International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 11, Issue 2, pp: 19-26, 2026
https://doi.org/10.55126/ijzab.2026.v11.i02.003 **http://www.ijzab.com**

Research Article

SEASONAL CHANGES IN ZOOPLANKTON DIVERSITY AND SPECIES RICHNESS IN KOT DAM OF JHUNJHUNU DISTRICT, RAJASTHAN

***Vipul Dev Beniwal, Rinku Kumari and Sushma Jain**

Department of Zoology, Vidya Bhawan Rural Institute (Mohanlal Sukhadia University), Udaipur, Rajasthan, India- 313001

Article History: Received 29th December 2025; Accepted 7th February 2026; Published 1st March 2026

ABSTRACT

Study was conducted at three sampling sites of Kot Dam located in Jhunjhunu district, Shekhawati region of Rajasthan from April 2021 to March 2023 to assess seasonal variation in species richness and diversity of zooplankton. During study, 58 zooplankton species were observed at all three sampling stations in Kot Dam. Of the 58 zooplankton species, the maximum number of species belonged to the Cladocera (21 species) followed by rotifers (15 species), protozoans and copepods, with eight species each. Minimum number of species was observed in the ostracod group (six species). At sampling station I, highest number of species (58 species in each season) was observed in summer 2021, monsoon 2021 and winter 2021-22 followed by summer 2022 (57), winter 2022-23 (56) and lowest number of species was observed during the monsoon 2022 (49). At sampling station II, the highest number of species was observed in summer 2021 and winter 2022-23 (56 species in each season) followed by winter 2021-22 (55), summer 2022 (54), monsoon 2021 (51) and lowest number of species was observed in monsoon 2022 (49). At sampling station III, maximum number of species was observed in winter 2022-23 (57) followed by summer 2021, winter 2021-22, summer 2022 (56 species in each season). Simpson diversity index ranged between 0.9743 to 0.9795 for sampling station I, 0.9736 to 0.9784 for sampling station II, and 0.9749 to 0.9785 for sampling station III, respectively. Shannon diversity index ranged from 3.75 to 3.963 for sampling station I, 3.739 to 3.91 for sampling station II, and 3.791 to 3.917 for sampling station III. Zooplankton is crucial biotic organisms of aquatic ecosystems and is an important component of food chains and webs.

Keywords: Zooplankton, Kot Dam, Cladocera, Season, Diversity, Ecosystem, Food chain, Food web.

INTRODUCTION

Zooplankton are crucial biotic organisms that are significantly important in aquatic ecosystems (Arora and Mehra, 2003; Pawar, 2015). They serve as a vital connection in energy transfer between phytoplankton and higher aquatic animals, making them essential for maintaining ecological balance (Sinha and Islam, 2002; Kadam and Tiwari, 2012; Goswami and Mankodi, 2012; Manickam *et al.,* 2014). Studying zooplankton communities can be helpful in predicting long-term changes in lake ecosystems because these communities are highly sensitive to environmental fluctuations (Manickam *et al.,* 2014 & 2015). Anthropogenic impacts can significantly affect zooplankton communities (Madin *et al.,* 2001). Several studies have shown that zooplankton communities are sensitive to environmental fluctuations as well as changes in physicochemical parameters of water bodies (Ferrara *et al.,* 2002; Preston and Rusak, 2010; Jeppesen *et al.,* 2011; Kehayias *et al.,* 2014). In addition, human activities and changes in lakes and their surrounding areas can impact the zooplankton community (Dodson *et al.,* 2000). A qualitative and quantitative study of zooplankton is necessary for the assessing water conditions of a particular water bodies. Abundance of plankton in water is influenced by the physicochemical conditions of the environment as well as by factors such as light penetration, temperature, nutrition levels, herbivores and heterotrophic microbes (Reynolds, 1987; Lashkar and

*Corresponding Author: Vipul Dev Beniwal, Department of Zoology, Vidya Bhawan Rural Institute (Mohanlal Sukhadia University), Udaipur, Rajasthan, India- 313001. Email: vipuldevbeniwal@gmail.com.

Gupta, 2009; Karuthapandi *et al.,* 2013; Nimbalkar *et al.,* 2013; Chishty and Choudhary, 2022a &b). Therefore, the present study was conducted to assess the seasonal variation in zooplankton diversity and species richness in Kot Dam, Jhunjhunu District, Rajasthan.

MATERIAL AND METHODS

Kot Dam was constructed from 1923 to 1924 by Thakur Sarju Singh to fulfill the demand for water for drinking purposes and agricultural activities of Shekhawati region of Jhunjhunu district. Kot Dam is located at 27°39'2"N latitude and 75°25'10"E longitude. Height of Kot dam is up to 7.6 m (25 ft), and length is up to 80 m (260 ft). Water samples were collected on a seasonal basis for two years (April 2021 to March 2023) from three sampling stations, *viz.,* sampling station I (SS-I), station II (SS-II) and station III (SS-III) for the analysis of seasonal variation in zooplankton diversity and species richness.

Sampling procedure utilized specialized nets to obtain microscopic zooplankton at different depths in the water column. This analysis generally includes microscopic examination, taxonomic identification, and enumeration of individual organisms. Collection of plankton samples entails filtering a significant volume of water, generally 50 litters, through specialized plankton net. Upon collection, the plankton samples were promptly stored in a 4% formalin solution. This preservation approach enables the storage of samples for extended durations, allowing for comprehensive microscopic studies, species identification, and subsequent quantitative analysis of the planktonic population (Slotwinski *et al.,* 2014; Manickam *et al.,* 2018). Quantitative examination of zooplankton was conducted using a Sedgwick-Rafter plankton-counting chamber at Department of Zoology, Vidya Bhawan Rural Institute, Udaipur. Plankton identification was performed within 24 hours of sample collection. Plankton was identified using conventional field guides (Ward and Whipple, 1959; Sladecek, 1973; Battish, 1992; APHA, 2012). Taxonomic identification and photography of plankton specimens were performed using a light microscope at 40×10 zoom. The Shannon and Simpson diversity indices of zooplankton were calculated using Past Software (Hammer *et al.,* 2001).

RESULT AND DISCUSSION

During study, 58 zooplankton species were observed at all three sampling stations in the Kot Dam (Table 1). Of the 58 zooplankton species, the maximum number of species belonged to the Cladocera (21 species) group followed by rotifers (15 species), protozoans and copepods consisted eight species each. The minimum number of species was observed in the Ostracod group (six species) (Table 1). Species richness: At sampling station I, the highest number of species (58 species in each season) was observed in summer 2021, monsoon 2021 and winter 2021-22 followed by summer 2022 (57 species), winter 2022-23 (56) and the lowest number of species was observed during the monsoon 2022 (49 species). At sampling station II, the highest number of species was observed in summer 2021 and winter 2022-23 (56 species in each season) followed by winter 2021-22 (55), summer 2022 (54) and monsoon 2021 (51), and lowest number of species was observed in monsoon 2022 (49). At sampling station III, maximum number of species was observed in winter 2022-23 (57) followed by summer 2021, winter 2021-22, summer 2022 (56 species in each season). Monsoon 2021 consisted of 54 zooplankton species and the lowest number of species was observed in the monsoon 2022 (54 species) (Table 2). Simpson diversity index: At sampling station I, highest value of Simpson diversity was observed in summer 2021 (0.9795) followed by winter 2022-23 (0.9793), summer 2022 (0.9787), winter 2021-22 (0.9786), monsoon 2021 (0.9756) and lowest value of Simpson diversity was observed in monsoon 2022 (0.9743). At sampling station II, highest value of Simpson diversity was observed in summer 2021 (0.9784) followed by winter 2022-23 (0.9783), winter 2021-22(0.9780), summer 2022 (0.9773), monsoon 2021 (0.9750) and lowest value of Simpson diversity was observed in monsoon 2022 (0.9736). At sampling station III, highest value of Simpson diversity was observed in winter 2022-23 (0.9785) followed by winter 2021-22 (0.9784), summer 2022 (0.9781), summer 2021 (0.9781) monsoon 2021 (0.9766) and lowest value of Simpson diversity was observed in monsoon 2022 (0.9749) (Table 2).

Shannon Diversity index: At the sampling station I, highest value of Shannon Diversity index was observed in summer 2021 (3.963) followed by winter 2022-23 (3.936), winter 2021-22 (3.926), summer 2022 (3.928), monsoon 2021(3.85) and lowest value of Simpson diversity was observed in monsoon 2022 (3.75). At the sampling station II, highest value of Shannon Diversity index was observed in summer 2021 (3.91) followed by winter 2022-23 (3.906), winter 2021-22 (3.893), summer 2022 (3.869), monsoon 2021 (3.785) and lowest value of Simpson diversity was observed in monsoon 2022 (3.739). At the sampling station III, highest value of Shannon Diversity index was observed in winter 2022-23 (3.917) followed by winter 2021-22 (3.912), summer 2022 (3.896), summer 2021 (3.894), monsoon 2021 (3.85) and lowest value of Simpson diversity was observed in monsoon 2022 (3.791) (Table 2). Dube *et al.* (2010) studied the community structure of zoo planktonic communities in the Kishore Sagar Tank, Rajasthan. They identified 36 species of zooplankton and classified them into seven groups, and the diversity of zooplankton exhibited immediate responses to alterations in the aquatic environment. Zooplankton is a reliable indicator of changes in water quality, trophic status, and pollution levels (Sharma, 1998). Dynamics of the plankton population, particularly the zooplankton community, largely determine fish populations (Madin *et al.,* 2001; Molinero *et al.,* 2020). Zooplankton plays a crucial role in aquatic ecosystems, affecting food chains, food webs, energy flow, and nutrient cycling (Lampert and

Sommer, 1997; Park and Shin, 2007). Direct and immediate response of zooplankton to several physical, chemical, and biological alterations in aquatic environments makes them a valuable indicator for assessing the impact of pollution and other disturbances on these ecosystems (Marques *et al.,* 2007).

Table 1. List of Zooplankton species observed in various seasons of different sampling stations of Kot Dam.

S. no.	Group wise distribution of zooplankton in different seasons	Sampling Station I						Sampling Station II						Sampling Station III					
		S 2021	M 2021	W 2021-22	S 2022	M 2022	W 2022-23	S 2021	M 2021	W 2021-22	S 2022	M 2022	W 2022-23	S 2021	M 2021	W 2021-22	S 2022	M 2022	W 2022-23
Group I: Protozoan																			
1	*Astramoeba radiosa*	8	4	9	6	3	7	1	0	3	3	0	6	3	4	6	1	3	7
2	*Euglina spp.*	6	5	5	3	2	6	2	4	3	5	6	7	0	0	2	1	0	5
3	*Paramecium Aurelia*	7	3	8	9	7	10	8	6	8	6	5	9	10	8	12	10	6	8
4	*Paramecium bursaria*	3	2	2	2	0	3	5	5	7	4	1	6	8	2	10	6	0	8
5	*Paramecium spp.*	4	1	5	2	0	4	3	0	3	0	0	2	4	2	5	4	0	6
6	*Vorticella campanula*	5	3	4	3	3	4	0	3	3	2	2	2	2	2	5	4	3	5
7	*Vorticella microstoma*	3	3	5	4	3	4	4	2	0	5	5	7	5	2	7	3	4	5
8	*Vorticella spp.*	5	4	5	4	0	5	4	0	7	3	3	6	7	4	7	8	5	7
Group II: Rotifers																			
9	*Filinia opoliensis*	5	2	6	13	9	14	6	2	10	10	5	17	9	10	17	12	4	16
10	*Asplanchna spp.*	14	7	10	7	3	11	7	4	11	5	2	8	15	6	13	9	7	9
11	*Brachionus calyciflorus*	10	6	11	9	9	12	8	5	11	10	6	7	11	5	13	12	9	8
12	*Brachionus diversicornis*	10	3	14	12	5	11	7	5	8	6	5	8	13	7	9	10	11	12
13	*Brachionus havanaensis*	13	7	13	10	7	9	9	4	9	8	5	8	10	8	14	10	5	8
14	*Brachionus plicatilis*	12	11	14	6	7	7	12	9	12	12	10	11	9	8	10	7	4	9
15	*Brachionus quadridentatus*	10	7	7	8	2	10	13	4	15	8	7	10	14	8	13	8	7	9
16	*Brachionus spp.*	5	4	9	3	0	8	2	3	7	5	2	7	8	3	8	6	3	9
17	*Branchionus rubens*	8	2	9	5	4	6	6	4	9	7	3	8	10	6	8	7	6	10
18	*Keratella cochlearis*	8	6	11	9	4	13	4	0	8	6	1	8	7	3	11	11	3	13
19	*Keratella tropica*	3	1	8	5	0	8	7	5	10	4	3	7	9	7	13	10	9	13
20	*Lecane papuana*	6	3	11	8	7	8	5	1	5	6	7	6	10	4	14	5	0	7
21	*Lecane spp.*	7	1	8	7	4	13	7	6	7	9	9	13	11	7	8	14	9	19
22	*Monostyla bulla*	10	7	9	6	8	9	9	6	9	12	5	14	13	10	11	15	7	19
23	*Tricocerca longiseta*	7	4	7	14	7	12	12	11	17	12	9	12	4	4	5	8	7	7
Group III: Copepods																			
24	*Cyclops leuckarti*	8	7	10	10	9	11	7	4	7	8	7	7	8	4	10	10	7	12
25	*Cyclops spp.*	9	10	11	8	8	11	10	8	13	13	13	20	14	9	12	8	5	9
26	*Diaptomus spp.*	8	5	13	14	8	18	8	11	11	10	6	17	19	9	21	20	15	22
27	*Mesocyclops leuckartii*	12	11	15	9	4	11	13	9	15	7	8	14	12	3	15	11	8	16
28	*Mesocyclops spp.*	10	8	14	4	2	6	8	0	9	9	5	10	6	2	10	10	5	17
29	*Nauplii*	12	9	15	7	4	11	10	7	5	8	1	7	13	9	8	7	8	14
30	*Paracyclops spp.*	7	5	9	9	8	15	12	8	14	13	13	15	3	0	9	9	5	10
31	*Thermocyclops spp.*	12	10	13	9	7	14	11	5	16	8	2	14	9	4	15	11	3	16
Group IV: Cladocera																			
32	*Alona quadrangularis*	9	7	9	10	9	13	8	8	9	11	4	10	12	8	17	6	6	13
33	*Bosmina fatalis*	10	6	12	8	1	13	11	10	13	5	0	6	11	4	16	8	2	14
34	*Bosmina longirostris*	15	18	16	17	7	15	13	12	14	10	7	9	18	16	22	16	9	18
35	*Bosmina spp.*	14	12	13	12	11	11	12	8	13	12	11	15	13	12	16	12	7	16
36	*Bosminopsis deitersi*	18	14	20	11	4	16	10	7	14	10	8	14	17	9	22	15	6	18
37	*Ceriodaphnia reticulate*	19	14	23	13	7	13	11	12	18	9	6	11	15	11	21	19	3	23
38	*Ceriodaphnia spp.*	14	4	13	17	4	15	13	6	16	6	0	12	19	8	18	15	11	14
39	*Chydorus sphaericus*	8	1	15	10	3	17	11	9	12	12	9	15	11	10	14	14	16	18
40	*Chydorus spp.*	9	7	14	8	5	7	15	7	15	7	5	9	6	7	10	9	1	7
41	*Daphnia dubia*	10	11	11	6	0	8	12	7	20	10	6	16	9	7	9	10	6	17
42	*Daphnia longiremia*	12	7	11	10	6	9	10	5	9	6	5	10	12	7	11	9	6	11
43	*Daphnia lumholtzi*	17	13	18	13	12	15	13	12	15	12	9	12	17	13	18	16	3	15
44	*Daphnia magna*	18	12	22	12	8	11	15	10	16	13	9	18	11	11	18	11	4	16
45	*Daphnia pulex*	11	13	20	10	7	13	14	12	13	12	7	16	15	13	16	12	11	14
46	*Daphnia spp.*	9	6	11	11	12	16	18	12	20	15	6	18	15	12	16	14	14	21
47	*Diaphanosoma excisum*	11	11	14	15	6	15	15	14	21	19	3	20	16	7	11	18	11	19
48	*Diaphanosoma sarsi*	12	6	15	11	9	10	14	4	13	15	11	14	14	6	19	14	13	15
49	*Eubosmina spp.*	13	9	17	15	2	12	8	1	12	14	16	18	17	8	20	15	8	15
50	*Eubosmina tubicon*	9	6	11	9	7	10	6	7	8	4	7	6	7	6	7	9	9	13
51	*Moina macrocopa*	10	6	16	4	5	9	12	8	17	6	6	13	6	7	8	4	7	6
52	*Pleuroxus trigonellus*	9	8	12	11	9	15	11	7	12	9	9	9	13	9	13	11	9	7

Group V: Ostrocods																		
53	*Cyclocypria spp.*	6	2	3	5	1	2	5	4	4	2	0	0	4	2	0	6	1	4
54	*Cypretta fontinalis*	7	2	3	5	1	5	4	1	6	0	0	1	4	5	2	3	3	0
55	*Cypris spp.*	3	1	1	5	0	2	3	2	2	1	0	1	1	0	3	1	0	4
56	*Eucypris*	6	2	2	3	1	3	3	1	1	1	0	9	0	1	3	1	2	1
57	*Heterocypris*	3	2	2	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1
58	*Stenocypris spp.*	2	1	1	0	0	0	3	0	0	0	0	2	1	1	2	0	0	1

Table 2. Seasonal variation in composition of Zooplankton species richness and diversity indices of different sampling stations of Kot Dam (SS- Sampling station).

S.No.	Species Richness and Diversity indices	Sampling Station	Different Season					
			S 2021	M 2021	W 2021-22	S 2022	M 2022	W 2022-23
1	Species Richness	SS I	58	58	58	57	49	56
		SS II	56	51	55	54	49	56
		SS III	56	54	56	56	51	57
2	Simpson Diversity index	SS I	0.9795	0.9756	0.9786	0.9787	0.9743	0.9793
		SS II	0.9784	0.975	0.978	0.9773	0.9736	0.9783
		SS III	0.9781	0.9766	0.9784	0.9781	0.9749	0.9785
3	Shannon Diversity index	SS I	3.963	3.85	3.926	3.928	3.75	3.936
		SS II	3.91	3.785	3.893	3.869	3.739	3.906
		SS III	3.894	3.85	3.912	3.896	3.791	3.917

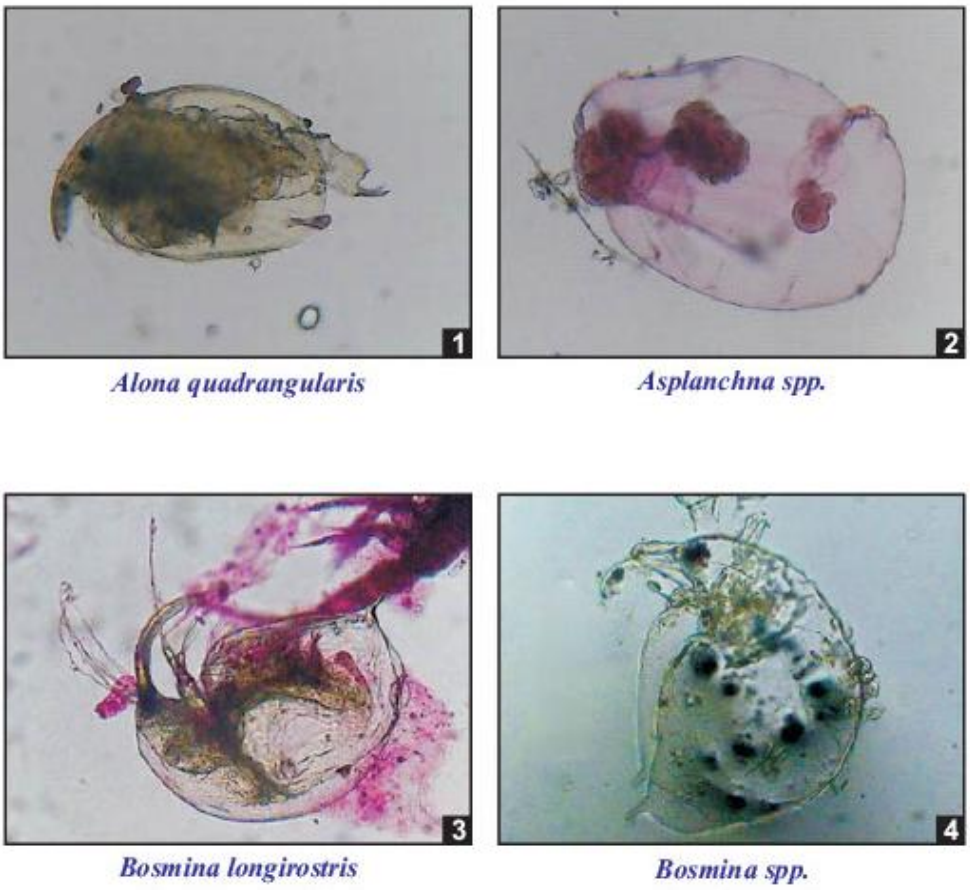

Figure A. 1. *Alona quadrangularis*, 2. *Asplanchna spp*., 3. *Bosmina longirostris*, 4. *Bosmina spp.*

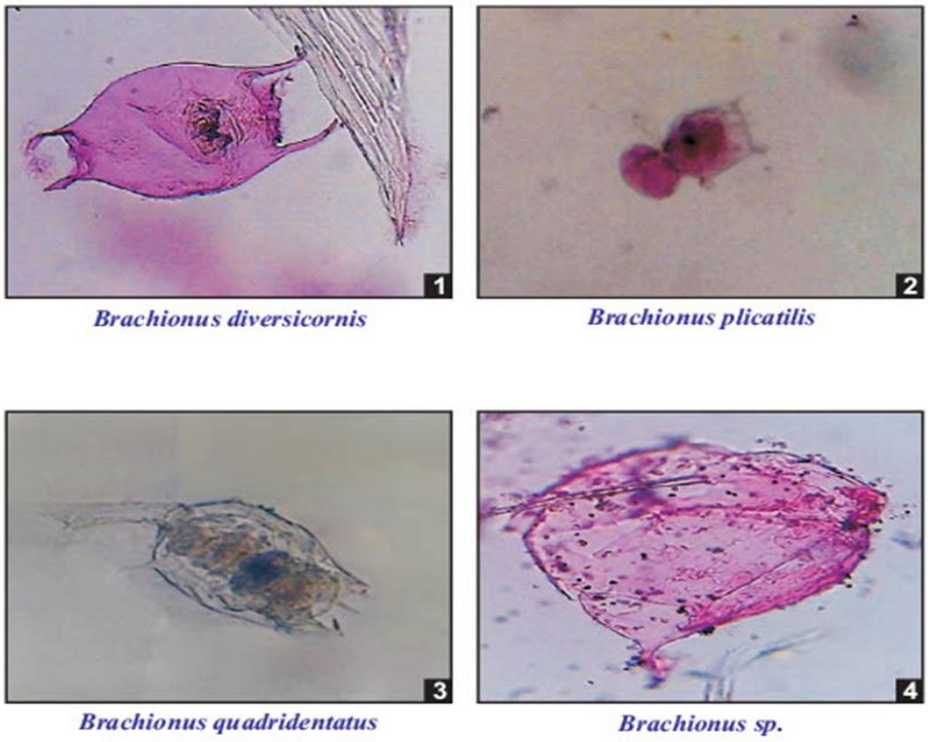

Figure B: 1. *Brachionus diversicornis*, 2. *Brachionus plicatilis*, 3. *Branchionus quadridentatus*, 4. *Branchionus spp*.

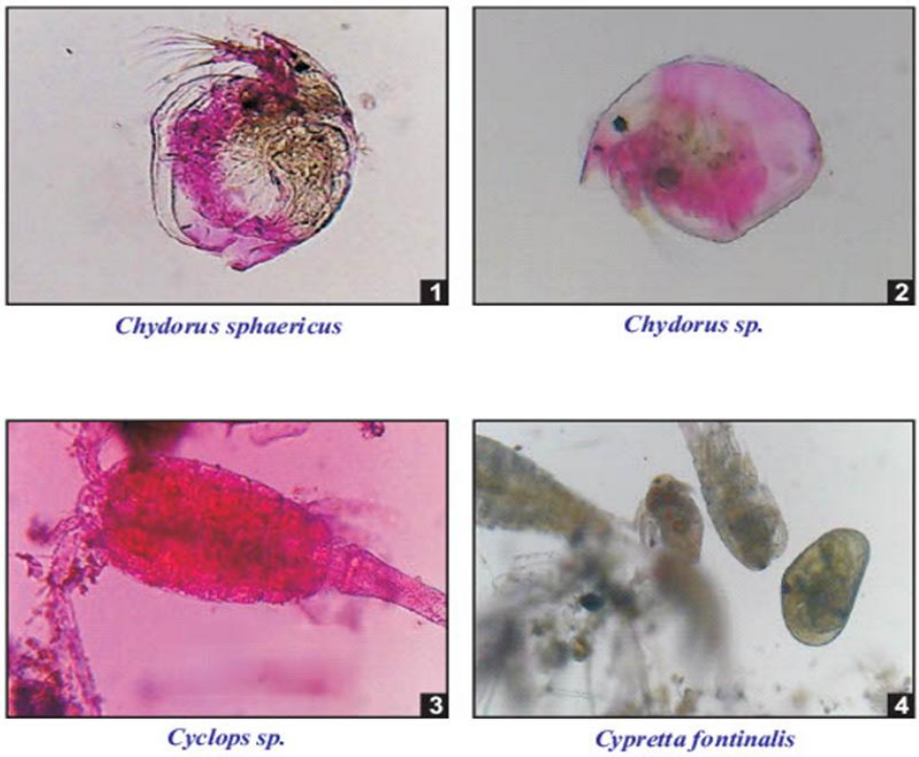

Figure C 1. *Chydorus sphaericus*, 2. *Chydorus spp*., 3. *Cyclops spp*., 4. *Cypretta fontinalis.*

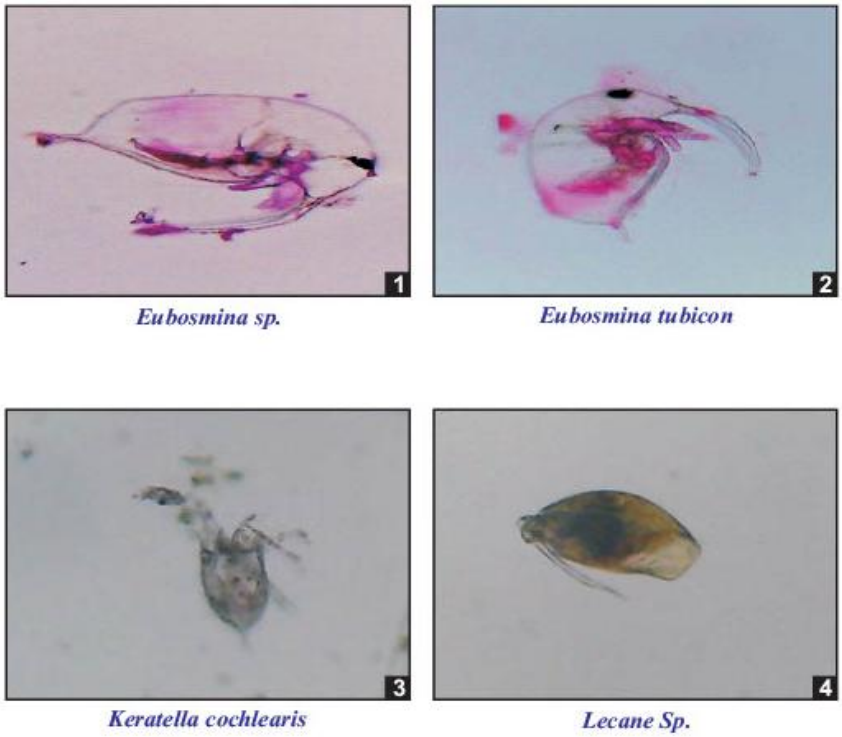

Figure D: 1. *Eubosmina sp.,* 2. *Eubosmina tubicon*, 3. *Keratella cochlearis*, 4. *Lecane spp*.

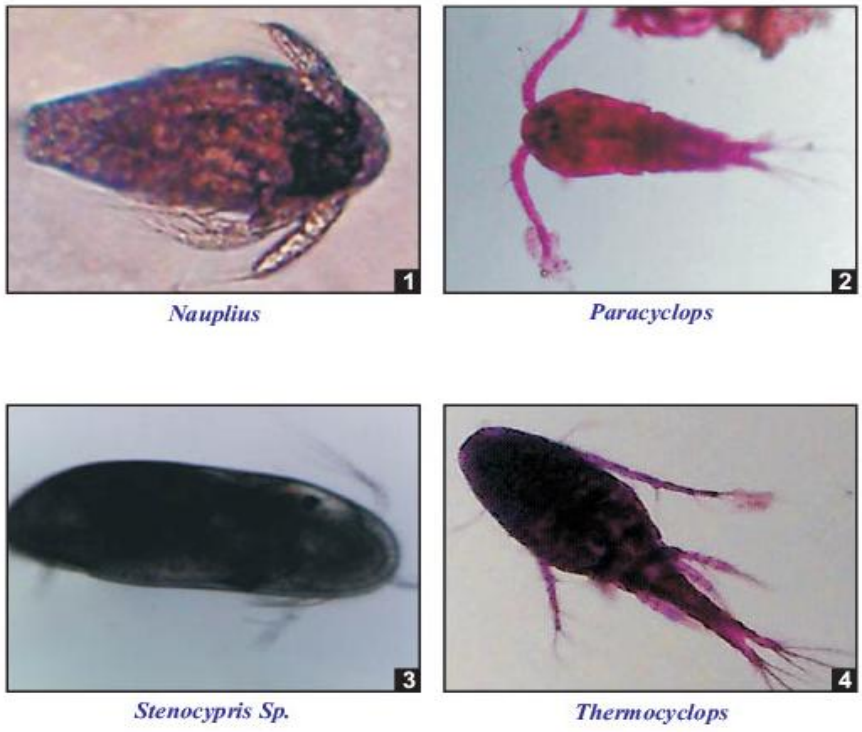

Figure E. 1. *Nauplius*, 2. *Paracyclops*, 3. *Stenocypris Sp.,* 4. *Thermocyclops.*

CONCLUSION

Therefore, present study provides a seasonal detailed account of zooplankton diversity in the different seasons of the Kot Dam. In the present study, the overall species richness and diversity of zooplankton were observed to be at their lowest during the monsoon season. This phenomenon is attributed to alterations in the physicochemical parameters and properties of water, such as increased turbidity, reduced light intensity, cloudy weather, and precipitation. Similar observations have been reported in various studies (Watkar and Barbate, 2013; Bhavan *et al.,* 2015; Manickam *et al.,* 2014, 2015, 2018).

ACKNOWLEDGMENT

The authors express sincere thanks to the head of the Department of Zoology, Vidya Bhawan Rural Institute (Mohanlal Sukhadia University), Udaipur, Rajasthan for the facilities provided to carry out this research work.

CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

FUNDING

This study received no specific funding from public, commercial, or not-for-profit funding agencies.

AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

REFERENCES

A.P.H.A. (2012). Standard Methods for the Examination of Water and Wastewater. 22nd Ed. American Public Health Association (APHA), American Water Works Association (AWWA) and Water Environment Federation (WEF), Washington D.C., U.S.A.

Arora, J., & Mehra, N. K. (2003). Species diversity of planktonic and epiphytic rotifers in the backwaters of the Delhi segment of the Yamuna River, with remarks on new records from India. *Zoological Studies*, 42(2), 239-247.

Battish, S.K. (1992). Freshwater Zooplankton of India. Oxford and IBH Publishing Co., Pvt. Ltd., New Delhi.

Bhavan, P. S., Selvi, A., Manickam, N., Srinivasan, V., Santhanam, P., & Vijayan, P. (2015). Diversity of zooplankton in a perennial Lake at Sulur, Coimbatore, India. *International Journal of Educational Research*, 5, 31-44.

Chishty, N., & Choudhary, N.L. (2022a). Seasonal Dynamic of Physicochemical Parameters of Berach River system in Udaipur district, Rajasthan. *Toxicology International*, 29(3):379-391. https://doi.org/10.18311/ti/2022/v29i3/29913 .

Chishty, N., & Choudhary, N.L. (2022b). Seasonal Dynamic in Primary Productivity and Phytoplankton Diversity in Berach River System of Udaipur District, Rajasthan. *Asian Journal of Biological and Life Sciences*, 11(1): 82-92. https://www.ajbls.com/article/2022/11/1/82-92.

Dodson, S.I., Arnott, S.E., & Cottingham, C.L. (2000). The relationship in lake communities between primary productivity and species richness. *Ecology*, 81, 2662–2679.

Dube, P., Garg, V., & Sharma, S. (2010). Community structure of zoo planktonic groups of Kishore Sagar Tank, Kota and Rajasthan. *Life Science Bulletin*, 6(3),451-453.

Ferrara, O., Vagaggini, D., & Margaritora, F.G. (2002). Zooplankton abundance and diversity in Lake Bracciano, Latium, Italy. *Journal of Limnology,* 61(2), 169-175.

Goswami, A. P., & Mankodi, P. C. (2012). Study on zooplankton of fresh water reservoir Nyari–II Rajkot district, Gujarat, India. *ISCA Journal of Biological Sciences*, 1(1), 30-34.

Hammer, O., David A.T.H., & Ryan, P.D. (2001). Past: Paleontological Statistics Software Package for Education and Data Analysis. *Palaeontologia Electronica*, 4(1), 1-9.

Jeppesen, E., Noges, P., Davidson, T.A., Haberman, J., Nõges, T., Blank, K., & Amsinck, S.L. (2011). Zooplankton as indicators in lakes: A scientific based plea for including zooplankton in the ecological quality assessment of lakes according to the European water framework directive (WFD). *Hydrobiologia*, 676, 279-297.

Kadam, S. S., & Tiwari, L. R. (2012). Zooplankton Composition in Dahanu Creek-West Coast of India. *Research Journal of Recent Sciences*, 1(5), 62-65.

Karuthapandi, M., & Rao, D. V. (2013). Zooplankton composition and diversity of Umdasagar, Hyderabad. *International Journal for Life Sciences and Educational Research*, 1(1), 21 26.

Kehayias, G., Chalkia, E., & Doulka, E. (2014). Zooplankton variation in five Greek lakes. In G. Kehayias (Ed.), Zooplankton, (85-119). Nova Science

Publishers, Inc. New York.

Lampert, W., & Sommer, U. (1997). Limnoecology- the ecology of lakes and streams. Oxford: Oxford University Press, 382.

Laskar, H. S., & Gupta, S. (2009). Phytoplankton diversity and dynamics of Chatla floodplain lake, Barak Valley, Assam, North East India-A seasonal study. *Journal of Environmental Biology*, 30(6), 1007-1012.

Madin, L. P., Horgan, E. F., & Steinberg, D. K. (2001). Zooplankton at the Bermuda Atlantic Time-series Study (BATS) station: diel, seasonal and interannual variation in biomass, 1994–1998. *Deep Sea Research Part II: Topical Studies in Oceanography*, 48(8-9), 2063-2082. https://doi.org/10.1016/S0967-0645(00)00171-5

Manickam, N., Bhavan, P. S., Santhanam, P., Bhuvaneswari, R., Muralisankar, T., Srinivasan, V., & Karthik, M. (2018). Impact of seasonal changes in zooplankton biodiversity in Ukkadam Lake, Coimbatore, Tamil Nadu, India, and potential future implications of climate change. *The Journal of Basic and Applied Zoology*, 79(1), 15. https://doi.org/10.1186/s41936-018-0029-3

Manickam, N., Bhavan, P. S., Santhanam, P., Muralisankar, T., Srinivasan, V., Vijayadevan, K., & Bhuvaneswari, R. (2015). Biodiversity of freshwater zooplankton and physico-chemical parameters of Barur Lake, Krishnagiri District, Tamil Nadu, India. *Malaya Journal of Biosciences*, 2(1), 1-12.

Manickam, N., Bhavan, S.P., Santhanam, P., Muralisankar, T., Srinivasan, V., Radhakrishnan, S., Vijayadevan, K., Chitrarasu, P., & Ali, A.J. (2014). Seasonal Variations of Zooplankton Diversity in a Perennial Reservoir at Thoppaiyar, Dharmapuri District, South India. *Austin Journal of Aquaculture and Marine Biology*, 1(1): 1- 7.

Manickam, N., Santhanam, P., & Saravana Bhavan, P. (2018). Techniques in the collection, preservation and morphological identification of freshwater zooplankton. In Basic and applied zooplankton biology, pp. 139-195. Singapore: Springer Singapore.

Marques, S.C., Pardal, M.A., Pereira, M.J., Gonçalves, F., Marques, J.C., & Azeiteiro, U.M. (2007). Zooplankton distribution and dynamics in a temperate shallow estuary. *Hydrobiologia*, 587,213–223.

Molinero, J.C., Piraino, S. & Dali Yahia, M.N. (2020). Population dynamics and predatory impact of the alien jellyfish *Aurelia solida* (Cnidaria, Scyphozoa) in the Bizerte Lagoon (Southwestern Mediterranean Sea) *Mediterranean Marine Science*, 21(1), 22-35.

Nimbalkar, R. K., Kamtikar, V. N., Shinde, S. S., & Wadikar, M. S. (2013). Studies on zooplankton diversity in relation to water quality of Ambe Ghosale lake of Thane city, (MS) India. *Bioscience Discovery*, 4(1), 124-127.

Park, K.S., & Shin, H.W. (2007). Studies on phyto-and-zooplankton composition and its relation to fish productivity in a west coast fish pond ecosystem. *Journal of Environmental Biology,* 28, 415-422.

Pawar, S.M. (2015). Zooplankton Diversity and Density in Some Freshwater Bodies around Satara (M.S.) India. *Global Journal of Animal Scientific Research*, 3(1):222-226.

Preston, N.D., & Rusak, J.A. (2010). Homage to Hutchinson: Does inter annual climate variability affect zooplankton density and diversity. *Hydrobiologia,* 653, 165–177.

Reynolds, C.S. (1987). The response of phytoplankton communities to changing Lake Environment. *Schweiz Z Hydrology*, 49, 220-236.

Sharma, B.K. (1998). Faunal diversity of India. (Eds. J.R.B. Alfred, A.K. Das and A. K. Sanyal) Zoological survey of India, *Environmental Centre*, 57-70.

Sinha, B., & Islam, M. R. (2002). Seasonal variation in zooplankton population of two lentic bodies at Assam State Zoo cum Botanical Garden, Guwahati, Assam. *Ecology Environment and Conservation*, 8, 273-278.

Sladecek, V. (1973). System of Water Quality. Archiv für Hydrobiologie - Beiheft: Ergebnisse der Limnologie 7. Stuttgart, 218 S., 70 Abb., 64 Tab., 502 Lit.

Slotwinski, A., Coman, F., & Richardson, A. J. (2014). Introductory Guide to Zooplankton Identification. Integrated Marine Observing System, Brisbane.

Ward & Whipple (1959). Fresh-water Biology, 2nd Edition., W. T. Edmondson, Ed., xx + 1248 pages, *Johan Wiley & Sons, New York.*

Watkar, A. M., & Barbate, M. P. (2013). Studies on zooplankton diversity of river Kolar, Saoner, Dist. Nagpur, Maharashtra. *Journal of Life Sciences and Technologies*, 1(1), 26-28.