



ENDEMIC FISHES OF WESTERN GHATS- A CASE STUDY OF RIVERS OF UTTARA KANNADA DISTRICT.

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Abstract— The results of all four rivers (*viz.* Kali, Bedti, Aghanashini and Sharavati) of Uttara Kannada District documented 29 species of Western Ghats endemics. This is 33 per cent of the total freshwater species richness of the districts. The endemism was highest in Aghanashini River with 37 per cent, followed by river Bedti with 33 per cent. Both Kali and Sharavati rivers were at par with each other reflecting 25 per cent of their species richness. Highest degree of endemism in Aghanashini river is due to pristine forest all along the river course and less human interference. The evergreen forest along the course of Aghanashini shows less fragmentation and provides more ideal habitats in the river. The good riparian vegetation might provide ample of food for those fishes. The low level of endemism in Sharavati and Kali rivers is due to the construction of dams across the rivers.

Keywords—endemic fishes, western ghats,uttara kannada rivers.

I. INTRODUCTION

India is a tropical country having large number of river systems. It ranks one of the foremost among the countries of the world in having rich inland resources [5]. In India the Western Ghats is identified as 'Hot Spots' of biodiversity [6]. The region is the home of many important organisms and it ranks 11th among the 'Hot Spots' of the World. Endemics are the species with restricted range. A taxon is considered endemic if confined to a particular area through historical, ecological and physiological reason, [1]. At global level, endemics are of high conservation on priority because if these unique species are lost they can never be replaced. Endemicity seems to be highest in the amphibian species where 77 per cent of total 118 species known are endemic. Fishes have also showed high degree of endemicity, of the 218 species recorded, 144 (52%) are endemic to Western Ghats and Sri Lanka. [4]

II. RELATED WORK

Literature were the second source of data where most of check lists, identification keys, monographs and scientific papers provided information on distribution of fish species. Among the vertebrate fauna of Western Ghats 335 (36%) species appeared to be endemic. Endemicity seems to be highest in amphibian species where as much as 77 per cent of total 118 species known are endemic. Fishes are also showed high degree of endemicity, of the 218 species recorded, 114(52%) are endemic to Western Ghats and Sri Lanka[4].

In this context an attempt has been made to synthesize the distribution pattern and ecological amplitude of endemic freshwater fish species in four major rivers of Uttara Kannada District, which are located in the Central Western Ghats.

III. RESEARCH METHODOLOGY

The investigation was aimed at ascertaining Westernghats Endemicity of fish population in four major rivers of Uttara Kannada district, which has been greatly affected due to human interference.

UTTARA KANNADA RIVERS

Uttara Kannada district has four major rivers having different ecological characteristics. In order to study the fish fauna in all the four rivers study locations were marked out, so that at regular intervals, the study can be undertaken in these specified locations. A total of 24 sites were selected, six on each river. These sites were marked all along the river from upstream to downstream. While choosing the locations the following criteria were also considered.

- 1) Diversity of the habitat
- 2) Accessibility of the location in all seasons
- 3) Human interference
- 4) Impact of different types of vegetation on the river

This would help to compare the fish fauna from location to location and river to river and the impact of natural vegetation, anthropogenic pressure and pollution.

For each river upstream location was selected at higher altitudes, middle stream locations along the slopes of the river course, and at lesser altitude and downstreams location below the Ghats.

HABITAT:

Each river has different habitat types based on width, depth, velocity, topography, terrain and geography of the riverbed. As these habitats are very important for the fish fauna an attempt was made to classify these habitats in each location. Even while selecting the locations care was taken to include habitat heterogeneity.

Fish sampling method:

Collection and sampling of the fish was the major fieldwork at all the specified locations in all the seasons. Fish sampling was conducted thrice in a year - Pre Monsoon, Post monsoon and at the end of the winter for two years. Totally six samplings were made in all the locations of all four rivers. Sampling was done early morning 6.30 am to 11.00 a.m. and in the afternoon from 3.30 p.m. to till evening. This was the time when more fishes can be caught. One night sampling was also made in all the locations. Usually minimum one hour was spent in each location. The effort continued for more time if the fishes were abundant in the location.

For collecting the fish variety of methods were involved. The use of different types of nets, hooks, and other traditional methods like plant based fish poisons and trapping etc. were employed. Though there were many methods used major collection was by the use of nets. Here we have used Gill nets, Cast Nets and dragnets of different mesh size. The descriptions of the different gillnets used during the investigation are as below.

| Net Size | Gill net-1 | Gill net-2 | Gill net-3 | Gill net-4 |
|-------------------|------------|------------|------------|------------|
| Length (in m) | 17.1 | 17.1 | 15.2 | 26 |
| Width (in m) | 2.3 | 2.3 | 2.3 | 4 |
| Mesh size (In cm) | 1.6 | 1.7 | 1.9 | 4.00 |

Here we have used two cast nets. The cast net-1 was having a height of 2.5 m with circumference of 12 m and mesh size of 1 cm. The cast net-2 is slightly larger with a height of 2.4 m, circumference 14.2 m and mesh size was 1.1 cm. At every location a minimum of 10 casts were made.

Drag Net: Drag nets were used for sampling the fish in shallow water near the river bank or where the water is less deep. This net is made up of nylon sheet and lead line tied to the bottom line. The nylon sheet is porous. Two persons have to operate it by dragging in shallow water scooping the small sized fishes. During collection we have used two dragnets with length of 6 m and 1 m breadth.

Fish Preservation:

The fishes caught alive or narcotised state was preserved in 4% Formaldehyde. Freshly collected fishes were studied for colours, colour patterns; spots, blotches number and design of fins were carefully noted in the field note book as soon as the fishes are caught and when they are fresh.

For all fishes of length 10 cm an incision was made on left abdominal wall. For fishes larger than 30 cm, undiluted concentrated formaldehyde was injected, in several places along the abdomen. Also 2 or 3 incisions of 2.5 cm was made along the belly.

Identification of the fishes:

Classification of the fishes for the study was done through taxonomy or systematics. Some of the very common fishes were identified in the field itself. Those, which could not be identified in the field, were brought to lab and identified. For identification to species level we used the identification keys from “The fresh water fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka --A hand book” by K.C. Jayaram, [6] “Inland Fishes Of India and adjacent countries by “Talwar and Jhingran” [2]. The field notes recorded during our survey over two years in all the 24 locations of Uttara Kannada district formed the source data.

IV. RESULTS AND DISCUSSION

In Uttara Kannada, 9 Western Ghats endemic species were recorded in river Sharavati. This is about 25 per cent of total fishes listed in the river. In river Aghanashini, 23 species of endemic fishes were recorded which accounts 37 per cent of Western Ghat endemism out of 56 fish species that were caught in the river. 17 endemic species have been recorded in the Bedti river are Western Ghats endemics and this is 33 % of Western Ghats endemism among the total freshwater fish species richness of the river. 12 species of endemic fishes were listed in Kali River and it is 25 % of the total fish species richness of the river Kali. (Graph-. 2)

After pooling the results of all the four rivers of Uttara Kannada district, which revealed that there were about 29 species of Western Ghats endemics and this is about 33 % of the total freshwater fish species richness of the district. The family *Cyprinidae* comprises 17 endemic fishes, while family *Balitoridae* and *Bagridae* four species each. Two endemic species were from family *Sisoridae*. *Siluridae* and *Clariidae* registered one endemic species each (Table 1).

The endemism was highest in Aghanashini river with 37 per cent, followed by river Bedti with 33 per cent. Both Kali and Sharavati rivers were at par with each other reflecting 25 per cent of their species richness (Graph- 1)

Discussion :

Among four rivers, in Aghanashini recorded maximum number of endemics which is due to pristine evergreen forest all along the river course and less human interference [8]. The evergreen forests along the course of Aghanashini show less fragmentation and provide more ideal microhabitats for the fishes in the river. Even in Bedti river, the endemism was also high. This is due to well wooded forest along the course. It is also observed that most of the endemic species in Uttara Kannada district were herbivores or omnivores and the good riparian vegetation provide ample of food for those fishes. The level of endemics appeared low in Sharavati and Kali river and this could be due to the dams construction across those rivers. This has altered the natural course of water and the flow is also regulated for power generation. This has led to the habitat loss and thus affected the fishes. It has been well recognized that river impoundments results in the formation of man made lakes that are ecotone of multifaceted ecosystems displaying the ecological conditions transient between those of stagnant water and river. [3]

It has been also observed that there is a threat to the endemic fishes due to

1. Habitat loss
2. Logging activities and encroachments.
3. Exploding Dynamites

The habitat loss appeared to be the major reason for the decline in the number of individual endemic species. It is observed from the present data that in the rivers where the dams were constructed the endemism is less, while the rivers without dams showed high endemism. The local fishermen opined that fishes both in species richness and abundance, including those of endemics declined considerably in both the rivers of Sharavati and Kali, after the construction of dams. Few fish species of *Tor* and *Puntius* fishes were not seen in these rivers after the construction of dams. The logging activities and encroachment of the forestland along the river course caused serious problems to the fishes. According to the local fishermen the pools are the ideal habitat for the

fishes. The fishes prefer those pools where canopy is covered by the vegetation. The tree species like *Callophyllum*, *Eugenia* and *Ficus* provide food for many species of fishes.

In recent days explosion of dynamites has become a regular practice to catch fishes and is usually done by the non-fisher folk community to catch the fish. This has aggravated the problem by killing the juveniles.

From the above facts it is clear that the fish diversity and abundance, including endemic fishes are declining at a faster rate. It is most important to conserve these fishes, which face the danger of overexploitation and habitat loss. Proper management strategies have to be undertaken on priority basis in the rivers of Uttara Kannada district to protect the endemic fishes.

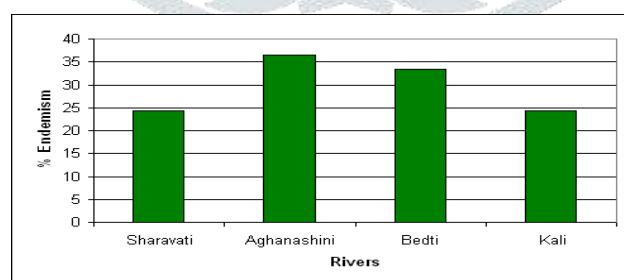
V. Conclusion and Future Scope

The four major rivers of Uttara kannada district have different ecological parameters which have fundamentally influenced the fish population. The river Sharavati has a total length of 178 km, with a catchment area of 2,209 sq. km and is subjected to two major dams. Similarly the river Kali with a total length 84 km and a catchment area of 5,179 sq. km is a biggest hydro – electric producer of the state and is industrially polluted. There are four major dams have been constructed for hydroelectricity. On the other hand the other two rivers, Aghanashini and Bedti have natural course of water without any dams and pollution (however in recent times Bedti river has been reported to be polluted through urban sewage water flow). Positive correlations between production and species abundance have been recognized in various earlier studies[2]. The species diversity of an ecosystem is often related to the amount of living and non living organic matter in it. However apparently, species diversity depends, less on characteristics of single ecosystem than on the interaction between ecosystems, e.g. transport of living animals across the different gradient zones in water body. The effect of such transport is important in enhancing the genetic diversity.

For mobile animals such as fishes can control their own distribution in the water, a rich mosaic of environmental possibilities become available. Moreover, the fishes have proved that they have the evolutionary flexibility to produce species to fill the spectrum of niches presented. They can be very big or very small, inhabit open waters or stay close to the bottom and they are present at every consumer trophic level in both the grazing and decomposer chains. Endemics are the species with restricted range. Endemic species are confined to a particular area and the confinement may be due to historical reasons, ecological and / or physiological [7]. In our study endemism was highest in Aghanashini river (37%) which is due to pristine forest all along the river course and less human interference. Further the Aghanashini shows less fragmentation and provide more ideal habitat like pools in the river. Similarly river Bedti revealed high endemism (33%) in spite of its pollution through urban sewage. The level of endemism appeared low in the river Sharvati and Kali which might be due to construction of dams across rivers.

VI. Figures and Tables

Graph 1. Percentage contribution of Endemism in Western Ghats rivers..



Graph 2. Density of Endemics in Western Ghat Rivers

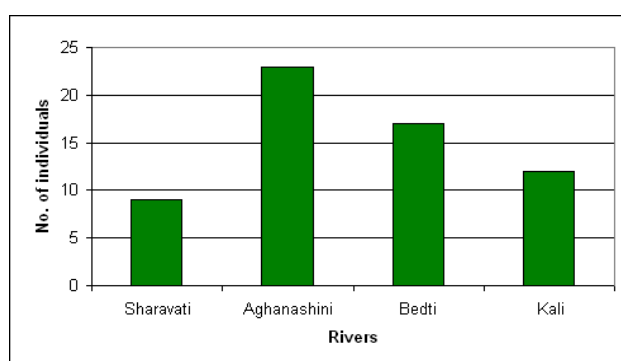


Table 1. List of Western Ghats endemic freshwater fishes of Uttara Kannada

| Sl.No. | Family | Species | Sharavati | Aghanashini | Bedti | Kali |
|------------|--------------------|-------------------------------------|-----------|-------------|-------|------|
| I | Cyprinidae | | | | | |
| 1 | | Puntius curmuca | * | * | | |
| 2 | | Puntius jerdoni(Day) | * | * | * | * |
| 3 | | Puntius narayani (Hora) | * | * | * | * |
| 4 | | Puntius lithopidas | | * | | |
| 5 | | Puntius melanompyx | | * | | * |
| 6 | | Puntius sayadrensis | * | * | * | |
| 7 | | Puntius palchellus | | * | | |
| 8 | | Puntius thomassi | | * | * | |
| 9 | | Gonoproktopterus wynadensis | * | | | |
| 10 | | Tor khudree | * | * | * | |
| 11 | | Labeo kawrus (Sykes) | | | * | * |
| 12 | | Osteobrama bakeri (Day) | | * | | |
| 13 | | Garra gotyla stenorhynchus (Jerdon) | * | * | * | * |
| 14 | | Salmostoma boopis (Day) | * | * | * | * |
| 15 | | Barilius gatensis (Valenciennes) | | * | * | * |
| 16 | | Barilius canarensis (Jerdon) | | | * | |
| 17 | | Osteochilus thomassi (Day) | | * | * | |
| II | Balitoridae | | | | | |
| 18 | | Nemacheilus semiarmatus (Day) | * | | * | * |
| 19 | | Nemacheilus sinuatus | | * | * | * |
| 20 | | Nemacheilus anguilla (Annandale) | | * | | |
| 21 | | Nemacheilus altipedunculatus | | * | | * |
| III | Bagridae | | | | | |
| 22 | | Mystus malabaricus (Jerdon) | | * | * | |
| 23 | | Mystus ocellatus (Valenciennes) | | | * | |
| 24 | | Horabagrus brachysoma (Guther) | | * | | |
| 25 | | Batasio Travancoria (Hora & Law) | | | * | |
| IV | Siluridae | | | | | |
| 26 | | Ompok malabarius (Valenciennes) | | * | | |
| V | Sisoridae | | | | | |
| 27 | | Glyptothorax madraspatanum (Day) | | * | | |
| 28 | | Glyptothorax anamalaiensis (Silas) | | * | | * |
| Sl.No. | Family | Species | Sharavati | Aghanashini | Bedti | Kali |
| VI | Claridae | | | | | |
| 29. | | Clarias dussumieri (Valanciennes) | | * | * | * |

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