



## JALANGI RIVER AND ITS FISH DIVERSITY: A REVIEW

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### ABSTRACT

This review includes the effects of pollution in the water of Jalangi River, caused by careless disposal of waste water or soil erosion, on the diversity of fish. So it also includes the relation between various characteristics of an aquatic ecosystem and also the procedure by which various pollutants can influence fish diversity. According to many review paper and references the water of Jalangi is less polluted than other rivers of the district. There are mainly agricultural and domestic effluents, mixed with the water as waste water. Nickel and ferus are found in the water of Jalangi as heavy metal but their quantity is very low. The total coliform of the water Jalangi is  $5 \times 10^4$  (MPN/100 ml) and the faecal coliform is  $3 \times 10^4$ . There are 44 species of fish which were found earlier, are also found at present. Jalangi River is none as the total number of species of fish remained same as found at past.

**KEYWORDS :** Jalangi River, waste water, surface runoff, fish diversity

### Introduction:

Water is considered as a characteristic feature of our planet. It is very crucial in our life for all aspects. A well-functioning aquatic ecosystem can give us a vast array of benefits like food, medicine, processing our waste, shoreline protection etc. The maintenance of the aquatic ecosystem is thus very important. The ecosystem of a river consists of mainly two components; they are biotic and abiotic components. Plants, animals and micro-organisms are included as biotic components and physical and chemical factors are non-living or abiotic components. These abiotic and biotic factors play different roles in an aquatic ecosystem and the aquatic biodiversity is fully dependent on the function of these factors. Now the question is how do these factors work in an ecosystem and how do they effect on aquatic biodiversity. *Abiotic characteristics:* In aquatic ecosystem the important abiotic factors are substrate type, temperature, light, nutrient level, salinity, the depth of the water and flow.

To determining the status of organic life in an aquatic system, examining the DO level of that water body is the key step. The lotic ecosystem like river ecosystem possesses faster moving and continuous water flow which helps this water body to contain great amount of dissolved oxygen. This characteristics influences greater biodiversity to grow than in the pond or lake ecosystem (Lentic ecosystem) having slow moving water.

The temperature of water affects the ecosystem of streams directly or indirectly. The temperature can determine which organism will flourish and which organism will decline in numbers and size. There is a thermal death point for each organism. In poikilothermic animals like fish, the temperature of their body fluctuates with the temperature of their medium. It influences the concentration of the oxygen in the water. The capacity of water to hold oxygen is higher in lower temperature than in higher temperature. In the presence of toxic substances in the water, increased or high temperature shows an important consideration. At high temperature many toxic substances causes increased toxicity on the aquatic organism. The temperatures can also effects on the metabolic rate of some aquatic organism. High temperature causes high metabolism which in turn causes high oxygen consumption, it results into the production of high amount of waste on water and the water quality become very poor which causes death of many aquatic organism.

In river ecosystem sedimentation is also an important abiotic factor. It occurs by the transported organic and inorganic particles which are suspended in the river water. Sedimentation is some time related to the cause of the degradation of water quality which can

reduces the diversity of aquatic life. The sediment increases the turbidity of water. These effects on light transmission and thereby also effecting on the growth of the algae and aquatic plants. The nutrient levels include the amount of nitrogen and phosphorus in that water body which can affect the ecosystem in determination of the dominative species of algae (Smith 1983). In aquatic ecosystem algae serve as the source of food but when they present in overabundance it can affect the fish biodiversity when they start decaying and a hypoxic region of water, known as dead zone appeared.

The determination of the quantity of solutes which are dissolved in the water and the biological availability of nutrients is occurred by measuring pH of the water of the river.

The salinity of water can also effect in changing of species diversity of any aquatic ecosystem. The sources of salt in the aquatic ecosystem are groundwater and terrestrial material which are released via weathering of rocks or from the atmosphere. As a result of saline ground water intrusions the water clarity increased and which can stimulate the formation of significant blooms of cyanobacteria. Salination also can change the relative proportions of anions and cations in the water that can alter the chemical equilibrium and also the solubility of some minerals. In general freshwater aquatic plants cannot tolerate the high salinity. The upper level of salinity of the water, within which most of the aquatic plant can live, is 4000 mg/L (Nielsen et al. 2003).

*Biotic characteristics:* This can determine by the presence of living organisms. They are bacteria, algae and plant as primary producers, insects and other invertebrates, fish and other vertebrates. Bacteria functions as mainly decomposer. In rivers the phytoplanktons and periphytons (algae) play the major role in primary production.

The function of both the biotic and abiotic factors of an aquatic ecosystem is very important. Any obstruction on their function can affect the ecosystem. It includes changes in physical, chemical as well as biological environment of the ecosystem which inturn causes the loss of aquatic biodiversity.

### Sources of Pollution:

#### 1. Waste water:

In the present days one of the major problems related to the loss of aquatic diversity is the pollution made by unmanaged wastewater. Waste water can be defined in different way by different people. It is formed by mixing of water coming from industrial effluent, hospitals, aquacultural and agricultural effluent as well as the water

coming from domestic effluent. Domestic effluent includes black water (made of excreta, urine etc.) and grey water consisting of kitchen and bathing waste water. The contamination of wastewater can be done by mixing pathogens, harmful synthetic chemicals, heavy metals and organic compounds. They may be present in solution or can be carried by water as particulate matter. These components can affect health and the function of aquatic ecosystem thus effecting food quality and human health. Water pollution of river caused by faecal matter present in waste water is very serious problem as it contains pathogen. The presence of pathogen can be determined indirectly by testing coliform bacteria. The source of pathogenic organism and the coliform bacteria is same. The total coliforms include some bacteria which are present in the soil, water and in human or animal waste. Other term is faecal coliforms. These are the group of total coliforms. The test for faecal coliform is considered to be more accurate for indication of the presence of human or animal waste in water as the origin of these coliforms is more specific than total coliforms.

## 2. Surface runoff:

The excess flows of storm water, melt water and other sources when flow over the surface of earth, surface runoff or overland flow of water occurs. Sometime the source of runoff water contains man made contaminants and causes pollution of the water. This source of runoff water is called nonpoint source pollution. At the time of flowing along the ground the runoff water can pick up some soil contaminants such as petroleum, pesticides and fertilizers.

*Effects of surface runoff:* One of the main causes of erosion is surface runoff. Erosion of silty soils can generate turbidity which in turn diminishes light penetration through the water. This incident can disrupts aquatic ecosystem. In case of surface waters, the effect translates to water pollution as the rivers have received runoff containing various chemicals or sediments. Contaminated surface water changes the metabolic processes of the aquatic animals. These changing can lead to death of aquatic animal such as fish kill. According to some researches, the surface runoff of pesticides like DDT can genetically change the gender of fish species.

## 3. Erosion:

In rivers or stream the erosion refers to the wearing away of the banks of rivers. It is a natural process without it the rivers would not change course. Erosion can change the water quality of a river or stream. Pollutants carried off by water for erosion. Any harmful chemical present on a site can be transported by the eroded sediments.

## Impacts of waste water on aquatic ecosystem:

1. One of the major impacts on aquatic ecosystem function is eutrophication. It is the process in which plant biomass increases in high volume. It occurs as high amount of plant nutrients like nitrogen and phosphorus (mostly coming from agricultural areas) is added in water. It results in changes in ecological integrity of total aquatic ecosystem. For example, agricultural effluents influencing the reaching of dead zones (Diaz et al. 2008).
2. Reduction of DO (dissolved oxygen) level associated with eutrophication is one of the most effective problems in aquatic ecosystem (Deegan et al. 2005).
3. Mechanical impacts include changes in sediment loading and thermal condition which can alter the physical status of the aquatic ecosystem. It can increase turbidity which in turn affects biodiversity.
4. As a great quantity of toxic pollutants, coming from land based sources like agricultural and industrial sites are found in water, they cause their toxicological effects on living organisms.
5. Waste water coming from municipality area can change the alkalinity of water of river, therefore effecting function of ecosystem.
6. Waste water is responsible for increasing suspended particles in aquatic habitat, this can create an elevation of turbidity level of

water which in turn cause the loss of productive benthic habitats.

7. Endocrine disruptors is another important topic of concern, caused by waste water pollution. This endocrine disruptors includes a group of chemicals that interfere with the function of endocrine system of many aquatic organisms. These chemicals may function as the sex hormones like estrogen and androgen, therefore they are known as "environmental hormones" (Thurberg et al. 2005). The adverse effects of chemicals include changes in reproductive function that may results in impacts on population level.

## RIVER JALANGI:

In west Bengal there are many rivers which are connected together forming a web like appearance. The Jalangi is one of them. It is the branch of the well-known Ganges River. After leaving the Padma river the Jalangi makes the part of the north – western boundary of the Nadia district and flows some miles within the district, then after reaching Krishnanagar it flows to the westwards and falls into the Ganges at Nabadwip. It flows over two districts and these are Murshidabad and Nadia. The river below the place where it meets the Ganges river is called Hooghly. Three main cities which are located at the bank of Jalangi river are Krishnagar, Tehatta, Mayapur. Jalangi river is known as modern river but the time when it was made is still unknown. Long after the Bhairab river it opened up. There is a very important point about Jalangi is that earlier this river flowed in a south eastern direction while after some time some energy pulled the Mathabhanga and the Jalangi river towards south western direction.



**Fig 1: Location of Jalangi River**

The type of soil of Jalangi river is loamy, silty loamy or silty. Presently the starting point of Jalangi is clogged by silting. The water of Jalangi river is source of a substantial amount of consumed water in Krishnanagar.

The result on analysing the number of dying fish communities makes people to be believed that there is contamination with bacteria and arsenic in the water of Jalangi (Das et al., 2007). Although there is little or no data which proves the presence or absence of bacteria and arsenic in the Jalangi river.

**Source of waste water in Jalangi:**

As there is not any big industry near the Jalangi River, its main sources of waste water are mainly domestic and agricultural sites. Some of the wastes releasing from local boats which are used in ferry ghats, are mixed with the water. Plastic bottles, containers are thrown into the water of Jalangi. Different types of waste product like useless parts of vegetables, latrine of animals and human beings are also added into the water of Jalangi.

**Water quality of Jalangi:**

The temperature of water of Jalangi river varies from 20 to 30 and pH varies from 7 to 8 (approximate) throughout year (Chakrabarty et.al. 2006). In most of the year the water of Jalangi river remained as saturated with DO but in monsoon it reduces slightly its oxygen concentration (Chakrabarty et.al. 2006).The toxic metals found in Jalangi river are Nickel and Ferus (Status of Trace and Toxic metals in Indian River, 2014). The degraded or partially degraded organic materials coming from banks of the river through erosion, affect the water of Jalangi river (Chakrabarty et.al. 2006).The total coliform of the water jalangi is 5 x 104 (MPN/100 ml) and the faecal coliform is 3 x 104.

**EROSION:** Erosion is one of the vital problem for most of the turbulent rivers like Padma and Bhagirathi as well as big problem for comparatively smaller streams like Jalangi river.

**LIST OF FISHES FOUND IN JALANGI RIVER:**

**Table 1:** (Ref: Chakrabarty, D. and Das, S.K. 2006) (January 2003–December 2004) (PL: planktivore, BE: benthic, OM: omnivore, CA: carnivore, Pelagic: P, Generalist: G, Benthic: B

Serial no.	Scientific name	Trophic level nature	Trophic level score	Habitat orientation
1	<i>Catla catla</i>	PL	31.81	P
2	<i>Labeo rohita</i>	PL	31.81	G
3	<i>Labeo bata</i>	PL	31.81	G
4	<i>Labeo calbasu</i>	BE	11.36	B
5	<i>Cirrhinus mrigala</i>	BE	11.36	B
6	<i>Puntius sarana sarana</i>	PL	31.81	P
7	<i>Puntius sophore</i>	PL	31.81	P
8	<i>Puntius ticto</i>	PL	31.81	P
9	<i>Chela laubuca</i>	OM	27.27	P
10	<i>Amblypharyngodon mola</i>	PL	31.81	P
11	<i>Esomus danricus</i>	PL	31.81	P
12	<i>Mystus aor</i>	OM	27.27	G
13	<i>Mystus seenghala</i>	OM	27.27	G
14	<i>Mystus vittatus horai</i>	OM	27.27	G
15	<i>Mystus bleekari</i>	OM	27.27	G
16	<i>Rita rita</i>	OM	27.27	B
17	<i>Ompok pabo</i>	CA	29.54	G
18	<i>Wallago attu</i>	CA	29.54	G
19	<i>Ailia coila</i>	PL	31.81	P
20	<i>Eritropiichlhy gongwree</i>	CA	29.54	P
21	<i>Eutropifchthys vacha</i>	CA	29.54	P
22	<i>Clarias batrachus</i>	OM	27.27	P
23	<i>Heteropneustes fossilis</i>	OM	27.27	P
24	<i>Glossogobius guiris</i>	OM	27.27	G
25	<i>Gobias striatus</i>	OM	27.27	B
26	<i>Anabas testudineus</i>	OM	27.27	G
27	<i>Trichogaster fasciatus</i>	OM	27.27	P
28	<i>Nandus nandus</i>	OM	29.54	G
29	<i>Channa striatus</i>	CA	29.54	G
30	<i>Channa punctatus</i>	CA	29.54	G
31	<i>Channa gachua</i>	CA	29.54	G
32	<i>Channa marulius</i>	CA	29.54	G
33	<i>Channa orientalis</i>	CA	29.54	G
34	<i>Mastacembelus bengalensis</i>	BE	11.36	B

35	<i>Macrogathus pancalus</i>	BE	11.6	B
36	<i>Amphipnous cuchia</i>	BE	11.36	B
37	<i>Notopterus chitala</i>	CA	29.54	P
38	<i>Notopterus notopterus</i>	CA	29.54	P
39	<i>Chanda nama</i>	CA	29.54	P
40	<i>Hilsa iillsha</i>	PL	31.81	G
41	<i>Gadusia chapra</i>	PL	31.81	P
42	<i>Setipinna phasa</i>	PL	31.81	P
43	<i>Mugil korsula</i>	PL	31.81	P
44	<i>Xenentodon cancila</i>	PL	31.81	P

**Trophic level score:** The trophic level score of a fish is (Gauch 1982, Wichert et.al. 1998) the relative frequency of the fish living and using the particular trophic level in the system.

**Habitat orientation score:** According to the habitat orientation there are mainly three generic groups by which fishes are classified. Those are pelagic, generalist and benthic. Those are levelled as (P) for pelagic, (G) for general and (B) for benthic. The relative frequency of fish that are using the particular habitat among all the habitats which are available in the system, referred to as habitat orientation.

**Table 2: Data regarding trophic level, habitat orientation:** (PL = Planktivores, BE = Benthic feeder, OM = Omnivore, CA = carnivore. P = pelagic, G = General, B = Benthic)

	Trophic level	Habitat orientation
	PL = 14 BE = 5 OM = 12 CA = 13	P = 20 G = 16 B = 8
<b>Total</b>	<b>44</b>	<b>44</b>

**Result and discussion:**

The adverse effect of waste water pollution on fish diversity of Jalangi River is comparatively lower than other river like Churni River. As there is not any big industry near the bank of the river, the chances to be polluted by the industrial effluent is very low. The amount of heavy metals (industrial pollutants) is thus very low in the water of Jalangi river. There are mainly agricultural and domestic effluents (Waste water) which are mixed with the water of Jalangi. Oil releasing from boats has some little effect on the water of the Jalangi river. Some of the degraded or partially degraded particles, made from soil erosion, are mixed with the water of Jalangi. The physical and chemical characters of the water of Jalangi are more or less favourable for growing fish. The physical characters like light penetration, temperature is optimum for fish growth. Chemical characters like DO, pH, alkalinity are also favourable. The temperature of the water varies between 20-30°C; the pH of the water is 7 – 8.

High level of diversity of fish has shown on Jalangi river. The environment for growing a large number species of fish, is present there. The total numbers of species of fishes which are found earlier in the river Jalangi are also found at present in that river. That is the species richness is same. That means there is not any loss of diversity of fish in Jalangi river as the level of pollution in the water of Jalangi is very low. Though the level of pollution in the Jalangi river, and its effect on growth of fish is very low, the effect of pollution may show adversely on fish diversity of Jalangi river at future. It is thus recommended to take any step against careless disposal of waste water on the river. We should also make more awareness to that topic, so that we don't have lose any species of fish.

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