

**STUDIES OF POLLUTION ON AQUATIC  
ORGANISMS OF NARMADA RIVER**

**SUMMARY**

**Ph. D. thesis submitted by  
K. N. SHARMA**

**Division of Fishery and Aquatic Biology  
Department of Zoology, Faculty of Science  
The Maharaja Sayajirao University of Baroda  
VADODARA – 390002  
INDIA**

**DECEMBER**

**2005**

## **SUMMARY**

**THE NARMADA** is the largest west flowing river of India. It arises in the Amarkantak hills of Vindhyaachal Mountains in Madhya Pradesh. It is the 5<sup>th</sup> largest river of India. The river from its origin to submersion passes from three states viz., Madhya Pradesh, Maharashtra and Gujarat and finally submerges with Gulf of Cambay near town Dahej in the Bharuch District of Gujarat State. Nearly 160 km river span with two distinct zones of fresh water and estuary is distributed in districts Narmada and Bharuch of the Gujarat state. From its confluence point eastward, due to tidal influence a vast saline intrusion zone is created, nearly of 30 km range upstream. Several small rivers like Amravati, Bhadar, Dhamni, Bhukhi, Kaveri, Nand and Manikaran nadi pours its water in the main channel of river Narmada.

The Industrial patch a part of 'Golden Corridor' has developed along the southern bank of river Narmada. The Ankleshwar, Panoli and Jhagadia Industrial zones uses the water of the river and pours waster water in the tributaries of the main river, collected treated effluent is poured near Samni village opposite Bhadbhut. On the north bank of the river NTPC – Jhanor, GNFC – Bharuch and GIDC - Vagra are the main industrial

establishment also utilizes the river water for its needs. The water of river Narmada is used mainly for humans' needs, agriculture and industrial needs.

Due to features like stratification of salinity intrusion, industrial and urban waste flow to the river, possible agriculture run off and finally the possible impact of Sardar Sarovar Project in altering water flow dynamics of fresh water inflow reduction etc. it was felt to analyze water quality of the river and its possible relation to aquatic organisms living in and on it.

This project has been planned to fulfill the requirement of data related to possible changes in the water quality and its impact on the biodiversity, fisheries etc. To achieve the aim of the project the selection of suitable site, water quality analysis, survey of organism diversity, impact analysis for water quality and organisms and fishery component analysis was carried out.

For the collection of samples a study area between north to Bharuch to north to Bhadbhut was selected and from this study area three most convenient sites were demarcated. Site I was close to tidal influences and effluent dispersal area, Site II was the zone of fresh water having impact of domestic sewage and

Site III was upstream location away from nearly all influences and was a pure fresh water zone.

All samples were collected during morning hours only. The samples were appropriately preserved for laboratory analysis. The abiotic parameter analysis was done using suitable methods described by American Public Health Association. Biotic parameters were also analyzed using appropriate methodology.

Water quality analysis for its physical and chemical nature was recorded. Physical factors like surface temperature, electric conductivity, turbidity etc. were collected while chemical factors like pH, Total solids, total hardness, dissolved gases, dissolved salts and heavy metals were analyzed. Various parameters during these two years were studied for three seasons viz., pre-monsoon, monsoon and post-monsoon and the sample collected during the specified time period.

Surface temperature ranged between 18°C - 30°C, it shows decline trend from pre-monsoon to post-monsoon seasons. The electric conductivity of the sample water remained to higher range compared to clear fresh water. No definite pattern was observed seasonally except usually it remained high during pre-

monsoon. Turbidity recorded high during pre-monsoon season during both the years. It was conclusive on the basis of our observation that physical parameters were in the high range during pre-monsoon always.

Chemical nature of water quality was due to its relation with soluble salts. pH remained in the alkaline level for all the sites and samples, was highly alkaline during post-monsoon season. Total alkalinity ranged from 100 – 350 mg/l as an average value; however, it was higher than 500 mg/l during post-monsoon season of 1<sup>st</sup> year. Hardness of water and total solid were recorded with in normal range and do not present any specific trend. Sulphate, phosphates and nitrates reported as high during December to February for both the seasons, high during late pre-monsoon and do not show any significant trend respectively. Chemical oxygen demand was high during pre-monsoon and also at the time of new water flow during mid-monsoon. During post monsoon dissolved oxygen content was found increased. Metals in the dissolved state from the water samples were quite negligible and also do not present any specific trend as per their content or seasonality.

Biotic factor were analyzed with reference to their relation with abiotic factors, mainly water quality. For phytoplankton a definite

pattern was observed as Bacillariophyceae → Chlorophyceae → Cyanophyceae → Eulgenophyceae for the unpolluted water. But at site I and site II some different pattern was observed. Phytoplankton with chlorophyll pigments were abundant at the site II due to the effect of domestic sewage which leads to increase in the organic content. At site I due to the influence of effluent as well as tidal water Bacillariophyceae → Eulgenophyceae relationship was marked. Aquatic macroflora was abundant at site II due the influence of sewage. All most all the tropical varieties of aquatic flora have been registered from different sites, usual dominance of floating weed was the main feature of this river.

Zooplankton communities were represented from the phylum Protozoa, Arthodpoda, Rotifera etc. Several other varieties of zooplankton from different groups were also recorded. Usual trend was Arthropods → Protozoa → Rotifera, at site I and site III. Only at site II immediate to post-monsoon marked increase in the abundance of Protozoa and different larval forms was seen. Several insect fauna has been reported from the study area. Main representation was of larvae and nymphs of various flies. At site II the presence of nematods and annelids was recorded.

Such presence in abundance may be due to high organic matter in the water of site II due to inflow of domestic sewage. Several different forms of invertebrates mainly from phylum mollusca has also been registered.

The vertebrate fauna from the river were represented by several fresh water and euryhaline fishes, turtles etc. The study area largely sustains the riverine fisheries of entire Gujarat. Two major fisheries like Palva (Hilsa) fishery and Scampi fishery regularly operates within this area, Due to several reasons the alteration in the status of these fisheries has been observed in last five years; however, no significant correlation could be established from our investigations also.

The river Narmada holds very significant position in Gujarat state. Several projects and investigations were carried out for various aspects of river Narmada. Here in this project it was an attempt to create database for recent status of its water quality and its relation to biodiversity. As scanty and patchy documentation has been observed for few essential inventories we have made an attempt to rationalize it.

Only concern about water quality of the main river stream, biodiversity and fisheries is that of fresh water inflow to sustain

natural and present environment. To sustain the importance of this river for its biotic features and economic values few steps should be taken. It is essential to maintain post-monsoon fresh water flow dynamics, control ingress of saline water as tidal water to reduce of increase in saline stratification in the saline intrusion zone, manage the dumping of treated effluent to other site and allow only treated effluent to flow to the outer most reach of river mouth to reduce its impact etc.

*fisher*

*Chankode*