

Ichthyofaunal Study in Trans-Himalayan Rakchham-Chhitkul Wildlife Sanctuary in Baspa (Sangla) Valley, District Kinnaur, Himachal Pradesh, India

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Abstract

The Trans-Himalayan landscape is a high elevation land. The area is characterized by extreme cold, low precipitation and rugged terrain of mountains. Biodiversity is the variety and variability of all forms of life on earth that plays a great role in human existence. This includes diversity within species, between species and of ecosystems. The exploration of Rakchham-Chhitkul Wildlife Sanctuary present in the Baspa (Sangla) valley situated in remote tribal district of Kinnaur in Himachal Pradesh, formed by the two of world's greatest mountain ranges namely Great Himalayan range and Dhauladhar ranges in India revealed the presence of 2 species of fish belonging to 2 genera, 1 families and 1 order. It was noticed that both species of fish were exotic species which were introduced in India in early twentieth century from European countries.

Keywords: Biodiversity, Ichthyology, Trout, Trans-Himalayan, Kinnaur

1. Introduction

Himalayan mountains are the most magnificent and youngest mountain systems in the world. The proportion of endemic taxa is substantial in the entire Himalayan Range and this ecoregion has been designated as a global biodiversity hotspot (Mittermier et al., 2004). The Trans-Himalayan landscape is a high elevation land with average altitude of about 4,000 m. The area is characterized by extreme cold, low precipitation and rugged terrain of mountains.

Biodiversity may be defined as the variety and variability among living organisms and the ecological complexes in which they occur. It encompasses the variety and variability of all forms of life on earth. It is necessary for our existence as well as valuable in its own right (Wanjui, 2013). It is measured most commonly, at the level of species.

The fishes are a group of animals formed of aquatic cold-blooded vertebrates possessing gills for respiration throughout life and limbs, if any, are in the shape of fins and primarily depend on water as a medium to live in. These are consumed by human world over as they are rich in proteins, vitamins, and other nutrients. They are also good indicator of the ecological well being of the waters they inhabit. This group comprises about half the total number of vertebrates with a total of 32447 valid species (www.Fishbase.org). The described number of species is 27,977 belonging to 62 orders, 515 families and 4,494 genera and valid number of extant species on earth is estimated to be close to 32,500 (Nelson 2006). Noteworthy is the fact that about 12000 species or 42.72%, normally live in freshwater lakes and rivers that cover only 1% of the earth's surface and account for a little less than 0.01% of its water while remaining around 16000 species live in salt water covering a full 70% of earth surface.

India considered as one of the mega biodiversity country is home to 2,546 species of fish belonging to 969 genera, 254 families and 40 orders out of which 930 species belonging to 326 genera, 99 families and 20 orders are the fresh water species (Talwar & Jhingram 1991). From amongst the 4 living classes of fishes, India harbours 2 classes, viz., Chondrichthyes (those with cartilaginous skeleton) and Osteichthyes (those with bony skeleton). The cartilaginous fishes, Chondrichthyes are represented by 131 species belonging to 67 genera, 28 families and 10 orders, and Osteichthyes by 2,415 species in 902 genera, 226 families and 30 orders of which five families notably the family Parapsilorhynchidae are endemic to India (Barman, 1998). Out of the 2200 species listed so far,

1440(65.45%) belongs to the marine ecosystem, 143(6.50%) to the brackish waters, 54(24.73%) to the warm freshwater domain, and 73(3.32%) cold freshwater regime. The checklist of Menon (1999) lists 446 primary freshwater species under 33 families and 11 orders from the Indian region alone. Of the primary freshwater species 68% are constituted by the Cyprinoids, 18% by Siluroids and 14% by other groups. Jayaram (1999) listed 852 freshwater species of fishes under 272 genera, 71 families and 16 orders, including both primary and secondary freshwater fishes from India, Bangladesh, Myanmar, Nepal, Pakistan and Sri Lanka.

Himachal Pradesh has only 1.7% of total geographical area of the country but contributes more than 4% of its fish species with 104 species belonging to 48 genera, 14 families and 8 orders (Mehta and Uniyal, 2005). The streams in Himachal Pradesh falls under two categories, the general water streams and trout water streams with estimated length of 600 and 2400 kms respectively, thus presenting suitable habitats for the fish fauna. The fish species distribution in the Himalayan streams depends on the flow rate, nature of substratum, water temperature and the availability of food; however water temperature is the most important limiting factor affecting geographical distribution and local occurrence within one water system. Because of the extreme climatic conditions, the fish fauna in Trans-Himalayan region of the state is not very high as evidenced by the reporting of 5 species from Kinnaur and only 2 species from Lahaul & Spiti district (Mehta and Uniyal, 2005). Similarly, only three species of fish were reported from Pin Valley National Park, Lahaul & Spiti district of Himachal Pradesh (Mehta and Sharma, 2008)

2. Study Area

Present study has been conducted in Rakchham- Chhitkul Wildlife Sanctuary located in the Baspa (Sangla) valley with geo-coordinates of latitude $31^{\circ}14'22''$ N - $31^{\circ}28'37''$ N and longitudes $78^{\circ}17'31''$ E - $78^{\circ} 31'30''$ E covering an area of about 304 Km² in the northeast corner of Kinnaur, a tribal district in Himachal Pradesh, India (Fig. 1). The Baspa river originating near the Indo-Tibet border from Baspa Bamak and Arsomang glaciers travels 72 Km through the valley giving it not only the water but also its name, joins the river Sutlej at Karchham. The Baspa (Sangla) valley is characterized by mountains covered by perpetual snow cover (Deota et al., 2011). These rugged, precipitous peaks represent two of the world's greatest mountain ranges namely Great Himalayan range and Dhauladhar ranges on the right and left bank of Baspa river respectively. The altitude of Baspa valley ranges from 2,800 masl to 5,486 masl. The temperature varying from -15°C to 18°C , mean rainfall 463 mm and annual snowfall 1,130 mm. The ecological characteristics changes very sharply in the mountains due to steep gradient. Thus there is a great variation in climatic conditions in the valley. The parts of the sanctuary up to altitude 3,450 m get good precipitation in the form of rain or snow but beyond that the precipitation is scanty and mainly in the form of snow. The forest type of this sanctuary includes Lower Western Himalayan Temperate Forest, Upper Western Himalayan Temperate Forest and Sub-Alpine Birch-Fir Forest. The sanctuary area is fed with numerous snow-fed perennial and seasonal streams.

The ichthyofauna of Himachal Pradesh has engaged the attention of many distinguished investigators since long, who have conducted studies on diversity of fishes in different parts of the state (McClelland 1839, 1842; Stenidachner 1867, Hora 1927, Menon 1951, 1954, 1962, 1974, 1987, 1999, Bhatanagar 1973, Tilak and Husain 1977, Sharma and Tandon 1990, Mehta 2000, Dhanze and Dhanze 2004, Jagtap 2013, Singh and Banyal, 2013). In a recent study, the distribution, conservation and abundance status of fish fauna of state were discussed which includes 81 fish species comprising of 49 genera, 18 families and 6 orders (Sharma and Sidhu 2016). In the past, a few attempts have been made to study the fish fauna of Trans-Himalayan region of Himachal Pradesh (Mehta and Uniyal 2005, Mehta and Sharma 2008, Kumar 2010). However, the present study area of Rakchham-Chhitkul wildlife sanctuary has received very little attention of the investigators due to severe cold climate, and inaccessible habitat. Only a few studies have been conducted on diversity and ecology of larger vertebrates of this sanctuary area (Wynter-Blyth, 1948; Narang, 1989; Negi and Banyal, 2015 a&b). The present study is the first of its kind and will act as baseline literature for further studies on the biodiversity of thus far neglected area.

3. Methodology

The present work is an attempt to study the abundance and diversity of fish fauna of the study area. The study area was divided in to three altitudinal zones viz., Zone-I: The area from Sangla to Kharogla (2700 to 3000 m) which support the forests of lower level fir like Tosh, Zone-II: The area from Rakchham to Mastarang (3050 to 3300 m) supporting the forests of Deodar and Blue pine and Zone-III: Area from Chhitkul to Dumti (3450 to 4200 m) supporting the tracts of blue pine, birch & rhododendron forests, and alpine meadows. The survey was conducted during June 2012 to June 2013 at various locations situated at different altitudes. Apart from the Baspa River which is the main river of the valley various spring water channels situated at different altitudes were also explored. Fish fauna of the area were studied by periodically trapping them using drag nets. These specimens were

photographed for identification and were then transferred back to the water body. No specimens were killed or brought to laboratory during the present study. Identification of these specimens was based on morphological characters. Fishes were identified with the help of keys and diagnostic character given in Talwar and Jhingran (1991) and Jayaram (1999).



Figure 1. Map of Baspa valley, the study area in District Kinnaur, Himachal Pradesh, India (Source: mapsofindia.com and diagrammatic map of Baspa Valley)

4. Results and Discussion

Present study revealed the presence of 2 species of fishes, belonging to two genera of Family Salmonidae, Order Salmoniformes and Class Actinopterygii. During present study these species were recorded in zone I & II while they were absent and not recorded in zone III.

Table 1. Systematic list of fishes observed in Rakchham-Chhitkul Wildlife Sanctuary, Baspa (Sangla) Valley, District Kinnaur, Himachal Pradesh (India)

S. No	Zoological Name	Common Name	Class	Order	Family
1	<i>Oncorhynchus mykiss</i> Walbaum, 1792,	Rainbow trout	Actinopterygii	Salmoniformes	Salmonidae
2	<i>Salmo trutta fario</i> Linnaeus 1758,	Brown trout.	Actinopterygii	Salmoniformes	Salmonidae

It was observed that the two species recorded, were the exotic species introduced in this region. Five species of salmonids were introduced in the Himalayas between 1905 and 1969 from Europe, North America and Canada.

These were: brown trout, rainbow trout, eastern brook trout (*Salvelinus fontinalis*), splake (hybrid between lake and brook trouts), and the land-locked variety of Atlantic salmon (*Salmo salar*). Of these, brown trout is now well established, with a number of self-sustaining populations in the streams of the Himalayas. Rainbow trout has failed to establish itself in the stream ecosystem but it is cultured in fish farms. The government has setup fish seed farms to produce the seeds of these exotic fishes and stock it in rivers and reservoirs with an aim to replenishing the harvested stocks from these water bodies. The study area has a small trout farm in zone I on the left bank of Baspa in Sangla which was established in 1965. This hatchery is producing seed of Rainbow trout (*Oncorhynchus mykiss*), and Brown trout (*Salmo trutta fario*). The fishes were recorded most frequently from the areas nearer to this trout farm. In addition to the river Baspa, the fishes were also recorded from spring water channels in the village of Rakchham and in the Nashi and Nagasti area of Chhitkul village. These spring water channels provide unique microhabitats to these fishes as the temperature in these water bodies remains comparatively high and they do not freeze during winters. The population of fishes were more in areas with low altitudes, while as the altitude increases there was marked decrease in population of these fishes.

The study area has of late witnessed various development activities. With its lofty snow capped peaks, mountain streams, magnificent biodiversity and fascinating ethnic diversity the valley, over the years has developed as a favoured tourist destination leading to the arrival of large number of tourists every year. The unregulated growth of tourism industry can make an upbeat destination lose its scenic charm and tranquillity. The visitors are offered angling activity which is going to be detrimental to these exotic species. The research in such protected areas can not only add to the body of human knowledge but also generate information useful for the efficient management of our national parks and wildlife sanctuaries and forests.

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