

DIVERSITY OF EDIBLE FISH SPECIES IN ADAYAR ESTUARY, CHENNAI, TAMIL NADU, INDIA

S. Nandini¹ and Dr. M.C. John Milton²

1 Assistant Professor, Department of Advanced Zoology and Biotechnology, Quaid-E-Millath Govt. College, Chennai, Tamil Nadu, India

2 Assistant Professor, PG and Research Department of Advanced Zoology and Biotechnology, Loyola College, Chennai, Tamil Nadu, India

Abstract: Systematic and updated checklist of Adayar estuarine fishes contains 42 species distributed under 35 genera, 22 families, 7 orders and one class. The most diverse order was order Perciformes with 19 species. Species diversity index was used as an indicator for determination of an ecosystem and environmental condition.

[Key words: Adayar estuarine fishes, updated checklist, species diversity index].

INTRODUCTION

Fishes are the best known species of aquatic animals among the organisms and are the only food source harvested from natural populations. They are distributed in wide range of aquatic ecosystems (De Silva *et al.*, 2007). They live in almost all conceivable aquatic habitats. They exhibit enormous diversity of size, shape and biology, and in the habitats they occupy (Gadgil, 1996). The species diversity of an ecosystem is frequently related to the amount of living and nonliving organic matter present in it. However, apparently, species diversity is governed on the characteristics of a single ecosystem than on the interaction between ecosystems, e.g., transport of living animals across the different gradient zones in the water body. The various organisms including the plankton play a significant role in the dynamics of the ecosystem (Kar and Barbhuiya, 2004).

Ichthyodiversity refers to collection of different fish species; depending on context and scale, it could refer to alleles or genotypes within piscian population, to species of life forms within a fish community, and to species of life forms across aqua regimes (Burton *et al.*, 1992). Biodiversity is also essential for stabilization of ecosystems, protection of overall environmental quality, for understanding intrinsic worth of all species on the earth (Ehrlich and Wilson, 1991).

Estuaries are the uniting place of freshwater rivers and saltwater from the sea and as such are dynamic environmental conditions (James *et al.*, 2007). Importance of estuaries is well understood in many parts of the world as breeding and nursery grounds for a wide variety of fishes (Balasubramanian *et al.*, 2002). Estuaries being a dynamic ecosystem provide diverse habitat for the proliferation of diadromous and estuarine resident fish species to complete their life cycle (Mogalekar *et al.*, 2017). They also form an important component of coastal ecosystem due to their immense biodiversity values in aquatic ecology. The fish fauna inhabiting the estuarine ecosystems of Tamil Nadu are diverse and fairly well known (Mogalekar *et al.*, 2017). Estuaries are heavily exploited in recent times and are among the most threatened ecosystems. Hence it is necessary to carefully assess the diversity status in these ecosystems (Yadav, 2000).

In the present study an attempt has been made to find the fish assemblages structure at Adayar estuary in relation to major hydrological and meteorological parameters.

MATERIALS AND METHODS:

Description of Study Area:

The Adayar estuary is situated in the southern part of Chennai city at Lat. 13°06'N, Long 80°18'E of south east coast of India. Adyar river starts as a stream only from the point where water from Chembarambakkam lake joins the river. It flows through Kancheepuram, Tiruvallur and Chennai district for about 42.5 kilometres (26.4 mi) before joining the Bay of Bengal in Adayar. At Chennai it forms an estuary, which extends from the Adayar Bridge to the sandbar at the edge of the sea, with some small islets in-between.

Plate: 1 Map showing the study area Adayar Estuary, Tamil Nadu, India



Plate: 2 Map of Adayar Estuary showing Three sampling sites



Source: Google

Procedure:

Fish were collected with the help of local fishermen using hand-operated dragnets, seine nets, cast nets, and the hook during March 2016 to February 2017. A field kit containing scale, measuring tape, rope, buckets, preservatives, trays, digital camera etc., was regularly used. A boat was engaged for visiting the stations sequentially, which was carefully followed throughout the investigation period.

Monthly survey of fishes was carried out during early morning. Fish were collected from the sampling sites between 5.00 and 9.00 am. The collected samples from five different points of each site

and were mixed together to prepare an integrated sample. Three surveys per month were taken and mean values were recorded. The fishes were examined in the field and were classified. The photographs of the collected fishes were taken at fresh condition and the fishes needed for further taxonomic examination preserved in 4% formalin, the Sample fishes were brought to the laboratory and placed in separate glass jars according to the size. Identification of the species was done mainly on the morphometric characters. Systematic identification of the fish species were carried out by using the standard keys of Talwar and Kacker, (1984); Talwar and Jhingran, (1991), Day's Fauna (1889) and Jayaram (1981, 1999).

Diversity Analysis:

Biodiversity is one of the key interests of ecologists. Species diversity has two separate components: i.) the number of species present (species richness), and ii.) their relative abundances (termed dominance or evenness). Two measures of biodiversity were explored. The Shannon index (H' , also termed the Shannon-Wiener index) and the Simpson index (D) (Magurran, 2004).

1. Shannon index: The diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum p_i \ln p_i$$

where p_i is the proportion of individuals found in species i . For a samples community proportion $p_i = n_i/N$, where n_i is the number of individuals in species i and N is the total number of individuals in the community. Since by definition the p_i s will all be between zero and one, the natural log makes all of the terms of the summation negative.

Due to the confounding richness and evenness in the Shannon index, for comparative studies, combining a direct estimate of species richness (the total number of species in the community, S) with some measure of dominance or evenness is used. The most common dominance measure is Simpson's index.

2. Simpson's index: Since evenness and dominance are simply two sides of the same coin, their measures are complimentary. Simpson's index is based on the probability of any two individuals drawn at random from an infinitely large community belonging to the same species:

$$D = \sum p_i^2$$

where p_i is the proportion of individuals found in species i . For a finite community

$$D = \sum \frac{n_i(n_i - 1)}{N(N - 1)}$$

3. Margalef Index:

$$Ma = S - 1 / \ln N$$

Where 'S' is the number of species, 'N' is the number of individuals in the sample.

4. Equitability (j = evenness)

$$J = H / \ln S$$

In addition to species richness, Shannon's diversity index was calculated using \log_e and Equitability evenness using the software Paleontological Statistic Software Package – PAST, version 2.07.

RESULTS AND DISCUSSIONS

A total of 927 individuals were enumerated which comprises of 42 species of fishes belonging to 7 orders and one class. Out of 42 species namely *Thryssa malabarica*, *Elops saurus*, *Megalops cyprinoides*, *Chanos chanos*, *Arius arius*, *Arius jella*, *Mystus gulio*, *Chelone parsia*, *Chelone tade*, *Mugil cephalus*, *Planiliza macrolepis*, *Lates calcarifer*, *Ambassis ambasis*, *Chanda nama*, *Sillago sihama*, *Gazza minuta*, *Secutor insidiator*, *Sphyræna jello*, *Oreochromis mossambicus* and *Etroplus maculate* are of common occurrence and so can be considered as commercial fish species (Table 1).

Tidal duration, height of the water, velocities of the water currents, salinity are the prime factors to determine the quality of the fish, their distribution and fishing (Ashim Kumar and Anindita Patra, 2015 and David, 1954).

The present study has revealed that there were 42 fish species are present in the study area (March 2016 to February 2017) (Plate 3, and 4). Among the 42 species 38 are marine species, 4 were fresh water species and all are seen in brackish water. The 42 species belonged to seven orders and one class. Out of these even orders Perciformes constituted about 48 %. This is similar to the study carried by Vanmali *et al.*, (2015) in Vaitarna estuary of district Palghar Maharashtra.

A list of Adayar estuarine fishes is presented along with their classification, distribution and IUCN Red list conservation status (Table 2). IUCN status of these species were confirmed and no endangered, vulnerable species were not observed, some were least concerned. Only two species were near threatened species and these were *Hypophthalmichthys molitrix* and *Oreochromis mossambicus*. Similar studies had been conducted on Ulhas estuary in Naigaon and Bhyander region (Devdatta Lad and Shashikant Patil, 2013) and in Vaitarna estuary of Palghar Maharashtra (Vanmali *et al.*, 2015). It was reported that fishes were mainly marine and estuarine while very few were fresh water species and were observed only during the monsoon. This is in accordance with the check list of estuarine fishes of Tamil nadu presented by Mogalekar *et al.*, (2017) and Ramanujam *et al.*, (2014). In the present study it was observed that among the fish species recorded majority of fish species belong to the order Perciformes (48 %). Similar dominance of single order Perciformes were indicated by Mogalekar *et al.*, (2017), Bijukumar and Sushma, (2001) and Rama Rao and Leela (2016).

The fishes belonging to the order Cypriniformes were available only during the monsoon season. Total number of fish recorded during pre-monsoon, monsoon and post monsoon were 297, 344 and 286 respectively. Fish diversity in different seasons of the year is represented in Figures 1, 2 and 3.

According to the study carried out by Beslin Leena Grace in 2015 (Poonthura Backwater Kerala, India), the estuarine fauna along the southwest coast of India, partially or completely eliminates the estuarine or marine fishes during monsoon and repopulating the species occurs during post monsoon. Also in the present study it was observed that few fresh water species were present in the monsoon season and these were absent in pre and post monsoon season. The decreased fresh water flow can significantly change the salinity, sediment regimes and nutrient loading of an estuary which directly affects the habitat, abundance, distribution of estuarine organisms and trophodynamics of the system. Similar findings were reported by Kennish, (2002) and Beslin Leena Grace, (2015). The fish species collected belongs to estuarine, marine and riverine environments. Estuarine environments have the characteristic features of rivers in the monsoon enabling the presence of fresh water species. In dry seasons the sea water dominates and increases the salinity, enabling of this the marine species to dominate. Similar trends were reported by Baran, (2000).

Fish of Adayar estuary belonged to 22 Families, 35 Genera and 42 Species (Table 1). Among 42 species, 4 species namely *Mugil cephalus*, *Elops saurus*, *Arius arius* and *Oreochromis mossambicus* were abundant throughout the year. Order Perciformes and Order Mugiliformes were found to be high in species abundance.

The present study reveals that *Oreochromis mossambicus* (138) was the most abundant fish, followed by *Mugil cephalus* (126) both having considerable economic importance. This is in accordance with Kurup *et al* (1993) and Beslin Leena Grace (2015). Many interrelating physical and biological factors influence the occurrence, distribution, abundance and diversity of estuarine tropical fishes. Among the environmental variables, temperature, water salinity, turbidity, dissolved oxygen and their regular or irregular fluctuations at different time scales have been identified as determinants in estuarine fish ecology (Marsac *et al.*, 2014 and Beslin Leena Grace 2015).

Fish belonging to different orders were observed and recorded as follows Perciformes 48 %, Mugiliformes 20%, Siluriformes 11%, Clupeiformes 9%, Elopiformes 7%, Gonorynchiformes 3% and Cypriniformes 2% (Figure 4). There were about 22 families out of which Mugilidae was the largest family constituting about 20 % of the total familial diversity in Adayar estuary (Figure 5).

Species diversity index is used as an indicator for resolution of an ecosystem and environmental condition (Ashim Kumar Nath and Andindita Patra, 2015). The index values of Shannon – Weiner (H), Simpson's (D), Margalef's (M) and Equitability (j) are shown in Figure 6. Shannon – Weiner diversity value were recorded as 3.312, 3.327 and 3.262 for pre monsoon, monsoon and post monsoon season respectively. Simpson's index value for the three seasons were 0.9453, 0.9405 and 0.9396, the Margalef index values were 6.498, 7.02 and 6.542 and the Equitability (J) were recorded as 0.9104, 0.89 and 0.8968 (Figure 7, 8, 9 and 10). Species diversity index of greater than 1 express stable environment for survival. Similar trend was observed and reported by Ashim Kumar Nath and Andindita Patra, (2015).

The diversity index (Table 3) values of Shannon – Weiner (H') ranged from 3.262 to 3.327 (Figure 7). The present study proves that Adayar estuary was quiet diverse in fish species. Shannon – Weiner index for three seasons indicates a strong relationship with similar richness. The highest fish diversity was recorded in monsoon season. Similar results were observed by Nurul Asyikin Binti Ya *et al.*, (2014) in Sepang Besar estuary. Pereira (2000) used this index to evaluate the diversity of Camaleao lake, with values varying from 3.9 to 4.1 (Thirumala *et al.*, 2011).

A biodiversity index seeks to characterize the diversity of a sample or community by a single number (Magurran, 1988 and Shahadat Hossain *et al.*, 2012). Therefore the concept of the “species diversity” depends on the number of species and the distribution of individuals among species and it is consistent with the reports of Williamson (1973) and Shahadat Hossain *et al.*, (2012). Confirming the earlier reports of Shahadat Hossain *et al.*, (2012) Shannon – Weiner diversity index reflects the richness and proportion of each species while Evenness and Dominance indices may represent the relative number of individuals in the sample and the fraction of common species respectively.

The Evenness index was highest in pre monsoon (0.7219) and was almost similar in monsoon and post monsoon season (Figure 10), this finding is in accordance with Thirumala *et al.*, (2011). The species diversity was at its peak in Monsoon season coinciding with the favourable conditions such as sufficient waters and ample food resources. The diversity was low in pre monsoon season probably due to the shrinkage of water spread of the estuary. Evenness indicates distribution of fish fauna in monsoon and

post monsoon seasons evenly. Divya Kumudini Minj and Agarwal (2015) reported 42 species from Pakhanjor reservoir and showed similar evenness distribution in monsoon and post monsoon season.

Table: 1 Summary of the Fish Diversity of Adayar Estuary (March 2016 – February 2017)

Taxa	Family	Genera	Species	
Osteichthyes (Bony fishes)	Name	Name	Name	No.
Clupeiformes	Ophichthidae	<i>Pisodonophis</i>	<i>Boro</i>	1
	Clupedia	<i>Hilsa</i>	<i>Kelee</i>	4
		<i>Nematolosa</i>	<i>Nasus</i>	
		<i>Sardinella</i>	<i>Gibbosa</i>	
		<i>Escualosa</i>	<i>thoracata</i>	
	Engraulidae	<i>Thryssa</i>	<i>Malabarica</i>	2
		<i>Mystax</i>		
Elopiformes	Elopidae	<i>Elops</i>	<i>Machnata</i>	2
			<i>Saurus</i>	
	Megalopidae	<i>Megalops</i>	<i>Cyprinoides</i>	1
Gonorynchiformes	Chanidae	<i>Chanos</i>	<i>Chanos</i>	1
Cypriniformes	Cyprinidae	<i>Labeo</i>	<i>Rohita</i>	4
		<i>Catla</i>	<i>Catla</i>	
		<i>Cirrhinus</i>	<i>Mrigala</i>	
		<i>Hypophthalmichthys</i>	<i>molitrix</i>	
Siluriformes	Ariidae	<i>Arius</i>	<i>Arius</i>	3
			<i>Jella</i>	
		<i>Maculatus</i>		
	Bagridae	<i>Mystus</i>	<i>Gulio</i>	1
Mugiliformes	Mugilidae	<i>Chelone</i>	<i>Parsia</i>	2
			<i>Tade</i>	
		<i>Mugil</i>	<i>Cephalus</i>	1
		<i>Planiliza</i>	<i>Macrolepis</i>	1
Perciformes	Latidae	<i>Lates</i>	<i>Calcarifer</i>	1
	Ambassidae	<i>Ambassis</i>	<i>Ambassis</i>	3
		<i>parambassis</i>	<i>Ranga</i>	
		<i>Chanda</i>	<i>Nama</i>	
	Sillaginidae	<i>Sillago</i>	<i>Sihama</i>	1
	Leiognathidae	<i>Gazza</i>	<i>Minuta</i>	4
		<i>Eubleekeria</i>	<i>Splendens</i>	
		<i>Secutor</i>	<i>Insidiator</i>	
			<i>Ruconius</i>	
	Sphyraenidae	<i>Sphyraena</i>	<i>Jello</i>	1
	Gerreidae	<i>Gerres</i>	<i>filamentosus</i>	1
	Teraponidae	<i>Terapon</i>	<i>Jarhua</i>	2
			<i>Putra</i>	
	Mullidae	<i>Upeneus</i>	<i>sulphureus</i>	1
	Cichlidae	<i>Oreochromis</i>	<i>mossambicus</i>	2
<i>Etroplus</i>		<i>Maculatus</i>		
Anabantidae	<i>Anabas</i>	<i>Testudineus</i>	1	
Carangidae	<i>Alepes</i>	<i>Kleinii</i>	1	
Triacanthidae	<i>Triacanthus</i>	<i>Biaculeatus</i>	1	
Total	7	22	35	42

Table: 2 List of Fish Species identified from three stations in Adayar Estuary (March 2016 – February 2017)

S. No	Fish Name	March 2016 to February 2017												Habitat	IUCN Status
		Pre Monsoon				Monsoon				Post Monsoon					
		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb		
		Station			Total	Station			Total	Station			Total		
I	II	III	I	II		III	I	II		III					
	Class: Osteichthyes (Bony fishes)														
	Order: Clupeiformes														
	Family: Ophichthidae														
1	<i>Pisodonophis boro</i> (Hamilton, 1822)	2	1	1	4	1	2	1	4	1	1	0	2	M, F, B	LC
	Family: Clupedia														
2	<i>Hilsa kelee</i> (Cuvier, 1829)	1	0	2	3	2	1	1	4	1	0	1	2	M, F, B	NE
3	<i>Nematolosa nasus</i> (Bloch, 1795)	2	2	1	5	1	0	2	3	2	1	0	3	M, F, B	LC
4	<i>Sardinella gibbosa</i> (Bleeker, 1849)	1	2	1	4	1	1	2	4	2	1	0	3	M	NE
5	<i>Escualosa thoracata</i> (Valenciennes, 1847)	1	0	2	3	2	1	1	4	3	1	2	6	M, B	LC
	Family: Engraulidae														
6	<i>Thyssa malabarica</i> (Bloch, 1795)	2	2	2	6	3	2	1	6	3	2	2	7	M, B	NE
7	<i>Thyssa mystax</i> (Bloch & Schneider, 1801)	2	1	2	5	2	0	1	3	2	2	2	6	M, B	LC
	Order: Elopiformes														
	Family: Elopidae														
8	<i>Elops machnata</i> (Forsskal, 1775)	2	3	0	5	0	1	1	2	2	1	1	4	M, B	LC
9	<i>Elops saurus</i> (Linnaeus, 1766)	5	4	3	12	3	3	4	10	5	5	3	13	M, B	LC
	Family: Megalopidae														
10	<i>Megalops cyprinoides</i> (Broussonet, 1782)	2	1	2	5	2	3	3	8	2	2	3	7	M, F, B	DD
	Order: Gonorynchiformes														
	Family: Chanidae														
11	<i>Chanos chanos</i> (Forsskal, 1775)	3	4	2	9	3	4	3	10	3	4	2	9	M, F, B	NE
	Order: Cypriniformes														
	Family: Cyprinidae														
12	<i>Labeo rohita</i> (Hamilton, 1822)				0	5	1	0	6				0	F, B	LC
13	<i>Catla catla</i> (Hamilton, 1822)				0	3	1	1	5				0	F, B	LC
14	<i>Cirrhinus mrigala</i> (Hamilton, 1822)				0	4	1	1	6				0	F	LC
15	<i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)				0	2	1	0	3				0	F	NT
	Order: Siluriformes														
	Family: Ariidae														
16	<i>Arius arius</i> (Cuvier & Valenciennes, 1840)	6	7	5	18	7	8	7	22	6	5	4	15	M, B	LC
17	<i>Arius jella</i> (Day, 1877)	2	3	1	6	2	3	2	7	2	1	1	4	M, B	NE
18	<i>Arius maculatus</i> (Thunberg, 1792)	1	2	1	4	3	2	2	7	2	1	0	3	M, F, B	NE
	Family: Bagridae														
19	<i>Mystus gulio</i> (Hamilton, 1822)	2	1	2	5	2	2	3	7	2	1	1	4	F, B	LC
	Order: Mugiliformes														
	Family: Mugilidae														
20	<i>Chelone parsia</i> (Hamilton, 1822)	3	2	2	7	3	2	1	6	3	2	2	7	M, F, B	NE

21	<i>Chelone tade</i> (Valenciennes, 1836)	2	2	2	6	2	1	1	4	3	2	3	8	M, F, B	DD
22	<i>Mugil cephalus</i> (Linnaeus, 1758)	14	10	10	34	18	17	15	50	15	14	13	42	M, F, B	LC
23	<i>Planiliza macrolepis</i> (Smith, 1846)	2	3	1	6	3	2	2	7	2	1	2	5	M, F, B	LC
	Order: Perciformes														
	Family: Latidae														
24	<i>Lates calcarifer</i> (Bloch, 1790)	2	3	2	7	2	3	3	8	2	1	1	4	M, F, B	NE
	Family: Ambassidae														
25	<i>Ambassis ambasis</i> (Lacepede, 1802)	2	4	1	7	1	2	1	4	3	3	1	7	M, F, B	LC
26	<i>Parambassis ranga</i> (Hamilton, 1822)	3	1	2	6	2	2	1	5	1	3	1	5	F, B	LC
27	<i>Chanda nama</i> (Hamilton, 1822)	1	2	2	5	2	2	2	6	2	2	3	7	F, B	LC
	Family: Sillaginidae														
28	<i>Sillago sihama</i> (Cuvier, 1817)	2	3	2	7	3	2	2	7	2	2	0	4	M, B	NE
	Family: Leiognathidae														
29	<i>Gazza minuta</i> (Bloch, 1795)	3	2	4	9	2	2	0	4	3	2	2	7	M, B	LC
30	<i>Eubleekeria splendens</i> (Cuvier, 1829)	2	1	0	3	2	2	1	5	2	1	1	4	M, B	LC
31	<i>Secutor insidiator</i> (Bloch, 1787)	2	3	1	6	2	2	0	4	3	1	1	5	M, B	NE
32	<i>Secutor ruconius</i> (Hamilton, 1822)	2	1	2	5	2	1	1	4	2	1	0	3	M, F, B	NE
	Family: Sphyraenidae														
33	<i>Sphyraena jello</i> (Cuvier and Valenciennes, 1829)	2	3	2	7	3	0	0	3	3	1	1	5	M, B	NE
	Family: Gerreidae														
34	<i>Gerres filamentosus</i> (Cuvier, 1829)	2	0	1	3	2	3	2	7	2	0	1	3	M, F, B	LC
	Family: Teraponidae														
35	<i>Terapon jarbua</i> (Forsskal, 1775)	3	3	1	7	2	4	3	9	3	2	2	7	M, F, B	LC
36	<i>Terapon puta</i> (Cuvier, 1829)	2	4	4	10	2	3	3	8	3	4	2	9	M, F, B	NE
	Family: Mullidae														
37	<i>Upeneus sulphureus</i> (Cuvier, 1829)	0	0	2	2	2	0	1	3	1	0	1	2	M, B	NE
	Family: Cichlidae														
38	<i>Oreochromis mossambicus</i> (Peters, 1852)	16	15	14	45	18	15	18	51	14	13	15	42	F, B	NT
39	<i>Etroplus maculatus</i> (Bloch, 1795)	2	3	2	7	3	2	3	8	2	3	1	6	F, B	LC
	Family: Anabantidae														
40	<i>Anabas testudineus</i> (Bloch, 1792)	3	4	2	9	4	3	5	12	3	2	1	6	F, B	DD
	Family: Carangidae														
41	<i>Alepes kleinii</i> (Bloch, 1793)	0	0	3	3	2	2	0	4	2	1	2	5	M	NE
	Family: Triacanthidae														
42	<i>Triacanthus biaculeatus</i> (Bloch, 1786)	0	1	1	2	2	0	2	4	2	2	1	5	M, B	NE
Total		104	103	90	297	132	109	103	344	116	91	79	286	Pre Mon + Monsoon + Post Monsoon = 927	

EN: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern, DD: Data Deficient, NE: Not Evaluated M: Marine, B: Brackish and F: Fresh

Plate:3 Fish Species of Adayar Estuary

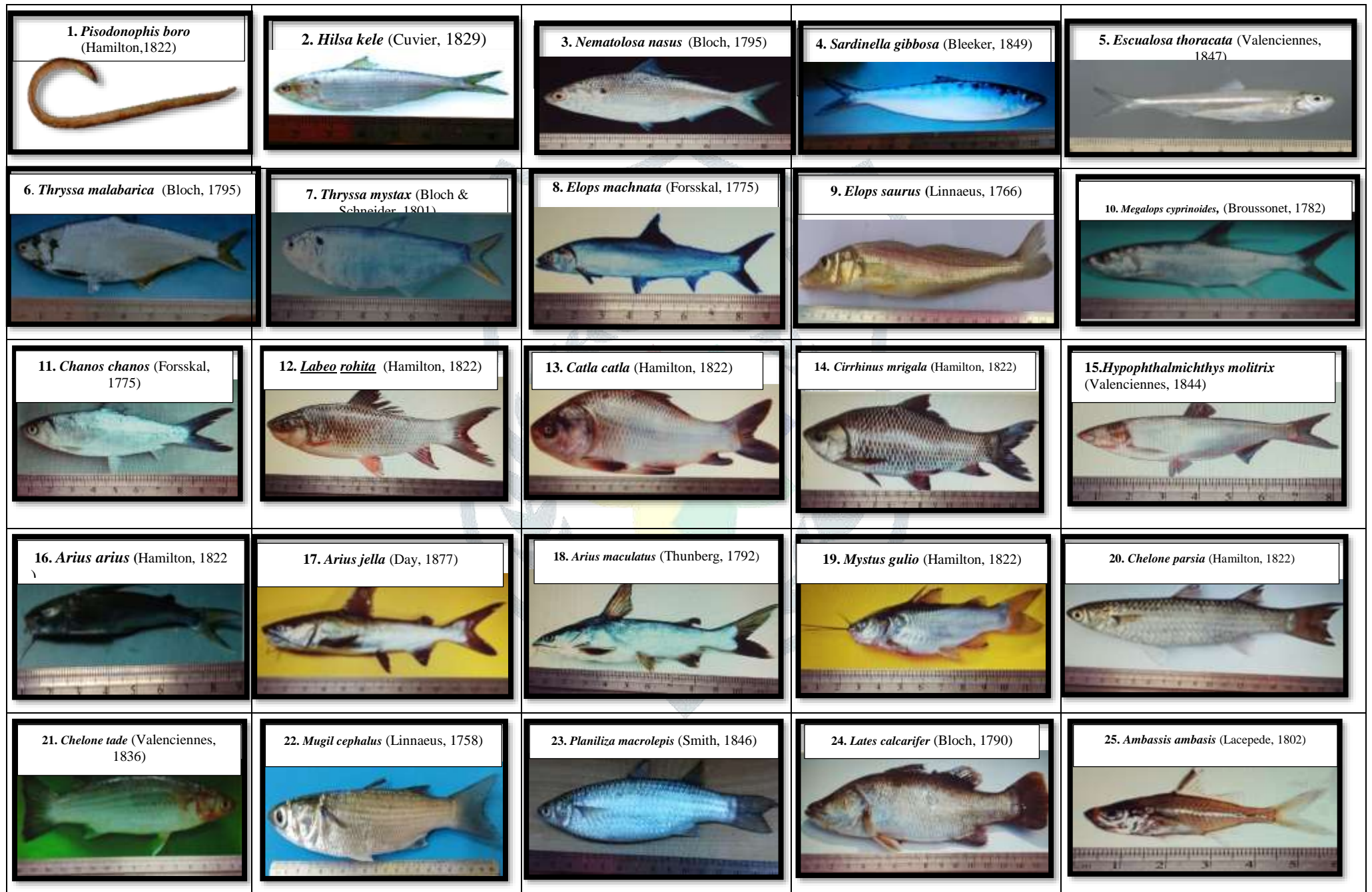
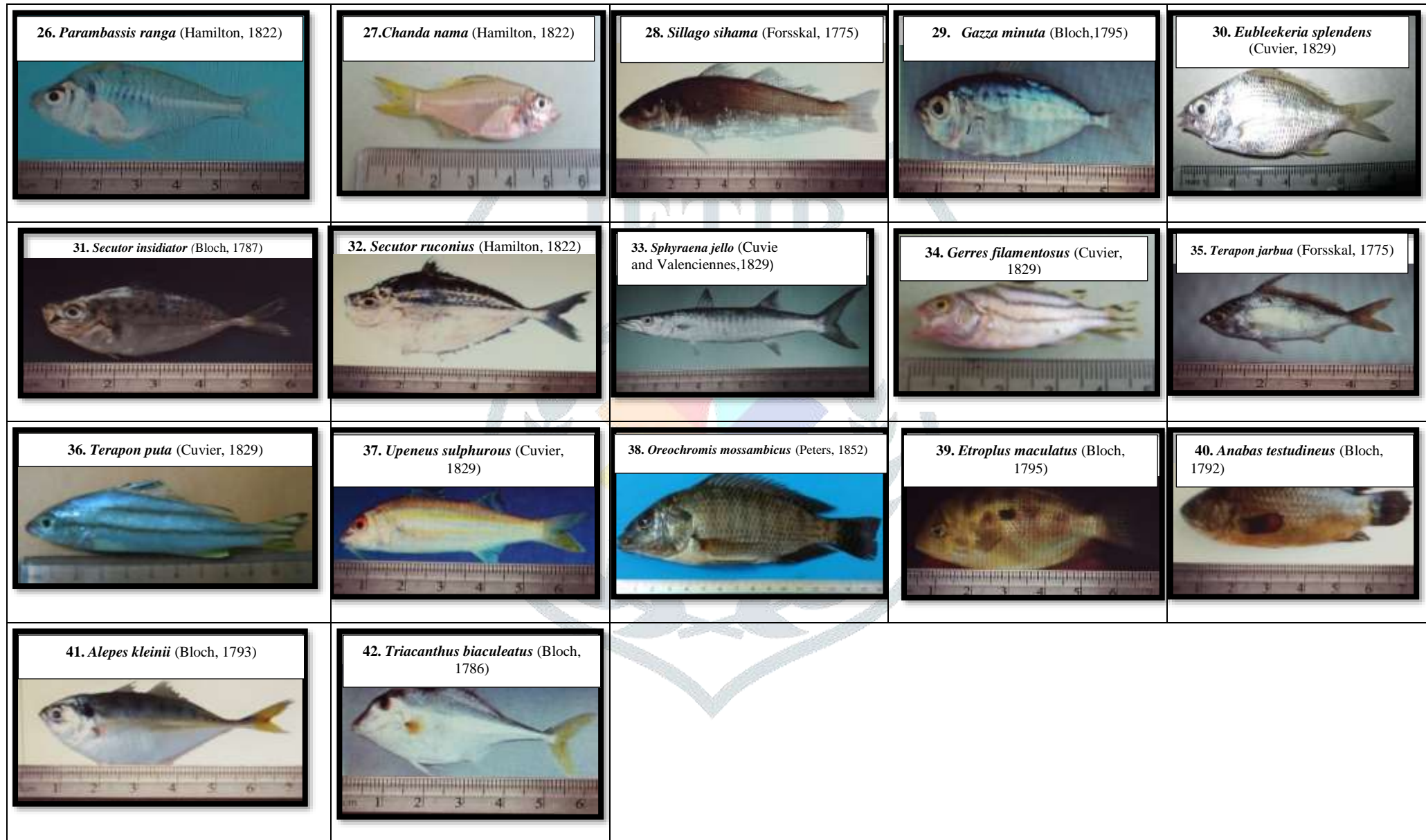


Plate: 4 Fish Species of Adayar Estuary



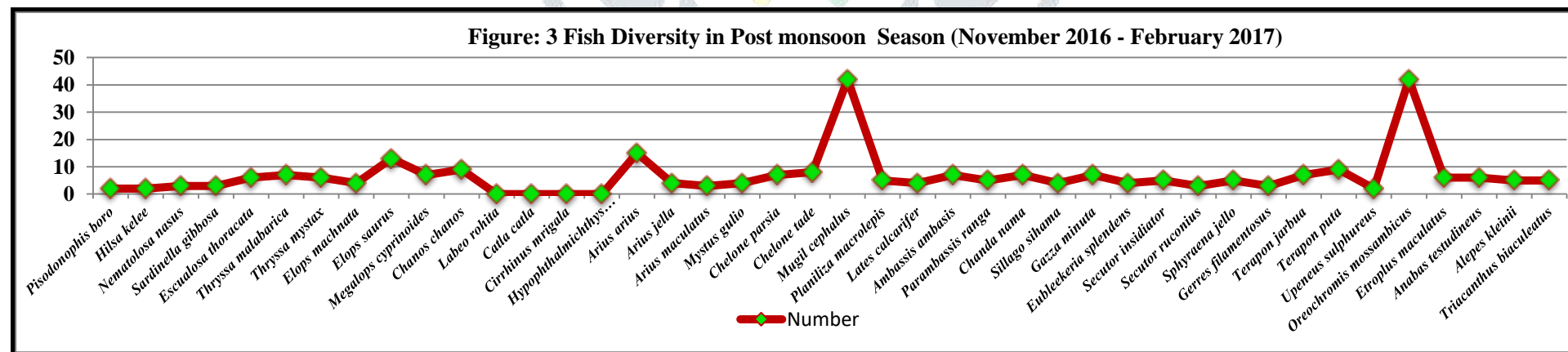
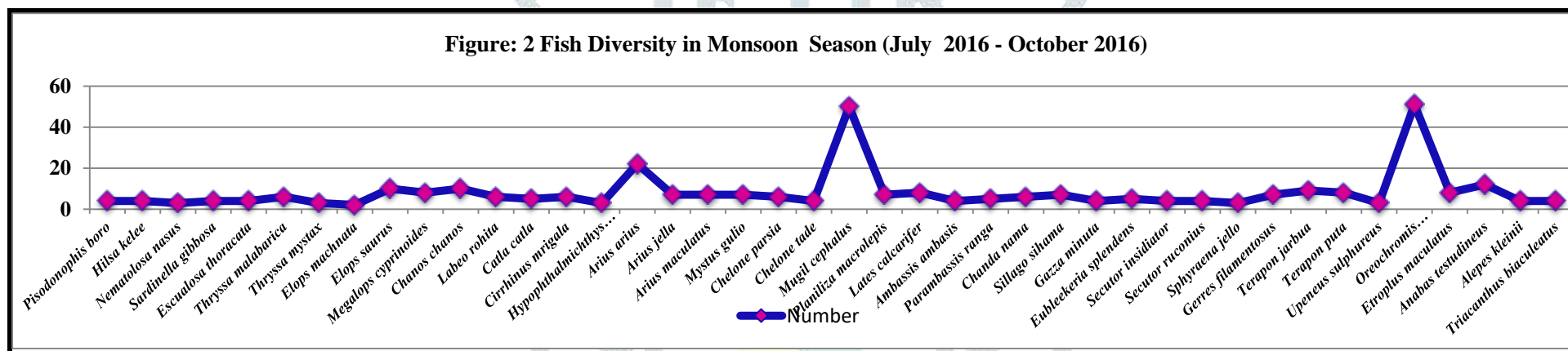
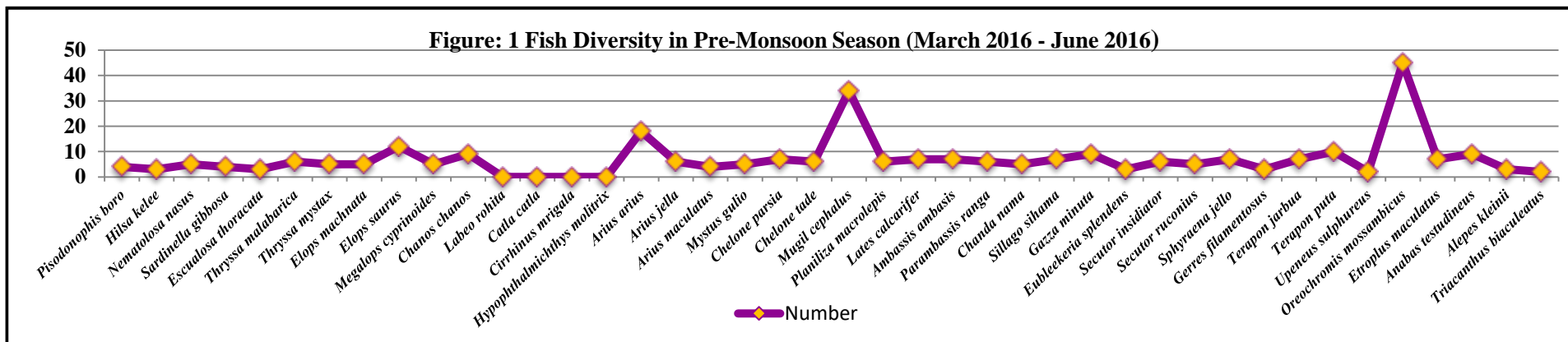


Figure: 4 Percent contribution of orders towards ichthyofaunal diversity of Adayar Estuary (March 2016 – February 2017)

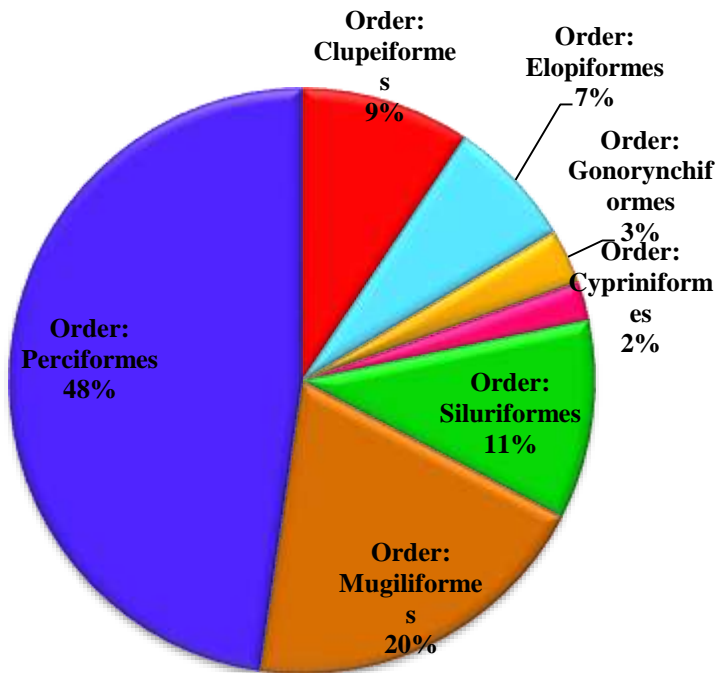


Figure: 5 Composition of fish species at family level in Adayar Estuary (March 2016 – February 2017)

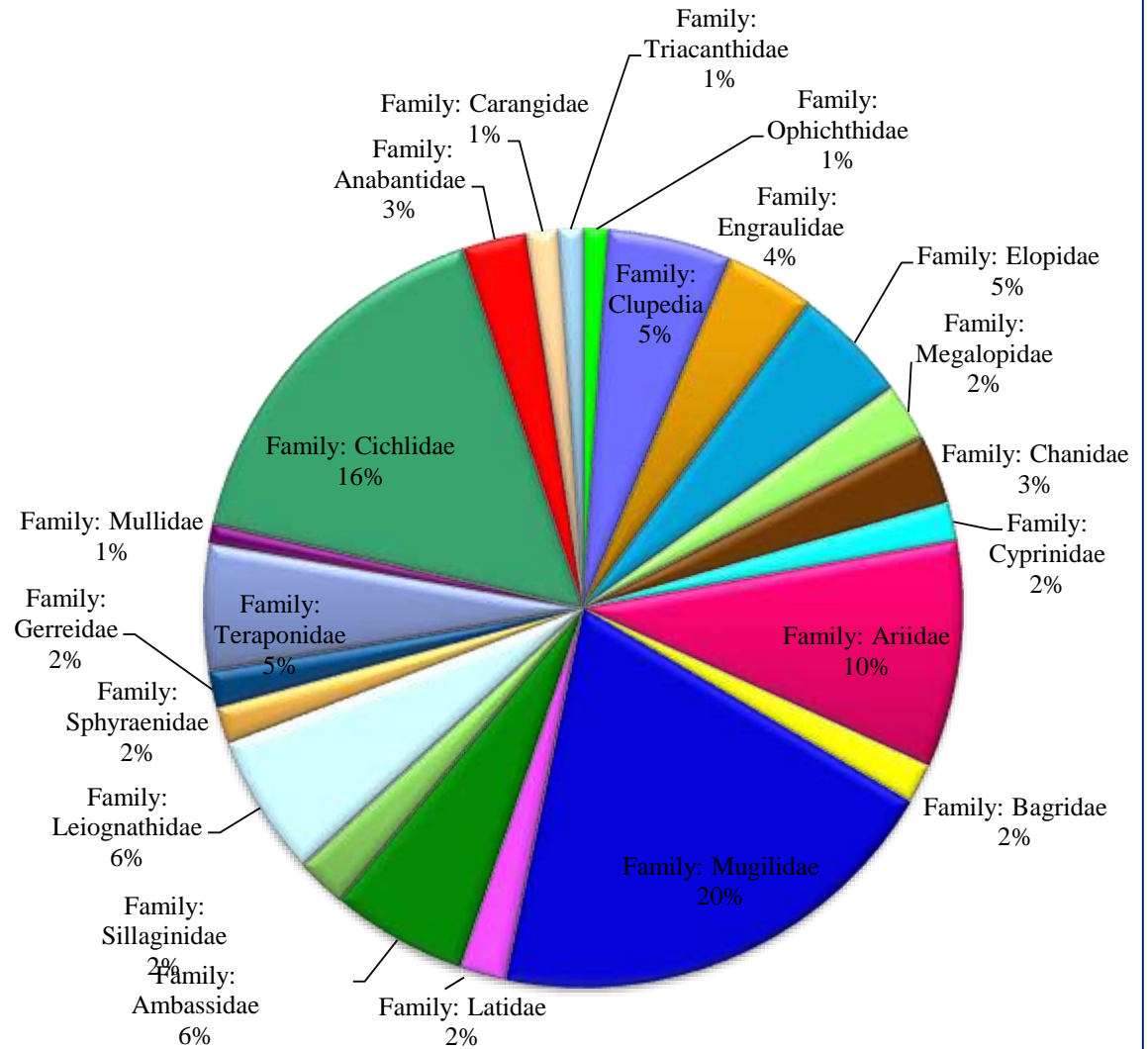
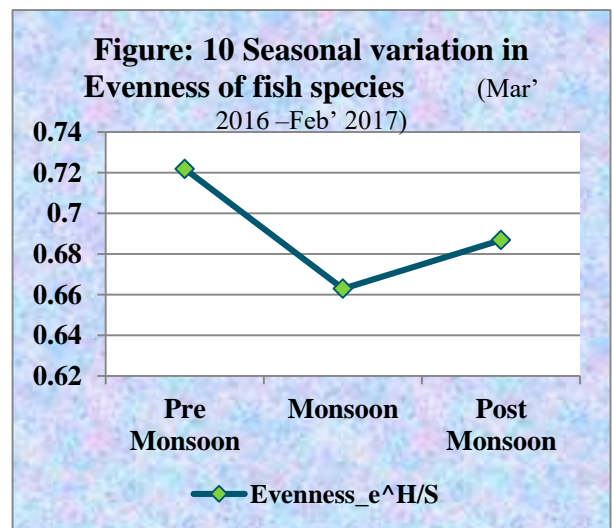
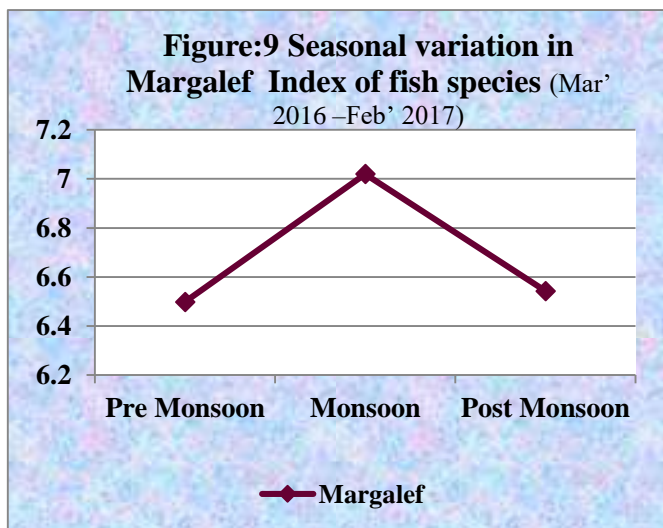
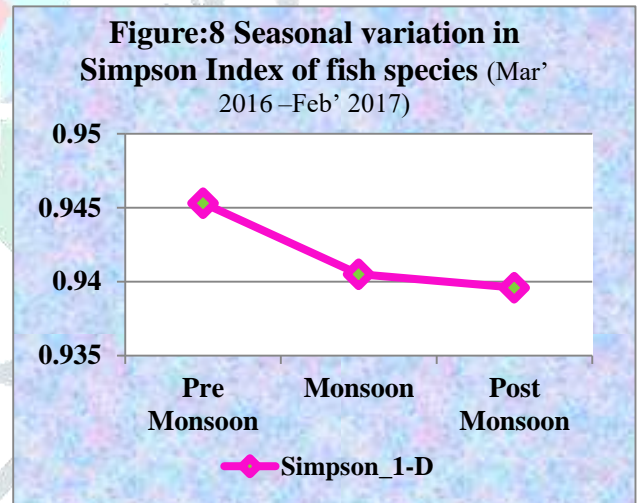
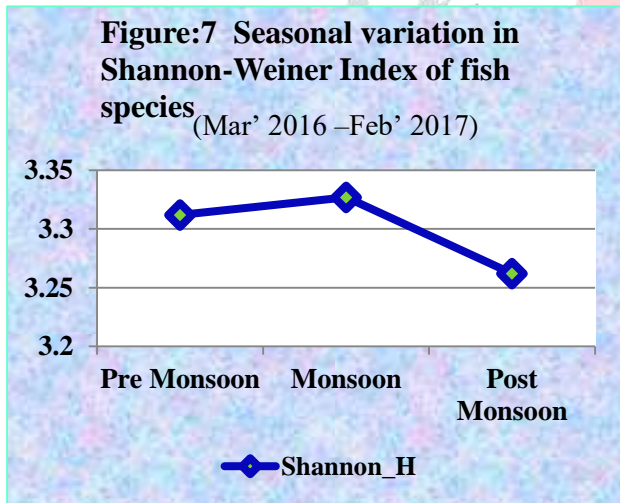
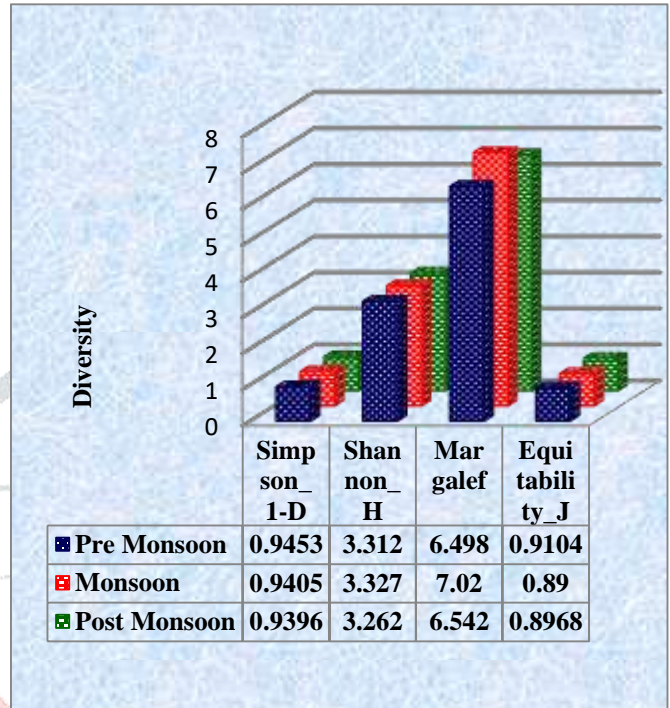


Table: 3 Fish Species Diversity Indices of Adayar Estuary (March 2016 – February 2017)

Diversity	Pre Monsoon	Monsoon	Post Monsoon
Taxa_S	38	42	38
Individuals	297	344	286
Dominance_D	0.05472	0.05949	0.06037
Simpson_1-D	0.9453	0.9405	0.9396
Shannon_H	3.312	3.327	3.262
Evenness_e^H/S	0.7219	0.663	0.6869
Brillouin	3.09	3.114	3.036
Menhinick	2.205	2.264	2.247
Margalef	6.498	7.02	6.542
Equitability_J	0.9104	0.89	0.8968
Fisher_alpha	11.57	12.55	11.76
Berger-Parker	0.1515	0.1483	0.1469
Chao-1	38	42	38

Figure: 6 Fish Species Diversity Indices of Adayar Estuary (March 2016 – February 2017)



Conclusion:

In conclusion, Adayar estuary provides a habitat, feeding and nursery space to 42 species of fish and hence can be considered rich in fish diversity. Fish diversity is considered as plentiful aquatic resources for supporting food and income source. Though number of species were more, the abundance is decreasing gradually. The reason for the depletion of the fish species are pollution and indiscriminate exploitation of the habitat and fish. The pollution of the Adayar estuary is definitely a matter of concern. Therefore there is a pressing need to give special attention to the conservation of fish (diversity) in Adayar estuary.

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