Evaluation of water quality: Physico chemical characteristics of River Narmada at Madhya Pradesh, India.

[1]Zahoor Pir, [2]Imtiyaz Tali, [1]L. K. Mudgal, [3]Shailendra Sharma, [2]Anis Siddique

1. Department of Zoology, Govt P. G. Girls College Motitabela Indore MP- 452001.
2. Department of Zoology, Govt Holkar Science College Indore MP- 452001.
3. Department of Zoology, Shri Omya College Maheshwar Indore MP- 452001.

Address for correspondence: Zahoor Pir, Department of Zoology, Mata Jijabai Govt P. G. Girls College Motitabela Indore MP- 452001. zahoor7887@yahoo.com

Abstract: The Narmada river is one among the most important river in central India and fifth largest river in Indian subcontinent. The river is continuously being polluted by various anthropogenic activities, which results to the threat to aquatic life. The present investigation was carried for the period of one year from August 2010 to July 2011 in two sampling stations viz, Maheshwar and Barwani. Minimum value of DO, turbidity, Free CO_2 and Nitrate was recorded in May month and maximum value of turbidity and DO was recorded in June-July months. The results of present study indicate that Narmada river is slightly polluted and needs regular monitoring.
[[1]Zahoor Pir, Imtiyaz Tali, L. K. Mudgal, Shailendra Sharma, Anis Siddique. **Evaluation of water quality: Physico chemical characteristics of River Narmada at Madhya Pradesh, India.** Researcher 2012;4(5):63-67]. (ISSN: 1553-9865). http://www.sciencepub.net/researcher. 12

Keywords: Evaluation; water quality; Physico chemical characteristics; River; Narmada; India

Introduction

In India freshwater bodies may be classified into two types viz, standing water (lentic) and flowing water (lotic). Ponds, reservoirs, lakes and swamps come under lentic water, whereas rivers, springs, perennial monsoon streams are included under the lotic water.

Definition of freshwater is water containing less than 1,000 milligrams per liter of dissolved solids often salt. Water is constantly misused and abused by human kind. Needless to mention here that growth in human population in the last century has severely damaged the aquatic resources as it has done to all other renewable resources. The longing for more production has thus impelled the inputs of sophisticated technologies leading to changes in their ecology. The change in water course together with multiple uses far beyond their assimilation capacities has severely affected their quality and availability. Natural surface water bodies like rivers and streams are subjected to pollution comprising of organic and inorganic constituent (Unnisa and Khalilullah 2004).

The river Narmada receives 41 principal tributaries (Alvares and Ramesh 1988), each with a catchments area exceeding 500sq. kms. Out of these 22 (21 in M. P. and 1 in Gujarat) joins the river from left bank and 19 (18 in MP and 1 in Gujarat) from right bank (Ghosh et al 2004). The total length of these principal tributaries is 3387 Kms. Besides this, there are other 50 important rivulets joining the river Narmada. Most of the tributaries and some of the rivulets arise from the highlands of Vidhyas and Sutpuras ranges and possess lot of rocks providing immense opportunity for the growth of macro benthos.

The valley of the river Narmada has been the seat of an uninterrupted flow of human civilization dating from pre-historic times. The Narmada finds mention as one of the seven most sacred rivers in ancient Indian texts. A number of written accounts and ballads refer to this river. Its banks are dotted with temples, myths and folklore, the living symbols of a timeless Indian tradition. The river Narmada has supported a bewildering variety of people and diverse socio-cultural practices ranging from the relatively autonomous aadivasi (tribal) settlements in the forests to non-tribal rural population.

There are about seven dams constructed on Narmada River. Due to the Dam formation the ecology of Narmada river is quite degraded which results in threat aquatic biodiversity of river. The idea of damming the Narmada was discussed as far back as the late 19th century during the days of the British Raj. Of the 30 big dams proposed along the Narmada, Sardar Sarovar Project and Narmada Sagar Project are the megadams. The Maheshwar and Omkareshwar dams along with Sardar Sarovar Project and Narmada Sagar Project are to form a complex which would ultimately cater to the needs of Sardar Sarovar Project. The struggle of the people of the Narmada valley against large dams began when the people to be displaced by Sardar Sarovar Project began organizing in 1985-86. Since then the struggle has spread to encompass other major dams in various stages of planning and construction chiefly Maheshwar, Narmada Sagar, Maan, Goi and Jobat.

Tawa and Bargi Dams were completed in 1973 and 1989 respectively have seen the affected people organize post-displacement to demand their rights. The government is planning to build 30 big dams, 135 medium dams and 3000 small dams on the Narmada & its tributaries. If all of these dams ever get built then the river as we know it will disappear and all that will be left are a series of lakes.

The construction of dam in the riverine system changes the biological and ecological conditions of rivers. Alteration occurs in the floral and faunal characteristics near the dammed site (Ogbeibu and Oribhabor, 2002). The developments like construction of dams and barrages along the river results in low water flow (Hassan *et al*., 1998a, 1998b). Dams causes physical alteration of tail waters or downstream areas, changes in water temperature, channel morphology or stream substrates and loss of spawning and rearing habitat due to upstream flooding, thus impacting indigenous fishes (Shrestha, 2001). The main purpose of this study is to assess the water quality of Narmada river and to suggest the conservative measures to increase the quality of the river.

Material and Methods

About the study area

The Narmada also called Rewa is a river in central India and the fifth largest river in the Indian subcontinent. It is the third largest river that completely flows within India after Ganges and Godavari. The Narmada river basin lies in the central part of India, between 72° 20" E to 81° 45" E longitude and 21° 20" N to 23° 45" N latitude with a drainage area of 98,796 sq. km and a mean elevation of 760 m. Narmada river originates in the Maikal Mountain ranges in Amarkantak in Madhya Pradesh state, and flows through west for a distance of 1312 km into the Gulf of Cambay, west of Bharuch District in Gujarat State (NIH, 1999).

The source of the Narmada is a small tank called Narmada Kund located on the Amarkantak hill 1,057 m (3,467.8 ft)), in the Anuppur District of eastern Madhya Pradesh.

Sampling stations

MAHESHWAR (S-I)

Maheshwar culturally rich town is located in north western part of Khargone district of Madhaya Pradesh state. This holy town is situated on north bank of sacred river Narmada formerly known as Mahishmati. Maheshwar was the capital city of Holkar State and finds mention as an important city in the Ramayana and the Mahabharata. Maheshwar is located 13 km east of NH-3 (Agra Mumbai highway) and at 91 km away from Indore, the commercial capital of the state.

The climate of Maheshwar may be divided into four seasons. The cold season, December to February is followed by hot season from March to middle of June. The Period from middle of June to September is the south west monsoon season. October and November form the post monsoon or transition period. There is a fort at Maheshwar that was constructed during the rule of the Mughal King Akbar. It's latitude (DMS) 22°18", 60"N and longitude (DMS) 75°34", 60"E.

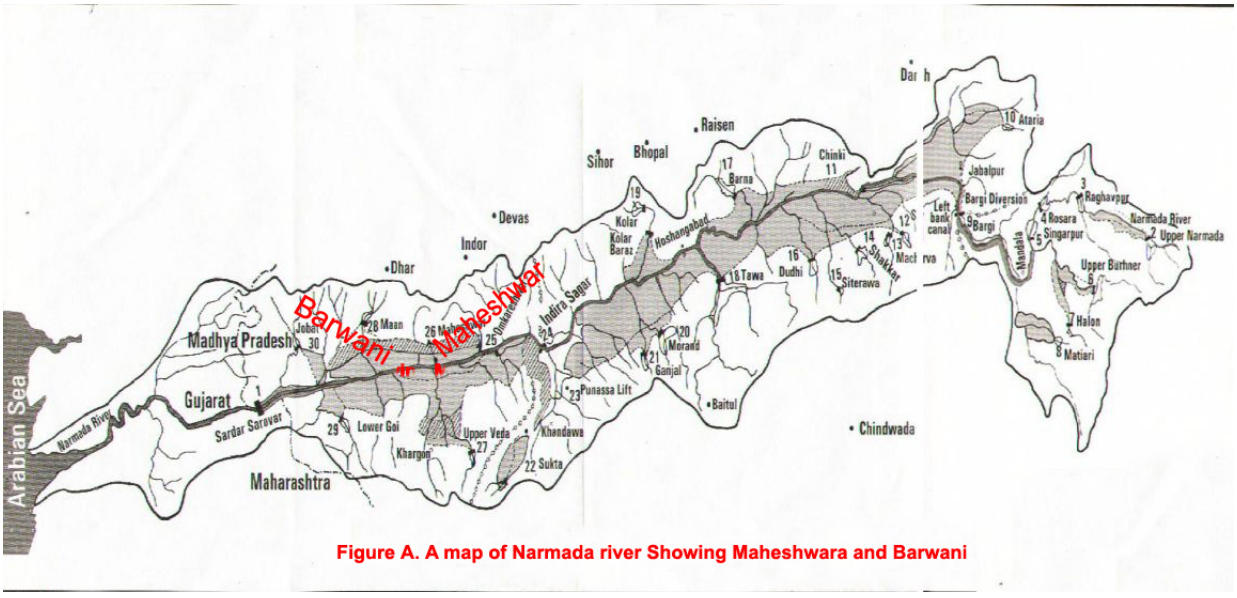

Figure A. A map of Narmada river Showing Maheshwara and Barwani

BARWANI (S-II)

Barwani, also known as Siddh Nagar is a city and a municipality in Barwani District in the state of Madhya Pradesh, India. The place is also famous for Chool Giri**,** Jain pilgrimage centre of Bawangaja. The town is situated near the left bank of the Narmada river. The great Narmada river flows through Barwani (Just 5 km from city). Barwani is located150 km away from Indore. Before Independence Barwani was known as **'The Paris of Nimar'**

It's latitude (DMS) 22º10", 60"N and longitude (DMS) 74º54", 0"E.

Water Analysis:

Water samples were collected for a period of one year from August 2010 to July 2011 from the sampling stations viz Omkareshwar and Mandleshwar. In the analysis of physico-chemical properties of water, standard methods prescribed in limnological literature were used. Temperature, turbidity, pH, Dissolved Oxygen (DO) were determined at the site while Phosphate, Free CO_2 and Nitrate were determined in the laboratory. The Physico- Chemical parameters of water were determined as per standard methods of APHA (2002), Welch (1998), Golterman (1991).

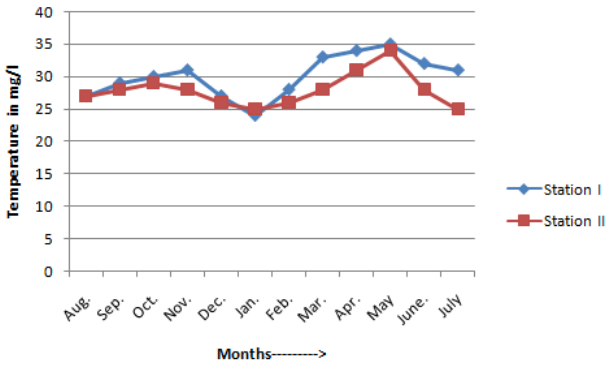

Fig-2 Graph showing variation of Temperature at station I and II.

Results and Discussion:

Water Temperature

The temperature of water is an important factor indicating the quality of water, influencing aquatic life and concentration of dissolved gases and chemical solutes. In the study period from August 2010 to July 2011 temperature was fluctuated between 24° C and 35° C at station I and from 25° C and 34° C at station II (Figure 2). The minimum temperature was recorded in January 2011 at station I and maximum in May 2011 at station II. Gupta et al (2001), Chaudhari et al (2001) and Singh and Singh (2003) also reported the same observation in various freshwater bodies.

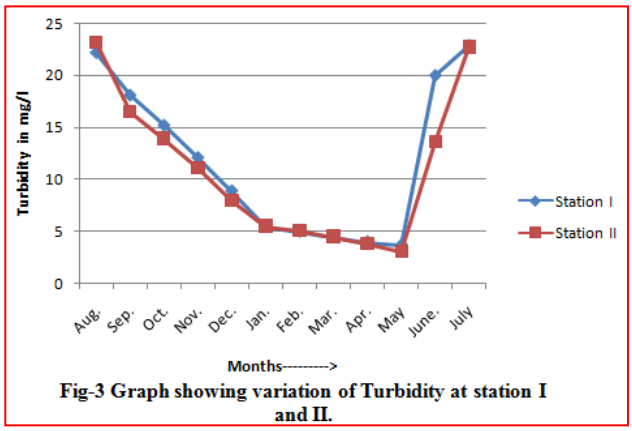

Fig-3 Graph showing variation of Turbidity at station I and II.

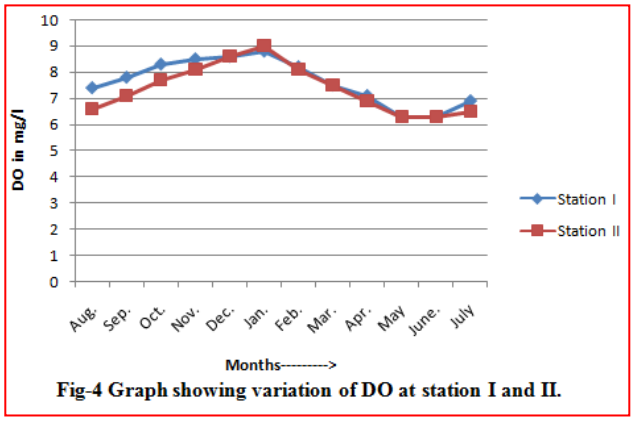

Fig-4 Graph showing variation of DO at station I and II.

Turbidity

Turbidity of the surface water is often an important limiting factor in the development and distribution of plant and animal life in fresh waters. This is most important significance of turbidity monitoring and therefore it has been an indication of effectiveness of filtration of water supplies (Hauser 2001). During August 2010 to July 2011 the fluctuation of turbidity was recorded between 3.7 NTU and 22.9 NTU at station I and from 3.1 NTU and 23.1 NTU at station II (Figure 3). The minimum value of turbidity was recorded in May and maximum in July 2011 at both stations. Prasanna and Panda (2010), Shraddha et al (2011) and Chandra et al (2011) also s upport our findings.

Dissolved oxygen

Dissolved oxygen (DO) has been a fundamental requirement of life for plant and animal population in any given body of water. Dissolved oxygen of water is an important test to study the quality of water. Its optimum value for good quality water has been 4 to 6 mg/lt of DO which is able to maintain aquatic life in a water body. If DO values

are somewhat lower than this value, this indicates water pollution. In the present investigation the value of DO ranges between 6.3 mg/l to 9.2 mg/l at station I and from 6.3 mg/l to 9 mg/l at station II (Figure 4). The minimum value was recorded in May 2011 and June 2011 at station I. our results tally with the results of Sangpal et al (2011) and Raja et al (2008).

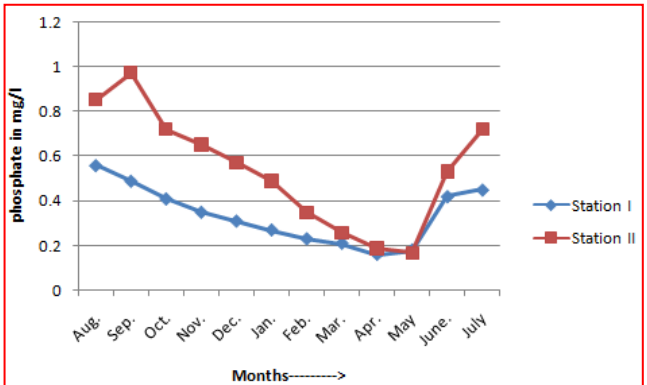

Fig-6 Graph showing variation of phosphate at station I and II.

FREE CO_2

Free Carbon Dioxide is the source of carbon that can be assimilated and incorporated into the living matter of all the aquatic autotrophs. Free CO_2 is directly proportional to bicarbonates and inversely to carbonates. In the present study the free CO_2 showed fluctuation between 0 mg/l to 5.52 mg/l at station I and 0 mg/l to 4.3 mg/l at station II, with minimum in April to July 2011 and maximum in March 2011 at both stations (Figure 5). Murhekar (2011) and Manjare et al observed the same values while studying on different freshwater

Nitrate

Nitrate represents the highest oxidized form of nitrogen. Nitrogen occurs in freshwaters in various forms, i.e. dissolved molecular nitrogen, inorganic nitrogen in the form of ammonia, nitrite and nitrate, and organic nitrogen as amino acids, proteins and various complex organic compounds. In the present study, the Nitrate showed variation from 0.2 mg/l to 0.85 mg/l at station I and 0.18 mg/l and 0.87 at station II, with minimum in May 2011 and maximum in September 2010 at both stations (Figure 6). Nnaji et al (2010), Murhekar (2011) and Manjare et al observed the same values while studying on different freshwater bodies.

Phosphate

Phosphates are very essential plant nutrients. In aquatic ecosystem the inorganic phosphate as soluble orthophosphate play a dynamic role. The orthophosphates are readily taken up by the phytoplankton or lost to the sediments. Natural sources of phosphorus in water are from the leaching of phosphate being rocks and organic matter decomposition. In the present study the value of Phosphate showed variation 0.16 mg/l and 0.56 mg/l at station I and 0.17 mg/l and 0.97 mg/l at station II (Figure 7). The minimum value was recorded in May 2011 and maximum in September 2010 at both stations. Similar observations were confirmed by many workers such as Trivedi et al (2008), Nduka et al (2008).

Acknowledgment

The Authors are highly thankful to Department of Science and Technology, New Delhi, for providing financial assistance (Dy. No. 100/ IFD/4492/2011-2012) for the completion of Research work.

References

1. Alvares, Claude and Ramesh (1988). Damming the Narmada Published by third world network Malasia 196pp.
2. APHA (2002): Standard method for examination of water and waste water, American Public Health Association Inc. New York 22nd Ed.
3. Chandra S. A. Singh,P. K. Tomar and A. Kumar (2011) Evaluation of physicochemical characteristics of various River water in India, *E-Journal of Chemistry*, 8(4), 1546-1555.
4. Chaudhari U., S. Johari, Seema and Chaudhari P. R. (2001) Trophic status of Chatri lake in vicinity of Amravati city. Indian J. Environ. Health. 43(3) pp. 135-137.
5. Ghosh T. K., Shakila B. and Kaul S. N. (2004); Protection of ecologicaliy sensitive areas: origin of rivers and upper catchment areas, *J. of Indian Association for Enviro. Management,* Vol. 31, 59-64.
6. Hassan, S.S., Sinha, R.K., Ahsan, S.N. and Hassan, N. (1998a); Impact of Fishing Operations and Hydrobiological Factors on Recent Fish Catch in Ganga near Patna, India. In: Inland Fish. Soc. Vol. 30. No. 1. pp. 1 – 12.
7. Hassan, S.S., Sinha, R.K., Hassan, N. and Ahsan, I. (1998b); The Current Seasonal Variation in Catch Diversity and Composition of Fish Communities Vis-a-vis Various Factors in the Ganges at Patna (India) and Strategies for Sustainable Development. Freshwater Biol. 10 (3–4). pp. 141 –157.
8. Hauser B. A. (2001) Drinking water chemistry, A laboratory Manual. Turbidity herp II, 2001, Lewis publishers, A CRC press Company Florida USA pp 71.

9. Manjare S. A., S. A. Vhanalakar and D. V. Muley (2010) Anamlysis of water quality using physico-chemical parameters at Tamdalge tank in Kolhapur district, Maharashtra. Int. Journal of Adv. Biotech. and Research. 1(2). pp 115-119
10. Nnaji J.C., A. Uzairu, G.F.S. Harrison and M.L. Balarabe (2010) Effect of Pollution on the Physico-chemical Parameters of Water and Sediments of River Galma, Zaria, Nigeria. *Libyan Agriculture Research Center*, 1 (2). pp 115-122.
11. Ogbeibu, A. E., Oribhabor, B. J. (2002); Ecological impact of river impoundments using benthic macro-invertebrates as indicators. *Wat. Res.* 36, 2427–2436.
12. Prasanna M. P. and P. C. Ranjan (2010) Physico-chemical properties of water collected from Dhamra estuary. Int. J. of env. Sciences 1(3) pp- 334-342.
13. Raja P., A. M. Amarnath, R. Elangovan and M. Palanivel (2008) Evaluation of physical and chemical parameters of river Kaveri, Tiruchirappalli, Tamil Nadu, India. J. of Envir. Biology. 29(5). pp 765-768.
14. Ram P. and A. K. Singh (2007) Studies on distribution of heavy metals in Ganga water and its bed sediments along the Patna stretch. J. of Environ. Sci. and Engg. 49(3) pp 211-214.
15. Sangpal R. R., U. D.Kulkarni and Y. M. Nandurkar (2011) An assessment of the physico-chemical properties to study the pollution potential of Ujjani reservoir, Solapur district, India. J. of Agr. & Biol. Sci. 6(3), pp 34-38.
16. Shraddha S., D. Savita, J. Praveen, K. W. Shah, R. Vishwakarma (2008) Statistical evaluation of hydrological parameters of Narmada river water at Hoshangabad city, India. Environ Monit Assess.143: 195-202.
17. Shrestha, J. (2001); Taxonomic Revision of Fishes of Nepal. In: *Environment and Agriculture: Biodiversity, Agriculture and Pollution in South Asia*. (eds.) Jha, P.K., Baral, S.R., Karmacharya, S.B., Lekhak, H.D., Lacoul, P. and Baniya, C.B. Ecological Society, Kathmandu, Nepal. Pp. 171 –177.
18. Trivedi P., A. Bajpai and S. Thareja (2009) Evaluation of water quality: Physico-chemical characteristics of Ganga river at Kanpur by using correlation study. Nature and science.1(6) pp91-94.
19. Unnisa S. A. and Khalilullah M.(2004); Impact of industrial pollution on ground and urface water uality in the Kattedan industrial area, *J. of Indian Association for Enviro. Management*, 31 pp 77-80.
20. Welch E. B, Jacoby J. M. and Christopher W. M. (1998); Stream quality in river ecology and management lesson from the pacific coastal eco region published by springer Varley New York. 69-94.

4/22/2012