



Study of vertebrate fauna in river Tawi.Jammu(J&K)

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1. ABSTRACT

Aquatic vertebrates play crucial role in their respective ecosystems for ecological balance and stability. Fresh water fishes constitutes the most conspicuous component of inland aquatic fauna. These cold blooded Gnathostome vertebrates are perpetually chained to an underwater existence and occur in all kind of hydrographic media. . The river water under goes drastic changes in hydrogen ion concentration according to the rain fall and other potential factors such as their origin in snow capped mountains, which melt during summers. The migration of the fish during rainy season or monsoon is mostly for breeding purpose. The Amphibians are known for their dual life both on land as well as in water, mostly they spend early stage or developmental stages of their life in water. Amphibians often spend their adult life near the water bodies and marshy or moist places. The River Tawi was investigated in 2007-08 for thorough study of fauna from its banks and inside the water . During the investigation very limited groups of vertebrates were explored and studied that included some species of prominent fishes of the region and a unique species of Amphibian. This investigation was carried out between Nagrota and nikki Tawi bridge that covers 7-8 kms stretch of the river. Attempts were made to collect the specimens periodically in all the seasons and several chances were gone vain since river is deteriorating due to direct and indirect exposure of pollutants and solid wastes coming from highly populated Jammu city in the form of sewerages and garbages. Pollution caused major damage to important fauna of the river and reduced population of its inhabitants to greater extent. Main emphasis have been laid on the recovery of fauna present in the river and particularly vertebrates (Fishes and Amphibians) that plays major role in the ecosystem and functions as top most consumers in the food chain and food webs at certain trophic levels. During the investigation three species of fishes and one species of Frog were found and studied for their characteristic features. The fishes studied were Tor tor, Labeo rohita and Mystus seenghala ,while one species of frog was Rana cyanophlyctis.

Keywords:-Amphibian, Fauna, Gnathostome, Tawi, Vertebrates.

2. INTRODUCTION

The aquatic vertebrates generally the most familiar of animals, and include fish, amphibians, reptiles, mammals and birds. The community of organisms in water body form an important link in the food web of fishes apart from their biological role in the mud water exchange of nutrients. The macro invertebrates of fresh water environments primarily insects, crustaceans and molluscs provide significant support to the aquatic food web and are responsible for the sustenance of fishes, amphibians, aquatic birds and other wild life. It has been observed that the growing recognition for better understanding its communities and

productivity has lead to increased exploitation of many inland water bodies (Rosillon, 1985; Cohen, 1988 and Bass 1986). The fact that water bodies have become dumping grounds of waste is well known to every body. Same is the true of river Tawi (Surya Putri), the holy river of Jammu and to which are attached numerous religious and aesthetic values, has not escaped this wrath. The river Tawi while running through the thickly populated and industrial area of Jammu, is increasingly being chocked with pollution. It is the length and size of the river, and the constant flow of melting snow from the Himalayas that dilutes the effect of pollutants to a certain degree.

But now, scientifically speaking, Tawi is not as serene as it was famous for. It was with a view to account for serenity attributed mainly to pollution encroaching and river – bed digging downstream; that this survey was planned and the river was investigated in the year 2007-8 to study its faunal elements in general and vertebrate fauna in particular. An effort had been made to present the changing ecology of the river Tawi and its impact on fish resources. During the investigation an effort was made to study the faunal elements (vertebrates) from the area falling very close vicinity of Jammu city and covering the 7-8 kms stretch between Nagrota and Nikki Tawi bridge of Mandal area. Available literature on the subject revealed that there were very limited informations on the rivers of Himalayan region, most of the studies were from fish ponds and lakes. Some contributions about Himalayan streams were made by Pahwa (1979), Dutta (1978) and Jhingran (1988). Scientific development of fish resources is impossible unless basic information on physio-chemical characteristics of the water and a thorough knowledge of the biotic constituents and their interrelationship is acquired. Unfortunately knowledge about the various hydrobiological parameters in inland water bodies have not attained the size and status on which firm foundation for the advancement and development of inland fisheries could be laid in Jammu and Kashmir. Keeping this in view River Tawi was investigated as a representative of the lotic environment in Jammu and Kashmir State now UT.

During the investigation main focus was given to explore and study vertebrate fauna of the river Tawi. Attempts were made to study distribution and abundance of fish fauna that comprises an economical assistance for local fishermen of the area. As it is evident from the existing literature that adversely affected fauna of the river is deteriorating day to day. To get better experience of its inhabitants the study was carried out through out the year in 2007- 08, in which mostly it was observed very least no of specimen belonging to diverse species of fishes. Although, all the studied species of fishes were of great ecological, scientific and economic importance but their numbers were reducing in alarming rate. Besides, one important species of frog was collected and studied from nearby small pools of river in the down stream area of study site. Repeated collections were carried out in order to get maximum species of vertebrates, but unfortunately very few collection sites were able to give good results. All the suitable methods or techniques as per existing literature were tried, such as hand net or scoop net method, fishing net with the assistance of local fishermen and in deep region of river even chemicals based spray was applied. Finally all the collected specimen were preserved in formalin and ethanol and then studied/ identified in the laboratory by using recommended key for identifications and consulting relevant literature or books.

3.MATERIAL AND

METHODS

Study area

River Tawi was selected for investigation keeping in view the presence of limited information about its faunistic elements. The river Tawi has its origin from Seoj near Bhaderwah a meadow of the Kailash Mountain in the middle Himalayas. It flows through middle mountains along Dudu, Chapar, Marothi, Cheneni and Udampur, several tributaries join it at different places on its way to Jammu. It is bounded by Siwaliks ranges from Jindrah to Jammu and thereafter, enters a plain stage. It covers a distance of 120 kms, from its sources to Jammu. Jammu city, the winter capital of J& K is situated on the bank of river Tawi. The river has been polluted and it can be saved only if a cleansing drive is under taken on a large scale besides, imposing strict restriction on the people from polluting it. The study area of the river was selected by following the populated and unpopulated stretch that was good to give comparative account about its existing fauna. The stretch falling between Nagrota and Nikki Tawi bridge measuring about 7-8 kms investigated. The desired sites of the river Tawi was selected as Nagrota, Nikki Tawi bridge area, Main Tawi bridge, Jewel area and Raipur Satwari area near river banks.

Collection Techniques

To collect vertebrate fauna we used conventional cast net in the river and on the isolated pools that varied between 1.0 and 2.0 m in diameter. A major feature of the cast net used was that of solid iron or lead sinkers, weighing about 5.0 kg, were provided on the peripheral cord. On account of heavy weighing of sinkers, the cast net after casting settled rapidly on the bottom thus preventing the net from being carried downstream by the current. After casting, the fishermen upturned the stones of the river bed in the area blanketed by the net and the fishes hiding underneath got caught in the peripheral pockets of the net.

The rod and line method was also applied to catch fishes and amphibian. The rod was about 1.5-2.0 m long, made of salix spp. to which the nylon thread was attached with a large hook. The bait mostly used was either earthworm, fingerlings of trash fish or kneaded maize/wheat flour.

Fixation and preservation

Vertebrate specimen thus collected alive or in a narcotised state were dropped directly into a solution of dilute formalin 10%. This solution was made by diluting one part of commercial formalin (37% to 41%) with nine to ten parts of water. A bucket with measured quantity of water to which (10%) formaldehyde solution was added also served as a transportation vessel for the collection.

The specimen were dropped into bucket, which was then covered with a cloth or lid preventing jumping and escape of the

specimens who finally died slowly and settled down. This assisted in their proper identification. The specimen, thus, collected remained soaked in the formalin solution for at least four or five hours till they became hard enough and well preserved. Once back to the laboratory the specimens were removed and put into freshly prepared formalin solution.

Identification

All the vertebrate fauna (Fishes & Amphibian) collected so far was identified by using the literature recommended after Tonapi (1980), Verma et al., (1995) and Jayaram (2000). While identifying the specimens some special features were kept in to considerations, such as Morphological features, Habit and Habitats, Food & feeding, and association with other biotic factors.

4. REVIEW OF LITERATURE

Aquatic fauna have been remained hotspot of ecological research since long and simultaneously this area has lot of potential for exploration , investigations, scientific importance and socio-economic benefits. Various research have been carried out in this field by numerous scholars and scientists across the globe. The vertebrate fauna and related investigations of fresh water bodies have been carried out by different observers. Though many rivers of india have been studied hydro biologically very few were studied with relation to aquatic organisms. Iyengar and Venkataraman (1951) observed seasonal succession of the Cooum river at Chennai (Madras) with reference to diatometaceae. Chacko and Ganpati (1952) studied hydrobiological survey of the Surali river. Das and Shrivastava (1956,59) observed seasonal fluctuations of the phytoplankton composition of fresh water bodies. Quasim and Siddiqui (1960) made preliminary observations of river Kali which is covered by the effluents of industrial water. Rai (1962, 1974a,b) studied the hydrobiological aspects of river Yamuna at okhla Delhi. One of the largest rivers in India, the Ganga was studied by Laxminarayan (1965a,b) at Varanasi and Dehradun. In Kerala, Verkey and Alexander (1968) have made preliminary report on the hydrobiology of Beypore river. Patra and Nayak (1982) investigated limnobiological survey of Mahanadi during winter season. Venkateswarlu and Kumar (1982) studied chemical and biological assessment of pollution in the river Moosi, Hyderabad (Telengana). Shukla et al., (1989) studied the physico-chemical and Biological characteristics of river Ganga Mirzapur to Ballia. Sudhakar and Venkateswarlu (1989) showed the observations on ecological imbalances in the rivers of Tungabhadra and Godavari of A.P (Telengana). Chacko and Rajagopal (1962) studied the Hydrobiology and Fisheries Enron river near Madras (Chennai). Sreenivasan et al., (1995) studied hydrobiological characteristics of three major rivers in Madras (Chennai). The effects of industrial wastes and sewage upon the chemical and biological composition and Fishries of the river Ganga at Kanpur was studied by Ray and David (1966). Sreenivasan and Raj (1967) studied effects of certain wastes on the water quality and

fisheries of rivers Cauvery and Bhavani. Vass et al ., (1977) studied hydrobiological features of river Jhelum in Kashmir.

The above review of literature reveals that most of the investigations carried out to assess the water quality , physico-chemical factors and effect of pollutions on respective water bodies across the country. The most urgent issue is to assess the impact of limnological parameters on the aquatic fauna or aquatic life , although varies study have been carried out on that but need to evaluate the same comprehensively yet.

5.OBSERVATIONS AND DISCUSSIONS

During this study which was carried out in 2007-08, Fishes belonging to different orders and families were recovered from river Tawi and a particular species of Frog was also recovered from the river among vertebrates. All the investigated vertebrates from the river Tawi are explained below systematically with the help of some suitable diagrams of specimens.

Fishes:- All the fishes studied so far from the river belongs to Order-Cypriniformes and Siluriformes, Family-Cyprinidae and Subfamily-Cyprininae. Description of specimens are as :

1. **Tor tor:-** Tor tor 1834, illustrations of Indian Zoology, 2, pl. 96 (type- species, *Cyprinus tor* Hamlin Buchanan, by monotype) Fig-1. The body of the Fish is elongated, moderately compressed and abdomen is round. Head small broad pointed snout angularly rounded, often with tubercles. Mouth inferior to sub-inferior, eyes are far towards, large and not visible from below ventral surface. Lips fleshy, continues at angles of mouth. Pharyngeal teeth in 3 rows, five to six barbells, a pair each of maxillary and rostral. Dorsal fin inserted above pelvic with 12-13 rays (8-9 branched) and a strong stout and smooth spine. Anal fin seven or eight rays (5 branched). Caudal fin deeply forked. Scales large, with numerical parallel striae.



2. **Labeo rohita:-** Labeo rohita, 1816, Regene Animale, 2 (ed.1) , p. 194 (type- species, Cyprinus niloticus) . Bangana Hamilton-b Buchanan, 1992 fish Ganges, p. 277, 385 (typr-species, Cyprinus dero Hamilton- Buchanan by subsequent designation). Body small or moderate sized, elongated to deep with abdomen rounded. Head fairly large. Snout more or less swollen, rounded or truncated, often projecting beyond mouth. Covered by a groove across and with or without tubercles, mostly overhanging the mouth. Jaws with a sharp margin and with a soft movable horny covering which may be thick or thin. Eyes moderately large, generally placed at the commencement of the posterior half of the head not visible from below the ventral surface.

Barbells always present, one or two in pairs; if one pair, it is only maxillary and not rostral; the second pair, if present, is rostral. Pharyngeal teeth hooked in three rows. Dorsal fin inserted above anterior to origin of pelvic fins with 11-26 rays and with out any osseous ray, Anal fin short with seven or eight rays. Caudal fin

deeply forked or emarginate. Scales large, moderate or small.

3. **Mystus seenghala:-** Mystus seenghala 1777, Introucio ad historiam naturalem, p.151 (type-species, Bagrus halepensis valenciennes IN: Cuvier & Valenciennes = Mystus pelusius (Solander). By subsequent selection- Jayaram, 1962, proc. Jayaram, 1996. Int Revue ges. Hydrobiology., 51 (3), p.444 list of valid species, generic composition (Fig-3).

The body of the fish is short, or moderately elongated. Abdomen rounded. Head of moderate size and compressed snout rounded. Mouth sub-terminal, transverse, moderate wide. Eyes moderately large, supralateral, in anterior part of head not visible from below ventral surface and with free circular margins. Lips thin, jaws subequal firmly villiform in bands on jaws and palate: that on latter always uninterrupted (Hora). Four pairs of barbells. Gill membranes free from each other and also from isthmus Branchiostegal rays 10-12. Rayed dorsal fins inserted above last quarter of pectoral fins with seven rays and a spine. Pectoral fins with 6-10 rays and spine serrated along inner edge with antrose teeth. Pelvic fins with six rays. anal fin short with 9-16 rays. Caudal fin forked, bilobed with unequal lobes. Lateral line complete and simple. An auxillary pore generally present.

All the above explained species are also found in several other parts of the world such Syria, Nepal, Pakistan, Sri-Lanka, Bangladesh, Myanmar, Thailand, Malaysia, West Indies and China. A very few species

enters the Seas and estuaries.



Frog:- The specimens of frog collected from Tawi river fall under genus *Rana*. There were 1-2 genus collected during the investigation belonging to Anura, sub order Diplasiocoela and family Ranidae. Two species were as *Rana* Linnaeus and *Rana cyanophlyctis* but mostly studied species was *cyanophlyctis* Schneider.

- 1. *Rana cyanophlyctis* Schneider:-** This frog is also known by the name as skittering Frog. *Rana cyanophlyctis*(Fif-4); Schneider (1799). Hist. Amph. I,p. 137. *Rana cyanophlyctis*, Daniel (1975). J.B.N.H.S. 72, No . (2), p. 158.

The head of frog is wider with 28.6- 36.5% of the snout-vent length, snout bluntly pointed; nostril dorsal nearer to tip of the snout than to eye; tympanum nearly half of the eye diameter;finger free, tips pointed, toes 3-1, 2-4 in decreasing order of the length; hind limb long and stout, tibia meta-tarsum articulation reaching beyond the tympanum; tibia 30.6- 40.8% of snout-vent length toes webbed the tip of web only slightly indented between toes, toes 4-3-5-2-1 in decreasing order of length, tips pointed; outer- metatarsal tubercle absent,

inner a short spur; dorsal skin diffused with warts ventral skin smooth. Colour is dorsum light olive green or brown; marbled or spotted with irregularly arranged scooty spots; a single white streak on hinder side of the thighs, the dark pigment below this streak giving appearance rather than forming a distinct second dark streak.



Fig-4

From the pre-historic period, Fishes have been used as protein-rich diet for human beings. The flesh of fish is a highly perishable commodity constituted by 60-80 % water, 13-20% proteins; and lesser amount of fats, besides phosphorus & vitamins. The fresh water fishes provide valuable source of food supply to the inhabitants of the countries located especially in the tropical and sub-tropical regions of the world.

The popularity of the fishes has been mentioned even in our religious books and consequently every family in Bengal traditionally has at least one pond for fishes. There are a number of freshwater fishes which are of much economic importance and the most important and common edible fishes from this group includes Carps, trout and cat fishes. The 'Cat fishes' are provided with very small eyes and well developed barbells.

The Anuran amphibians *Rana cyanophlyctis* is the commonest Frog of J & K. It has been found to inhabit ponds, rains puddles, streams, lakes and stagnant water bodies (Verma et al.,1995). It is almost ubiquitous in habitat and can be seen throughout the year. It is diurnal as well as nocturnal and moves away from water to land to prey upon insects particularly during monsoon season. This frog feeds essentially on aquatic beetles, larvae of odonata and fresh water crustaceans.

6.CONCLUSION

It is concluded from the above investigation that some important vertebrates belonging to class Pisces and Amphibians have been observed and studied in detail at morphological and morphometric level. It has also been observed that despite high exposure of river Tawi to various harmful pollutants some of the vertebrates exists in the river. All these species of Fishes and Amphibians are ecologically, scientifically and socio-economically important. In future efforts must be made to overcome the pollution problems and to check the exploitation of the riverine fauna of Tawi.

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