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Research Article

Taxonomic study of rotifers in relation to abiotic parameters from Kagzipura lake around Chhatrapati Sambhajinagar

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ABSTRACT

Environmental parameters like temperature, pH, dissolved oxygen, TDS were measured during collection of rotifers from Kagzipura Lake in Khultabad, ChhatrapatiSambhajinagar district, Maharashtra. The samples were collected from month of January 21 to December 21. The population density was also measured in these months. It was observed that minimum density of the rotifer recorded in the month of February and October, while the maximum density was recorded in the month of April and May. There are abundance of rotifers were recorded The seasonal fluctuation in population density of rotifer is related to the physico-chemical factors and due to the organic pollution in the lake water by adding detergents to the water due to washing clothes in the lake water. In Kagzipura Lake various physico-chemical parameters determined that the fluctuation in water temperature, pH, dissolved oxygen (DO) and nutrients like nitrate were within the desirable limits. The contamination of water bodies might lead to a change in water that it is unsuitable for fish farming. Several physico-chemical or biological factors could acts as a barrier and adverse effect on the fish growth and reproduction. For that the regulation monitoring of physico-chemical and biological water quality parameters is essential to determine status of water body.

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1. Introduction

In India agriculture is totally based on south-west monsoon and its consequent effects have made compulsion in utilization of the country's surface and ground water resources in the form of large number tanks, small resources besides the large multipurpose dams, wells, and diversion canals, to raise the gross irrigated areas. We constructed large multipurpose reservoir, the small irrigation reservoir, constructed on small intermittent water resources for serving to capture the surface run-off for its abstraction during seasonal irrigation demands. These projects have provide and revealed that an immense potential for fish husbandry, irrigation, drinking purpose.

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It is also possible through extensive techniques of aquaculture, and they would contribute significantly in the production of inland fisheries. It is managed with right scientific approaches. Good quality water is essential for living organisms. The quality of water can be known by studying its physico-chemical characteristics as well as zooplankton and hydrophytes growing in it. Because of vast population and negligence of human being the quality of water is deteriorated. The limnology plays an important role in decision making process for problems like lake construction, pollution control, fish and aquaculture practices. A change in the water quality affects the biotic community of the aquatic ecosystem which ultimately reduces the primary productivity. The aim of the present study was to assess the quality of water by studying its physico-chemical characteristics and rotifer diversity. Studies on physico-chemical characteristics and biological characteristics ao dam water in Maharashtra are known through Pawar and Pulle (2005), Gore and Pingale (2007), Magar (2008).

2. Materials and methods

Kagzipura region situated between the latitude 21.15^0 N and 21.45^0N and Longitudes 76.57^0E and 77.33^0E is one of the natural freshwater lake in ChhatraptiSambhajinagar district. It is situated in the mountain region, the Daultabad hills of ChhatrapatiSambhajinagartahsils of Maharashtra state. These parts of Khultabad hills are known as Kagzipura and consist of succession of hills and valley showing many variations in aspect, gradient and altitudes.For the study of various abiotic and biotic parameters, water samples were collected from the selected two lakes viz., Mandwa Lake on every month in between 7 to 8 am. Regularly for a period of 12 months from January 2021 to December 2021. The water samples were collected, about 5 meters away from the shore and one-meter depth from the surface by using sieve net no. 40. One liter of water was collected in a wide mouth polythene bottle and tightly stoppered for subsequent Physico-chemical analysis. The care was taken to avoid air bubbling during the sampling and also during transporting of water samples from Kemmerer sampler to PVC Container. Another bottle of same capacity was similarly filled with surface water for biological analysis. Dissolved oxygen was estimated at the site. Plankton net (mesh size 65 µm) was used to filter 50 liters of surface water to obtain the net plankton concentration. All the samples were packed in a cane basket protecting them from intense sunlight and contamination was transported to the laboratory without any delay.

3. Result and discussion

The result of abiotic parameters with their mean and SE are given in Table 1 while the Rotifer diversity is given in Table 2.In the present study lake having maximum water temperature (32.3 ^oC) in the month of June and minimum (18.7 ^oC) in the month of December.The mean and SE (24.7 ± 1.34). Transparency value was higher in May (47) and lower (28) in November. The mean and SE (35.7 ± 1.77).pH value was higher (8.24) in April and lowest (6.79) in September. The mean and SE (7.4 ± 0.13). Turbidity was higher (49) in January and lower (23) in October. The mean and SE (40.1 ± 3.5). Total dissolved solids was higher(168) in November and lower (112) in October. The mean and SE (151 ± 5.51). Dissolved oxygen was higher (8.60) in December and lower (7.10) September. The mean and SE (7.65 ± 0.15). Free CO_2 found higher (4.90) in July and lower (0.60) in December. The mean and SE (2.55 ± 0.41). Total alkalinity was higher (261) in July and lower (21) in February. The mean and SE (83.3.± 19.8). Total hardness found higher (273) in November and lower (72) in August. The mean and SE (193 ± 16.8).The mean and SE (49.43 ± 5.29 & 36.75 ± 4.37).Chloride was found higher (72.3) in February and lower (24.6) in August Nitrate having higher (1.90) in june and lower (1.00) in November, mean and SE (1.39 ± 0.09). the maximum value of silicates (1.70) in the month of September while minimum (0.80) in November, mean and SE (1.30 ± 0.09).

Table 1. Monthly variation and Mean ± SE abiotic parameters of water from mandwa lake during jan – 2021 to dec – 2021.

Parameter / Month	WT	Tra	pH	Tur	TDS	DO	CO_2	TA	TH	Chl	Nit	Sil
Jan -21	19.6	32.0	7.10	49	162	7.30	0.90	65	165	68.10	1.20	0.90
Feb -21	21.2	33.0	7.25	48	164	7.10	1.30	21	270	72.30	1.40	1.10

Mar -21	23.6	41.0	7.53	46	165	7.30	2.10	29	245	58.10	1.60	1.50
Apr -21	28.7	45.0	8.24	41	152	7.60	2.60	129	176	38.00	1.80	1.70
May -21	31.1	47.0	7.62	37	160	7.50	3.40	131	182	35.00	1.70	1.50
Jun -21	32.3	41.0	7.34	34	158	8.20	4.60	123	156	37.00	1.90	1.60
Jul -21	29.2	31.0	6.82	33	163	8.00	4.90	261	189	51.00	1.00	1.10
Aug -21	26.1	32.0	7.23	27	145	8.60	2.80	25	72	24.60	1.10	1.30
Sep-21	24.6	33.0	6.79	25	114	7.10	3.20	36	175	26.80	1.30	1.70
Oct -21	22.2	35.0	7.25	23	112	7.20	3.50	48	165	43.70	1.60	1.50
Nov -21	20.1	28.0	8.10	65	168	7.40	0.80	67	273	61.20	1.00	0.90
Dec -21	18.7	31.0	7.86	51	158	8.60	0.60	65	256	64.20	1.10	0.80
Mean	24.7	35.7	7.42	40.1	151	7.65	2.55	83.3	193	48.33	1.39	1.30
SE	1.34	1.77	0.13	3.58	5.51	0.15	0.41	19.8	16.8	4.72	0.09	0.09

Table 2. Variation in the abundance of rotifers

Sr. No.	Name of Rotifers	Abundance
1	*Anuraeropsisfissa*	+
2	*Brachionusangularis*	++
3	*Brachionusbidentata*	+
4	*Brachionuscaudatus*	+
5	*Brachionusdiversicornis*	+
6	*Brachionusdurgae*	+
7	*Brachionusforficula f. typicusurawensis*	+
8	*Brachionusquadridentatus*	+
9	*Brachionuspatulus*	+
10	*Keratellacochlearis*	+
11	*Keratellavalga*	+
12	*Lepadella patella**	++
13	*Monostylaclosterocera**	++
14	*Polyarthra vulgaris*	++

(+) Denotes 1000 org. /l, (*) Denotes Pollution Indicator Species.

Taxonomic Study of Rotifers

1. *Anuraeropsisfissa* Gosse,(1851)

Lorica with two plates, dorsal and ventral with lateral sulci. Dorsal plate arched and ventral plate flat. Cuadal extremity of the lorica truncated. Small in size.

Distribution : Cosmopolitan

2. *Brachionusangularis* Gosse, (1851)

Lorica stippled, with two very small projections in occipital margin. Posterior spines absent.Small in size.

Distribution : Cosmopolitan.

3. *Brachionusbidentata*,Anderson (1889)

Lorica with dorsal, ventral and basal plates. Six occipital spines present, of which the laterals and medians are of same length. Lightly stippled. Forms with single lateral posterior spine were also present.

Distribution : America, Europe, Africa, China, Japan and India.

4. *Brachionuscaudatus*, Barrios &Dadday (1894)

Lorica with foue occipital spines, the lateral slightly longer than the medians.Posterior spines long.

Distribution : Cosmopolitan.

5. *Brachionusdiversicornis*, Daday (1883)

Lorica elongate with four occipital spines, of ehich the laterals longer than medians. Right posterior spine longer than the left. Foot long and toes with characteristic claws.

Distribution : Cosmopolitan

6. *Brachionusdurgae*, Dhanapathi (1974)

Lorica smooth, nearly round, with dorsal and ventral plates. Anterior dorsal margin with six saw-tooth like spines of nearly equal length. Anterior dorsal margin with 'V' shaped sinus, ventral margin with projecions having truncated edges. Foot opening situated below the centre of the ventral plate, pear shaped and flanked by small anchor shaped projections. Foot sheath developed.

Distribution : India, Japan, Africa, S. America (Tropicopolitan).

7. *Brachionusforficula*Ftypicus-urawensis, Sudzuki (1955)

Lorica with four occipital spines. Posterior spines stippled and bowed inwards with characteristic knee-like swellings at the inner side. This differs from *B. forficula*varkeralaensisNayar& Nair 1969 by the presence of knee-like swellings for the posterior spines.

Distribution : India, Japan

8. *Brachionusquadridentatus*, Hermann (1783)

Lorica broader than long, with six occipital spines of which the median are long and curved outward. Two posterior spines present. Highly variable.

Distribution : Cosmopolitan

9. *Brachionuspatulus* ,Muller (1786)

Occipital margin with six spines of which medians slightly longer than the outer.Ventral margin with four spines. Posterior lateral spines are longer than the median.

Distribution : Cosmopolitan

10. *Keratellacochlearis*,Gosse (1851)

Lorica with a strong median spine.Dorsum with characteristic median longitudinal line, with symmetrically arranged plaques on either side.

Distribution : Cosmopolitan.

11. *Keratellavulga*, Ehrenberg (1934)

Lorikabroder at posterior margin. The posterior spines, one is long and another is short, divergent and unequal. Median occipital spines are little and longer than other.

Distribution : Cosmopolitan.

12. *Lepadella patella*, Muller (1773)

Resembles L. ovalis but differes from it by convex dorsal plate and anterior and posterior margins of lorica.

Distribution : America, Canada, India.

13. *LecaneMonostylaclosterocera*, Schmarda (1898)

Lorica sub-circular. Anterior dorsal and ventral margins coincedental making a broad 'V' shaped sinus. Posterior segment broad, semicircular and extends a little beyond the dorsal plate. Toe is slender, long and tapering into point.

Distribution : Cosmopolitan.

14. *Polyarthra vulgaris*, Carlin(1943).

Body illoricate and little squarish. Four groups of major lateral paddles inserted dorsally and ventrally in the neck region. Each group with three paddles of equal length extending beyond the posterior end of the body.Accessory pair of ventral paddles present between ventral bundles.Vitellarium with 4-6 nuclei.Trophi modified virgate type.

Distribution: India (Tropical)

During study period, rotifers were represented by 19 species of8 genera, among rotifers; *Brachionusangularis&durgae*dominated the lakes Pollution indicator rotifers like *Monostyla, Lepadella,* and *Brachionusfalcatus*were found. Paras Lake represented highest number of pollution indicator species. Among pollution indicator species*Lepadella*was abundant at both lakes. The lakes represented the highest number of the species of the genus *Brachionus*Ten species of this genus were recorded duringthe period of investigations. Similarly the genus *Keratella*with two species and remaining 7genera were represented by one species each. The rotifers invariably constitute a dominant component of freshwater zooplankton and contribute significantly to their dynamics and production. These organisms are regarded as valuable bioindicator to depict the trophic status of water quality.

Brachionus have a wide range of occurrence and are found from potable water to diluted sewage tanks. In much polluted water they occur in small number but abundant in moderately polluted waters. He recorded *B. calyciflorus, B. caudatus and B. quadridentatus* from heavily polluted Jummalake. A number of studies have evaluated *Brachionus* species as indicator of eutrophication Chandrashekhar and Kodarkar (1995) described six species of *Brachionus* from saroornagar lake Hydrabad and reported that B. calyciflorus was most dominated followed *by B. caudatus* in term of seasonal occurrence and uniform occurrence of *B. forficula , B. durgae, B. bidentata and B. angularis*in monthly collections due to change in water quality associated with nutrient concentration in summer. Somani and Pejawar (2003) in lakeMasunda Thane reported the dominance of this tolerant genera as an indication of onset of eutrofication in the system.In the present observation *Lepadella patella, Monostyla* was dominant species followed by *B. falcatus, B. caudatus* . The occurrence of these species indicates the water of this lake is polluted. However further detail studies on seasonal variation in diversity and biomass would be helpful in evalution their bioindicator role in eutrophication.

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