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Effects on habitats and fish diversity for artificial concrete bottom of Vadavar River in Tamil Nadu, India

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Abstract

In the present study, to analyze impact of artificial concretes effect on fish diversity has been studied based on habitat destruction of Vadavar River by new veeranam project which providing drinking water to Chennai city. The cement concretes have been made in the bottom of river by the new veeranam project from lower Anaicut to Veeranam Lake for overcoming wastage of water flow to the lake. It destroyed the natural habitats of sandy and muddy surface which affect the fish diversity of the river,

The fish diversity has been reduced particularly muddy and sandy habitats fishes such as *Anguilla bengalensis*, *Tenualosa ilisha, Anguilla bicolar, Oreochromis mossambicus* and *Anabas testudineus*. Its also observe that fresh water aquatic weed diversity has maximum decreased due to habitat destruction. It has been reported in the present study. The results presents here, strongly suggest that the mechanism of effect on habitats which has been severely affected the fishes living environments of river. Its also lead to ground water level decreased surrounding areas due to concretes prevents the water absorption by the soil.

The results indicate that the fish diversity has been reduced particularly sandy and muddy habitats fishes. It's observed the some muddy substrate living fishes unable to live in the concretes surface area as made by the new veeranam project. It is suggested that before implementing any project on river environment which should be ensured that the project should not be affected the natural habitats of the river and ecosystems.

The River Vadavar is a branch from Kollidam River (Fig. 1 and Fig. 2). The branch starting point at lower Anaicut at Anaikarai and end up with veeranam lake which receives water from Cauvery River system through Kollidam (a tributary of Cauvery), Lower Anicut and through Vadavar river. The vadavar river length from Veeranam Lake is around 28 kilometers. The river supporting agriculture practice particularly paddy cultivation field and also need of drinking water of Chennai City through new veeranam project of Tamil Nadu state.

Fishes are very important source of protein as well as an integral component of the food chain of an aquatic ecosystem. Fishes are the best bio-indicators of a water body. Freshwater riverine fishery is one of the important economic constituents of the fishery sector of many countries including India. India possesses great biodiversity and ranks ninth in the world in terms of fresh water biodiversity[13,23] Jayaram[16] has listed 852 species of freshwater fishes from the Indian region. India has 14 major and 44 medium river sand innumerable streams, flood plains, riparian zones, mangroves and estuaries. These inland water bodies make India one of the richest fish germplasm bank in the world.

Tamil Nadu is a state with diverse water resources including rivers, lakes, reservoirs and tanks. Stony and muddy landscape of Tamil Nadu encompasses good vegetal cover and also harbors ideal habitat for water resource and potential for development.

Fish fauna of India is mainly known to us due to the work of Hora *et al.*[14], Datta *et al.*[8], Johal *et al.*[18] and Mohan, *et al.*[24] whereas southern and south eastern part of the state is surveyed for fish diversity primarily by Dubey and Mehra[9], Jayaram[16], Sharma and Johal[26,27], Gupta and Kulshreshta[12], Khatri *et al.*[20], Johal and Sharma[17], Kumar and Rathore[21,22], Juyal and Chaudhary[19], Vyas and Singh[33], Sharma and Choudhury[28], Srivastava[30], Sivakumar and Choudhury[29] and Banyal and Kumar[1-7]. Dubey and Mehra[9] described 71 species, Ridhi, *et al.*[25] has recorded 22 species of fish from Madhya Pradesh portion of River Chambal, Verma *et al.*[32], have documented 39 fish species from Rana Pratap Sagar reservoir part of Chambal River whereas, Banyal and Kumar 2015 have recorded 54 species of fish from Rajasthan portion of River Chambal.

The vadavar is a branch from Kollidam river which has providing water for agricultural land in the district of cuddalore and also border Ariyalur district in Tamilnadu and traveling around 28 km to reach veeranam lake where the water stored for agricultural practice and also improving ground water levels in the Cuddalore district belt.

Sampling was mainly done in lower Anaicut vadavaar river which is located viz. at two locations in lower Anaicut and Kanjan Kollai which is located two kilometer from the lower Anaicut station during monsoon season in 2020. Fishes were collected mainly by using cast and gill nets. Hand, scoop and drag nets were also used. The fishes were preserved in 5-10% formalin. The collected fishes were identified following Talwar and Jhingran[31], Jayaram[16] and Froese and Pauly[10] *i.e.*, www. Fish base.org, [version (02/2014)].

Vadavar is a semi perennial river

which supports moderate fishery in Cuddalore district in Tamil Nadu. This River is a good diversity of fresh water fishery as capture fishery and contributes to peoples in Kattumannarkoil taluk border for livelihood of the local peoples.

The fish taxonomy is an important tool which helps to evaluate fishery potential of a river. Fisheries development, sustainable use of fishery assets & thereafter implementation of suitable conservation measures become successful only when ichthyofaunal diversity of an aquatic ecosystem is known to researchers, fishery managers and policy makers. The present work deals with fish diversity, taxonomy and also 28 fishes recorded from the vadavar River going through in Cuddalore district in Tamil Nadu (Table-1). Most of the fishes recorded during the course of present work are commonly found in the inland water bodies of India. However, some species were under various categories of threatened species and cypriniformes order was with maximum species (13), and perciformes, represented with 4 spp., clupeiformes represented with 3 spp. each, whereas, Beloniformes is represented only by 2 species. Anguilliformes is represented by 2 spp, Siluriformes by 3 and Mugiliformes is represented by 1.

Amongst all the families' cyprinidae was most dominant family which is followed by perciformes, Siluriformes, clupeiformes beloniformes, anguiliformes and mugiliformes respectively.

All the fish species described in the manuscript are reported from Vadavar River. (Table-1).

Systematic list of the fishes which are identified are as follows			
Order	Family	Scientific Name	Vernacular Name (Tamil)
Anguilliformes	Anguillidae	*Anguilla bengalensis* (Gray1831)	Aaara
		Anguilla bicolar (McClelland1844)	Vilaangu
Beloniformes	Hemiramphidae	*Hyporhamphus xanthopterus* (Valaenciennes 1847)	Kokkurali, Kokku meenu
		Hyporhamphus limbatus (Valenciennes 1847)	Kokkurali
Clupeiformes	Clupeidae (Hamilton1822)	*Tenualosa ilisha* ulam, Sevva, Ullam	Oolam, Karuva
	Pristigasteridae	*Ilisha novacula* (Valenciennes	Naattu matti
	Engraulidae	*Thryssa dussumieri*	Keela, Semporuva
Perciformes	Ambassidae	*Ambassis dussumieri* (Cuvier1828)	Kannadi thattai
		Chanda nama (Hamilton 1822)	Velicha podi,

	Cichlidae	*Etroplus suratensis* (Bloch1790)	Sella kasu, Setta kendai Puradi, Salladai podi	
		Oreochromis mossambicus (Peters 1852)	Jelebi kendai, Tilapi	
Mugiliformes	Mugilidae	*Mugil cephalus* (Linnaeus 1758)	Madavai, Manalei,	Listing,
Cypriniformes	Cyprinidae	*Gibelion catla* (Hamilton 1822)	Kanavi, Kora kendai, Thoppa kendai,	
		Garra mullya (Sykes 1839)	Kallu koravai, Kallukendai	
		Ctenopharyngodon idellus (Valaenciennes 1844)	Pullu kendai	
		Devario aequipinnatus (McClelland 1839)	Vannathipodi	except cat fishes which are strictly
		Cirrhinus mrigala (Hamilton 1822)	Mirigal kendai	
		Puntius cauveriensis (Hora1937)	Saani podi, Salli podi	
		Puntius amphibeus (Valaenciennes 1842)	Kulla kendai	
		Puntius conchonius (Hamilton 1822)	Chenna kunni	
		Labeo rohita (Hamilton 1822)	Kannadi kendai	
		Labeo calbasu (Hamilton 1822)	Selkendai,	
		Hypothalmichthys molitrix (Valaenciennes 1844)	Velli kendai	
	Anabantidae	*Anabas testudineus* (Bloch 1792)	Panaiyeri Kendai	
	Channidae	*Channa striata* (Bloch 1793)	Karuppu viral, Viral	
Siluriformes	Bagridae	*Mystus cavasius* (Hamilton 1822)	Nai keluthi,	
		Mystus vittatus (Bloch 1794)	Vella keluthi Cutta keluthi,	
		Mystus bleekeri (Day 1877)	Naattu Keluthi	

Listing, monitoring and frequent documentation of biodiversity has become an essential tool to understand dynamics of different ecosystem and influences on them. Analysis of the fish diversity revealed that Vadavar river ecosystem possesses varied fish diversity which is a testimonial that this river is quite healthy and productive. Majority of the recorded fish species except cat fishes which are strictly carnivorous, have diverse food habits like herbivorous, carnivorous omnivorous and detritus consumers which are enormously supported by this water body. Rampant poaching of fishes by natives particularly during spawning period, deregulation of mesh size of fishing nets, removal of bed material, effluents and other household pollutants, frequent water flow disconnection to vadavar river from the lower Anaicut channels and cement concrete bottom of the Vadavaar River are the potential threats which can affect the diversity of ichthyofauna. It's also observed that the habitat destruction of the river has severely affected the entire aquatic organism including fishes and aquatic freshwater weeds in Vadavaar River. Cauvery water issue also one of the major cause for decreasing the fishery diversity in the south Indian rivers those are tributary of Cauvery River.

Presence of trash fishes such as Oreochromis mossambicus (Peters, 1852) in Vadavaar River is also a matter of concern for Indian major carps and other commercially important fishes. Moreover, the Vadavaar River is also suffering from the effects of having regulatory gates at lower Anaicut on its course. This barrier is accounting for loss in the breeding and nursery grounds of important freshwater fishes. Hence, to conserve this vital riverine treasure, a long term management plan should be prepared and implemented. Besides, large scale awareness of all the stakeholders would be crucial to conserve the fish fauna of this river.

Summary and conclusion :

Twenty eight species of fishes belonging to 12 families and 7 orders were recorded from the Vadavar River. This is the first comprehensive attempt to describe fish diversity of the Vadavaar River in the Tamil Nadu state.

The results indicate that the fish diversity has been reduced particularly on sandy and muddy habitats fishes. It's observed that some of the muddy substrate living fishes unable to live or sustain in the concretes surface area as made by the new veeranam project. It's also observed that most of the freshwater weeds also been disappeared due to habitats destruction of the river. It is suggested that before implementing any project on river environments which should be scientifically ensured that the project should not be affected the natural habitats of the river system and also the ecosystems.

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