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STUDIES ON SEASONAL ABUNDANCE AND FLUCTUATION OF MACROZOOBENTHOS IN ABHEDA POND, DISTRICT, KOTA (RAJASTHAN)

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ABSTRACT:- These seasonal abundance and fluctuation of macrozoobenthic fauna of Abheda pond, Kota district was studied on the basis of collection obtained from seasonal surveys for the period Aug2015 to July2016.Four sites were selected for the collection of samples. Macrozoobenthos give an index of water quality and are easy to collect and can be seen with naked eyes. In the present study an attempt has been made to investigate the seasonal fluctuation and abundance of macrozoobenthos in Abheda pond. During the study a total of 21 taxa of macrozoobenthos belonging to three phyla viz, Arthropoda, Mollusca and Annelida were recorded from the system. Arthropoda was most dominant group constituting 76.71%, followed by Mollusca 22.22% and Annelida contributed 1.06 % of total macrozoobenthos. The hard and stony bottomed sites were dominated by insects belonging to orders Ephemeroptera, Odondata, Coleoptera and Diptera. The maximum number of macrozoobenthos population was found during winter season followed by monsoon and summer.

KEYWORDS:- Macrozoobenthos, Physico-chemical parameter, Pond, Seasonal fluctuation.

INTRODUCTION:-

Abheda Pond is an artificial pond, it was dug during the 'Riyasatkaal' to quench the thirst of wild animals, like any other pond it has no wave action, has shallow depth, and negligible temperature variation along its depth. Ponds are an important component of the freshwater ecosystem and help in controlling water cycles, recharge of underground water level and bear the load of pollution caused by runoff from the neighborhoods. Abheda pond is located near village Nanta, and about 8 km south-west from Kota city. It lies between 25º12'-11" North latitude and 75º-53'-15" East longitude. Abheda pond support a rich variety of aquatic and marshland flora including submerged, emergent free floating and amphibious plants. The fauna which is observed in the vicinity of the pond consists of variety of species and some migratory birds which comes in the winter season.

Macro invertebrates are sensitive to physiochemical integrity of water due to pollution; they make excellent biological indicators for determining the health of the pond. By determining richness and abundance of these macrozoobenthos the health of the pond can be assessed.

Many investigators such as Khana and Bhutani (2003), Maltchik et al(2005), Khan et al (2007), Sheeba and Ramanujan (2009), Kabir et al (2011), Hbeeba et al (2012), Nupur et al (2013), Mukherji M (2015), Haider et al (2017) carried out various studies on relationship between macrozoobenthic diversity and water quality.

MATERIAL AND METHODS:-

The study was carried out at Abheda pond during the period Aug 2015 to July 2016.The macrozoobenthos was collected seasonally over a period of one year at four sampling stations. During the period of investigation benthic samples were collected with the help of tray type sampler. Samples were collected in polythene bags along water and were preserved in 4% formalin. It was then transferred to the laboratory and identified by keys of Edmondson (1959), Tonapi (1980), and Pennak (1989) up to genus level. Species couldn't be identified because we collected larval and immature stages of this organism.

RESULT AND DISCUSSION:-

Many aquatic invertebrates have specific and narrow habitat requirement and are therefore restricted to a limited range while others are general and can survive over a wide range of habitat types (Thorp & Covich, 1991).

A total 21 species of macrozoobenthos were recorded during the studies which belong to three major phyla Arthropoda, Mollusca and Annelida. Arthropoda was the most dominant group, comprising of 11species, followed by Mollusca with 8 species and Annelida with two species. The maximum diversity (21 species) and population density (5539ind/m2) was recorded at site I and minimum diversity (15species) and population density (1658ind/m2)at site IV. In general the density of macrozoobenthic invertebrate are followed in spatial order as site I> site II >site III >site IV. Among these phyla Arthropoda was the dominant (76.71%) and was followed by Mollusca(22.22 %) and Annelida (1.05%) (table 6).At sites where anthropogenic stress was there, Chironomidae, Oligochaeta were abundant whereas non-tolerant families like Ephemeroptera were in fewer number .Similar result was found by Sharma K.K.et al (2013) while investigating the biodiversity and abundance of Benthic communities of Datte-Da- Talab, Pond, Birpur. In Annelida Tubifix sp. belonging Oligocheta class shows its appearance in winter season at site I and II. Tubifix sp. inhabits areas with strong sewage pollution and anoxic water (Hawkes, 1979).Presence of good organic detritus content contributed the maximum quantity of Oligochaetes. These communities have been observed in soft depositing substrates rather than stony beds (Bhatt et al.2010).Generally Oligochaetes increase with eutrophication of water body (Brinkhurst, 1966, 1974).

Phylum Arthropoda was mostly represented by class Insecta. The chironomus larva of order Diptera and Hydrophilus sp.of order Coleptera showed dominance throughout the season at all sites but Eristalis species showed its dominance in winter and monsoon season at sitesI, III and IV.Patil et.al (1983) pointed out that the presence of Chironomus and Eristalis species in the water body is a sign of eutrophic water body. Verma and Dale la (1975) observed that the Chironomus larvae were common in polluted bottom samples. The Chironomides have then been recognized as indicator of tropic status of pollution in various lentic systems (Saether, 1979), (Hul, 1987).

ln Mollusca, class Gastropoda was most abundant among them Gyraulus species showed their dominance on all the sites, Pila species were more in winter and Lymnaea and Planorbis in monsoon season. There is no clear evidence of any other species of Gastropods at these sites. Water hardness favors the growth of Mollusca (Arce and Boyd, 1975).This statement supported the present investigation. Anitha et.al, (2002) recorded 10 species of Mollusca and stated that number of Mollusca

species and their abundance are associated with rich vegetation as well as slightly polluted nature of water bodies. Harman (1974) has also pointed those Mollusca are bio-indicators of pollution.

In the present investigation at all the sampling stations winter population was higher and was followed by monsoon and summer. Present investigation which is an accordance the findings of Joshi et al(2007) who reported maximum diversity during winter season when the amount of dissolved oxygen is more and the temperature is low. Similarly Maustafa et al(2013) found abundance of macrozoobenthos in winter and summer season in his study of three water bodies of Dhaka, Bangladesh they found density of macrozoobenthos was little higher in winter than summer.

Table- 1: Seasonal Abundance and Fluctuation of Macrozobenthos at site I of Abheda Pond

S. No.	Phylum	Macrozoobenthos species	Type	Summer	Monsoon	Winter
1	Annelida	Tubifex sp.	Adult	-	+	+
2		Limnodrillus sp.	Adult	-		+
3	Arthropoda	Chironomus sp.	Larva	+	+	+
4		Eristalis sp.	Larva	-	+	+
5		Ephemera sp.	Nymph	+	-	+
6		Anax sp.	Nymph	-	-	+
7		Ischunura sp.	Nymph	-	+	+
8		Tropisternum sp.	Larva	+	-	+
9		Dalotia(Atheta)coriaria sp.	Adult	+	-	-
10		Hydrophilus sp.	Adult	+	-	+
11		Berosus sp.	Adult	+	-	+
12		Helochares sp.	Adult	+	-	+
13		Haliplus sp.	Adult	+	+	+
14	Mollusca	Planorbis sp.	Shell	-	-	+
15		Indoplanorbis	Shell	-	-	+
16		Gyraulus sp.	Shell	+	+	+
17		Lymnaea auricularia	Shell	-	+	-
18		Lymnaea acuminata	Shell	-	+	-
19		Bellamya bengalensis	Shell	-	+	-
20		Viviparous bengalensis	Shell	-	+	-
21		Pila sp.	Shell	-	+	+

Table-2: Seasonal Abundance and Fluctuation of Macrozoobenthos at site II of Abheda pond

S..N.	Phylum	Macrozoobenthos species	Type	Summer	Monsoon	Winter
1	Annelida	Tubifex sp.	Adult	-	-	+
2		Limnodrillus sp.	Adult	-	-	+
3	Arthropoda	Chironomus sp.	Larva	+	+	+
4		Eristalis sp.	Larva	-	-	+
5.		Ephemera sp.	nymph	-	-	+
6		Anax sp.	nymph	-	+	+
7		Ischunura sp.Damsal fly	nymph	-	-	+
8		Tropisternum sp.	larva	-	-	-
9		Dalotia(Atheta)coriaria	adult	+	-	-
10		Hydrophilus sp.	adult	+	-	-
11		Berosus sp.	adult	+	-	-
12		Helochares sp.	adult	-	-	+
13		Haliplus sp.	adult	-	-	+
14	Mollusca	Planorbis sp.	shell	+	-	+
15		Indoplanorbis	shell	-	-	+
16		Gyraulus sp.	shell	+	-	+
17		Lymnaea auricularia	shell	-	+	-
18		Lymnaea acuminate	shell	-	+	-
19		Bellamya bengalensis	shell	-	+	-
20		Viviparous bengalensis	shell	-	-	-
21		Pila sp.	shell	-	-	+

Table-3: Seasonal Abundance and Fluctuation of Macrozoobenthos at site III of Abheda pond

S.N.	Phylum	Macrozoobenthos species	Type	Summer	Monsoon	Winter
1	Annelida	Tubifex sp.	adult	-	-	-
2		Limnodrillus sp.	adult	-	-	-
3	Arthropoda	Chironomus sp.	larva	+	+	+
4		Eristalis sp.	larva		+	+
5.		Ephemera sp.	nymph	-	+	-
6		Anax sp.	nymph	-	+	-
7		Ischunura sp.	nymph	-	+	-
8		Tropisternum sp.	larva	+	-	-
9		Dalotia(Atheta)coriaria	adult	-	-	-
10		Hydrophilus sp.	adult	-	-	+
11		Berosus sp.	adult	-	-	+
12		Helochares sp.	adult	-	+	-
13		Haliplus sp.	adult	+	-	-
14	Mollusca	Planorbis sp.	shell	-	-	+
15		Indoplanorbis	shell	-	+	-
16		Gyraulus sp.	shell	+	+	+
17		Lymnaea auricularia	shell	-	+	-
18		Lymnaea acuminata	shell	-	+	-
19		Bellamya bengalensis	shell	-	+	-
20		Viviparous bengalensis	shell	-	+	-
21		Pila sp.	shell	-	-	+

Table- 4: Seasonal Abundance and Fluctuation of Macrozoobenthos at site IV Abheda pond

S.N.	Phylum	Macrozoobenthos species	Type	Summer	Monsoon	Winter
1	Annelida	Tubifex sp.	adult	-	-	-
2		Limnodrillus sp.	adult	-	-	-
3	Arthropoda	Chironomus sp.	larva	-	-	+
4		Eristalis sp.	larva	-	+	+
5.		Ephemera sp.	nymph	-	-	+
6		Anax sp.	nymph	-	-	+
7		Ischunura sp.	nymph	-	+	-
8		Tropisternum sp.	larva	-	-	-
9		Dalotia(Atheta)coriaria	adult	+	-	-
10		Hydrophilus sp.	adult	-	-	+
11		Berosus sp.	adult	-	-	+
12		Helochares sp.	adult	-	-	+
13		Haliplus sp.	adult	+	-	-
14	Mollusca	Planorbis sp.	shell	-	-	+
15		Indoplanorbis	shell	-	-	-
16		Gyraulus sp.	shell	+	+	+
17		Lymnaea auricularia	shell	-	+	-
18		Lymnaea acuminata	shell	-	+	-
19		Bellamya bengaensis	shell	-	+	-
20		Viviparous bengalensis	shell	-	-	-
21		Pila sp.	shell	-	-	+

Table-5: Seasonal density and species diversity of different sites of Abheda pond during study

	Site I	Site II	Site III	Site IV
Seasonal Density	5539	3939	2576	1658
No. of Species	21	21	18	15

Table-6: Population density and percentage of macrozoobenthos in Abheda pond during study

Major Phyla	Total Macrozoobenthic forms	% Composition
Arthropoda	863	76.71%
Mollusca	250	22.22%
Annelida	20	1.05%

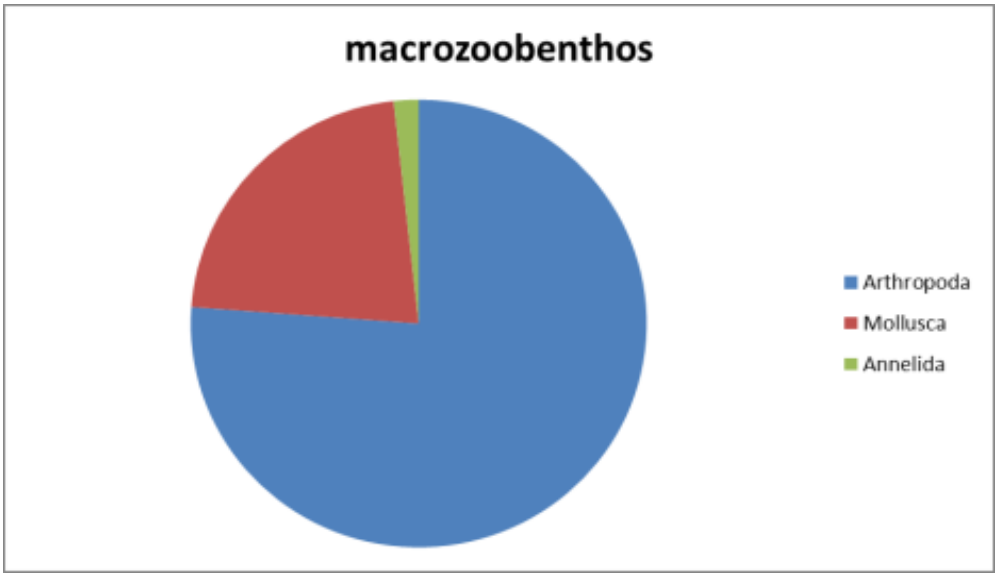

Figure: Showing Percent composition of macrozoobenthos inhabiting the Abheda pond during the study period.

CONCLUSION:-

As evident in the present study it seems that seasonal abundance of benthos is strongly influenced by composition of sediments in terms of proportion of silts, mud and clay (Gupta,1976)The pond shows 21 species, out of them insects were dominant in the whole study because of their potency to tolerate the organic pollution. The present study shows some pollution indicator species such as Tubifex sp.,Limnodrillus sp. among Annelida, Chironomous sp. and Eristales sp. Among Arthropoda, Lymnaea sp. among Mollusca directly points to the shifting of status of the pond from non-polluted to pollute. Domestic waste showed alarming shift of sensitive biotic community from the habitat. As the human population continues to grow, it will contribute significantly towards the process of pond biodegradation. This bio-survey of the macrozoobenthic invertebrate fauna gives an important insight into the health of the pond.

REFERENCES:-

1. Adoni, A.D. (1985): Workbook of LimnologyPratibha Publications, Sagar.
2. Anita, G., Kodarkar, M.S., Chandreshaker, S.V. and Nalini, G.G. (2004) : Studies on macrozoobenthos in Mir AlamLake, Hyderabad ,Andra Pradesh.J.aqua.Biol.19(1):61- 68
3. Brinkhurst, R.O. (1966): The biology of tubificidae with special reference to pollution Bio. Probl.Waterpoll.Scien: Pp 57 - 56.
4. Brinkhurst, R.O. (1974): The benthos of Lakes : McMillan Press Ltd., London: 190
5. Bhat, S., and Pandit. A.K. (2010) Ecological study of benthic communities in Three Limnocrenefresh water springs in Kashmir Himalaya. J. of Natural Sciences and Mathematics Vol. 3 No.2, PP.89-96.
6. Edmondson, W. T. (1959): Freshwater Biology. John Wiley, N.Y.
7. Gupta, S.D. (1976): Macrobenthic fauna of Lonireservoir. J. Ind. Fish. Soc. India. (8): Pp 49 - 59.
8. Harman, W.N. (1974): Snails (MolluscaGastropoda) In: Pollution ecology of fresh water invertebrates. Hart.C.W.Jr. and S.L.H. Fuller. Academic Press, N.Y: Pp 275 - 312.
9. Habeeba K.A., Saltant P., Uzma A. (2012) Seasonal Variation of Benthic community & Biodiversity indics in relation to environmental variables in disturbed Ponds. Int. J. Envir. Sci. 2 (4): 2120-25
10. Joshi, P.C.Negi, R.K. and Negi T.(2007)Seasonal variation in benthic macroinvertebrate and their co-

relation with environmental variable in a fresh water stream in Gariwal region(India).Life Science Journal.4:64-68.

11. Haider, M.L., Shahriar, S.I.M., Hosen, M.H.A., Chhanda, M.S. and Khatun, M.M.(2017) A study on water quality parameters and benthos abundance in freshwater homestead ponds of Dinajpur, Bangladesh. International Journal of Fisheries and Aquatic Studies. 5(2): 27-32.

12. Kabir, H.A., Parveen, S., Khan, A.A., Ansari, S., Ahmad, U., Maryam, and Ganai, A.H.(2011) Seasonal variation of benthic community in medical pond of Aligarh. Biology & Medicine. 3(2) : 370-375

13. Khan, A.N., Kamal, D., Mahmud, M.M., Rahman and Hossain, M.A.(2007) Diversity, distribution and abundance of Benthos in MouriRiver, Khulana, Bangladesh. Int. J. Sustain. Crop Prod. 2(5) : 19-23

14. Khanna D.R., and Bhutani, R.(2003)Ecological status of Sitapur pond at Haridwar(U.P.) Indian j.Environ.& Ecophon. 7(1) :175-178.

15. Khinchi, P.J., Subhas, M., Misar, S.D. and Telkhade, P.M.(2016) Studies seasonal abundance and fluctuations of macro-zoobenthic fauna of Junona lake district, Chandrapur(M.S.).Int.J. Of Biosci. Agricult. And Tech. Special Issue Feb 2016: 84-87.

16. Maltchik, L., Flores, M.L.T. and Sternert,C (2005) Benthic macroinvertebrate dynamics in shallow flood plain lake in the south of Brazil. Acta Limnol. Bras.17 (2).

17. Mukherji, M.(2015) Macrozoobenthic diversity of rural pond near Naihati, WestBengal. Int.Res. J. Interdiscipilinary & Multidiscipilinary Studies. 1(4): 11-14.

18. Mustafa, T., Alam, S.M.I., Jamal, M.S., Johra, F.T., Likhon, M.A.K., Hog, T. and Nasir, M.N.(2013): Abundance of benthic fauna in winter and summer seasons at three water bodies of Dhaka, Bangladesh. Bangladeshj. Zool.41(1):79-86

19. Nupur, N., Shahjahan, M., Rahman, M.S. and Fatima, M.K.(2013) Abundance of macrozoobenthos in relation to bottom soil texture types and water depth in Aquaculture Ponds. Int. J. Agril. Res. Innov. & Tech. 3(2) : 1-6.

20. Pennak, R.W. (1978): Fresh water invertebrates of United States. 327-334.

21. Patil, S. G., Singh D. P., and Harshey D. K. (1983): Ranital (Jabalpur) A sewage polluted water body, as evidenced by chemical and biological indicators of pollution. J.Environ.Biol. 4 (2):43 - 49.

22. Saether, O.A. (1979): Chironomid communities as water quality indicators Holarct. Ecol. (2): Pp65 – 74

23. Sharma, K.K., Antal, N., Kour, S., Devi, A. and Sharma, V.(2013) Biodiversity and abundance of Benthic macro invertebrates community of Datte-Da-Talab pond, Birpur(J&K) India. International Multidisplinary Research Journal.3 (1):13-17.

24. Sheebha S., Ramanujan N. (2009) Macroenvertibrate fauna of Ithikkara River, Kerala, India. J. Ind. Pollut. Control. 25(2): 161-4.

25. Thorp and Covich A. (1991): Ecology and classification of North American fresh water invertebrates, Sandi ego, Harcourt Brace Jovanovich.

26. Tonapi, G. T. (1980): Freshwater animals of India, An ecological approach. Oxford and IBH Publishing Company, New Delhi.

27. Verma, S.R. and Dalela R.C. (1975): Studies on the pollution of Kalinadi by Industrial near Mansurpur, Part-I: Hydrometric and wastes Physico-chemical characteristics of the wastes and river water. ActaHydrochim.Hydrobiologia.3 (3): Pp 239 - 257.