

# Diversity of Fishes in River Viashaw: The left tributary of River Jhelum of Jammu and Kashmir, India.

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**Abstract:** River Viashaw is the left tributary of the river Jhelum which originates from lake Kousarnag located within the lap of Pir Panjal mountain range at an altitude of 11500 ft and forms the famous waterfall at Aharbal. River Viashaw is coldwater river, hence habitat for coldwater aquatic organisms. During present study there were 6 species of fishes found at different selected locations which mostly belong to order Cyprinidae. Fish Species found were Schizothorax plagiostomas 40%, Schizothorax curvifrons 2%, Schizothorax esocinus 12%, Schizothorax richardsonii 16% Triplophysa kashmirensis 24%, Crossocheilus diplochilus 6%. According to Water quality parameter index the water of river Viashaw is classified good but is gradually approaching towards bad quality as revealed from results. Illegal mining i.e. extraction of sand and boulders from river and over fishing has resulted in decline in the number of fish in river Viashaw.

**Index Term:** Viashaw, Aharbal, Schizothorax, Cyprinidae, Water quality parameters, Illegal mining.

## I. INTRODUCTION:

Diversity is related to the living and non-living organic matter existing in the world. According to data available at FishBase there are about 33,100 species of fish which had been described by April 2015, that form more than the combined total of all the major vertebrate like Mammals, Amphibians, Reptiles and Birds. Fish being diverse is categorized into marine and freshwater and can be demersal or pelagic. Demersal fish live on or near the bottom of oceans and lakes. Whereas pelagic fish inhabit water column away from the bottom. Although fish is almost found in every aquatic environment but most of the fish whether by species count or abundance live in warm environment with moderate temperature, while remaining ones withstand the coldwater environment Jammu and Kashmir has enormous potential resources of cold water which makes its one of the largest habitat for freshwater fishes in northern India.

Fresh water ecosystem is most threatened with rapid extinction of various species. One of many fresh water sources are considered as the life line. The fresh water fishes inhabit the entire network of snowfed streams and rivers of the valley. Fish diversity has been assessed by fish abundance composition and richness these attributes which form the community structure and species assemblage in the rivers and streams are influenced by many biotic and abiotic factors which determine the assemblage or dispersal of fishes in rivers and streams. Anthropogenic activities led to different adaptabilities due to different geographical location, temperature, pH has disrupted the pattern distribution among different species. Likewise Tropical, and Sub-tropical regions have less diversity in comparison to the groups of aquatic organisms including fishes inhabiting the temperate regions. Fish diversity is an essential tool for the stability of aquatic ecosystem. Apparently this diversity depends upon the different ecosystem. The valley of Kashmir is endowed with Lakes, springs, snowfed streams and rivers which make it an excellent habitat for most of fresh water fishes of northern India. It is reported that 19 species of fishes were found so far in river Jhelum and its tributaries belonging to different orders like Cypriniforms, Silluriforms, Cyprinidae, and Salmoniforms. Population explosion has



month of February to April. Fishing was done in morning and evening hours of the day, at an average of about 5 hours in a day.

**b) Fish Identification:**

The fish collected were examined by using morphometric techniques from the handbook -The freshwater fishes of India, Pakistan, Bangladesh, Burma and Sri-Lanka by K.C. Jayaram (zoological survey of India) and were identified using database FishBase. The fish caught were measured for preservation.

**c) Water sample collection:**

Water samples were collected in 1 litre capacity plastic bottles from selected sites of the river Viashaw –The left tributary of river Jhelum. Temperature of air and water was recorded during collection of water samples from selected sites using digital thermometer.

pH of collected water samples was recorded at room temperature within hour of the collection. Other parameters were analyzed in the laboratory using standard measures recommended by American Public Health Association (APHA).

**d) Water Analysis:**

Water quality parameters like Alkalinity, Conductivity, Transparency, pH and Temperature of collected water samples from three different sites of river Viashaw were determined.

According to EPA the water quality of river Viashaw is categorized good quality class but is gradually shifting towards the bad quality class due to anthropogenic activities.

**e) Statistical Analysis and Interpretation :**

Analysis of collected data was done using Shannon-Wiener diversity index , this diversity index is used to measure the species diversity in community as well as richness of the species .This provides us the requisite information about the rareness and commonness of species in community . Shannon-Wiener diversity is measuring tool for both abundance and evenness of the species present with equal weight age. It is represented by H' letter. The value of this index ranges from 0 to ~4.6, a value near indicates that every species in sample is same and value near 4.6 indicates that the number of individuals of a given sample are evenly distributed between all species. Following are the formulae used for statistical analysis of fishes

$$H' = \sum P_i \ln P_i$$

$$E = H / \ln S$$

The value for “E”(evenness) ranges from 0 to 1, 1 represents the complete evenness, where as the H' value for H' ranges from 0 to ~4.6.value towards 4.6 indicates high diversity where as value towards 0 indicates low diversity in a community.

### III. Results:

From the three selected sites of river Viashaw fish were caught and examined morphologically, later handed over for preservation.

At site A (Mah): Out of 238 fish caught in aggregate from river Viashaw among these 98 fish were caught from this selected site which was confined to five species such as Schizothorax plagiostomas, Schizothorax esocinus, Schizothorax richardsonii, Triplophysa kashmirensis, and Crossocheilus diplochilus.

Alkalinity, pH, Conductivity, Transparency reveals the moderate type of aquatic habitat.

At site B (Brazloo/Pahloo): Out of 238 fish caught from three different sites of river Viashaw, only 30 fishes were caught at this site which were confined to three species only likewise

Schizothorax plagiostomas, Schizothorax richardsonii, Triplophysa kashmirensis. Water quality parameters of this selected site were found more inclined towards the unhealthy range for aquatic life, which results in the decline of fish diversity as well as number of fish inhabiting the area.

At site C (Khudwani): Most number of fishes from the total was caught from this site. Transparency, Conductivity, pH, Temperature, Alkalinity Water quality parameters were found supportive to aquatic life, as Viashaw is joined by small stream called Vethvathur. About 110 fishes were caught from this site which was found to comprise the 6 different species, most number of species found among selected sites. Like Schizothorax plagiostomas, Schizothorax curvifrons, Schizothorax esocinus Triplophysa kashmirensis Crossocheilus diplochilus Schizothorax richarsonii.

Total 6 species were found in river Viashaw, only Schizothorax plagiostomas were found dominant in count ,contributing about 40% to the total and was found almost evenly distributed at all the selected sites, where as Schizothorax curvifrons were found confined to a only one of the selected sites and were least in number contributing 2% to the total. The comparative study of the diversity and distribution of fish in river Viashaw revealed that there has been a rapid decline in the number of fishes in river Viashaw.

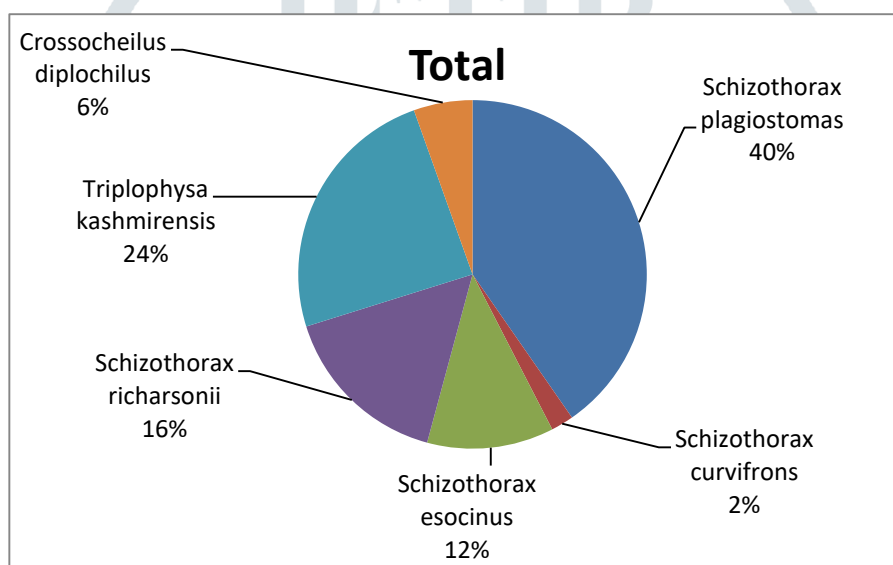


Fig 1.1 Representation of fish composition caught from river Viashaw

**a) Water Analysis:**

Water quality parameters like Alkalinity, Conductivity, Transparency, pH and Temperature of collected water samples from three different sites of river Viashaw were determined.

Table 2. Water quality parameters of rivers Viashaw at three different sites.

Water parameters	Site A	Site B	Site C
Transparency	80 mm	120 mm	50 mm
Alkalinity	156 mg/l	140 mg/l	186 mg/l
Conductivity	260 $\mu\text{S/cm}$	210 $\mu\text{S/cm}$	300 $\mu\text{S/cm}$
Water Temperature	8 °C	5 °C	10 °C
pH	7.1	6.8	7.8

Water of river Viashaw is gradually shifting towards the bad quality class due to anthropogenic activities. Transparency of river Viashaw was observed between 50 mm to 120 mm

Alkalinity determined was in range of 140 mg/l to 186 mg/l, Conductivity determined was in a range of 210  $\mu\text{S/cm}$  to 300  $\mu\text{S/cm}$ . pH determined was between 6.8 to 7.8. This concludes that the water of river Viashaw is good quality class according to EPA, good quality class water of river Viashaw provides suitable habitat for the aquatic life but decline in number of fishes in river Viashaw is mainly due to over fishing and illegal mining.

**b) Statistical Analysis and Interpretation:**

Diversity	Evenness
H'	E <sub>H</sub>
1.48	0.826

From the above results the value of H' and "E" indicates that diversity of fish is very less in river Viashaw, and is dominated by single species i.e. evenness is poor among species.

Table 3. Total length of the fishes measured from three different sites of river Viashaw. Values are in length in (cm) Mean ±SE Figure in parenthesis denotes the number of fishes.

S.No	Species	Site A	Site B	Site C
		Length in cm (Mean ±SE) (n)	Length in cm (Mean ±SE) (n)	Length in cm (Mean ±SE) (n)
01	<i>Schizothorax plagiostomas</i>	20.0 ±0.54 (30)	25.00 ±0.62* (18)	25.07 ±0.49* (42)
02	<i>Schizothorax curvifrons</i>	— (—)	— (—)	20.00 ±0.95 (05)
03	<i>Schizothorax esocinus</i>	17.00 ±0.45 (11)	— (—)	18.05 ±0.67 <sup>NS</sup> (17)
04	<i>Schizothorax richarsonii</i>	20.05 ±0.77 (14)	18.00 ± 1.29 <sup>NS</sup> (04)	18.05 ± 0.67 <sup>NS</sup> (20)
05	<i>Triplophysa kashmirensis</i>	08.0 ±0.15 (40)	06.12 ± 0.39* (08)	05.00 ±0.29* (10)
06	<i>Crossocheilus diplochilus</i>	12.00 ±1.15 (03)	—	10.00 ±0.80 <sup>NS</sup> (10)

Superscript \* indicates statistical significance in comparison to Site A. Site B and Site C denotes \*p < 0.001 respectively. NS = Not significant

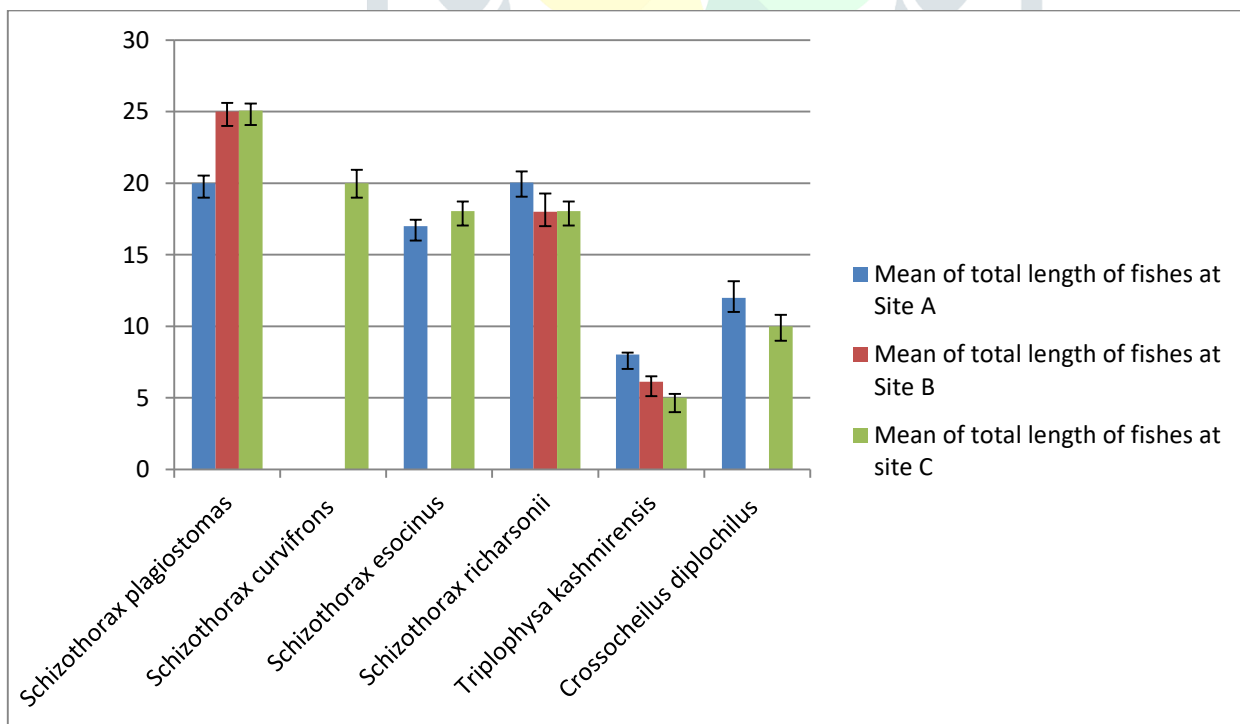


Fig 1. Comparison of Total length of fishes caught from three different sites of river Viashaw.



#### IV. Conclusion and suggestions

River Viashaw being the snowfed coldwater stream provides suitable habitat to endemic fish species as well as to exotic ones although they are threat to the native of river. The fishes in river Viashaw are under constant threat of declination as evident from the results because of anthropogenic activities like illegal mining i.e. extraction of sand and boulders, sewage disposal and construction of bridges (habitat fragmentation) and over fishing. Water quality of river Viashaw is getting changed gradually and is inclining towards the unsuitable range. Among all the species found in river Viashaw only Schizothorax plagiostomas has shown the resistance or is capable to withstand the challenging habitat as compared to other species which inhabit the same river at similar or different places.

To protect the existing fish species of river Viashaw from rapid declination, measures should be taken by concerned authority. Illegal mining should be banned and the areas where vulnerable Schizothorax richarsonii often inhabits should be declared sensitive zone for the anthropogenic activities and should be monitored for maintenance of water quality parameters that will provide ample time to the fish species to increase its number. Sewage disposal near the river should be avoided or banned by concerned authority. Fishing should be limited to 3-4 days a week that will provide chance of recovery to fish species. Same suggestion should be forwarded to the respective authorities for the implementation and campaigning about the effect of declination of fish on humans should be done on priority bases.

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