



## Hydrological conditions of River Beas and its fish fauna in Kullu Valley, Himachal Pradesh, India

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### Abstract

The present communication highlights the hydrological regime of Beas river in Kullu Valley which was studied at four sites during the whole year of 2003. Flow of current ranged between 378 - 432 cubic feet/sec. Depth of river ranged between 1-4 mts. Width of the river ranged between 40-50 mts. Water temperature ranged between 5.2 °C -17.7 °C. pH showed only little fluctuation. Transparency of the water was high throughout the year except rainy season. Dissolved oxygen was high and it showed an inverse relationship with water temperature. Total alkalinity was also high. Investigation of fish fauna of the river in the valley revealed the presence of 6 species of fishes belonging to 3 orders and 3 families.

**Keywords:** *Beas*, *fish fauna*, *physico-chemical*, *hydrological*, *fish catch*

### Introduction

Kullu district is situated between 31° 58' 00" N latitude and 77° 06' 04" E longitude. The district of Kullu forms a transitional zone between the lesser and the greater Himalayas and presents a typical rugged mountainous terrain with moderate to high relief. The altitude varies from 1300 meters to over 6000 metres from the mean sea level. The high reaches are bestowed with magnificent snow peaks and glaciers. The important glaciers of the district are Kalihen, Beaskund, Saraomga, Tirchu, Parbati, Dibbi and Mantalai.

The river Beas originates from southern slope of Rohtang pass (Beas Kund) at an elevation of 4062 m (msl). The water of Beas and its tributaries remains shallow, rapid cool and clear except during the rainy season. The bed comprises of mainly the boulders, stones and rubble. The river receives a number of tributaries both on right and left banks during its downward drift of over 470

km. Its principal tributaries are Solang, Manalsu, Sujjain, Fojal and Sarvari on the right bank and Alain, Duhagan, Chhaki, Haripur Nalah, Parbati, Tirthan and Sainj on the left bank. The vegetation along the banks consist mainly of the alnus, willow, rubenia and conifers.

The brown trout *Salmo trutta fario* (Linnaeus) was first of all successfully transplanted in the river Beas in the first decade of twentieth century *i.e.*, in 1909 (Howell, 1916). Since after its introduction in the valley its stock is being replenished by stocking trout fry in river Beas and its tributaries. Till date, very limited work has been done on the ecology of River Beas. Shah (1975) reported the food and feeding habits of brown trout in River Beas. Observations were therefore made in the river Beas to study the fish fauna and hydrological conditions in selective stretches. The location of the sampling sites along the River Beas in Kullu district is shown in Fig. 1.

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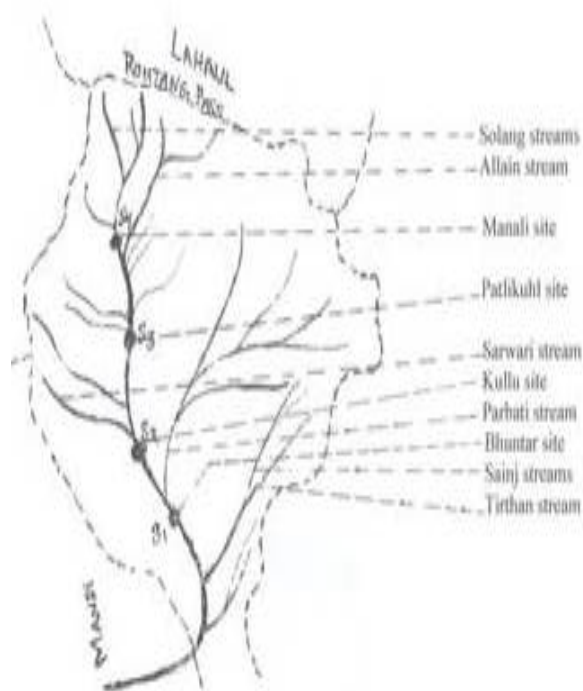
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### Materials and Method

In the River Beas, four sampling sites were chosen namely, Bhuntar, Kullu, Patlikulah and Manali. Collections were made from these sites at fixed

time and almost remained uniform throughout as far as possible. The hydrological conditions of the river Beas *viz.*, water current, depth, width, longitude, latitude and altitude. Water current (cubic feet/sec.) was calculated by cork floating method. The flow of current was measured by the following formula:  $R = WDaL/T$ .

The river depth was calculated with the help of a marked bamboo stick. It was recorded from at least 5-6 points having different depths and the average of all these points was considered as the mean depth. The river width was measured with the help of measuring tape. Longitude, latitude and altitude (msl) were determined with the help of Magellan GPS.



**Fig.1: Location of the sampling sites along the river Beas in Kullu District, Himachal Pradesh**

The physico-chemical parameters of water of the River Beas *viz.*, water temperature, pH, transparency, dissolved oxygen, total alkalinity were analyzed fortnightly following APHA (1998). Due to shallow depth, stony bottom and fast current, the transparency was measured by bright pin head method (Saha *et al.*, 1971). Hydrogen ion concentration of water was determined by digital pH meter. For dissolved oxygen, unmodified Winkler's method was adopted (Welch, 1948), while carbonate and bicarbonate (total alkalinity) were determined by

titration method with N/50 Sulphuric acid using phenolphthalein and methyl orange as indicators. Fishes were collected regularly by some indigenous methods *viz.*, by bait and hook and by cast net. Collected specimens were preserved in 5% formalin solution with a small abdominal incision. Fishes were identified using key given by Jayaram (1999).

## Results and Discussion

The physico-chemical parameters studied in the River Beas includes water temperature, transparency, pH, dissolved oxygen and total alkalinity. Monthly variations in physico-chemical parameters of water are shown in Table-1.

**Table.1 Monthly fluctuations in physico chemical factors in River Beas during the year 2003**

Months	Water Temperature (°C)	Transparency (cm)	pH	Dissolved Oxygen	Alkalinity (ppm)
<b>January</b>	5.2	47.8	7.6	12.0	70.6
<b>February</b>	7.1	43.3	7.4	11.2	85.0
<b>March</b>	9.2	46.1	7.4	11.2	83.1
<b>April</b>	11.3	51.5	7.3	10.0	80.1
<b>May</b>	10.0	29.3	7.1	10.8	61.2
<b>June</b>	12.8	10.2	7.3	10.2	57.5
<b>July</b>	16.0	6.1	7.5	9.7	59.3
<b>August</b>	17.7	7.7	7.7	9.2	53.7
<b>September</b>	17.1	9.9	7.0	9.9	56.2
<b>October</b>	12.9	29.5	7.0	10.9	67.5
<b>November</b>	8.1	53.2	7.4	11.4	75.6
<b>December</b>	8.2	62.3	7.5	12.8	75.6

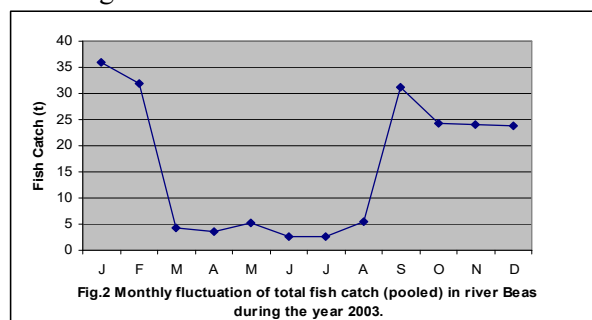
Temperature showed distinct seasonal variation. Water temperature (average) ranged from 5.2 °C (January) to 17.7 °C (August). The pH of the river water was always found to be in the alkaline range (7.0-7.7). River water was clear and transparent during winter and transparency low during monsoon (6.1cm) which was due to fast current and greater inflow of muddy rain water. Total alkalinity was high and the value was maximum in the month of February (85.0 ppm) and minimum (53.7 ppm) in the month of August. Dissolved oxygen was quite high and showed wide fluctuation. Its value was maximum in December

(12.8 ppm) and minimum during August (9.2 ppm). Fish catch in River Beas in Kullu valley and its composition during different months are depicted in Table 2 and graphically shown in Fig. 2. Fish catching was maximum during January (36.0 tons) while minimum in the month of July (2.6 ton).

**Table 2: Fish catch in river Beas**

Months	Catch(t)
January	36.0
February	31.9
March	4.3
April	3.6
May	5.3
June	2.7
July	2.6
August	5.4
September	31.1
October	24.2
November	24.1
December	23.8

The literature is available on the fish fauna of the River Beas (Tandon and Sharma, 1976; Sharma, 1979 and Tandon and Sharma, 1984; Sehgal, 1970; Shah, 1975). Earlier, during its flow it was a fast flowing typical hill stream with a network of rivulets in the form of khads and ravines and harboured a variety of rich hill stream fish fauna and indigenous fish fauna.



The fish fauna of River Beas include two exotic fishes namely *Salmo trutta fario* L. and *Onchorhynchus myskiss*. According to Jayaram, (1999) it should be *S. gairdnerii gairdnerii richardsonii*) and only one native fish i.e. *Schizothorax richardsonii*. Data is not available on four fish species; hence, their exact status is not evaluated. As *S. trutta fario* feeds voraciously on the young ones of *S. richardsonii*, there is a possibility that in the near future, the population of

*S. richardsonii* may decline in the river. *Onchorhynchus myskiss* has been reported to feed on insect larvae under natural conditions; therefore, it may not affect the population of *S. richardsonii*.

A survey of fish fauna at different study areas of the River Beas revealed the presence of following Pisces:

Species	Local name
<b>Order:</b> Cypriniformes <b>Family:</b> Cyprinidae	
1. <i>Schizothorax richardsonii</i> (Gray)	Gurgal, Googly
2. <i>Gara gotyla gotyla</i> (Gray)	
3. <i>Nemacheilus rupecola</i> (Mc Clelland)	Natwa
<b>Order:</b> Siluriformes <b>Family:</b> Sisoridae	
4. <i>Glyptothorax indicus</i> (Talwar)/ Syn. <i>G. horii</i> (Show & Shebbeare)	
<b>Order:</b> Salmoniformes <b>Family:</b> Salmonidae	
5. <i>Salmo trutta fario</i> Linn.	Brown trout
6. <i>Onchorhynchus myskiss</i>	Rainbow trout

Further *Onchorhynchus myskiss* is most suitable for culture in high altitude waters, as it is easy to domesticate, accepts artificial feed, withstands low oxygen content of water, shows more resistance to disease especially ferunculosis and exhibits fast growth rate. Hence, its culture in captivity has been undertaken successfully in Kullu region (Johal, 2001). Our observation and the earlier observations have indicated that during the past few years the native fish species have been adversely affected by anthropogenic factors in the upper catchments area of the hill streams. Thus snow trout populations have declined not only due to over fishing, but also by the use of unscientific methods of capture and changes brought about by flash floods, increasing load of silt and hydroelectric projects (Sharma and Singh, 1980; Singh, 1987).

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