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Diversity, Abundance and Seasonal Fluctuation of Zooplankton from few Wetlands in and around Kolkata

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ZOOLOGICAL SURVEY OF INDIA

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INTRODUCTION

Wetlands being one of the most productive ecosystems are crucial for biodiversity conservation. Wetlands are often traditionally grouped as either temporary or permanent, depending on natural water regime patterns. Richness of wetlands depends a lot on its plankton community because they are placed on the base of the food pyramid (Junk *et al*., 1999). Tropical wetlands have played an important role for humankind in all continents (Junk, 2002). These are characterized by a large number of ecological niches and harbour a significant percentage of world's biological diversity. As a consequence of anthropogenic modification to water regimes many 'permanent' wetlands now dry during extended periods (Thoms, 1993; Williams, 1998; Brock *et al*., 1999; Brock & Jarman, 2000). Biological monitoring and assessment of a wetland is an integral part for the management of the total ecological health of the water body and is becoming increasingly important (Bajpai *et. al.*, 2001; Verma *et al.*, 2009).

Zooplankton are one among the important biotic components influencing all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of organic matter (Murugan *et al.*, 1998; Dadhick and Sexena, 1999; Sinha and Islam, 2002; Park and Shin, 2007, Jalilzadeh *et al*., 2008). These are often an important link in the transformation of energy from producers to consumers due to their large density, drifting nature, high group or species diversity and different tolerance to the stress. Zooplankton diversity is one of the most important ecological parameters as these are the intermediate link between phytoplankton and fish. They also play a key role in cycling of organic materials in an aquatic ecosystem. Due to short life span, the zooplankton community often exhibits quick and dramatic changes in response to the changes in the physico-chemical properties of the aquatic environment (Dar and Dar, 2009). They do not only form an integral part of the lentic community but also contribute significantly, the biological productivity of the fresh water ecosystem (Wetzel, 2001). The distribution of zooplankton community depends on a complex of factors such as, change of climatic conditions, physical and chemical parameters and vegetation cover (Rocha *et al.*, 1999; Neves *et al*., 2003). Zooplankton plays an integral role, serve as bio indicators and well-suited tool for understanding water pollution status. Comparisons of size structure, fecundity, and reproductive strategies of zooplankters can indicate the nature and extent of pollutant loads (Ahmad, 1996; Sarma 1996; Mukhopadhyay *et al.* 2000; Contreras *et al.*, 2009).

Indian literatures on studies on zooplankton from freshwater ecosystem are enormous. Information on zooplankton diversity of wetlands of the country is scanty and scattered except some reports of Khan from Kashmir (1987), Rai and Datta Munshi from Bihar (1988), Sugunan (1995), Sharma (2005, 2010), and Sharma and Sharma (2008) from Assam; Sharma (2009) from Manipur etc., Notable contributions from West Bengal are Anderson (1889); Gurney 1906; 1907; Sewell (1932, 1934, 1935), Gopalakrishnan (1971); Tiwari and Sharma (1977), Roy (1978), Sharma (1977; 1978a, b, c; 1979 a, b, c, d, e, f; 1999); Venkataraman, (1998, 1999); Mukhopadhyay *et al*. (2000); Khan (2002, 2003); Ganesan and Khan (2008) and Datta (2011). Locally surveys on wetland are more essential in view of fast disappearing wetland for human settlement or other development projects besides eutrophication from pollution of large number of wetlands all over the country. Keeping in view, the importance of such wetlands and general dearth of literature, the present work was undertaken to assess the diversity, abundance, seasonal variation of zooplankton community and physico-chemical quality of water from few wetlands situated in and around kolkata.

MATERIAL AND METHODS

Geography

Kolkata is located in eastern India at 22°33´N, 88°20´E in the Ganges Delta at an elevation ranging between 1.5 to 9 metres. It spreads linearly along the banks of the River Hooghly in a north-south direction. Much of the city was originally a vast wetland, reclaimed over the decades to accommodate the city's burgeoning population. The Sundarbans National Park separates the city from the Bay of Bengal, which is located about 154 km to the south.

Like the most of the Indo-Gangetic plains, the predominant soil type is alluvial. Quaternary sediments consisting of clay, silt, various grades of sand and gravel underlie the city. These sediments are sandwiched between two clay beds, the lower one at depths between 250 and 650 m and the upper one ranging between 10 and 40 m in thickness.According to the Bureau of Indian Standards, the town falls under seismic zone-III, in a scale of I to V (in order of increasing proneness to earthquakes) while the wind and cyclone zoning is "very high damage risk", according to UNDP report.

Climate

Kolkata has a tropical climate. The annual mean temperature is 26.8°C (80°F); monthly mean temperatures range from 19°C to 0°C (67°F to 86°F). Summers are hot and humid and maximum temperatures often exceed 40°C (104°F) during May and June. Winter tends to last for only about two and a half months, with seasonal lows dipping to 12°C-14°C between December and January. The highest recorded temperature is 4.9°C (11°F) and the lowest is 5°C (41°F). Often during early summer, dusty squalls followed by spells of thunderstorm

and heavy rains lash the city, bringing relief from the humid heat. These thunderstorms are convective in nature, locally known as Kal baisakhi (Nor'westers). The southeast monsoon rains lash the city between June and September and supplies the city with most of its annual rainfall of 1,582 mm. The highest rainfall occurs during the monsoon in August (6 mm). The city receives 2,528 hours of sunshine per annum, with the maximum sunlight occurring in March. Pollution is a major concern in Kolkata, and the Suspended Particulate Matter (SPM) level is high when compared to other major cities of India, leading to regular smog and haze.

The present seasonal investigations on the plankton diversity from different wetlands in and around kolkata carried out from Feb. 2008 to Feb. 2010. The details of locations selected for the study are as follows., (Fig. 1-10)

STUDY AREA

1. RABINDRO SAROVAR WETLAND

Dhakuria Lake located in South Kolkata is an artificial Lake providing rowing facilities with a safari garden and children's play center. It was earlier named as Dhakuria Lake and was later rechristened as Rabindra Sarobar. The ambience is placid, soothing and peaceful. The veterans loiter around breathing in the fresh air. There is a tiny island at the south of the Lake, which is linked with the mainland via a wooden bridge. Shoal of fishes swim in the pellucid water, but fishing is strictly prohibited here. Within a short distance Japanese Buddhist Temple, Rabindra Sarobar Stadium, etc. have sprung up. A five minutes walk from here will lead one to the 'Ramakrishna Mission' at Golpark. This is an ideal location for picnics. There is an open-air theatre. Swimming pool training centre is also available.

2. NATURE PARK

Nature park situated at Brace Bridge, Near Coca Cola Factory at Taratala. There are various flora and fauna in that place. There are deers, ducks, boating in the Lake. It is fairly spread area with lots of ponds. Those ponds were from the result of a great cooperative movement which has become model for fisheries in Bengal which was undertaken on lease from Port Trust by a cooperative society consisting of fishermen. The society is known as Mudiali Fisherman's Co-operative Society. These are displaced from Damodar Valley in 1930. There are about eight settling ponds where the industrial waste water from the factories located at Budge Budge, Taratala. Garden gets cleaned by using stage by stage settling process and then treating with lime. The Hyacinth on these ponds absorbs greese, oil and other chemicals. Ultimately the treated water from the last pond flows to Hoogly river. Fishing taken place in these ponds yields fish worth of about 60 lakhs during the financial year of 2006-2007.

3. INDIAN MUSEUM TANK

Indian Museum Tank is situated near Indian museum and close to the Department of Zoological Survey of India, Fire proof spirit building. The Indian Museum is a fine and huge example of Italian architecture built in 1875. This is the largest museum in the country having six sections namely Art, Archaeology, Anthropology, Geology, Zoology and Industry. It may also called as 'heritage Tank' since it have the historical importance where as earlier many research findings were well explored from this Tank.

4. HOOGLY RGBG (Ramchandra Goenta zenana Bathing Ghat)

Howrah, City of West Bengal, northeast India, on the right bank of the River Hooghly opposite Kolkata (formerly Calcutta); population (2001) 1,008,700. The capital of Howrah district, it has jute and cotton factories; rice, flour, and saw mills; iron and steel works and chemical factories; and railway engineering works. Howrah suspension bridge, opened in 1943, spans the river. Ramchandra Goenta Zenana Bathing ghat is located near the railway junction towards the end of Rabindrasetu bridge crossings, and facing towards each other on either sides of this river where the tourists from various places taking bath and domestic purposes like washing utensils and clothes were also taken place.

5. NALBAN LAKE

Nalban is a serene watery world where the centerpiece of attraction is the giant Lake. The Lake water is crystal clear sans any pollution. On a clear sunny day, the mirror image reflecting on the still waters of the magnificent Lake. Nalban boating complex is located in sector V, Salt Lake. As far as water sports are concerned, a wide array of boats is available, ranging from the luxurious, tastefully decorated "Shikaras" to the simple "Paddle Boats". To make the overall boating experience a pleasure, there are fascinating floating huts at strategic locations of the turquoise Lake. As the luxurious Shikara moves on rhythmetically on the sparkling waters of Nalban, are transported to a Bengal youngever knew existed. During the voyage on the Shikara, sometimes get to hear the lilting Bhatiyali songs being sung by the simple looking boatman (Majhi). At Nalban, the sight of boats at the distant horizon, gently moving through the shimmering waters of the majestic Lake by sturdy movement of the quintessential boatman's oars is a sight to behold.

6. MAIDAN TANK

Maidan Tank is situated facing towards the Chowringee road. The pond was surrounded by palm trees and local people takes bathing, domestic purposes. Veterans (ex., goats) were resting under the shaded trees near this waterbody. Tourists were attracted to this spot. The most picturesque part of the city, Maidan is the centre of almost every action and attraction of the city. The expansive 400 hectares of greenery from the north and south of the city

covers a huge 3 km in length. The stretch is bounded by the most renowned roads of the city like the Strand Road to the West, the Chowringhee Road to the east. The southern part is surrounded by the Tolly Nullah which also covers the Royal Kolkata Race Course and Victoria Memorial. The best view of the gorgeous Raj Bhawan or the Governor's House can be sighted from the northern part of the Maidan.

7. **PATULI LAKE**

Baishnabghata Patuli township is a town in the district of South 24 pargans in the west Bengal, India. The township is located at 22°33.76´N, 88°28.85´E. Some parts of kolkata around it are Jadavpur and Garia. Mainly the patuli jheel is the vast Lake which now reduced due to land invasion by buildings etc., recently the patuli jheel were intersected into several Tanks and interconnected through big pipes. The water body is surrounded by rich vegetation like macrophytes and hydrophytes. Domestic activities like washing clotes utensils, fishing and other miscellaneous works etc., were used by the local people.

8. CAPTAIN BHERRY

The Lakes which acted as spill reservoirs for the Bidyadhari, teemed with fish and birds. With urban development in the early 1800, untreated sewage and storm water began to be discharged into these wetlands, changing their water characteristics from highly saline predominantly nonsaline. The other water bodies in the area being reduced in size (like Captain Bherry, Goltala bheri etc.,) no longer attract much waterbirds (except egrets and cormorants) and especially no ducks and geese. Captain Bherry is one among the East Calcutta wetlands (22°36´N to 88°32´E) are a complex of natural and manmade wetlands lying east of the city of kolkata, West Bengal in India. Finally, Captain Bherry with variety of community sustains rich biological diversity.

9. BAGHAJATIN LAKE

The Lake is situated in Baghajatin suburban area near Bijoygarh, kolkata. Just adjacent to the road Raja Subpdh Chandra mullick road. The residents surrounded this Lake have individual inlets to this Lake for their domestic purposes. The aquatic vegetation mainly of *Eicchornia crassipes and Ipomoea aquatica* were noticed. Local people uses this water for washing, bathing and other domestic purposes. through a private sector taken charge of fishes of this Lake and fishing will be charged on hourly basis. Few cage culture of fishes were seen.

10. SANTOSHPUR LAKE

The Lake is situated in Santoshpur is a suburban area I the southeastern part of kolkata, India. The area is loosely bounded by Garia area on the north, the eastern Metropolitan Bypass on the east and the Sealdah-sonarpur railway tracks on the west and the south. The area was comprised mainly of shallow marshy lands and agricultural fields even as late as the

seventies. Agricultural lands were becoming scarce and could be found only on the other side of the Panchannagram canal (popularly called khaal). Santoshpur Lake is maintained with compound and surrounded by ornamental plants and there washing and bathing were taken place by the local people. The Lake was maintained by the Municipal Corporation.

11. SANTRAGACHI LAKE

Santragachi Jheel (22°58´N and 88°27´E) is one of the most important urban wetland of the District Howrah, W.B., India. The Santragachi Jheel has received various sewage waters from the nearby localities of the Howrah Township. The total area of the Santragachi Jheel is 10.87 hectares. The shape of the Jheel is roughly rectangular, the length is about 915 m. and widths 305 m., perimeters is 2418 m. and mean depth varies from 4 to 7 ft. Santragachi Lake is a large Lake located next to the Santragachi railway station the number has increase in recent years, as migratory birds have started to avoid destinations like the Lakes in alipore zoo, kolkata. Birds like Saras Crane from North America and Australia, Gadwall, Northern pintail, Northern Shoveler, Northern Pintail, Garganey from North of the Himalayas and many other local migratory birds such as cotton pygmy goose, Comb duck etc, are spotted seasonally. However, Lesser whistling duck is the most dominant species visible here.

The Lake owned by south eastern railway, since August, 1992 the Wild-life wing of the Forest Department, Govt. of West Bengal has taken up management and developmental work of this wetland. Every year before the migratory birds are expected to arrive, the forest department cleans water hyacinth from the Lake, though leaving some portion of it which adds up to an enviroment suitable for the birds. Santragachi Lake is surrounded on all sides by human habitation including railway quarters, shops, railway yard, a number of industrial units, domestic and commercial cattle sheds. Effects are made by local residents, forest department and railways to improve the environment for the birds. Forest ministry of the State government of West Bengal imends to convert the Lake to a wildlife conservation centre. The Lake gets polluted by dumping of waste materials and sewage inlets by the locals.

ANALYSIS

Physico-chemical parameters :

Surface water samples were collected from each site. For the analysis on the basic water quality parameters like pH, temperature, salinity, Dissolved oxygen, Turbidity and alkalinity followed by APHA (1992). For Dissolved oxygen samples were fixed at sampling sites and brought to the laboratory for analysis.

S. No.	Parameters	Method
1	pH (Conc.)	Elico model pH meter
2	Temperature (ºC)	Mercury Thermometer
3	Alkalinity (mg/L)	Titration Method
4	Dissolved oxygen (mg/L)	Modified Winkler's method
5	Salinity (mg/L)	Argentometric method
6	Transparency (cm)	Secchi disc

Biological Parameters :

Plankton samples were collected by filtering 50 L of surface water through 50 µm mesh size nylon plankton net and preserved in 4% formalin. Investigation were carried out qualitatively and quantitatively on surface water avoiding the macrophytes. Taxonomic identification of zooplankton done following the authors., Battish (1992), Edmondson (1959), Khan (2003), Koste (1978), Michael and Sharma (1988), Sharma (1998). Quantitative enumeration (ind. L^{-1}) of zooplankton and their constituent groups was done with a Sedgewick-Rafter counting cell with different magnification. Report zooplankton as number per cubic meter :

$$\text{No. individuals/ } m^3 = \frac{C \times V1}{V2 \times V3}$$

Where C = number of organisms counted,
V1 = volume of the concentrated sample (ml),
V2 = volume of the sample counted (ml),
V3 = volume of the filtered volume of water (L^{-1})

RESULTS

SYSTEMATIC ACCOUNT OF ZOOPLANKTON

34 species of rotifera, 21 species of cladocera, 10 species of copepoda and 3 species of ostracoda were recorded from the investigation. The recorded taxa were as follows.,

1. Rotifera

SYSTEMATIC LIST OF THE EXAMINED TAXA

Class ROTIFERA
Subclass Eurotatoria Bartos, 1959
Superorder Monogononta Wesenberg-Lund, 1889
Order Ploimida Delage, 1897
Family BRACHIONIDAE Wesenberg -Lund, 1899

Brachionus angularis Gosse, 1851

B. bidentata bidentata Anderson, 1889

B. calyciflorus Pallas 1766

B. calyciflorus f. anureiformis (Brehm, 1909)

B. calyciflorus f. dorcas (Gosse, 1851)

B. caudatus Barrios & Dadday, 1894

B. caudatus aculeatus (Hauer, 1937)

B. caudatus personatus (Ahlstrom, 1940)

B. diversicornis (Daday, 1883)

B. falcatus Zacharias, 1893

B. forficula forficula Wierzejski, 1891

B. forficula minor (Voronkov, 1913)

B. plicatlis Müller, 1786

B. quadridentatus quadridentatus Hermann, 1783

B. rubens Ehrenberg, 1838

*B. urceolaris (*Müller, 1773)

Keratella cochlearis (Gosse, 1851)

K. tropica (Apstein 1907)

Anaeureopsis fissa Gosse, 1851

Family EUCHLANIDAE Bartos, 1959

Euchlanis dilatata Ehrenberg, 1832

Family MYTILINIDAE Bartos 1959

Mytilina ventralis ventralis (Ehrenberg, 1832)

Family LECANIDAE Bartos, 1959

Lecane (L) crepida crepida Harring, 1914

L. (L) hornemani (Ehrenberg, 1834)

L. L. leontina (Turner, 1892)

L. (L) luna luna (Müller, 1773)

L. (L.) papuana (Murray, 1913)

L. (M) unguitata (Fadeev, 1925)

Family NOTOMMATIDAE Remane, 1933

Cephallodella gibba (Ehrenberg, 1830)

Family TRICHOCERCIDAE Remane, 1933

Trichocerca diurella similis (Wierzejski, 1893)

Family ASPLANCHNIDAE Harring & Myers, 1926

Asplanchna brightwelli Gosse, 1850

Family SYNCHAETIDAE Remane, 1933

Polyarthra vulgaris Carlin, 1943

Order GNESIOTROCHA De Beauchamp, 1965

Suborder FLOSCULARIACEA Remane, 1933

Family FILINIDAE Bartos, 1959

Filinia longiseta (Ehrenberg, 1834)

F. opoliensis Zacharias, 1898

F. terminalis (Plate, 1886)

SYSTEMATIC ACCOUNT

Phylum ROTIFERA

Class EUROTATORIA Bartos, 1959

Subclass MONOGONONTA Wesenberg-Lund, 1889

Order PLOIMIDA Delage, 1897

Family BRACHIONIDAE Wesenberg -Lund, 1899

Genus ***Brachionus*** Pallas, 1766

1. ***Brachionus angularis*** Gosse, 1851

1851. *Brachionus angularis* Gosse, A catalogue of Rotifera found in Britain, with descriptions of five new genera and thirty-two new species. *Ann. Mag. Nat. Hist.*, **8** : p203. Sharma, 1979. Rotifers from West Bengal. III. Further studies on the Eurotatoria. *Hydrobiologia*, **64** : 239-250. pl. I, figs. 5 & 6.

1998. *Brachionus angularis* Gosse : Sharma, Fresh water Rotifers *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 354, fig. 2-5.

1998. *Brachionus angularis* Gosse : Sharma, Fresh water Rotifers *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 354, fig. 2-5.

Materials examined : 2 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J ; 2 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J ; 4 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J ; 2 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J ; 2 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J ; 3 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Andhra Pradesh, Assam, Orissa, Maharashtra, Madhya Pradesh, Delhi, Kashmir, Punjab, Haryana and Chandigarh.

Elsewhere : Cosmopolitan.

2. ***Brachionus bidentata bidentata*** Anderson, 1889

1889. *Brachionus bidentata bidentata* Anderson, p. 352, pl. 21, fig. 13.

1998. *Brachionus bidentata bidentata* Anderson: Sharma, Fresh water Rotifers *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 354, Fig. 6.

Materials examined : 3 Ex. Santragachi Lake, 03.X.2009, Coll : Chitra, J ; 2 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J ; 3 Ex. Nalban Lake, 10.IX.2008., Coll : Chitra, J ; 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : Assam, West Bengal, Andhra Pradesh, Orissa, Punjab and Haryana.

Elsewhere : Pantropical.

3. ***Brachionus calyciflorus*** Pallas, 1766

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

2008. *Brachionus calyciflorus* Pallas, Sharma and Sharma, Zooplankton diversity in Floodplain Lakes of Assam. *Rec. zool. Surv. India. Occ. Paper* : p. 290, fig. 21-23.

Materials examined : 3 Ex. Captain Bherry, 03.III.2010, Coll : Chitra, J ; 3 Ex. Bhagajatin Lake, 01.III.2010, Coll : Chitra, J ; 4 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J ; 4 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J ; 2 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 2 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J.

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

Elsewhere : Cosmopolitan.

4. ***Brachionus calyciflorus f. anuraeiformis*** (Brehm, 1909)

1909. *Brachionus pala anuraeiformis* Brehm, Uber die Mikrofauna chinesischer und sudasiatischer Susswasserbecken *Hydrobiologia.*, **4** : p 210; text-fig.

1998. *Brachionus calyciflorus anuraeiformis* (Brehm) : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 358, fig. 11.

Materials examined : 2 Ex. Captain Bherry, 03.III.2010, Coll : Chitra, J ; 2 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J ; 1 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 12.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Madhya Pradesh and Punjab.

Elsewhere : Cosmopolitan.

5. ***Brachionus calyciflorus f. dorcas*** (Gosse, 1851)

1886. *Brachionus dorcas* Gosse, Hudson and Gosse, The Rotifera or Wheel-Animalcules, *British and foreign suppl.*, London. p. 118, pl. 28, fig. 4.

1998. *Brachionus calyciflorus anuraeiformis* (Brehm) : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11**, p. 356, fig. 10.

Materials examined : 2 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J.

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

Elsewhere : Cosmopolitan.

6. ***Brachionus caudatus*** Barrois & Daday

1894. *Brachionus caudatus* Barrois & Daday, *Revue Biol. DuNord de la* France, 61. P. 232, pl. VII, fig. 9. 10, 13.

1998. *Brachionus caudatus* Barrois & Daday : Sharma, Fresh water Rotifers *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11**, p. 358.

2003. *Brachionus caudatus* Barrois & Daday : Khan, *Zool. Surv. India, Occ. Paper,* **204** : P. 23, fig. 4.

Materials examined : 4 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J ; 3 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 2 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J.

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

Elsewhere : Tropics and Subtropics.

7. ***Brachionus caudatus aculeatus*** (Hauer, 1937)

1937. *Brachionus caudatus v. aculeatus,* Hauer, Neue Rotatorien aus Indien. *III. Zool Anz.*, **120** : p 18, fig. 1a.

1998. *Brachionus caudatuss aculeatus* (Hauer) : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11**, p. 358, fig. 13 & 14.

Materials examined : 2 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J ; 2 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 26.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Madhya Pradesh, Rajasthan, Orissa and Punjab.

Elsewhere : Cosmopolitan.

8. ***Brachionus caudatus personatus*** (Ahlstrom, 1940)

1940. *Brachionus caudatus personatus,* Ahlstrom 1940, A revision of the Rotatorian genera *Brachionus* and *Platyias* with descriptions of one new species and two new varieties. *Bull. Amer. Mus. Nat. Histt.,* **77** : p. 158, pl. 7 figs 1, 2, 5-7.

1998. *Brachionus caudatus personatus* Ahlstrom : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11**, p. 359. fig. 15.

Materials examined : 3 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 3 Ex. Captain Bherry, 01.X.2009., Coll : Chitra, J; 3 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J; 4 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 3 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 4 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 3 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Meghalaya, Tripura, Haryana, Orissa and Punjab.

Elsewhere : Cosmopolitan.

9. ***Brachionus diversicornis*** (Daday, 1883)

1940. *Brachionus diversicornis* Daday : Ahlstrom A revision of the Rotatorian genera *Brachionus* and *Platyias* with descriptions of one new species and two new varieties. *Bull. Amer. Mus. Nat. Histt.*, **77** : p. 161, pl. 9, fig. 7.

1998. *Brachionus diversicornis* Daday : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 359. fig. 17.

Materials examined : 7 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 2 Ex. Captain Bherry, 01.X.2009, Coll : Chitra, J; 4 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J; 2 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 1 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 1 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Orissa, Bihar, Haryana, Meghalaya, Tripura, Assam and Punjab.

Elsewhere : Cosmopolitan.

10. ***Brachionus falcatus*** Zacharias, 1898

1998. *Brachionus falcatus* Zacharias 1898, Faunstische und biologische Beobachtungen am *Gr. Ploner See. Fo Biol. Stm. zu Plon*, **1** : p. 45, taf IV, fig. 4.

1998. *Brachionus falcatus* Zacharias : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 361. figs. 19 & 20.

Materials examined : 6 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 3 Ex. Captain Bherry, 01.X.2009, Coll : Chitra, J; 3 Ex. Bhagajatin Lake, 29.XI.2009, Coll : Chitra, J; 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 2 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 12.VI.2008, Coll : Chitra, J; Ex. Hooghly RGBG, 11.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Bihar, Madhya Pradesh, Rajasthan, Kerala, Haryana, Andhra Pradesh, Orissa, Gujarat and Punjab.

Elsewhere : Pantropical and subpantropical.

11. ***Brachionus forficula forficula*** Wierzejski, 1891

1886. *Brachionus forficula forficula* Wierzejski, 1891. Liste des Rotiferes observes en Glacie (Autriche-Hongrie). *Bull. Soc. Zool.* France, **16** : p. 51.

1998. *Brachionus forficula forficula* Wierzejski : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 361. figs. 21 & 22.

Materials examined : 3 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 1 Ex. Captain Bherry, 01.X.2009, Coll : Chitra, J; Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 2 Ex.

Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 2 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 1 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Andhra Pradesh, Orissa, Bihar, Gujarat, Meghalaya, Assam, Tripura and Punjab.

Elsewhere : Pantropical.

12. ***Brachionus forficula minor*** (Voronkov, 1913)

1886. *Brachionus forficula minor* Voronkov, 1913. *Zur Rotatorienfauna Russlands. Arb. Hydrobiol. Stat.* Glubokom-See, 5 : p. 103, fig. 9.

1925. *Brachionus forficula f. minor* (Voronkov) : Fadeev, Das Radertiere Brachionus forficula Wierz. und seine Varietaten. *Zool. Anz.*, **64** : p. 288, figs. 8-9.

1998. *Brachionus forficula f. minor* (Voronkov) : Sharma, Fresh water Rotifers *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11** : p. 362. fig. 23.

Materials examined : 3 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Orissa, and Punjab.

Elsewhere : Cosmopolitan.

13. ***Brachionus plicatlis*** Müller, 1786

1886. *Brachionus plicatlis* Müller, 1786, Animalculcula Infusoria fluviatilia et marina, quae defexit systematic ad vivum delineari curavit. *Havniae* : p. 344, p. l. L, figs. 1-8.

1978. *Brachionus plicatlis* Müller : Koste, 1978, Rotatoria. *Die. Radertiere Mittleuropas. Bagrundet von Max Voigt. Uberordnung Monogononta. Gebruder Borntraeger, Berlin, Stuttgart. Text. U. Tafelbd.* p. 77, T.9 : 1, a-e, T. 12 : 7.

1998. *Brachionus plicatlis* Müller : Sharma, Fresh water Rotifers *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 363. Fig. 26.

Materials examined : 1 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Rajasthan, Ladakh and Punjab.

Elsewhere : Cosmopolitan.

14. ***Brachionus quadridentatus quadridentatus*** Hermann, 1783

1886. *Brachionus quadridentatus* Hermann, 1783, p. 47, pl. II, fig. 9.

1998. *Brachionus quadridentatus quadridentatus* Hermann : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 364. Figs. 29 & 30.

Materials examined : 1 Ex. Captain Bherry, 03.III.2010, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Meghalaya, Tripura, Rajasthan, Kerala, Bihar, Kashmir, Andhra Pradesh, Orissa, Madhya Pradesh and Punjab.

Elsewhere : Cosmopolitan.

15. ***Brachionus rubens*** Ehrenberg, 1838

1838. *Brachionus rubens* Ehrenberg, Die Infusiontierchen als vollkommene Organismen. *Ein Blick in das tiefere organische Leben der Natur. Leipzig* : **1-XVIII**, p 513; pl. LXIII.

1998. *Brachionus rubens* Ehrenberg : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 365. Fig. 34.

Materials examined : 2 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J; 2 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J.

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

Elsewhere : Cosmopolitan.

16. ***Brachionus urceolaris*** Müller, 1773

1773. *Brachionus urceolaris* Müller, 1773 Vermeium terrestrium et fluviatilium, seu animalium helminthicorum et testaceorum, nom-marinorum siccinets historia. *Infusoria Havniae* **1** : p. 131.

1978. *Brachionus urceolaris* Müller : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 363. Fig. 26.

1998. *Brachionus urceolaris* Müller : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 367. Fig. 36.

Materials examined : 6 Ex. Indian Museum Tank, Kolkata; 05.VI.2009, Coll : Chitra, J, 1 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Madhya Pradesh and Punjab.

Elsewhere : Cosmopolitan.

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

17. ***Keratella cochlearis*** (Gosse, 1851)

1851. *Anurea cochlearis* Gosse, A catalogue of Rotifera found in Britain, with descriptions of five new genera and thirty-two new species. *Ann. Mag. Nat. Hist., Ser.* 2, **8** : p. 202.

1998. *Keratella cochlearis* (Gosse) : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11** : p. 369. Figs. 41-43.

Materials examined : 1 Ex. Hooghly RGBG, 12.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Meghalaya, Tripura, Kerala, Kashmir, Ladakh, Rajasthan, Orissa and Punjab.

Elsewhere : Cosmopolitan.

18. ***Keratella tropica*** (Apstein, 1907)

1907. *Anurea valga f. tropica* Apstein, Das Plankton in Colombo-See auf Ceylon. Sammelausbeute von A. Borgert, 1904-1905. *Zool. Jb. Abt. Syst.*, 25 : p 210, Fig. 1F.

1998. *Keratella* tropica (Apstein) : Sharma, Fresh water Rotifers. *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal*, **11**, p. 369. Figs. 41-43.

Materials examined : 1 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 4 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Andhra Pradesh, Bihar, Gujarat, Tamil Nadu, Madhya Pradesh, Kashmir, Kerala, Rajasthan, Haryana, Kashmir, Ladakh, Orissa and Punjab.

Elsewhere : Tropics and Subtropics.

Genus ***Anuraeopsis*** Lauterborn, 1900

19. ***Anuraeopsis fissa*** (Gosse, 1851)

1851. *Anuraeopsis fissa* (Gosse), A catalogue of Rotifera found in Britain, with descriptions of five new genera and thirty-two new species. *Ann. Mag. Nat. Hist., Ser.* 2, **8** : p. 202.

1998. *Anureopsis fissa* (Gosse) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 370, figs. 45 & 46.

Materials examined : 4 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 2 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J; 2 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J; Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Kerala, Rajasthan, Haryana and Tripura.

Elsewhere : Cosmopolitan.

Family EUCHLANIDAE Bartos, 1959

Genus ***Euchlanis*** Ehrenberg, 1832

20. ***Euchlanis dilatata*** Ehrenberg, 1832

1832. *Euchlanis dilatata* Ehrenberg, Ehrenberg, Uber die Entwickelung und Lebensdauer der Infusionthiere, nebts ferneren Beitragen zur einer Vergleichyng ihrer organischen Systema. *Abhandl. Akad. Wiss., Berlin,* p. 131, pl. 4.

1998. *Euchlanis dilatata* Ehrenberg : Sharma, *State fauna ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 374, figs. 49 & 50.

Materials examined : 2 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Distribution : India : widely distributed and reported so far from West Bengal (Calcutta, North and South 24-Parganas, Barddhaman, Nadia, Bankura, Jalpaiguri and Koch Behar); Assam, Meghalaya, Orissa, Gujarat, Punjab, Ladakh and Kashmir.

Elsewhere : Cosmopolitan.

Family MYTILINIDAE Bartos, 1959

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

21. ***Mytilina ventralis ventralis*** (Ehrenberg, 1832)

1832. *Salpina ventralis* Ehrenberg, Uber die Entwickelung und Lebensdauer der Infusiontheire, nebts ferneren Beitragen zur einer Vergleichung ihrer organischen Systema. Abhandl. Akad. Wiss., Berlin (1931), p. 133, pl. 4, fig. 7.

1998. *Mytilina ventralis ventralis* Ehrenberg : Sharma, *State fauna ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 376, fig. 60.

Materials examined : 1 Ex. Nature Park, 23.II.2009, Coll : Chitra, J.

Distribution : India : Assam, Meghalaya, Tripura, West Bengal, Orissa, Bihar, Andhra Pradesh, Gujarat, Madhya Pradesh, Kerala, Punjab, Kashmir, Ladakh and Rajasthan.

Elsewhere : Cosmopolitan.

Family LECANIDAE Bartos, 1959

Genus ***Lecane*** Nitzsch, 1827

22. ***Lecane (Lecane) crepida*** Harring, 1914

1914. *Lecane crepida* Harring, p. 533. pl. XXII, figs. 4-7.

1978. *Lecane crepida crepida* Harring : Koste, 1978, p. 232. T. 76 : 6, a, b.

1998. *Lecane crepida crepida* Harring : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 395, fig. 112 & 113.

Materials examined : 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Meghalaya, Tamil Nadu, Gujarat and Punjab.

Elsewhere : Tropics and subtropics.

23. ***Lecane (Lecane) hornemanni*** (Ehrenberg, 1834)

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

1998. *Lecane hornemanni* (Ehrenberg) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* p. 400, fig. 121 & 122.

Materials examined : 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Andhra Pradesh, Gujarat, Jammu and Kashmir, Tamil Nadu.

Elesewhere : Tropics and Subtropics.

24. ***Lecane (Lecane) leontina*** (Turner, 1892)

1970. *Lecane leontina* (Turner) : Kutikova, Contribution to the rotifer fauna of West Bengal. Part I. Hydrobiologia, **57** : p. 436, fig. 571.

1998. *Lecane (Lecane) Leontina* (Turner) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11**, p. 401, fig. 126.

Materials examined : 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : widely distributed and reported from West Bengal; all the states in North-Eastern India, Orissa, Andhra Pradesh, Madhya Pradesh and Punjab.

Elsewhere : Tropics and Subtropics.

25. ***Lecane (Lecane) luna luna*** (O.F. Muller, 1776)

1776. *Cercaria luna Muller,* Zoologic Danicae prodromus, seu animalium Daniae et Norvegiae characters, nomina et synonyma imprimis popularium. *Havniae* : I-XXXII, p. 280.

1998. *Lecane luna luna* (Muller) : Sharma, *State fauna ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 402, fig. 135.

Materials examined : 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J.

Distribution : India : widely distributed and reported from West Bengal; all the states in North-Eastern India, Orissa, Gujarat, Rajasthan, Punjab, Kashmir and Ladakh, Andhra Pradesh, Madhya Pradesh and Punjab.

Elsewhere : Cosmopolitan.

26. ***Lecane (Lecane) papuana*** (Murray, 1913)

1913. *Cathypna papuana* Murray, *J. Roy. Micr. Soc*, P. 353.

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

1998. *Lecane (Lecane) papuana* (Murray) : Sharma, *State Fauna Ser. Zool. Surv, India*, Fauna of West Bengal, 11. p. 405.

Materials examined : 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

27. ***Lecane (Monostyla) unguitata*** (Fadeev, 1925)

1925. *Monostyla unguitata* Fadeev, Das Radertiere *Brachionus forficula* Wierz. und seine Varietaten. *Zool. Anz.*, 64 : pl. 21, pl. 1, fig. 7.

1938. *Monostyla unguitata* Fadeev Hauer, Die Rotatorien von Sumatra, Java und Bali, Nach Ergebnissen Limnologischen Sunda-Expedition. I. II. *Arch. Hydrobiol. Suppl.,* **15** : P. 548, Abb. 71, a-b.

1998. *Anureopsis fissa* (Gosse) : Sharma, *State Fauna Ser. Zool.Surv. India, Fauna of West Bengal,* **11** : p. 370, fig. 45 & 46.

Materials examined : 6 Ex. Indian Museum Tank, Kolkata; 05.VI.2009, Coll : Chitra, J; Ex. Hooghly RGBG, 26.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Meghalaya and Gujarat.

Elsewhere : Eastern Europe, North America, Indonesis and Sri Lanka.

Family NOTOMMATIDAE Remane, 1933 (partim)

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

28. ***Cephalodella gibba*** (Ehrenberg, 1832)

1832. *Furcularia gibba* Ehrenberg, 1832, p. 130, Taf. iv, fig, 16.

1998. *Cephalodella gibba* (Ehrenberg) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 422, fig. 187.

Materials examined : 3 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Gujarat, Kashmir and Ladakh.

Elsewhere : Cosmopolitan.

Family TRICHOCERCIDAE Remane, 1933

Genus ***Trichocerca*** (Lamarck, 1801)

29. ***Trichocerca (Diurella) similis*** (Wierzejski, 1893)

1893. *Coelopus similis* Wierzejski, Rotatoria (wrotlki) Galicyi. *Bull. Internat. Acad. Sci.,* Cracovie (for 1892) : p. 406.

1970. *Trichocerca (Diurella) similis* (Wierjski) : Kutikova, Rotifer fauna of USSR. Subclass Eurotatoria (in Russian). Fauna USSR Akad. Nauk Leningrad, 104 : p. 315. Fig. 307.

1998. *Trichocerca (Diurella) similis* (Wierjski) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 424, fig. 191 & 192.

Materials examined : 3 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 2 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal and Gujarat.

Elsewhere : Cosmopolitan.

Family ASPLANCHNIDAE Harring & Myers, 1926

Genus ***Asplanchna*** Gosse, 1850

30. ***Asplanchna brightwelli*** Gosse 1850

1978. *Asplanchna brightwelli* Koste, ROTATORIA. Die. Radertiere Mittleuropas. Bagrundet von Max Voigt. Uberordnung Monogononta. Gebruder Borntraeger, Berlin, Stuttgart. Text. U. Tafelbd. **63** : p. 454, T. 163 : 10, a-d, Abb. 24, b, Abb. 2.

1998. *Asplanchna brightwelli* Gosse : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 428, fig. 204.

Materials examined : 4 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 4 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 4 Ex. Captain Bherry, 01.X.2009, Coll : Chitra, J; 3 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J; 2 Ex. Santragachi Lake, 03.X.2009, Coll : Chitra, J; 2 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J; 2 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 2 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 2 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 2 Ex. Hooghly RGBG, 26.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal; Assam, Orissa, Andhra Pradesh, Punjab, Kashmir and Ladakh.

Elsewhere : Cosmopolitan.

Family SYNCHAETIDAE Remane, 1933

Genus ***Polyarthra*** Ehrenberg, 1834

31. ***Polyarthra vulgaris*** Carlin1943

1943. *Polyarthra vulgaris* Carlin, Die Planktonrotatorien des Motalastrom. Medd. Lunds Univ. Limnol. 68 : p. 82, Taf. I, Abb. 1, Taf, 3, Abb. 1.

1998. *Polyarthra vulgaris* Carlin : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 429, fig. 206.

Materials examined : 4 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 2 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J.

Measurement : Body length : 105-135 mm; length of blades : 120-145 mm; ventral appendages : 30-40 mm.

Distribution : India : West Bengal, Assam, Orissa and Punjab.

Elsewhere : Cosmopolitan.

Family FILINIDAE Bartos, 1959

Genus ***Filinia*** Bory de St. Vincent, 1824

32. ***Filinia longiseta*** (Ehrenberg, 1834)

1834. *Triarthra longiseta* Ehrenberg, Organischen in der Richtung des Kleinsten Raurnes. Dritter Beitrage. Folio. Berlin p. 222, pl. 8, fig. 1.

1998. *Filinia longiseta* (Ehrenberg) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 441, fig. 223.

Materials examined : 2 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 3 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 2 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal (Calcutta, North & south 24-Parganas, Bankura, Nadia, Medinipur, Malda and Koch Behar); Assam, Orissa, Madhya Pradesh, Gujarat, Rajasthan, Punjab and Haryana.

Elsewhere : Cosmopolitan.

33. ***Filinia opoliensis*** (Zacharias, 1898)

1898. *Tetramastrix opoliensis* Zacharias, Untersuchungen uber das okabjtib der Teichgewasser. *Forschungsber Biol. Stn. Zu Plon,* **1** : 132, T Zaf. 1, figs. 6, 7.

1998. *Filinia opoliensis* Zacharias : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 441, fig. 225.

Materials examined : 3 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Assam, Orissa, Madhya Pradesh, Gujarat, Rajasthan and Punjab.

Elsewhere : Cosmopolitan.

34. ***Filinia terminalis*** (Plate, 1886)

1886. *Triarthra terminalis* Plate, Beitrage zur Naurgeschichte der Rotatorien. *Jenaische S. Naturwiss (n.s.),* p. 19.

1957. *Filinia terminalis* (Plate) : Voight, totatoria : Die Radertitoris : Die Radertiere Mittleuropas. Berlin-Nikolasse, I, Textbd. II. Tafelbr. p. 421.

1998. *Filinia terminalis* (Plate) : Sharma, *State Fauna Ser. Zool. Surv. India, Fauna of West Bengal,* **11** : p. 441, fig. 224.

Materials examined : 2 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Tamil Nadu and Gujarat.

Elsewhere : Cosmopolitan.

2. Cladocera

SYSTEMATIC LIST OF REPORTED SPECIES

Superclass CRUSTACEA

Subclass BRANCHIOPODA

Superorder CLADOCERA

Order CTENOPODA

Family SIDIDAE Baird, 1850

Diaphanosoma excisum Sars, 1885

Pseudosida bidentata Herrick, 1884

Lantonopsis australis (Sars, 1888)

Order ANOMOPODA

Family DAPHNIDAE Straus, 1820

Ceriodaphnia cornuta Sars, 1885

Daphnia carinata King 1853

Simocephalus vetulus (O.F. Muller, 1776)

Simocephalus exspinosus (Koch, 1841)

Scapholeberis kingi Sars, 1903

Family BOSMINIDAE Sars, 1865

Bosmina longirostris (O.F. Muller, 1776)

Bosminopsis deitersi Richard, 1895

Family MOINIDAE Goulden, 1968

Moina micrura Kurz, 1874

Family MACROTHRICIDAE Norman & Brady, 1867

Macrothrix spinosa King, 1852

Macrothrix goeldi Richard, 1897

Family CHYDORIDAE Stebbing, 1902

Subfamily CHYDORINAE Stebbing 1902

Chydorus sphaericus (O.F. MÜller, 1776)

Chydorus barroisi (Richard, 1894)

Dunhevedia crassa crassa King, 1853

Alonella excisa (Fischer, 1854)

Subfamily ALONINAE Frey, 1967

Alona davidi davidi Richard, 1895

Alona rectangula rectangula Sars, 1862

Kurzia longirostris (Daday, 1898)

SYSTEMATIC ACCOUNT

Family SIDIDAE Baird, 1850

Genus ***Diaphanosoma*** Fischer, 1850

1. ***Diaphanosoma excisum*** Sars, 1885

1901. *Diaphanosoma excisum* var. longiremis Ekman, Cladoceran und freilebende copepoden aus agypten und dem Sudan. *Results of the Sweedish Zool . Exped. To Egypt and the White Nile.*, p. 1-2, figs. 2-3;

1988. *Diaphanasoma excisum* Sars : Michael and Sharma, *Fauna of India and adjacent countries* : *Indian cladocera. Zoological survey of India, Calcutta* : 47.

1999. *Diaphanasoma excisum* Sars : Venkataraman, The Freshwater Cladocera, Fauna of West Bengal, part **10**, I-IV : p. 257.

Materials examined : 2 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Nature Park, 23.II.2009, Coll : Chitra, J; 1 Ex. Nalban Lake, 10.IX.2008, Coll : Chitra, J; 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 12.VI.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Rajasthan, Bihar.

Elsewhere : Common in tropics and subtropics.

2. ***Diaphanosoma sarsi*** Richard 1894

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

1988. *Diaphanasoma sarsi* Richard : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 44.

1999. *Diaphanasoma excisum* Sars : Venkataraman, The Freshwater Cladocera, Fauna of West Bengal, part 10, I-IV : p. 257.

Materials examined : Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Rajasthan, Bihar.

Elsewhere : Common in tropics and subtropics.

Genus ***Pseudosida*** Herrick, 1884

3. ***Pseudosida bidentata*** Herrick 1884

1884. *Pseudosida bidentata* Hierrick, On some Australian Cladocera raised from dried mud. *Norske. Vidensk. Selsk. Forhandl. Christiania*., **8** : 1-46. p. 20, pl. K, figs. 1-3.

1988. *Pseudosida bidentata* Hierrick : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 37.

1999. *Pseudosida bidentata* Hierrick : Venkataraman, The Freshwater Cladocera, Fauna of West Bengal, part **10**, I-IV : p. 256, fig. 4-7.

Materials examined : 2 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 04.III.2010, Coll : Chitra, J; 1 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 2 Ex. Captain Bherry, 01.X.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J; 2 Ex. Santoshpur Lake, 02.III.2010, Coll : Chitra, J; 1 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J; 2 Ex. Santragachi Lake, 03.X.2009, Coll : Chitra, J; 2 Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J.

Distribution : India : West Bengal, Rajasthan, Meghalaya, Quilon.

Elsewhere : Cosmotropical, also recorded from China and Japan.

Genus ***Lantonopsis*** Sars, 1888

4. ***Lantonopsis australis*** **(**Sars, 1888)

1888. *Lantonopsis australis* Sars, Additional notes on australian cladocera, raised from the dried mud. *Forth. Vidensk. Selsk. Christiania,* **7** : p. 6, pl. 1, figs. 1-6.

1988. *Lantonopsis australis* Sars : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 42.

1999. *Pseudosida bidentata* Herrick : Venkataraman, The Freshwater Cladocera, *Fauna of West Bengal,* part **10**, I-IV : p. 256, fig. 4-7.

Materials examined : 2 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Maidan Tank, 27.II.2009, Coll : Chitra, J.

Distribution : Andhra Pradesh, Maharashtra, Rajasthan, Tripura, Tamil Nadu, West Bengal.

Elsewhere : Australia and Oriental regions.

Family DAPHNIIDAE Straus, 1820

Genus ***Ceriodaphnia*** Dana, 1853

5. ***Ceriodaphnia cornuta*** Sars 1885

1885. *Ceriodaphnia cornuta* Sars, On some Australian Cladocera raised from dried mud. *Norske. Vidensk. Selsk. Forhandl. Christiania*., **8** : 1-46. p. 26-28, pl. 5.5, figs. 1-3.

1988. *Ceriodaphnia cornuta* Sars : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 52.

Materials examined : 4 Ex. 21.2.2008, Coll : Chitra, J, Loc : Indian Museum Tank; 2 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 2 Ex. Nature Park, 23.II.2009, Coll : Chitra, J; 1 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 12.VI.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 11.IX.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 26.II.2009, Coll : Chitra, J; 2 Ex. Maidan Tank, 13.VI.2008, Coll : Chitra, J; 1 Ex. Maidan Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Maidan Tank, 27.II.2009, Coll : Chitra, J; 2 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J ; 1 Ex. Patuli Lake, 25.VI.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 02.X.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 04.III.2010, Coll : Chitra, J; 1 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 01.III.2010, Coll : Chitra, J; 1 Ex. Santoshpur Lake, 23.VI.2009, Coll : Chitra, J; 3 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J; Ex. Santragachi Lake, 03.X.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Rajasthan, Meghalaya, Quilon.

Elsewhere : Cosmotropical, also recorded from China and Japan.

Genus ***Daphnia*** Muller, 1785

6. ***Daphnia carinata*** King 1853

1853. *Daphnia carinata* King, On some of the species of Daphnidae found in New South Wales. *Pap. Proc. R. Soc. Van Diemans* Land., 2.

1988. *Daphnia carinata* King : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 60.

Materials examined : 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Mysore, Banaras, Meerut and Surat, Rajasthan, Tamil Nadu, Bihar and West Bengal.

Elsewhere : Australia, Indonesia, Africa and Srilanka.

Genus ***Scapholeberis*** Schoedler, 1858

7. ***Scapholeberis kingi*** Sars, 1903

1903. *Scapholeberis kingi* Sars, Freshwater Entomostraca from from China and Sumatra. *Arch. Math. Nat.,* **25** : p. 8-10, pl. 1, figs. 2, a-c.

1978. *Scapholeberis kingi Sars* Sharma, A note on freshwater cladocerans from West Bengal. *Bangladesh J. Zool.,* **6** : 149-151. P. 149.

1988. *Simocephalus exspinosus* Koch : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 79.

Materials examined : 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 29.XI.2009, Coll : Chitra, J.

Distribution : India : West Bengal, Kashmir, Nilgiri hills, Rajasthan, Meghalya, Assam.

Elsewhere : Africa, Australia, North America, Sri Lanka, Germany, China, Thailand, Indonesia.

Genus ***Simocephalus*** Schoedler, 1858

8. ***Simocephalus vetulus*** (O.F. Müller, 1776)

1776. *Daphnia vetulus* Müller, O.F. Zoologiae Danicae prodromus seu Animalium Daniae et Norvegiae indigenarum characteres, nomina et synonyma imprinis popularium, *Havniae*. p. 199, No. 2399; Baird, 1850, P. 95-96, pl. 10, fig. 1.

1858. *Simocephalus vetulus* Müller : Schoedler, J.E. Die Brachiopoden ded Umgegend von Berlin. *Jahrb. Louisenst. Realschue*. Berlin, p. 18.

1988. *Simocephalus vetulus* Müller : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 76.

Materials examined : 1 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J.

Distribution : India : Punjab, Kashmir & Mysore, Kumaun, Western Himalaya, Rajasthan, Bihar, West Bengal.

Elsewhere : Cosmopolitan.

9. ***Simocephalus exspinosus*** (Koch, 1841)

1841. *Daphnia exspinosa* Koch, Deutschlands crustacean, myriapoden und Arachniden. *Friedrich Pustet* : Rosenberg. Hefts. Pl. 11.

1988. *Simocephalus exspinosus* Koch : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 79.

Materials examined : 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J.

Distribution : Meghalaya, West Bengal.

Elsewhere : Cosmopolitan.

Family MOINIDAE Goulden, 1968

Genus ***Moina*** Baird, 1850

10. ***Moina micrura*** Kurz, 1874

1874. *Moina micrura* Kurz, Dodekas neuer Cladoceren nebst einer kurzen Ubersicht der Cladoceren fauna Bohmens. *K. Acad. Wiss. Wein. Math. Nat.,* **70** : 1-82. p. 13-15, pl. I. fig. 1.

1927. *Moina dubia* Gurney, Some Australian freshwater entomostracan reared from dried mud. *Proc. General meetings for the scientific business of the Zool Soc London*., **1** : p. 66-67, figs. 5E-F.

1988. *Moina micrura* Kurz : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta.* 86. Fig. 26, a-f.

Materials examined : 4 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 1 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Maidan Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 25.VI.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 04.III.2010, Coll : Chitra, J; 2 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 2 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J.

Distribution : India : West Bengal (Sewell, 1935, Sharma, 1978), Nilgiri Hills, Bihar, Bijapur, Rajasthan.

Elsewhere : Africa, Syria, USSR, France, Phillippines.

Family BOSMINIDAE Sars, 1865

Genus ***Bosmina*** Baird, 1845

11. ***Bosmina longirostris*** (O.F. Muller, 1776)

1776. *Lynceus longirostris* Muller, Zoologiae Danicae prodromus seu Animalium Daniae et Norvegiae indigenarum characteres, nomina et synonyma imprinis populatium. *Havniae* : p. 76, tab. 10, figs, 7-8.

1978. *Bosmina longirostris* Muller : Sharma, A note on Freshwater cladocerans from West Bengal. *Bangladesh J. Zool.*, **6** : p. 149.

1988. *Bosmina longirostris* Muller : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 97. Fig. 29, a-h.

Materials examined : 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 26.II.2009, Coll : Chitra, J.

Distribution : India : Kashmir, Meghalaya, West Bengal.

Elsewhere : Cosmopolitan.

Family MACROTHRICIDAE Norman & Brady, 1867

Genus ***Macrothrix*** Baird, 1843

12. ***Macrothrix goeldi*** Richard, 1897

1897. *Macrothrix goeldi* Richard, Entomostraces de 1'Amerique du Sud, receillis par MMU. Deiters, H. von Ihering, G.W. MÜller et C.O. Poppe. *Mem. Soc. Zool. France*., **10** : p. 287-289, figs. 32, 33, 43.

1988. *Macrothrix goeldi* Richard : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 104. fig. 32, a-d.

Materials examined : 2 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J; 2 Ex. Santragachi Lake, 03.X.2009, Coll : Chitra, J; 1 Ex. Santragachi Lake, 03.X.2009, Coll : Chitra, J.

Distribution : India : West Bengal (Gurney, 1907; Sharma, 1978), Rajasthan.

Elsewhere : Chile, Nigeria, Uganda.

13. ***Macrothrix spinosa*** King, 1853

1853. *Macrothrix spinosa* King, On some of the species of Daphnidae found in New South Wales. *Pap. Proc. R. Soc. Van Diemans Land*, **2** : p. 256, plate vi f.

1988. *Macrothrix goeldi* Richard : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 103. Fig. 31, a-e.

Materials examined : 2 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J.

Distribution : India : Manipur.

Elsewhere : Chile, Nigeria, Uganda.

Family CHYDORIDAE Stebbing, 1902

Subfamily CHYDORINAE Stebbing, 1902

Genus ***Pleuroxis*** Baird, 1843

14. ***Pleuroxis similis*** Vavra, 1900

1900. *Pleuroxis similis* Vavra, Süsswasser–Cladoceren. *Hamburger Magalhaensische Smmelreise 2, Hamburg.* p. 23-24, fig. 6.

1978. *Pleuroxis similis* Vavra : Sharma, A note of freshwater cladocerens from West Bengal. *Bangladesh J. Zool.,* **6** *:* p. 150.

1988. *Pleuroxis similis* Vavra : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 127. Fig. 39, a-e.

Materials examined : 2 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J.

Distribution : India : Kashmir, West Bengal.

Elsewhere : Australia, Srilanka, Chile, Northern Caucasus.

Genus ***Chydorus*** Leach, 1816

15. ***Chydorus barroisi*** Richard, 1849b

1849. *Pleuroxus barroisi* Richard, p. 375-377, figs. 9.

1978. *Chydorus barroisi barroisi* Richard : Sharma. A note of freshwater cladocerens from West Bengal. *Bangladesh J. Zool.,* **6** : P. 150.

1988. *Chydorus barroisi barroisi* Richard : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 149. Fig. 49, a-d.

Materials examined : 1 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Gujarat.

Elsewhere : Cosmotropical.

Genus ***Chydorus*** Leach, 1816

16. ***Chydorus sphaericus*** (O.F. Muller, 1776)

1776. *Lynceus sphaericus* O.F. Muller, Zoologiae Danicae prodromus seu Animalium Daniae et Norvegiae indigenarum characteres, nomina et synonyma imprinis popularium, *Havniae* : P. 119.

1900. *Chydorus sphaericus* W. Lilljeborg, Cladocera Sueciae, *Nova Acta. Reg. Soc. Sci. Upsala*, Ser. III., **19** : p. 561-567, pl. 77, figs. 8-25.

1988. *Chydorus barroisi barroisi* Richard : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 149. Fig. 49, a-d.

Materials examined : 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 11.IX.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J, 2 Ex. Patuli Lake, 25.VI.2009, Coll : Chitra, J; Ex. Captain Bherry, 24.VI.2009, Coll : Chitra J; 1 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J.

Distribution : India : West Bengal (Gurney, 1906; Sharma, 1978), Bihar, Kashmir, Ladakh, Nilgiri hills and Meghalaya.

Elsewhere : Cosmopolitan.

Genus ***Alonella*** Sars, 1862

17. ***Alonella excisa*** (Fischer, 1854)

1854. *Lynceus excisus* Fischer, p. 428-429, pl. 3, figs. 11-13.

1907. *Alonella excisa* Fischer : Gurney, Further notes on Indian Indian freshwater Entomostraca. *Rec. Indian Mus.*, **1** : p. 26.

1988. *Alonella excisa* Fischer : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 135. Fig. 43, a-d.

Materials examined : 1 Ex. Maidan Tank, 27.II.2009, Coll : Chitra, J.

Distribution : India : Madhya Pradesh, Kashmir.

Elsewhere : Cosmotropical.

Genus ***Dunhevedia*** King, 1853

18. ***Dunhevedia crassa*** King, 1853

1853. *Dunhevedia crassa* King, On some of the species of Daphnidaefound in New south Wales. *Pap. Proc. R. Soc. Van Diemans Land*, **2** : p. 261, pl. VII F.

1907. *Dunhevedia crassa* Gurney, Further notes on Indian Indian freshwater Entomostraca. *Rec. Indian Mus.*, **1** : 21-33. p. 27.

1988. *Dunhevedia crassa* King : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 158. Fig. 52, a-e.

Materials examined : Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal, Meghalaya, Tripura, Gujarat, Tamil Nadu, Kerala, Rajasthan and Little Andaman.

Elsewhere : Cosmotropical.

Subfamily ALONINAE Frey, 1967

Genus ***Alona*** Baird, 1843 emend Smirnov, 1971

19. ***Alona davidi davidi*** Richard, 1895

1895. *Alona davidi,* Richard, Sur quelques Entomostraces déau douce Haiti, Mem. Soc. Zool. France, **8** : 192-195, figs. 5-8.

1988. *Alona davidi davidi* Richard : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : **175**. Fig. 59, a-g.

Materials examined : 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J.

Distribution : India : West Bengal.

Elsewhere : Ethiopian region. Haiti.

20. ***Alona rectangula rectangula*** Sars 1862

1862. *Alona rectangula rectangula,* Sars, Medeelte en af talrige Afbildninger ledsaget Oversight af de af ham I Oemgmen af christiana iagttagne Crustacea Cladocera. Forhandl. Vidensk. Selask, Christiania : p. 160.

1988. *Alona rectangula rectangula,* Sars: Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 175. Fig. 57, a-d.

Materials examined : 2 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Distribution : India : West Bengal.

Elsewhere : Ethiopian region. Haiti.

Genus ***Kurzia*** Dybowski & Grochowski, 1894

21. ***Kurzia longirostris*** (Daday, 1898)

1898. *Alona longirostris,* E. Daday, Mikroskopische SÜsswassertiere aus Ceylon. Termés. *FÜzetek*., 21 : p. 34, fig. 14, a-b.

1956. *Kurzia longirostris* Daday : Harding, Crustacea : Cladocera. *Explor. Hydrobiol. Lac. Tanganyika. Res. Scientifique*., **3** : p. 73, fig. 15.

1988. *Kurzia longirostris* Daday : Michael and Sharma, Fauna of India and adjacent countries : Indian cladocera. *Zoological survey of India, Calcutta* : 175. Fig. 217, a-d.

Materials examined : 1 Exs. 09.V.2009, Coll : Chitra, J, Loc : Indian Museum Tank.

Distribution : India : West Bengal, Meghalaya, Rajasthan, Tamil Nadu, Kerala and Little Andaman.

Elsewhere : Cosmotropical.

3. **COPEPODA**

SYSTEMATIC LIST OF REPORTED SPECIES

Phylum ARTHROPODA

Superclass CRUSTACEA

Class COPEPODA

Order CALANOIDA

Family DIAPTOMIDAE

Heliodiaptomus cinctus (Gurney, 1907)

Heliodiaptomus contortus (Gurney, 1907)

Heliodiaptomus viduus (Gurney, 1916)

Family PSEUDODIAPTOMIDAE

Pseudodiaptomus annandalei Sewell, 1919

Order CYCLOPOIDA

Family CYCLOPIDAE

Mesocyclops hyalinus (Rehberg, 1880)

Mesocyclops leuckarti (Claus, 1857)

Microcyclops varicans (Sars, 1863)

Paracyclops fimbriatus (Fischer, 1853)

Tropocyclops prascinus (Fischer, 1860)

SYSTEMATIC ACCOUNT

Order **Calanoida** Sars 1903

Family DIAPTOMIDAE Baird, 1850

Subfamily DIAPTOMINAE Kiefer, 1932

Genus ***Heliodiaptomus*** Kiefer, 1932

1. ***Heliodiaptomus cinctus*** (Gurney, 1907)

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

Materials examined : 2 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 1 Ex.

Nature Park, 23.II.2009, Coll : Chitra, J; 1 Ex. Maidan Tank, 12.IX.2008., Coll : Chitra, J; 1 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J, 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J.

Distribution : India : Andhra Pradesh, Bihar, Kerala, Orissa, West Bengal.

Elsewhere : Myanmar and Srilanka.

2. ***Heliodiaptomus contortus*** (Gurney, 1907)

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

Materials examined : 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Nature Park, 23.II.2009, Coll : Chitra, J; 2 Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Maidan Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 01.III.2010, Coll : Chitra, J.

Distribution : India : Andhra Pradesh, Assam, Bihar, Goa, Kerala, Maharashtra, Orissa, Tamil nadu, West Bengal.

Elsewhere : Endemic to India.

3. ***Heliodiaptomus viduus*** (Gurney, 1916)

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

1981. *Heliodiaptomus viduus* Reddy & Radhakrishna. *Hydrobiologia,* **83** : 162.

Materials examined : 2 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 11.IX.2008, Coll : Chitra, J; 1 Ex. Maidan Tank, 12.IX.2008, Coll : Chitra, J; 1 Ex. Maidan Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 12.IX.2008, Coll : Chitra, J; 2 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 25.VI.2009, Coll : Chitra, J; 1 Ex. Santoshpur Lake, 30.XI.2009, Coll : Chitra, J; 1 Ex. Santoshpur Lake, 02.III.2010, Coll : Chitra, J.

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

Elsewhere : India, Srilanka, Pakistan, Bangladesh, Myanmar and Thailand.

Family PSEUDODIAPTOMIDAE Sars, 1902

Genus ***Pseudodiaptomus*** Sars, 1903

4. ***Pseudodiaptomus annandalei*** Sewell 1919

1919. *Pseudodiaptomus annandalei* Sewell, *Rec. Indian Mus.*, **16** : 389.

Materials examined : 2 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J.

Order CYCLOPOIDA

Family CYCLOPIDAE Dana, 1853

Genus ***Mesocyclop***s Sars, 1914

5. ***Mesocyclops hyalinus*** (Rehberg, 1880)

1880. *Cyclops hyalinus*, Rehberg, *Abh. Ver. Bremen*, 6 : 542.

Materials examined : 1 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 2 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 2 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 1 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 1 Ex. Hooghly RGBG, 11.IX.2008, Coll : Chitra, J; 2 Ex. Maidan Tank, 13.VI.2008, Coll : Chitra, J; 1 Ex. Maidan Tank, 12.IX.2008, Coll : Chitra, J; Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Captain Bherry, 24.VI.2009, Coll : Chitra, J; 1 Ex. Captain Bherry, 03.III.2010, Coll : Chitra, J; 2 Ex. Bhagajatin Lake, 29.XI.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 01.III.2010, Coll : Chitra, J; 2 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J.

Distribution : Andhra Pradesh, Jammu & Kashmir, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal.

6. ***Mesocyclops leukarti*** (Claus, 1857)

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

Materials examined : 1 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 09.IX.2008, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Rabindra Sarovar, 24.II.2009, Coll : Chitra, J; 1 Ex. Nature Park, 09.VI.2008, Coll : Chitra, J; 1 Ex. Nature Park, 08.IX.2008, Coll : Chitra, J; 1 Ex. Nature Park, 23.II.2009, Coll : Chitra, J; 1 Ex. Nalban Lake, 11.VI.2008, Coll : Chitra, J; Ex. Naban Lake, 25.II.2009, Coll : Chitra, J; 1 Ex. Maidan Tank, 13.VI.2008, Coll : Chitra, J; 1 Ex. Maidan Tank, 27.II.2009, Coll : Chitra, J; Ex. Indian Musuem Tank 13.VI.2008, Coll : Chitra, J; 2 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J; 1 Ex. Patuli Lake, 25.VI.2009, Coll : Chitra, J; 2 Ex. Patuli Lake, 02.X.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 22.VI.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 29.XI.2009, Coll : Chitra, J; 1 Ex. Bhagajatin Lake, 01.III.2010, Coll : Chitra, J; 1 Ex. Santoshpur Lake, 23.VI.2009, Coll : Chitra, J; 1 Ex. Santoshpur Lake, 23.VI.2009, Coll : Chitra, J; Ex. Santragachi Lake, 05.III.2010, Coll : Chitra, J.

Distribution : India : Andhra Pradesh, Jammu & Kashmir, Karnataka, Orissa, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal.

Elsewhere : Africa, South America.

Genus ***Microcyclops*** Claus, 1893

7. ***Microcyclops varicans*** (Sars, 1863)

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

1972. *Microcyclops varicans* Wilson. *Bull. U.S. Natn. Mus*., Washington 158 : 326.

Materials examined : 2 Ex. 27.II.2009, Coll : Chitra, J, Loc : Indian Museum Tank; 2 Ex. Santragachi Lake, 26.VI.2009, Coll : Chitra, J.

Distribution : India : Andhra Pradesh, Punjab, Uttar Pradesh, West Bengal.

Elsewhere : Cosmopolitan.

Genus ***Paracyclops*** Claus, 1893

8. ***Paracyclops fimbriatus*** (Fischer, 1853)

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

1972. *Paracyclops fimbriatus* Wilson. *Bull. U. S. Natn. Mus*., Washington, 158 : 342.

Materials examined : 1 Ex. Maidan Tank, 12.IX.2008, Coll : Chitra, J.

Distribution : India : Andhra Pradesh, West Bengal.

Elsewhere : Cosmopolitan.

Subfamily EUCYCLOPINAE Kiefer, 1929

Genus ***Tropocyclops*** Kiefer, 1927

9. ***Tropocyclops prasinus*** (Fischer, 1860)

1860. *Cyclops prascinus* Fisher, *Abh. Math. Phy. Classe. Kon. Akad. Wiss. Munich*, 8 : 652.

1939. *Tropocyclops prascinus* Kiefer. *Mem. Indian Mus.*, **13** : 131.

Materials examined : 1 Ex. Indian Musuem Tank, 27.II.2009, Coll : Chitra, J.

Distribution : India : Andhra Pradesh and West Bengal.

Elsewhere : Cosmopolitan.

4. **Ostracoda**

Class CRUSTACEA

Subclass OSTRACODA

Order PODOCOPA

Family CYPRIDIDAE

Subfamily CYPRIDINAE Baird

Genus ***Cypris*** Müller

Cypris subglobosa Sowerby 1840

Strandesia indica Hartmann, 1964

Stenocypris major (Baird) 1859

SYSTEMATIC ACCOUNT

Order PODOCOPA

Family CYPRIDIDAE Baird, 1845

Subfamily CYPRIDINAE

1. ***Cypris subglobosa*** Sowerby 1840

1964. *Cypris subglobosa* Hartmann, Asiatische Ostracoden. Systematische und zoogeographische Untersuchungen. *Int. Rec. Gesamten Hydrobiol. Syst. Beih.* **3** : p. 92, Abb. 34 a, b.

Materials examined : 1 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Remarks : Mostly these specimens inhabitants of benthic forms or clinged to the aquatic fauna and submerged biota. The specimens were obtained from the surface water during the plankton collection from the Indian museum Tank.

2. ***Strandesia indica*** Hartmann 1964

1964. *Strandesia indica* Hartmann, Asiatische Ostracoden. Systematische und zoogeographische Untersuchungen. *Int. Rec. Gesamten Hydrobiol. Syst. Beih*. **3** : p. 101, Abb. 39, a-c; 40, a-b; 41.

Materials examined : 1 Ex. Rabindra Sarovar, 10.VI.2008, Coll : Chitra, J.

Distribution : India : Gujarat, Tamil Nadu, Kerala, West Bengal (Calcutta).

Remarks : These specimens were observed from Indian Museum Tank during summer season.

3. ***Stenocypris major*** (Baird) 1859

1859. *Cypris cylindrical major* Baird, Description of some new Entomostraca from Nagpur, collected by *Rev. S. Hislop. Proc. Zool. Soc.*, London, p. 233, fig. 1, 4a-f.

Materials examined : 6 Ex. Indian Museum Tank, Kolkata; 05.VI.2009, Coll : Chitra, J.

Distribution : India : Tamil Nadu, Karnataka, Andhra Pradesh, Kerala, Gujarat, Maharashtra, Madhyapradesh and West Bengal.

ZOOPLANKTON DIVERSITY AND ITS COMPOSITION

The seasonal impact on the diversity of zooplankton were examined in detail during 2008 to 2009 at Rabindra sarovar, Nature Park, Indian Museum Tank, Hooghly RBGB (Ramchandra goenta zenana bathing ghat), Maidan Tank and Nalban Lake, were analysed. In the year 2009 to 2010, Patuli Lake, Captain bherry, Bhagajatin Lake, Santoshpur Lake and Santragachi Lake were studied. A total of 33 species of Rotifers belonging to 9 families viz., brachionidae, euchlanidae, mytilinidae, lecanidae, notommatidae, trichocercidae, asplanchnidae, synchaetidae and filinidae were recorded. Maximum number of species were encountered from the family

brachionidae (18 sp). Few commonly occurred species discovered from the study were *Anuraeopsis fissa, Asplanchna brightwelli, Brachionus angularis, B. calyciflorus, B. diversicornis, B. caudatus personatus, B. falcatus*. Rotifer eggs were also recorded from few wetlands. These recorded taxa of rotifers from various wetlands showed significant variation in occurrence between each selected study area. Species richness were observed in Nature park, Rabindra Sarovar and Captain bherry when compared to other study areas.

Cladocera were represented by 20 species belongs to 16 genera and 7 families viz., sididae, daphniidae, bosminidae, moinidae, macrothricidae, chydoridae and 2 orders namely ctenopoda and anomopoda. Some of the species were listed as common species based on their availability through the evaluations were *Moina micrura, Ceriodaphnia cornuta* and *Pseudosida bidenta* appeared in all the selected localities. Disparities among cladoceran diversity were largely seen in Santragachi, Rabindra sarovar and Bhagajatin Lake. Among Copepods, 10 species belongs to 6 genera and 3 families (diaptomidae, pseudodiaptomidae, cyclopiidae) and 2 order viz., calanoida and cyclopoida were recorded. Cladoceran diversity were recorded in Santragachi, Rabindra sarovar and Bhagajatin Lake. 3 species of ostracods belongs to 3 genera and 2 families were registered. When compared to rotifers, copepods and cladocerans, ostracods were seen lesser since most of them are benthic and only few are free living. Ostracods were recorded only in few wetlands (Table-5).

Along with the zooplankton, phytoplankton were also recorded upto generic level were identified. A total of 19 species of phytoplankton were encountered from 15 genera and 3 order. *Closterium tumidum, Closterium* sp., *Merismopedia glauca, Merismopedia minima, Harmidium flaccidium, Harmidium* sp., *Oscillatoria subbrevis, Oscillatoria* sp. , *Pediastrum simplex, Phormidium* sp., *Scenedesmus oblius, Scenedemus* sp, *Spirulina* sp *Spirogyra* sp., from chlorophyceae. *Lyngbya* sp., *Microcystis aeruginosa from cyanophyceae and Navicula* sp., *Thallassiosira subtilis* from dinophyceae. *Lyngbya* sp., *Spirogyra* sp., *Navicula* sp. and *Oscillatoria* sp. were commonly occurred algae in all the location. *Spirulina* bloom were observed in Nalban Lake during premonsoon season 2008. Other miscellaneous forms like aquatic insects (adults, eggs, and larval stages), oligochaetes, nematodes, molluscan shells like *Bellamya bengalensis* and *Gyrulus* sp., egg sacs of copepods, mysis stages, small fishes, protozoans like *Arcella* sp., *Vorticella* sp. and *Centropyxis* sp. were also encountered during the study period.

ZOOPLANKTON ABUNDANCE AND SEASONAL FLUCTUATION

ROTIFERA

Maximum population of rotifers were observed during premonsoon season at Rabindra sarovar, Indian Museum Tank, Maidan, Nature park, Bhagajatin Lake, Captain bherry, Patuli

Lake. At Indian Museum Tank, more or less similar abundance were noticed during all the seasons. Nalban Lake registered the maximum abundance observed during monsoon season (*Asplanchna brightwelli*) registered 14,660 ind/m^3 abundance during monsoon season and *Brachionus caudatus aculeatus* were dominant during premonsoon season (16,890 ind/m^3). The species diversity and their abundance were lower in Hooghly. Rotifers were not observed from Santoshpur Lake during the study period. At Santragachi, the population of rotifers were maximum during premonsoon season and post monsoon season. The higher recruitment of rotifers were from brachionidae family represented more than 25,000 ind/m^3 at Rabindra Sarovar (Fig. 11 a-j).

COPEPODA

At Rabindra Sarovar, copepod abundance were registered higher (39,770 ind/m^3) during monsoon season whereas, cylopoid nauplii were dominant. Similarly, the highest peak was observed in monsoon season at Maidan due to mass recruitment of calanoid copepodites. Higher population of cyclopoid nauplii and copepodites were registered in Patuli Lake during postmonsoon season and lower in monsoon season. Similarly Captain Bherry showed maximum abundance in postmonsoon season and minimum abundance during monsoon season. Brood females of calanoid copepod *Heliodiaptomus contortus* were observed during premonsoon season and cyclopoid copepod *Mesocyclops hyalinus* were recorded during postmonsoon season. Nauplii and copepodite stages of cyclopoids were enormous during postmonsoon season at Captain Bherry. As such in Bhagajatin Lake, Santoshpur Lake also showed the record of maximum abundance during monsoon season. Peak was observed at Nature Park, Indian Museum Tank, Hooghly RGBG (Ramchandra zenana goenta bathing ghat) and Nalban Lake during premonsoon season. Nauplii and copepodites of calanoida and cyclopoida were ranked higher at Indian Museum Tank. In over all, the population of *Heliodiaptomus viduus*, *H. contortus*, *Mesocyclops hyalinus* accompanied with nauplii and copepodites were recruited in large scale. (Fig. 12 a-k).

CLADOCERA

Rabindra Sarovar showed the highest cladoceran diversity from the study. The cladocerans were abundant during monsoon followed to premonsoon and postmonsoon season. The seasonal fluctuation were noticed at species level. *Ceriodaphnia cornuta* (4,553 ind/m^3), *Chydorus sphaericus* (6,778 ind/m^3) and cladoceran neonates (5,667 ind/m^3) were showed maximum abundance during the study. At Nature Park, the cladoceran density showed generosity during postmonsoon season. *Diaphanasoma excisum* and *Ceriodaphnia cornuta* witnessed the peak during postmonsoon season (9,433 ind/m^3). Nalban Lake depicted the

higher density of *Moina micrura* (2,780 ind/m^3) and *Ceriodaphnia cornuta* (2,560 ind/m^3) during postmonsoon season. The cladoceran were reduced during premonsoon season thereby increases during monsoon and sustained higher abundance during postmonsoon season. The population density of cladocerans were higher during premonsoon season at Hooghly. In Maidan Tank the maximum population were perceived during postmonsoon season. *Ceriodaphnia cornuta* were traced in all the seasons.

Patuli showed the marked variation in the population density profile. *Ceriodaphnia cornuta* (13,250 ind/m^3) was abundant during post monsoon season. *Moina micrura* (8,330 ind/m^3) were higher during premonsoon season. Overall result showed maximum density observed during postmonsoon season followed in premonsoon season where, the density were truncated during monsoon season. At Captain bherry, cladocerans were abundant during premonsoon season and slowly reduced in monsoon season and least during postmonsoon season. *Pseudosida bidenta* (8,670 ind/m^3) found to be abundant during premonsoon season at Bhagajatin Lake. Similar peak was observed during premonsoon and postmonsoon season at Santoshpur Lake. The recruitment of *Pseudosida bidenta* (42,670 ind/m^3) in Santragachi jheel were recorded during monsoon season (Fig 13 a-k).

OSTRACODA

The Ostracod abundance were comparatively lesser among the zooplankton during the investigations. In some of the selected localities like Hooghly, Santoshpur Lake, Maidan Tank and Nalban Lake, the planktonic ostracods were not noticed during the study period. At Rabindra Sarovar, the population abundance of *Cypris subglobosa* extended about 1,330 ind/m^3 during premonsoon season and two peaks were observed in premonsoon and postmonsoon season. There was not much variation observed in Indian Museum Tank, Nature park, Santragachi and Captain bherry showed their occurrence with lower density. (Fig. 14 a-f).

ZOOPLANKTON-PERCENTAGE COMPOSITION

PRE-MONSOON SEASON

The percentage composition among zooplankton copepoda bears a higher representation at Rabindra Sarovar, Indian Museum Tank, Maidan Tank. Rotifers dominated and seized Nalban Lake, Hooghly Ramchandra zenana Goenta Bathing Ghat and Nature Park (2008-2009). Copepods inhibited enormously in Bhagajatin Lake, Santoshpur Lake and Santragachi Lake (2009-2010). And the rotifers showed the higher composition at Captain Bherry and Patuli Jheel. Cladocera were observed in the next position to copepoda and rotifers. Ostracods were the least percentage contributed during the study period. The percentage composition at each waterbody showed higher variation and alteration in the community structure of zooplankton (Fig. 15).

MONSOON SEASON

Higher percentage composition of zooplankton were major representation of copepoda and rotifera from the study (2008-2009). Copepoda contributed the maximum percentage composition at Rabindra Sarovar, Nature park, Indian Museum Tank and Maidan Tank. The major representation of copepods were found at Baghajatin Lake, Patuli Lake and Santoshpur Lake (2009-2010). Rotifers were contributed much composition at Nalban Lake (2008-2009) and Captain bherry (2009-2010). Equally cladocera occupied the major portion during Hooghly Ramchandra Goenta Bathing Ghat (RGBG) (2008-2009) and at Santragachi Lake (2009-2010) (Fig. 16).

POST MONSOON SEASON

During post monsoon season (2008-2009) among zooplankton, copepods were copious at few localities viz., Rabindra sarovar, Nature Park, Indian Museum Tank, Maidan Tank (2008-2009) and Bhagajatin Lake, Santoshpur Lake and Santragachi Lake (2009-2010). Rotifers showed the higher percentage composition in Nalban Lake (2008-2009) and Captain Bherry. Similar to copepoda composition cladocera were higher in Rabindra sarovar and Santragachi Lake. Studies at Patuli Lake revealed the major representation of cladocera during the study period (Fig. 17).

PHYSICO-CHEMICAL PARAMETERS OBSERVED DURING THE STUDY AS FOLLOWS :

The temperature on the surface waters at the various locations revealed lowest during winter season and higher during summer season ranged between 24ºC and 32ºC. The increase and decrease in the surface water temperature noticed were according to the seasonal change. The water transparency measured from 5 cm to 110 cm by secchi disc readings. Nalban Lake and Santoshpur Lake showed high transparency when compared to other locations. The turbid conditions were noticed in Hugli (RGBG) and Santragachi. The range between the minimum and maximum pH recorded was very less being nearly 7.5 to 8.5 conc. The maximum pH were recorded (8.0 to 8.5 conc.) during post monsoon season. Salinity ranged from 0 mg/L to 0.4 mg/L, the highest value recorded at Nalban Lake and Captain Bherry during all the seasons recorded higher salinity in the surface water. The dissolved oxygen were fluctuated beween 4.82 mg/L and 8.50 mg/L. Alkalinity varied from 150 mg/L at Nature park during premonsoon season to 185 mg/L at Nature park and Santragachi Lake during post monsoon season (Table-1 & 2).

Table -1 : Physico-chemical characteristics of few wetlands studied (Mean value)

Sl. No.	Wetlands	pH (Conc)			Temperature (°C)			Salinity (mg/L)		
		Pr.M	M	Po.M	Pr.M	M	Po.M	Pr.M	M	Po.M
1.	Rabindra Sarovar	7.5	7.8	7.6	26	28.0	30.5	0	0	0
2.	Nature Park	7.8	8.2	8.5	24	28.6	31.4	0	0	0
3.	Nalban lake	7.5	7.5	8.3	25	29.2	30.6	0.4	0.2	0.3
4.	Indian Museum Tank	7.7	7.7	7.7	24	27.5	31.3	0	0	0
5.	Maidan	8.1	7.5	8.0	26	27.8	32.1	0	0	0
6.	Hooghly (RGBH)	7.6	7.6	7.6	26	29.3	31.7	0	0	0
7.	Patuli Jheel	7.9	8.0	8.2	25	28.4	32.4	0	0	0
8.	Captain Bherry	7.5	7.5	7.8	25	28.6	32.0	0.1	0.1	0.1
9.	Baghajatin lake	7.7	7.5	7.9	27	28.0	30.0	0	0	0
10.	Santoshpur lake	7.5	7.8	8.4	25	29.3	32.3	0	0	0
11.	Santragachi Jheel	7.9	8.0	8.2	24	28.3	31.8	0	0	0

Table -2 : Physico-chemical characteristics of few wetlands studied (Mean value)

Sl. No.	Wetlands	Alkalinity (mg/L)			Dissolved Oxygen (mg/L)			Transparencey (cm)		
		Pr.M	M	Po.M	Pr.M	M	Po.M	Pr.M	M	Po.M
1.	Rabindra Sarovar	155	168	190	6.0	6.5	8.5	75	95	90
2.	Nature Park	150	173	185	4.82	7.20	8.0	52	55	48
3.	Nalban lake	163	178	182	5.55	6.85	8.25	92	110	98
4.	Indian Museum Tank	169	175	178	6.20	8.10	7.65	15	25	20
5.	Maidan	157	162	180	6.72	7.15	8.10	17	30	25
6.	Hooghly (RGBH)	162	170	176	5.0	6.78	7.80	10	20	18
7.	Patuli Jheel	160	175	182	6.25	6.90	7.65	34	40	39
8.	Captain Bherry	155	164	180	5.85	6.84	7.95	45	52	50
9.	Baghajatin lake	159	167	170	6.10	7.05	7.60	25	32	30
10.	Santoshpur lake	145	159	173	5.90	7.22	8.50	65	64	60
11.	Santragachi Jheel	158	170	185	5.85	7.37	6.82	5	10	5

Note : Pr.M—Premonsoon; M—Monsoon; Po.M—Post Monsoon.

DISCUSSION

Most studies have reported on the rise in zooplankton species richness in Lakes (Patalas, 1972; Fryer, 1985; Dodson, 1991, 1992) on size and with Lake depth (Keller & Conlon, 1994), which may be explained by the larger heterogeneity (Keller & Conlon, 1994) and perhaps also the lower fish predation pressure in deeper Lakes (Jepessen *et al.*, 1997). In the present study, shallow waterbodies selected were ponds, lakes and tanks with significant variation noticed in the species richness of free living rotifers, and microcrustaceans (cladocera, copepoda and ostracoda). And the successful life of microcrustaceans are adapted to life in the oxygen-poor hypolimnion (Hoffmann, 1985), implying that the abundance of species is probably higher in stratified than in non stratified lakes. Even pH alter the plankton richness in the Lakes of Norway (Walseng and Karlsen, 2001). Here the recorded pH and dissolved oxygen from the investigation was within the normal limit.

Khan (2003) reported 89 species belonging to rotifer (29%), cladocera (63%) and copepod (11.3%) of the species known from West Bengal and showed high fluctuation of zooplankton compared between different water bodies classified into different categories such as oxbow lakes, natural wetlands, sewage fed fish culture ponds etc. But the present studies were conducted in few wetlands to analyse the community structure of zooplankton only on surface water. Their diversity, abundance along with the seasonal pattern were studied. Earlier elaborate studies on rotifer fauna from various parts of Calcutta were carried out from July 1974-September 1978 and on various occasions between the years 1984-1987 by Sharma (1978 a, b, c, 1979 a, b, c; 1980; 1991; 1998). But the seasonal investigations depicted very clearly on the variation of species composition, diversity, abundance and complete community structure of zooplankton from the selected wetlands in the present study. Zooplankton is a good indicator of changes in water quality, because it is strongly affected by the environmental conditions and it is quickly responded to changes in environmental quality (Gannon and Stemberger, 1978). Saldeek (1983) reported that among zooplankton, cladocerans and copepods can used as the indicator of aquatic environment.

Sharma 1992 reported high population densitiy of rotifer were noticed during the monsoon and early winter. However summer maxima as reported by Khan *et al.* (1986). Jayadevi (1994) have noticed higher rotifer densities in winter. Similar observation on rotifer density in Lake Masunda by Somani *et al.* (2003). Tijare and Thosar (2008) observed maximum rotifers in winter months while minimum in summer months from three Lakes of Gadchiroli, a tribal district of Maharashtra. The Cyclopoids formed dominant component of Copepoda and thus concurred with earlier reports (Khan 1987, Sanjer and Sharma 1995, Sharma and Hussain 2001, Sharma and Sharma 2011 and Sharma 2011). The species richness of rotifer showed the dominance over cladocera and copepod reported earlier by Khan and Sinha (1999) were

coincided with the present study. High rotifer population in the Lake waters indicate pollution due to direct entry of untreated domestic sewage from input area (Arora, 1966). Likewise in the selected localities the direct incharge such as anthropogenic inputs were introduced mainly the idol immersion which may leads to toxicity in relation to the paints and local domestic wastes settlements in the wetlands were observed during the investigations. Such prolonged exposures may lead to high algal blooming leads to the damage to the food chain ultimately alters the zooplankton community may destroys the aquatic system at higher level.

Ashis *et al.* (2011) reported 18 species of zooplankton and *Polyarthra vulgaris* were dominant during the study. Santragachi Jheel showed very high organic load and comparatively low predation pressure resulted in the increased density of few species of each group. Rotifers showed a major pulse in the Lake during summer months. Santragachi Jheel with considerably high organic load exhibited low species richness and diversity from the investigations during 2000-2002. Enormous weeds may be one of the causative factor where the collection could not be administered successfully which may show lesser population among zooplankton. Further intensive study is to be implemented on the freeliving and weed associated plankton in detail at Santragachi jheel. The occurrence of harpacticoid nauplii during monsoon season at Indian Museum Tank would be the result of the mixing up of sediment and surface water due to precipitation. And this would be the first hand information on the record of harpacticoid nauplii. Still further studies on the sediment characteristics along with the faunal components will reveal surprisingly on Indian Museum Tank.

Venkataraman (1999) reported 56 species of cladocera from West Bengal. Mukhopadhyay *et al.* (2007) studied the zooplankton diversity in waters contaminated with composite effluents revealed the occurrence of 22 species of zooplankton, among these 3 species of cladocera, 2 species of copepoda, 15 species of rotifera, and 2 species of ostracoda were recorded from five selected sites of the East Calcutta Wetlands. The copepod *Mesocyclops leuckarti* was found in all the five sites, rotifers *Asplanchna brightwelli, Brachionus angularis, B. calyciflorus* and cladocera *Ceriodaphnia cornuta* were found in four sites; *Moina micrura* and *Diaphanosoma sarsi* were found at three sites. In the present investigation, Captain Bherry and Nalban Lake from East Calcutta Wetlands selected showed the species occurrence from rotifera, cladocera, copepoda and ostracoda were recorded. Especially *Pseudodiaptomus annandalei* and *Mesocyclops leuckarti* from copepoda, *Brachionus calyciflorus, B. angularis, A. brightwelli* and *Brachionus diversicornis* from rotifera and *P. bidentata* from cladocera were few common species available.

Zooplankton peak was observed during summers and least abundance of these microscopic animals was recorded in monsoon (Sadguru *et al.*, 2002 and Pandey *et al.*, 2004). The net zooplankton abundance increased during summer, probably corresponding to the water quality,

decaying vegetation, increased levels of organic matter in the sediment and higher abundance of bacteria in the wetlands during this time (Coman *et al.*, 2003; Chattopadhyay and Bairik, 2009). Sudden reduction in the zooplankton population during the rainy season as noticed in the present findings could be due to sudden fall of temperature and dilution in concentration of minerals and salts in wetland water (Chakkraborty, 2004). Dominance of cladocera among zooplankton peak was found during summer might be due to optimal thermal and nutritional conditions and lower concentration of oxygen (Ojha *et al*. 2007). Effect of rains may explain low records of cladocerans from July to September. The fluctuation in the abundance of copepods appear to be due to mainly predation pressure from higher level organisms such as fishes (Contreras *et al.*, 2009). Therefore, zooplankton richness, diversity reflects based on the environmental conditions of water, climatic conditions and the influence of anthropogenic inputs. Seasonal investigion is essential in zooplankton studies comparatively to picturize the community structure and their abundance.

SUMMARY

A total of 66 species of zooplankton belonging to 21 families recorded int the present investigation explore the species richness of few wetlands in and around Kolkata. In the present study, rotifera, copepoda, cladocera and ostracoda among zooplankton were focused mainly. 33 species of rotifers belonging to 9 families where maximum were encountered from the family brachionidae (18 sp). 20 species belongs to 16 genera and 7 families of cladocera, 10 species belongs to 6 genera and 3 families of copepods and ostracods belongs to 3 species; 3 genera and 2 families. The detailed community structure of zooplankton abundance and the percentage composition from the selected wetlands Rabindra Sarovar, Nature Park, Nalban Lake, Indian Museum Tank, Maidan, Hooghly (RGBG), Patuli Jheel, Captain Bherry, Bhagajatin Lake, Santoshpur Lake, Santragachi Lake interpreted seasonally (premonsoon, summer and monsoon season). Zooplankton diversity were higher in Rabindra Sarovar and Nature Park. There were not much significant influence by abiotic parameters related to zooplankton population in the study. The pollution threats to the wetlands mainly by the domestic wastes and idol immersion during durga pooja celebrations were noticed witnessed with fishkills.

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PLATE-I

Fig. 1. Rabindra Sarovar

Fig. 2. Duck weed and Eichornia sp. on surface water with dense vegetation surrounded by the lake, Nature Park Taratala

Fig. 3. Indian Museum tank near Fire Proof Spirit building

Fig. 4. Nalban lake showing rich vegetation on the littoral region

PLATE-II

Fig. 5. Hooghly Ramachandra zenana goenta bathing ghat

Fig. 6. Patuli Jheel

Fig.7. Fish kills during immersion of idols on the occasion of puja at Patuli Lake

Fig. 8. Baghajatin lake where fishing taken place by the tourists on payment

PLATE-III

Fig.9. Showing domestic activities at Santoshpur lake

Fig. 10. Santragachi lake

PLATE-IV

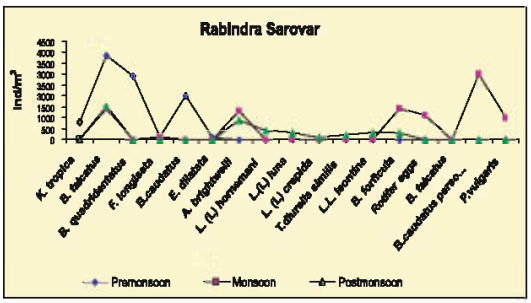

Fig. 11a. Abundance of Rotifera at Rabindra Sarovar during 2008 – 2009

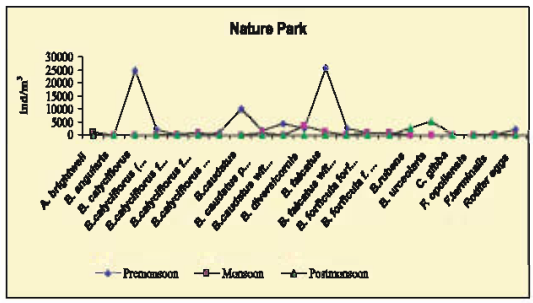

Fig. 11b. Abundance of Rotifera at Nature Park during 2008 – 2009

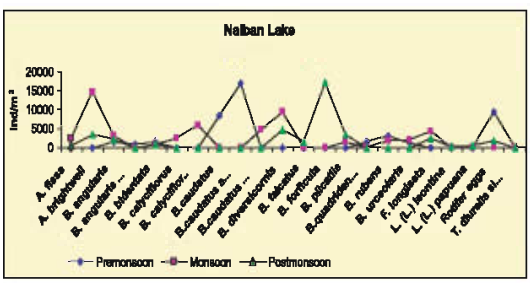

Fig. 11c. Abundance of Rotifera at Nalban lake during 2008 – 2009

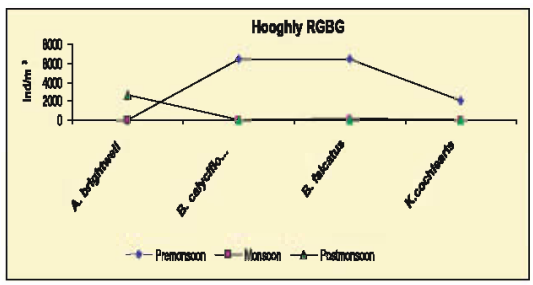

Fig. 11d. Abundance of Rotifera at Hooghly RGBG during 2008 – 2009

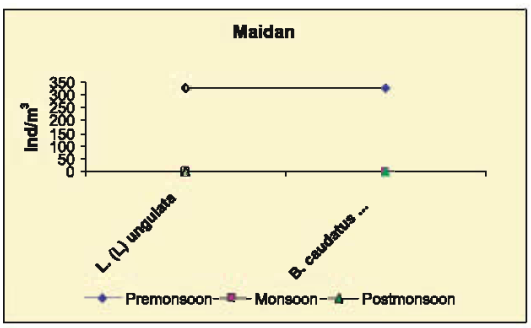

Fig. 11e. Abundance of Rotifera at Maidan tank during 2008 – 2009

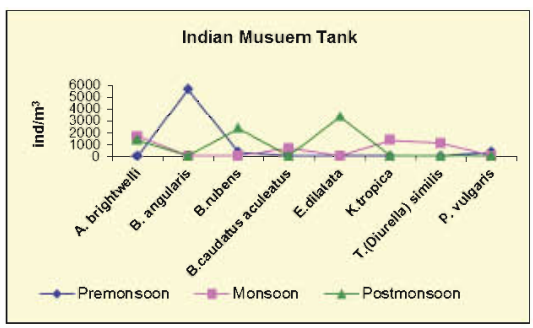

Fig. 11f. Abundance of Rotifera at Indian Museum tank during 2008 - 2009

PLATE-V

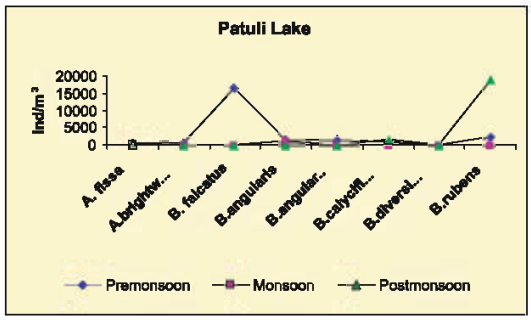

Fig. 11g. Abundance of Rotifera at Patuli lake during 2009–2010

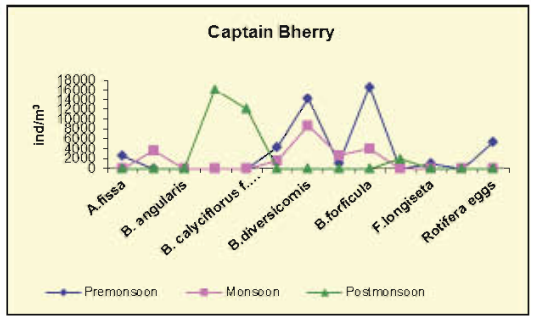

Fig. 11h. Abundance of Rotifera at Captain Bherry during 2009–2010

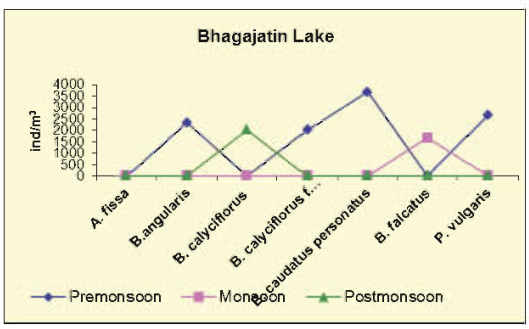

Fig. 11i. Abundance of Rotifera at Bhagajatin lake during 2009–2010

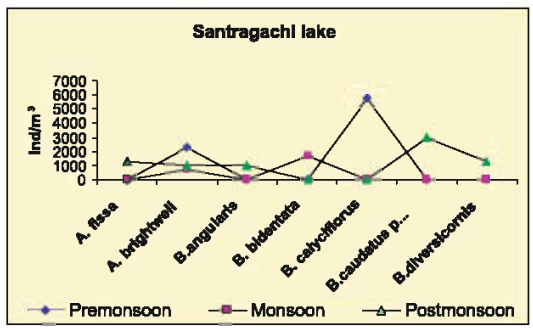

Fig. 11 j. Abundance of Rotifera at Santragachi lake during 2009–2010

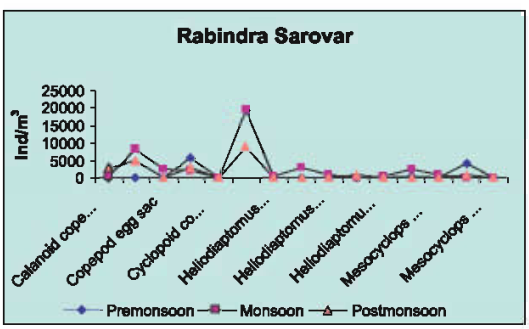

Fig. 12a. Copepoda abundance during the invcstigation (2008–2009) at Rabindra Sarovar

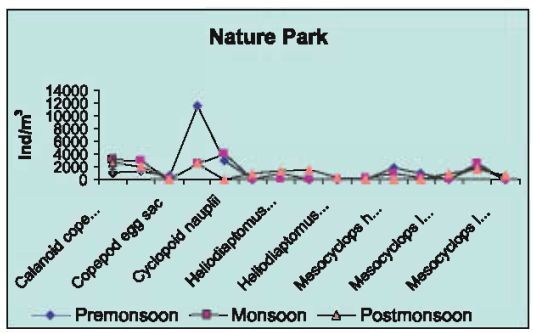

Fig. 12b. Copepoda abundance during the investigation (2008–2009) at Nature Park

PLATE-VI

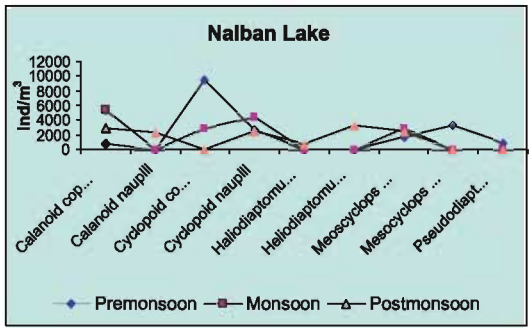

Fig. 12c. Copepoda abundance during the investigation (2008 – 2009) at Nalban lake

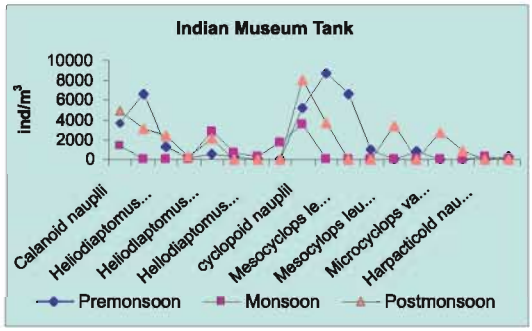

Fig. 12d. Copepoda abundance during the investigation (2008 – 2009) at Indian Museum tank

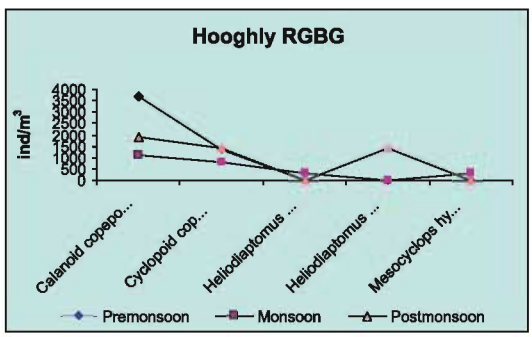

Fig. 12e. Copepoda abundance during the investigation (2008 – 2009) at Hooghly RGBG

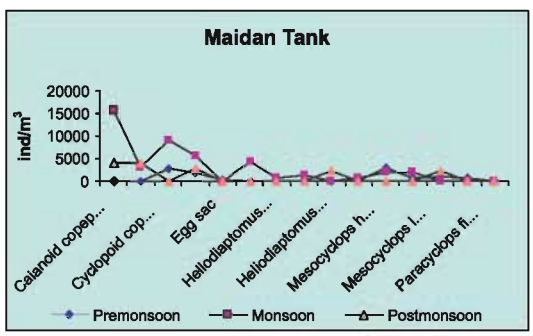

Fig. 12f. Copepoda abundance during the investigation (2008 – 2009) at Maidan Tank

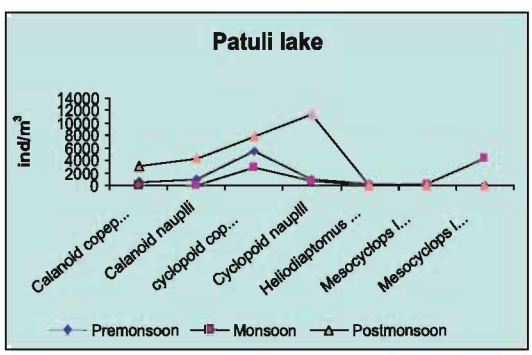

Fig. 12g. Copepoda abundance during the investigation (2009 – 2010) Patuli lake

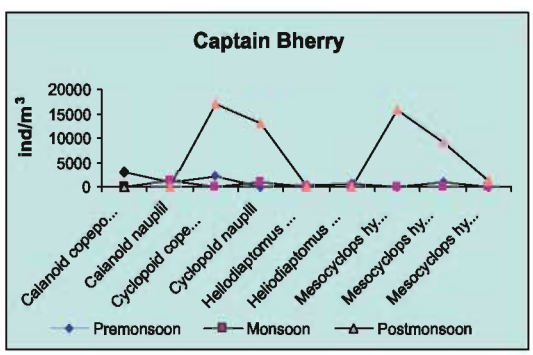

Fig. 12h. Copepoda abundance during the investigation (2009 – 2010) at Captain Bherry

PLATE-VII

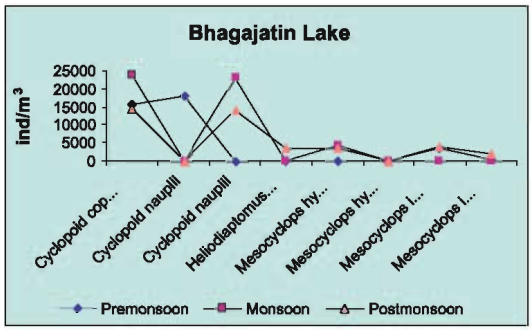

Fig. 12i. Copepoda abundance during the investigation (2009 – 2010) at Bhagajatin lake

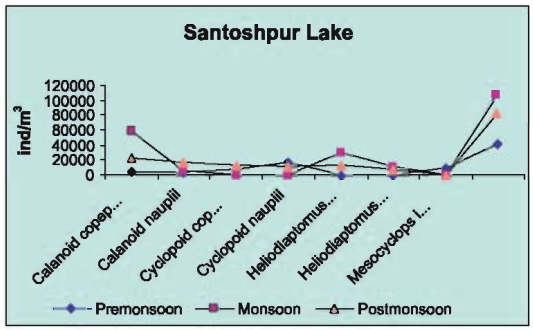

Fig. 12j. Copepoda abundance during the investigation (2009 – 2010) at Santoshpur lake

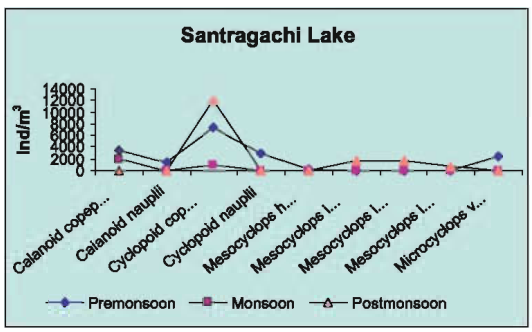

Fig. 12k. Copepoda abundance during the investigation (2009 – 2010) at Santragachi lake

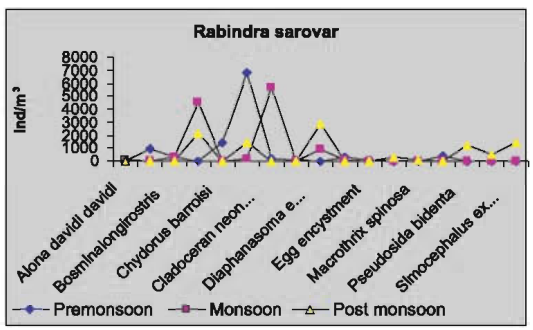

Fig. 13a. Abundance of Cladocera at Rabindra Sarovar during the study period (2008 – 2009)

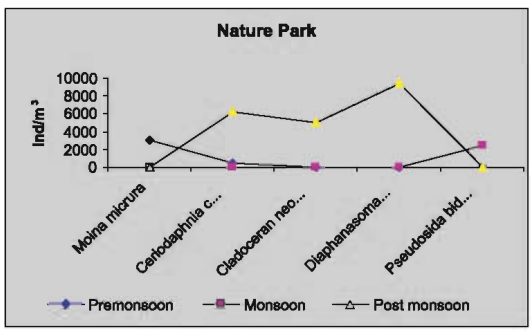

Fig. 13b. Abundance of Cladocera at Nature Park during the study period (2008 – 2009)

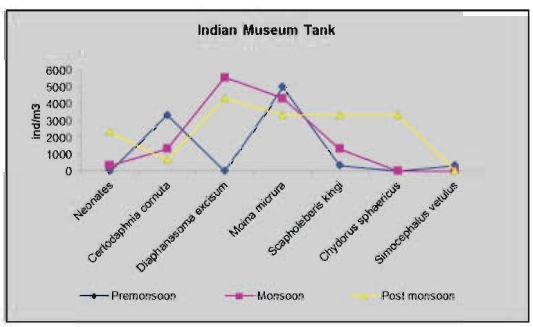

Fig. 13c. Abundance of Cladocera at Indian Museum tank during the study period (2008 – 2009)

PLATE-VIII

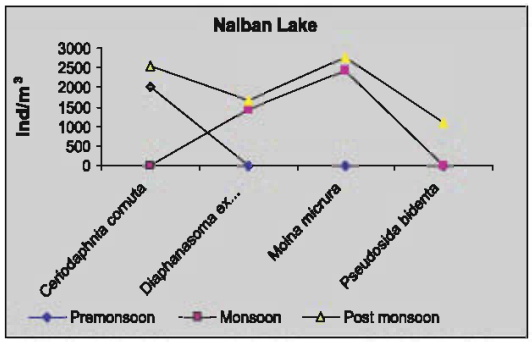

Fig. 13d. Abundance of Cladocera at Nalban Lake during the study period (2008 – 2009)

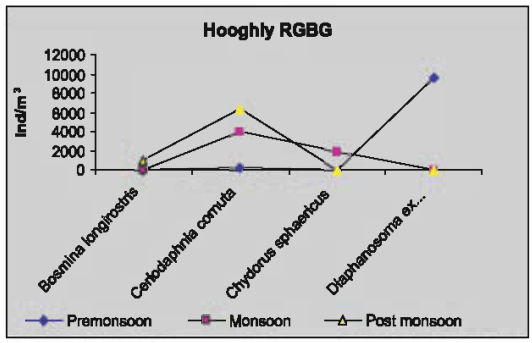

Fig. 13e. Abundance of Cladocera at Hooghly RGBG during the study period (2008 – 2009)

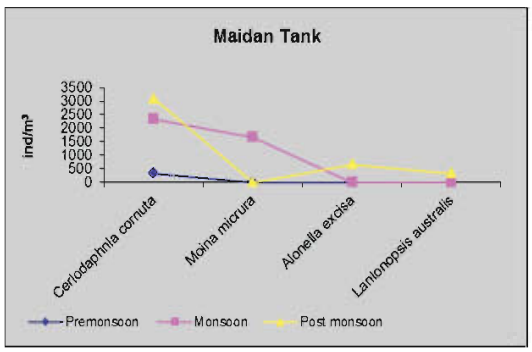

Fig. 13f. Abundance of Cladocera at Maidan tank during the study period (2009 – 2010)

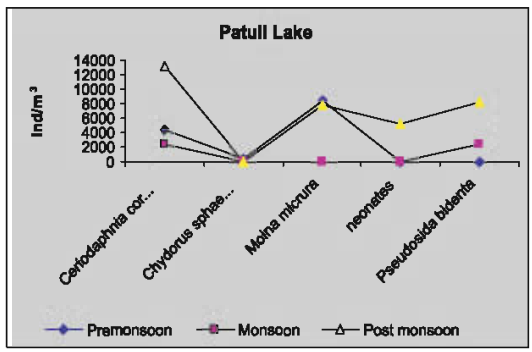

Fig. 13g. Abundance of Cladocera at Patuli lake during the study period (2009 – 2010)

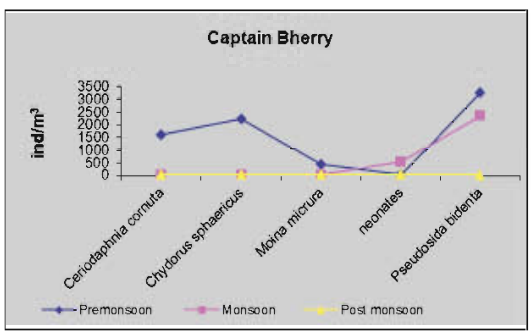

Fig. 13h. Abundance of Cladocera at Captain Bherry during the study period (2009 – 2010)

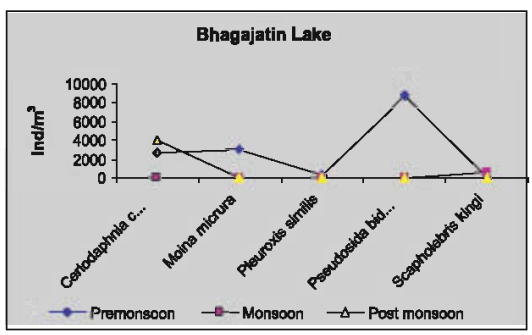

Fig. 13i. Abundance of Cladocera at Bhagajatin lake during the study period (2009 – 2010)

PLATE-IX

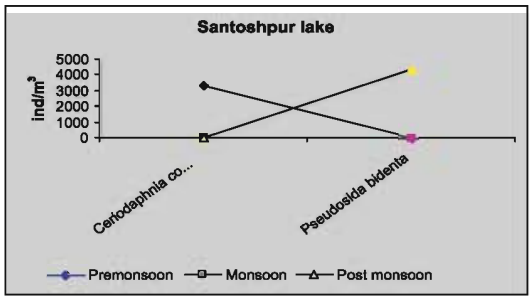

Fig. 13j. Abundance of Cladocera at Santoshpur lake during the study period (2009 – 2010)

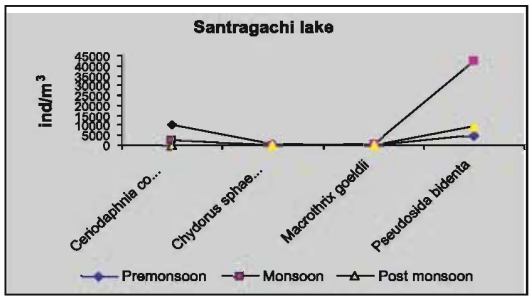

Fig. 13k. Abundance of Cladocera at Santragachi lake during the study period (2009 – 2010)

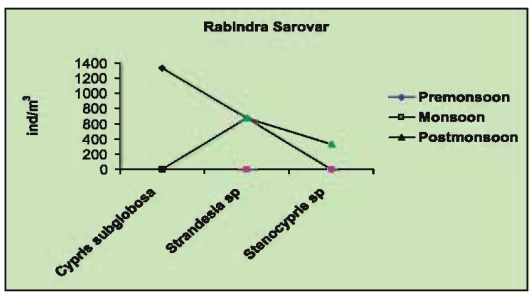

Fig.14a. Ostracoda abundance at Rabindra Sarovar during study period (2008 – 2009)

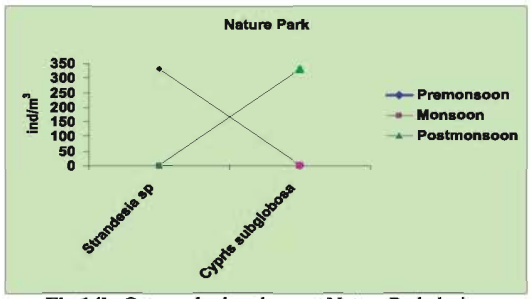

Fig.14b. Ostracoda abundance at Nature Park during study period (2008 – 2009)

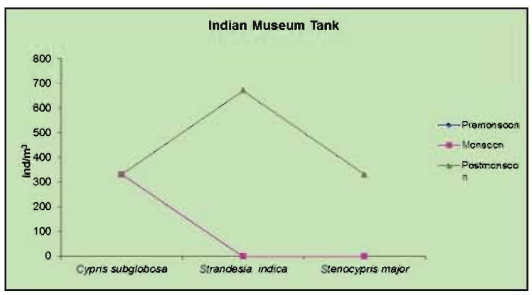

Fig. 14c. Ostracoda abundance at Indian Museum Tank during study period (2008 – 2009)

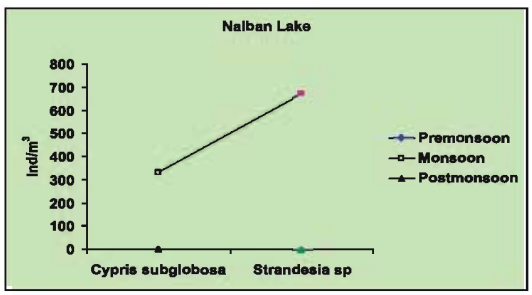

Fig.14d. Ostracoda abundance at Nalban lake during study period (2008 – 2009)

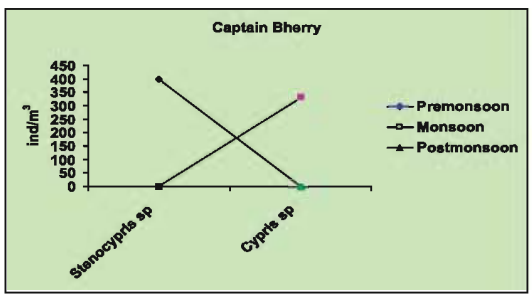

Fig. 14e. Ostracoda abundance at Captain Bherry during study period (2009 – 2010)

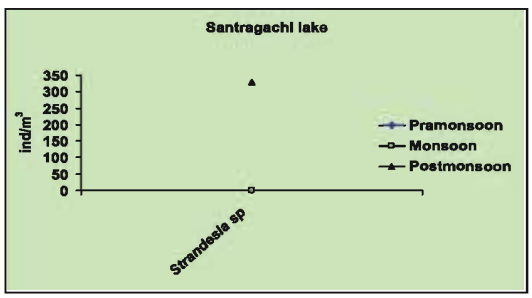

Fig. 14f. Ostracoda abundance at Santragachi lake during study period (2008 – 2009)

PLATE-X

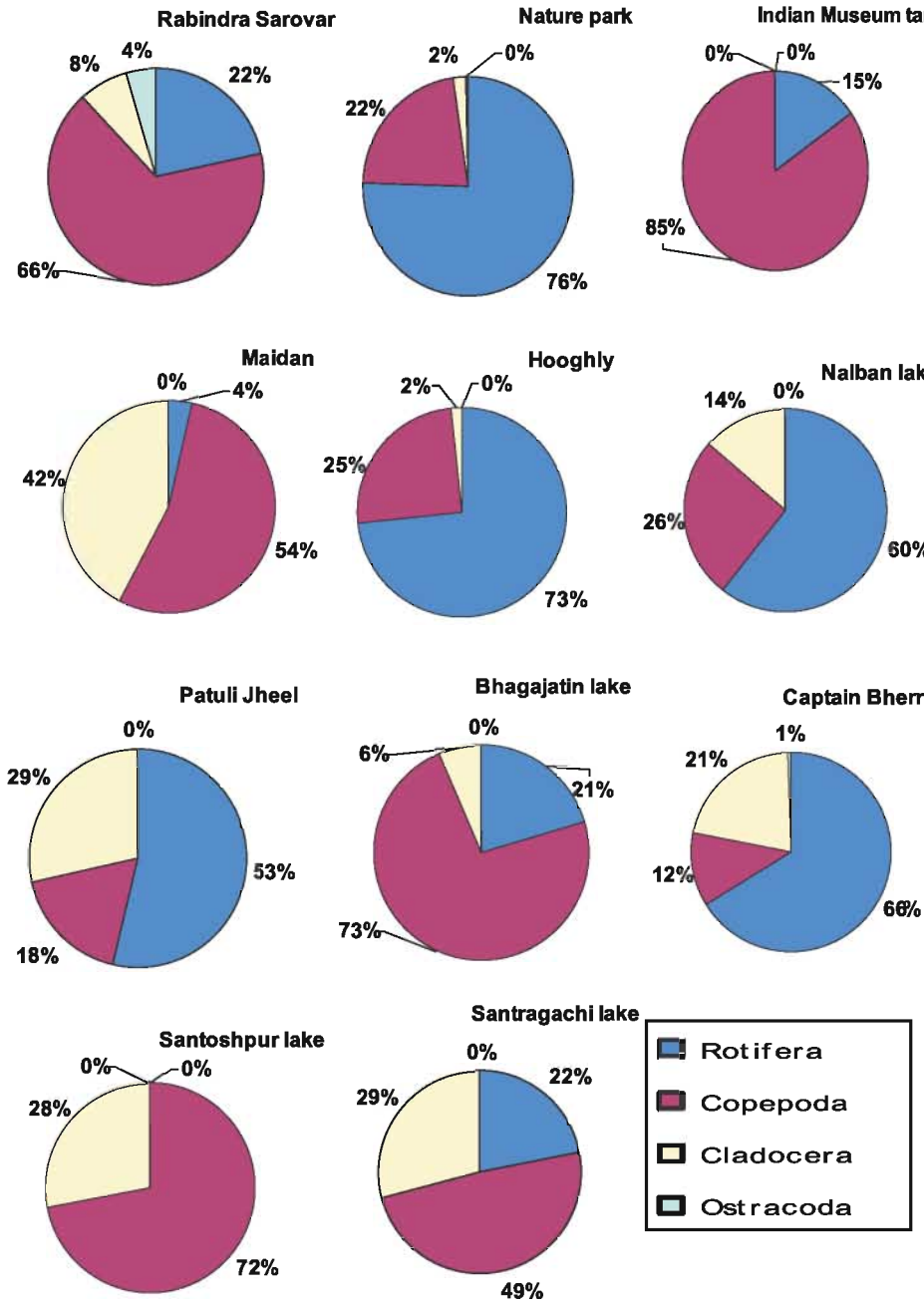

Fig. 15. Percentage composition of zooplankton (rotifera, copepoda, cladocera and ostracoda) during premonsoon season in 2008–2010

PLATE-XI

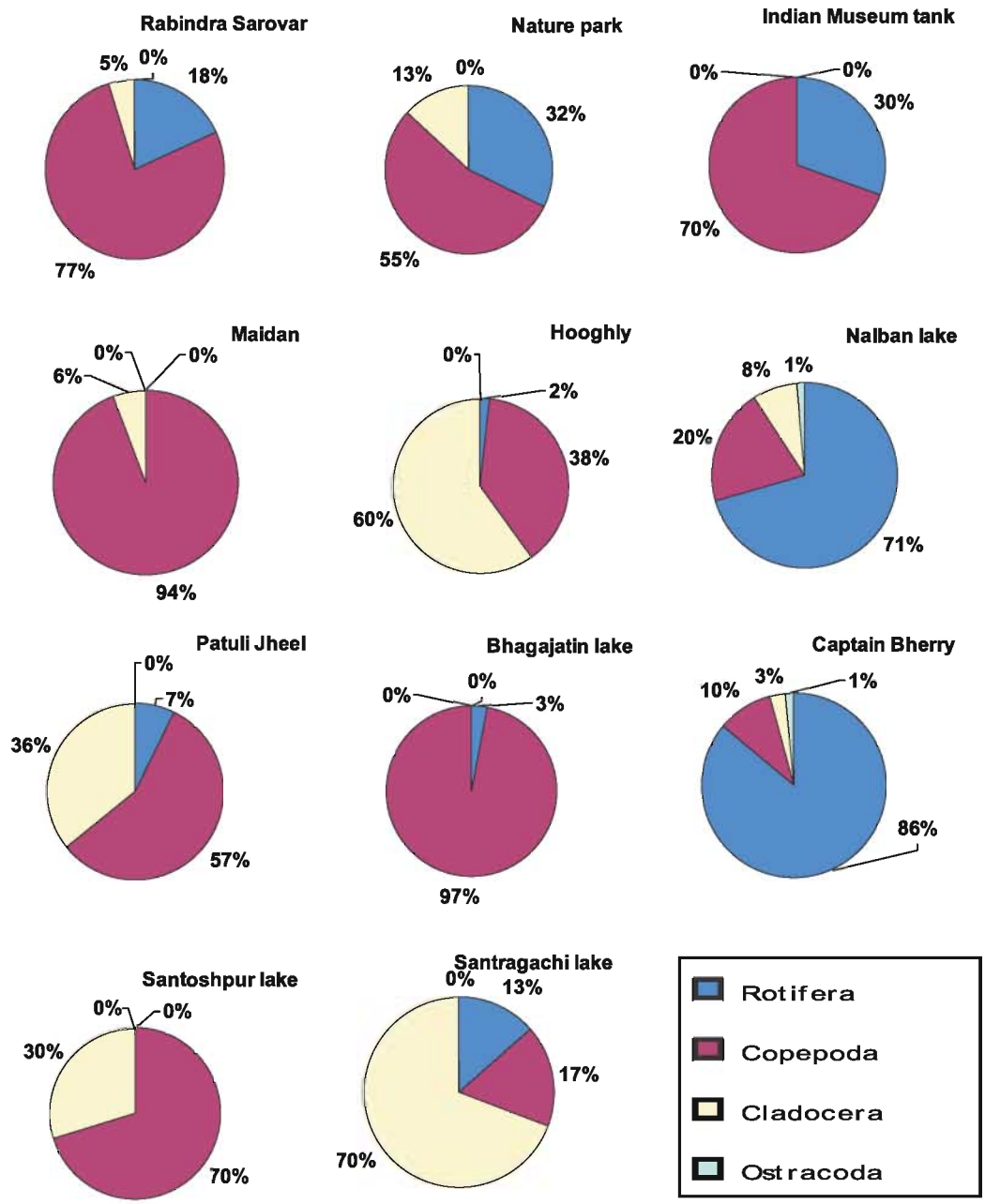

Fig. 16. Percentage composition of zooplankton (rotifera, copepoda, cladocera and ostracoda) during monsoon season in 2008–2010

PLATE-XII

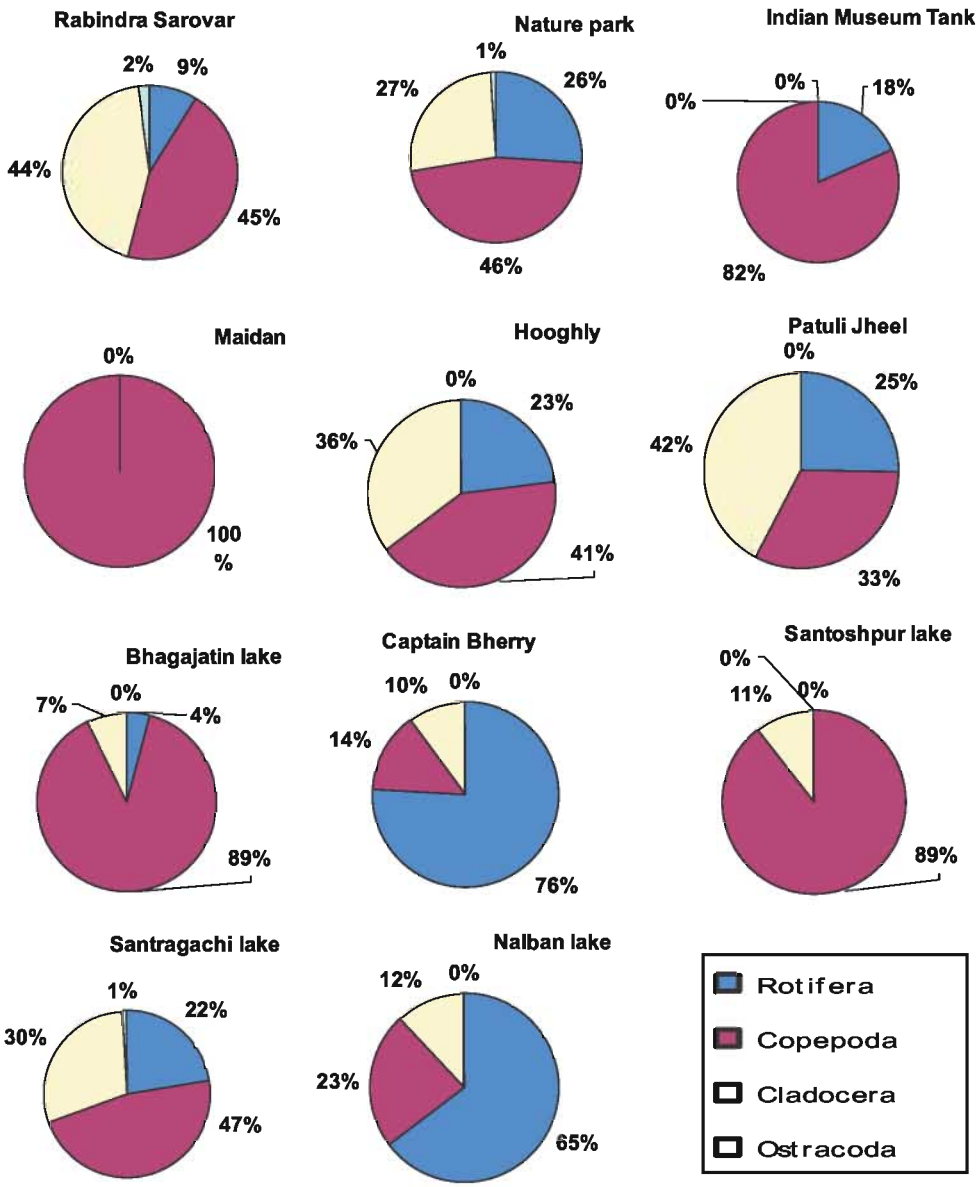

Fig. 17. Percentage composition of zooplankton (rotifera, copepoda, cladocera and ostracoda) during postmonsoon season in 2008–2010.