MATERIALS AND METHODS

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The study area:

The Narmada River is one of the major rivers of Gujarat plain. The study area covers nearly 35 km of downstream of river Narmada from Jhanor to Bhadbhut. (Fig.1B). Within this downstream area few sampling sites were selected, on the basis of primary analysis the study sites with varied features were finalized.

The study sites:

To fulfill the requirement of the aim set forth the different study sites were determined. Three main study sites were finally decided for further critical analysis The sampling was carried out from the study site on a random sampling basis. Usually the study site was covering area of around 0.5 km with having all possible similarities in the properties (Plate 1). Following three study sites also termed as sampling sites were finalized.

Site – I

The site I on the northern bank of the river but around 30 kms from Bharuch. The site is within tidal influence zone but over criteria for the selection of this site is purely dependent on the

Plate - 1

influence of effluent discharge The sampling site was just opposite to the opening of Amlakhadi, which brings treated and untreated effluent from GIDC Ankleshwar and Valia (Plate 2A & 2B). Here the river bed widens and then is bifurcated due to an island - Aliabet. This site is selected as it is the dumping place for Aliabet. The channel towards south bank is generally narrow and due siltation has high level has less tidal influence while the channel on North side is wider and due to less siltation has more effect of tidal influence and water flow.

Site – II

This site is on the north bank of river and just west to the town Bharuch. This site selected as it is the dumping place for domestic sewage. The ephemeral ponds and few pools have been developed in the river bed around this site. The water usually is greenish or blackish in colour and having turbid optical appearance due to high density of algal matter. (Plate 3)

Site – III

This site is having minimum influence of agriculture runoff and not having any effluent or sewage entering in to it. The site is located on the north bank near Sardar Bridge (Plate 4). This site is considered as freshwater site or impact free site This area

Plate - 2

Plate - 2

Plate - 2

also receives minimum tidal influence. The water usually is less turbid over here.

Sampling procedures:

To evaluate the abiotic status of the river, the water quality analysis was carried out. Biological component analysis was done by the collection of flora and fauna from each site. Planktonic analysis was done in detail to understand the ecology and impact on it. The entire sampling was carried out during morning hours.

Water Sampling:

Water samples were collected randomly from the selected site. The water was collected in 500 ml plastic bottles at a depth of 0.5 meter from the surface. This sample was used for routine physico-chemical and pollution status analysis. The physico-chemical analysis was carried out by adopting methodology described by American Public Health Association (APHA) bulletin (APHA, 1960). Routine measurement of temperature was done by alcoholic centigrade thermometer and pH was measured by pH indicator papers, all the parameters were expressed in universal units of measurements.

Table showing unit of parameters used

Parameter	Units of measurement
Temperature	^0C
Turbidity	mg/l
Electrical conductivity	Mhoms
pH	
Dissolved Oxygen	mg/l
Sulphates	mg/l
Phosphates	mg/l
Chlorides	mg/l
Nitrates	mg/l
Carbonates	mg/l
Bicarbonates	mg/l
Ammonical Nitrogen	mg/l
Chemical Oxygen Demand	mg/l
Total alkalinity	mg/l
Total Hardness	mg/l
Calcium Hardness	mg/l
Magnesium Hardness	mg/l
Suspended Solids	mg/l
Total Dissolved Solids	mg/l
Total Solids	mg/l
Copper	Ppm
Cobalt	Ppm
Ferrous	Ppm
Zinc	Ppm

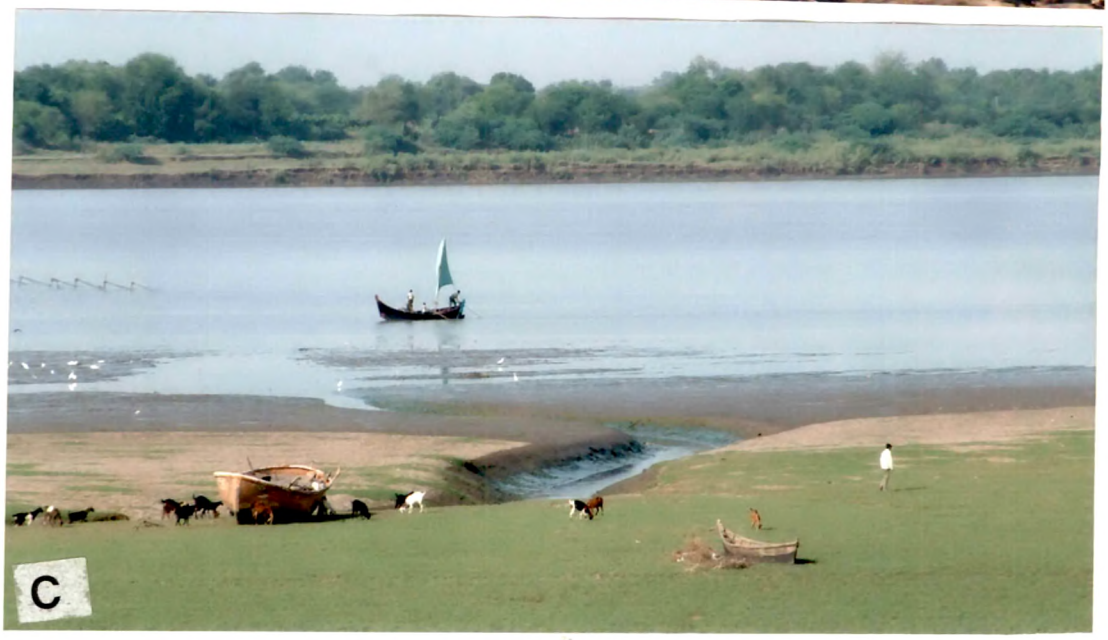
For confirmation of accuracy of the quality parameter data, such samples were subjected to colorimetric or spectro-photometric analysis. The quality parameters related to pollution status were analyzed by using atomic absorption spectro-photometer at private laboratory. The data were pooled to generate monthly as well as seasonal data set.

Sampling of Biota:

From each site the floating, and submerged plants were collected and were brought to the laboratory for their identification. The identification of such plant matter was done using standard keys. The phytoplankton material was collected by filtering 10 liters of water sample through fine mesh net several times to obtain sufficient study materials (Plate 5). The planktonic matter was than transferred to Lugol's Iodine Solution for preservation. In the laboratory such saturated planktonic matter was mixed with 50 ml water and than centrifuged at different speeds to get stratified phytoplankton matter. The phytoplankton were identified using identification monograph and APHA volume.

Animals invading this river were collected by operating cast net and small drag net. Also this river is a good source of fishable material, such is collected by a static net - Gola net (Plate 6). The samples were collected from the catch of this Gola net. All this animals were preserved in 10% formalin and brought to the laboratory for their identification. The identification was done using appropriate illustration, keys and references. Zooplankton were collected by a conical fine mesh net. A net made from 20 micron nylon mesh of 2 ft. was used for collection of

Plate - 3




D


E

Plate - 4

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Carbonates	mg/l
Bicarbonates	mg/l
Ammonical Nitrogen	mg/l
Chemical Oxygen Demand	mg/l
Total alkalinity	mg/l
Total Hardness	mg/l
Calcium Hardness	mg/l
Magnesium Hardness	mg/l
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Plate - 5

A

B

Plate - 6

Zooplankton. The collection of plankton was done by allowing flow of water to pass through this net at surface and sub surface. The material was collected in a plastic bottle and preserved by 10% formalin. The analysis of identification of zooplankton using standard reference and optical microscope was carried out in the laboratory. Statistical analysis for these plankton was done for their group level taxa.

Data collected by various methods described earlier were pooled together and tabulated for monthly and seasonal analysis. The data are presented in table and graphical forms. The photographic evidence is documented and presented for various samples. For such photographic documentation a digital camera was used.