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Planktonic Rotifers Occurring in the Adjacent Areas of Hyderabad

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Abstract.- Zooplankton samples from 20 different localities in the adjacent areas of Hyderabad were collected during May 8 to July 16, 2003. These water bodies included Indus River and its canals, temporary water body near Rajputana Hospital, small ponds in the Kotri SITE area and near railway crossing at Jamshoro town, rain fed water bodies near Thermal Power House and experimental water tank of the Department of Fresh Water Biology and Fisheries. A total of 36 rotifer species were identified. The salinity and trophic status showed a clear effect on the distribution of different rotifer species. These species included *Brachionus plicatilis*, *B. quadridentatus*, *B. unreolaris* and *B. dimidiatus f. inermis* commonly occurring in brackish water, while *Keratella quadrata* and *Keratella cochlearis* were common in freshwater (Indus River and its canals). Among the above studied rotifers 25 species are new records from Pakistan.

Keywords: Rotifera, salinity, trophic status, Hyderabad, Pakistan.

INTRODUCTION

In Pakistan, information on rotifer fauna is scanty. Only few researchers have worked on the rotifers of Pakistan. Akhtar and Ali (1976) worked on the rotifers of streams and ponds of Rawalpindi area. Mahar *et al.* (2000) has given detailed information on the freshwater rotifers of Manchar lake. Recently, Baloch (2000) has reported the plankton community of the Indus River.

Rotifera is considered to be most diverse group of zooplankton. They increase and decrease abruptly depending upon availability of food and other favourable climatic conditions (Allan, 1976). They play important role in aquatic ecosystem. They transfer energy from producers to the higher consumers like invertebrates, crustaceans, and small fish. Some rotifer species are also considered as indicators of the lake type. The salt tolerance of different species differ, some species are stenohaline however others are considered to be euryhaline. In the present study rotifers occurring at different salinity range and trophic status were studied. Previously, Mahar *et al.* (2000) worked on the taxonomy of the lakustrine rotifera. In the present work the rotifer samples were collected from different types of water bodies ranging the salinity from freshwater (0.3 ppt) to the hyper-saline water (>35 ppt).

Present work aims to document the distribution of rotifer species occurring at different salinity and trophic status in different water bodies near Hyderabad city.

MATERIALS AND METHODS

Zooplankton samples were collected from 20 different spots from May 8 to July 16, 2003 (Table I). Most of them were temporary ponds which ranged in between few inches to half meter in depth and few meters to 1.5 km in size. The water temperature and dissolved oxygen were measured using portable digital oxygen meter (Oxi 3I5i/SET, WTW). Where as electric conductivity and salinity were recorded using a portable digital conductivity meter (Cond 315i/SET, WTW) in the field. Zooplankton samples were collected using plankton net having a mesh size of 55 μm . All samples were preserved in 5% formaldehyde on the spot and were brought to the laboratory for identification. Samples were observed under Stereo Microscope (Swift, M3300-D) and rotifers were identified to the species level (in some cases genera, forma or variety) using the keys and illustrations given by Ward and Whipple (1959), Mizuno (1964), Mizuno and Takahashi (1991) and Battish (1992).

RESULTS

A total of 36 rotifer species were identified belonging to different genera (Table II). *Brachionus*

Table I.- List of different sampling stations and their water quality.

No.	Type and location of sampling station	Temp. (°C)	Electric conductivity	D.O. (mg/l)	Salinity (ppt)	Sampling time and date
1.	Temporary pond, near bypass	29	112.6 m S/cm	8.7	>35	09:50 am, 8-5-03
2.	Temporary pond, near K.B. Feeder	29.4	113.5 m S/cm	9.9	>35	10:20 am, 8-5-03
3.	K.B. Feeder, near bypass	27.5	528 µ S/cm	5.6	0.3	10:35 am, 8-5-03
4.	Indus River, near bypass bridge	27.2	450 µ S/cm	6.9	0.3	10:50 am, 8-5-03
5.	Temporary pond, near highland Cotton Mill	29.3	445 µ S/cm	5.0	0.3	10:00 am, 24-5-03
6.	Highland Cotton Mill waste water pond	30	3.8 m S/cm	5.3	0.3	10:25 am, 24-5-03
7.	Roadside pond in Kotri Industrial area	29	929 µ S/cm	2.2	0.3	10:40 am, 24-5-03
8.	Saline pond, near Kotri pumping station	35.6	207 m S/cm	1.8	>35	11:15 am, 24-5-03
9.	Indus River, near Kotri Barrage	32	335 µ S/cm	4.3	0.3	12:05 pm, 6-6-03
10.	Pinyari Branch, near Indus River	31.5	222 µ S/cm	4.6	0.3	12:35 pm, 6-6-03
11.	Phulaily Branch, near Indus River	31.5	222 µ S/cm	4.5	0.3	01:15 pm, 6-6-03
12.	Temporary pond, near Rajputana Hospital	34.8	23.6 m S/cm	12.3	14.5	12:40 pm, 6-6-03
13.	Temporary pond, near T.P.H. filter plant	32.4	3.96 m S/cm	5.0	2.5	11:30 am, 10-7-03
14.	Temporary pond I, near Thermal Power House	33.4	3.8 m S/cm	1.5	2.0	12:05 pm, 10-7-03
15.	Temporary pond II, near Thermal Power House	35	6.4 m S/cm	0.4	3.7	12:25 pm, 10-7-03
16.	Temporary pond III, near Thermal Power House	34.6	29.9 m S/cm	5.2	18.8	1:10 pm, 10-7-03
17.	Temporary pond IV, near Thermal Power House	34.7	4.77 m S/cm	4.6	2.5	1:30 pm, 10-7-03
18.	Open water stretch I, near Jamshoro town	33.2	6.1 m S/cm	8.4	3.4	1:50 pm, 10-7-03
19.	Open water stretch II, near Jamshoro town	34	6.3 m S/cm	8.0	3.5	2:10 pm, 10-7-03
20.	Experimental tank of F.W. Biol. & Fish. Deptt.	32	552 µ S/cm	8.0	0.3	11:35 am, 16-7-03

was most diverse genera constituting nine species. *Keratella*, *Lecane*, *Mytilina* and *Notholca* were having three species each, while *Platylas Euchlanis* and *Testudinella*, contributed two species each. The other genera *Monostyla*, *Pompholyx*, *Polyarthra*, *Hexarthra*, *Diurella*, *Squantinella* and *Asplanchna*, contributed one species each.

Genus *Brachionus* was found in all types of water bodies having a higher status of eutrophication. *B. rubens*, *B. dimidiatus f. inermis* had high tolerance to salinity. These were frequently found at the stations having higher trophic status and higher salinity. *B. plicatilis*, *B. quadridentatus f. anchylognathus* were found in fresh and saline water (0.3-3.4 ppt). *Brachionus urceolaris*, *B. angularis var. chelois*, *B. angularis angularis* and *B. quadridentatus brevispinus* were restricted at one station having a salinity of 3.4 ppt (Table I). *Brachionus falcatus* appeared only in fresh water. *Polyarthra trigla* occurred in River Indus as well as small ponds having eutrophic status and a salinity of 3.4 ppt. Another species, *Hexarthra mira*, a eutrophic species, was caught in a pond having higher trophic status. Three species of *Notholca*, only occurred in eutrophic pond of the department of Freshwater Biology and Fisheries, but did not

appear in any other water body.

All the species of *Keratella* occurred in River Indus and its canals only but did not appear in eutrophic ponds or at higher salinity. The other species *Monostyla bulla*, *Asplanchna priodonta*, *Pompholyx complanta*, *Lecane elasma*, *L. tenuiseta*, *L. luna*, *Platylas quardicornis var. brevispinus*, *P. patulis* and *Euchlanis* sp. also appeared in freshwater habitats only. However, species like, *Testudinella patina*, *Keratella tropica tropica* and *Squadinella mutica* occurred in freshwater ponds having higher trophic status.

Most of *Brachionus* species occurred at comparatively higher trophic status as well as at higher salinity. Species like *Filinia longiseta*, *Mytilina bicarniata*, *Mytilina* sp. *Euchlanis triquetra*, *Testudinella elliptica*, *Hexarthra mira* occurred at higher salinities.

DISCUSSION

Rotifers are considered to respond more quickly to environmental changes than crustacean zooplankton. They appear to be more sensitive indicators of changes in water quality (Gannon and Stemberger, 1978). Most of the species belonging to

Table II.- Rotifer species showing their occurrence at different range of electric conductivity and salinity.

Name of species	Conductivity range	Salinity range	Occurrence at stations
<i>Asplanchna priodonta</i>	552 μ S/cm	0.3	20
<i>Brachionus falcatus</i>	552 μ S/cm	0.3	20
<i>Diurella</i> sp.	445 μ S/cm	0.3	5
<i>Euchlanis</i> sp.	445 μ S/cm	0.3	5
<i>Keratella cochlearis</i>	450 – 528 μ S/cm	0.3	3, 4
<i>Keratella quadrata</i>	528 μ S/cm	0.3	3
<i>Keratella tropica tropica</i>	3.8 m S/cm	0.3	6
<i>Lecane elasma</i> *	450 μ S/cm	0.3	4
<i>Lecane luna</i>	445 μ S/cm – 3.8 m S/cm	0.3	5, 6
<i>Lecane tenuiseta</i> *	445-450 μ S/cm	0.3	5
<i>Monostyla bulla</i>	445 μ S/cm	0.3	4, 6
<i>Monostyla lunaris</i> *	445 μ S/cm – 3.8 m S/cm	0.3	5, 6
<i>Mytilina ventralis</i> *	552 μ S/cm	0.3	20
<i>Notholca</i> sp. 1*	552 μ S/cm	0.3	20
<i>Notholca</i> sp. 2*	552 μ S/cm	0.3	20
<i>Notholca</i> sp. 3*	445-939 μ S/cm	0.3	5, 7
<i>Platylas patulis</i> *	445 μ S/cm	0.3	5, 20
<i>Platylas quadricornis</i> var. <i>brevispinus</i> *	450 μ S/cm	0.3	4
<i>Pompholyx complanta</i> *	3.8 m S/cm	0.3	6
<i>Squatinella mutica</i> *	3.8 m S/cm	0.3	6
<i>Testudinella patina</i> *	3.8 m S/cm	0.6	6
<i>Filinia longiseta</i>	450 μ S/cm – 3.86 m S/cm	0.3-2.0	3, 4, 14, 20
<i>Brachionus plicatilis</i>	445 μ S/cm – 29.9 m S/cm	0.3-18.8	5, 14, 15, 16, 18
<i>Brachionus quadridentatus</i> var. <i>anchylognathus</i> *	445 μ S/cm – 6.4 m S/cm	0.3-3.4	5, 15, 18
<i>Polyarthra trigla</i> *	450 μ S/cm – 6.1 mS/cm	0.3-3.4	4, 6
<i>Brachionus angularis angularis</i> *	6.1 mS/cm	3.4	18
<i>Brachionus angularis</i> var. <i>chelois</i> *	6.1 mS/cm	3.4	18
<i>Brachionus quadridentatus brevispinus</i> *	6.1 mS/cm	3.4	20
<i>Brachionus urceolaris</i> *	6.1 mS/cm	3.4	18
<i>Hexarthra mira</i> *	6.1 mS/cm	3.4	18
<i>Testudinella elliptica</i> *	6.1 mS/cm	3.4	18
<i>Brachionus dimidiatus</i> f. <i>inermis</i> *	6.1-23.6 mS/cm	3.4-14.5	12, 18
<i>Brachionus rubens</i> *	6.1-23.6 mS/cm	3.4-14.5	12, 18
<i>Euchlanis triquetra</i> *	23.6 mS/cm	14.5	12
<i>Mytilina</i> sp.	23.6 mS/cm	14.5	12
<i>Mytilina bicarniata</i> *	23.6 mS/cm	14.5	12

*Newly recorded species.

Brachionus, *Keratella* and *lecania* are typical cosmopolitan (Mangestou *et al.*, 1991). *Brachionus*, a cosmopolitan genera, is considered to be abundant in eutrophic environments. Species like *Brachionus quadridentatus* var. *anchylognathus* and *B. rubens* were found in a salinity range of 0.3-3.4 ppt, whereas *B. plicatilis*, *B. dimidiatus* f. *inermis*, *B. quadridentatus brevispinus*, *B. urceolaris* and *B. angularis* var. *chelois* appeared at higher salinity (3.4-14.5 ppt). It suggests that these species have high tolerance to saline waters. *Brachionus plicatilis* is considered to be brackish or estuarine species (Mallin *et al.*, 1995). This species also appeared in

hyper saline water body at higher salinity (19.8 ppt) (Baloch *et al.*, 2004).

Conductivity is closely linked with the productivity of waters. High conductivity is associated with fertile water bodies and low conductivity indicators low fertility (Ali, 1993). All the *Brachionus* species occurred, showed their preference to those water bodies having higher conductivity (Table II). This is in accordance with several researchers considering *Brachionus* to inhabit in eutrophic water bodies (Pejler, 1957; Radwan, 1976; Hakkari, 1978; Gannon and Stemmerger, 1978; Maemets, 1983). Among

Brachionus, *B. falcatus* only appeared at low salinity (cemented pond) and did not appear at higher salinity. This indicates that these species are restricted to freshwater only.

Species like *Filinia longiseta*, *Mytilina ventralis*, *Mytilina* sp., *M. bicarniata*, *Euchlanis triquetra*, *Testidunella elliptica* and *Hexarthra mira* are considered as indicator species of eutrophication (Maemetes, 1983; Miura and Cai, 1990). *Filinia longiseta* is also considered to be a eutrophic species by many researchers (Pejler, 1965; Hakkari, 1972; Gannon and Stemberger, 1978; Maemetes, 1983; Baloch *et al.*, 2000). This species appeared in meso-eutrophic waters (Table II).

Keratella species occurred in freshwater of River Indus and its canals (Phulaili, K.B. Feeder and Pinyari), but did not appear in eutrophic ponds or at higher salinity. *Keratella* is considered as typical species of river systems (Beach, 1960; Baloch, 2000). It is also considered as dominant rotifer of warm lakes (Fernando, 1980) or may occur abundantly over whole range of temperatures (May, 1983). The other species like *Monostyla bulla*, *Phompholyx complanta*, *Lecane elasma*, *L. tenuiseta*, *L. luna*, *Asplanchna priodonta*, *Platytias quadricornis* var. *brevispinus*, *P. patulis*, *Euchlanis* sp. and *Diurella* sp. only appeared in freshwater bodies occurring at low trophic status.

From the present study it can be concluded that, most of *Brachionus* species occurred at higher trophic status as well as higher salinity. *Keratella* species are restricted to riverine system occurring at lower salinity.

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