



A STUDY OF FISH DIVERSITY INDICES ON RIVER THAMIRABARANI AT TIRUNELVELI DISTRICT

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Abstract: Fish species diversity in Thamirabarani River was investigated from May-October 2018. Ten species belonging to 7 families (Channidae, Anchariidae, Lepisosteidae, Cyprinidae, Anguillidae, Cichlidae and Lesbiasinidae) were identified. The results indicated that in Pottal and Vannarpettai sites were more fish species. Melapalayam and Cheranmahadevi sites were less fish species. Because these two sites were highly polluted. Industrial waste water entering into water body represent a heavy source of environmental pollution in Thamirabarani River. It affects the aquatic fauna. With competing demands on limited water resources, awareness of the issues involved in water pollution, has led to considerable public debate about the environmental effects of industrial sewages discharged into aquatic environments. The present study deals with the fish species diversity .It was concluded that the samples of river water was highly polluted mostly associated with industrial sewage discharge and affect the fish species diversity.

Index Terms - Thamirabarani River, Fish Diversity, Environment, Sewage, Aquatic fauna.

I. Introduction

Water is essential for the survival of the world. It plays an array of vital role in ecosystems across the planet earth. It is one of our most important natural resources without which, there is no life. Given that most of the earth is covered with water, understanding aquatic ecosystem is very important. Aquatic ecosystems perform many important environmental functions like recycling nutrients, purifying water, attenuating floods, recharging ground water and provide habitats (R.I.Smith 1980). It is also used for human recreation are very important to the fisheries. Thamirabarani River flows through Tirunelveli and Tuticorin districts of Tamilnadu state of Southern India. Thamirabarani River is a Perennial river and diversity of fishes. Fresh water fishes are one of the most treated taxonomic groups (W.R.T.Darwall) because of their high subscribing to the aquatic habits (P,Laffaille *et al.*,2005,U.K.Sarkar *et al.*,2008, B.Kang *et al.*,2009). In previous study 223 endemic fish species are found in India (Thirumala *et al.*, 2011). In Thamirabarani River water is present in countless living organisms. Such habitats of water discharge of water regime, maintenance water quality and benefits of conservation of biodiversity of fishes have been identified (W.J.Mitch *et al.*, 2000).But due to various activities the river gets highly polluted which leads to the origin of certain deadly diseases and threat in the fish biodiversity. In order to create awareness among the Public and to conserve the river, I Planned and carried out this project at Thamirabarani River. The present study is proposed to carry out to analyse the fish species diversity by using diversity indices.

II. Study Area

The study area is situated in Thamirabarani River on a length of 125kms starting from its origin in Tirunelveli district. I had chosen four sites such as Melapalayam, Cheranmahadevi, Pottal and Vannarpettai. The river is situated between latitude 8°30'N and 9°18'N and longitude 77°07'30"E and 78°15'E. Melapalayam is a developing town at the banks of river Thamirabarani at a distance of 60kms. Cheranmahadevi is another fast developing town on the banks of river Thamirabarani at 55kms. At Melapalayam site and Cheranmahadevi site more sewage gets into the river. Another reason for my study area is presence of paper Industry in Cheranmahadevi which is situated on the banks of the river and which caused lots of grievance in the local community for discharge of waste into the river till recent times. Pottal is in the rural area and so it is less polluted on comparison with Vannarpettai which is an urban area (Plate 1). The average rainfall of the river basin area is 1082 mm (northeast 565 mm; southwest 233 and summer and winter 284 mm) with the annual average temperature of 25.5°C - 34.4°C (20.9°C min, 39°C max) (RDA-AER, 2008; PWD-WRO; 1999; 2006; 2007). Population density of the river basin is 362 persons per sq.km against the state average of 428 persons per sq.km. It is the only source of water for daily purpose such as drinking, washing etc. as well as for agriculture.

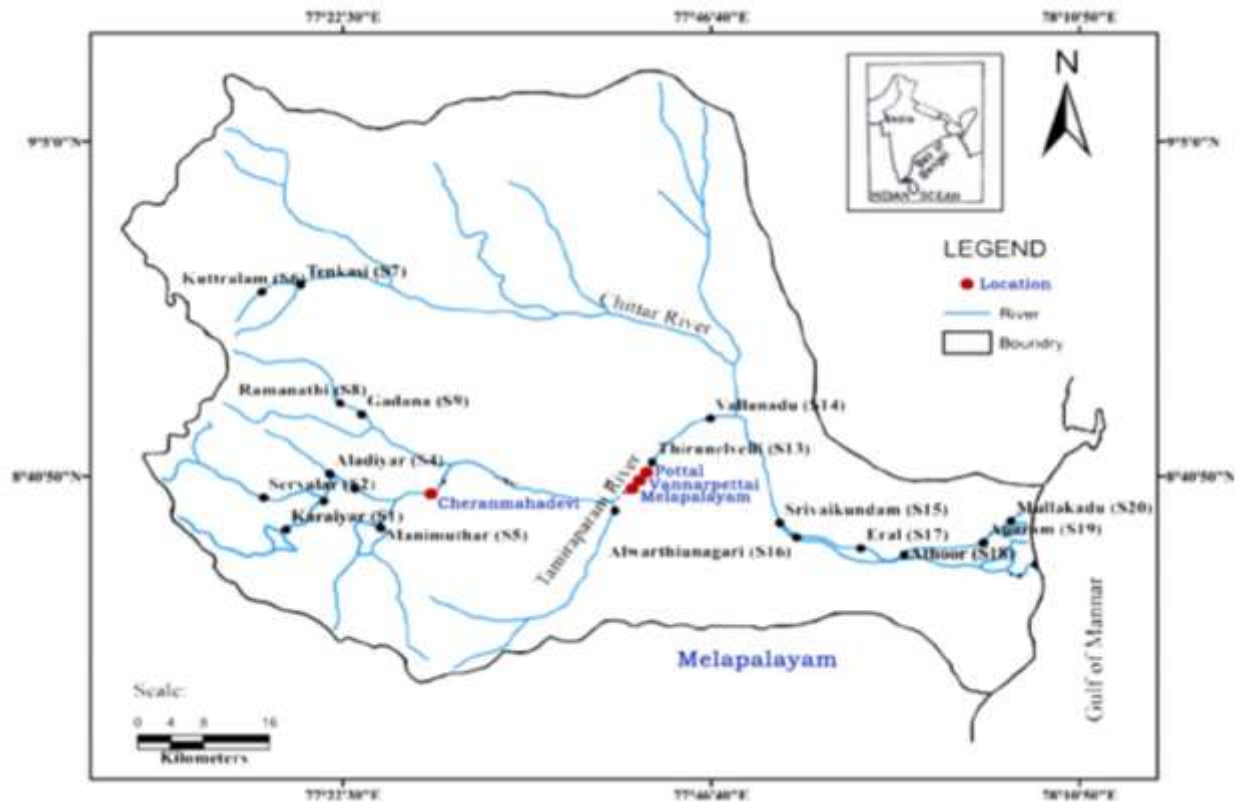


Plate 1. Study Area.

III. Materials and methods

Fish collections were done in four study sites from May – October 2018 for a period with the help of local fishermen using a variety of gears including cast nets, gill nets, drag net, scoop nets and traps. Fishes were collected in each sites. Common and scientific names for fishes collected in this survey and denoted the scientific names of fishes. Species were counted for number of individuals in each sites. After I have identified the fishes in another help of following the key of [12, 13, 14].

3.1. Shannon diversity index “H”

Fish species diversity was subjected to diversity analysis using Shannon Wiener index (H)

Data were analyzed by using the Shannon-wiener function formula; species diversity

$$H = -\sum(P_i \cdot \ln P_i)$$

Among them most widely used one is the Shannon index (1963) given as follows:

$$H = -\sum_{i=1}^S P_i \log_e P_i$$

$$\log_e = \ln; P_i = n_i/N$$

Where, H’=Diversity

S=Number of species

N=Total No.of individuals

P_i=Proportion of individuals of the total sample belonging to the number

∑=Summation

Evenness Index (J)

$J = H/H_{max}$

J= Evenness Index

H = The observed value of Shannon index

S= Total number of species.

$H_{max} = 1/Ns$

IV. Result and Discussion

Plate 1 indicated the study area. Table 1 denoted Fish species diversity in Thamirabarani River. Figure 1 represented number of fish species found in 4 study sites. Figure 2 denoted diversity and evenness in Thamirabarani River.

Table 1. Fish species diversity in Thamirabarani River

S.No.	Family	Order	Scientific Name	Common Name	No.of individuals
1	Channidae	Anabantiformes	<i>Channa striata</i>	Viraal	37
2	Anchariidae	Siluriformes	<i>Siluriformes</i>	Cat fish	15
3	Lepisosteidae	Lepisosteiformes	<i>Alligator gar</i>	Alligator gar	1
4	Cyprinidae	Cypriniformes	<i>Cyprinus carpio</i>	Carp	7
5	Anguillidae	Anguilliformes	<i>Anguilla japonica</i>	Eels	4
6	Cyprinidae	Cypriniformes	<i>Labeocalbasu</i>	Labeo	8
7	Cichlidae	Perciformes	<i>Oreochromismossambicus</i>	Tilapia	15
8	Lesbiasinidae	Characiformes	<i>Dawkinsafilamentosa</i>	Filament barb	27
9	Cyprinidae	Cypriniformes	<i>Salmophasiaacinales</i>	Silver rozabell	17
10	Cyprinidae	Rasborames	<i>Rasboradaniconius</i>	Black line fish	1
				Total	145

Figure 1. Fish species found in four study sites.

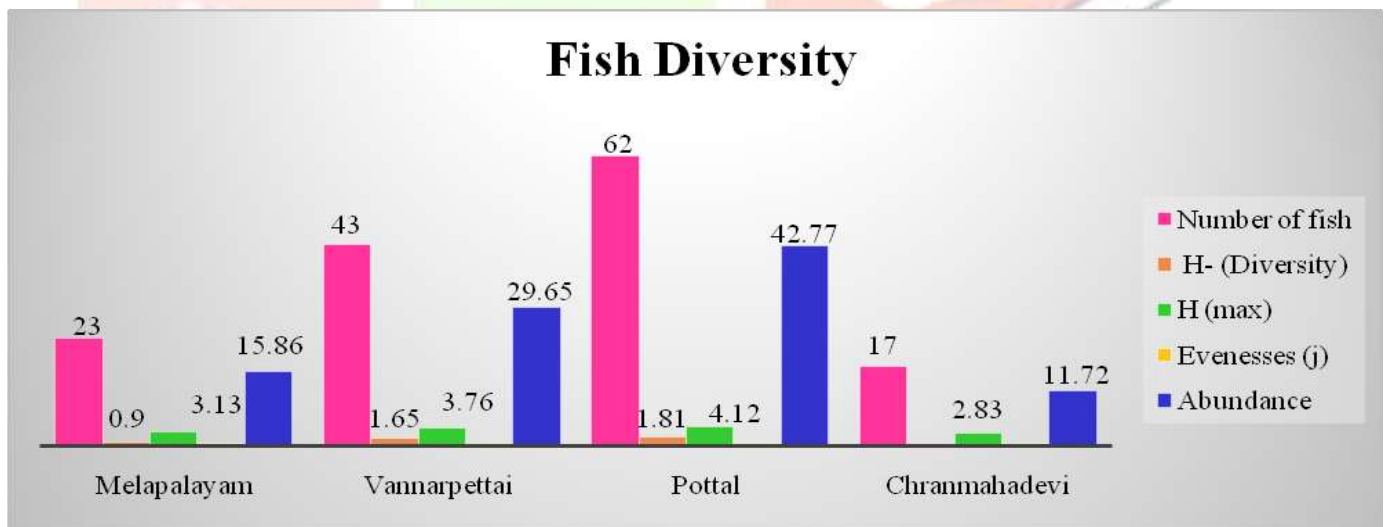


Figure 2. Diversity and Evenness in Thamirabarani River.

Aquatic fauna is very important to evaluate the ecological health in the river. For fish diversity I had selected four stations namely Melapalayam, Vannarpettai, Pottal and Chranmahadevi. Ten fish species were collected in this survey. In previous study Hubbs (1957), Smith and Miller (1986), Hubbs *et al.*, (1991), Lee *et al.*, (1980) reported 51 species to the Pecos River. At present study we have analysed 10 fish species and denoted Order, Family and scientific names at 4 different sites in Thamirabarani River (Table 1). In Melapalayam (Site I) I found 23 fish species, in Vannarpettai (Site II) 43 species, in Pottal (Site III) 62 fish species and in Chranmahadevi (Site iv) 17 fish species (Figure 1).

Among the families Cyprinidae having 4 species followed by Channidae, Anchariidae, Lepisosteidae, Anguillidae, Cichlidae and Lesbiasinidae. The available fish species and family wise species is depicted in the Table 1. The diversity indices so far calculated is also shown in the figure 2.

Shannon index is an index applied to biological systems derived from a mathematical formula used in communication area by Shannon in 1948 (S.M.Mandaville, 2002). It's the most preferred index among the other diversity indices. The values above 3.0 indicate that the structure of habitat is stable and balanced; the values under 1.0 indicate that there are pollution and degradation of habitat structure. In Melapalayam site fish diversity value is 0.9. The Vannarpettai site fish diversity value is 1.65. The Pottal site fish diversity value is 1.81. The Cheranmahadevi site fish diversity value is 0.46. The Pottal site has a higher fish diversity than the other 3 sites (Melapalayam, Vannarpettai, Cheranmahadevi). The Abundance % (Figure 2) of the Melapalayam site is 15.86, Vannarpettai is 29.65, Pottal is 42.77, Cheranmahadevi is 11.72). On comparison with the four stations selected and analysed the fish diversity in which the lowest at Cheranmahadevi and a little higher at Melapalayam. Pottal had the highest fish diversity because of absence of Polluted water. As there is mixing of domestic sewage in the Melapalayam site there is low diversity of fishes. At Cheranmahadevi site near the Paper Industry and the release of waste materials into the river leads to the lowest fish diversity and so the amount of fish species is lower than Melapalayam site.

V. Threat on Thamirabarani River

In Melapalayam site due to lot of sewage the river gets more polluted and also because of the farming sites usage of urea pesticides during rain they run off into the river. The industrial waste garbage from the Cheranmahadevi site is getting released into the river. So the river is highly polluted. In Vannarpettai site there are many cottages and the people in and around the places washes clothes, take bath and pollute the river. Pottal site is inside the village area that it is found a little safer, but algae is abundant here. Algae affects the human health and aquatic eco system. Mixing of sewage, industrial effluents, dumping etc into the river is a worrying aspects and mining in this river was banned in 2010 but it still continues illegally. Pepsi and other Cola companies bottling facility plants were thought to be exploiting the river water, however a court ruling in April 2018 dismissed the allegations and allowed the companies to extract excess water as per the original agreements they have signed. Untreated sewage from towns like Ambasamuthiram, Tirunelveli, Papanasam etc also reduce the water quality downstream. Domestic sewage is also treated and the waste water will be used as a bio-fertilizer which will be an alternative source of income, treated waste water can be used for irrigation. Microbial disinfectants should be employed in the water resources.

VI. Conservation

Thamirabarani River, the lifeline for people living in Tirunelveli and Tuticorin districts, is dying a slow death. There is an urgent need to protect the river from illegal sand miners and steps needed to be taken to prevent pollutants from flowing into the river. Drainage was being let out into the river causing pollution. Moreover used oil from private vehicles, including Lorries and buses, were also drained into the river. To clean the river, adequate funds and steps should be allotted by the Government. The river provides a large percentage of water for irrigation and power generation. However, the mixing of untreated sewage, industrial effluents, dumping etc. has reduced its water quality. Add to that religious practices like letting off clothes in the river after taking a bath to wash sins. The river is severely clogged and has increasing bacteria levels. 10, 000 students from 30 colleges and 20 schools participated in the cleaning drive. 5, 000 people including teachers, members of revenue employees association, police and fire service personal besides employees of various other departments will involve cleaning in Thamirabarani River.

VII. Conclusion

The effluents from the existing units should be monitored regularly and allowed to discharge into the river only after satisfactory clean up treatment. Underground drainage system is built within municipal limits and sewage treatment plants of adequate capacity installed at chosen locations. Only treated water with permitted quality should be allowed into the river somewhere downstream after municipal limits. Domestic sewage is also treated and the waste water will be used as a bio-fertilizer which will be an alternative source of income, treated waste water can be used for irrigation. Microbial disinfectants should be employed in the water resources. The physicochemical characteristics of river water in the study area suggested that Thamirabarani River is contaminated by various effluents. If proper measures are taken for the treatment of sewage before discharge and restrictions are put various anthropogenic activities upstream, the estuary would remain healthy in the long run off.

The analysis of the water samples collected from various points along the course of the Thamirabarani clearly indicates that only few sites such as Cheranmahadevi industry downstream, KTC depot downstream are polluted due to industrial wastes. Cheranmahadevi site has the worst water quality due to industrial wastage. It is suggested that the Cheranmahadevi industries have to upgrade their effluent treatment processes and plants and KTC depot needs to release the wash water only after treatment. Thamirabarani River needs to give the water supply. It is the only river which never goes dry and it is a fabulous resource gifted from God. So, People should worship the river and pledge to make it pure and protect the diversity of fishes.

References

- [1] Darwall, W.R.T. and Vie,J.C. **2005**. *Fish Manag Ecol* 12, 287–293.
- [2] Hubbs, C. **1957**. Distributional patterns of Texas fresh-water fishes. *The Southwestern Naturalist* 2(2/3):89-104.
- [3] Hubbs, C., R.J. Edwards, and G.P. Garrett. **1991**. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. *Texas Journal of Science, Supplement* 43(4):1-56.
- [4] Jayaram,K.C. **1999**.*The freshwater Fishes of the Indian region*. Narendra Publishing house, New Delhi, 551 p.
- [5] Kang, B., He,D., Perrett,L., Wang,H., Hu, W., Deng,W., and Wu,Y. **2009**. *Rev. Fish. Biol.Fish.* 19,465–480.
- [6] Laffaille,P., Acou,A., Guillouet, J., and Legult, A. **2005**.*Fish. Manag. Ecol.*, 12.123–129.
- [7] Lee, D.S., Gilbert, C.R., Hocutt, C.H., Jenkins, R.E. and McAllister, D.E., eds. **1980**. *Atlas of North, American Freshwater Fishes*. Raleigh, NC: North Carolina State Museum of Natural History.
- [8] Mandaville,S.M. **2002**.Project H - 1. (Nova Scotia: Soil & Water Conservation Society of Metro Halifax).
- [9] Mitch,W.J., Gosselink,J.G., John Wiley and Sons, **2000**. *Wetlands,Inc*. New York, pp 31.
- [10] Miller, R.R., Minckley, W.L. and Norris, S.M. **2005**. *Freshwater Fishes of Mexico*. Chicago, IL:University of Chicago Press.
- [11] Sarkar,U.K., Pathak, A.K.,and Lakra, W.S. **2008**.*Biodivers Conserv.* 17, 2495–2511.
- [12] Smith, R.I. **1980**. *Ecology and Field Biology* ;(3rd edition) Harper and Row, New York.
- [13] Talwar,P.K. and Jhingran, A.G.**1992**. *Inland Fisheries of India and Adjacent Countries*. Oxford & IBH Publ. Com., NewDelhi: Vol. 1 & 2.
- [14] Thirumala,S., Kiran, B.R., and Kantaraj, G.S. **2011**. *Advances in Applied Science Research*,2 (5) 34-47.
- [15] Viswantath, W. **2002**. *Fishes of North East India*, A field guide to species Identification. NATP, NBFGR, and Lucknow, 158p.