



A Study on Fish Diversity of Thodupuzha River, Idukki District, Kerala

Salu K. Sasi & Ambili T.R.

Department of Zoology, Alphonsa College, Pala - 686574, Kottayam, Kerala

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Abstract

The present study was conducted to document the diversity of fishes in Thodupuzha River, Idukki District, Kerala. It is a tributary of Muvattupuzha River, Kerala. The study period was during December 2018 to February 2019. There are about 19 species of fishes were collected and identified. Fishes belonging to the species *Puntius mahecola* dominate the study site with about 10.6% abundance followed by the species *Etrplus maculates*. Rare species like *Puntius muvattupuzhaensis* was also collected during the study. Currently, the river is under severe ecological degradation due to sand mining and other anthropogenic activities. Despite this, the present study also highlights the rich diversity of fishes in this river, hence it is suggested that these river been protected to conserve for future generation.

1. Introduction

Freshwater fishes are those that spend some or all of their lives in fresh water, such as rivers and lakes, with a salinity of less than 0.05%. These environments differ from marine conditions in many ways, the most obvious being the difference in levels of salinity. To survive fresh water, the fish need a range of physiological adaptations (Jayaprakash, and Nair, 1981). 41.24% of all known species of fish are found in fresh water. When dealing with ponds and lakes, one might use the same basic models of speciation as when studying island biogeography (Jayaram, 1981).

Many species of fish do reproduce in freshwater, but spend most of their adult lives in the sea. Species migrating between marine and

fresh waters need adaptations for both environments; when in salt water they need to keep the bodily salt concentration on a level lower than the surroundings, and vice versa. Many species solve this problem by associating different habitats with different stages of life (Kurup, 2002). Most of freshwater fishes are well adapted to survive in different climates and environments. And many other fishes have got additional respiratory organs to enable breathing air while crawling through the land that enable them to migrate from one to another habitat (Nelson, 2006).

Our rivers and wetlands and the rich biodiversity that they possess from the vital resource base for our own survival. Originating from the Western Ghats, 41 of the 44 rivers which run through the entire breadth

of the state of Kerala and ultimately join the Arabian Sea, have a predominant role in determining the hydrology and ecology of the “God’s own country” Moreover, the rich biodiversity, especially of fish fauna of these rivers contribute much to the recognition of the Western Ghats as one of the biodiversity Hotspot of the world (Karmakar *et al.*, 2008). A large amount of freshwater fish species are also being threatened by degradation, reduction or even loss of floodplains by damming, agriculture practices, urban development rivers dredging and geomorphologic modifications. (Sarkar and Banerjee, 2000).

The riverine fishery of Kerala is highly diverse and is around 207 species (Gopi 2000). Many species of fishes documented in earlier studies have not been found in recent reports (Ajithkumar *et al.*, 2003). Though a number of studies have been conducted on the fish diversity in the rivers of Kerala (Bijukumar and Sushama 2001; Raju Thomas *et al.*,

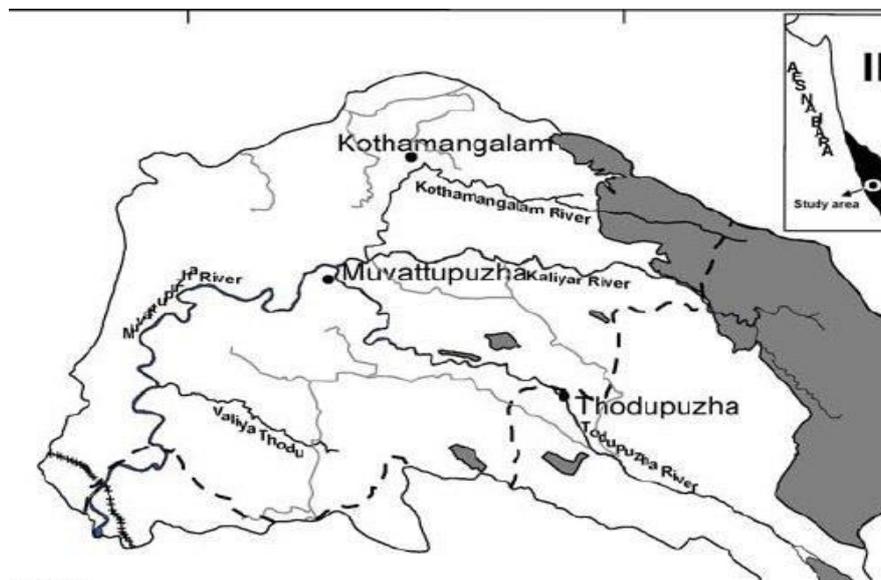
2001; Jameela Beevi and Ramchandran 2002, 2009; Ramchandran *et al.* 2001; Ajithkumar *et al.* 2003; Prasanth Narayanan *et al.* 2005; Raghavan Rajeev *et al.* 2008; Swapna 2009) not much study has been done on the diversity of Thodupuzha River. In view of this paucity of information, the present survey was carried out to document the fishes of Thodupuzha River.

2. Materials and Methods

Study Area

The study area for the present study is the Thodupuzha River, Idukki District, Kerala. It is a tributary of Muvattupuzha River. The river is one of the few in the state that does not become dry in the summer as the outflow from the Idukki hydroelectric project is drained into the river via Kanjar River. Thodupuzha river and Kanjar are major tourist attraction of its serene landscape and boating. A temple is also occupied in the bank of the river.

Fig. 1 Map and Image of the study area





Study period

The study period was started on 8th December 2018 to 23rd February 2019. For diversity study, keen observation of the fauna and flora of the river was necessary. The availability of fish fauna will be related to the flora of the region, rate of flow of water, oxygen content etc.

For diversity and density analysis the study area is 300 meter of Thodupuzha River is divided into 3 parts and this is known as point analysis. The 5 parts must be equal and must be marked with 3 poles. After observing the fauna of the river, the fishes were collected with the help of cast net, Gill net, and Rode and Line. Then they were transferred into a bucket. From each part 3 catches are done and the fishes are counted and grouped and identified. The collected fish samples were preserved in a bottle containing 40% formalin solution and rest released back into the river.

For getting data about fishes, the fishes must be caught at regular intervals. Each part of the 300 meter area must have 3 catches and the species of fishes must be identified and numbered. From the data obtained graphs, tables etc. are made. Photo of the fishes were also taken for better understanding. From the data obtained Simpson's diversity index was calculated. Then abundance and Frequency of fishes were also calculated.

Simpson's index

Simpson's diversity index is a simple mathematical measure that characterizes species diversity in a community. Species diversity for the selected sites was calculated based on the observed values using Simpson's Diversity index.

$$\text{Simpson's index, } D = \frac{\sum n(n-1)}{N(N-1)}$$

Where N = the total number of organisms of all species and n = the

total number of organisms of a particular species.

From which Simpson's Diversity Index, $1-D$, is found. D ranges from 0 to 1, with 1 representing infinite diversity and 0 representing no diversity.

Abundance

Relative abundance is the percent composition of an organism of a particular kind relative to the total number of organisms in the area. The abundance of a species compares the number of individuals of that species with the total number of animals of all species in the study area.

$$\text{Abundance} = \frac{\text{Number of individuals of a particular species}}{\text{Total number of all species}}$$

Observations

Thodupuzha River is rich in diversity of fish fauna. A total of 19 species were identified by using Fish base website by comparing with its common names that is acquired from fisher man. The fishes was collected,

observed and identified. The names of documented fishes are as follows:

Name of the Species found in the study area

1. *Ablennes hians*
2. *Anguilla bengalensis*
3. *Aplocheilus panchax*
4. *Barilius canarensis*
5. *Channa marulicus*
6. *Channa striata*
7. *Dawkinsia arulius*
8. *Etroplus maculates*
9. *Etroplus suratensis*
10. *Garra hugi*
11. *Garra surendranathanii*
12. *Haludaria fasciata*
13. *Mastacembelus armatus*
14. *Mystus montanus*
15. *Oreochromis niloticus*
16. *Pethia muvattupuzhaensis*
17. *Puntius chola*
18. *Puntius mahecola*
19. *Wallago attu*

Fig. 2. Images of the fish Species found from the study area



Ablennes hians



Anguilla bengalensis



Aplocheilichthys panchax



Barilius canarensis



Channa marulius



Channa striata



Dawkinsia arulius



Etroplus maculatus



Etroplus suratensis



Garra hughii



Garra surendranathanii



Haludaria fasciata



Mastacembelus armatus



Mystus montanus



Oreochromis nilot



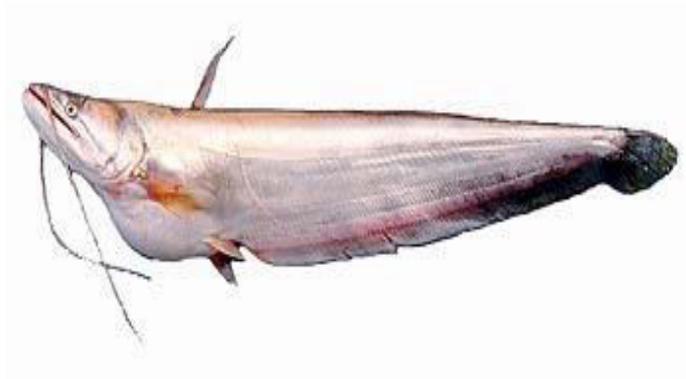
Pethia muvattupuzhaensis



Puntius chola



Puntius mahecola



Wallago attu

3. Result and Discussion

The present observation noticed that, there are about 19 species were documented from the 3 sites of the study area (Fig.2). Among the 19 species identified the most common fish species was *Puntius mahacola*. The second position was occupied by *Etroplus maculates* and followed by *Barilius canarensis* and *Etroplus suratensis*. The species includes *Mystus montanus*, *Channa striata*, *Channa marulius*, and *Anguilla bengalensis* shows less number from the study sites.

According to the monthly distribution December shows high number of species. February shows least number but there was a slight variation in the number of species obtained and the reason for this may due to the climate change.

The following figure/graph shows the diversity of fishes obtained from the 3 sites with respect to observing period (December to February) (Fig. 3-5).

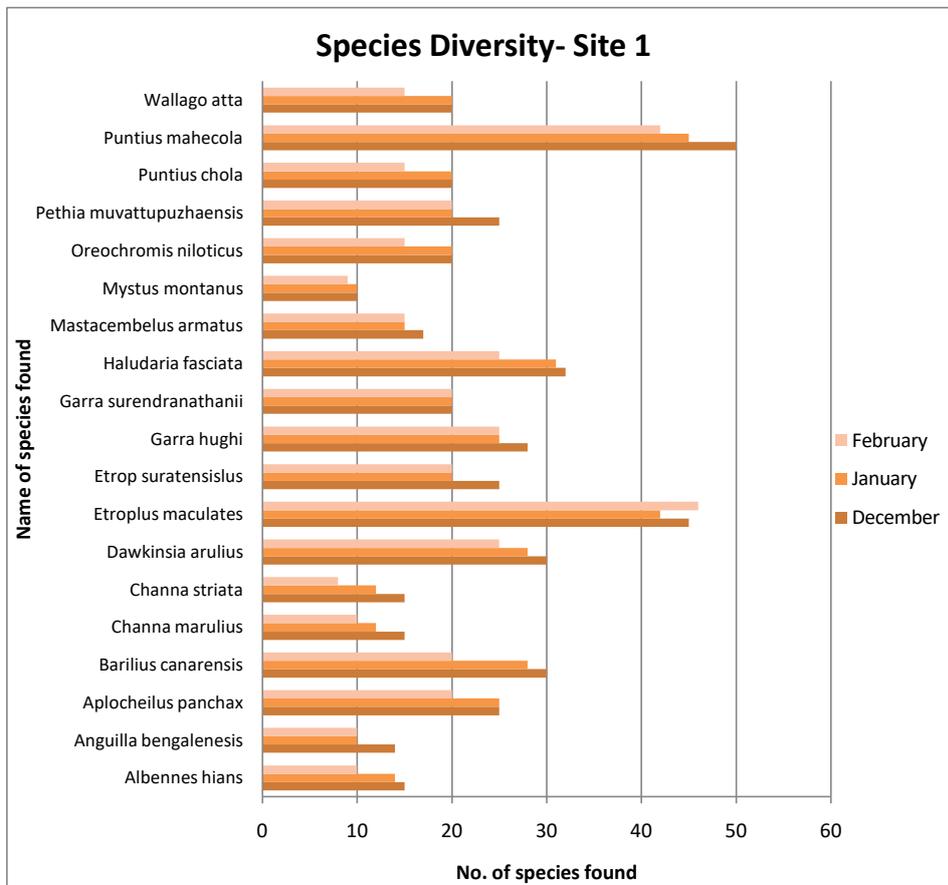


Fig.3. Graph showing fish diversity of Site 1

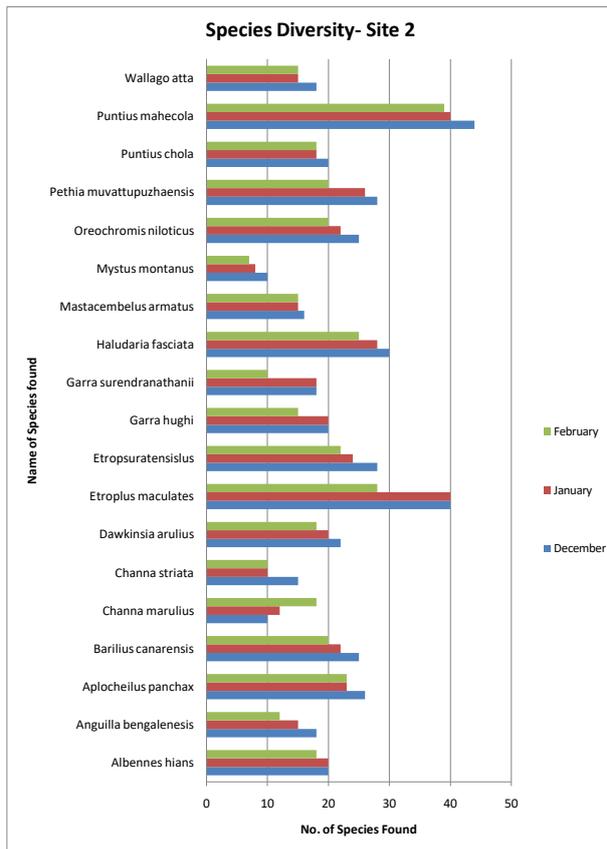


Fig. 4. Graph showing fish diversity of Site 2

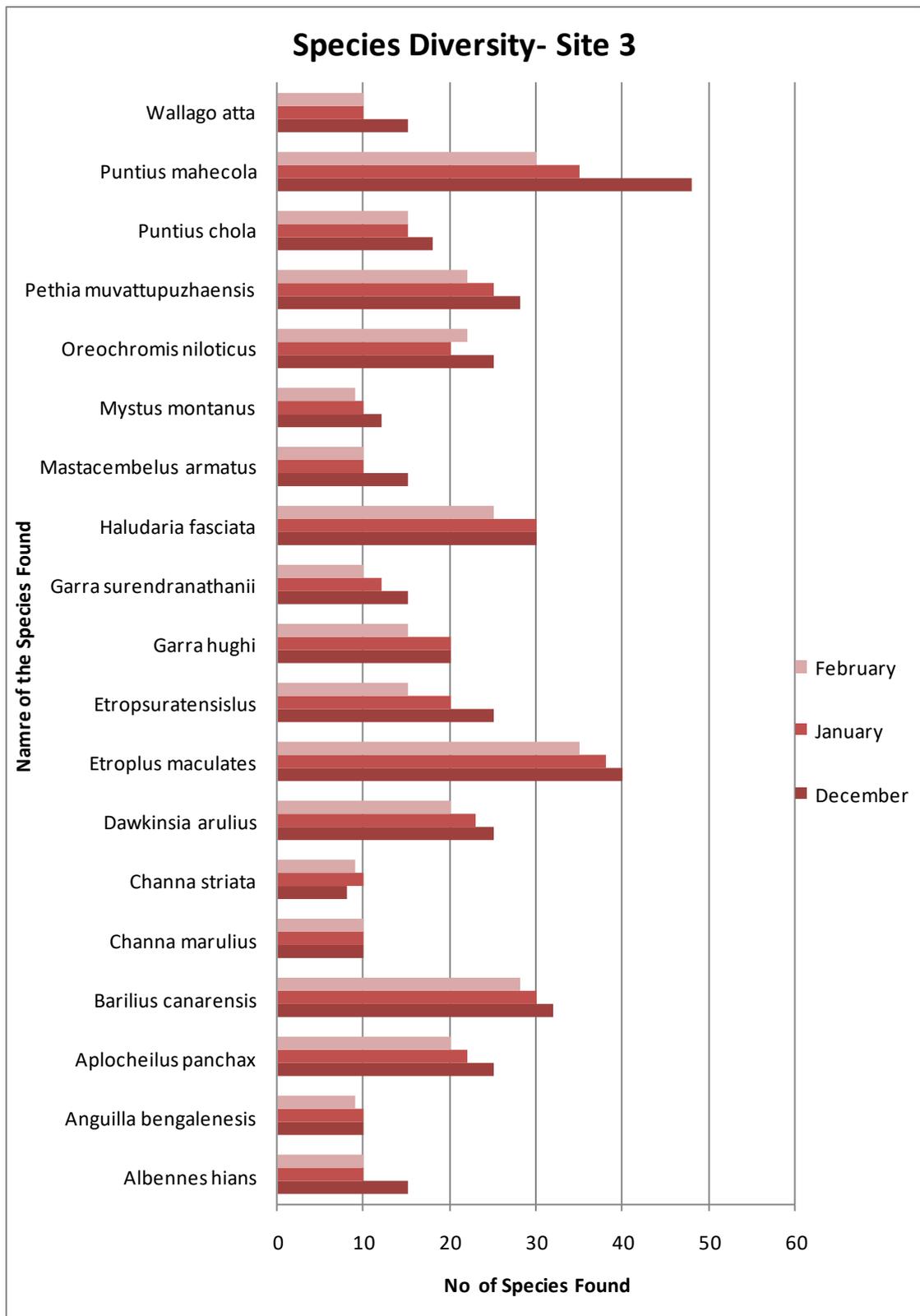


Fig.5. Graph showing fish diversity of Site 3

According to the Simpson's diversity index, there was a large diversity in the 3 sites of the river. The three sites shows approximately equal diversity index among them site 2 and

3 with index value of 0.94 and site 3 with 0.938. Fig. 6 showing the Simpson's diversity index comparison of 3 sites with month.

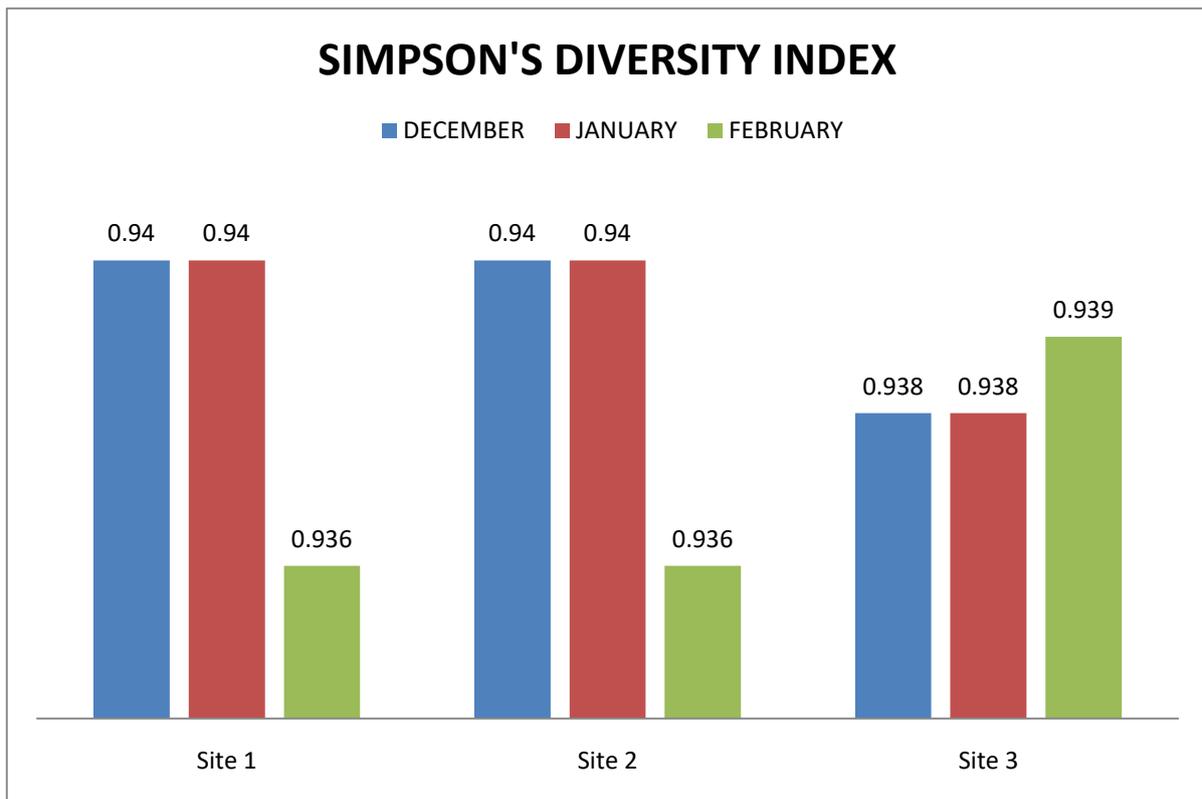


Fig.6. Simpson's diversity index of fishes

By calculating abundance of species in the river, the Site 1 shows more abundant species *Puntius mahecola* with 11.02 and *Etroplus maculatus* of 10.7. The less abundant species were *Mystus montanus* of 2.33 and *Anguilla bengalensis* with 2.74 followed by *Channa striata* and *Channa marulius*, 2.82, 2.98 respectively. *Puntius mahecola* was also the great abundant species of site 2 and 3 with 10.41 and 10.3 percent respectively. In Site 3 the species

Etroplus maculatus shows equal abundance with *Puntius mahecola*. In site 2, *Etroplus maculatus* shows abundance with 9.14 and *Mystus montanus* and *Channa striata* shows least abundance (2.12 and 2.96). *Channa striata* (2.5), *Anguilla bengalensis* (2.64), *Channa marulius* (2.72) and *Mystus montanus* (2.8) were shows least abundance in site 3 (Fig. 7).

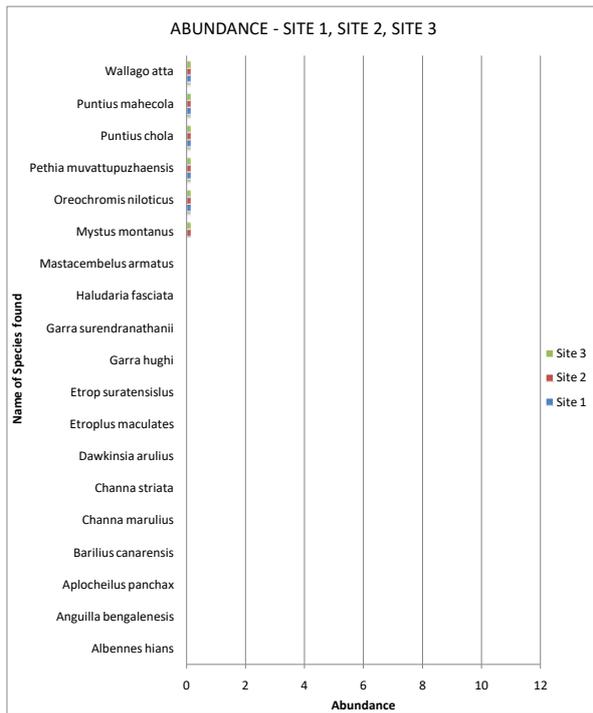


Fig.7. Graph showing the abundance of fishes in site1, site2 & site3

Puntius mahecola has abundant in the river, were, 3 sites shows great number of this particular species. And *Etroplus maculatus* in the second position. *Barilius canarensis* and *Haludaria fasciata* also shows high abundance. Species

include *Mystus montanus*, *Channa striata*, *Anguilla bengalensis*, *Channa marulius* are least in number and abundance. Following graph (Fig. 8-10). shows the abundance of the fish in different sites.

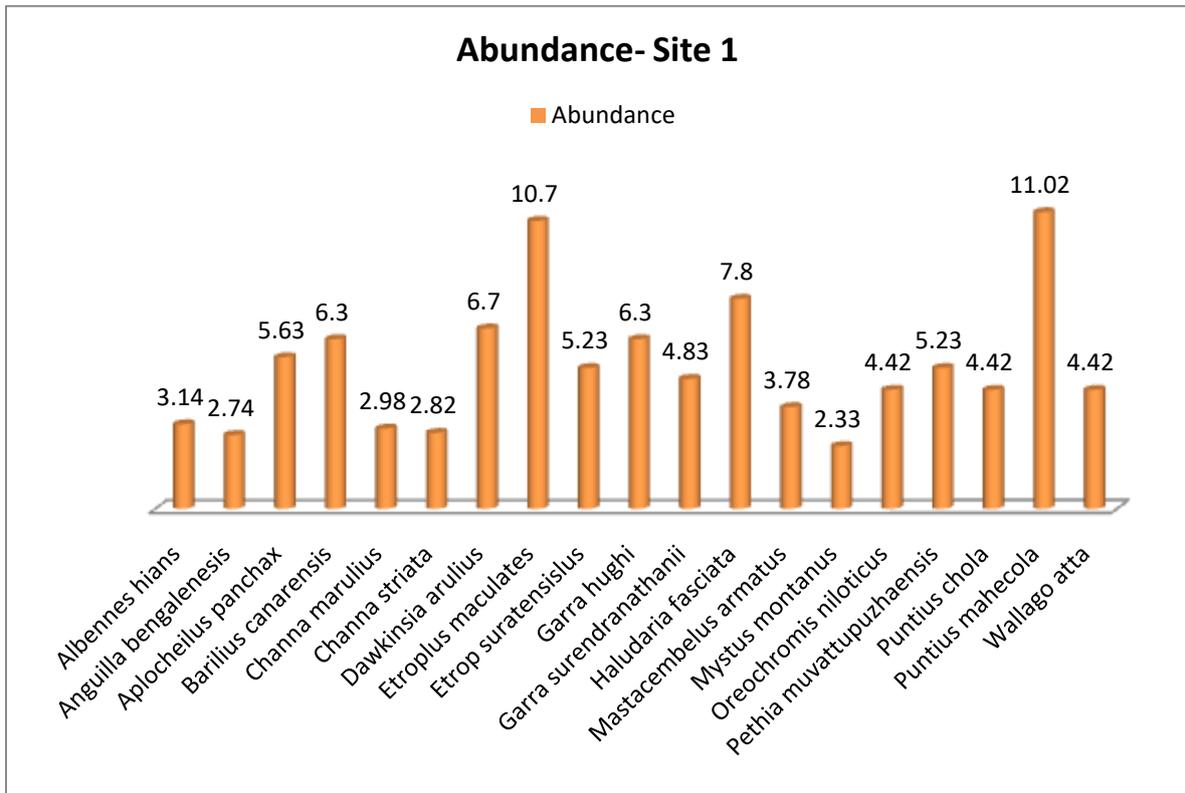


Fig.8. Graph showing the abundance of fishes in site1

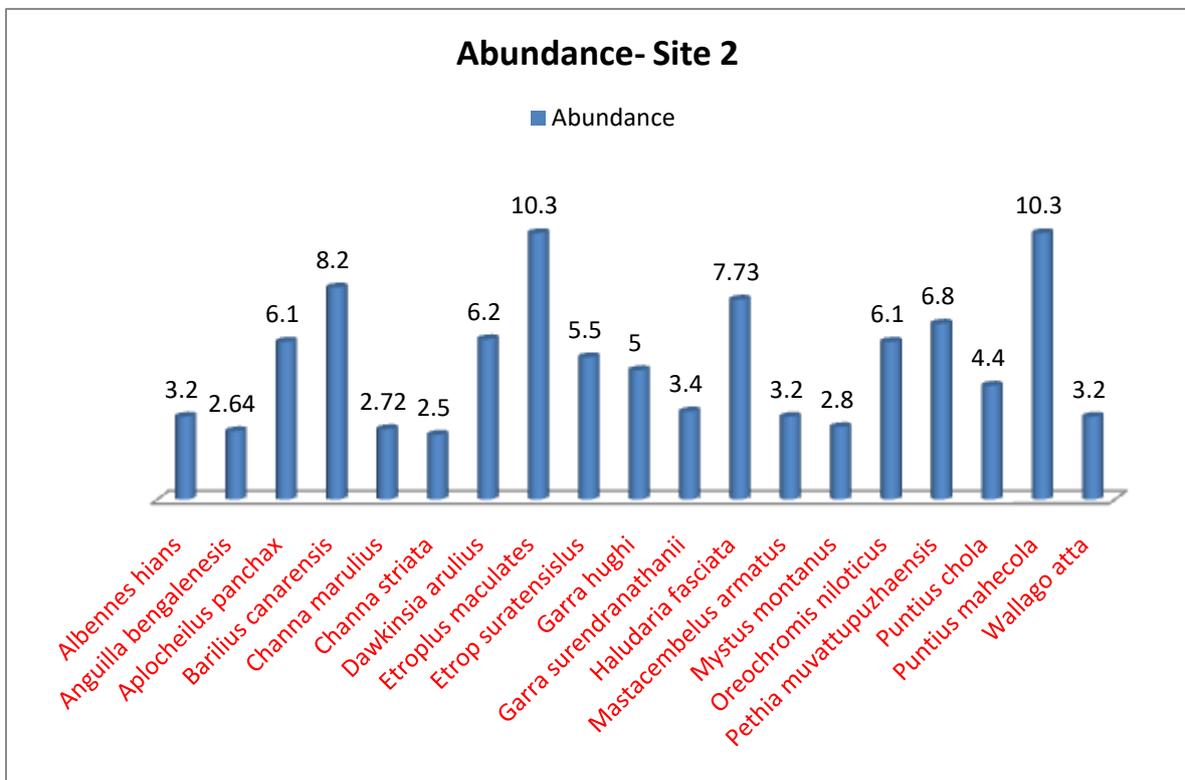


Fig.9. Graph showing the abundance of fishes in site2

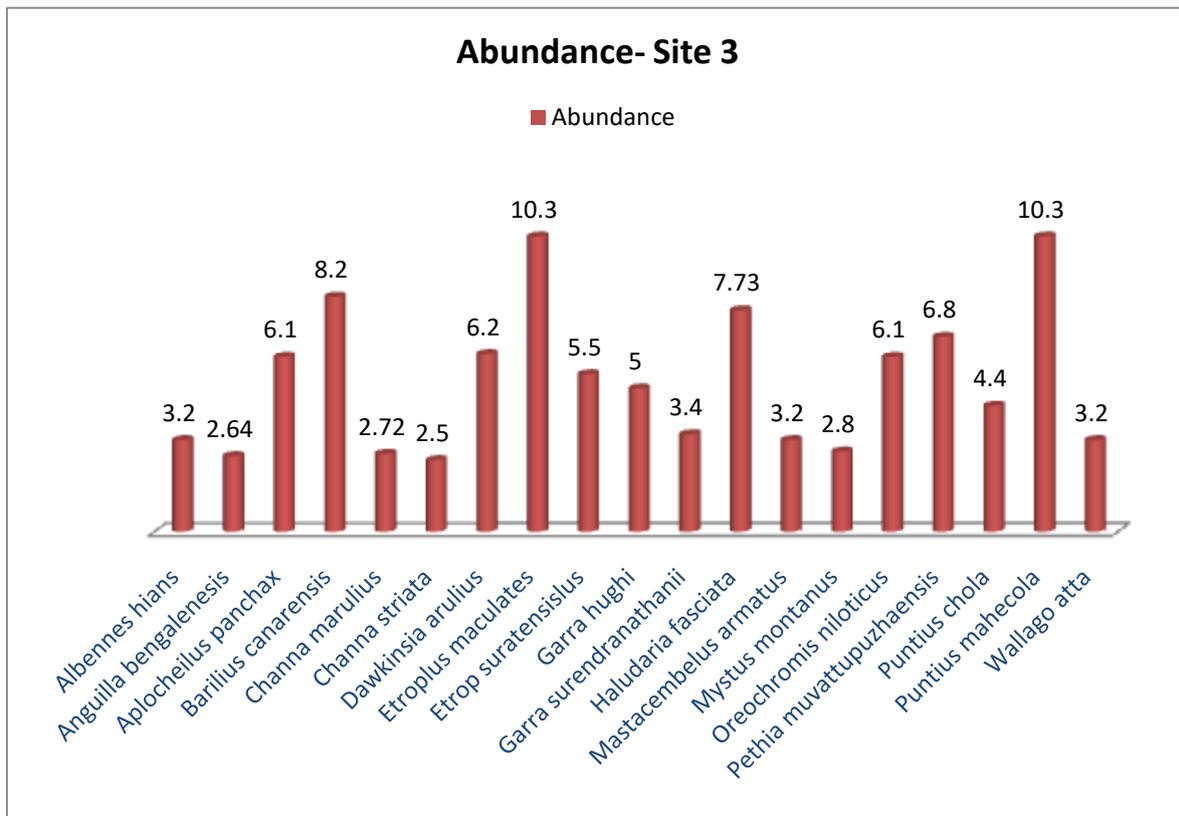


Fig.10. Graph showing the abundance of fishes in site3

The present investigation also observed the rare species *Pethia muvattupuzhaensis* from the present study area. Beevi & Ramachandran (2005) described *Puntius muvattupuzhaensis* as a small elongate barb from the Muvattupuzha River. The current occurrence of the species is known to encompass the lower and middle reaches of the Muvattupuzha River, including Ithipuzha and Murinjapuzha tributaries, which include my study area, and the lower reaches of Periyar River in Kerala (Zeena & Beevi 2011). *Pethia Muvattupuzhaensis* show abundance of 5.23%, 6.3%, and 6.8% for site 1, site 2 and site 3 respectively. They show comparatively moderate diversity among the species.

When the river shows large diversity reason for the presence of large diversity of fishes may be the following features. A large density of fishes can be seen in Thodupuzha River and the reasons for this may be of the following features. The main reason is that the river is free from pollution. If pollution is there it will be very mild, the reason for that is because the river flows through a village. So the rate of pollution is comparatively less. The next reason may be the rate of oxygen concentration; it may high in the river. The water is flowing and not a stand still model. The river had low and high tide so the water moves. Moving water contain large amount of oxygen.



The next reason can be because of vegetation on river bank made it rich. This vegetation keeps the water cool and protect the fishes from extreme condition. But now many unsettled points are arising in fishes diversity and density had decreased and reason is unknown. And some people point out that reason for the decrease in number is the increased number of houses in the bank of the river. This leads to deposition of sewage waste into water and it affect the population of the river. Because of the high density of fish people like to have fishes in their diet, and the increased consumption of fish and the pollution leads to the decrease in the number of fish diversity in the river.

According to the local fishermen, many species of fishes, which were abundant in past years, showed a decline in recent catches, due to destruction and degradation of their habitat by ecological and man-made interventions. The recent studies of Bhakta and Bandyopadhyay (2008), Raghavan Rajeev *et al.* (2008), Swapna (2009), and Palavai and Davidar (2009) also indicated that habitat loss is the main cause of reduction in fish diversity. A few important management plans that result from this study for the conservation of fish species could be included into the fishery policies of the Government, such as identification and listing of threatened and endangered species, determination of population size and distribution, finding out the breeding behavior of threatened species, which is essential for both *ex situ* and *in situ* conservation for captive breeding and

brood stock maintenance of fishes of potential economic importance (Bhakta and Bandyopadhyay 2008).

From the present study, it is clear that Thodupazha River is rich in fish diversity. However, these rivers are facing a high degree of threat from sand mining and various anthropogenic activities, and over fishing and proper management strategies should be implemented to protect and conserve the existing ichthyofaunal wealth of our nation.

4. Conclusion

The present investigation was documented 19 fish species from different study sites of the present study area. Among these the species like *Puntius mahecola* is the most abundant species. The second position was occupied by *Etroplus maculatus* and followed by *Barilius canarensis* and *Etroplus suratensis*. The species includes *Mystus montanus*, *Channa striata*, *Channa marulius*, and *Anguilla bengalensis* shows less number from the study sites. The present investigation also observed the rare species *Pethia muvattupuzhaensis* from the present study area. While analysing the diversity index, the three sites shows approximately equal diversity index. By calculating abundance of species in the river, the Site 1 shows more abundant species than site 2 and 3. According to the monthly distribution December shows high number of species. While February shows least number and there is also many threats that destruct the fish diversity of the river and a proper precautions should taken by



the authority and also be conduct awareness classes for local people about the importance of the conservation of water bodies and its faunal and floral diversity for future generation.

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