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# Individual and Synchronized Correlation between water and Rotifer from Dynaneshwar Dam, Ahmednagar, Maharashtra

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## ABSTRACT

The study was attempts correlation analyses in rotifers, water and rotifer-water from Dynaneshwar dam water during 2008-09. A total of twenty one species of rotifer were observed representing two orders as Ploimida and Gnesiotricha. The correlation results in rotifer revealed 53.8% positive relation and 46.2% negative in which eighteen pairs were high related [ $r > 0.60$ ]. Water parameter correlations were revealed 44.7% positive and 55.3% negative unions in which 5 pairs were high related. The relation between water parameters v/s rotifer species was noticed 45% positive & 55% negative unions in which twelve pairs were high positive and three were negative.

**Key words:** Synchronized correlation, rotifer, water parameters, Dynaneshwar dam.

## INTRODUCTION

Rotifers are economically and ecologically important group, they occupy a wide range of habitats existing in aquatic ecosystem [2,4,8]. They comprising integral link in aquatic food-webs, and contributing significantly to secondary productivity. These organisms have been studied in Indian freshwater habitats by various workers but yet there is limited information [14,15,16]. Recently it has shown that diversity & abundance of rotifer are sensitive to change in water variables [12,15,10]. In addition the influences of biotic on abiotic parameters are correlated in order to understand ecological relationship.

Several workers have studied diversity, density, variations, seasonality, correlation, indices, etc. in the rotifer community. But biotic and abiotic correlations are lacking. Correlation can provide a better insight for understanding adaptation & tolerance of organisms in aquatic ecosystem. However, the present study was assigned to evaluate individual and synchronize correlation of water, rotifer species and both from the Dynaneshwar dam water.

## MATERIALS AND METHODS

**Study area:** Dynaneshwar dam was a study area, a 26 TMC man made located at Rahuri, Ahmednagar District MS [19<sup>0</sup>20' -35' N latitude and 74<sup>0</sup>25' -36' E longitude]. It was built across the Mula River in 1971 and capacity being 840847 m<sup>3</sup>. It experiences an average rain fall 58 cm. The bottom is composed of detritus-mud layer in the littoral zone. The basin is semi-agricultural and semi-arid with cultivated top soil bank.

**Collection & identification:** The rotifers were collected from ten selected sites bimonthly early in the morning [7 to 9 am] during 2008-09. The samples were collected by filtering 50 liter of water through planktonic net (75 $\mu$ ) and concentrated in 5% formalin. The specimens were sorted and identified with the help of standard literature [5]. The enumeration of rotifer was done by drop method and analysis was carried out using Sedgwick-Rafter counting cell.

**Physico-chemical analysis:** The pH and temperature of water samples were recorded on the spot. The analysis of filtered water samples was carried out for the parameters, as Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Hardness (TH), Calcium (Ca), Magnesium (Mg), Sodium (Na), Potassium (K), Chloride (Cl), Total Alkalinity (TA), Sulphates (SO<sub>4</sub>), Phosphate (PO<sub>4</sub>), Nitrate (NO<sub>3</sub>), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). The samples were done according to standard methods [3].

**Statistical analysis:** The correlation analysis was performed using Window<sup>TM</sup>/Excel/2007. The correlation of rotifer [Table 1], water [Table 2] and rotifer-water [Table 3] were presented.

## RESULTS AND DISCUSSION

The correlation is a relationship between two variables which can provide a better insight for understanding of adaptation and tolerance of organisms. In the study individual and synchronic correlation of water, rotifer and both were noticed. A total of twenty one individuals representing two orders as Ploimida and Gnesiotricha collected from sampling sites. Of these Ploimida was representing fourteen species from nine families & Gnesiotricha represent seven species belonging to four families.

The correlation noticed in between rotifer were 53.8% positive unions and 46.2% negative in which eighteen pairs were high related and three pairs were high negative. The pairs in between *B. calyciflorus* with *T. longiseta*, *C. dossuarius* and *M. quadricornifera* revealed  $r=0.70$ ,  $0.83$  and  $0.61$  correlations respectively. The relation between species of *K. tropica* with *S. spinosa* and *K. tropica* with *T. patina* were  $r=0.60$  and  $0.61$  respectively. The species *L. pyriformis* revealed correlation with *P. dicipiens* [ $r=0.70$ ], *L. flosculosa* [ $=0.71$ ], *S. spinosa* [ $r=0.74$ ] and *M. quadricornifera* [ $=0.60$ ]. The rotifer pair *L. verecunda* with *R. rotatoria* revealed  $r=0.60$  correlations. The species *P. dicipiens* revealed  $r=0.65$  correlation with *L. flosculosa* and  $r=0.68$  with *S. spinosa*. The genus *S. longicaudatum* showed negative relation with *L. ceratophylli* as  $r=-0.62$ . *T. longiseta* noticed positive correlation with *C. dossuarius* and *M. quadricornifera* as  $r=0.63$  and  $r=0.93$  respectively, also *A. brightwell* with *R. rotatoria* was noticed  $r=0.82$ . The correlation coefficient 'r' for various physico-chemical parameters of water is given in Table 2. Water parameter correlations were revealed 44.7% positive and 55.3% negative unions in which five pairs was high related [ $r=0.6$ ]. Table 2 revealed that the high positive correlation was observed in between the pairs of pH-PO<sub>4</sub>, EC-SO<sub>4</sub>, TH-DO, and TH-BOD and high negative between the pairs of pH-PO<sub>4</sub> and TH-BOD. It showed that pH bears negative relation with PO<sub>4</sub> [ $r=-0.66$ ]. It indicates that the resulting pH of the water sample depends upon phosphate and TH on BOD. The analysis is very useful in the rapid study of water quality.

Regarding the correlation of water parameters more contribution was paid [19]. They reported highly positive correlation between EC-TDS, EC-Cl, EC-Mg TH-Mg TDS-Cl TDS-MG and Cl-Mg from Coimbatore. A high correlated parameters between EC-TDS, TDS-HCO, Mg-Cl and HCO-RSC from Sonai, Ahmednagar district [6] and also noticed high correlation between the parameters TA-TH, Cl-SO<sub>4</sub> and Mg-Cl from Pravara area Ahmednagar district Maharashtra [7]. Shah [13] reported thirty five unions [64%] positive and twenty unions [36%] negative related from the fifteen rail stations in between Ahmedabad to Khedbrahma route. Patel [11] noticed positive correlation between forty two unions and rest was negative related from water of Surat district. So, it reveals that the correlation studies of the water quality parameters have a great significance in the study of water sources. The relation between water parameters varies water to water, season, location, time, agriculture, soil and rock conditions. In between water-rotifer synchronic correlation was noticed 52.4% and 47.8% positive and negative unions in which twelve pairs were positive and three pairs were negative relations. The species *B. calyciflorus* represented positive relationship in between calcium, chloride and sulphates as  $r=0.71$ ,  $0.65$  and  $0.67$  respectively. A species *L. pyriformis* noticed positive correlation with total dissolve solids & phosphates such as  $r=0.78$  and  $0.60$  respectively while negative correlation with pH and chromium as  $r=-0.61$  and  $r=-0.63$  respectively. A rotifer species *L. verecunda* reported negative [ $r=-0.63$ ] with total dissolved solids. A species *T. deciapiens* depicted positive relation with electric conductivity & total alkalinity as  $r=0.66$  and  $0.76$  respectively. The unions of *G. hyptopus* with total dissolve solids, *L. flosculosa* with calcium, *S. spinosa* with total dissolved solids, *C. dossuarius* with calcium and *R. rotatoria* with cadmium noticed  $r=0.62$ ,  $0.74$ ,  $0.61$ ,  $0.74$  and  $0.66$  respectively.

Table 1. Correlation between rotifer species

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	1.0	0.26	0.13	-0.21	0.05	0.49	-0.03	-0.53	-0.06	0.35	-0.19	0.13	-0.23	0.17	-0.03	0.17	0.46	-0.14	-0.40	-0.27	0.13
2		1.0	0.21	0.12	-0.35	-0.07	-0.03	0.31	-0.18	-0.47	-0.07	0.21	0.44	-0.37	0.10	0.32	0.09	0.42	-0.31	0.31	0.26
3			1.0	0.25	-0.55	0.14	-0.16	0.33	-0.031	0.25	-0.34	0.70	-0.34	-0.11	0.32	0.59	0.10	0.83	0.31	-0.32	0.61
4				1.0	-0.49	-0.39	0.40	-0.26	-0.12	0.39	0.57	-0.03	0.15	0.10	0.06	0.01	-0.62	0.55	0.61	0.52	-0.11
5					1.0	-0.09	-0.09	-0.41	-0.26	-0.14	-0.29	-0.52	0.22	-0.24	0.13	-0.50	0.27	-0.49	-0.26	0.13	-0.57
6						1.0	-0.34	0.70	0.33	-0.16	-0.08	0.47	-0.07	0.57	-0.15	0.71	0.74	-0.10	-0.26	-0.48	0.60
7							1.0	-0.38	-0.19	0.41	0.30	-0.31	0.39	-0.35	-0.48	-0.14	-0.51	0.01	0.34	0.60	-0.27
8								1.0	0.31	0.26	-0.21	0.46	-0.01	0.21	0.11	0.65	0.68	0.04	-0.40	-0.36	0.48
9									1.0	-0.11	0.51	0.16	-0.16	0.56	-0.45	0.20	0.02	-0.36	-0.17	-0.35	0.18
10										1.0	0.37	-0.15	-0.44	0.12	-0.38	-0.15	-0.27	0.13	0.42	-0.03	-0.12
11											1.0	-0.27	0.01	0.55	-0.62	-0.13	-0.43	-0.14	0.26	0.24	0.16
12												1.0	-0.32	0.18	0.13	0.78	0.13	0.63	-0.11	-0.57	0.93
13													1.0	-0.41	0.14	0.11	0.09	-0.01	0.02	0.82	-0.35
14														1.0	-0.29	0.19	0.10	-0.22	0.07	-0.44	0.31
15															1.0	0.03	0.17	0.37	0.07	0.09	-0.09
16																1.0	0.44	0.53	0.02	-0.24	0.79
17																	1.0	-0.19	-0.39	-0.30	0.20
18																		1.0	0.34	0.07	0.49
19																			1.0	0.28	-0.15
20																				1.0	-0.61
21																					1.0

Rotifer species are represented by their code number (1-21).

*E. clavulata* (1), *B. angularis* (2) *B. calyciflorus* (3), *K. tropica* (4), *C. bicuspidata* (5), *L. pyriformis* (6), *L. verecunda* (7), *P. diciptiens* (8), *C. mucronata* (9), *T. diciptiens* (10), *S. longicaudatum* (11), *T. longiseta* (12), *A. brightwell* (13), *G. hyptopus* (14), *L. ceratophylli* (15), *L. flosculosa* (16), *S. spinosa* (17), *C. dossuarius* (18), *T. patina* (19), *R. ratoria* (20), *M. quadricornifera* (21).

Table 2. Correlation between water characteristics

	pH	EC	TDS	TH	Ca	Mg	Na	K	Cl	TA	SO <sub>4</sub>	PO <sub>4</sub>	NO <sub>3</sub>	DO	BOD	COD
pH	1.0	0.13	-0.57	0.31	0.06	-0.24	0.15	-0.03	0.07	-0.13	-0.14	-0.66	0.40	0.21	0.17	-0.23
EC		1.0	-0.08	0.13	0.19	-0.34	-0.31	-0.09	-0.04	0.28	0.62	-0.03	0.13	0.04	-0.09	-0.30
TDS			1.0	-0.35	0.26	0.31	-0.06	0.11	0.22	-0.16	0.21	0.46	-0.22	-0.25	-0.23	0.48
TH				1.0	-0.14	-0.09	-0.41	0.19	-0.11	0.29	-0.46	0.55	-0.33	0.73	-0.65	-0.06
Ca					1.0	0.001	-0.42	0.32	0.40	-0.17	0.50	0.09	-0.37	0.03	-0.36	0.06
Mg						1.0	-0.08	0.02	-0.12	-0.02	-0.37	-0.18	-0.13	0.13	-0.46	0.11
Na							1.0	-0.28	-0.19	-0.28	-0.55	0.07	0.23	0.25	-0.05	0.46
K								1.0	-0.03	0.46	-0.01	-0.01	-0.40	0.25	-0.54	0.52
Cl									1.0	-0.29	0.43	-0.38	0.02	0.34	0.17	0.14
TA										1.0	-0.25	-0.03	0.13	0.05	-0.25	-0.01
SO <sub>4</sub>											1.0	0.16	-0.25	-0.18	0.22	-0.30
PO <sub>4</sub>												1.0	-0.47	-0.56	-0.04	0.11
NO <sub>3</sub>													1.0	-0.10	0.45	-0.14
DO														1.0	-0.55	0.44
BOD															1.0	-0.55
COD																1.0

Table 3. Synchronic correlation between water-rotifer species

	pH	EC	TDS	TH	Ca	Mg	Na	K	Cl	TA	SO <sub>4</sub>	PO <sub>4</sub>	NO <sub>3</sub>	DO	BOD	COD
1	0.08	0.52	0.32	-0.01	0.22	-0.38	-0.14	0.26	0.08	0.09	0.38	0.04	0.27	-0.7	-0.07	0.31
2	0.32	-0.018	0.05	-0.13	0.50	0.15	0.38	-0.31	0.20	-0.50	-0.06	0.01	0.02	-0.01	-0.11	0.02
3	-0.09	0.45	0.24	0.05	0.71	0.08	-0.55	-0.04	0.65	-0.06	0.67	-0.15	-0.24	0.23	-0.21	-0.18
4	0.17	-0.20	-0.13	-0.34	0.34	0.17	-0.16	0.60	0.25	0.53	-0.33	-0.29	-0.18	0.44	-0.47	0.23
5	0.01	0.01	-0.12	-0.11	-0.55	0.02	0.18	-0.23	-0.75	-0.06	-0.28	0.23	-0.01	-0.26	0.06	-0.22
6	-0.61	0.10	0.78	-0.33	0.30	-0.03	-0.02	0.20	0.10	-0.28	0.45	0.61	-0.36	-0.18	-0.22	0.53
7	0.41	0.20	-0.63	0.02	0.23	-0.38	-0.19	0.51	-0.34	0.44	-0.04	-0.05	-0.11	0.01	-0.13	-0.17
8	-0.17	0.10	0.54	-0.14	0.42	-0.35	0.20	-0.04	0.56	-0.48	0.46	0.24	0.05	0.02	0.06	0.47
9	-0.58	-0.21	0.19	-0.11	-0.37	-0.16	0.38	-0.05	0.03	0.20	-0.18	0.36	0.19	-0.06	0.16	0.41
10	0.14	0.66	-0.12	-0.03	0.02	-0.27	-0.40	0.42	0.01	0.76	0.24	-0.16	0.03	0.15	-0.16	-0.09
11	-0.11	-0.21	0.001	-0.44	-0.22	0.07	0.33	0.51	-0.14	0.61	-0.51	0.07	-0.04	0.23	-0.33	0.51
12	-0.51	0.20	0.48	0.10	0.59	0.31	-0.42	-0.08	0.39	-0.09	0.47	0.15	-0.08	-0.06	-0.21	0.04
13	0.15	-0.46	-0.17	-0.40	0.24	-0.21	0.29	0.14	-0.32	-0.26	-0.31	0.41	-0.35	-0.20	-0.09	0.07
14	-0.57	-0.21	0.62	-0.33	-0.17	0.31	0.07	0.46	0.15	0.22	-0.12	0.14	-0.17	0.18	-0.32	0.73
15	0.05	-0.33	0.16	0.11	0.18	0.18	-0.23	-0.24	0.39	-0.40	0.02	-0.21	-0.03	0.02	0.14	-0.18
16	-0.55	0.11	0.60	-0.28	0.74	-0.02	-0.26	0.11	0.36	-0.21	0.56	0.56	-0.46	-0.17	-0.24	0.23
17	-0.28	0.17	0.61	-0.30	0.13	-0.26	0.20	-0.25	0.08	-0.58	0.46	0.55	-0.25	-0.23	0.06	0.23
18	-0.07	0.16	0.17	-0.10	0.74	0.32	-0.49	-0.04	0.39	0.11	0.27	-0.07	-0.26	0.12	-0.37	-0.20
19	-0.09	-0.08	-0.25	-0.16	0.15	-0.03	-0.47	0.47	0.25	0.35	0.11	-0.10	-0.62	0.32	-0.17	-0.12
20	0.47	-0.37	-0.42	-0.32	0.32	0.15	-0.19	0.18	0.32	-0.28	0.10	-0.46	0.03	-0.20	-0.01	-0.12
21	-0.47	0.21	0.57	0.10	0.58	0.33	-0.36	-0.01	0.36	-0.17	0.54	0.20	-0.16	-0.12	-0.20	0.11

Rotifer species are represented by their code number (1-21).

Sharma [16] reported Lacanida family was negatively correlated with magnesium and beside this family was correlated positively with specific conductivity, transparency, alkalinity, hardness, chloride, nitrate and dissolved organic matter. An earlier [9,17] were noticed correlation in Asplanchnidae and Brachionidae family which gave negative correlation with water temperature and positive with transparency, specific conductivity, alkalinity, total hardness, and chloride, also cumulative effects of ten abiotic factors.

To sum up, the individual and synchronic correlation from the aforesaid result, it could be made out that the availability of species, water parameters and food sources for rotifer in reservoir is important for the occurrence, abundance, tolerance and adaptations. Water chemistry is the important for the influences and distribution for specimens. The proper and regular study would further useful for the maintenance of population. The result is useful for the conservation of the organisms and water habitats.

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