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Studies on Conservation Status of Freshwater Fishes in Palani Hills, Western Ghats, South India

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Abstract: The species diversity, ecology, and ensemble architecture of 10 rivers inside the southern Western Ghats was studied. Sixty freshwater fish were recorded from the study area, belonging to 1 order, 3 families, and 6 genera. The groundwater resources evaluation was carried out to learn more about alive bio-ecological scenario of freshwater creeks and sea creature. Palani hills water flows harm bio-ecological situation of Palani hills, inhabiting freshwater fishes and biodiversity. There is need of increased general awareness about the importance of river ecology as well as its unique species of fish amongst local populations in order to maintain the important environment for future generations.

Keywords: Ecological studies, Endemic fishes, Diversity, Conservation, Distribution status, Palani hills, Biodiversity

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Introduction

The Western Ghats, often known as the "Great Escarpment of India," are a UNESCO World Heritage Site and one of the "hotspots" of biological variety (Myers *et al.*, 2000). The Western Ghats extend from north to south along the western border of the Deccan Plateau, separating it from a short coastal plain along the Arabian Sea known as the Konkan. The diverse freshwater fish fauna of the Western Ghats is well recognized for its high level of endemism. Human interference and invasive species, however,

endanger a large portion of the Western Ghats' faunal richness (Dahanukar *et al.*, 2004). As a result, understanding the richness and distribution of the fish fauna is critical for developing and executing conservation plans. Small hill streams in the Latitudinal range of 10.10 N – 10.44 N, Longitudinal range of 77.23 E to 77.68 E, and altitudinal range of 250 m – 2050 m Mean Sea Level (MSL) that flow southeast and southwest and span an area of roughly 90.5 sq. km were recorded in this study. The presence,

distribution, and productivity of fish species are all influenced by the rough, rocky, boulder, and pebbled substratum found in small hill streams. Diverse kinds of fish have been abundantly inhabited in different streams in the present study area, indicating that the Western Ghats region's freshwater resources have a very rich and colorful ichthyo-fauna. The geographical location, ecological circumstances, and physico-chemical composition of the aquatic habitat, all have been shown to influence fish variety. Various researchers have assessed the distribution and quantity of fish in various sections of the Western Ghats. Day (1865, 1878) has provided a detailed description of freshwater fishes.

Materials and Methods

Palani hills and its conservation:

The Palani hills' Vandaravu summit is the highest point. The range is located between the Cumbum Valley, which is drained by the Vaigai River and its higher tributaries, and the Kongunadu area, which is drained by the Vaigai River and its upper tributaries. The Shanmukha River, Nanganji River, and Kodavanar River, all tributaries of the Kaveri River, drain the northern slopes. Except in the western section, where it marks the boundary between Dindigul district and Theni district to the south and Idukki District to the south west, the range is largely inside Dindigul district. The hill station of Kodaikanal is located in the range's southern central region. At Anamudi peak in Kerala, the Palani Hills are joined by the Anamalai Hills and the Cardamom Hills.

Study area:

The Southern Western Ghats are located between 8° and 12° north latitudes and 76° and 78° east latitudes. In Tamil Nadu and Kerala, the area has around km of mountain valleys. Agasthyamalai, Anamalai, Cardamom Hills, and Nilgiris Hills are among the key eco-regions. The Anamalai Range of Hills, with its highest peak at Anaimudi 2695 mMSL, is interrupted in the north by the 30 km wide Palghat Gap at approximately 110° N, while the Anamalai Range of Hills is interrupted in the

south by the 30 km wide Palghat Gap at roughly 110° N. The South-West (June-Sep) and North-East (Oct-Nov) monsoons provide rain to this region, and the average annual precipitation (AAP) surpasses 2,800 mm. In this study, fifteen streams (Table 1) in the Palani highlands of the Western Ghats were surveyed-- Moolayar stream, Kurusedi stream, Silver cascade stream, Pillar-rock stream, Kumbakkarai stream, Adukkam stream, Samakkadu stream, Kozhikottu stream, Rat tail falls, Guntar stream, Bear shoal falls, Thalakuthu falls, Pachalur stream Poolathur Stream.

Sampling:

Fish sampling was carried out within a 100-meter radius of all sample locations. Monofilament gill nets of various mesh sizes (10 to 34 mm), drag, scoop, and cast nets were used to collect samples in various habitats such as pools, riffles, runs, and cascades in each stream. The Arunachalam (2000) technique was used to sample the fish. After collection, the specimens were inspected, numbered, and a small number of samples were kept in 10% formalin for laboratory examination. Using conventional fish taxonomy literature, fish species were identified (Jayaram, 1999). At the time of each collection, the temperature (air and water). The latitude and longitudinal coordinates of each research location were acquired once using a hand-held Global Positioning System (GPS) equipment (Garmin International Inc., Olathe, SK).

Results and Discussion

The fish fauna of the southern Western Ghats was surveyed in streams and rivers. The collecting locations were chosen based on previous faunal distribution studies published in the literature. The Western Ghats are a mountain range that runs practically parallel to the western coast of the Indian peninsula and is recognized for its abundant biodiversity and endemism. Table 1 shows the physical and climatic data of the research locations (Adukkam, Bear Shola falls, Fairy falls, Guntar, Kozikottu, Kumbakarai, Kurusedi, Moolayar, Pachalur, Pillar Rock, Poolathur, Rattail falls, Samakadu, Silver cascade,

Table 1: Physical/ Climatic parameters of the study sites

Collection Sites	Physical/ Climatic Parameters				
	Latitude (N)	Longitude (E)	Elevation (m)	Atmosphere Temp (°C)	Water Temp (°C)
Guntar	10.10927	77.318	1990	17.2	13.4
Bear Shola falls	10.13182	77.239	1980	17.2	14.8
Pillar Rock	10.21018	77.466	1534	17.3	15.2
Kurusedi	10.27633	77.559	1213	22.7	16.5
Fairy falls	10.13524	77.281	2050	19.7	16.7
Silver cascade	10.24537	77.516	1256	23.5	18.4
Moolayar	10.26903	77.611	1186	22.1	19.7
Thalakuttu falls	10.44181	77.686	250	22.3	20.1
Adukkam	10.23687	77.553	1406	22.4	20.1
Samakadu	10.24044	77.564	1538	27.3	20.6
Pachalur	10.39085	77.667	296	23.4	21.5
Rat tail falls	10.13143	77.373	290	28.0	22.2
Kozikottu	10.23731	77.546	1182	24.6	23.1
Kumbakara	10.18130	77.531	400	26.7	23.2
Poolathur	10.16152	77.321	900	26.0	24.0

Table 2: Fish recorded from the study sites

Binomial	Common Name	Vernacular	Nature of the water body
<i>Puntius denisonii</i> (Day, 1865)	Denison barb	Kendai	Freshwater
<i>Puntius dorsalis</i> (Jerdon, 1849)	Long-snouted Barb	Kendai	Freshwater
<i>Puntius saphore</i> (Hamilton, 1822)	Pool barb	Undakanni	Freshwater
<i>Pethia ticto</i> (Hamilton, 1822)	Ticto barb	Kadumkali	Freshwater
<i>Devario malabaricus</i> (Jerdon, 1849)	Malabar Danio	Keyal Meen	Freshwater
<i>Nemacheilus guentheri</i> (Day, 1867)	Koima	Koima	Freshwater
<i>Nemacheilus keralensis</i> (Rita, Banarescu and Nalbant, 1978)	Koima	Koima	Freshwater

and Thalakuttu falls).

The species of fish (Table 2) collected from the selected locations include *Puntius denisonii* (Day, 1865), *Puntius dorsalis* (Jerdon, 1849), *Puntius saphore* (Hamilton, 1822), *Pethia ticto* (Hamilton, 1822), *Devario malabaricus* (Jerdon, 1849), *Nemacheilus guentheri* (Day, 1867), and *Nemacheilus keralensis*. The Order, Family and

genera of the fish species collected from the study area has been given in Table 3.

Puntius denisonii, *Puntius dorsalis*, *Devario malabaricus*, *Nemacheilus guentheri* and *Nemacheilus keralensis* were identified as endemic to the Western Ghats among the fishes collected from the study area. These fish, however, were discovered to be the dominating species in the

Table 3: Order, Family and Genera the Fishes recorded in the study sites

Order	Family	Genera	Species
Cypriniformes	Cyprinidae	<i>Puntius</i>	<i>Puntius denisonii</i> (Day, 1865)
Cypriniformes	Cyprinidae	<i>Puntius</i>	<i>Puntius dorsalis</i> (Jerdon, 1849)
Cypriniformes	Cyprinidae	<i>Puntius</i>	<i>Puntius sophore</i> (Hamilton, 1822)
Cypriniformes	Cyprinidae	<i>Pethia</i>	<i>Pethia ticto</i> (Hamilton, 1822)
Cypriniformes	Cyprinidae	<i>Devario</i>	<i>Devario malabaricus</i> (Jerdon, 1849)
Cypriniformes	Nemacheilidae	<i>Nemacheilus</i>	<i>Nemacheilus guentheri</i> (Day, 1867)
Cypriniformes	Nemacheilidae	<i>Nemacheilus</i>	<i>Nemacheilus keralensis</i> (Rita, Banarescu and Nalbant, 1978)

Table 4: Endemism, localization, abundance and IUCN status of the fishes recorded in the study sites

<i>Puntius sophore</i>	Non-endemic	Common	Abundant	LC	India, Pakistan, Nepal, Bangladesh, Burma, China
<i>Pethia ticto</i>	Non-endemic	Common	Abundant	LC	India, Nepal, Pakistan, Sri Lanka, Bangladesh, Burma
<i>Puntius denisonii</i>	Endemic	ENWG	Very rare	EN	Mundakayam, Travancore, Aralam, Kannur, Nilgiris
<i>Puntius dorsalis</i>	Non-endemic	ENWG	Very rare	EN	Tamilnadu, Kerala, Karnataka, Andhra, Orissa, Sri Lanka
<i>Devario malabaricus</i>	Endemic	ENWG	Threatened	LC	Western Ghats, Tamil Nadu, Kerala, Karnataka
<i>Nemacheilus guentheri</i>	Endemic	ENWG	Very rare	VU	Western Ghats, Tamil Nadu, Kerala, Karnataka
<i>Nemacheilus keralensis</i>	Endemic	ENWG	Very rare	VU	Western Ghats, Tamil Nadu, Kerala, Karnataka

ENWG- Endemic to Western Ghats; LC= Least Concern; EN= Endangered; VU= Vulnerable

areas studied. Table 4 shows the IUCN status and abundance of fish taken from minor streams.

Geomorphological variables such as temperature and altitude have been regarded as key contributors in macro-invertebrate dispersion in large-scale studies conducted at other places. Large scale factors were shown to be responsible for shaping the variety of fish populations. Physical and chemical characteristics appear to

have a considerable impact on the distribution and quantity of fish in streams in the southern Western Ghats. Besides these elements, elevation also played a significant role.

Hora (1942) and Hora and Law (1941) studied the freshwater fish fauna of the Western Ghats. Silas (1951) listed 25 fish species from Anamalai Hills and 10 fish species from Nelliampathi Hills (Western Ghats). Arunachalam and Manimekalan

(2000) reported the assemblage structure of stream fishes in the Western Ghats and commercially significant and cultivable fishes of the Nilgiri biosphere reserve (Arunachalam, 2000). A new catfish species *Glyptothorax davissinghi* (Pisces: Sisoridae) from the Nilgiri Biosphere has been reported by Manimekalan and Das (1998). From the Moyar River, Manimekalan and Singh (1997) reported *Schismatorhynchus nukta* (Sykes, 1839) (Pisces: Cyprinidae). Later, *Neolissochilus wynaadensis* was reported from Karnataka by Arunachalam *et al.* (2005). Biju *et al.* (1999) reported *Puntius filamentosus* from Orukomban and *Puntius melanampyx* (Day) from Thelikal. In Mudumalai Wildlife Sanctuary, Manimekalan and Arunachalam (2002) rediscovered the critically endangered air-breathing catfish *Clarias dayi* Hora (Pisces: Claridae). The variety, distribution, and assemblage structure of fishes in streams of the southern Western Ghats were studied by Johnson and Arunachalam (2009). Knight *et al.* (2012) identified a new barb species *Puntius nigripinnis* (Teleostei: Cyprinidae) from the southern Western Ghats. *Horallabiosa palaniensis*, a new Cyprinid fish from the Palani Hills in the Western Ghats was described by Rema Devi and Menon (1994). Arunkumar *et al.* (2015) found approximately 37 species in the Cauvery River System. Mogalekar and Jawahar (2015) provide detailed descriptions of Tamil Nadu's freshwater ornamental fish variety. Several studies have concluded that breeding of the *Nemacheilus* species and *Puntius denisonii* is necessary, as overexploitation of the natural population of these fishes may be the primary cause of their extinction. The fundamental restriction with indigenous ornamental fish species in captivity is the loss of inherent vivid color.

Conclusion

It is concluded that compared to other orders, the order Cypriniformes was the most prominent among the fish fauna gathered from several places in the Western Ghats. Physical, chemical, and climatic factors have a substantial impact on fish

species in the southern Western Ghats. Furthermore, the current data support the idea that diversity varies with elevation. Many challenges to the survival of fish fauna from the Western Ghats' tiny stream, such as tourism and ornamental fish export, have been noted. As a result, there is an immediate need to raise awareness among local populations about the importance of stream habitat and its unique fish species in order to preserve these wonderful resources for future generations.

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