

Species richness and abundance of Macro invertebrates in Sabarmati river, Gujarat.

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Abstract:

Benthic macro invertebrates are best indicators for Bio-assessment. The abiotic environment of the water body directly affect in the distribution, population density and diversity of the macro benthic community. Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (walker et. al 1991). The present study deals with the population density and species diversity of aquatic macro invertebrate fauna. Macro-invertebrates were identified up to family level, and bio assessment at various locations has been done. 27 species of taxonomical group like *Oligochaetes*, *Diptera*, *Mollusca*, *Hirudinea*, *Insecta*, *Crustacea* etc have been found in different composition inhabiting the river.

Key words : Oligochaeta, Hirudinea, Gastropoda, Pelecypoda, Insecta, Shrimps

Introduction :

The present study deals with the Species richness and abundance of Macro invertebrates in Sabarmati river. *India's river system ranges from 14 major rivers, 44 medium sized rivers to 55 minor rivers with total linear length of 45,000 km. Some of the largest rivers in the world are in India and 80% of the total length is covered by 14 major rivers (Belsare 2006).*

Benthic macro invertebrates are best indicators for bio-assessment. The abiotic environment of the water body directly affect in the distribution, population density and diversity of the macro benthic community. Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (Sharma, 2002). The littoral region is an important interface between land and pelagic zone of water body. Rooted plants, micro and macro-invertebrates and demersal fish species occupy it.

Macrozoobenthic organisms play an important role in the energy cycle of fresh-water bodies. Their value as indicator organisms of water quality and occurrence with relation to the

sedimental particle size were highlighted in several reports. Pennak (1989), Sharma and Belsare (1997), Pathak and Mudgal (2005), Sharma et.al. (2007).

After preliminary survey of the Sabarmati river for the benthic biodiversity and nature of bottom. Four sampling stations were selected for the study, on shore line of the river. Monthly sampling of all these stations were made (March 2010 – April 2011). A rod net was used in collecting hand sample and sieving them for isolation. The bigger animal species picked up by hand where as the smaller. Form were isolated by sugar floatation method and studied them under low power (x50) microscope. They were preserved by narcotizing them by Methanol and Chloral hydrate and late 70% Alcohol. The benthic organisms were identified with the help of Tonapi (1980), Pennak (1989). APHA (1998) Standard books.

Material and method:-

A sample consists of collection of 20 sub samples each of $0.25 \times 0.25 \text{ m}^2$ taken from all microhabitat type. This procedure results in sampling of approximately 1.25 m^2 river bottom area. Net of mesh size $500\mu\text{m}$ is used for collecting the macro invertebrates. Every large boulder or cobble in the area is picked up if it could be lifted and organisms vigorously washed by hand into the net. Finally, the substrate with smaller boulders should be distributed by kicking systematically across the area 3-4 times such that invertebrate wash D/S into the net. The organisms are then picked from the net surface & preserved immediately in 80% ethanol or 4% formaldehyde. These samples are returned to the laboratory for processing. Specimen collected are sorted & identified up to family level with the help of regional keys in the laboratory under the dissecting microscope. The benthic organisms were identified with the help of Tonapi (1980), Pennak (1989). APHA (1998) Standard books. Water samples were collected in plastic container for different physico-chemical parameters. The chemical characteristic were determined by the standard methods suggested of APHA (2002), Weltch(1998), & Golterman(1978).

Sampling site

(1)Dharoi Dam

Located at Dharoi in Sabarkantha District, the Dharoi Dam was built for supplying drinking water to urban areas such as Ahmedabad that is located 85 km away. Dharoi Dam was constructed across the Sabarmati River in 1973. The dam is also one of the tourist spots in the state, with Gadada Shamlaji another nearby tourist attraction. Dharoi Dam can be reached from Poshina, which is located about 45 km away. . The latitude and longitude of the dam are 24° 00' N and 72° 52' E, respectively. Its purposes are water supply , irrigation, flood control and power generation. The catchment area of the river at the dam site is 5,540 sq. Km

(2) GANDHINAGAR

Gandhinagar got its name from the Father of the Nation, Mahatma Gandhi. Gandhinagar is the capital city of Gujarat and is an important city in Gujarat in India. At a distance of 32 kilometers towards north east from Ahmadabad lies Gandhinagar. Gandhinagar is situated on the west bank of river Sabarmati. History of Gandhinagar states that the city was established around 1960. The latitude and longitude of the Gandhinagar are 23° 13' N and 72° 41' E, respectively.

(3) AHMEDABAD

Ahmedabad is the largest city in Gujarat, India. It is the seventh largest city and eighth largest metropolitan area of India, with a city population of approximately 3.96 million and metropolitan population of 5.41 million. Ahmedabad is the fastest growing city of India, and ranked third as the fastest growing city worldwide. It is located on the banks of the River Sabarmati, 32 km from the state capital Gandhinagar. The city is the administrative centre of Ahmedabad district and was the capital of Gujarat from 1960 to 1970; the capital was shifted to Gandhinagar thereafter. The latitude and longitude of the Ahmedabad are 23° 03' N and 72° 40' E, respectively.

(4) VAUTHA

This fair is held every year at Vautha, where two rivers, the Sabarmati and the Vatrak meet. Vautha fair site is also known as Saptasangam as it is at the confluence of seven rivers..The Vautha Mela site is 3 square miles in area. The site, also known as Saptasangam, is at the confluence of seven rivers. Traders at Vautha would be wont to describe the transactions as being on a "take it, ass is" basis. This means that before you count out the hundred rupee notes, you have to debate and discuss the physical attributes and utilitarian qualities of your purchase. Which is what you would see the thousands doing every year on the 11th day after Diwali at a nondescript hamlet of 3,500 people in Dholka taluka of Ahmedabad district. The latitude and longitude of the Vautha are 21° 38' N and 69° 37' E, respectively.

Results and discussion

Table-01: QUALITATIVE ANALYSIS OF BENTHIC MACRO- INVERTEBRATES

Macro-invertebrates recorded at different depth of Sabarmati River (year 2010-2011)

Group	Macro-invertebrates	0.2m	0.5m	1m	1.5m
1. Phylum Annelida (A) Class-Oligochaeta	1. <i>Tubifex tubifex</i>	RA	RA	RA	RA
	2. <i>Chaetogaster sp.</i>	I	I	I	SR
	3. <i>Nais simplex</i>	I	I	I	I
	4. <i>Aeolosoma bengalensis</i>	I	I	I	NR
	5. <i>Dero limosa</i>	I	I	RA	RA
	6. <i>Branchiura sowerbyi</i>	RA	RA	RA	RA
	7. <i>Stylaria fossularis</i>	RA	RA	RA	RA
(B) Class-Hirudinea (Leeches)	1. <i>Helobdella sp.</i>	I	I	NR	NR
	2. <i>Glossiphonia sp.</i>	I	I	NR	NR
	3. <i>Hemiclepsis marginata</i>	NR	NR	NR	ILA
2. Phylum Mollusca (A) Class-Gastropoda	1. <i>Planorbis sp.</i>				
	2. <i>Limnaea auricularia</i>	RA	RA	RA	SR
	3. <i>L. acumainata</i>	RA	RA	SR	NR
	4. <i>Limnaea sp.</i>	RA	RA	SR	NR
	5. <i>Vivipara bengalensis</i>	I	I	I	I
	6. <i>V. oxytropsis</i>	RA	RA	RA	ILA
	7. <i>B. bellamyia sp.</i>	RA	RA	RA	ILA
(B) Class-Pelecypoda	1. <i>Lamellidens marginalis</i>	RA	ILA	RA	RA
	2. <i>L. consobrinus</i>				

(Bivalvia)		ILA	ILA	NR	NR
		ILA	ILA	NR	NR
3. Phylum Arthropoda	1. <i>Chironomus phumosus</i>				
	2. <i>Strictochironomus sp.</i>				
	3. <i>Baetis sp.</i>				
	4. <i>Corixa sp.</i>	RA	RA	RA	RA
(A) Class-Insecta	5. <i>Berosus sp.</i>				
	6. <i>Hydaticus sp.</i>	RA	RA	RA	RA
		ILA	ILA	ILA	-
	1. <i>Apus (tadpole shrimp)</i>	I	I	RA	-
	2. <i>Daphnia (water flea)</i>	I	I	I	I
(B) Class-Crustacea		ILA	ILA	-	-
1. Branchipoda (Shrimps)		ILA	ILA	ILA	ILA
		ILA	ILA	ILA	ILA

Key :

RA = Regular and abundant.

I = Irregular

- = Absent

ILA = Irregular and less abundant

NR = Not Recorded

RLA = Regular & less abundant

TSO = Two Specimens in one month.

SR = Single Record Specimens

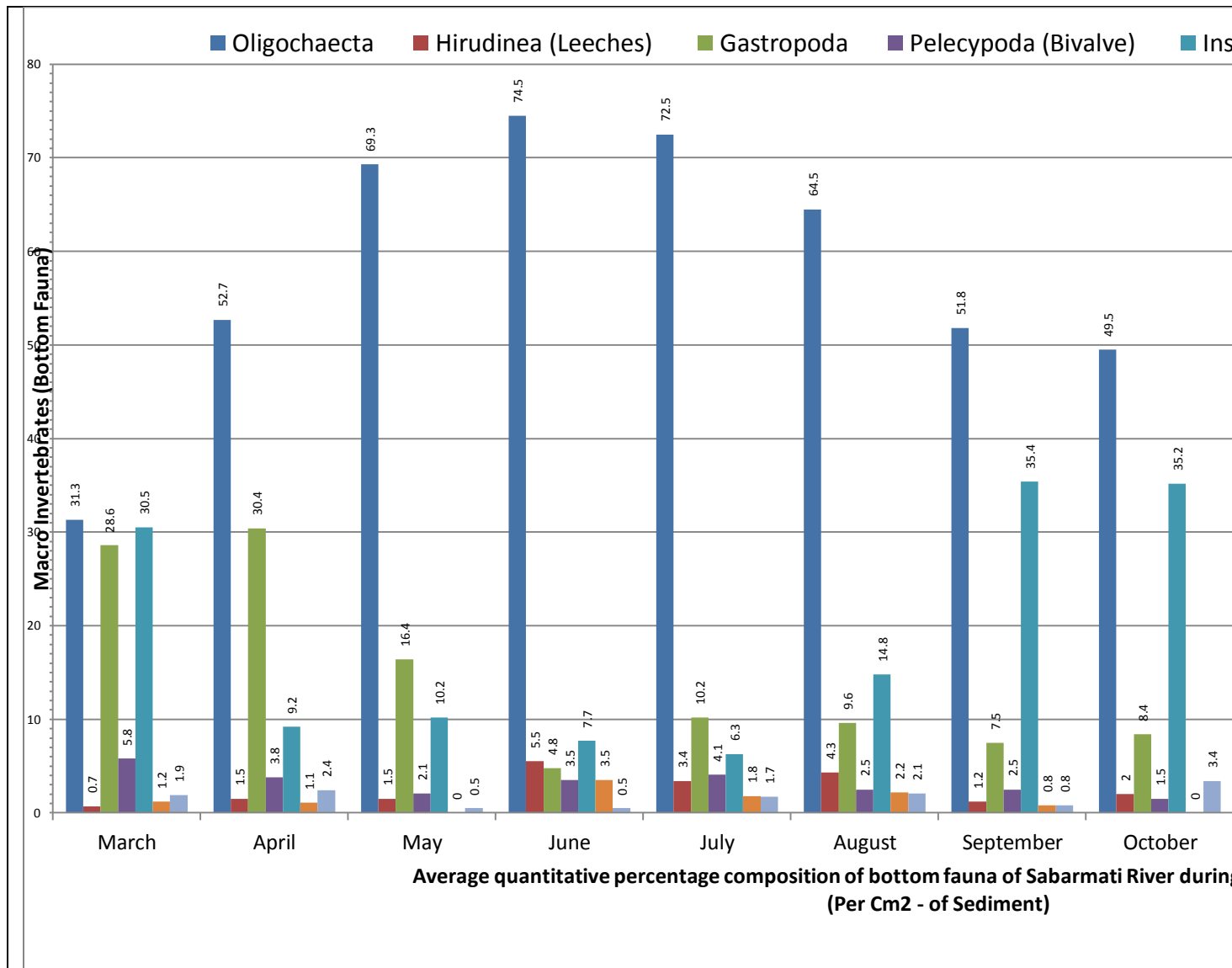
Table –02: Average quantitative percentage composition of bottom fauna of Sabarmati River during 2010-

2011 Four Station (Per Cm²- of sediment)

Average quantitative percentage composition of bottom fauna of Sabarmati River during 2010-2011 Four

Station (Per Cm²- of sediment)

Macro Invertebrates (Bottom Fauna)	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB
Oligochaeta	31.3	52.7	69.3	74.5	72.5	64.5	51.8	49.5	49.0	38.3	35.0	32.5
Hirudinea (Leeches)	0.7	1.5	1.5	5.5	3.4	4.3	1.2	2.0	1.8	1.4	3.5	1.5
Gastropoda	28.6	30.4	16.4	4.8	10.2	9.6	7.5	8.4	8.6	10.3	17.8	24.8
Pelecypoda (Bivalve)	5.8	3.8	2.1	3.5	4.1	2.5	2.5	1.5	1.4	1.8	3.5	4.8
Insecta	30.5	9.2	10.2	7.7	6.3	14.8	35.4	35.2	35.3	46.7	36.5	32.4
Shrimps	1.2	1.1	Nil	3.5	1.8	2.2	0.8	Nil	Nil	0.5	3.0	2.4
Miscellaneous	1.9	2.4	0.5	0.5	1.7	2.1	0.8	3.4	3.9	1.0	0.7	1.6



Benthic macro invertebrates are best indicators for Bio-assessment. The abiotic environment of the water body directly affect in the distribution, population density and diversity

of the macro benthic community. Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (Sharma, 2002). The littoral region is an important interface between land and pelagic zone of water body. It is occupied by rooted plants, micro and macro-invertebrates and demersal fish species. Gupta and Pant (1983) reported energy content of macro-invertebrates and their seasonal changes in Indian sub-tropical lake water body which explains rich biodiversity of the region. The present studies deals with the population density and species diversity of aquatic macroinvertebrate fauna.

Oligochaeta

Seven species like *Tubifex tubifex*, *Chaetogaster* sp., *Nais simplex*, *Aeolosoma bengalensis*, *Dero limosa*, *Branchiura soverbyi*, *Stylaria fossularis* were identified during the present study. *Tubifex tubifex*, *Branchiura* and *Stylaria* species were collected regularly while *Chaetogaster*, *Nais simplex*, *Aeolosoma*, *Dero limosa* were irregular in shallow dept. *Aeolosoma bengalensis* was not recorded in deeper zone, while *Chaetogaster* recorded as a single species at 1.5 m depth.

Hirudinea

Three species, *Helobdella* sp. *Glossiphonia* sp. and *Hemiclepsis marginata* of the family *Glossiphonidae* were identified during the present study period. *Helobdella* sp. was collected irregularly in depths of 0.2m - 0.5m and not recorded in deeper depth zone (1m-1.5m). *Glossiphonia* sp. was also irregularly found in shallow depth and not recorded in deeper depth. *Hemiclepsis marginata* was not recorded in shallow zone and was recorded only irregular and less abundant in deeper zone (1.5m).

Gastropoda

Altogether individuals of the three families *Planorbidae*, *Lymnadae* and *Viviparidae* were recorded among the class *Gastropoda* during the study period. In the family *Planorbidae* only one species *Planorbis* was identified during the study period. This species was regular and abundant and constituted the largest group composer in February, March and April. It was single record in 1.5m depth.

Among family Lymnaidae three species were identified. They were *Limnaea auricularia*, *L. acumainata* and other *Limnaea* sp. *Limnaea auricularia* and *L. acumainata* were not recorded from the depths of 1.5m but regular and abundant at the depths of 0.2m - 0.5m and single record at depth of 1m. Other *Limnaea* sp. was also irregularly present in shallow and deeper depth zone. In the family Viviparidae only three species namely *Vivipara bengalensis*, *V. oxytropis* and *Bellamya* sp. were identified during the investigation period. *Vivipara bengalensis* and *V. oxytropis* were regular and abundant at the depths of 0.2m to 1m but these two species were irregular and less abundant at the 1.5m zone. Both the species were more abundant, in the shallower depth zone than in the deeper depth zone. *Bellamya* sp. was collected at 0.2m, 1m and 1.5m zones in regular and abundant, but in 0.5m depth; it was irregular and less abundant.

Bivalvia (Pelecypoda)

Only two species of Lamellidens was identified in the family unionidae during the study period. *Lamellidens marginalis* and *L. consobrinus* were found irregular and less abundant at the depths of 0.2m - 0.5m. But these two species, were not recorded in the deeper depth zone (1.0m to 1.5m).

Insecta

Insecta formed the second largest group of bottom fauna. *Chironomus* (family-chironomidae) was the most abundant genus and they were found throughout the year in greater number. They were recorded at shallower & deeper zones (0.2m to 1.5m). Similarly, *Stictochironomus* sp was regular and abundant throughout the study period in both zones. Other insects represented in the collection were *Corixa*, which were found to cling vegetation. These showed wide seasonal fluctuations in the distribution and diversity in this river. They were found irregular at the depths of 0.2m-0.5m and was regular and abundant at 1.0m depth zone but was completely absent at the depth of 2.0m zone.

Baetis sp. was irregular and less abundant and was not found at 1.5m depth zone. *Berosus* sp. was irregular in both zones (Shallower & deeper). *Hydaticus* sp. represented the coleoptera, always few in number and irregular & less abundant. These species were not recorded at the depths from 1.0m to 1.5m respectively.

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