occuurred regularly and abundantly. A tentative list of such species was drawn and presented in Table 6. It may be seen that only a limited number of species formed the

abunndant component of zooplankton in each wetland. Excepting rotifers in Type-I, oxbow lakes, most of the numerically abundant species were common in rest of the wetlands. However, there were certain species which occurred abundantly only in a particular wetland type. The numerically abundant taxa of Type-I comprised of certain rotifer species like *Mytilina ventralis* and *Ascomorpha* sp which were never recorded from othwer wetlands. However, not much differences in the abundant species of Cladocera or Copepoda were observed. In other wetlands, among rotifers, 3-5 species of *Brachionus*, one species of *Keratella* and 1-2 species of *Lecane* generally formed the numerically abundant group. Among cladocera, 1 species of Sididae, 2 species of Daphnidae, 1 species of Moinidae, 1 species of Chydorinae and 1 species Aloninae comprised the abundant species. Excepting Type-1, only 1 species of calanoid and one of cyclopoid formed the dominant species component in each wetland.

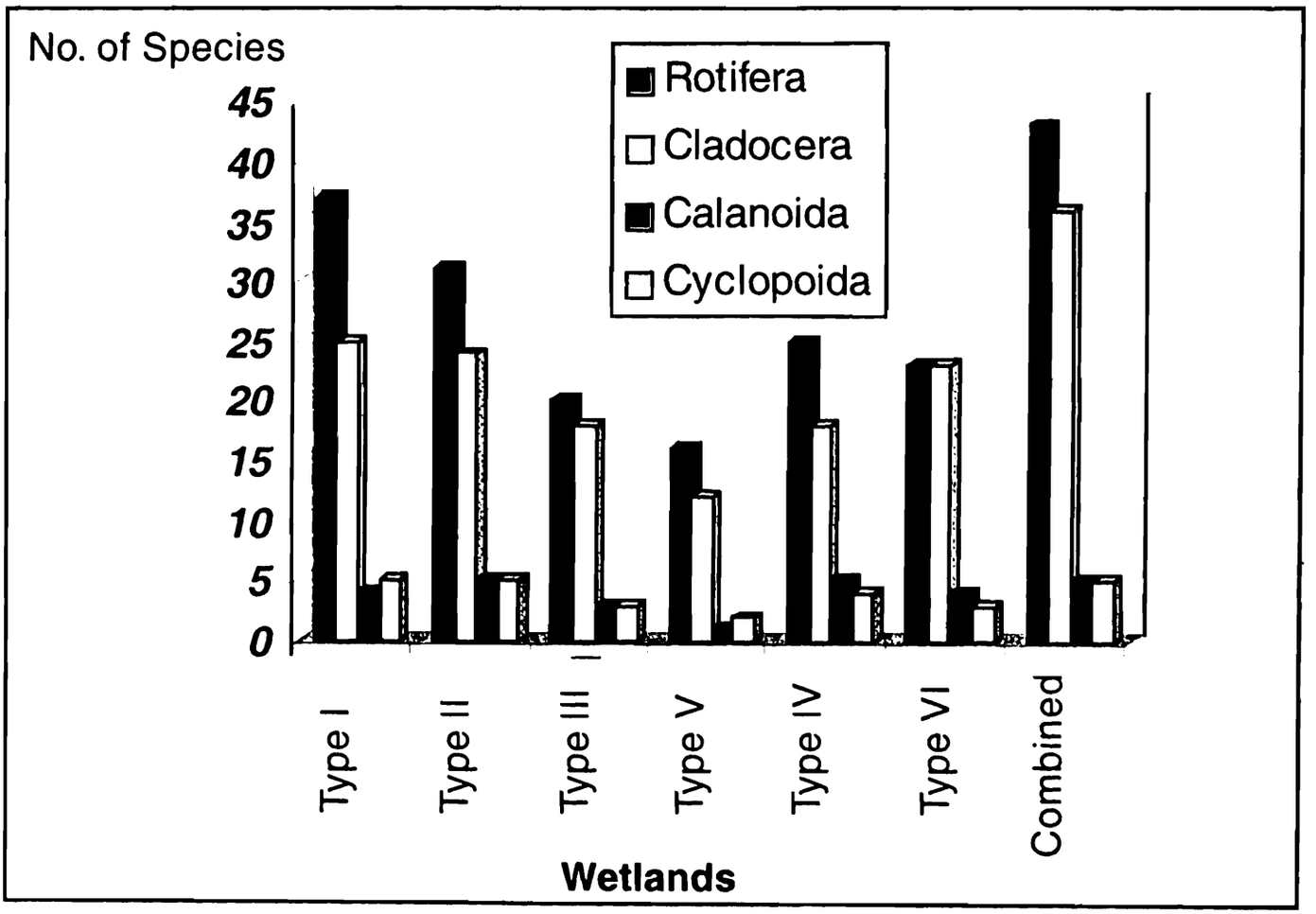

Fig. 1. Total Number of species of different groups of Zooplankton recorded during the period of investigations.

Table 5. Mean(annual) total and relative densities of different groups of zooplankton in one selected wetland of each type.

	Type-I	Type-II	Type-III	Type-IV	Type-V	Type-VI
	Oxbow wetlands Beri Gopalpur	Natural wetlands Borti beel	Fish culture ponds Kalikapur	Sewage-fed fish culture ponds Bantala-1	Multiprur pose village Canning	Urban re-creation al lakes Rabindra Sarovar
Total Density (No/l)	700	625	580	495	1440	895
Relative Composition (%)						
Rotifera	25.0	30.0	40.0	46.0	32.0	32.0
Cladocera	23.0	28.0	33.0	34.0	32.0	20.0
Copepoda	52.0	42.0	27.0	20.0	36.0	48.0

Table 6. Numerically abundant species of diferent wetland types

Type-I	Type-II	Type-III	Type-IV	Type V	Type-VI
Rotifera	**Rotifera**	**Rotifera**	**Rotifera**	**Rotifera**	**Rotifera**
B.calcyflorus	*B. angularis*	*B. angularis*	*B. angularis*	*B. bidentata*	*B. bidentata*
Keratella tropica	*B. bidentata*	*B. bidentata*	*B. bidentata*	*B. calciflorus*	*B. calciflorus*
Mytilina ventralis	*B. calciflorus*	*B. calciflorus*	*B. calciflorus*	*B.caudatus*	*B. fulcatus*
L.(L.) papuana	*B. rubens*	*B. fulcatus*	*B. rubens*	*B. farficula*	*K. tropica*
L.(Monostyla)bulla	*K. tropica*	*B. rubens*	*K. quadrata*	*K. quadrata*	*L)l.) aculeata*
Ascomorpha sp	*L(L) Curvocornis*	*K. tropica*	*Lepadella ovalis*	*Lecane(L.)*	*L(L)Curvocornis*
Asplanchna	*L.(M.) bulla*	*Lecane (L.)*	*Lecane luna*	*aculeata*	**Cladocera**
brightwelli	**Cladocera**	*aculeata*	*P .vulgaris*	*Lecane (M) bulla*	*Simocephalus*
Polyarthra vulgaris	*Diaphanosoma*	*L. (L) ungulata*	**Cladocera**	**Cladocera**	*expinosus*
Sida crystillana	*Sarsi*	**Cladocera**	*Ceriodaphnia*	*Diaphanosoma*	*Ceriodaphnia*
Diaphanosoma sarsi	*Ceriodaphnia*	*Diaphanosoma*	*cornuta*	*excisum*	*cornuta*
Ceriodaphnia cornuta	*cornuta*	*excisum*	*Chydorus*	*Simocephalus*	*Chydorus*
Simocephalus	*Simocephalus*	*Ceriodaphnia*	*sphaericus*	*Vetulus*	*sphaericus*
vetulus	*Vetulus*	*cornuta*	*A.quadrangulirs*	*Ceriodaphnia*	*Alona davidi*
Moina micrura	*Moina micrura*	*Simocephalus*	**Copepoda**	*cornuta*	*Alona pulchella*
Chydorus	*Chydorus*	*expinosus*	*M. leuckarti*	*Moina micrura*	**Copepoda**
sphaericus	*sphaericus*	*Moina micrura*		*B. longirostris*	*H. contortus*
Biapertura karua	*Alona pulchella*	*Chydorus*		*P. similis*	*M.leuckarti*
Copepoda	**Copepoda**	*sphaericus*		**Copepoda**	
H. Contortus	*H. viduus*	*Alona davidi*		*H. viduus*	
H. viduus	*M.hyalinus*	**Copepoda**		*M.leuckarti*	
M. leuckarti	*M.leuckarti*	*H. contortus*			
		M.leuckarti			

Measurement of Diversity

Table 7 Gives the mean values of Margalef's Species richness index (d). The highest species richness was observed in oxbow lakes (11.4485)., followed by natural wetlands (9.9414) and urban. lake (7.6570). The sewage fed fish culture ponds exhibited lowest diversity (4.8350). Not much differtences were observed in the species richness values between Types-III and V.

Table 7. Mean values of Margalef's Species richness index (d). in different wetlands

Wetlands	D Values
I Oxbow lakes	11.4485
II. Natural wetlands	9.9414
III. Fish culture ponds	6.7578
IV. Sewage fed fish culture pond	4.8350
V. Multipurpose village ponds	6.6000
VI. Urban recreational lakes	7.6570

Measurenent of similarity between the Wetland

The similarities between the wetlands were determined by of Sorenson's (1978) Index of Similarity. Highest similairy values were observed between Type-I and Type-II, wetlands (0.85). Next in the order were between Type-II and Type-VI (0.60) and III and V. Lowest values were between Type –II and Type IV (Table 8). As a whole the similarities between sewage–fed ponds and other wetlands were significantly lower than any other pair.

Table 8. Index of Similarity (Sorensen,1978) between different types of wetlands

	I	II	III	IV	V	VI
Wetland Type	Oxbow lakes	Natural wetland	Fish culture pond	Sewage-fed fish culture pond	Multi purpose village pond	Urban recreational lake
I-Oxbow lakes		0.85	0.55	0.22	0.48	0.52
II-Natural wetland			0.58	0.15	0.52	0.60
III-Fish Culture ponds				0.32	0.58	0.46
IV-Sewage fed fish culture					0.25	0.29
V-Multipurpose village ponds						0.43
VI-Urban recreational lakes/						

DISCUSSION

The zooplankton communities of freshwater wetlands of southeastern West Bengal were chiefly comprised of 89 commonly occurring species belonging to Rotifera, Cladocera and Copepoda. A general tropical character (Fernando, 1980b; Dussart *et al.*, 1984; Sharma and Michael, 1987; Michael and Sharma, 1988; Sharma, 1991, 1999b) was clearly evident and most of the species were typically associated with this region of the world representing mainly cosmopolitan and cosmotropical elements followed by pantropical elements. The qualitative dominance of rotifers over Cladocera and Copepoda in terms of species richness is in accordance with general faunal composition of this region as reported earlier (Khan and Sinha, 1999).

With a total of 43 species belonging to 14 genera and 12 families, rotifers exhibited highest diversity. The species richness of rotifers in the freshwaters of West Bengal has also been pointed out by Sharma (1999a) who recorded as many as 129 species, from some wetlands of the state, mostly from southeastern part (Calcutta North 24 Parganas, South 24 Parganas, Haora and Hugly). Adding 19 species described by Anderson (1889), which could not be collected by him, the total number of known species from the state now stands to 148. This constitutes nearly 44.848% of the country's rotifer fauna (Table 9) and about 30% of the Oriental fauna (Sudzuki, 1989). However, the number of species recorded from both littoral and limnetic zones of the wetlands studied during present investigations, based on repeated samplings, is far lesser than those recorded by Sharma (1999a) and constituted only 29% of the species reported from West Bengal and 13% of the country's rotifer fauna (Table 9). It may be due to the fact that many of the species listed by him are non planktonic forms or are of rare occurrence, contributing little to zooplankton density and biomass.

The tropical rotifer fauna are characterised by the abundance of certain families and genera. Out of 25 families known from the country, five, *viz* Lecanidae, Brachionidae, Colurellidae, Notommatidae and Trichocercidae (in the descending order of abundance) are reported to constitute nearly 58.5% of total recorded species (Sharma, 1999b). However, from West Bengal (Sharma, 1999a), only the former three families constituted the bulk of species composition (58.1%). The occurrence of 32 species belonging to these three families out of the total 43 (74.4%) in the wetlands of southeastern West Bengal, not only supports the findings of Sharma (1996) but also reveals their far greater role.

Among genera, the dominance of the species belonging to *Brachionus* and *Lecane* in tropical waters of the world is by now well established and they have been rightly designated as 'tropic centre genera' This has been discussed in considerable details by several workers (Green, 1972; Pejler, 1977; Fernando, 1980a, 1980b; Dumont, 1983; Dussart *et al.*, 1984). Sharma (1999b) observed that this fact, coupled with the absence or reduced availability of temperate centre species/genera of the family Brachionidae and restricted occurrence of other cold water genera, seem to be applicable to rotifer communities from different parts of the country, excepting northern latitudes. The

occurrence of 9 species of *Brachionus* and 16 of *Lecane* and absence of cold water genera from the wetlands studied, strongly support this viewpoint. Sharma (1983, 1999b) also observed the rich diversity of these genera in West Bengal and reported that out of 21 and 74 species of *Brachionus* and *Lecane* documented from the country, 17 and 42 respectively occurred in West Bengal.

Sharma (*op. cit.*) observed that rotifer diversity exhibits interesting variations in hard alkaline and soft acidic/slightly alkaline waters in different parts of the tropics. The former is characterised by the abundance of alkalophilic species of *Brachionus* and *Keratella tropica* and latter by the abundance of eurytopic Brachnonids like *Brachionus angularis, B. calcyflorus, B. forticula, B. falcatus, Keratella lenzi and K. cochearis.* The common occurrence of many of the above stated *Brachionus* species, classified as acidophilic, in the highly alkaline wetlands of southeastern West Bengal, could not support the viewpoint. Further, Sharma (*op. cit.*) again listed a large number of acidophilic and alkalophilic species, none of which, except *Brachionus bidentata, Brachionus rubens* and *Keratella procurva* were recorded during present investigations. It appears that the distribution of rotifer species in the country's freshwaters, particularly in this region, does not follow any rigid pattern.

The species richness of cladocera in the wetlands studied was reasonably high. The recorded number of species (36) represented nearly 63% of the total cladoceran species (57) known from West Bengal (Venktataraman, 1999) and 32.727% of the country's cladoceran fauna of 110 species (Table 9). In earlier studies on cladoceran diversity from Calcutta and nearby areas of South and North 24 Parganas, Sharma (1978a) recorded the existence of 24 species and Sinha and Khan (2000) found 26 species belonging to 20 genera under six families from only 4 wetlands. Compared to these, the number of species recorded by Venkataraman (*op. cit.*), is considerably large. However, several species added by him are new records, not only from the state but also from the region/ country. The new records included 23 species, most of which were of very rare occurrence. He further reported the occurrence of 11 temperate water species in floodplain region of West Bengal (latitude 22° - 23° 5 N) which were previously not recorded either from West Bengal or from any part of tropical and oriental regions. The author related this extraordinary occurrence to the region's. "closeness to temperate region", which needs further investigations. However, during present investigations, excepting *Alona rectangula,* none of the other 10 species was observed.

The Diversity of cladocera in tropics as compared to temperate waters have been discussed in considerable detail and contrary to earlier belief (Fernando and Kandùru, 1984; Fernando, 1994; Green, 1990), it has been by now almost well established that the diversity in tropics is no way lesser than those in temperate freshwaters (Dumont, 1994). The Indian cladocera alone contribute nearly 26% to world fauna (Table 10). The availability of 36 species in the wetlands studied and 57 species recorded by Venkataraman (*op. cit.*) from West Bengal, which constituted nearly 51.81% of the country's fauna (Table 9), points towards a moderate cladoceran diversity. Further, the cladoceran

diversity of the tropics in general is characterised by the qualitative abundance of littoral chydorid species and the diversity of limnetic fauna is comparatively lesser than temperate waters. This is apparently due to abundance of macrophytes which mainly control their diversity and abundance (Whiteside and Harmsworth, 1967; Freyer, 1968; Quade, 1969). Most of the wetlands studied, particularly floodplain wetlands and natural wetlands were infested with littoral macrophytes and therefore, the species composition was dominated by chydorids which were represented by 18 species, constituting 50% of total cladoceran diversity. Besides, several species belonging to other limnetic families also occurred in littoral macrophytes where they seem to be well adapted and there appeared to be no truly limnetic species. Similarly some chydorids were also recorded in the samples from open water. These findings supported the views, expressed by several earlier workers, that in tropics all pelagic zooplankton species are also found in the littorals and hardly any species can be characterized as exclusively pelagic (Fernando, 1980a, 1980b, 1994) and littoral zooplankton may sometimes also invade the pelagic zones both in tropics and temperate regions (Fernando and Holcik, 1990).

Table 9. Number of species of different groups of freshwater zooplankton recorded during present study, from West Bengal and from the country.

Group	Present Study South eastern West Bengal	Sharma (1999a) West Bengal	Venkat-araman (1999) West Bengal	Roy (1999) Sehgal(1983), Battish,(1992) West Bengal (only fresh-water species	Total in India (Sharma, 1991b, 1999a, 1999b, Battish, 1992)	Percent in West Bengal studied	Percent In the wetlands studied
Rotifera							
Species	43	148			330	44.848	13.030
Genera	14	39			63	61.190	22.222
Families	12	20			25	75.000	48.000
Cladocera							
Species	36		57		110	51.818	32.727
Genera	26	-	29		40	72.500	65.000
Families	6		6		8	75.000	75.000
Copepoda							
Species	10			20	88	22.727	11.363
Genera	7	-		11	25	44.000	28.000
Families	2			2	2	100.00	100.000

The high species diversity of Chydoridae as compared to Daphnidae, Sididae, Moinidae, Bosminidae and Macrothricidae in the wetlands studied supports the views of earlier workers (Green, 1962; Mamril and Fernando, 1978; Dumont, 1980; Dumont *et al.* 1981; Sharma and Michael, 1987; Sharma, 1991b; Egborge *et al.*,1994) that such combination, specially the dominance of chydoridae is the characteristics of tropical water bodies. There was a general scarcity of larger bodied limnetic species particularly *Daphnia* sp in all the wetlands. The comparatively reduced occurrence of limnetic species and *Daphnia* in tropics has also been pointed out by several workers (Fernando, 1980a; Kerfoot and Lynch, 1987; Fernando, *et al.,* 1987). The impoverishment of limnetic and larger–sized species in tropical fish culture wetlands is related to intense grazing pressure by planktivorous fishes throughout the year resulting in the elimination of larger-sized species (Fernando, 1994).

Copepods, that formed the sizable component of zooplankton community of the wetlands of this region in terms of biomass, were least diverse qualitatively. Only 5 species each of calanoids and cyclopoids were recorded from all wetlands studied. This constituted nearly 50% of the freshwater copepod species recoded from West Bengal and 11.363% of the country's copepod fauna (Table 9). Among calanoids, *Heliodiptomus contortus* and *H. vidvus* and among Cyclopoids, *Mesocyclops leuckarti* and *M. hyalinus* (Rehberg) occurred throughout the year in all wetland types. Generally the number of species of copepod occurring in an ecosystem is never very large, either in temperate or tropical freshwaters. From various waterbodies of the country too the number of copepod species recorded varied between 7 and 8 (George, 1966; Zutshi and Vaas, 1982; Baruah *et al.*, 1993). However, Roy (1999) reported the occurrence of 21 species of calanoid and 4 species of cyclopoids from West Bengal, which included 12 brackishwater calanoid species described from North and South 24 Parganas districts around Bidyadhari river and erstwhile salt lakes of east Calcutta.

The diversity of zooplankton of country is considerably rich as compared to world fauna, as evident from foregoing accounts and also from a few serious studies carried out in other parts of the country (Table 10). As per a rough estimate, the Rotifera (330 species), Cladocera (110 species) and Copepodas (88 species) of the country, comparise nearly 13.20%, 25.88% and 17.60% respectively of the world fauna. Inspite of this, a scrutiny of literature revealed a very poor understanding of the concept of faunal component of the ecosystem by the ecologists of the country in general. Although most of known taxa belonging to rotifer and crustacean zooplankton of the country were identified and systematically classified long time ago and a number of authentic documents are available as mentioned earlier, still vague words like "*Cyclops*", "*Diaptomus*" or "*Daphnia*" are reported by many workers as species of crustacean zooplankton. All the species belonging to Order Calanoida and Cyloipoida (number of approximately known freshwater species from the country–56 and 32 respectively) and Cladocera (number of known species-

nearly 110) are clubbed together under the abovementioned three "taxa." The casual treatment of the animal classification sometimes resulted in grossly confusing statement. For example, Sinha and Jha (1997) described *Diaphanosoma* as a species of Copepoda and *Daphnia, Ceriodaphnia* and *Moina* as "Crustacea" from the floodplain wetlands of Bihar. Further Some workers have mentioned the occurrence of few species (*Daphnia galeata, D. longiuris*) which are not yet been recorded from the country or clubbed phytoplankton with zooplankton, which belong to different trophic status, while expressing the diversity and density or designating a separate status to nauplius (CIFRI, 2000). Even those reports which include a list of zooplankton species, deal with only a few species ranging between 5-15, which appears to be an underestimation of the number of species occurring naturally in a lake/reservoir or pond.

Table 10. Estimated number of species of differnt gropus of freshwater zooplankton from India and World

Group	India	World	% in India	Source
Rotifera	330	2500	13.20	Sharma, 1999b
Cladocera	110	425	25.88	Sharma, 1991b; Battish, 1992; Dumont,1994
Copepoda ***Calanoida and Cyclopoida*)**	88	500*	17.60*	Variuos sources *gross estimation

The density of zooplankton between the wetlands fluctuated widely and was related to the nature of wetlands. Highest density was recorded from village pond where very high organic load and comparatively lower predation pressure resulted in the increased density of few species of each group. The density was also high in the urban recreational lake, where too, the predation pressure was low because of the absence of fish culture activities. The impact of predation is quite evident in the two fish culture ponds where the density was considerably low. Inspite of very high nutrient load of Sewage-fed fish culture ponds, the density of zooplankton species was severely limited. The relative densities of different groups also varied significantly between wetlands. While copepods dominated numerically in oxbow lakes, natural wetlands, village pond and urban lakes, rotifers formed numerically dominant component in the fish culture ponds. Generally copepods, inspite of their limited species number, form the dominant component of zooplankton biomass and numerical density in most of the wetland of this region. However, under highly specialised condition, like extensive fish culture ponds, their numerical densities reduce due to size selective predation by predators (fishes) because of their;

large sizes (Brooks and Dodson, 1965; Harback, 1977). The reduction in their number results in the dominance of some other group like rotifers.

The quantitative dominance of different groups of zooplankton in freshwater wetlands of the country differs widely. While copepods were found to dominate in some (Das and Srivastava, 1959; Khatri, 1992; Barua *et al.*, 1993; Dash *et al.*, 1993), cladocera (Kaul and Hando, 1993) or Rotifera (George, 1966; Rai and Sharma, 1991; Joshi and Adoni, 1993; Pandit, 1993; Kumar, 1995) were dominant component in others. It can be concluded that the dominance of any group solely depends upon local factors and no generalization can be made.

In the zooplankton community of an ecosystem, the main role is played by only a few commonly occurring species (Anderson, 1971, 1974; Patalas, 1972). Anderson (1974) found that a few numerically abundant species contributed 27% of the communities in 340 lakes and ponds of Canada. Yousuf *et al.* (1986) found that 35.5% of total community were contributed by only four species in some freshwater lakes and ponds of Kashmir. During present study too, all the wetlands were characterized by a set of few numerically abundant species that controlled the bulk of zooplankton density.

The diversity indices revealed clearly the status of these wetlands. The floodplain wetlands (Oxbow lakes and natural wetlands), mainly fed by rainwater with abundant macrophytes, exhibited high species richness and on the other hand, the highly specialised sewage–fed fish culture pond with considerably high organic load, was characterised by lowest diversity. Highly enriched condition, obviously limited the species diversity of almost all groups of zooplankton.

Because of their comparatively unpolluted conditions, the floodplain wetlands *viz.* oxbow lakes and natural wetlands exhibited a greater similarity in respect of their zooplankton fauna. The analysis has significantly isolated the sewage fed fish culture ponds, which, due to their highly specialised nature, exhibited considerably different conditions.

The fluctuation in the density of zooplankton in temperate waters has been reported to be governed mainly by temperature and food supply (Elgmerck 1959, Hazelwood and Parker, 1961, Vijverberge, 1976). However, in tropics, particularly in this region of the country, neither temperature does drop drastically (Khan 1981) nor food is in short supplies, because of eutrophic nature of waterbodies. The factor, which appears to govern the cycle of abundance, is monsoon. In fact, heavy precipitation during monsoon season and dry spell during premonsoon control the entire biological cycle of this region.

SUMMARY

The rich faunal diversity of Zooplankton community, which play an important role in the trophic dynamics of freshwater ecosystem, has not been given due attention by the ecologist in the country, due to the non availability of a concise taxonomic literature. Realising this, a detailed programme of work was initiated to work out the species

diversity, community structure and dynamics of zooplankton in some freshwater wetlands of southeastern West Bengal. This region of the country, which covers the districts of North 24 Parganas, Calcutta, South 24 Parganas, Hugly, Haora and Mednipur of West Bengal State, located on either side of the major River Ganga near or on Sunderban delta, is very rich in freshwater resources where almost all types of wetlands occur. The studies were carried out for a period of over one decade (1991-2001) in 20 selected wetlands belonging to six different types *viz.*, I) floodplain oxbow lakes (open and closed types, II) natural wetlands (jheels), III) urban recreational lakes and ponds, IV) fish culture ponds, V) sewage-fed fish culture ponds and VI) multipurpose village ponds.

The zooplankton community was mainly comprised of 89 species belonging to Rotifera Cladocera and Copepoda. A general tropical character was very much visible and most of the species recorded were typically associated with this region of the world representing cosmopolitan : cosmotropical : pantropical elements in the descending order of abundance. The rotifers were represented by highest number of species (43), which constituted nearly 29% of the species reported from West Bengal and 13% of the country's rotifer fauna. This was followed by Cladoceran, represented by 36 species, which constituted 63% of the total cladoceran species known from West Bengal and 32.% of the country's cladoceran fauna. The species diversity of copepods was lowest as only 10 species belonging to both, calanoids and cyclopoids, were recorded. This constituted nearly 50% of the species known from West Bengal and about 11.3% of total known species of the country. Variations in the diversity of zooplankton in different wetland types was quite evident. Highest number of species of all groups were recorded from Type-I, Oxbow lakes.

The density of zooplankton fluctuated widely between the wetlands and was related to the nature of wetlands. Highest density was recorded from village pond where very high organic load and comparatively lower predation pressure resulted in the increased density of a few species of each group. The impact of predation was quite evident in the two fish culture ponds where the density was considerably low. Inspite of very high nutrient load of Sewage–fed bheries, the density of zooplankton species was severely limited. While copepods dominated numerically in oxbow lakes, natural wetlands, village pond and urban lakes, rotifers formed numerically dominant component in the fish culture ponds. All the wetlands were characterized by a set of a few numerically abundant species that controlled the bulk of zooplankton density. The analysis of species richness indices revealed clearly the status of these wetlands. Oxbow lakes and natural wetlands, mainly fed by rainwater with abundant macrophytes, exhibited high species richness and on the other hand, sewage–fed fish culture pond, with considerably high organic load, was characterised by lowest diversity. Further, due of their comparatively unpolluted conditions, the oxbow lakes and natural wetlands exhibited a greater similarity in respect of their zooplankton fauna. The analysis has significantly isolated the sewage–fed fish culture ponds, which due to their highly specialised nature, exhibited considerably different conditions.

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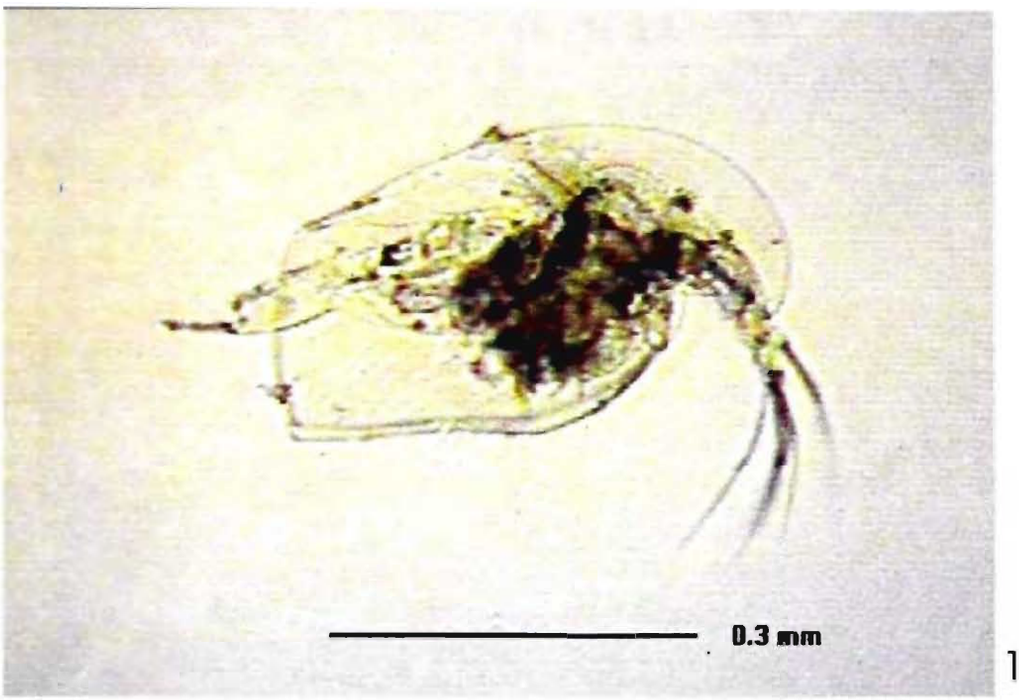
PLATE-I



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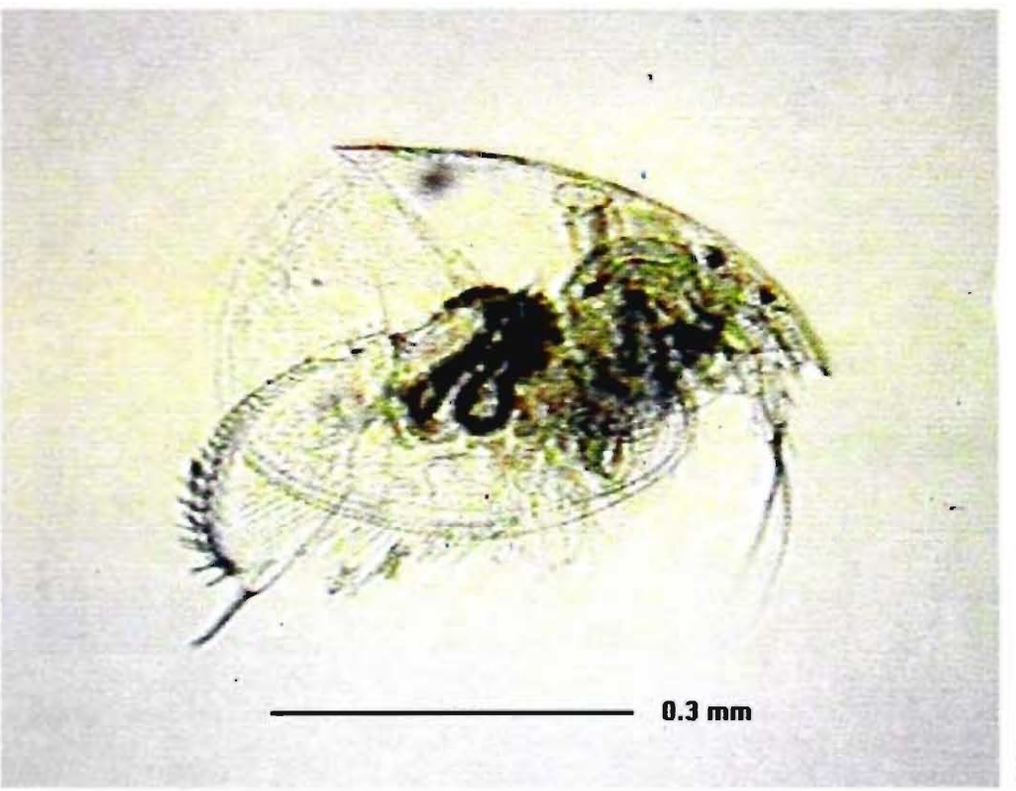
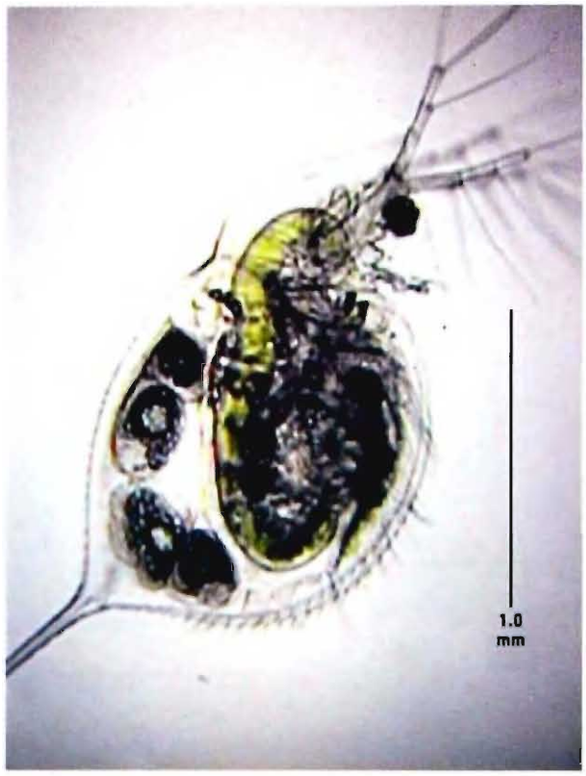


2

1. *Acropus harpae* (Baird)
2. *Leydigia acanthocercoide* (Fischer)

PLATE-II



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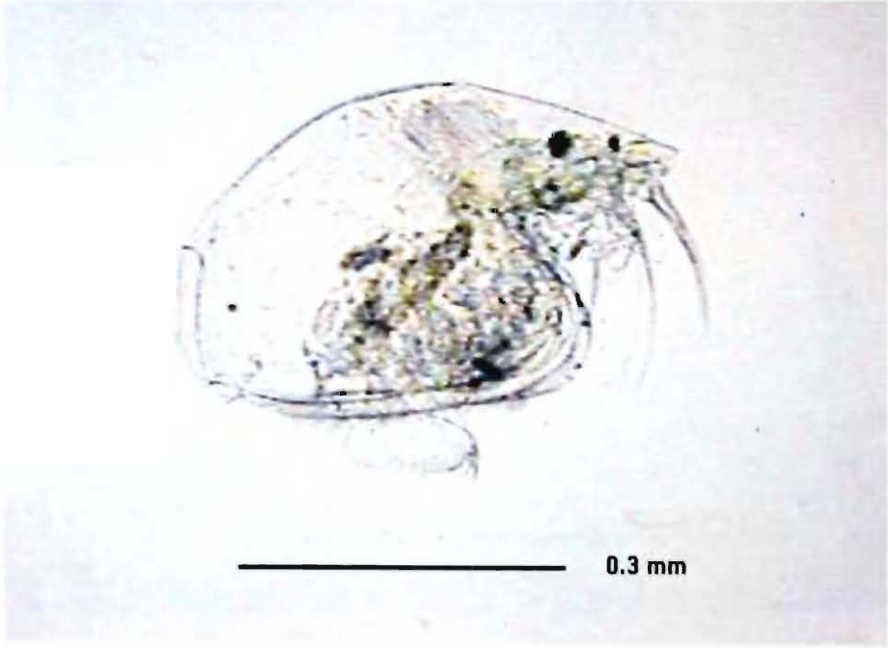
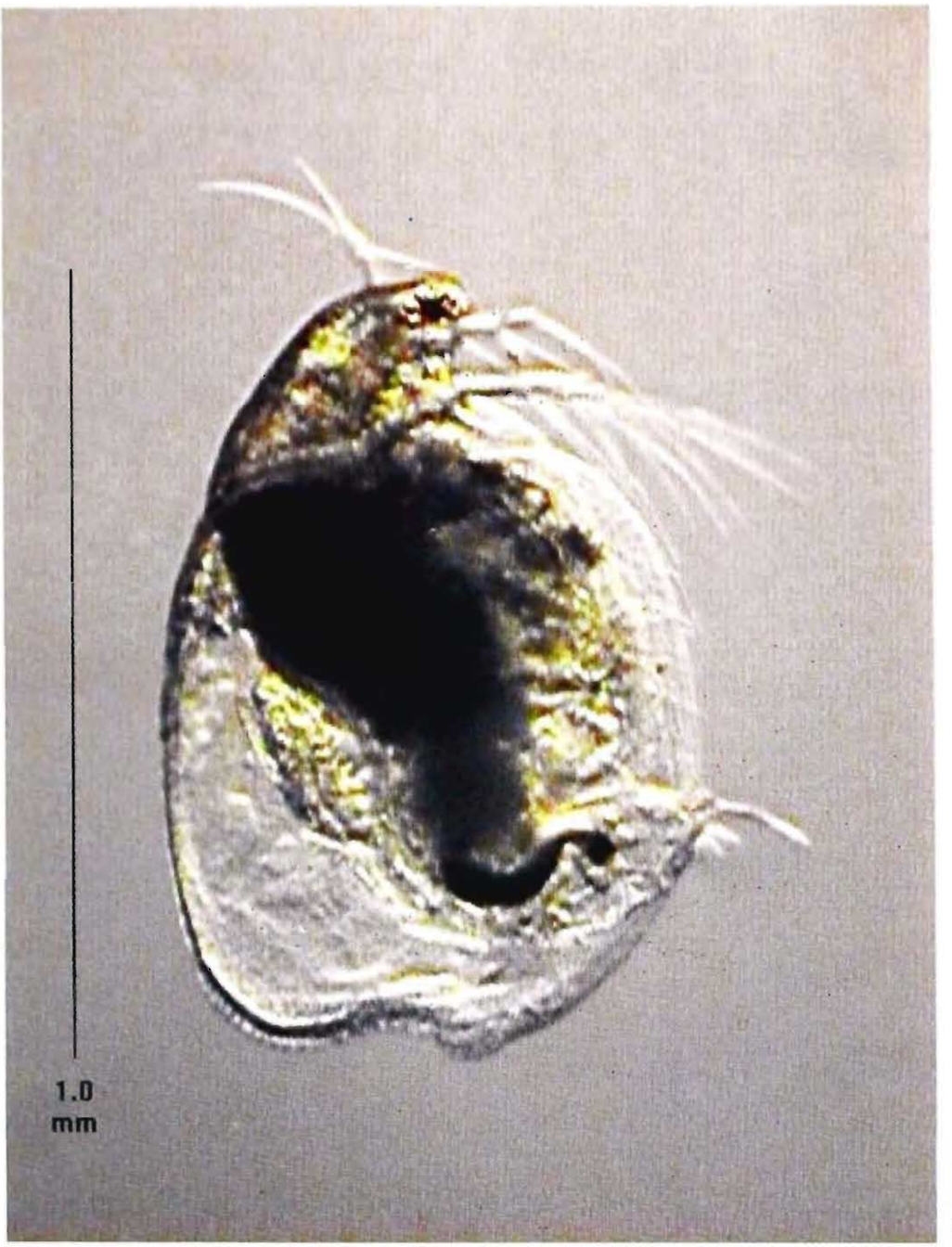


4

3. *Daphnia lumholtzi* (Sars)
4. *Daphnia carinata* (King)

PLATE-III



5

5. *Simocephalus expinosus* (Kuch)