



## ECOLOGICAL STUDY ON MACROZOOBENTHIC COMMUNITY OF ANCHAR LAKE

<sup>\*a</sup>Mohammad Farooq Mir, <sup>a</sup>Nasrul Amin, <sup>b</sup>Anis Ramzan, <sup>c</sup>Noor Mohammad Malik, Manzoor Ahmad <sup>c</sup>Bhat, <sup>d</sup>Muzamil Bashir

<sup>a,d</sup>Hydrobiology Research Laboratory, S.P. College Srinagar, India

<sup>b</sup>Govt. Degree College Bemina Srinagar, India

<sup>c</sup>Department of zoology, S.P. College Srinagar, India.

<sup>\*</sup>Corresponding author email: nasrulaminshah@gmail.com

### ABSTRACT

Benthic macro invertebrate assemblages at Anchar Lake, corresponding to different catchment and land uses acts as indicators of water quality were assessed in a year 2015. Physico-chemical parameters and population density of Annelida, Arthropoda, Mollusca (AAM) individuals were determined. Diptera was dominating the study area instead of Annelida. The oxygen concentration was high and the mean dissolved oxygen was  $12.5 \pm 2.51$ mg/l. The presence of relatively high oxygen value seems to be a function of good periphytic algal population liberating oxygen during photosynthesis. The water of the lake was well buffered with mean pH >7.

**KEYWORDS:** Anchar Lake, limnology, Macrozoobenthos, Diptera, Bioindicators.

### INTRODUCTION

The valley of Kashmir lying in the midst of Himalayan range is located at an altitude of 1500-1700 m.s.l. Kashmir valley is situated between  $31^{\circ} 17'$  and  $34^{\circ} 5'$  North latitude and  $72^{\circ} 70'$  and  $80^{\circ} 30'$  East latitude. The Total geographic area of the state is 4920 Sq. kms. The valley is surrounded by the mountainous ranges of central Himalaya, characterized by snow covered lofty peaks which bifurcates near Kullu into Zaskar range (North-West branch) and Pir-Panjal range (extended further to North-West). The mountain ranges rising to a height of 5550 m in the south, where the Banihal-Pass (Jawahar tunnel) provides an exit from the valley. Numerous but varied freshwater ecosystems existing in the valley are of great aesthetic, cultural, socio-economic and ecological value besides playing an important role in the conservation of genetic resources of both plants and animals. These water bodies are also important for the sustainable economy of

the state in as much as they provide food, fodder, fish, wildlife, green manure, vegetables, medicinal plants, timber and other useful products, besides being a potential source of recreation. The major freshwater natural lakes of Kashmir include Dal Lake, Manasbal lake, Trigam Lake, Nigeen Lake, Khushalsar Lake, Wullar Lake, Anchar Lake and Nilnag Lake.

### MATERIALS & METHODS

#### Study area

Anchar lake is situated in Srinagar district near SKIMS Soura. The Anchar lake plays an important role in the conservation of biological resources besides irrigation; water supply, fishery and wildlife. At the same time, it is becoming the victim of cultural eutrophication, which in turn is due to the increase in anthropogenic pressures in its catchment area.



**FIGURE 1:** Showing sampling sites of Anchar Lake

**PHYSICO-CHEMICAL PARAMETERS**

The seasonal variation of Physico-chemical factors of water was studied from Mar 2015 to Aug 2015. Monthly samples were collected from the lake by dipping one litre polythene bottle just below the surface of water. Temperature, pH, Conductivity was recorded on the spot. For the estimation of Dissolved oxygen, water samples were collected in glass bottles and fixed at the sampling site in accordance with Winklers method (A.P.H.A.,1998). Free CO<sub>2</sub>, Hardness, Alkalinity, Calcium, Magnesium and chloride were determined by titrimetric methods (Mackereth *et al.*, 1978).

**MACROZOOBENTHOS**

For collection of macrozoobenthos sediment samples were collected by using Ekman dredge having an area of 225cm<sup>2</sup>.The sediment sample were sieved and benthic organisms retained in the sieve were picked with the help of forecep and then preserved in 4% formaline. Benthos sampling was done on monthly basis. Preserved samples then were identified according to standard works: Edmondson (1959) pennak (1978) Adoni (1985) and Tonapi (1980). The abundance of these organisms was calculated as number per square meter by applying the following formula:

$$N = O/A.S \times 10,000 \quad (\text{Welch, 1948})$$

Where,

N = no. of macrobenthic organisms/m<sup>2</sup>.

O = no. of organisms counted.

A = area of sampler in square meter.

S = no. of samples taken at each stations.

**RESULTS & DISCUSSION**

The physico- chemical parameters and macrozoobenthic invertebrates of the Anchar Lake were observed and represented in Table 1 and 2. During the period of present investigation Table 1 shows physico-chemical characteristics of water and their Range of variation, mean and standard deviation and Table 2 shows macrozoobenthos population density, mean and Standard deviation . The Air temperature of the sampling site during the period of field collection fluctuate from a minimum of 5°C to a maximum of 27°C (mean: 17 S.D:8.27), water temperature was appreciably lower than the Air temperature and fluctuated from a minimum 9°C to a maximum of 17°C (mean: 11 S.D:2.80). Significant difference between air and water temperature is related to the continues oozing out of water from underneath. In the present study, Dissolved oxygen of the lake water fluctuated from a minimum 8 mg/l to a maximum 15mg/l (mean: 9.9 S.D:2.61). The presence of relatively high oxygen value seems to be a function of good periphytic algal population liberating oxygen during photosynthesis (Reid 1961) and (Hynes 1979). Conductivity of the lake water fluctuated from minimum 150µS/cm to maximum 185µS/cm (mean: 164 S.D:12.36). High Conductivity of the lakes is attributed to the more time for water to interact with the host rock (Jeelani, 2008). Carbon dioxide seemed to be an important component of the buffer in the lake and fluctuated from minimum 7mg/l to a maximum 13mg/l (mean: 9.5 S.D:1.67). Large amount of carbondioxide is due to exposure of organic matter and bacterial respiration in the soil (Hynes 1979), as well as its passage, percolation through limestone. The pH in the lake ranged between minimum 7 to a maximum of 7.8 (mean: 7.5, S.D: 0.26). Therefore, the pH of the water generally did not exceed 8.0.

**TABLE 1:** Range of mean variation and Standard Deviation of the physico-chemical characteristics of water of anchar lake during Mar 2015 to Aug 201s.

S.No.	Parameters	Units	Range of variation		Mean & S.D
			Min	Max	
1.	Air temperature	°C	5	27	17±8.27
2.	water temperature	°C	9	17	11±2.80
3.	Conductivity	µS/cm	150	185	164±12.36
4.	pH	-	7	7.8	7.5±0.26
5.	Free Co <sub>2</sub>	mg/l	7	13	9.5±1.67
6.	Dissolved oxygen	mg/l	8	15	9.9±2.61
7.	Total Alkalinity	mg/l	128	180	164±18.14
8.	Total Hardness	mg/l	95	270	158±61.52
9.	Calcium Hardness	mg/l	50.4	178	80.2±46.62
10.	Magnesium Hardness	mg/l	9.4	55.1	22.5±12.93
11.	Chloride	mg/l	4.2	10.9	7.9±2.32

**TABLE 2:-** Population density, Mean and Standard deviation of different Macrozoobenthic invertebrates at anchar lake during Mar 2015 to Aug 2015

S no.	Species	Population density (ind/m <sup>2</sup> )	Mean (ind/m <sup>2</sup> )	Standard deviation
	Arthropoda			
	Ephemeroptera	9392	799.3	121.34
1.	<i>Baetis sp.</i>	4664	388.6	98.9
2.	<i>Ecdyonurus sp.</i>	4092	341	59.6
3.	<i>Epeorus sp.</i>	836	69.6	39.6
	<i>Tricoptera</i>	4620	385	70.51

1.	<i>Hydropsyche sp.</i>	704	58.6	50.8
2.	<i>Limnophilus sp.</i>	3916	324	71.3
	<i>Coleoptera</i>	748	63.3	109.5
1.	<i>Elmidae</i>	748	63.3	109.5
	<i>Diptera</i>	11352	946	376.87
1.	<i>Simlium sp.</i>	2024	168.6	188
2.	<i>Limnonlli sp.</i>	1672	139.3	105
3.	<i>Tiploidy sp.</i>	484	40.3	36.81
4.	<i>Bezzia sp.</i>	2596	216.3	54.5
5.	<i>Diamessa sp.</i>	4576	381.3	90.6
	<i>Plecoptera</i>	1408	117.3	39.0
1.	<i>Perlidae sp.</i>	1408	117.3	39.0
	<i>Amphipoda</i>	6820	568.3	80.60
1.	<i>Tubifex sp.</i>	264	22	19.67
2.	<i>Limnodrillus sp.</i>	352	29.3	24.09
	<i>Hirudinea</i>	3388	282.3	68.8
1.	<i>Erpobdella</i>	3388	282.3	68.8
	<i>Gastropoda</i>	2024	168.6	141.4
1.	<i>Lymnaea sp.</i>	2024	168.6	141.4
	<i>Pelecypoda</i>	3476	289.6	34.89
1.	<i>Corbicula sp.</i>	1496	124.6	31.5
2.	<i>Promenetus sp.</i>	1980	165	42.47

Macrozoobenthos represents one of the most important groups of animals particularly with respect to food of fishes and also a important role in Cycling of the organic material. Macrozoobenthos contributed a total of 18 taxa of which 11 belonged to Insecta, 1 to Crustacea, 3 to Annelida, and 3 to Mollusca. Insecta, represented by Ephemeroptera (May flies), Coleoptera (beetles), Tricoptera (Caddis flies) Diptera (mosquitoes, flies and midges), it was represented by a total no. of 11 taxa. The Dipterans contributed the highest mean density  $946 \pm 376.87$  (ind/m<sup>2</sup>). Dipterans in the Anchar Lake included *Simlium sp.*, *Limnonlli sp.*, *Tiploidy sp.*, *Bezzia sp.*, and *Diamessa sp.* Presence of these bioindicators indicates the pollution status of lake. Ephemeroptera ranked second as per mean population density  $799.3 \pm 121.34$  (ind/m<sup>2</sup>). Hawkes (1979) reported that Ephemeroptera do not tolerate organic enrichment. *Baetis sp.* are an exception in being quite tolerant of appreciable organic enrichment. In the present study it is clearly indicates that the lake water is still polluted.

#### ACKNOWLEDGMENTS

The authors are very thankful to the Head, Hydrobiology Research Laboratory, Govt. S.P. College Srinagar for providing the necessary facilities and timely guidance whenever we were in great need and during the sampling periods. We also acknowledge the help provided by the research scholars of the Hydrobiology Research laboratory.

#### REFERENCES

Akhter, P., Sarwar, S.G. & Yousuf, A.R. (1992) Abiotic features of two interconnected lakes of Srinagar, Kashmir. p. 219-223. In: Current Trends in Fish and Fishery Biology and Aquatic Ecology. (A. R. Yousuf, M. K. Raina and M.Y. Qadri, eds.). Sahyog Prakashan 7/1, Pant nagar, Jangpora, New Delhi.

Ahangar, I.A. Farooq, M., Mir, Saksena D.N. and Ahangar, M.A. (2012) Zooplankton Diversity with Relation to Trophic Status In Anchar Lake, Kashmir. *Int. J. Curr. Res.* 4(7):46-48.

Ahangar, I.A., Farooq Mir, M., Saksena, D.N. and Ahangar, M.A. (2012) Survey and Study of Phytoplankton Ecology in Anchar Lake, Kashmir, (India). *Int. J. Curr. Res.* 4(7):40-45

Ahangar, I.A., Farooq Mir, M., Saksena D.N. and Ahangar M. A. (2012) Crustacean Community in Anchar Lake. *Bull. Environ. Pharmacol. Life Sci.* 4(7):40-45

Ahangar, I.A., Saksena, D.N. and Mir, M.F. (2012) Seasonal variation in zooplankton community structure in Ancharlake. *Univ. J. Environ. Res. Tech.* 2(4):305-310

Balkhi, M.H., Yousuf, A.R. & Qadri, M.Y. (1987) Hydrobiology of Ancharlake, Kashmir. *Comp. Physiol. Ecol.*, 12 (3): 131-139.

Bhat, S.A., Rather, S.A. & Pandit, A.K. (2001) Impact of effluents from SKIMS, Soura on Ancharlake. *J.Res.Dev.*, 1: 31-38.

Burns, N.M. (1976) Temperature, oxygen and nutrient distribution patterns in Lake Eric (1970). *J. Fish. Res. Board Canada*, 33:485-511.

Charu, P. & Savita, D. (2006) Seasonal variations in Physico-chemical Characteristics in Upper lake of Bhopal. *Asian J. Exp. Sci.*, 297-302

Das, S.M. & Akhter, S. (1970) A report on the freshwater Cladocera from Dallake, Kashmir. *Kashmir Sci.*, 7: 133-137.

- Edmondson, W.T. (1970) Phosphorus, nitrogen and algae in Lake Washington after diversion of sewage. *Science*, 196: 690-691
- Ishaq, M. & Kaul, V. (1988) Ca<sup>++</sup> and Mg<sup>++</sup> in Dal Lake, a high altitude Marl lake in Kashmir Himalayas. *Int. Revue. Ges. Hydrobiol.*, 73 (4): 434-439.
- Kaul, V. & Handoo, J.K. (1987) Chemical parameters useful in the evaluation of eutrophication and ecological state of lakes of Jammu and Kashmir p. 363-367. In: *Environmental Issues and Researches in India*. (S.K. Agarwal and R.K. Garg, eds.). Himanshu Publications, Udaipur, India
- Pandit, A.K. (1999) *Freshwater Ecosystems of the Himalaya*, Parthenon Publications, New York, London.
- Pandit, A.K. & Qadri, S. S. (1990) Floods threatening Kashmir wetlands. *J. Environ Manag.*, 31 (4): 299- 311.
- Pandit, A.K. (1993) Dal lake ecosystem in Kashmir Himalaya: Ecology and management. P.131-202. In: *Ecology and Pollution of Indian lakes and reservoirs* (P. C. Mishra and R. K. Trivedy, eds.). Ashish Publishing House, New Delhi, India.
- Pandit, A.K. & Yousuf, A.R. (2002) Trophic status of Kashmir Himalaya lakes as depicted by water chemistry. *J. Res. Dev.*, 2: 1-12
- Qadri, M.Y. & Yousuf, A.R. (1978) Seasonal variation in the physico-chemical factors of a subtropical lake of Kashmir. *J. Inland Fish Soc. India*, 10: 89-96.
- Qadri, M.Y. & Yousuf, A.R. 1979. Physico-chemical features of Beehama spring. *Geobios*, 6:212-214.
- Rather, S.A. Bhat, S.A. & Pandit, A.K. (2001) Water quality of Hokarsar, a typical Wetland of Kashmir. *J. Res. Dev.*, 1: 36-43.
- Sahu, K. & Mehta, A. (2007) Physico-chemical and Bacteriological studies of Daphrin Hospital Discharge at Sagar, Madhaya Pradesh. *Asian J. Exp. Sci.*, 21:309-314.
- Suthura S.S., Pathak, D. & Singh, R. (2002) Physico-chemical properties of some freshwater bodies of Hanumangarh and Srignganagar district of Rajasthan. *Poll. Res.*, 24(3): 695-698
- Yousuf, A.R., Pandit, A.K. and Qadri, M.Y. (1992) Changes in the physical and chemical limnology of Lake Manasbal, Kashmir, from 1976-1988. P. 199-206. In: *Current Trends in Fish and Fishery Biology and Aquatic Ecology*. (A. R. Yousuf, M. K. Raina and M. Y. Qadri, eds.). Sahyog Prakashan, New Delhi.
- Yousuf, A.R. (1995) Changing relationship between human society and aquatic ecosystems in Kashmir Himalaya, In: *Society and Culture in the Himalaya*. (K. Warikoo, ed.).pp. 55-65. Har Anand Publications, New Delhi.
- Zutshi, D.P., Subla, B. A., Khan, M.A. & Wanganeo, A. (1980) Comparative limnology of nine lakes of Jammu and Kashmir Himalayas. *Hydrobiol.* 72 (1-2):101-112.
- Zutshi, D.P. & Vass, K. K. (1973) Variations in the water quality of some Kashmir lakes. *Trop. Eco.*, 14(2):182-196.