PROJECT REPORT

2015-2016

FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

AJMI.A	**25013142001**
ARUNA NUJOOM	**25013142017**
FATHIMA.N	**25013142007**
MARIYAM.M	**25013142022**
NOUFIYA.S	**25013142011**
RESNA.N	**25013142029**
SELFI NAJUDEEN	**25013142012**
SHABINA.S	**25013142013**

FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : FATHIMA.N

Reg.No : 25013142007

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Fathima.N , Reg.No: 25013142007 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA .M V

Supervising teacher

Certified Bonafide:

Dr. Sirajudheen.T.K

Head of the department

EXAMINERS:

1.

2.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Miss. Rohini Krishna. M.V, Assistant Professor , Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science (CBCSS) in Zoology

March 2016 **FATHIMA.N**

ACKNOWLEDGEMENT

I express my sincere gratitude to Miss. Rohini Krishna.M.V , Assistant Professor, Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen. T.K, Assistant professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

I am also grateful to Dr.MK Anil, Principal Scientist and Scientist In Charge, Vizhinjam research centre of CMFRI for the help rendered in doing the work.

I am also grafeful to Miss Neethu Raj.P, Research Scholar, Vizhinjam research centre of CMFRI for the help rendered in doing the work.

I extend my sincere thanks to all the teachers of Dept. of Zoology for their advice and encouragement.

FATHIMA.N

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FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : MARIYAM.M

Reg.No : 25013142022

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Mariyam.M , Reg.No: 25013142022 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr. Sirajudeen

Head of the department

EXAMINERS:

1.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Smt. Rohini Krishna.M.V , Assiatant Professor , Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science (CBCSS) in Zoology

March 2016 **MARIYAM.M**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt. Rohini Krishna.M.V, Assistant Professor, Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen, Associate professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

I extend my sincere thanks to all the teachers of Dept.of Zoology for their advice and encouragement

MARIYAM.M

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FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : SHABINA.S

Reg.No : 25013142013

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Shabina.s , Reg.No: 25013142013 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr.Sirajudeen

Head of the department

EXAMINERS:

1.

2.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Smt. Rohini Krishna.M.V , Assistant Professor , Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science(CBCSS) in Zoology

March 2016 **SHABINA.S**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt. Rohini Krishna.M.V , Assistant Professor Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen, Assistant professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

I extend my sincere thanks to all the teachers of Dept.of Zoology for their advice and encouragement

SHABINA.S

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Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : SELFI NAJUDEEN

Reg.No : 25013142012

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Selfi Najudeen , Reg.No: 25013142012 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr.Sirajudeen

Head of the department

EXAMINERS:

1.

2.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Smt. Rohini Krishna. M.V, Assistant Professor, Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science (CBCSS) in Zoology

March 2016 **SELFI NAJUDEEN**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt.Rohini Krishna ,Assistant Professor Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen, Assistant professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

I extend my sincere thanks to all the teachers of Dept.of Zoology for their advice and encouragement

SELFI NAJUDEEN

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Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : NOUFIYA.S

Reg.No : 25013142011

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Fathima.N , Reg.No: 25013142007 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr.Sirajudeen

Head of the department

EXAMINERS:

1.

2.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Smt. Rohini Krishna.M.V,Assistant Professor , Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science(CBCSS) in Zoology

March 2016 **NOUFIYA.S**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt.Rohini Krishna ,Associate Professor Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen, Assistant professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

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NOUFIYA.S

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FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : RESNA.N

Reg.No : 25013142029

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by , Resna.s Reg.No: 25013142029 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr.Sirajudeen

Head of the department

EXAMINERS:

1.

2.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Smt. Rohini Krishna.M.V, Assistant Professor , Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science(CBCSS) in Zoology

March 2016 **RESNA.S**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt.Rohini Krishna.M.V, Assistant Professor Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen, Assistant professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

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RESNA.S

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FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : ARUNA NUJOOM

Reg.No : 25013142017

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Aruna Nujoom , Reg.No: 25013142017 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr.Sirajudeen

Head of the department

EXAMINERS:

1.

DECLARATION

I hereby declare that this project entitled “Fish biodiversity in Vellimon sector of Ashtamudi Lake” has been done by me during the Year 2015-2016 under the supervision of Smt.Rohini Krishna.M.V , Assistant Professor , Dept. Of Zoology, T.K.M College of Arts and Science, Kollam in partial fulfillment of the requirements for the Bachelor of science (CBCSS) in Zoology

March 2016 **ARUNA NUJOOM**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt.Rohini Krishna, Assistant Professor Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

I am grateful to Dr.Sirajudeen, Assistant professor and Head of the Department of Zoology for the necessary facilities provided to carry out the work successfully.

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ARUNA NUJOOM

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Project Report Submitted to the University of Kerala in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science (CBCSS) in Zoology

Name : AJMI.A

Reg.No : 25013142001

Years of study : 2013-2016

Department of Zoology

T.K.M. College of Arts & Science

Kollam -5

2015-2016

CERTIFICATE

This is to certify that this project work entitled, " Fish biodiversity in Vellimon sector of Ashtamudi Lake" is an authentic record of the work carried out by Ajmi.A , Reg. No: 25013142001 of Zoology department under my supervision and guidance and this project has not been submitted earlier for any other degree or diploma or similar title of any other University.

ROHINI KRISHNA.M.V

Supervising teacher

Certified Bonafide:

Dr. Sirajudeen

Head of the department

EXAMINERS:

1.

2.

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March 2016 **AJMI.A**

ACKNOWLEDGEMENT

I express my sincere gratitude to Smt.Rohini Krishna.M.V , Assistant Professor Department of Zoology , T.K.M. college of Arts and Science for the valuable guidance and encouragement given throughout the period of work.

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AJMI.A

CONTENTS

FISH BIODIVERSITY IN VELLIMON SECTOR OF ASHTAMUDI LAKE

Introduction

The coastal region of Kerala is unique due to the fact that it contains an extensive network of estuaries and backwater lakes lying parallel to the Arabian Sea. These water bodies popularly known as 'Kayals' which exist in different sizes and shapes have their bed level at about 1.5 to 1.8 m below mean sea level. Kerala has 44 rivers of which 41 are west flowing and 3 are east flowing. The waters of a majority of the rivers in Kerala drain into the Kayals before they empty into the sea through a large number of perennial and seasonal openings and the Ashtamudi Lake is one of the most important estuarine/backwater systems in Kerala.

Ashtamudi Lake (*Ashtamudi Kayal*) is situated in the Kollam District of Kerala. It is located at 8^{o} 53'- 9^{0} 2' N; 76^{0}31'- 76^{0} 41' E and it is the second largest estuary in Kerala and consists of 8 palm shaped lakes covering an area of over 32 sq km. The wetland ecosystem of Ashtamudy is unique and it was also declared as a Ramsar site in 19 August 2002. It is an international treaty for the conservation and sustainable utilization of wetlands, the Convention was signed in 1971 in the city of Ramsar in Iran. The lake has many major tributaries of which Kallada River is the major one. The Kallada river originates near Ponmudi in Western Ghats and it is formed by the confluence of three rivers viz., Kulathupuzha, Chenthurnipuzha, and Kalthuruthipuzha. The Kallada river empties itself into the Ashtamudi Lake at Neendakara as it enters the Arabian sea and forms Kerala's deepest estuary. Ashtamudi Lake has many branches like Thevally, Kandachira, Kureepuzha Thekkumbhagam, Kallada, Perumon, Kumbalathu, Kanjirottu, Vellimon, Chavara. Munroe Island (Munroethuruth), Chavara South and Thekkumbhagom Island are the major islands situated on Ashtamudi Lake.

The biodiversity of Ashtamudi Lake is unique as it has both marine and estuarine organisms. At and near the mouth of the river, where it meets the sea, a special and

distinctive environment prevails. This ecotone, or “buffer zone”, between freshwater of the stream and salt water of the sea is called an estuary.

Estuaries may be classified according to their geomorphology in coastal plain, fjord, bar built and tectonic (Pritchard, 1952). Coastal plain estuaries, also called drowned river valleys, are those that were formed as a result of the Pleistocene increase in sea level, starting ~15,000 years ago. Originally rivers, these estuaries formed during flooding over several millennia by rising sea levels. Their shape resembles that of present-day rivers, although much wider. They are typically wide (order of several kilometers) and shallow (order 10 m) with large width/depth aspect ratios. Fjords are associated with high latitudes where glacial activity is intense. They are characterized by an elongated, deep channel with a sill. The sill is related to a moraine of either a currently active glacier or an extinct glacier. Riverine fjords are related to extinct glaciers and their main source of buoyancy comes from river inputs. They are usually found equator ward of glacial fjords. Glacial fjords are found in high latitudes, poleward of riverine fjords. They are related to active glaciers and their main source of buoyancy is derived from melting of the glacier and of snow and ice in mountains nearby. Fjords are deep (several hundred meters) and narrow (several hundreds of meters) and have low width/depth aspect ratios with steep side walls. Fjords are found in Greenland, Alaska, British Columbia, Norway, New Zealand, Antarctica and Chile. Bar-built estuaries, originally embayments, became semi-enclosed because of littoral drift causing the formation of a sand bar or spit between the coast and the ocean. Some of these bars are joined to one of the headlands of a former embayment and display one small inlet (few hundreds of meters) where the estuary communicates with the ocean. Some other sand bars may be detached from the coast and represent islands that result in two or more inlets that allow communication between the estuary and the ocean. In some additional cases, sand bars were formed by rising sea level. Tectonic estuaries were formed by earthquakes or by Earth’s crust fractures and creases that generated

faults in regions adjacent to the ocean. Faults cause part of the crust to sink, forming then a hollow basin. An estuary is formed when the basin is filled in by the ocean.

Ashtamudi Lake harbours great diversity of both vertebrate and invertebrate faunal elements. The previous studies conducted revealed great diversity of fin fishes and also a few species of crabs, clams, prawns and mussels. The lake also supports diversity of avian fauna like Tailor bird, Indian white- breasted kingfisher, Common sandpiper, Cattle egret.

The brackish waters are areas of confluences of fresh water and sea water and the salinity ranges from 5 to 27 ppt. They contain unique brackish water species and also some marine species who invade brackish areas depending upon the salinity. One of the most commonly occurring and commercially important brackish water fish in Kerala is *Etroplus suratensis* also known as pearl spot (Karimeen in Malayalam). In 2010 it was also announced as the official state fish of Kerala. Ashtamudi Lake possess a dense population of this species. *Etroplus* is included in the least concerned category of the IUCN red list of marine species. Another abundant species found in Ashtamudi Lake is *Paphia malabarica,* also known as short necked clam which is an edible bivalve and is commercially very important as it contributes to 90% of India's clam meat export. The short-neck clam fishery of Ashtamudi Lake was awarded the Marine Stewardship Council (MSC) certification during 2014.The Marine Stewardship Council is an independent non-profit organisation that sets standards for sustainable fishing around the world. The Central Marine Fisheries Research Institute (CMFRI), Kochi, the Kerala State Fisheries Department and the World Wildlife Fund, had joined hands with the local fishing community to achieve the certification. It was for the first time that a fishery in India has been awarded the certification.

Fish have been adapting to changes in their living environments throughout evolutionary history. Those that are unable to adapt, eventually die out (Vostradovsky, 1973). Over the years, humans have contributed to the extinction of many species. On

a smaller scale, we have continually tested the adaptability of species by disturbing their living environments (Gulland, 1977). So the documentation of the fish fauna of important backwater systems like Ashtamudi Lake is very important.

Fish is one of the most important sources of protein in human diet. It contains lysine and sulphur containing amino acids. Most fishes contain 15-25% protein and 1-5% fat. Fish is a good source of vitamins A, D and B. Fish proteins are characterised by high digestibility, biological value and growth promoting value.

The present project focuses on the fish biodiversity of Vellimon sector of Ashtamudi Lake. Most of the studies carried in Ashtamudi Lake are restricted to the mouth of the estuary and adjoining areas. The diversity or other parameters of interior areas like Vellimon sector of Ashtamudi Lake has not been studied before. So the present study will help to reveal the unexplored fish diversity of Ashtamudy Lake. The region is unique in possessing high population density of a species of black clam *Villorita cyprinoides* it is endemic to India and it is sparsely seen in high salinity conditions. It is locally known as Kakka. Many people harvest it for their lively hood and the clam meat serves as a basic source of protein and its shell as a source of lime.

Vellimon is a village area and the area surrounding the lake is not thickly populated and no industries are located around the lake so the pollution is very much less compared to the other parts of the lake such as Chavara and Thevally. The Chavara sector is highly polluted due the presence of high concentration of minerals such as titanium in the soil and the factories such as KMML operating there discharge their effluents into the lake. Thevally sector of the lake is polluted due to various anthropogenic activities due to the presence of high population density around the lake and also due to the presence of various tourist activities such as resorts and house-boating in the lake.

Many studies focussing on the hydrobiological parameters and fish diversity of various estuarine systems in India have been carried out. Hydrobiological observations of the Hoogly- Matalah estuary have been made by Dutta *et al.* (1954), Bose (1954), Shetty *et al*.(1961) and Basu and Ghosh(1970). The ichtho-fauna of the estuary has been reported upon by Hora and Nair (1940) and David (1954). A brief hydrobiological survey of parts of the Mahanadi estuary was conducted by INS *Investigator* during 1952 and the fish disposal status of the estuary was studied by (Shetty *et al*.,1965). A stretch of Godavari estuary covering an area of about 45 sqkm were studied by scientists of Andhra University,Waltair.(Anon.,1965). Hydrobiological and fisheries observations on the relatively less known Vellar estuaries discharging into the Bay of Bengal were made by Chacko *et al*. (1954).The hydrobiology,flora ,fauna and fisheries of the Adayar estuary were studied by Panikkar and Aiyar (1937) and Jones (1937). The fish diversity of the Adyar estuary was described by Evangeline (1967). Hyrobiological observations relevant to fisheries of Zuari and Mandovi estuaries discharging into the Arabian Sea were made by Dehadrai(1970).

Bottom salinity characters of the entire Cochin backwaters were studied by Josanto(1975).The fish diversity of the Vembanad Lake were documented by Shetty, 1965; Kurup, 1982; Kurup and Samuel, 1983, 1985, Kurup *et al*. 1989. Fishery diversity of Ashtamudi Lake was studied by Nair *et al*. (1983), Kurup and Thomas (2001), Binushma Raju (2011), Saumya (2012) and Vimal Raj *et al*., (2014). The total faunal diversity of Ashtamudy Lake was studied by Raghunathan (2007).

Materials and Methods

The study area selected was the Vellimon sector of the Ashtamudi Lake (Figures 1,2,3 and 4). The fishes were caught with the help of nets, mainly two types of nets were employed for the collection. They are cast net and gill net. The method of operation are described below.

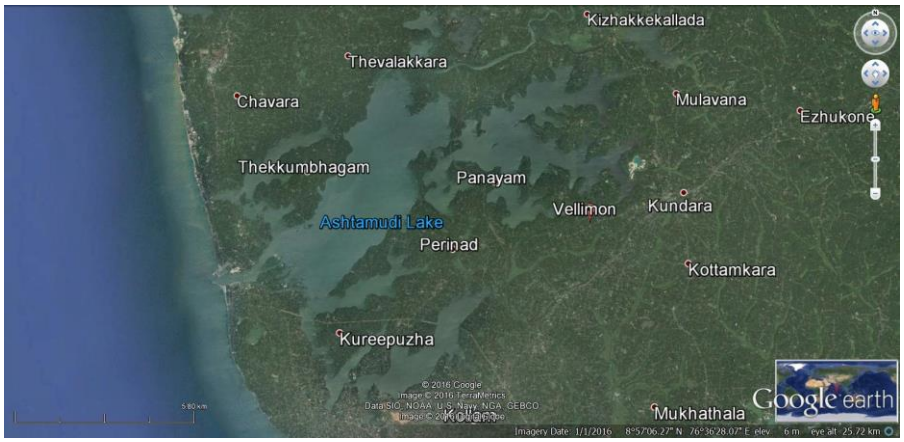


Fig.1. Map showing the position of Ashtamudi Lake

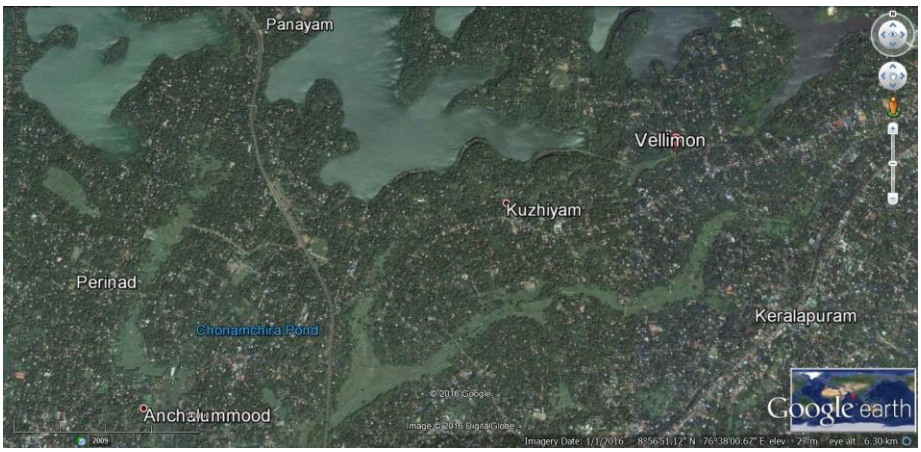


Fig.2. Map showing Vellimon village

Fig .3. Vellimon part of Ashtamudi Lake from where the fishes were collected.

Fig .4. Vellimon part of Ashtamudi Lake from where the fishes were collected.

Cast net- This is the simplest type of net which can be operated by a single man throwing it over the water surface. It is a long circular umbrella like net (Fig. 5,9) with lead sinkers attached along the periphery which helps in throwing open the net covering a large circular area and helps in sinking the net over the fishes faster than the fishes swimming away from the area to escape. Cast nets are operated from the shore or from a boat. At the time of fishing the net is swung over the head and dropped to the distance reachable by attached rope. After sometime it was slowly dragged out of water with the rope. The fishes which entered the net were caught and collected.

Fig.5. Operation of the cast nest

Gill net- Gill nets are wall-like with a mesh opening of varying sizes ranging from 20 to 50 mm. It has head rope with floats and foot rope with sinkers which will help to keep the net stretched like a wall in the water column. Fishes get trapped in the net depending upon the size of mesh employed. Gill nets (Fig. 6) are prepared from synthetic fibres and are translucent due to which it is not possible for the fishes to see the nets. These nets are operated mostly during night time and catches are more during the dark phase of the moon during which net will not be visible to fishes. As the fishes

try to swim through a net wall they get entangled by the operculum or the whole body get entangled and they are caught.

Fig .6.Gill net catch

The fishes were collected with the help of local fishermen and the collection was carried out during the morning from 6.00 to 10.30 AM. The fishermen operate the gill net at night and collect the entangled fishes in the early morning hours from 6.0 - 6.30 AM. The collections were carried out during a time period of December to February (Fig 8). Monthly visits were conducted to the site during the time span of 3 months. The specimens collected were preserved in 10% formalin for systematic studies. The body colouration was noted in fresh condition and photographed in digital camera. For identification of fishes the important taxonomic treatise of Day (1967), Jayaram (1999), Talwar and Jhingran (1991) were consulted in addition to FAO sheet and Fishbase.

For identifying the fishes various morphometric and meristic characters such as – dorsal rays, anal rays; pectoral rays, lateral-line scales; gill rakers and body depth were measured according to Allen and Erdmann (2009)

Various physicochemical parameters such as temperature (Air and water), depth, salinity, pH, dissolved oxygen were checked during the sampling days using standard techniques. Salinity was measured using Master Refractometer (ATAGO), pH (Compact pH meter), dissolved oxygen (Winkler,1888).

Fig. 8. Students at the study site

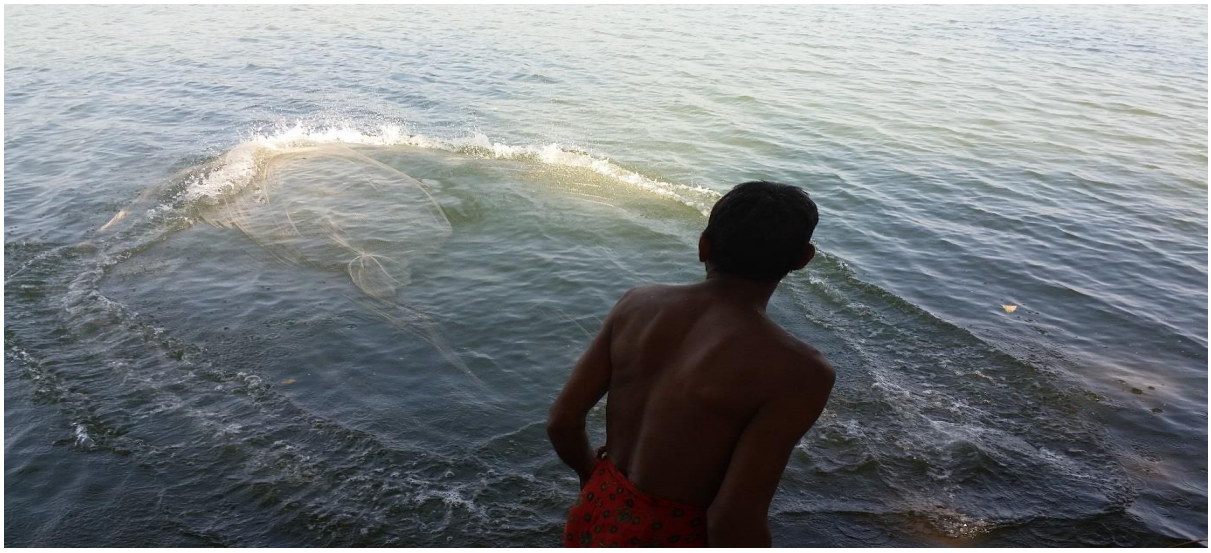


Fig 9. A Fisherman operating a cast net

Results

I. Physicochemical parameters.

During the study period physicochemical parameters such as temperature (Air and water), depth, salinity, pH, and dissolved oxygen were measured and presented in Table1.

Table 1

Parameters/month	**December**	**January**	**February**
Depth (cm)	90	75	95
Air temperature ^{0}C	28.5	30	31
Water temperature ^{0}C	27	28.5	29.1
Salinity (ppt.)	20.5	26	27
Ph	7.4	7.7	7.7
Dissolved oxygen (mg/lit)	4.2	4.5	4.0

During the period under report the air temperature varied between 28.5 to 31 ^{0}C whereas the water temperature varied between 27 to 29.1 ^{0}C. Value of pH did not change significantly during the study period and showed an average value of 7.6. Salinity showed an increase from 20.5 ppt. in December to 27 ppt. in February and the dissolved oxygen values were between 4.0 to 4.5 mg/lit.

II. Identification of fishes

Twenty species of fishes belonging to 16 Families were recorded during the study period. Identity of the species, salient morphological and biological characters and economic importance of each species is described below.

1. **Scientific name : *Etroplus suratensis* (Bloch, 1785)**
   Common name: Pearl spot

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Cichlidae

It is a popular and delicious table fish popularly called *karimeen* in Malayalam. Though their natural habitat is the brackish waters; they enter rivers and canals adjoining backwaters. It is called pearl spot due to the presence white spots which resemble pearls. The body is laterally compressed. The dorsal fin has numerous spines and the anal fin has only 3 or 4 spines. The colour is greenish or deep purple with eight vertical bands across the body. It can attain a maximum length of about 30 cm and a weight of 1.4 kg. It is ominivorous; feeding on aquatic vegetation, planktonic organisms, worms, shrimps and small insect larvae. Etroplus breeds throughout the year with two peak periods during December – February and another during May- June months. Adults engage in altruistic multiple parental care where several adults care for a single brood that presumably were spawned by only two of the adults. One kg of grown fish can cost about Rs.300-350/-. This fish is very valuable and has very high demand, hence it is being cultured ponds, pens and cages.

2. **Scientific name: *Pseudoetroplus maculatus* (Bloch, 1785)**
   Common name: Orange chromid

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Cichlidae

It is known as “pallathi” in Malayalam. Body disc shaped, deep and strongly compressed. Eyes are large. The fishes are in general peaceful. The fishes are highly sensitive to sudden changes in the water chemistry. The fish will deposit 200 to 300 eggs on any suitable surface. It can withstand pH between 6.0 to 7.5. Females are smaller and less colourful, they lack the red region in the fins. The species co-occurs throughout its range with *Etroplus suratensis*. Orange chromides prey on the eggs and larvae of *E. suratensis* and also act as a "cleaner fish" removing parasites from the larger green chromides in a cleaning symbiosis. The species also feeds on zooplankton and algae. *Pseudoetroplus maculatus* juveniles feed on mucous coating of their parents; this is essential for the small fry survival. This small species attains a length of 8 cm and is used as a food fish though of low value.

3. **Scientific name: *Siganus javus*** (Linnaeus,1766)

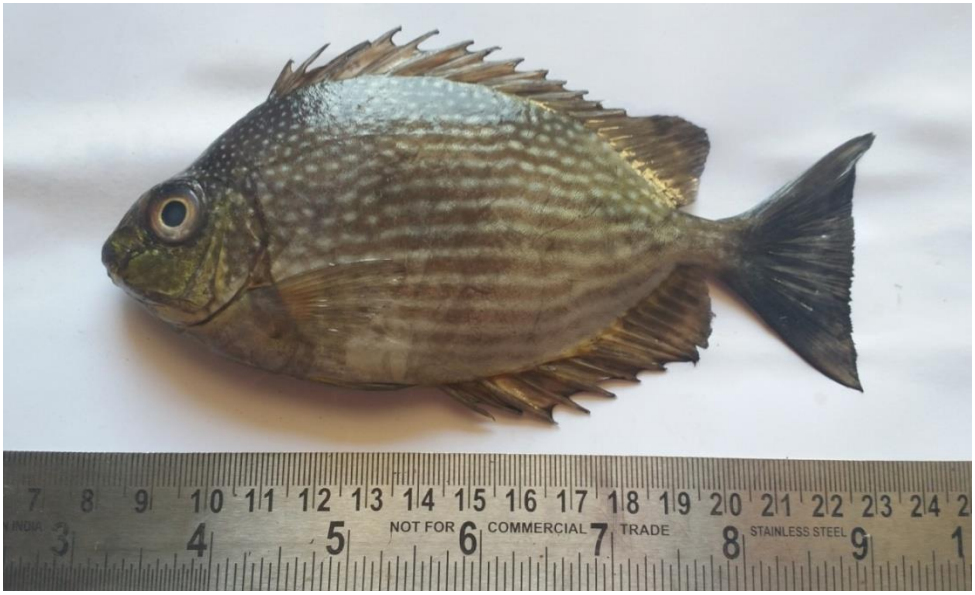
Common name: Streaked spine foot.

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Siganidae



They occur in small schools of up to 10 individuals or so, in shallow coastal waters, brackish lagoons and rocky or coral reefs. Feeds on algae attached to the substrate and on floating algal fragments. Found resting in midwater at depths of 2 to 6 m when not feeding. They can grow upto a size of about 40cm, but the most common size range is between 10-20cm. It has many small white spots on the upper side of the body and fine longitudinal lines on the lower part of the body. The head and fins are often yellow and the tail fin is dark. The rabbit fish has spines on its fins that are grooved and contain venom glands. These spines may be found on the dorsal, anal and pelvic fins. The sting of these spines can be quite painful to humans, but is generally not fatal. The fishes use their spines in self-defence and not for hunting prey. The fish is marketed fresh in some places as food.

4. **Scientific name: *Gerres abbrevatius* (**Bleeker, 1850)
   Common name: Short Silverbelly.

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Gerreidae

They inhabit marine or brackish habitat. Depth 1.9 to 2.3 times in standard length. Base of first dorsal-fin spine, ascending at an angle of about 45° to the horizontal. Dorsal- and anal-finspines strong, particularly second anal-fin spine; second dorsal-fin spine longer than head minus snout, fewer than 38 lateral-line scales to base of caudal fin. Body silvery, indistinct, fine, dark stripes following scale rows in older fish, caudal fin dusky, anal and pelvic fins yellowish. They may reach a maximum total length about 30 cm, commonly to 20 cm.They live in small schools on sandy bottoms, juveniles in the littoral zone, larger fish down to 40 m. Small juveniles feed on zooplankton, larger fish on small polychaetes, bivalves, crustaceans, and fishes. One of the more common gerreids in markets. Caught in set-traps, seines and gill nets. Usually marketed fresh, but the flesh deteriorates rapidly.

5. **Scientific name: *Scathophagus argus*** (Linnaeus, 1766)
Common name: Spotted scat

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Scathophagidae

Found in marine, brackish estuaries and lower reaches of fresh water streams, mangroves, tiny juveniles are seen floating on the surface, It is a schooling species. Individuals typically grow to a length of 20–30 cm.

Greenish brown in colour. Juveniles with a few large roundish blotches, about size of eye, or with about 5 or 6 broad, dark, vertical bars. In large adults, spots may be faint and restricted to dorsal part of flanks. Body quadrangular, strongly compressed. Eye moderately large, its diameter somewhat smaller than snout length. Snout rounded. Mouth small, horizontal, not protractile. Teeth villiform, in several rows on jaws.

Feeds on worms, crustaceans, insects and plant matter. The dorsal, anal and pelvic spines are believed to be venomous and capable of inflicting wounds. They are of limited commercial value but are sometimes used both as an aquarium fish and is also for consumption. It is used in Chinese medicine and marketed in both fresh and dried form.

6. Scientific name: ***Caranx ignobilis*** (Forsskal, 1775)
Common name -Giant trevally

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Carangidae

They occur in marine and brackish water. They are pelagic in nature and silvery in colour. The head has a steep sloping profile. The fins are usually grey to black. There is no dark spot around the gill covers. It has an ovate, moderately compressed body with the dorsal profile more convex than the ventral profile, particularly anteriorly. The dorsal fin is in two parts. The caudal fin is strongly forked, and the pectoral fins are falcate, being longer than the length of the head. The lateral line has a pronounced and moderately long anterior arch, with the curved section intersecting the straight section below the lobe of the second dorsal fin. The curved section of the lateral line contains 58-64 scales, while the straight section contains none to four scales and 26 to 38 very strong scutes. The chest is devoid of scales with the exception of a small patch of scales in front of the pelvic fins. The eye has a horizontal streak in which ganglion and photoreceptor cell densities are markedly greater than the rest of the eye. Juveniles are found in estuaries. Sold mostly fresh and dried salted.

7. Scientific name: *Ephinephlus malabaricus* (Bloch & Schneider, 1801)

Common name- Malabar grouper

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Serranidae

The Malabar grouper is one of the largest and most common cods found in tropical estuaries and on coastal reefs. They are marine; brackish and solitary in habitat. Characterized by light grey to yellowish brown colour; five slightly oblique dark brown bars that bifurcate ventrally; numerous small black spots and blotches in head and body which increase in number with age. Five irregular dark brown bars are often visible on the body this brown bars will be distinct in young fishes but are indistinct in large adults. Ctenoid scales on body except cycloid anterodorsally on body, thorax and abdomen; body with auxiliary scale, rounded caudal fin; pelvic fins, 2-5 rows of teeth on midlateral part of lower jaw. Their tail fins are rounded and five irregular dark brown bars are often visible on the body. Juveniles found near shore and in estuaries; sex reversal probable, protogynous. Feed primarily on fishes and crustaceans, and occasionally on cephalopods. It is Common in markets. It is widely used as an item of food and an important maricultured finfish.

8. **Scientific name:** ***Nematalosa nasus*** (Bloch, 1795)

Common name: Bloch's gizzard shad

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Clupidae

It occurs in marine, freshwater and brackish water. The body is dark bluish dorsally and silvery below. The sardines are known to swim at a maximum depth of 30 metres. The largest known standard length for the species is 22 cm. The fish can be separated from its sister species by the presence of a dark spot behind gill opening. Belly consists with 17 to 20and 9 to 13 scutes. It has 15 to 19 dorsal soft rays and 17 to 26 anal dorsal soft rays. Anterior arm of pre-operculum with the third infra-orbital bone immediately above it, no fleshy gap between; lower jaw strongly flared outward. Pectoral axillary scale present; hind edge of scales distinctly toothed. It is a filter feeder and feeds on planktons. Widely used as a food fish, it can make in to fish balls and can eat both as fresh and dried forms. It can be marketed fresh, dried-salted or boiled and also can be made into fish balls. This fish is very bony in nature.

9. Scientific name: *Alepes djedaba* (Forsskal, 1775)

Common name: Shrimp scad

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Carangidae

It occurs in marine and brackish water. The snout is pointed and the eye diameter is nearly equal to the snout length, with an adipose eyelid well developed on the posterior half of eye. The anterior section of the lateral line is strongly curved, containing thirty one to thirty six scales, while the straight section consists of seventy seven to eighty five scutes. The colour of the body is an overall silver colour. There is a diffuse dusky blotch on margin of operculum which is bordered by a smaller white spot. The spinous dorsal fin, including the last dorsal fin spine is blackish or dusky, the soft dorsal fin is blackish or dusky above the scaly sheath and the margin of first to fourth upper soft rays is whitish. The middle portion of the anal fin below the scaly sheath is slightly blackish or dusk. The caudal fin is often a striking yellow, especially when fresh, with the upper caudal lobe often fading to a darker shade. Feed mainly on young fishes, crustaceans like decapods, ostracods, amphipods and cladocerans with minor amounts of nematodes, insect body parts and insect larvae

10 Scientific name: ***Stolephorus indicus***(van Hasselt, 1823)

Common name: Indian anchovy

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Engraulidae

Marine and brackish, pelagic-neritic, oceanodromous and commonly occurs at a depth range 20 - 50 m. Belly with 2 to 6 small needle-like pre-pelvic scutes. Maxilla tip pointed, reaching to or only just beyond front border of pre-operculum; hind border of pre-operculum convex, rounded. Isthmus muscle tapering evenly forward to hind border of branchial membrane. Body light transparent fleshy brown, with silver stripe down flank; no dark pigment lines on back between head and dorsal fin.

A schooling species occurring in coastal waters and which appears to enter at least the estuarine parts of rivers and tolerate brackish water. Feeds most likely on zooplankton .Used for human consumption and as a bait in the tuna fishery. Migrates out into deeper and more saline water to breed, returning inshore immediately thereafter. Used as bait in the tuna fishery although said to be fragile.

11. Scientific name: *Brachiurus orientalis* (Bloch & Schneider, 1801)
Common name: Oriental sole

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Solidae

Inhabits shallow sand and mud bottoms in coastal waters. Enters brackish waters. Reported to enter fresh waters.Body oval and flat, both contours equally arched, with ctenoid (rough) scales on both sides; head scales of blind side modified into cutaneous sensory processes. Eyes on right side, separated by a scaly space; mouth small, curved, cleft reaching to below middle of lower eye. Dorsal and anal fins joined to caudal fin; pectoral fins well developed, the left somewhat shorter than the right; pelvic fins moderately symmetrical, united basally. Colour grey or brown with cloudy indistinct patches on eyed side, tinged yellow on blind side; right pectoral fin dark.

Feeds mainly on bottom-dwelling invertebrates, especially small crustaceans. Marketed fresh, frozen and dried and salted.

12. Scientific name: *Glossogobius giuris* (Hamilton, 1822)

Common name: Tank goby

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Gobiidae

Found mainly in freshwater and estuaries, but also enter the sea. Also occur in canals, ditches and ponds. Found in clear to turbid streams with rock, gravel or sand bottoms. Head flattened, lower jaw projecting; body pale without longitudinal lines. Dorsal fins with small spots forming longitudinal stripes. Pelvic fins united but attached to the body only from their anterior part. The body is brownish yellow with 5 to 6 dark and rounded spots on its sides. Some specimens living on dark substrates can be very dark. Some living on very light substrates show an ivory coloration. Dorsal fins are light with brownish spots. Pelvic fins are grey. Pectorals and caudal are grey and often hyaline.

Feed on small insects, crustaceans and small fish. Grow to a much larger size in brackish water than in fresh water. Marketed fresh. Cannibalism is relatively common for this species.Potential threats include activities that may which damage or modify the river systems in which this species occurs. Utilization as a food fish may be a localised threat.

13. Scientific name: *Gerrus oyena* (Forsskål, 1775)

Common name: Blacktip silver biddy

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Gerreidae

It occurs in the marine and brackish waters of coastal waters of the Indian Ocean and the western Pacific Ocean. It inhabits estuaries, coastal waters and lagoons. This species can reach a length of 30 cm (12 in), though most do not exceed 20 cm (7.9 in). This species is important to local commercial fisheries.

Body laterally compressed, mouth terminal, strongly protractile, pointing downward when extended. Bands of minute, acute teeth in both jaws; no incisors, canines, or molars. Dorsal fin long, single. Caudal fin markedly to very deeply forked. Scales large, obvious but deciduous, cycloid or finely ctenoid, extending over sides of head. Brilliant silver in colouration.

Based on the seasonal reproductive cycle of the species, ovary development of the females occurs from March to September, while the testes development of the males occurs between March and August. For both sexes, the maximal development occurs during April and May.

14. Scientific name: *Leiognathus brevirostris* (Valenciennes, 1835)

Common name: Shortnose ponyfish

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Leiognathidae

Marine or brackish in habitat, amphidromous. Body silvery; live or fresh specimens with a golden gleam. Head naked; with nuchal spine. Protracted mouth pointing downward. Scales minute. 2nd dorsal spine less than 1/3 of body depth. Body rhomboid and compressed. Head naked; nuchal spine present; mouth pointing downward when protracted. Colour: body silvery, back greenish; a yellow band along lateral line; upper half of spinous part of dorsal fin black; tip of lower caudal fin lobe yellow; pectoral axil black (covered by fin).

Lives in shallow waters down to depths of about 40 m, predominantly near the bottom, found in schools. Feeds mainly on diatoms, copepods, *Lucifer*, nematodes and polychaetes.

15. Scientific name : ***Strongylura strongylura*** (Van Hasselt, 1823)

Common name : Spot tail needlefish

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Belonidae

Marine; brackish; pelagic and may occur in neritic regions. Depth range 10 - 13m. Tropical in habitat. Caudal peduncle without lateral keels. Caudal fin rounded or truncate. Predorsal scales few and relatively large, 100-130. Caudal fin light with a prominent round black spot near its base. Dorsal fin lobe and distal margin of caudal fin yellow in live adults, anterior margin of anal fin orange.

Found in coastal areas and mangrove-lined lagoons, also enters freshwater. Carnivorous; feeds mainly on small fishes, especially clupeoids. Occurs at temperatures ranging from 26 to 29°C. Eggs may be found attached to objects in the water by tendrils on the egg's surface. Sold fresh in markets.

16. Scientific name: *Arius maculates*(Thunberg, 1792)

Common name: Spotted catfish

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Ariidae

Named for their prominent barbels,which resemble a cat's whiskers, Marine; freshwater; brackish. Adults occurs in inshore waters and estuaries. Occasionally form schools.

Head shield somewhat rugose; deep and long median fontanelle groove. Strong venomous dorsal and pectoral spines provide protection for the fish. Feed on invertebrates and small fishes. Males incubate eggs in the mouth. During incubation, males starve which sometimes make them resort to swallowing one or two eggs probably to maintain basal metabolism. Early hatching embryos commence feeding on inhaled particles by the female when still in possession of large yolk. Caught mainly with set bag nets and bamboo stake traps. Marketed fresh Air bladders are exported as isinglass used by the wine industry

17. Scientific name: ***Terapon puta*** (Cuvier, 1829)

Common name: Small scaled therapon

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Terapontidae

Found in inshore waters, sometimes entering brackish and fresh water. Body somewhat elongate and laterally compressed. Jaws equal, gape horizontal; rear of upper jaw reaching to vertical through posterior nostril; teeth conical, strong, in villiform bands, outer row enlarged; vomer and palatines (on roof of mouth) toothless. Body light grey or brown dorsally, tan or silvery white ventrally; 4 straight, narrow, dark brown longitudinal stripes on body; juveniles also have 6 or 7 light grey vertical bars; spinous portion of dorsal fin with a blackish blotch dorsally on membranes between third or fourth and seventh or eighth spines; soft portion of dorsal fin with a black blotch along top of anterior rays; caudal fin with medial rays pigmented; both lobes of caudal fin with dark tips and a transverse band. Maximum total length about 15 cm, commonly between 11 and 13 cm. Feeds on smaller fishes and invertebrates. Caught with all types of inshore fishing gear including gill nets, traps, handlines, and bottom trawls. Marketed fresh and dried-salted.

18. Scientific name: ***Ambassis ambassis*** (Lacepède, 1802)

Common name: Commerson's glassy perchlet

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Ambassidae

Freshwater; brackish; marine demersal; oceanodromous**.** Euryhaline fish capable of tolerating of freshwater when water temperature is within 7-32°C. Tends to be more tolerant of lower temperatures in water of low salinity (2ppt.) than in seawater.

With a single supraorbital spine. Rostral spine absent. Preopercle ridge and rear margin serrate. Interopercle edge smooth except for few small serrae at angle. Cheek scales, 2-3 rows. Lateral line continuous. Carnivorous, nocturnal or crepuscular. Often spends its time in small shoals, in the cover of marginal roots or floating vegetation

Feeds at night on crustaceans, fish fry and larvae and insects. Salt dried and eaten in India and some countries.

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19. **Scientific name**: ***Valamugil cunnesius***, (Valenciennes, 1836)

Common name: Round-headed Mullet

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Mugilidae

Euryhaline; inhabiting coastal marine waters, brackish water lagoons, estuaries, and may enter fresh water. Elongate with subcylindrical body. Head often broad and flattened dorsally .Eyes partly covered by adipose 'eyefold' tissue that may cover most of eye except for a small area over pupil; adipose eyefold absent in juveniles Snout short; mouth small or moderate in size, terminal or inferior; premaxillae protractile; teeth small, hidden, or absent. Lateral line absent. Scales moderate to large size, with 1 or more longitudinal rows of striae (grooves) on each scale; scales ctenoid except for those on anterior predorsal and lateral parts of head, which may be cycloid.

Feeds by rowing on submerged surfaces and filtering large quantities of benthic detritus; ingesting microalgae, detritus, small invertebrates, microorganisms, and particulate organic material. Relatively important foodfishes; caught with diverse net types. Small-scale and subsistence fisheries are probably also relatively large. The hardiness, simple diet, and rapid growth of mullets have made some species the object of aquaculture.

20. Scientific name: ***Oxyurichthys tentacularis*** (Valenciennes, 1837)

Common name: Tentacled goby

Super class : Pisces

Class : Actinopterygii

Order : Perciforms

Family : Gobidae

Occurs inshore, enters rivers and lagoons. Exclusively in brackish habitat, is known as ‘kuravali’ in Malayalam. A modified gill net,“koozhalivala”,is used for its f ishing.Body is very elongate, compressed, the body profile is convex. Snout obtuse, a little longer than the eye or shorter than eye, tip before margin of eye. Anterior nostril in a short tube. Mouth oblique, lower jaw prominent .Maxillary extends to below posterior part of eye. On each side 20 curved teeth are present in the upper jaw. Some longitudinal mucous canals are present on the cheek.

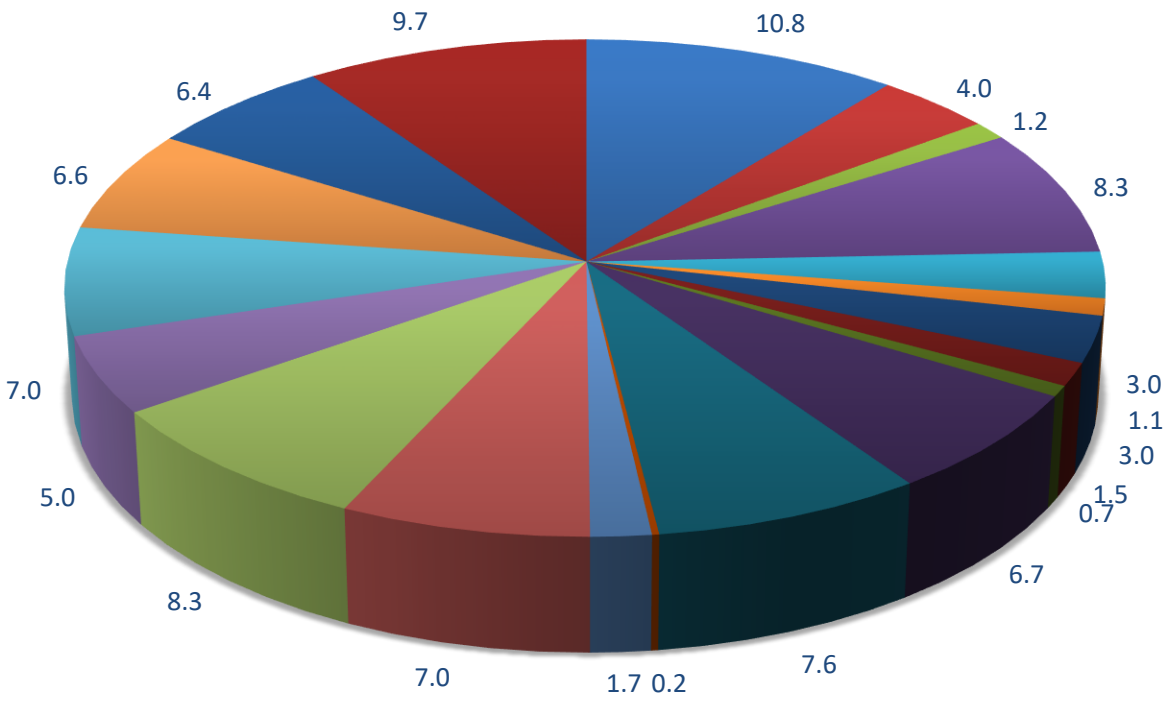
The fish has a dull greenish colour. They are omnivorous bottom-dwelling fishes. They are relatively inactive, hence, function as food of larger fishes and are also used as food fish locally**.**

Number and percentage availability of different species of fish recorded during the study period are presented in the Table 2.

Table 2. Number and percentage availability of different species during the study period

% AVAILABILITY OF DIFFERENT SPECIES DURING THE STUDY PERIOD			
Sl No.	*Species*	NUMBER	% OF SPECIES
1	*Etroplus suratensis*	87	10.8
2	*Pseudoetroplus maculatus*	32	4.0
3	*Siganus javus*	10	1.2
4	*Gerres abbrevatius*	67	8.3
5	*Gerrus oyena*	24	3.0
6	*Scatophagus argus*	9	1.1
7	*Caranx ignobilis*	24	3.0
8	*Alepes djedaba*	12	1.5
9	*Ephinephlus malabaricus*	6	0.7
10	*Nematalosa nasus*	54	6.7
11	*Stolephorus indicus*	61	7.6
12	*Brachiurus orientalis*	2	0.2
13	*Glossogobius giuris*	14	1.7
14	*Strongylura strongylura*	56	7.0
15	*Arius maculates*	67	8.3
16	*Terapon puta*	40	5.0
17	*Ambassis ambassis*	56	7.0
18	*Leiognathus brevirostris*	53	6.6
19	*Valamugil cunnesius*	51	6.4
20	*Oxyurichthys tentacularis*	78	9.7

% AVAILABILITY OF DIFFERENT SPECIES DURING THE STUDY PERIOD



- *Etroplus suratensis*
- *Pseudoetroplus maculatus*
- *Siganus javus*
- *Gerres abbrevatius*
- *Gerrus oyena*
- *Scatophagus argus*
- *Caranx ignobilis*
- *Alepes djedaba*
- *Ephinephlus malabaricus*
- *Nematalosa nasus*
- *Stolephorus indicus*
- *Brachiurus orientalis*
- *Glossogobius giuris*
- *Strongylura strongylura*
- *Arius maculates*
- *Terapon puta*
- *Ambassis ambassis*
- *Leiognathus brevirostris*
- *Valamugil cunnesius*
- *Oxyurichthys tentacularis*

Fig .10**.** Percentage availability of different species.

Species wise average length and length range is given in the Table No. 3

Table 3.

Sl No.	***Species***	**Av. Length (cm)**	**Range (cm)**
1	*Etroplus suratensis*	14.2	6- 17
2	*Pseudoetroplus maculatus*	5.4	4 -6
3	*Siganus javus*	18.45	16-19
4	*Gerres abbrevatius*	15.7	5.7- 25
5	*Gerrus oyena*	8.5	8.5-15.5
6	*Scatophagus argus*	9.5	9.5-15.5
7	*Caranx ignobilis*	13.5	10-14
8	*Alepes djedaba*	13.1	10.5-14
9	*Ephinephlus malabaricus*	14	11-15
10	*Nematalosa nasus*	18.8	15-18.8
11	*Stolephorus indicus*	7	6-8
12	*Brachiurus orientalis*	12.2	11-13
13	*Glossogobius giuris*	20.6	19-27
14	*Strongylura strongylura*	38.2	30-38.5
15	*Arius maculates*	9.3	9-11
16	*Terapon puta*	15.2	10-15.2
17	*Ambassis ambassis*	7.1	7-9
18	*Leiognathus brevirostris*	8.4	8-9
19	*Valamugil cunnesius*	11.2	9-12
20	*Oxyurichthys tentacularis*	14.2	10-14.2

Of all the fishes recorded *E.suratensis* and *Oxyurichythys tentacularis* were the most abundant species whereas *Therapon puta, Ambassis ambassis and Leiognathus brevirostris* were present in medium numbers, *Brachiurus tentacularis* was present in the least number. The percentage abundance of species are represented in the table 3.

Discussion

During the period under study the air temperature varied between 28.5 to 31 ^{0}C whereas the water temperature varied between 27 to 29.1^{0}C in February and the dissolved oxygen values were between 4.0 to 4.5 mg/lit. The dissolved oxygen value didn't show much variation during in the present study. Similar results were obtained in the study conducted in Ashtamudy estuary by Raghunathan (2007) where the oxygen values ranged from 4-4.6 mg/L. Whereas lower values were obtained in other studies conducted by Evangline (1975) in Vaigai estuary in Tamil Nadu, where the oxygen concentration was recorded to be between 2.3 -2.9 mg/L. The depth of water showed variation during the study period and it was observed to be 90 during December and decreased to 75 during January and it again increased to 95 during February. The variation in depth occurred due to daily tidal variation. Value of pH did not change significantly during the study period and showed an average value of 7.6. Salinity showed an increase from 20.5 ppt. in December to 27 ppt in February. The increase in salinity during the study period is due to the reduced rain fall during the post monsoon period and resulting low fresh water influx from the rivers into the estuary resulting in comparatively higher domination of saline influence of the tidal seawater.

About 20 species belonging to 16 families were recorded from the present study and of this 2 species each were recorded from the families Cichlidae, Gobidae, Gerridae and Carangidae and all the other families such as Siganidae, Scathophagidae, Serranidae, Clupidae, Engraulidae, Solidae, Leiognathidae, Belonidae, Ariidae, Terapontidae, Ambassidae were represented by single species each.

Asha *et al* (2014) had conducted studies in the Vembanad estuary and some of the fishes which are commonly observed in both the estuaries are *Ambassis ambassis, Brachiurus orientalis, Psueudoetroplus maculatus, E. suratensis, Nematolusa nasus, Stolephorus indicus, Oxyurichthys tentecularis, Leiognathus brevirostris, Scathophagus argus* and *Siganus javus.*

Some of the fishes recorded during the present study were also observed by Vimal Raj *et al* (2014) in the studies conducted on the Ashtamudy Lake. The common species recorded during both the studies were *Arius maculatus, Strongylura strongylura, Caranx ignobilis, Etroplus suratensis, Psedoetroplusmaculatus, Glossogobius gyuris, Oxyurichthys tentacularis, Brachiurus orientalis, Therapon puta, Valamugil cunnesius, Ambassis ambassis* and *Stoliphorous indicus.* Grouper *Ephinephlus malabaricus* was observed during the current study period while the earlier studies conducted by Vimal

Raj et al (2013) had recorded the presence of *E .tauvina* in the Lake. Similary *Siganus javus,Scathophagus argus , Nematalosa nasus, Alepes djedaba, Gerrus oyena, Leiognathus brevirostris* were also recorded during the present study.

In the present study the collection was dominated by *Ertoplus suratensis* (10.8%) followed by *Arius maculatus (8.3%), Gerrus abbrevatius(8.3%)* and *Stoliphorous indicus* (7.6%) whereas the species like, , *Ambassis ambassis (7%), Nematalosa nasus(6.7%),Leiognathus brevirostris(6%), Valamugil cunnesius(6.4%),, Therapon puta* (5%), were present in medium numbers. Least numbers were recorded in species such as *Glossogobius giuris* (1.7%), *Siganus javus* (1.2%), *Scathophagus argus* (1.1%) *Brachiurus orientalis*(0.2%) and *Epinephelus malabaricus* (0.7%). High variation in length range was observed in *Strongylura strongylura* and lowest in *Leiognathus brevirostris.*

Fish assemblages are influenced by the size and tidal influence of the estuary, habitat diversity, biological productivity, water quality and human activities. The abundance and diversity of estuarine fish are therefore are reflection of ecological conditions of that estuary. Estuarine fishes exhibit a number of unique adaptations and they are euryhaline in nature ie, they can tolerate a wide range of salinity variations. Estuarine fish have adapted to use both mechanisms – in high saline water they excrete salts and retain water, and when the water gets fresher, they excrete water and retain salts. This remarkable physiological adaptation allows these species to exploit both marine and freshwater (or semi-freshwater) environments. The estuaries consists of a unique mixture of distinct habitats and this habitats do not exist in isolation. Estuaries are important as they function as spawning grounds, nursery areas, feeding grounds and as pathways in diadromous (catadromous or anadromous) migrations. Estuaries are very important habitat for resident fish and other aquatic animal in addition to marine fishes and shrimps, as some of the very important fish and prawn species use estuaries as their nursery ground and must be protected. In addition to this estuaries are of great commercial importance as seeds of prawns and economically important fishes are easily available in estuaries. The estuaries can also be used for commercial farming of food fishes such as Pearl spot (*Etroplus)*, scads (*Caranx* and *Alepes*), mullet (*Valamugil)* and groupers (*Epinephelus*) through techniques such as cage and pen culture as juveniles of these commercially important species are observed during the present study. So the study and conservation of estuarine fishes is very important.

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