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BIODIVERSITY OF LITTORAL BENTHIC COMMUNITY OF SAKALDA POND DISTRICT – DHAR, (M.P.)

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Abstract

Biological diversity or "biodiversity" refers to the variety of life on the earth. As defined by the United Nations Convention on Biological Diversity, it includes diversity of ecosystems, species and genes and the ecological processes that support them. Macroinvertebrates are important constituents of an aquatic ecosystem and had functional importance in analyzing the tropic status as abundance of benthic fauna mainly depends on physical and chemical property of the substratum. At the onset of the study, a meticulous survey was carried out using proper surveying techniques to decide sampling points in such a manner that they represent the average faunal composition of the Sakalda pond. Littoral benthic community from four sampling stations of Sakalda pond were collected seasonally and studied for a period of one year. During the present 28 species of fishes belonging to fourteen families were recorded. Among Macro benthos 12 species of class Gastropoda and Pelecypoda were recorded. The dominant species recorded were Bellamya bengalensis and Vivipara bengalensis belonging to family Viviparidae, while the species Melanoides pyramis and Thiara scabra belonging to family Thiaridae were recorded less dominant throughout the season.

Key Words: Fishes, Benthic macro invertebrates, Littoral zone and Molluscans.

INTRODUCTION

Biological diversity is the variety and variability of life and its process. There are four categories of biodiversity of ecosystem. These are inland water, forest, marine and coastal biodiversity. Maintaining biological diversity helps in maintaining resources and ecological services. Due to human influence they are altered and

introduction of alien species provides further ecological problems. The lakes are used for many purposes and hence they are the ones, which are exploited more.

The main components of pond Biodiversity are planktons, benthic communities, fishes and waterfowls. The littoral region of the lake has an additional component i.e., macrophytes, which play major role. Thus, this region being interface region of water and land, the pollutants are manipulated and degraded by these communities, thus maintain water quality of lake. The present investigation was focused on trophic relationships between shorebirds, benthic communities and fishes.

The littoral area of lake/pond is an interspaced of land & water. Its fauna is poorly studied (**Belsare,** 1982). The investigations have not gone a great deal beyond necessary descriptive analysis of their types and distribution within freshwaters. The population dynamics and trophic interrelationships of the benthic fauna are poorly understood (Hynes 1970, Belsare 1982).

Benthic macroinvertebrates are an important biological group in aquatic ecosystems, and they affect the nutrient and energy flow of freshwater ecosystems (Ma *et al.*, 2008; Gonzalez-Ortegon *et al.*, 2015; Boeker *et al.*, 2016). On the one hand, these animal species can regulate the amount of nutrients in freshwater ecosystems by ingesting sediment, plankton, and organic matter resulting from the decay of animals and plants. For example, benthic mollusks can remove organic particles, such as lower algae, through filter feeding. This behavior provides excellent purification performance in relation to chlorophyll and COD in eutrophic freshwater. On the other hand, numerous studies have also shown that aquatic animals are important biological indicators for monitoring water quality in ponds, wetlands, and rivers (Salanki *et al.*, 2003; Pedersen *et al.*, 2007; Pander and Geist, 2013; Kail *et al.*, 2015; Garcia-Chicote *et al.*, 2018).

STUDY AREA AND METHOD

Sakalda pond is located in the Tehsil Manawar, district Dhar. This water body was basically constructed for drinking water for tribal people. But nowadays water is mainly utilized for irrigation and fish culture. The main source of water in this pond is rainy water. There are many villages are situated around this pond. Distance of Sakalda pond is 104 km from Indore.

The samples were collected from Four stations Sakalda pond which is located in the Tehsil Manawar of District Dhar. Accordingly study area was divided into following selected stations.

Panjariya village S-I

Bhilat Dev temple S-II

Hanuman temple S-III

Outlet channel S-IV

Analysis of bottom Fauna

Collection of Samples: Fish samples were collected from all the four selected stations of Sakalda pond. The fishes were collected using cast net (Ghagaria Jal), gill nets for differs mesh size (10, 20, 30, 40, 50, 60, 70, 80, 90 and 100), line hooks with the help of local fishermen.

After the collection of fishes were cleaned and preserved in 5-10% formalin according to the size. Plastic jars were used to collect and preserve the fishes. Smaller fishes were directly placed in the formalin solution, while larger fishes were given an incision on the abdomen before they were fixed. The fishes were identified in laboratory using taxonomic keys of Day (1958) and Jhingran (1982).

Different methods were employed to collect Zoobenthos from the target habitats. Samples were collected from the deeper profundal zone by using Ekman grab and at shallow profundal zone by using Surber sampler following Wetzel (2001).

Zoobenthic samples were collected by using Kick net and Surber sampler (mesh size 250 µm) and five samples were taken (20 x 20 cm) into a single sample following the semi-quantitative procedure of Stark *et al.* (2001). Organisms were collected by stirring and disturbing the substrate for about 5 minutes to the depth of several inches to dislodge the borrowing Zoobenthos ahead of the net per square meter (Hoffsten and Malmqvist 2000, Ilmonen and Paasivira, 2005). Samples were obtained from the same location by brushing the organisms of the cobbles and rocks, following standard methods of APHA (2002).

OBSERVATIONS

Station-I: Panjariya village

During the present study, 28 species of fishes belonging to fourteen families were recorded Among the recorded families the *Cyprinidae* was found dominant throughout the season. Among the total enlisted species, the dominant ones included *Cypriniformes* order have 1 family Cyprinidae which was represented by species like *Labeo gonius, Labeo rohita, Labeo bata, Labeo calbasu, Catla catla, Crrhinus mrigala* etc. Among Macro benthos 12 species of class Gastropoda and Pelecypoda were recorded. The molluscan diversity was maximum in April & May months and minimum in the month of August. Among Zooplanktons the rotifer was found dominant throughout the season. The species *Brachionus quadridentatus* and *Brachionus caudatus* were recorded dominant in April and Many months. The reason may be due to the ample food availability.

Station-II: Bhilat Dev temple :

In Station II, Among the total enlisted species, the dominant ones included Cypriniformes order have 1 family Cyprinidae. The species include *Rasbora daniconius, Garra gotyala, Puntius sarana, Osteobrama cotio* and *Catla catla* etc. Among the Macro benthos 7 species of class Gastropoda and 5 species of class Pelecypoda were recorded. The dominant species was belonging to family Thiaridae, while the species like *Indoplanorbis exustus* & *Gyraulus convexiusculus* belonging to family Planorbidae was recorded less dominant throughout the season. The diversity was recorded maximum in April & May month and minimum in August month. Among

crustacians, *Daphnia cercinate* was recorded Maximum in all the season and *Foina dubia* was recorded lower in the station.

Station-III: Hanuman temple

During the present study, among the recorded fish species the *Labeo rohita* was recorded dominant throughout the season. Among macro benthos 6 families of class Gastropoda and 4 families of class Pelecypoda comprising of total 12 species were recorded. The dominant species were *Vivipara bengalensis* of class Gastropoda and the species *Gyraulus labiatus* of class Gastropoda were recorded less dominant. The diversity was recorded maximum in summer season and minimum in monsoon season. Among Zooplanktons rotifera and cladocera were found dominant.

Station-IV: Outlet channel

Among the recorded species the dominant ones included Cypriniformes order with family Cyprinidae which was represented by different species like *Labeo gonius, Labeo rohita, Labeo calbasu, Catla catla, Cirrhinus mrigala, Osteobrama cotio, Rasbora daniconius, Puntius sarana and Puntius ticto.* The fishes shows remarked diversity in the area wise and were found dominant in the litoral zone. Among this the *Chanda nama, Chanda ranga* belonging to Ambassiidae family were dominant. The molluscan diversity was maximum in April & May months and minimum in July August month. Zooplantons shows good dominance in the station. Among this *Acanthodiaptomas sp.* and *Heliodiaptomus viduus* belonging to copepod were recorded dominant.

DISCUSSION

The littoral region of lake is much influenced by shore birds, which feed on fish, variety of benthic communities and also control vector population of water borne diseases (Morris, 1994; Batzer and Resh, 1994; Carlson *et al.*, 1994; Belsare *et al.*, 1999). Belsare (1994) mentioned important role played by fish and shorebirds in maintaing trophic relationship of littoral aquatic food chain. However, limnologists in studying productivity and water quality of topical lake neglected these important communities. Belsare (1981) reviewed the work done on tropical lakes the New as well as of Old world and reported that there is no information on benthic communities and the role played by them in maintaining aquatic ecosystem of tropical region. The present observations indicate that the population of oligochaetes is increased during cold period, which might be due to their breeding habit and adaptability to organic waste and has nothing to do with abundance of shore birds or demersal fish which feed on them. The decreased population of oligochaetes during summer is probably due to their dormancy period rather than reduced organic matter from domestic waste and runoff water from catchments area which is a source of food to them. On the contrary littoral mollusk population depends on dissolved oxygen and suitable substratum. The littoral benthic fauna of insects is influenced by detritus mass and recycled organic matter. The presence and absence of demersal fish species as well as shore birds which feed on them do not limit insect

biodiversity. Our hypothesis of more prey species when there is more predator species during cold period is applicable to oligochaete population than to mollusk or insect population.

Table-1 : List of fishes reported in sakalda pond

Family	Scientific name of fish	
	Genus	Species
Clupeidae	Gadusia	*Gadusia chapra*
Notopteridae	Notopterus	*Notopterus notopterus*
Cyprinidae	Rasbora	*Rasbora daniconius*
	Garra	*Garra gotyala*
	Puntius	*Puntius sarana*
		Puntius ticto
	Osteobrama	*Osteobrama cotio*
	Catla	*Catla catla*
	Cirrhinus	*Cirrhinus mrigale*
	Labeo	*Labeo rohita*
		Labeo calbasu
		Labeo gonius
	Cyprinus	*Cyprinus carpio*
Siluridae	Wallago	*Wallago attu*
Bagridae	Mystus	*Mystus seenghala*
Heteropneustidae	Heteropneustus	*Heteropneustes fossillis*
Clariidae	Clarias	*Clarias batrachus*
Ambassiidae	Chanda	*Chanda nama*
		Chanda ranga
Anabantidae	Colisa	*Colisa faciatus*
Gobiidae	Glossogobius	*Glossogobius gluris*
Nandidae	Nandus	*Nandus nandus*
Ophiocephalidae	Channa	*Channa punctatus*
		Channa striatus
		Channa gachua
Belonidae	Xenentodon	*Xenentodon cancila*
Mastacembalidae	Mastacembalus	*Mastacembalus armatus*
	Mastacembalus	*Mastacembalus puncalus*

Table-2 : Monthly distributions of macro benthic communities in sakalda pond at station 1 panjariya village

Name & Group Organism Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Worms												
Dero digitata	25	30	20	17	12	15	9	5	12	9	17	18
Tubifex tubifex	32	28	25	18	15	11	10	15	18	24	27	30
Hirudena	1	-	-	-	-	-	-	-	-	1	-	-
Limmodrilus hoffmeisteri	**19**	**22**	**11**	15	18	15	**12**	**20**	**15**	**NIL**	**NIL**	**12**
Telmatodrilus multispinosus	**9**	**15**	**8**	11	12	14	**4**	**10**	**7**	**NIL**	**NIL**	**2**
Dero dorsalis	**17**	**25**	**12**	10	15	11	**10**	**15**	**NIL**	**NIL**	**NIL**	**9**
Stylaria fossularis	**12**	**15**	**4**	7	9	10	**8**	**10**	**4**	**8**	**4**	**10**
Branchiodrillus hortensis	**6**	**9**	**11**	10	12	15	**5**	**2**	**3**	**NIL**	**NIL**	**4**
Tubifex albicola	**5**	**12**	**15**	10	18	12	**5**	**12**	**7**	**NIL**	**NIL**	**7**
CRUSTACIANS												
Daphnia cercinate	5	8	15	10	8	11	9	2	4	**NIL**	**NIL**	8
D. magna	4	7	6	4	2	8	4	2	1	**NIL**	**NIL**	9
Foina dubia	2	7	3	2	1	2	2	-	-	**NIL**	**NIL**	-
Cypris	7	12	17	8	5	3	2	6	4	**NIL**	**NIL**	7
Cyclopes	10	8	15	7	5	2	6	10	12	**NIL**	**NIL**	12
Nauplius	6	12	8	9	4	3	7	10	8	**NIL**	**NIL**	7
MOLLUSCS												
Vivipara bengalensis	22	33	39	42	35	27	15	24	29	**NIL**	**NIL**	12
Melanoides tuberculatus	15	22	30	34	28	35	10	15	24	**NIL**	**NIL**	8
M.lineatus	17	20	18	25	28	30	35	40	25	**NIL**	**NIL**	8
Digiostana pulchella	27	45	50	45		104	30	38	42	**NIL**	**NIL**	20
Gyraulco convexiculus	12	35	30	60	40	50	45	35	40	**NIL**	**NIL**	7
Pissidium clarkeanum	3	5	12	10	9	12	13	17	10	**NIL**	**NIL**	8
Digostoma punchella	6	8	9	5	4	3	12	17	20	**NIL**	**NIL**	4
Limnaea auricularia	5	8	9	10	8	10	12	15	18	**NIL**	**NIL**	7
Bellamva bebgalensis	4	7	6	8	6	9	10	18	19	**NIL**	**NIL**	9
Thira scabra	7	5	8	9	10	12	10	18	22	**NIL**	**NIL**	5
Unio sp.	8	9	10	12	10	8	8	12	18	**NIL**	**NIL**	6
Pila sp.	12	8	7	10	5	7	6	10	15	**NIL**	**NIL**	10
Diptira												
Chironomus sp.	**19**	**22**	***12***	**10**	**8**	**9**	**12**	**15**	**17**	**3**	**2**	**15**
Chaoborus sp.	**15**	**18**	***15***	**10**	**7**	**9**	**8**	**10**	**10**	**NIL**	**NIL**	**12**
EPHEMEROPTERA												
Baetis simplex	***3***	***7***	***10***	***12***	***9***	***10***	***5***	***7***	***9***	***NIL***	***NIL***	***1***
Heptagenila nubile	***5***	***10***	***8***	***5***	***8***	***5***	***3***	***5***	***8***	***NIL***	***NIL***	***NIL***
Caehis sp.	***8***	***11***	***12***	***8***	***4***	***6***	***4***	***5***	***7***	***NIL***	***NIL***	***NIL***
Ephemera nadinac	***20***	***5***	***7***	***8***	***10***	***8***	***3***	***6***	***6***	***NIL***	***NIL***	***NIL***

Table-3 : Monthly distributions of macro benthic communities in sakalda pond at station 2 bhilat dev temple

Name & Group Organism Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Worms												
Dero digitata	15	20	12	10	12	10	6	4	9	NIL	NIL	8
Tubifex tubifex	18	12	10	8	5	7	8	10	12	NIL	NIL	15
Hirudenia	1	-	-	-	-	-	-	-	-	1	-	-
Limmodrilus hoffmeisteri	**15**	**18**	**8**	11	10	7	**8**	**10**	**11**	**NIL**	**NIL**	**10**
Telmatodrilus multispinosus	**4**	**5**	**7**	9	10	11	**2**	**5**	**8**	**NIL**	**NIL**	**2**
Dero dorsalis	**13**	**16**	**10**	12	10	7	**5**	**8**	**NIL**	**NIL**	**NIL**	**6**
Stylaria fossularis	**10**	**11**	**4**	8	3	9	**3**	**5**	**2**	**NIL**	**NIL**	**8**
Branchiodrillus hortensis	**10**	**6**	**10**	8	9	12	**2**	**5**	**8**	**NIL**	**NIL**	**7**
Tubifex albicola	**10**	**12**	**18**	13	15	9	**2**	**9**	**12**	**NIL**	**NIL**	**8**
CRUSTACIANS												
Daphnia cercinate	6	4	12	14	7	9	3	5	6	**NIL**	**NIL**	9
D. magna	9	3	5	1	5	3	2	3	4	**NIL**	**NIL**	11
Foina dubia	3	6	9	1	4	1	3	2	NIL	**NIL**	**NIL**	5
Cypris	19	22	10	12	8	5	5	9	14	**NIL**	**NIL**	17
Cyclopes	14	10	12	8	6	3	8	15	18	**NIL**	**NIL**	11
Nauplius	9	15	10	12	5	1	9	12	9	**NIL**	**NIL**	4
MOLLUSCS												
Vivipara bengalensis	15	22	29	32	28	17	10	14	19	**NIL**	**NIL**	10
Melanoides tuberculatus	11	18	20	24	18	15	8	13	17	**NIL**	**NIL**	9
M.lineatus	12	18	21	24	17	10	11	14	18	**NIL**	**NIL**	5
Digiostana pulchella	19	25	29	30	18	11	13	15	22	**NIL**	**NIL**	12
Gyraulco convexiculus	10	22	29	38	27	20	15	19	20	**NIL**	**NIL**	17
Pissidium clarkeanum	7	11	10	15	5	8	11	14	15	**NIL**	**NIL**	18
Digoniostoma punchella	8	10	6	2	1	2	2	7	10	**NIL**	**NIL**	2
Limnaea auricularia	3	9	10	12	7	5	5	7	9	**NIL**	**NIL**	4
Bellamva bebgalensis	5	6	1	5	8	4	8	10	13	**NIL**	**NIL**	7
Thira scabra	17	9	7	6	5	12	9	12	15	**NIL**	**NIL**	10
Unio sp.	8	9	10	12	10	5	8	12	18	**NIL**	**NIL**	6
Pila sp.	15	10	8	11	8	9	10	18	25	**NIL**	**NIL**	12
Diptira												
Chironomus sp.	**19**	**21**	***25***	**28**	**17**	**15**	**12**	**15**	**12**	**NIL**	**NIL**	**10**
Chaoborus sp.	**12**	**27**	***25***	**17**	**15**	**10**	**10**	**14**	**18**	**NIL**	**NIL**	**4**
EPHEMEROPTERA												
Baetis simplex	***1***	***3***	***5***	***2***	***4***	***2***	***2***	***3***	***2***	***NIL***	***NIL***	***NIL***
Heptagenia nubile	***2***	***5***	***7***	***4***	***3***	***3***	***1***	***3***	***4***	***NIL***	***NIL***	***NIL***
Caehis sp.	***NIL***	***1***	***2***	***3***	***5***	***3***	***2***	***1***	***3***	***NIL***	***NIL***	***NIL***
Ephemera nadinac	***NIL***	***3***	***2***	***6***	***2***	***2***	***2***	***2***	***4***	***NIL***	***NIL***	***NIL***

Table-4 : Monthly distribution of macro benthic communities in sakalda pond at station 3 hanuman temple

Name & Group Organism Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Worms												
Dero digitata	10	12	10	9	8	11	5	8	8	NIL	NIL	6
Tubifex tubifex	16	11	7	9	4	3	5	9	10	NIL	NIL	13
Hirudenia	1	2	5	-	-	-	-	-	-	1	-	-
Limmodrilus hoffmeisteri	**13**	**15**	**7**	15	11	5	**5**	**12**	**14**	**NIL**	**NIL**	**12**
Telmatodrilus multispinosus	**5**	**9**	**12**	15	10	6	**3**	**7**	**10**	**NIL**	**NIL**	**NIL**
Dero dorsalis	**13**	**16**	**10**	12	10	7	**3**	**10**	**NIL**	**NIL**	**NIL**	**5**
Stylaria fossularis	**12**	**10**	**6**	4	2	5	**2**	**4**	**8**	**NIL**	**NIL**	**7**
Branchiodrillus hortensis	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**	**NIL**
Tubifex albicola	**15**	**13**	**12**	10	9	5	**5**	**19**	**15**	**NIL**	**NIL**	**10**
CRUSTACIANS												
Daphnia cercinate	6	4	12	14	7	9	3	5	6	**NIL**	**NIL**	9
D. magna	9	3	5	1	5	3	2	3	4	**NIL**	**NIL**	11
Foina dubia	3	6	9	1	4	1	3	2	NIL	**NIL**	**NIL**	5
Cypris	19	22	10	12	8	5	5	9	14	**NIL**	**NIL**	17
Cyclopes	14	10	12	8	6	3	8	15	18	**NIL**	**NIL**	11
Nauplius	9	15	10	12	5	1	9	12	9	**NIL**	**NIL**	4
MOLLUSCS												
Vivipara bengalensis	19	25	30	35	25	12	12	18	21	**NIL**	**NIL**	15
Melanoides tuberculatus	18	21	27	22	16	11	9	18	25	**NIL**	**NIL**	12
M.lineatus	22	28	15	14	12	8	5	11	19	**NIL**	**NIL**	10
Digiostana pulchella	15	20	18	25	15	9	10	12	20	**NIL**	**NIL**	11
Gyraulco convexiculus	30	27	22	19	14	11	5	11	18	**NIL**	**NIL**	28
Pissidium clarkeanum	11	15	12	10	7	4	15	18	25	**NIL**	**NIL**	16
Digoniostoma punchella	5	9	5	4	2	1	4	9	15	**NIL**	**NIL**	3
Limnaea auricularia	2	10	15	10	9	2	3	4	7	**NIL**	**NIL**	2
Bellamva bebgalensis	6	7	5	4	9	2	4	9	11	**NIL**	**NIL**	9
Thira scabra	19	11	13	9	6	2	5	9	10	**NIL**	**NIL**	15
Unio sp.	12	7	15	14	12	7	10	15	19	**NIL**	**NIL**	10
Pila sp.	18	14	9	12	4	2	12	15	20	**NIL**	**NIL**	14
DIPTIRA												
Chironomus sp.	**17**	**20**	***28***	**22**	**15**	**10**	**8**	**10**	**15**	**NIL**	**NIL**	**12**
Chaoborus sp.	**10**	**12**	***16***	**11**	**10**	**12**	**5**	**8**	**9**	**NIL**	**NIL**	**5**
EPHEMEROPTERA												
Baetis simplex	***NIL***	***3***	***4***	***2***	***5***	***7***	***1***	***2***	***4***	***NIL***	***NIL***	***NIL***
Heptagenia nubile	***2***	***2***	***3***	***7***	***6***	***3***	***1***	***3***	***2***	***NIL***	***NIL***	***NIL***
Caehis sp.	***3***	***5***	***2***	***6***	***5***	***3***	***2***	***3***	***8***	***NIL***	***NIL***	***NIL***
Ephemera nadinac	***NIL***	***2***	***1***	***3***	***2***	***3***	***1***	***3***	***2***	***NIL***	***NIL***	***NIL***

Table-5: Monthly distributions of macro benthic communities in sakalda pond at station 4 outlet channel

Name & Group Organism Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Worms												
Dero digitata	5	7	6	3	4	4	2	3	4	NIL	NIL	3
Tubifex tubifex	12	10	8	6	2	1	2	5	8	NIL	NIL	10
Hirudenia	1	2	5	4	2	1	NIL	NIL	1	NIL	NIL	NIL
Limmodrilus hoffmeisteri	10	11	9	12	8	2	3	7	9	NIL	NIL	NIL
Telmatodrilus multispinosus	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Dero dorsalis	10	12	9	10	8	5	2	5	8	NIL	NIL	7
Stylaria fossularis	10	8	5	2	5	9	1	3	6	NIL	NIL	3
Branchiodrillus hortensis	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Tubifex albicola	13	11	10	7	6	4	4	9	10	NIL	NIL	8
CRUSTACIANS												
Daphnia cercinate	5	3	8	10	5	3	1	3	4	NIL	NIL	6
D. magna	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Foina dubia	2	4	7	NIL	2	1	1	2	NIL	NIL	NIL	3
Cypris	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Cyclopes	11	8	10	6	4	1	5	7	10	NIL	NIL	8
Nauplius	7	10	13	10	8	2	4	5	8	NIL	NIL	3
MOLLUSCS												
Vivipara bengalensis	15	19	21	15	18	8	8	10	12	NIL	NIL	12
Melanoides tuberculatus	13	17	20	15	12	7	4	9	15	NIL	NIL	10
M.lineatus	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Digiostana pulchella	12	18	15	21	11	7	8	9	14	NIL	NIL	10
Gyraulco convexiculus	20	17	12	17	11	7	3	9	11	NIL	NIL	18
Pissidium clarkeanum	10	17	10	12	6	2	5	8	13	NIL	NIL	12
Digoniostoma punchella	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Limnaea auricularia	2	8	10	12	7	4	2	6	8	NIL	NIL	3
Bellamva bebgalensis	4	5	3	2	7	2	2	4	9	NIL	NIL	7
Thira scabra	11	12	10	7	4	2	3	5	8	NIL	NIL	10
Unio sp.	10	8	12	10	12	5	5	10	12	NIL	NIL	8
Pila sp.	14	17	7	8	2	1	10	12	18	NIL	NIL	12
DIPTIRA												
Chironomus sp.	10	12	18	20	12	8	5	8	10	NIL	NIL	9
Chaoborus sp.	6	9	13	10	7	10	2	4	7	NIL	NIL	3
EPHEMEROPTERA												
Baetis simplex	1	3	2	2	3	4	1	2	3	NIL	NIL	NIL
Heptagenia nubile	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Caehis sp.	5	6	2	4	5	7	2	2	3	NIL	NIL	NIL
Ephemera nadinac	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

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