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## Water Quality Analysis of Chenab River and Aquaculture Production, Jammu, J & K, India

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**Abstract:** During these investigations, Water Quality Analysis of Chenab River and Ornamental Fish Farm Doomi, Jammu, J & K, India was carried out to understand its impact on Aquaculture Production in the area. Doomi region is an important area for aquaculture in India, with a long history of fish farming in both fresh water and brackish water environment. During the research work different types of commercial carp (catla, rohu), ornamental carp (koi) and endangered species (Tor, Tor putitora) were observed. Considering the significance of fishes as the most important group of the organisms suitable for human consumption, the aquaculture production plays significant role in providing the quality protein to ever increasing human population and to combat malnutrition. Also, Aquaculture practices generate employment and foreign exchange. As water quality is being disturbed due to various changes in the physico-chemical & biological parameters of the water, the observed morphology of Tor and Tor putitora have shown deformities and displacement of fins.

**KEYWORDS:** *River Chenab, Doomi, Water analysis, Aquaculture, Ornamental fish farm, Physio-Chemical Analysis, Fishes.*

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## 1. Introduction

Aquaculture also known as aquafarming, is the farming of fish, crustaceans, molluscs, aquatic plant algae and other organism. The term aquaculture covers all forms of farming of aquatic animals and plants in freshwater and brackish water. The controlled production of food to improve the supply for our consumption. In the case of aquaculture, the products are aquatic animals and plants that grow in the water. Even in small quantities fish can have a positive effect on the overall health and nutrition of humans. Aquaculture is breeding, raising and harvesting fish and aquatic plants. As River Chenab is one the highly hydrologically managed to river and facing several environmental issues related to human population growth, industrialization, agriculture, advancement and rapid urbanization. In respect to temperature, fish may be classified as warm water, cool water and the cold water species, with each type having an optimal temperature range. These issues are the major threat to the fish diversity of the river Chenab. In this regard, the present study was designed to make something clear about the fish diversity distribution pattern, food production and any conservation issues.

Some of the different species of *Tor tor*, *Tor putitora*, *Catla*, *Rohu*, *Red drum*, *Silver carp* and *Koi* were noticed among the fish collection made by the fishermen from the ornamental fish farm Doomi area Akhnoor over a period of three years, and reported morphologically deformed fishes were truncated and showed displacement of fins. The important food and game fishes, are widely distributed in Himalayan lotic waters in India [1]. In Jammu region of union territory of J&K these fish species in habitat the different aquaculture fish farms. River Chenab and its tributaries in Kishtwar, Doda, Banihal, Reasi, Udhampur, Rajouri and Jammu [2]. The river Ravi and its tributaries in Kathua and Samba and Poonch river and its tributaries including Mendhar nullah [3]. Endangered species which are *Tor* spp. these migrate from plains, including Pakistan for breeding in freshwater streams of Jammu region during monsoon and in summer season and are needed in good number [4]. Due to good water quality in river, ponds and streams of jammu region, there are few reports of anomalous fishes in natural water [5]. Fish is an important source of nutrients such as vitamins A, B and D, calcium, iron and iodine.



As in River Chenab deformed specimens of Tor Tor and Tor Putitora were noticed along with normal fishes and has been described [6]. These are the “ANGLE DELIGHT” is one of the importance cold water fish groups that inhabit the pristine stream with high content of dissolved oxygen [7]. In developing countries policy maker need to ensure that their policies promote broad based economic growth, especially agricultural growth, so their countries can produce enough food to feed themselves or enough income to buy the necessary food on the world market [8]. This research should include marketing harvesting, transport, and the investment. Pollution along with other stresses has intensified the problem leading to fish migration, local population extinctions or exotic species introduction [9]. Most of the people like fish as food because it is excellent food for human beings. As it is very rich in protein. Its protein is easily digestible to maximum even by child or also by old person. The meat is less fatty and it is cholesterol free meat. The role of aquaculture in food production, economic development and food security is now well recognized. Wild fish on the outside of cages may feed on waste feed pellets that pass through the cage, while populations of small fish living inside the cages may be supported by the smaller

feed particles, or “dust”, that is a waste component of most feeds [10]. A detailed survey was conducted in some tributaries and streams of River Ravi and River Chenab during the period from March 2012 to Feb 2014 with a view assess the status of Tor Putitora in Jammu region of Jammu and Kashmir State. The various water bodies scanned so far Tor Putitora was recorded from River Chenab and different streams [11]. The water quality index (WQI) developed by the Canadian Council of Ministers of the Environment (CCME) was applied to Hebbal Lake of Mysore, Karnataka State, India, to study its impact on aquatic life, livestock and to know whether it is suitable for recreation, irrigation and drinking [12]. The two lakes namely Kalwa and Jail Lake of Thane city are eutrophicated and hence the study was done to find the quality of water for the period of 6 months for various physicochemical parameters to study the pollution status of the lakes. The Jail Lake is found to be relatively more organically polluted and has a greater degree of eutrophication than the Kalwa Lake [13]. In many countries, the fishery regulations allow for or oblige small-scale fishing vessels to be registered, and boat-owners must have an official license to fish.



Fig.2.1: Map of Sampling Site on, Fish Farm (DOOMI), Jammu.

Full registration, combined with the licensing and numbering of vessels, could provide basic structural data on small-scale fisheries, so could replace frame surveys [14]. Hence, while the types of effects and interactions described for mussel farms may be possible in the case of oyster farms, virtually nothing is known of their significance [15]. In the Coromandel, for example, marine farms are generally viewed as good fishing locations, particularly when the crop is being harvested and the fouling organisms that are being cleaned from the mussels are being discharged back into the water [16].

## 2. Material & Methodology

### 2.1. Study area

**Location:** Random and regular field survey were carried out at ornamental fish farm Doomi and Chenab River which is located in the Akhnoor Division of Jammu and Kashmir,

India for the period of 3-5 days in month of April and May. Viz., Station 1 (Doomi) 32°88' N latitude and 74°73' E longitude. Line 1:- VPM+ JX3, Chak Singha, 181201 Line 2:- Null.

The total catchment area of the fish farm is 6700 sq. km before its convergence with river Indus after traversing a total length of about 1240km [17].



Fig. 2.2.: Construction Pond.

### 2.2. Research Objective

The objective of the study is to analyse the physicochemical and bacteriological parameters of selected water samples of Chenab River and Pond Doomi and to check its impact on the aquatic life. The result will suggest how to promote culture fisheries in the state by utilizing all the available resources to boost fish production in state.

## 2.3. Methodology

### 2.3.1 Field Survey

Field Survey involves collecting information on specific individuals or entities usually in their natural environment. The study was carried out in fish farm and Chenab River Doomi in 2023. This survey involves the interaction with the management team and visit at fish farm Doomi. The department developed carp unit which involves the fish of commercial importance reared in the UT include the Common Carp, Indian Major Carps, Silver Carp, Grass Carp and some other species, Construction of ponds, Water system (inlet and outlet) Construction of tank and Fishing nets was used as fishing net have been used widely in the pasts, including by stone age societies.

The oldest known fishing net is the ‘Net of Antrea’. The net was made from willow, and dates back to 8300 BC [18]. Feed the fish at proper fixed hours and spots in the pond and observe in the pond and observe how the fish consume the feed [19]. During this survey 3 species of major carp and 1 species of minor carp, 1 species of ornamental carp and 2 deformed species was observed.

### Identification of the fishes

(a) **Rohu (*Labeo rohita*)** They are bottom feeder. They have small and inferior type of mouth with soft fringed lips, absence of teeth in the bucco-pharyngeal regions.

#### (B) **Silver Carp**

*Silver carp (*Hypophthalmichthys molitrix*)* Its mouth lacks teeth, but it has comb-like structures called gill rakers. Has sharp spine on its dorsal fin.

#### (C) **Common carp (*Cyprinus carpio*)**

Common carp is a bottom feeder. It has a large, fleshy mouth and mouth is tube like. It has a single dorsal fin located on the back



Fig.2.3.Site showing Area the Fish Farm Covers

#### (D) **KOI**

*Koi* is an ornamental fish when it lives in pond its colour is colourful but it moves to the concrete surface its colour changes to colourless. *Koi* fish have a robust body.

(E) *Tor putitora* In a normal streamlined *Tor putitora* head length is greater than body depth. Dorsal fin insertion is midway between snout tip and caudal fin base.

### 2.3.2 Sampling

The water sample was collected from Fish farm Doomi and Chenab River. As plastic bottle were used to collect water sample from the sites. The BOD samples were collected in separate 3 bottles. The reason for sampling was to determine effect of water on the aquatic species and terrestrial species on the environment and their health. While collecting water sample from the river or pond it was collected very carefully and the bottles was properly submerged inside the water and was tightly close after being filled. After collecting the samples the bottle were labelled properly, were tightly closed and stored at room temperature and were put into the carry bag for water testing. After that the samples were brought to the water lab for detail physico-chemical and bacteriological analysis.

**Physico-chemical and Bacteriological Analysis:** Various physiochemical and biological parameters were analysed to understand the water quality & its impact on aquaculture production.

## 3. Result and Discussion

### 3.1. pH

The water quality parameters of the Chenab River and Fishpond, Doomi showed pH value 8.4 at the sampling site 1 and 8.0 at the sampling point 2. As per the results the pH value of the site 1 is higher than the site 2. The main difference in the pH values is due to their water quality, change in colour, weather condition and presence of the different species and vegetation in the river or pond.

### 3.2. Temperature

The water quality parameters of the Chenab River and Fishpond, Doomi showed pH value 8.4 at the sampling site 1 and 8.0 at the sampling point 2. As per the results the pH value of the site 1 is higher than the site 2. The main difference in the pH values is due to their water quality, change in colour, weather condition and presence of the different species and vegetation in the river or pond.

### 3.3. Alkalinity

The present water quality analysis of both the site showed to be same as there is no difference in their values. Because the alkalinity of both the site may be sharing same geological characteristic, input of

groundwater, organic matter decomposition and mixing due to rainfall.

### 3.4. Total Hardness

The Total Hardness ranged from 200-250 mg/l in both the selected sampling site. The value of site 1 was founded to be lower than the value of the site 2 and the difference of the value was due to environmental factor, or due to exchange of ions and water softening.

### 3.5. Chloride

Chloride concentration is one of the most indicators of water pollution and one of the major anion found in water. In the present study chloride concentration ranged b/w 600-80 mg/l in both 2 sampling sites. Chloride concentration was found to be very high in site 1 and very low in site 2.

### 3.6. Fluoride

The fluoride concentration in the water sample was determined to be 0.15-0.0 mg/l in both the sampling site. Where according to Bureau of Indian Standards (BIS) for the value ranges from 1.5-1.0 mg/l. As according to result water quality analysis of both the site showed to more in site 1 and there was no effect and presence of fluoride in site 2. The effect of fluoride in site 1 was more because of fluoride

rich sources, weathering of rocks, due to some human made activities.

### 3.7. Dissolved Oxygen

Concentration of DO is an important parameter in assessing water quality particularly for aquatic ecosystem. The acceptable DO level can vary depending upon the specific water body and its intended use. The Dissolved Oxygen in water sample was determined to be 11.3-4.8 in both two sampling sites. As seen the DO concentration was found to be low in site 2 as compare to the site 1. The value variation was due to some possible reason such as change in vegetation, organic matter, decomposition, pollution, change in temperature and nutrient level.

### 3.8. Iron

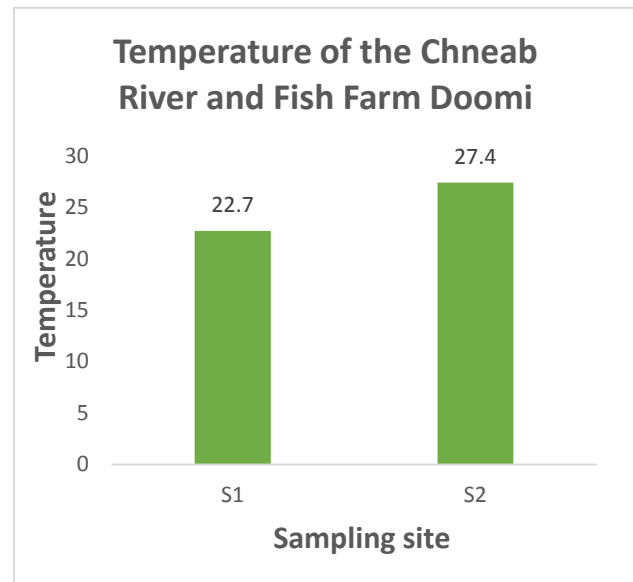
The iron concentrations in both the 2 sampling site fall within the acceptable range according to BIS standards. The measured iron concentration of both the sample ranges from 0.25-0.3 mg/l but according to result site1 was having low concentration of iron as compare to the site2. And it indicates good water quality according to BIS standards.

### 3.9. Biological Oxygen Demand

The BOD analysis was conducted to assess the organic pollution level and the oxygen-consuming capacity of the water sample. The BOD values provide insights into the water quality and the potential impact on aquatic life. The BOD analysis of both the 2sites was determined to be 2.5-7.4 mg/l. As the BOD concentration in site 1 is lower than the site 2. The BOD analysis of both the 2sites was determined to be 2.5-7.4 mg/l. As the BOD concentration in site 1 is lower than the site 2. The site which has lower concentration of BOD suggests low organic pollution and indicates good water quality indicates minimal organic material present in water which result in lower demand of oxygen and healthier ecosystem. Whereas site which show higher concentration of BOD suggests high level of organic pollution in water and leading to increased oxygen demand and result in oxygen depletion, potentially harming aquatic life and overall ecosystem. . Whereas site which show higher concentration of BOD suggests high level of organic pollution in water and leading to increased oxygen demand and result in oxygen depletion, potentially harming aquatic life and overall ecosystem.

**3.10. *E. coli* (*Escherichia coli*)** *Escherichia coli*, commonly known as *E.coli*, is a

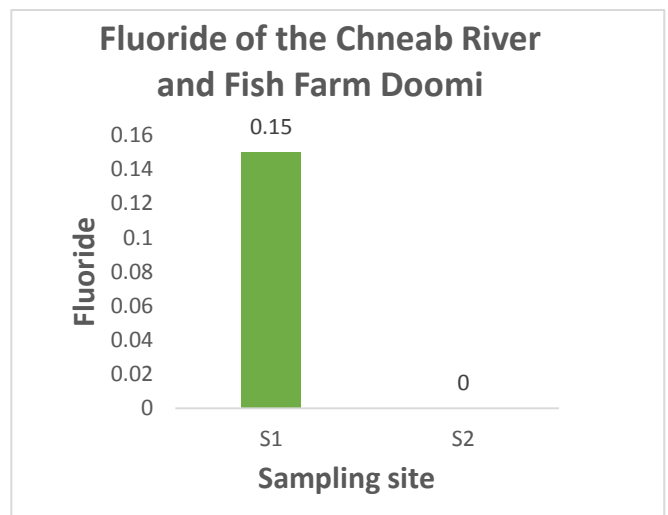
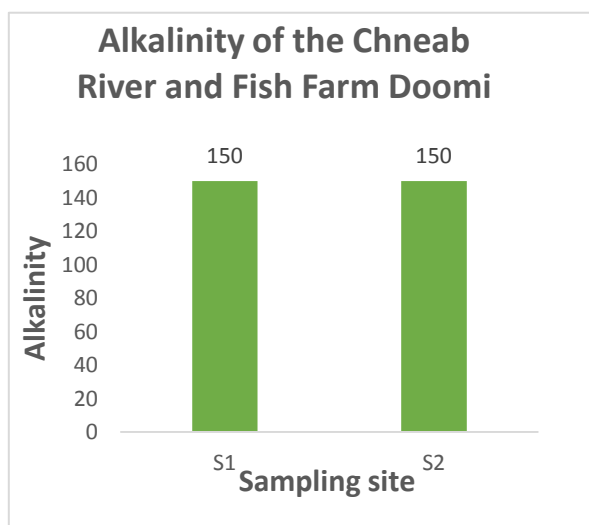
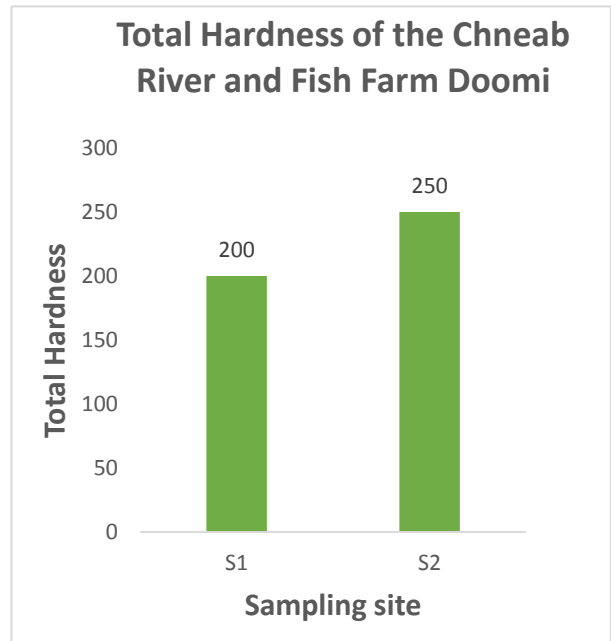
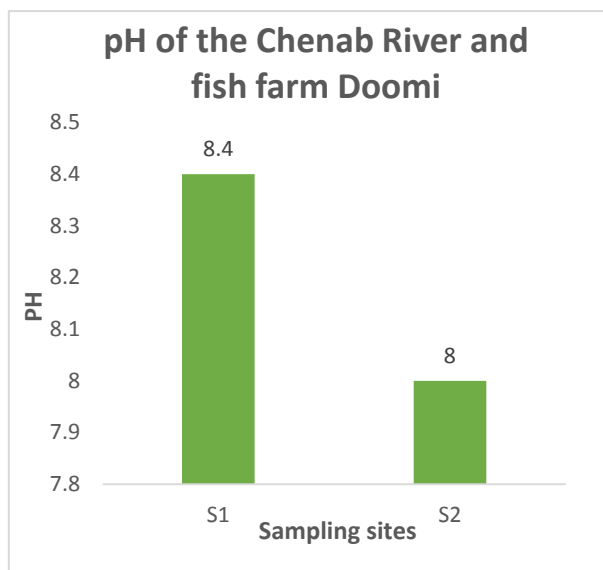
bacterium that belongs to the family



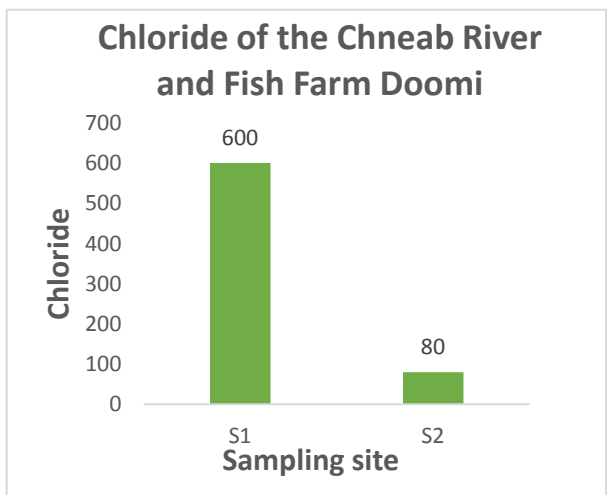
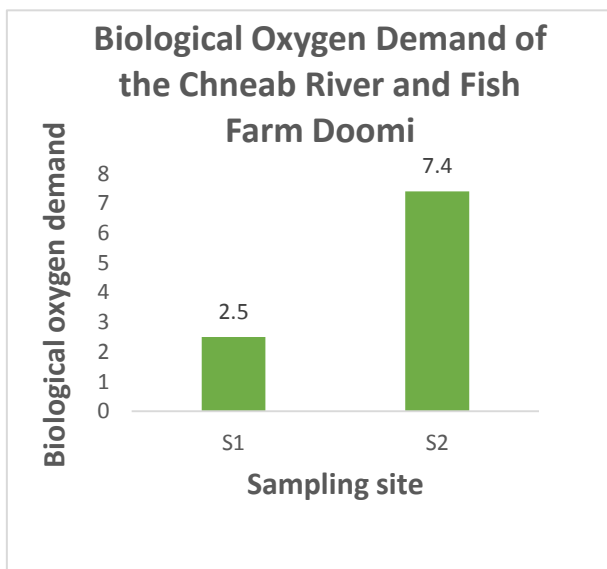
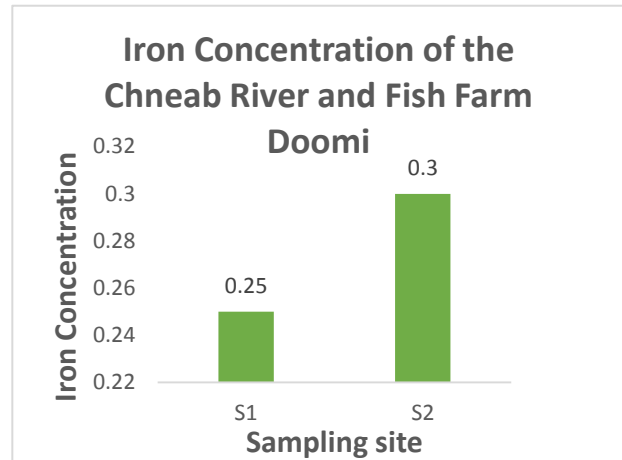
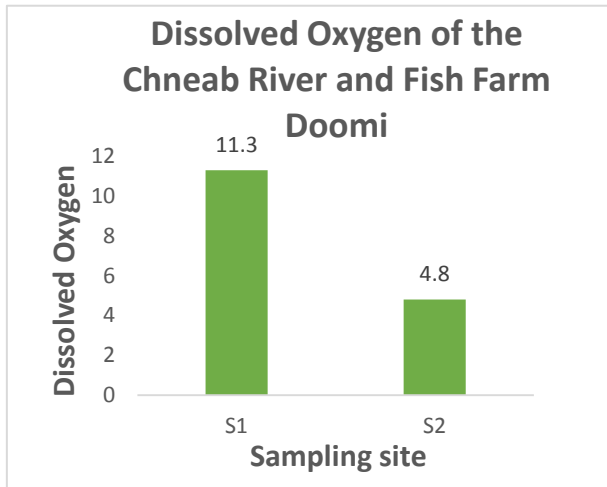
*Enterobacteriaceae*. It is a gram-negative, rod-shaped bacterium that is commonly found in the intestines of humans and warm-blooded animals. While most strain of *E.coli* are harmless and even beneficial, some strains can cause illness, particularly that produce toxins. They can be transmitted through contaminated food or water, contact with infected individuals, or contact with animal faces. *E.coli* is often used as an indicator organism in water quality testing. The *E.coli* testing was conducted to assess the presence of faecal contamination and potential health risks association with the water sample. The sample collected from the 2 sampling site were tested positive for the presence of *E.coli*, indicating the presence of faecal contamination. This



exceeds the permissible and desirable limits set by BIS, which specify that E.coli should be absent in 100ml of water. The presence of E.coli suggests a potential risk to human health and aquatic ecosystem and indicates that water may be contaminated with faecal matter. and overall ecosystem.



As DO and BOD played a significant role in affecting the pond water quality, hence ecosystem of Chenab River is disturbed. It was also observed that the major threat affecting ecosystem is from construction of ponds.



Besides, clearing of land, loss of habitat and fragmentation are also important factors in disturbing the entire ecosystem. Change in water availability, Nutrient enrichment and eutrophication, soil is also highly effected due feed and the waste that is released by fishes in pond.

#### 4. Conclusion

During these investigations, it was concluded that not much considerable changes in water quality parameters at different locations (sampling sites) were expect in few sites, where a modest increase in a couple of parameters, however indicated good water quality status. During process of aquaculture, various observed morphological features provided insight into feeding habits, reproductive strategies and interaction among



different fish species. More over the bacteriological analysis provided the presence of the bacteria in the water body which has the positive impact on the vegetation, fish health and on the environment. The different external parasites which may have high adverse on the fish health, were also observed. As Chenab River is facing multiple threats to water

diversion & destructive method of fishing, fish banning in seasons must be implemented. As in fish farm Doomi management of the pond is done in comprehensive manner but where as in in Chenab River conservation management of the river must be in a comprehensive manner, involving local stakeholders and people.

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