International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182 Print ISSN: 2349-5979
www.allsubjectjournal.com
Volume 3; Issue 1; January 2016; Page No. 278-280

Survey and study of fish fauna of river Jhelum, Kashmir (J&K)

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Abstract
Fish fauna form an essential part of aquatic ecosystems, and any variation taking place in the medium in which they live can affect their productivity, diversity, distributions and behavior. In order to assess the current status of the fish fauna of the river Jhelum, study was undertaken from Dec. 2014 to Dec. 2015. Monthly samplings were carried out at the four study sites –Ladkipore Bridge,Khanabal, Sangam, Zero Bridge covering a total river length of about 85 km (about 35% stretch of the river Jhelum through the Valley). During the study period, nine species of fish were recorded – *Schizothorax plagiostomus* Heckel 1838, *Schizothorax esocinus* Heckel 1838, *Schizothorax curvifrons* Heckel 1838,*Schizothorax labiatus* McClelland 1842, *Schizothoraxniger*,Heckel 1838, *Cyprinus carpio communis* Linnaeus 1758, *Cyprinuscarpiospecularis* Linnaeus 1758, *Crossocheilus diplochilus* Heckel 1838 and *Triplophysa marmorata* Heckel 1838. 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, River Jhelum**,** Schizothorax

Introduction
Fish are a diverse group of animals, highly specialized for their aquatic existence and comprising almost half the number of vertebrate species in existence today. Fish plays an imperative role in the development of a nation.Fish makes an essential contribution to the survival and health of significant portion of worldpopulation as most of the portion of the diet comes from the fish and fisheries product (Mineret al., 2012).Fish is considered as one of the major source of animalprotein for over a billion people in most developing countries. Around 60% of people indeveloping countries depend on fish at least 30% of the animal protein supplies, while almost 80% in most developed countries obtain less than 20% of the animal protein from the fish (Delgado *et al.*, 2003). Fish forms an important role in the food of the Kashmiris, and those who inhabit 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(Lawrence WR 1895) .The valley of Kashmir is endowed with enormous potential of aquatic resources in terms of upland rivers, streams, high and low altitude natural lakes. The biological productivity of these aquatic resources are quite high, which can suitably be harnessed for fish culture. By virtue of this fish farming has tremendous potential for rationalizing natural resource to the social and environmental demand.These lentic and lotic habitats comprise chiefly of indigenous and exotic food fish species. The water in the lentic and lotic water bodies of Kashmir is cold, crystal clear, has high oxygen content and also temperate climate provides excellent habitats for peculiar typeof fish fauna. Among the indigenous fish species the most valuable genus which is used asfood as well as commercial purpose on a large scale throughout the valley is Schizothoraxspp., which represents the most native dominant group of fishes in Kashmir Himalayas.Heckel (1838, 1844) publishedtwo we illustrated taxonomic accounts of the fish collection based on Hugel'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. Several studies have been conducted in the past on the fish and fisheries of the Valley. Yousuf et al. (2006) reported 19 species of fish belonging to Cypriniformes, Siluriformes, Cyprinodoniformesand 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.

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 PanjalMountains 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 Wullarlake. 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 catchmen.

Study sites

A total of fourstudy sites markedly differentin respect of demographical features of Kashmir were selected for the sampling. Site I was located at bridgeLadkiporein District Anantnag about 15km km from the main Town. This site was characterized by having agriculture fields both the banks and moderatre human population. Site II was located at Khanabal in distract Anantnag. Site iii Sangam was located in district Pulwama. Site IV zero bridge. In this stretch of River Jhelum from Anantnag to Srinagar was characterized by dense human population and moderate agriculture fields on both the banks.

Methods

Fish specimens were procured on the monthly basis from Dec 2014 to Dec. 2015 with the help of fishermen. The fishers used indigenous method of cast net for fishing. The specimens werecollected in bucket and brought to the laboratory for further studies. Fish specimens were identified with the help of the standard taxonomic works (Kullander et al.) Fishing was usually carried out during morning hours.

Results and Discussion

During the present study, a total of nine species of fish were encountered at four different sites from the river Jhelum (Table 1).*Schizothoraxplagiostomus* was found to be the most abundant *Schizothorax*species at(site I) and Khanabal site, Sangam (II), (III) followed by *S. plagiostomus*, *S.esocinus*, *Schizothoraxlabiatus, S. curvifrons, Crossocheilusdiplochilus, Triplophysamarmorata, Cyprinuscarpiocommunis, CyprinusCarpioSpecularis*. At site IVZero bridge, S. esococinuswas the dominant fish followed by and *S. plagiostomus S. labiatus, S. curvifrons, S. niger*.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 *S. plagiostomus>Schizothoraxesocinus> S. curvifrons>S. labiatus>Crossocheilusdiplochilus>Triplophysamarmorata> Cyprinuscarpiocommunis>Cyprinuscarpiospecularis> S. niger*(Table 2 and fig .1). Kullander et al. who made a regular 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 (*Schiozothoraxniger*) is chiefly found in lentic. However, certain fish species viz. Carassiuscarassius Linnaeus 1758, *Gambusiaaffinis*, Girard 1859, *Puntiusconchonius* Hamilton 1822, *Banganadiplostoma*Heckel1838 While studying river Jhelum and its important tributaries in Kashmir, Yousuf et al. (2006) collected 13 species of fish (*Schizothoraxplagiostomus, Schizothoraxlabiatus, Schizothoraxesocinus, Schizothoraxcurvifrons, Schizothoraxniger, Gambusiaaffinis, Triplophysasp., Crossocheilusdiplochilus, Glyptothoraxkashmirensis, Puntiusconchonius, Banganadiplostomus.*

Table 1.The fish species presently encountered from the river Jhelum, Kashmir

S. No	Fish Species	Local names
1	*Schizothoraxplagiostomus* (Heckel 1838)	Khont
2	*Schizothoraxesocinus* (Heckel 1838)	Chhurru
3	*Schizothoraxlabiatus* (McClelland 1842)	Chush
4	*Schizothoraxcurvifrons* (Heckel 1838)	Satter gad
5	*Schizothoraxniger* (Heckel 1838)	Ale gad
6	*Cyprinuscarpiocommunis* (Linnaeus 1758)	Punjabe gad
7	Cyprinuscarpiospecularis (Linnaeus 1758)	Punjabe gad
8	*Crossocheiludiplochilus* (Heckel 1838)	Tetther
9	*Triplophysamarmorata* (Heckel 1838)	Araguran

Table 2 Contribution of fish by number at different study sites, Dec 2014- Dec 2015

S.No	Fish Species	Site I	Site II	Site III	Site IV
1	*Schizothoraxplagiostomus* (Heckel 1838)	16	12	9	8
2	*Schizothoraxesocinus* (Heckel 1838)	10	10	5	10
3	*Schizothoraxlabiatus* (McClelland 1842)	7	3	5	5
4	*Schizothoraxcurvifrons* (Heckel 1838)	7	5	4	6
5	*Schizothoraxniger* (Heckel 1838)	0	1	3	3
6	*Cyprinuscarpiocommunis* (Linnaeus 1758)	0	2	5	5
7	Cyprinuscarpiospecularis (Linnaeus 1758)	0	1	3	6
8	*Crossocheiludiplochilus*(Heckel 1838)	5	6	3	5
9	*Triplophysamarmorata* (Heckel 1838)	8	3	2	1

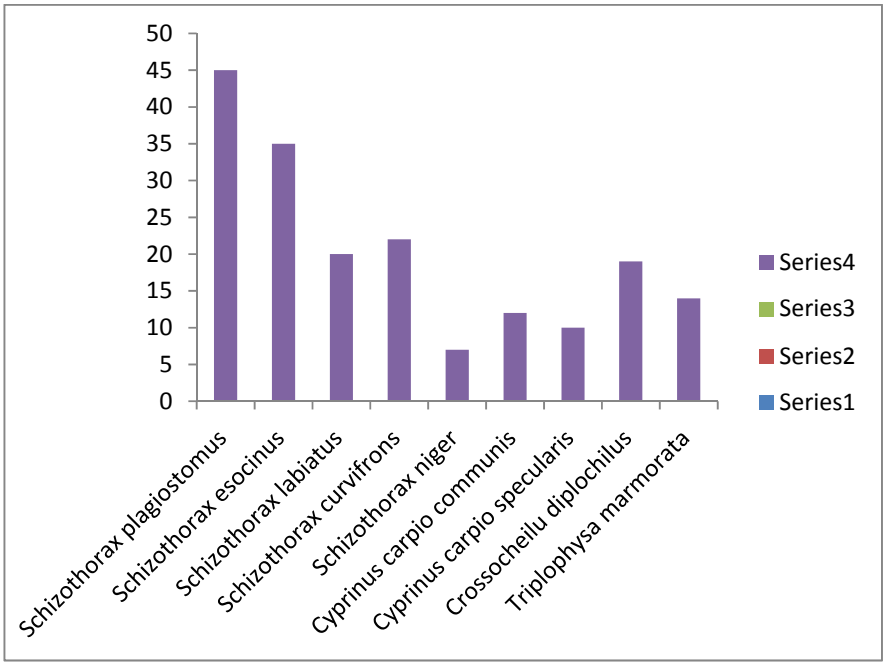

Fig.1 Shows fish catch from the river Jhelum Dec 2014-2015

Conclusion

During this study we find 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 Schizothoraxspecies 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 separateauthority needs to be established to monitor the physico-chemical and biological characteristics of the River Jhelum water body.

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