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Research Paper

A report on some planktonic Cladoceras (Crustacea: Branchiopoda) occurring in some freshwater bodies in adjacent areas of Hyderabad, Telangana State, India.

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Abstract: Zooplankton communities are typically diverse and occur in almost all type of aquatic habitat. They play a key role in the aquatic food web by providing crucial source of food to a number of aquatic animals especially for fishes and are highly sensitive to environmental changes. They act as primary consumers of aquatic ecosystem. Their growth and distribution are depending on various biotic and abiotic factors. The anthropogenic activities which leads to the reduction of water quality play a significant impact natural resource. The freshwater zooplankton mainly comprise of Protozoa, Rotifera, Cladocera, Copepoda and Ostracoda. Cladocera's which forms an important part of zooplankton group, acts an important role in aquatic food webs and are also used as environmental tools for toxicological studies and in bioassay studies. In the present study efforts have been made to ascertain the abundance of Cladocera in the 12 water bodies near to Hyderabad city, Telengana state, India. The present study reports a total of 24 Cladocera species belonging to 2 orders, 14 different genera under 5families from these water bodies. The family Chydoridae represents the most dominant family and the abundance of Cladocerans, particularly the members of Chydoridae indicates the eutrophic conditions of a water body, resulting from organic pollution. The results of this study indicated that potentiality of zooplankton as bioindicator is very high and also is an attempt to list out the Cladocerans from these water bodies.

Keywords: Zooplankton, Ecosystem, Anthropogenic, Habitat, Cladocera, Bioassay, Eutrophic, Bioindicator.

Introduction:

Water, is the most precious of all-natural resources and covers about three quarters of the surface of our planet. Freshwater ecosystems provide vital resources for humans and are the sole habitat for an extraordinarily rich, endemic, and sensitive biota, which constitute larger part of our biosphere (Palmeri et al., 2013). The

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zooplankton, the microscopic drifting or wandering animals plays a vital role in the aquatic tropic structure as well as a key role in the energy transfer.

Zooplankton are the best indicators of water quality in aquatic ecosystem (Litchman et al., 2013) as they can react to water quality change by making changes in their species composition, abundance and by morphological abnormalities (Telesh 2004). Zooplankton are one of the major primary consumers in most of the aquatic ecosystems. These indicators serve as inexpensive and efficient early warning and control system. Zooplankton serves as a valuable food source for the planktivorous fish and other organisms. Their presence or absence can determine some commercial fisheries success in both fresh and salt water bodies. The plankton diversity is associated with limnological properties of that water body and the climate change influences the entire composition and biodiversity (Prakash and Srivastava, 2019). Manickam et al., 2014 suggested that if the lower parts of the food chain are healthy, we can protect the higher ordered organisms, like fish, whales and even humans. The main fresh water zooplankton consists of the groups such as Rotifera, Cladocera, Copepoda and Ostracoda. Zooplankton production can be used to estimate the exploitable fish stock, while the population density of fish / eggs/ larvae will provide an index to define the breeding ground (Tiwari and Nair, 1991 & 1993). The present paper deals with the Cladocera's recorded from some freshwater bodies around Hyderabad city, Telangana state, India.

Cladocera which are commonly known as 'Water fleas' are an order of small crustaceans found in most fresh water habitats inhabiting pelagic, littoral, and benthic zones and rare in the ocean. Cladocera considered as the most important herbivore in lake plankton (Sommer et al., 2006). Generally, four cladoceran orders are recognised (Fryer, 1987) Anomopoda, Ctenopoda, Onychopoda, and the monotypic Haplopoda. Most species of the cladocera are filter feeders, they have significant role in the food web of stagnant waters. Cladoceran populations are dominated mostly by females and reproduction is by parthenogenesis. Because of their easy culturing, short generation time, and clonal reproduction Cladocerans (especially *Daphnia* species) are used as environmental tools for toxicology studies and are used in bioassay studies (Forro et al., 2008). As they play an integral role in fresh water ecosystems they are recognized as ecological indicators (Stemberger et.al., 2001; Jeppesen *et. al*., 2001).

Table: 1- Showing the co-ordinates and the other details of the freshwater bodies of Hyderabad which were subjected for the present study.

GLOBAL & INDIAN STATUS

No	Wold	India	Telangana
1	700	137	19

The global diversity of Cladocerans is nearly 700 species Kotov (2011). Forró et al. (2008) stated that about 620 species of Cladocerans are globally known, and they underestimated that the real number of species is 2–4 times higher and also established that from the Oriental zone alone 107 valid taxa of the Cladocera were recorded. Chatterjee et. al (2013) recorded 137 species (among them, six exclusively

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marine species) belonging to 4 Orders, 59 genera under 12 families from India. A total of 90 species of Cladocerans belonging to 37 genera under 8 families were reported from India (Michael and Sharma, 1988). Later, Chatterjee et. al, (2013) recorded 137 species (among them, six exclusively marine species) belonging to 4 Orders, 59 genera under 12 families from India. The Indian Cladoceran diversity comprises of 131 species belonging to 48 genera, 4 orders under 11 families and 4 subfamilies (Sharma & Sharma, 2017).

Material and Methods:

Qualitative sampling of zooplankton was done from 12 different localities near to Hyderabad, Telengana viz. Stations: 1. Kokapet lake 2. Attapur lake 3. Shameerpet lake 4. Pasumala Cheruvu 5. Gangaram lake 6. Alwal lake 7. Ameenpur lake 8. Kutloor Pedda 9. Fox Sagar 10. R.K. Puram Cheruvu 11. Turkamagal Masad Cheruvu 12. Udma Sagar with the aid of plankton net of mesh size 60µ by sweeping it through water and also filtering by 50 liters of water through the net. The co-ordinates of the sample collection localities were shown as Tab:1, Fig.1, Plate-1 shows some photographs of the lakes from where the samples were collected. The collected samples were preserved in 5% formalin- glycerol mixture. These were later sorted out and detailed taxonomic identification was done with the help of (80i Nikon) stereoscopic microscope having different magnifications and by referring standard literatures viz. Edmondson (1959), Michael & Sharma (1988), Needham & Needham (1962), Pennak, (1978), Smirnov (1971), Sharma & Sharma (2008), Chatterjee et. al, (2013). A total of 24 Cladocera species belonging to 2 orders, 14 different genera under 5families from the different freshwater bodies from Hyderabad, Telangana, India during the present study.

Table: 2. Systematic list of Cladoceran species recorded from the different freshwater bodies of Hyderabad, Telangana during the present study.

No.	Station name	Alt.	Lat.	Long.	St. No.	Lot no.	Date
1	Kokapet lake	562m	17°24'08"N	78°19'39"E	5	4	16-09-2022
2	Attapur lake	543m	17°21'34"N	78°25'27"E			16-09-2022
3	Shameerpet lake	574m	17°36'34"N	78°33'51"E	5	6	17-09-2022
4	Pasumala Cheruvu	493m	17°21'19"N	78°39'08"E			17-09-2022
5	Gangaram lake	561m	17°30'01"N	78°19'46"E	5	7	16-09-2022
6	Alwal lake	587m	17°30'28"N	78°30'42"E			17-09-2022
7	Ameenpur lake	575m	17°31'01"N	78°20'13"E			16-09-2022
8	Kutloor Pedda	507m	17°20'53"N	78°37'10"E	5	4	17-09-2022
9	Fox Sagar	581m	17°31'37"N	78°28'09"E	5	5	17-09-2022
10	Osmanasagar lake	250.4m	17°3693"N	78°36'63"E			17-09-2022
11	Turkamagal Masad Cheruvu	550m	17°17'21"N	78°34'48"E	1	5	16-09-2022
12	Udma Sagar	583m	17°17'29"N	78°27'21"E	5	3	16-09-2022

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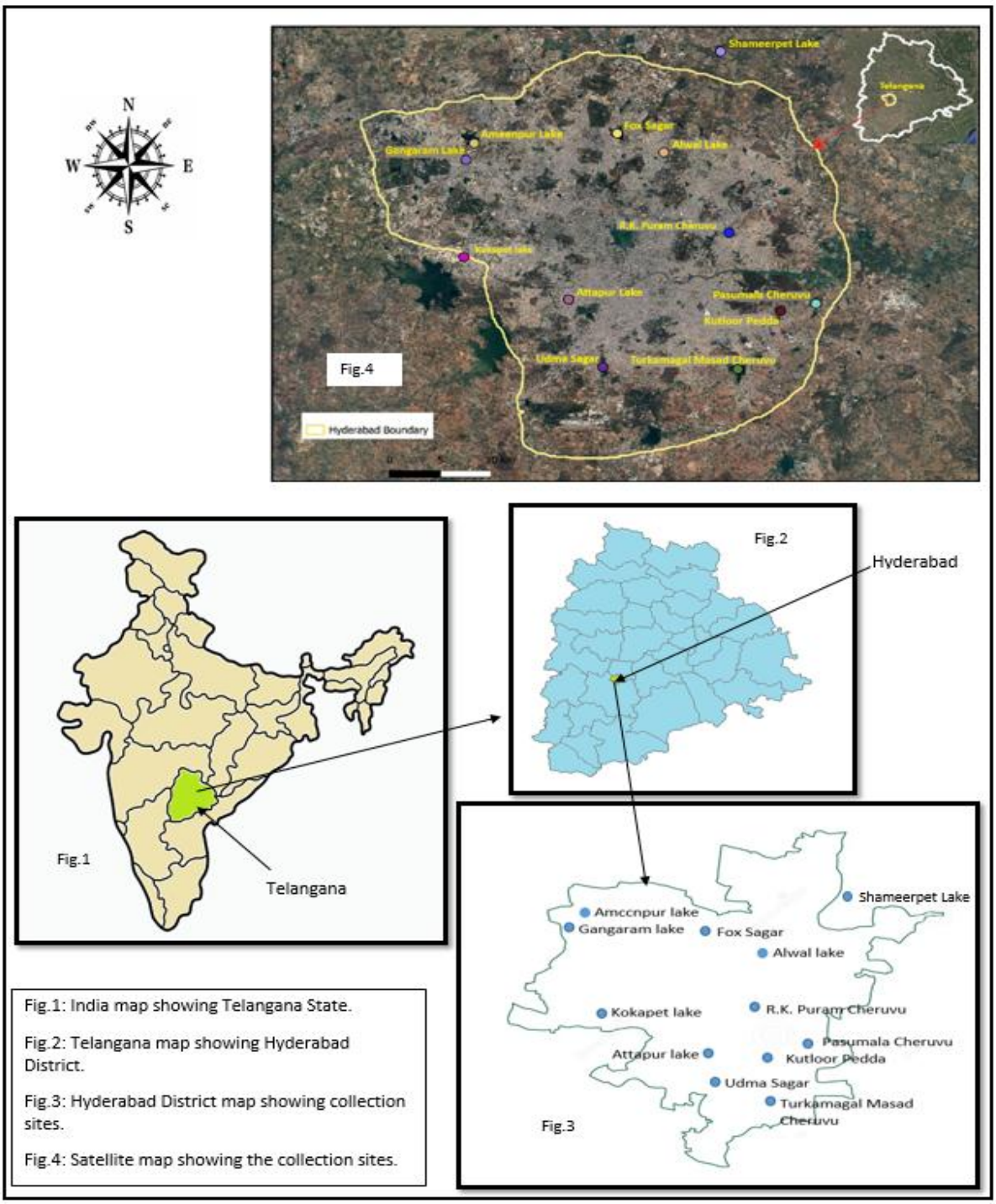

Fig.1: India map showing Telangana State.

Fig.2: Telangana map showing Hyderabad District.

Fig.3: Hyderabad District map showing collection sites.

Fig.4: Satellite map showing the collection sites.

Figure-1: Showing the location map of the different freshwater bodies subjected for the present study from Hyderabad, Telangana, India.

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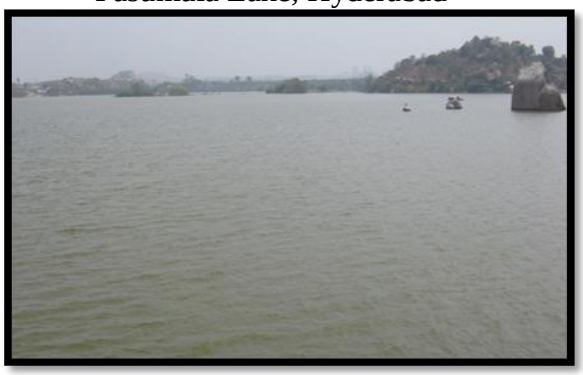
Some photographs of the zooplankton collection sites.
Plate-1


Fox Sagar Lake Hyderabad


Kuntloor Pedda Cheruvu, Hyderabad


Pasumula Lake, Hyderabad


Ameenpur Lake, Hyderabad


Umdasagar, Hyderabad


Attapur pond, Hyderabad


Sammerpet Lake, Hyderabad


Alwal lake, Hyderabad

Figure-1: Showing the location map of the different freshwater bodies subjected for the present study from Hyderabad, Telangana, India.

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Result and Discussion:

SYSTEMATIC LIST

Superclass CRUSTACEA Cuvier in. 1800

Class BRANCHIOPODA Latreille, 1817

Superorder CLADOCERA Latreille, 1829

Order CTENOPODA Sars, 1865

Family SIDIDAE Baird, 1850

Genus ***Diaphanosoma*** Fischer, 1850

1. *Diaphanosoma sarsi* Richard, 1894

2. *Diaphanosoma senegal* Gauthier, 1951

Order **ANOMOPODA**Sars, 1865

Family **DAPHNIIDAE** Straus, 1820

Genus ***Ceriodaphnia*** Dana, 1853

3. *Ceriodaphnia cornuta* Sars, 1885

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

4. *Daphnia (Ctenodaphnia) cephalata* King, 1853 s. lat.

Genus ***Scapholeberis*** Schoedler, 1858

5. *Scapholeberis kingi* Sars, 1901

Genus ***Simocephalus*** Schoedler, 1858

6. *Simocephalus (Simocephalus) vetulus* (O.F. Muller, 1776)

7. *Simocephalus (Echinocaudus) expinosus* (De Geer, 1778)

Family **MOINIDAE** Goulden, 1968

Genus ***Moina*** Baird, 1850

8. *Moina micrura* Kurz, 1874

Genus. ***Moinodaphnia*** Herrick, 1887

9. *Moinodaphnia macleayi* (King, 1853)

Family **MACRITHRICIDAE** Norman and Brady, 1867

Genus ***Macrothrix*** Baird, 1843

10. *Macrothrix laticornis* (Jurine, 1820) s. lat

11. *Macrothrix spinosa* King, 1853

12. *Macrothrix goeldi* Richard, 1897

13. *Macrothrix triserialis* Brady, 1886

Family **CHYDORIDAE** Dybowski & Grochowski, 1894

Subfamily **ALONINAE** Dybowski & Grochowski, 1894

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

14. *Alona globulosa* (Daday, 1898)

15. *Alona pulchella* King, 1853

16. *Alona quadrangularis* (O.F. Muller, 1776) s. lat

Genus ***Coronatella*** Dybowski & Grochowski, 1894

17. *Coronatella rectangula* Sars, 1862 s.lat

Genus ***Leberis*** Smirnov, 1989

18. *Leberis davidi* (Richard, 1895)

19. *Leberis punctatus* (Daday, 1898)

Genus ***Chydorus*** Leach, 1816

20. *Chydorus parvus* (Daday, 1898)

21. *Chydorus sphaericus* (O.F. Müller, 1776) s.lat.

22. *Chydorus barroisi* (Richard, 1894)

Genus ***Pleuroxus*** Baird, 1843

23. *Pleuroxus aduncus* (Jurine, 1820) s.lat.

Genus ***Leydigia*** Kurz, 1875

24. *Leydigia (Neoleydigia) australis ceylonica* (Daday, 1898)

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Table: 3- Showing the occurrence of Cladocera species in the zooplankton samples collected from different freshwater lakes in and around Hyderabad city.

Sl. No	Name of species	Stations										
		1	2	3	4	5	6	7	8	9	10	11	12
1.	*Diaphanosoma sarsi* Richard, 1894			*	*	*				*			
2.	*Diaphanosoma senegal* Gauthier, 1951			*									
3.	*Ceriodaphnia cornuta* Sars, 1885	*				*				*			*
4.	*Daphnia (Ctenodaphnia) carinata* King, 1853s.lat												
5.	*Scapholeberis kingi* Sars, 1901			*									
6.	*Simocephalus (Simocephalus) vetulus* (O.F. Muller, 1776)			*	*								
7.	*Simocephalus (Echinocaudus) expinosus* (De Geer, 1778)			*			*		*				
8.	*Moina micrura* Kurz, 1874			*									*
9.	*Moinodaphnia macleayi* (King, 1853)				*		*						
10.	*Macrothrix laticornis* (Jurine, 1820) s.lat											*	
11.	*Macrothrix spinosa* King, 1853				*				*			*	*
12.	*Macrothrix goeldi* Richard, 1897										*		
13.	*Macrothrix triserialis* Brady, 1886				*			*					
14.	*Alona globulosa* (Daday, 1898)			*									
15.	*Alona pulchella* King, 1853		*										
16.	*Alona quadrangularis* (O.F. Muller, 1776) s. lat			*									
17.	*Coronatella rectangula* Sars, 1862 s.lat												*
18.	*Leberis davidi* (Richard, 1895)											*	
19.	*Leberis punctatus* (Daday, 1898)											*	
20.	*Chydorus parvus* (Daday, 1898)			*									
21.	*Chydorus sphaericus* (O.F. Müller, 1776) s.lat.			*					*				*
22.	*Chydorus barroisi* (Richard, 1894)							*					
23.	*Pleuroxus aduncus* (Jurine, 1820) s.lat.			*							*		
24.	*Leydigia (Neoleydigia) australis ceylonica* (Daday, 1898)			*							*		

1. Kokapet lake 2. Attapur lake 3. Shameerpet lake 4. Pasumala Cheruvu 5. Gangaram lake 6. Alwal lake 7. Ameenpur lake 8. Kutloor Pedda 9. Fox Sagar 10. Osmanasagar lake11. Turkamagal Masad Cheruvu 12. Udma Sagar.

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Table: 4. Showing the genera wise % composition and species wise % composition of the families of Cladocera's recorded during the present study the different waterbodies from Hyderabad, Telangana.

No	Family	No of Genera	Genera wise % composition	No of Species	Species wise % composition
1	Sididae	1	7	2	8
2	Daphnidae	4	29	5	21
3	Moinidae	2	14	2	8
4	Macrothricidae	1	29	4	17
5	Chydoridae	6	43	11	46

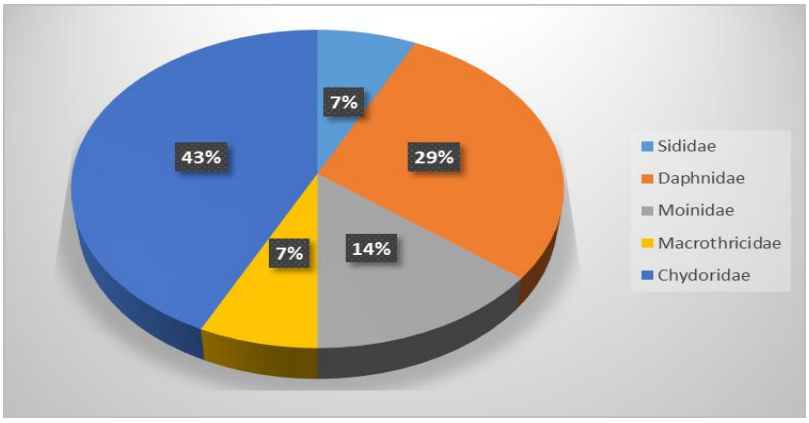

Figure-2: Chart showing the genera wise % composition of the Cladocera families recorded from the different waterbodies from Hyderabad, Telangana.

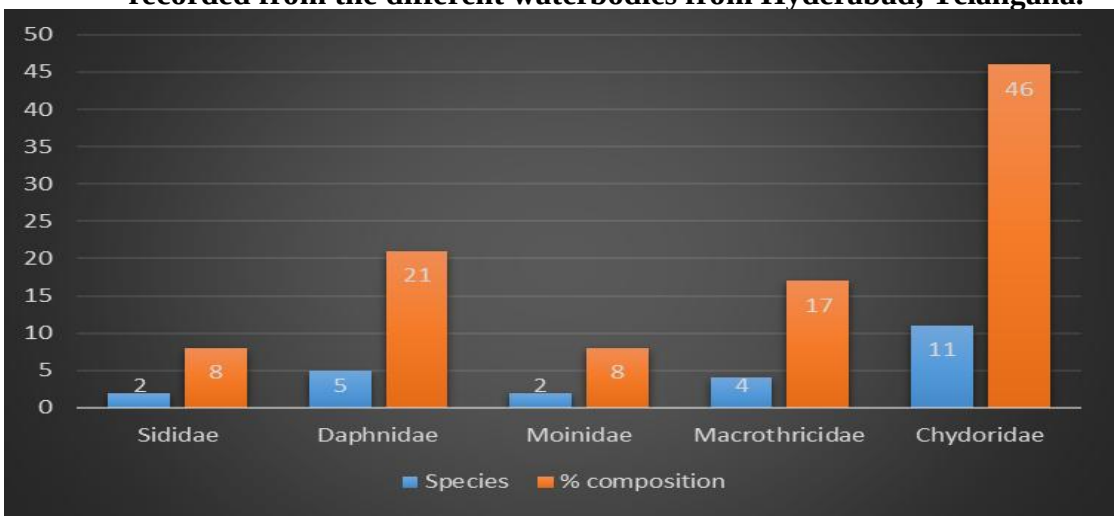

Figure-3: Chart showing the species wise % composition of the Cladocera families recorded from the different waterbodies from Hyderabad, Telangana during the present study.

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During the present study a total of 24 Cladocera species belonging to 2 orders, 14 different genera under 5families (Tabl. 2) are recorded from the different freshwater bodies from Hyderabad, Telangana state. The family Chydoridae represented the most dominant family with six genera and 11 species, followed by Daphnidae 4 genera, 5 species followed by Sididae, Moiniidae 2 species each and Macrothricidae 4 species. The most frequently observed Cladocerans were *Diaphanosoma sarsi, Ceriodaphnia cornuta, Macrothrix spinosa* which are reported from 4 sites (Tab-3). The species wise % composition of the Cladocera families recorded from the different waterbodies from Hyderabad during the present study are represented as Fig. 3. Wisniewski *et al*., 2002 stated that in the littoral zone the members of Chydoridae represent major part of zooplankton fauna. Cladocerans are usually associate with macrophytes, periphyton or sediment. Uttangi (2001) stated that Cladocerans prefer to live in clear waters. The abundance of the members of Chydoridae indicates the eutrophic conditions of a water body, resulting from organic pollution (Khan and Seshagiri Rao, 1981). According to Das (1989) *Chydorus sphaericus* and *Simocephalus* sp., are the chief representatives of Oligotrophic lakes and the presence of genera viz., *Daphnia, Moinadaphnia, Ceriodaphnia* and *Diaphanosoma* indicates eutrophic state. The monitoring of these indicators' species will help to identify the presence, extent, and source of contamination and enables to take targeted control measures. By studying the Cladoceran composition, most of these lakes can be classified as eutrophic. Increased anthropogenic activities, siltation, sewage contamination, and high nutrients problems due to the indiscriminate use of fertilizers in the agricultural catchment area are the major cause for the eutrophication. The study indicates that these water bodies have already reached the eutrophication stage. Most of the above water bodies attract variety of birds and considered as stopover sites for migratory birds. The climate change as well as limnological parameters are associated with plankton diversity of a fresh water body.

Conclusion:

Authors strongly recommend the competent authorities and policy makers to make the effective strategies for the conservation and management of such type of biologically important fresh water bodies. Remedial measures have to be taken to prevent further degradation of these fresh water ponds. monitoring of biological indicators provides valuable data on pollutant levels, trends, and potential sources of pollution.

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