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Current Status of the Fish Fauna of River Jhelum, Kashmir, J&K

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Abstract

Fish fauna form an integral part of aquatic ecosystems, and any changes taking place in the medium in which they live can affect their productivity, diversity and distributions. In order to assess the current status of the fish fauna of the river Jhelum, study was undertaken from June 2011 to January 2012. Monthly samplings were carried out at the three study sites – Marval, Zero Bridge and Tengpora, covering a total river length of about 60 km (about 29% stretch of the river Jhelum through the Valley). During the study period, six species of fish were recorded - *Schizothorax curvifrons* Heckel 1838, *Schizothorax esocinus* Heckel 1838, *Schizothorax plagiostomus* Heckel 1838, *Schizothorax labiatus* McClelland 1842, *Schizothorax niger* Heckel 1838, and *Cyprinus carpio* Linnaeus 1758. Earlier studies carried out by Yousuf et al. [1] on this river at Butengoo (Khanabal) and Zero bridge (Srinagar) report the occurrence of eleven species of fish which include the above mentioned six species and a further of following five species – *Carassius carassius* Linnaeus 1758, *Gambusia affinis* [*holbrooki*] Girard 1859, *Puntius conchonius* Hamilton 1822, *Bangana diplostoma* Heckel 1838 and *Triplophysa* sp. Mean fishing effort fluctuated between a low of 120.2-280.5 g/man-hour at site II (Zero Bridge) to a high of 140.2-300.4 g/man-hour at site I (Marval), with a mean fishing effort of about 130.26 - 290.46 g/man-hour. Earlier studies by Sunder & Subla [2] and Yousuf et al. [1] report the fishing effort in the river Jhelum at 261-829 g/man-hour and 173.2-360.1 g/man-hour respectively. Apparently, the fishery resource of the River Jhelum has thus declined over a period of time indicating some stress or abnormal external influences which are altering the health of this vital economic-ecologic lotic waterbody.

Keywords: Fish fauna; *Schizothorax*; Fishing effort; Catch composition; Population decline; River Jhelum; Kashmir

Introduction

Fish plays an important role in the development of a nation. Besides being a cheap source of highly nutritive protein, it also contains essential nutrients required by the human body (Sikoki and Otobotekere) [3]. Fish forms an important item in the food of the Kashmiris, and those who dwell near the lakes; and the floating population of boatmen depend for a considerable part of their sustenance on the prey of their nets or lines [4]. Jammu & Kashmir has enormous potential resources in the inland sector teeming with fish. The country is endowed with vast and varied resources possessing river ecological heritage and rich biodiversity. The valley of Kashmir is famous throughout the world for its fresh waters, and has tremendous potential for the development of fisheries especially in the cold water sector. The fish fauna of the Jhelum River is one of the earliest local fish faunas known to science. The first collection was made by the Austrian Carl Alexander Anselm von Hügel at the end of a long trip through Eurasia over the period 1831-1836, and deposited in the Naturhistorisches Museum in Vienna, Austria. Heckel (1838, 1844) [5,6] published two well illustrated taxonomic accounts of the fish collection based on Hügel's specimens, summing to 16 species all of which he considered to be new to science. Ten of the species belong to the group of cyprinid fishes now commonly referred to as oreinins, schizothoracines, mountain barbels, snow trout, or snow barbels. In the minds of ichthyologists and others interested in fisheries, the Kashmir Valley is forever The Snow Barbel Place. Several studies have been conducted in the past on the fish and fisheries of the Valley. Yousuf et al. [1] reported 19 species of fish belonging to *Cypriniformes, Siluriformes*, *Cyprinodoniformes* and *Salmoniformes* from river Jhelum and its tributaries. There is need to have many more studies, so as to develop a strategy for the overall improvement of the fishery resources of the region. The present study provides an updated status of the fish fauna of River Jhelum so as to assess the possible management strategies that need to be implemented.

Materials and Methods

Study area

The Kashmir valley, nested in the north western folds of the Himalaya, enjoys a continental climatic condition with marked seasonality resembling sub-Mediterranean type characterized by the varying rainfall occurring throughout the year. The valley is mainly drained by river Jhelum and its tributaries and has passed through various geological successions ranging from the oldest Archean to the recent Alluvium.

Jhelum, the major river of Kashmir, originates from the spring Verinag located in the foot of the Panjal mountains in the district Islamabad/ Anantnag. The river runs a course of 203 kms through the valley. The river flows across the main valley of Kashmir in Northwest direction up to Bonyari in Bandipora district where it joins the Wullar lake. It then reemerges from the lake near Sopore in Baramulla district taking southwestern direction leaving the valley near Gantamulla. From there it assumes torrential nature and flows through the Uri town before entering over to Pakistan administered Kashmir. On its course through the valley, it carries the waters of a host of streams that flow down from the bordering mountain slopes. Unfortunately, all along its course through the valley of Kashmir the river is loaded with large quantities of sewage and agricultural runoff from the catchment.

Study sites

A total of three study sites (Figure 1 and Table 1) markedly different

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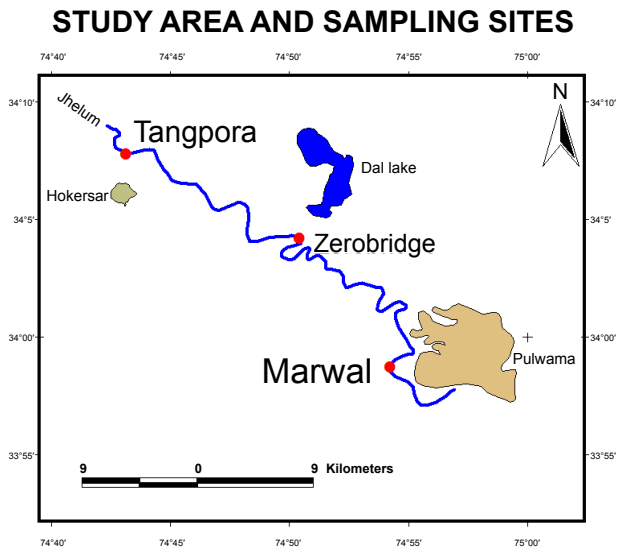

Figure 1: Geographical map of study area showing the location of study sites (indicated as solid circles).

Site ▼	Elevation	Latitude	Longitude
I. Marval	1601 m	33° 58' 45.4" N	74° 54' 16.5" E
II. Zero bridge	1582 m	34° 4' 9.2" N	74° 50' 20.88" E
III. Tengpora	1577 m	34° 7'47.1" N	74° 43' 11" E

Table 1: Geographical attributes of the study sites [Positional error ± 6m].

in respect of demographical features were selected for the sampling. Site I preceded the section of the river flowing through the Srinagar city (Site II), and Site III was downstream to the Site II.

Site I was located at Marval in District Pulwama about 32 km from the main city centre. This site was characterized by having the moderate human population on both the banks along with the agricultural fields. Site II was located (about 1.2 km from the city centre) at Zero bridge in Srinagar city. This stretch of the Jhelum River is characterized by congested human population and commercial activities along both the banks. All along its course from Marval to Srinagar the river receives significant quantities of domestic wastes from human settlements and army cantonment areas. Site III was located at Tengpora about 26 km from the main city centre. This stretch of Jhelum River was characterized by moderate human population on both the banks along with the vegetable cultivation.

Methods

Fish specimens were procured on the monthly basis from June 2011 to January 2012 with the help of fishermen. The fishers used indigenous method of cast net for fishing. The specimens were preserved in 10% formalin and brought to the laboratory for further studies. Fish specimens were identified with the help of the standard taxonomic works (Kullander et al.) [7]. For calculating the fishing effort, two fishermen were hired, one for rowing the boat and other for fishing with net for a particular period of time. The results were reported as g per man-hour. Fishing was usually carried out during morning hours.

Results and Discussion

During the present study, a total of six species of fish were encountered at three different sites from the river Jhelum (Table 2). *Schizothorax esocinus* was found to be the most abundant *Schizothorax* species at the Zero Bridge (site II) and Tengpora site (III) followed by *S. curvifrons*, *S. plagiostomus*, *C. carpio*, *S. labiatus* and *S. niger*. At site I (Marval), *S. plagiostomus* was the dominant fish followed by *S. curvifrons* and *S. esocinus* (Tables 3 & Table 4). The distributional pattern of fish community in the river showed variation at different sites. Species composition highlighting the dominance pattern of the species by number followed the trend as *Schizothorax esocinus* > *S. curvifrons* > *S. plagiostomus* > *Cyprinus carpio* > *S. labiatus* > *S. niger* (Figure 2).

Kullander et al. [7] who made a standardized fishing along the Jhelum River and associated lakes in Kashmir valley obtained fourteen native and four introduced fish species over a period of eight years, five species of *Schiozothorax*, four of which are specialized lotic forms and one of which (*Schiozothorax niger*) is chiefly found in lakes. Yousuf et al. [1] reported eleven species from river Jhelum (at two sites – Butengoo (Khanabal) located in District Anantnag, about 45 km from Srinagar and 2 km downstream of Islamabad town; and River Jhelum at Zero bridge in Srinagar city), and during the present study only six species were observed (Table 2). However, certain fish species viz. *Carassius carassius* Linnaeus 1758, *Gambusia affinis holbrooki* Girard 1859, *Puntius conchonius* Hamilton 1822, *Bangana diplostoma* Heckel 1838 and *Triplophysa* sp. were not observed during the present study. While studying River Jhelum and its important tributaries in Kashmir, Yousuf et al. [1] collected 13 species of fish (*Schizothorax plagiostomus*, *Schizothorax labiatus*, *Schizothorax* esocinus, *Schizothorax curvifrons*, *Schizothorax niger*, *Gambusia affinis*, *Triplophysa* sp., *Crossocheilus diplochilus*, *Glyptothorax kashmirensis*, *Puntius conchonius*, *Bangana*

S. No.	Fish Species ▼	Local Name
1	*Schizothorax curvifrons* Heckel 1838	Satter gad
2	*Schizothorax esocinus* Heckel 1838	Chhurru
3	*Schizothorax plagiostomus* Heckel 1838	Khont
4	*Schizothorax labiatus* (McClelland 1842)	Chush
5	*Schizothorax niger* Heckel 1838	Ale gad
6	*Cyprinus carpio* Linnaeus 1758	Punjabe gad

Table 2: The fish species presently encountered from the river Jhelum, Kashmir.

S. No.	Fish species ▼	Site I	*Site II*	*Site III*
1	*Schizothorax curvifrons*	11	8	13
2	*Schizothorax esocinus*	10	9	14
3	*Schizothorax plagiostomus*	17	6	2
4	*Schizothorax labiatus*	8	2	0
5	*Schizothorax niger*	2	2	2
6	*Cyprinus carpio*	3	3	6
	Total	51	30	37

Table 3: Contribution of fish by number at different study sites, June 2011 - January 2012.

Fish Species ▼	Jun. 2011	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan. 2012
Schizothorax curvifrons	3	2	4	5	4	3	6	5
Schizothorax esocinus	4	7	2	2	5	6	3	4
Schizothorax plagiostomus	3	2	1	2	5	3	5	4
Schizothorax labiatus	1	2	1	0	0	2	3	1
Schizothorax niger	2	1	0	0	0	1	2	0
Cyprinus carpio	2	2	1	0	2	0	3	2
Total	15	16	9	9	16	15	22	16

Table 4: Monthly fish catch from River Jhelum, June 2011 - January 2012.

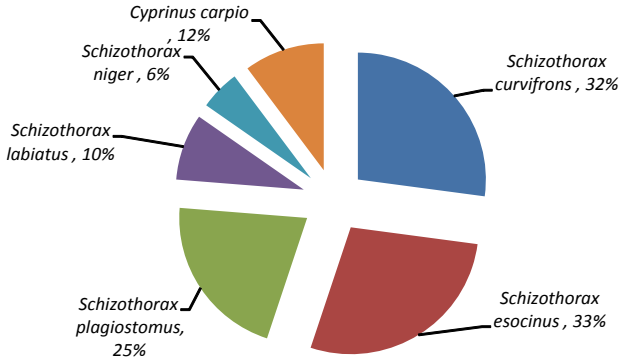

Figure 2: Percent contributions of fish catch from the river Jhelum, June 2011 – Jan. 2012.

Site▼	Fishing effort, g per man-hour
I	140.2 – 300.4
II	120.2 – 280.5
III	130.4 – 290.5
Average	130.2 – 290.4

Table 5: Fishing effort at various study sites.

diplostoma, Cyprinus carpio communis, Cyprinus carpio specularis and *Carassius carassius* in the main river with the maximum number of 11 species recorded at the Zero bridge site in Srinagar. Khan [8] opined that the anthropogenic pressure along the catchments has adversely affected the fish density in the lentic and lotic water systems of Kashmir.

Fishing effort calculated at three different sites showed variation and on the whole the mean fishing effort was about 130.26 - 290.46 g/man-hour (Table 5). Sunder and Subla [2] and Yousuf et al. [1] reported the fishing effort in the river Jhelum at 261 – 829 g/man-hour and 173.2 - 360.1 g/man-hour respectively. Since fishing effort is an index of fish population structure in a water body, it appears that the fish population in the river has comparatively got lowered over the past few decades, probably because of overexploitation, habitat destruction, disturbance of breeding grounds, increasing level of pollution, etc. According to Dudgeon et al. [9] the major threat to riverine ecosystems of India is the intense human interventions resulting in habitat loss and degradation and as a consequence many fresh water fish species have become endangered. The good catch composition in the winter months can be attributed to low water level during the winter months.

Conclusion

The present study partially reflects that the fish catch as well as the diversity has apparently got reduced in the river Jhelum. Most probably the river ecosystem is not getting the adequate time to recover its natural community structure. Efforts need to be oriented to preserve this important lotic fish habitat which has tremendous economic and ecological significance.

Suggestions

Since over-fishing is one of the main concerns for the depletion of fishery resources in the river, therefore, monitoring needs to be carried out regularly. The fishermen reportedly are not adhering to the mesh size standards, as prescribed under the rules. In order to manage fisheries, especially *Schizothorax* species in the river, immediate steps need to be undertaken, for example, fishing in the river need to be regulated so to avoid over exploitation of this vital resource. The entry of sewage, agricultural wastes and solid wastes into the river needs to be controlled and properly managed. Regulating the sand excavation especially during the breeding season forms the utmost priority. Similarly, river sections need to be identified and marked were sand excavations can be banned on the basis of a hydrological study because it is an acknowledged understanding that the river adjusts itself according to the mass eroded and the extra quantity that it can transport. Certain river sections like the meanders which assume different hydrodynamic properties than the usual river sections can affect a larger area of the river and thus also its biota. A separate authority needs to be established to monitor the physico-chemical and biological characteristics of the River Jhelum water body.

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