Assessment of water quality by monitoring different water parameters of Narmada River Madhya Pradesh, India

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Abstract
The macro invertebrate community was found in the different types of micro-habitat and various flowing speed levels in good quality of water of river Narmada consisted mainly of aquatic insects. There are large numbers and wide species of aquatic insects in aquatic habitats make them of great ecological importance. There are three divided strata with total of five sampling location were carried out within several varieties of microhabitats such as sandy, cobble, gravel, leaf and the pool area. Water samples were collected from sampling stations every month and were analysed as per standard methods. Minimum value of Total solids, DO and Chloride was recorded in January month and maximum value in June-July months. The results of present study indicate that physico- chemical parameters of Narmada River are within WHO limits.

Introduction:

India is a unique country with great cultural diversity associated with all kinds of climates, rich flora and fauna. In spite of enormous volume of hydrosphere only a small portion of it is actually available as resource. More than 97% occurs in the form of sea, whose salinity makes it useless, while fresh water makes up only 2.6%.

Water is a basic need of life and is the foundation for human survival and development. Water is the most common substance on earth, covering seven tenths of the world's surface, and that is why earth is also called the blue planet. Life first started in water and 96% of the composition of all living cells is water. Water is one of the prime needs of life. We can hardly live for few days without water. Since time immemorial freshwater has always been of vital importance to man as his early habituations were within easy reach of rivers, tanks, dams, ponds and lakes. The importance of freshwater resources, their conservation and utilization has attained almost utmost importance during the present time.

The Narmada river, hemmed between Vindya and Satpuda ranges, extends over an area of 98,796 km². And lies between east longitudes 72 degrees 32' to 81 degrees 45' and north latitudes 21 degrees 20' to 23 degrees 45' lying on the northern extremity of the Deccan Plateau. The basin covers large areas in the states of Madhya Pradesh (86%), Gujarat (14%) and a comparatively smaller area (2%) in Maharashtra.

Water pollution, including siltation, is endemic to almost all inhabited parts of the world and is consistently ranked as one of the major threats to freshwater ecosystems (Richter et al., 1997). Habitat loss and habitat degradation are also major reasons for worldwide biodiversity loss in aquatic ecosystems, and are caused by a multitude of anthropogenic disturbances (Allan and Flecker, 1993; Richter 1997). The threat of global climate change is pervasive across all of the Earth's ecosystems, and is also often cited as a major threat to freshwater

biodiversity (Sala et al., 2000; Strayer and Dudgeon, 2010). The objectives of the present study are to study the various parameters of the Narmada River and to suggest measure to minimize the pollution, which is increasing due to anthropogenic activities.

Material and Methods:

Study Area:

The Narmada basin, hemmed between Vindya and Satpuda ranges, extends over an area of 98,796 km^2 and lies between east longitudes 72 degrees 32' to 81 degrees 45' and north latitudes 21 degrees 20' to 23 degrees 45' lying on the northern extremity of the Deccan Plateau. The basin covers large areas in the states of Madhya Pradesh (86%), Gujarat (14%) and a comparatively smaller area (2%) in Maharashtra. 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 MP 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.

Sampling stations:

(A) Indra Sagar Dam (S1)

Indra Sagar Dam is 10km away from Punasa village in Khandwa district of western Madhya Pradesh. It is 653 m long concrete gravity dam with a slightly curved alignment. It is about 92 m high from the deepest foundation level. Itscatchment area is 61542 sq. kms.

Its longitude is 76º28’00’’ and latitude 22º17’00’’.

(B) Omkareshwar (S2)

Omkareshwar is a famous place of pilgrimage situated 77 km from Indore in Khandwa District, Madhya Pradesh. This station has a religious importance and is visited by pilgrims from all over the country to seek blessing at the temple of Shri Omkar Mandhata.

It’s Latitude 22º15, 1”N and Longitude 76º8’, 48”E.

(C) Maheshwar (S3)

Maheshwar is a small town in Khargone district of Madhya Pradesh state in central India. It is located 91 km away from Indore, the commercial capital of the state. The town lies on the north bank of the Narmada River.

It’s latitude 22º10’, 60”N and longitude 75º34’ 60”E.

Physico chemical analysis of water

The water samples were collected from the sampling stations for the period of 12 months. In the analysis of the Physico-chemical properties of water, standard methods prescribed in limnological literature were used.

Parameters like Temperature, pH and Turbidity were determined at the site, while other parameters like Dissolved Oxygen, Chloride, Alkalinity, total Solids were determined in the laboratory. The Physico-Chemical parameters of water were determined as per standard methods of APHA (2002), Welch (1998), Golterman (1991)

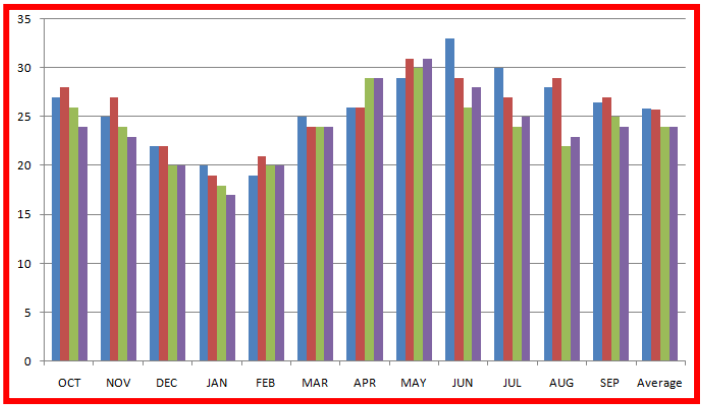
Results and Discussion

Water Temperature

The oxidation of organic matter is highly influenced by the temperature of water. Temperature of river water depends upon the season, climatic zone, where river is flowing, time of sampling and also upon the temperature of the effluents, which are being added in the river. During October 2019 to September 2020 water temperature was recorded from 18º C to 33º C. The

minimum temperature of 18° C was recorded at Station-I in January 2020 and maximum temperature 35 ° C was recorded in station-II in May 2020 and in Station-I & Station –III in May 2020 (Graph 1). The same observations were also reported by Sharma et al (2011) and Shraddha et al (2008) in Narmada River. Shraddha et al (2008) while studying the hydrological parameters of Narmada River at Hoshangabad recorded water temperature between 27.6°C to 38.4°C.

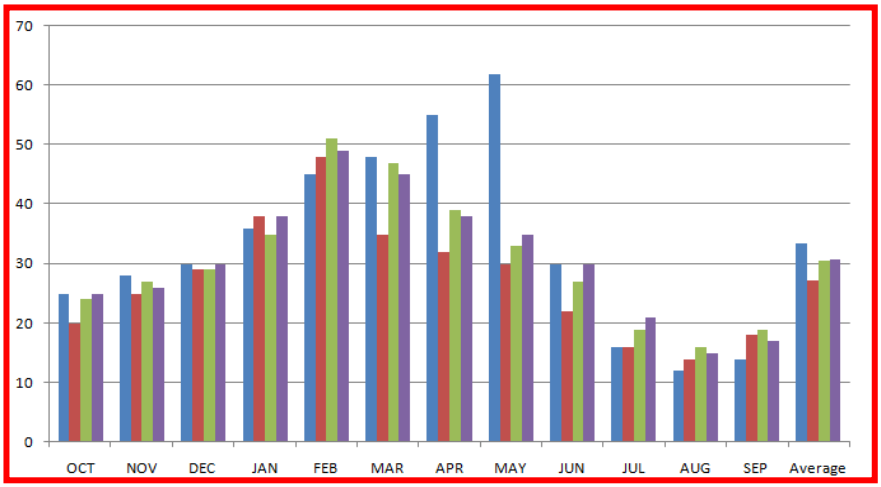
GRAPH 1. SHOWING MONTHLY FLUNCTUATION IN TEMPERATURE (°C) IN NARMADA RIVER



Turbidity

Turbidity has been long known to hinder disinfection by shielding microbes, some of them perhaps pathogens. 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 October 2019 to September 2020 turbidity fluctuated from 12 NTU to 62 NTU. The minimum turbidity of 3.1 NTU was recorded at station-I in August 2020 and maximum of 62 NTU at Station-I in May 2020 (Graph 2). These observations were also supported by Prasanna and Panda (2010), Shraddha et al (2008) and Trivedi et al (2009).

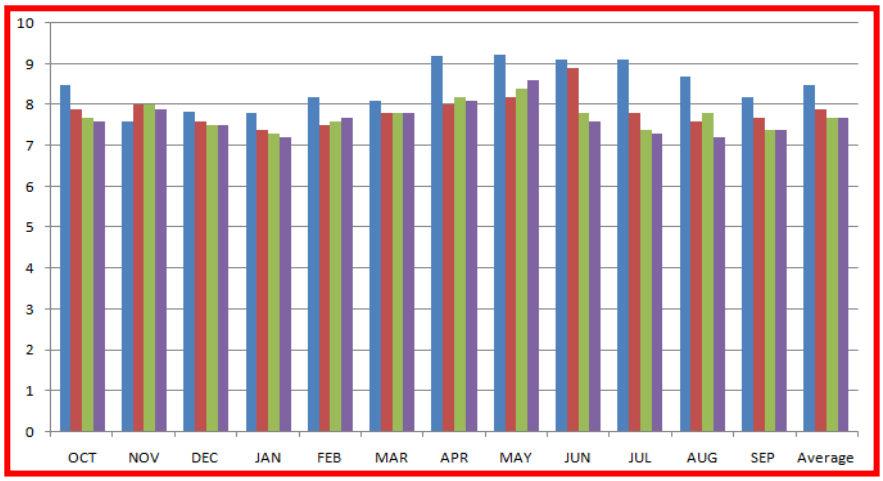
GRAPH 2. SHOWING MONTHLY FLUNCTUATION TURBIDITY (NTU) IN NARMADA RIVER



pH

pH is an important parameter which is important in evaluation the acid base balance of water. Natural waters generally have been found to range from 5.5 to 8.6 because of the presence of bicarbonates and carbonates of alkaline earth metals. Drinking water with a pH range from 6.5 to 8.3 has been necessary. During October 2019 to September 2020 pH showed variation between 7.2 to 9.3. The minimum pH of 7.3 was recorded at station-IV January 2020 and maximum of 9.3 at station-I May 2020 (Graph 3). Sharma et al (2011) observed pH fluctuation between 7.6 to 9.9 in Hoshangabad area of Narmada River. Prasanna and Ranjan (2010) observed pH value between 7.5 to 8.5 in Dharma estuary.

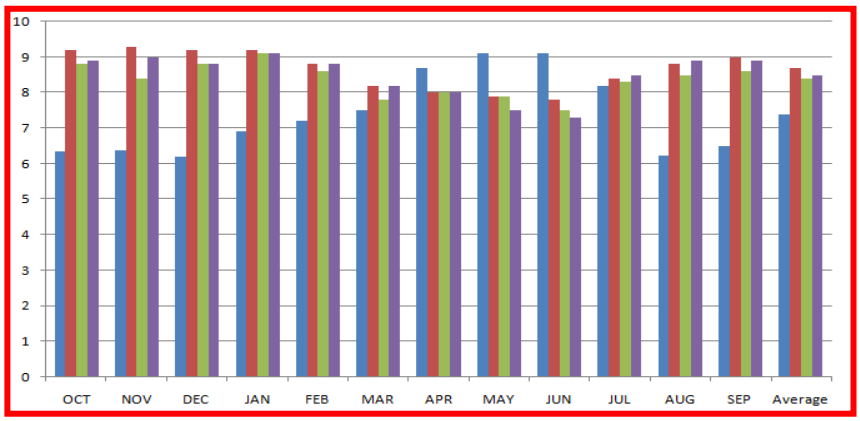
GRAPH 3. SHOWING MONTHLY FLUNCTUATION pH IN NARMADA RIVER

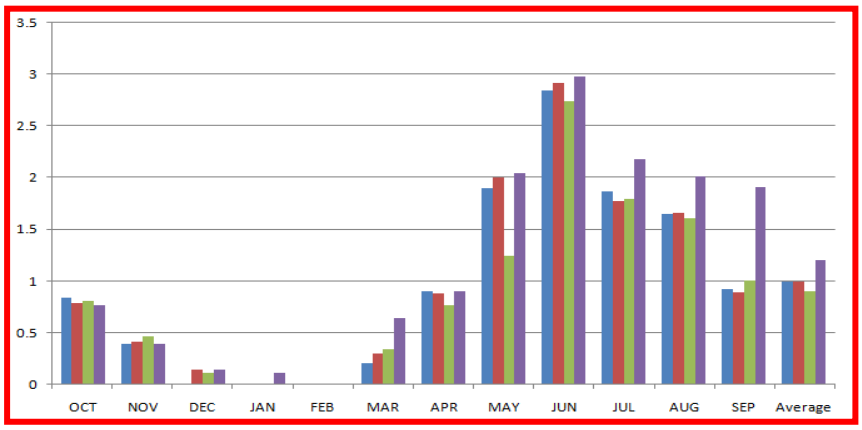


Dissolved Oxygen

Dissolved oxygen is paramount importance to all living organisms and is considered to be the lone factor, which to a greater extent can revealed the nature of whole aquatic system. During the present study the dissolved oxygen showed variation from 6.2 mg/l to 9 mg/l. The minimum dissolved oxygen of 6.2 mg/l was recorded at station-I in December 2019 and maximum of 9 mg/l at station-I & station-IV in June 2020 respectively (Graph 4). Same observations were also recorded by Nnaji et al (2010) and Mary et al (2008).

GRAPH 4. SHOWING MONTHLY FLUNCTUATION IN DISSOLVED OXYGEN IN NARMADA RIVER





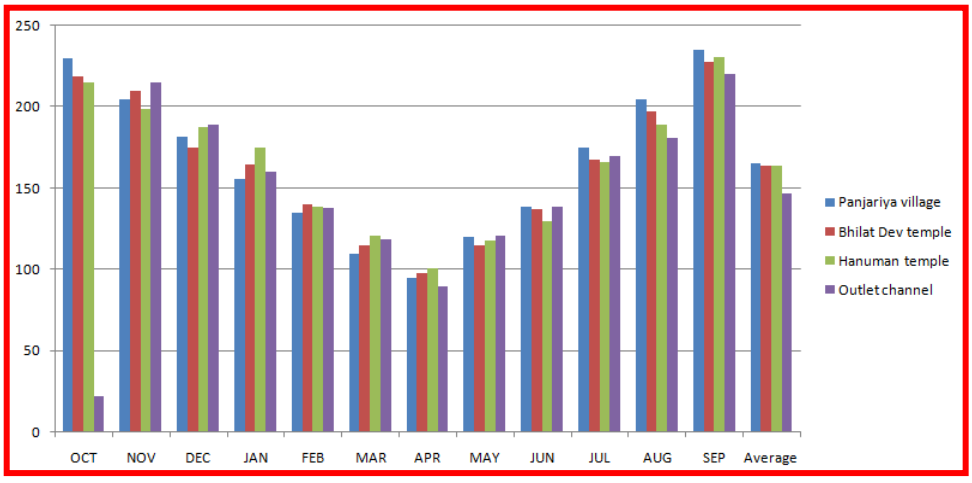
FREE CO_2

Free Carbon Dioxide is the source of carbon that can be assimilated and incorporated into the living matter of all the aquatic autographs. Free CO_2 is directly proportional to bicarbonates and inversely to carbonates. Free CO_2 is added to the water as a by product of decomposing organic matter, which is common phenomenon in natural waters. Free CO_2 in polluted water is generally high. Permissible limit of Free CO_2 in drinking water is 2 mg/l. During October 2019 to September 2020 the free CO_2 showed fluctuation between 0 mg/l to 2.98 mg/l with minimum in February 2020 at all the four stations and maximum at station-IV in June 2020 (Figure 5). Nduka et al (2008) also recorded value between 1.00 to 2.20 mg/l in Niger delta of Nigeria.

Alkalinity

Alkalinity measures the buffering capacity of water and content of CO_2 in its various forms are involved in this carbonate-bicarbonate carbonic acid buffering system. In the present study the value of Alkalinity varied from 22 mg/l to 235 mg/l. The minimum alkalinity of 22 mg/l was recorded at station-IV in October 2019 and maximum of 235 mg/l at station-I in September 2020 (Figure 6). Trivedi et al (2009) also observed the same value in Ganga river India.

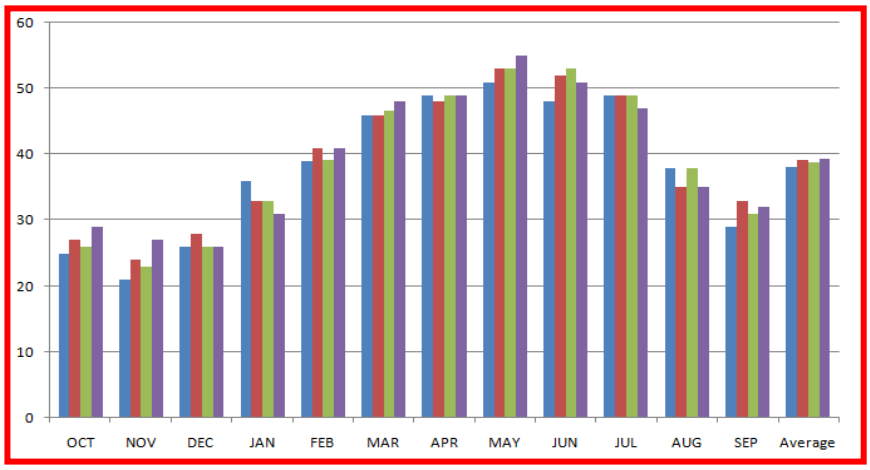
GRAPH 6. SHOWING MONTHLY FLUNCTUATION IN ALKALINITY IN NARMADA RIVER



Chloride

Chlorides occur naturally in all types of waters, in Natural freshwaters, however, their concentration remains quite low and generally less that of sulphate and bicarbonate. Higher concentration of chlorides is considered to be the indicator pollution due to higher organic waste of the animal origin or industrial effluents. In the present study the value of Chloride varied from 21 mg/l to 55 mg/l. The minimum chloride of 21 mg/l was recorded at station-I in November 2019 and maximum of 55 mg/l at station-IV in May 2020 (Figure 7). Similar results have been observed by Chowdhary (2011) and Siraj et al (2010).

GRAPH 7. SHOWING MONTHLY FLUNCTUATION IN CHLORIDE IN NARMADA RIVER



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