



**TAXONOMY OF FISH LANDINGS AT AZHEEKAL
LANDING CENTRE, KOLLAM**



**DEPARTMENT OF ZOOLOGY
TKM COLLEGE OF ARTS AND SCIENCE
KOLLAM-5**

*Dissertation submitted to the
University of Kerala in partial
fulfillment of the requirements
for the award of the degree of*

BACHELOR OF SCIENCE

IN

ZOOLOGY

Salma.N	25016142013
Devika.R	25017142003
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2017-2020

CERTIFICATE

This is to certify that the dissertation entitled "**TAXONOMY OF FISH LANDINGS AT AZHEEKKAL LANDING CENTRE, KOLLAM**" is an authentic record of the work done by **Ahamed Suhail.S, Amina.S ,Devika.R, Devika.S, Manoj.U, Nihal Ahammad.S, Noufia.S , Ramsy.R , Renesha Bintah Ajeem, Salma.N, Vinitha.V** under my supervision as partial fulfillment of the requirements for the Degree of *Bachelor of Science* in **Zoology** and this report has not been submitted earlier for the award of any degree or diploma or any other similar titles anywhere.

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EXAMINERS:

- 1.
- 2.

DECLARATION

I do hereby declare that this dissertation "**TAXONOMY OF FISH LANDINGS AT AZHEEKKAL LANDING CENTRE, KOLLAM**" is a bonafide report of the project work carried out by me, under the supervision and guidance of Rohini Krishna. M V, Asst. Professor, Department of Zoology, TKM College of Arts and Science, Kollam as partial fulfillment of the requirements for the award of the Degree of *Bachelor of Science* in Zoology.

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INTRODUCTION

Fishes and fisheries have always been an unavoidable part of human life. Today fishes form an important element in the economy of many nations while giving incalculable recreational and psychological value to the naturalist, sports enthusiast, and home aquarist. They have long been a staple item in the diet of many people. Fishes are low in fat content and high in protein. Fish is filled with omega 3 fatty acid and vitamins such as D and B2. It is rich in calcium and phosphorous and a great source of minerals such as iron, zinc, iodine, magnesium and potassium. This aspect unfortunately has led to the downfall of many species. They are also the subject of international and domestic agreements and disagreements. Many government institutions are devoted to the study of fish biology and propagation. Particular aspects of various species lend themselves to studies in behavior, ecology, evolution, genetics, and physiology. They are used as general indicators of pollution, their studies are concerned partly to the direct benefit of humans and partly to protect what people consider a valuable and necessary part of their heritage and life. Growth in the global supply of fish for human consumption has outpaced population growth in the past five decades (FAO, 2016).

Fishes occur in lakes, streams, estuaries, and oceans throughout the world. In most species of fishes, all individuals live entirely either in fresh or in marine waters. Over 225 species are diadromous, regularly living part of their lives in lakes and rivers and part in the oceans. Among these, most are anadromous, spawning in fresh water but spending much of their time in the sea. A few are catadromous, spawning in the oceans but returning to fresh water. Classification of some species as marine, diadromous, estuarine, or freshwater is impossible, except as a generalization. Just as in an otherwise marine family there may be one species confined to fresh water. Individuals of some otherwise marine species ascend rivers for short distances in part of their range, and those of some species that are usually freshwater are anadromous in some areas. Many freshwater and marine species are also common in brackish-water estuaries. About one-third of the 555 families have at least one species with individuals that spend at least part of their life in fresh water. Berra (2001) gives much information and distribution maps for the freshwater fish families.

Many environmental factors influence just where a certain species will predominate. Competition and other biological interactions may exert a strong influence along with physicochemical factors. In freshwater environments, species may show a preference for lakes or streams. Variations in preferences may exist over the range of a species. Among lakes they may show a preference for deep, cold, oligotrophic lakes or for shallower, warmer, and more reproductive mesotrophic and eutrophic lakes. In lake waters they may show preferences (horizontal and vertical) for the open-water limnetic zone, the benthic area, or shallow littoral areas. Fishes may even be restricted to certain types of bottom or do best under certain physicochemical conditions. Streamfishes may prefer riffle or quiet areas, and a zonation of species is usually found from the headwaters to the mouth. In the oceans, the vast majority of fishes are coastal or littoral. Most of those living beyond the 200-m-deep continental shelf (oceanic species) are deep-sea

(mesopelagic, bathypelagic, abyssopelagic or benthic at various depths); only a small minority regularly live close to the surface in the well-lighted upper 200-m zone (epipelagic), a region much larger in volume than the coastal waters. The epipelagic and mesopelagic fishes, which consist of both large predators and small plankton feeders, are varied, whereas most of the bathypelagic and abyssal fishes are relatively small.

Various methodological and philosophical approaches are used to explain the origin of distributional patterns of fishes, including areas of endemism. Both dispersal and vicariant events are important. Dispersal is regarded here as the movement, active or passive, of individuals to areas new to the existing population. Barriers of varying effectiveness may be involved as well as varying degrees of chance of reaching particular sites. It is of greatest biogeographic significance if the breeding range of the species is increased. Vicariance is the fragmentation of a former continuous distribution of the ancestral group into geographically separated units through the appearance of a barrier—for example, through plate tectonics. Both dispersal and vicariant approaches are used to explain disjunct distributions (the occurrence of a taxon in different areas with a marked geographical gap between them).

It is desirable to maintain the fish diversity so systematic study and systematists can play a leading role in protecting this diversity. We should recognize the value and our dependency upon fishes and other organisms, but our threats to the integrity of the environment also pose a serious threat to our fishes. As examples, rising sea surface temperatures, ocean acidification, and rising sea level will negatively affect fishes. Increased temperatures associated with lower dissolved oxygen levels in estuaries are affecting distribution patterns and abundance and may likely have devastating effects on these fisheries. Changing distribution patterns of many species and the extinction of native fishes has been directly linked to the human intervention. Systematists have unique roles as experts on natural geographic distributions and as witnesses recording changes in biodiversity, whether natural or human-induced.

The main factor that threatens marine fish biodiversity globally is fishing (Dulvy *et al.*, 2003; Garcia *et al.*, 2006). For example, worldwide over 40 local populations of marine fishes have gone extinct as a result of overexploitation (Dulvy *et al.*, 2003). These local losses represent an erosion of global biodiversity. Moreover, stress due to other factors such as climate change, habitat loss, invasive species, eutrophication and pollution can accentuate fishing-induced declines and inhibit or prevent recoveries (Garcia *et al.*, 2006). Moreover, biodiversity is important for the future sustainability of marine natural resources that include commercial fisheries. While it is axiomatic that biodiversity is essential for sustainable productive fisheries there is surprisingly little supporting evidence. Fisheries that exploit a range of species or a range of populations may have more stable catches than fisheries that exploit a single species (Dulvy *et al.*, 2000; Hilborn *et al.*, 2003). The contribution of some geographic components and of different life histories and populations to fisheries yield has been minor in one climate regime yet dominant in another (Hilborn *et al.*, 2003). Maintaining such diversity or biological complexity of population structures can only build resilience and insure against climate change (Yachi and Loreau, 1999).

Increased capacity-building (especially for developing countries) is necessary to identify, record and monitor invasions, provide current and accessible lists of potential, identify potential threats to neighbouring countries, and to access information on taxonomy, ecology, genetics and control methods. It is vital that adjacent countries, and all countries along a particular pathway for invasive species, can recognize such species and concur on their nomenclature. Baseline taxonomic information on native biota at the national level is also important to ensure that Invasive alien species can be recognized and distinguished from naturally present species. Development of a longer-term management view, the reconciliation of fisheries and conservation objectives toward sustainability and the support for consumer choice can reduce the likelihood of losing fish biodiversity.

The ichthyologist Regan (1910) defined a fish species as a product of interrelated communities with common morphological features (today this is termed as “morphospecies”), it should be noted that the species classification concept differs among scientists. While authorities such as Nelson (2006) and Mayr (1942) accept the “biological species” concept, others like Simpson (1951) promotes the “evolutionary species” concept. Then there is Cracraft (1983) who prefers to adopt the “phylogenetic” or “cladistic” species concept.

While most researchers are concerned with fishes as a food source and their work involves enriching the body of aquaculture knowledge, there are some who are interested in their diversity, distribution patterns, ecology and functional physiology. Recently, there has also been an overwhelming interest in the molecular constitution of fishes (Wong *et al.*, 2011; Pereira *et al.*, 2013; Rakshit *et al.*, 2015 Quraishia *et al.*, 2015) and their function as biological indicators to monitor waterbody pollution (Fonge *et al.*, 2011; Khodadoust *et al.*, 2013; Authman *et al.*, 2015). Correspondingly, the interest in fish has expanded exponentially, and the ichthyology discipline is often sought to contribute too many other fields of studies (Padilla and Williams, 2004; Lauder *et al.*, 2007; Feist and Longshaw, 2008; Rudkowska *et al.*, 2010). Generally, species is the basic unit in these studies and sound taxonomy is a prerequisite to prevent confusion and misinterpretation.

Growth of fish taxonomy in India can be traced back to the late 18th century, when European scientists and British Officers of the East India Company, particularly medical doctors, began to collect and describe Indian fishes. As on date, a total of about 2500 species of fish are known from India (Talwar and Jhingran 1991) of which about 1570 are truly marine. Early marine taxonomic studies were carried out by Day (1865, 1878), Day and Dawson (1878), Munro (1955) Smith and Heemstra (1986). Despite over 200 years of exploration and research, the fish fauna of peninsular India and Kerala continue to be poorly known (Bijukumar and Rajeev, 2015).

Taxonomic investigations on deep-sea fishes of India began with the publications of A. Alcock, based on the samples collected during the voyage of Indian marine survey steamer H.M.S. Investigator (Alcock 1899); and the descriptions also include a few deep-sea fishes off the erstwhile Travancore State. In the 20th century, several ichthyologists compiled information on marine fish fauna of the Indian Ocean, including those in the western ocean, notable in this series

being *The Fishes of Indo-Australian Archipelago* (Weber & de Beaufort, 1916–1936; de Beaufort 1940; de Beaufort & Chapman 1951).

Extensive investigation on the taxonomy of fishes along the Indian Coast was carried out. Jones (1957) republished authorship of Names of Indian Fishes Proposed in “ Histoire Naturelle Des Poissons” by Cuvier and Valenciennes and Recorded By Day. Silas (1958) studied Cyprinid fishes in the Indian Ocean. Jones and Silas (1960) published a preliminary review of Indian Tunas with a key for their identification. Silas *et al.* (1969) studied the rare Chimaeroid and Elasmobranch fishes from the continental slope off the West Coast of India. James (1969) studied a new species of Silver-belly, *Leiognathus jonesi* from the Indian Seas. Jones and Kumaran (1971) published a new record of fishes from the seas around India. James (1971) published a new record of *Micrognathus brevirostris* from the Indian seas with observations on its early development. Jones and Kumaran (1980) studied fishes of the Laccadive archipelago. Pillai *et al.* (1983) published code list of common marine living resources of the Indian Seas. Sivakumaran *et al.* (1987) published identification key for species of *Sardinella*. Andrews (1994) prepared a list of scientific, common and vernacular names of commercially important fin and shell fishes of Kerala. Siraimetan (1994) published Scientific, common and vernacular names of commercially important fin and shell fishes of Lakshadweep. Savaria (1994) studied the scientific, common and vernacular names of commercially important fin and shell fishes. Sahayak (2003) studied the taxonomy and biology of the fishes of the Family Balistidae from the Indian seas. Abraham *et al.* (2011) studied the taxonomy of the fishes of the family Leiognathidae. Joshi *et al.* (2012) published taxonomy and key for the identification of tuna species exploited from the Indian Waters. Rekha *et al.* (2013) studied the range extension of Trigger fishes from the Indian Coast. Rekha *et al.* (2013) studied the taxonomy of Serranid fishes from Indian Waters. Sahayak *et al.* (2013) studied morphological characteristics of trigger fishes of Family Balistidae from India. Sathianandan (2013) studied the diversity in fish taxa along the Indian coast. Akhilesh *et al.* (2014) prepared a checklist of Chondrichthyans in Indian waters. Akhilesh *et al.* (2014) prepared notes on the Indian swellshark, *Cephaloscyllium silasi* from the west coast of India. Rekha and Gopalakrishnan (2014) studied the fisheries, taxonomy, and status of the Flatfishes in Tropical Waters. Rekha and Somy (2014) published a Field Guide on Reef Associated Fishes of India. Sahayak *et al.* (2014) published a taxonomic review of the Family Balistidae occurring in Indian Seas. Manju (2015) studied the population characteristics and taxonomy of Lantern fishes of genus *Diaphus* (Family Myctophidae) off south west coast of India. Rekha and Gopalakrishnan (2015) studied the taxonomy of Family Bothidae from the Indian Coast. Sahayak *et al.* (2015) studied the taxonomy of fishes of the family Balistidae in India. Joshi *et al.* (2016) prepared a check list of fishes of the Gulf of Mannar ecosystem. Rekha and Dinesh (2016) studied about the Soldier fishes in Indian Waters. Abdussamad (2017) studied the Common Pelagic Finfish Families along the Indian Coast. Joshi *et al.* (2017) reviewed the present status of ichthyofaunal diversity of Indian seas. Najmudeen *et al.* (2017) studied the taxonomy of exploited Demersal Finfishes of India. Rekha (2017) published a manual for Identification of Groupers and Snappers and another manual for Identification of Rays and Some Common Flatfishes of India. Wilson *et al.* (2017) published a field guide for identification of

Threadfin breams, Silverbellies, Croakers and Bullseye. Rekha and Dinesh(2018) studied about the fish diversity of Indian waters.

Studies on the fish landing along the Kerala coast was also carried out by Day(1865), Naomi *et al.*(2001). Abraham (2001) studied the taxonomy, biology and population dynamics of the silverbellies along the Kerala coast. Studies on the fish landings of the Azheekal Landing centre is very meagre, as Azheekal landing centre is one of the important landing centres of Kerala the study of the taxonomy of the fishes landed in this centre are of immense importance. This will help to throw light on the taxonomy of fishes which are of immense significance in identification of species and thereby the identification of threatened species and to suggest measures to prevent its overexploitation and to promote sustainable fishery practices.

MATERIALS AND METHODS

The site selected for collection was Azeekal landing centre.(Fig 1).Azheekkal harbour is situated on the coast of the Arabian sea, in Karunagappally Taluk of Kollam, Kerala, India. It is a confluence of backwaters and the sea.It is located at the northern end of the land mass of Alappad peninsula.It is 12 km away from Kayamkulam and 14 km away from Karunagappally.It can be accessed through Azheekkal-Ayiramthengu bridge,Panikkar kadavu bridge or Kallum moottil kadavu bridge.Azheekkal beach is located near the harbour.It is the second largest harbour in Kollam district.

Nearly 3000 mechanised boats operate out of its fishing harbor.The fish landings started at 5am and usually took place during the whole day,with different boats landing at different time intervals. The fish landings took place during 7 days in a week (Fig 3). Major crafts are motorized fibre boats.(Fig 2).The different gear types used include bottom trawling gear, purse seine and gill nets.(Fig 4). Fishing floats were also widely used (Fig 5). Visits to the landing centre carried twice montly for a period of 4 months from October 2019 to February 2020 (Fig 6 and Fig 7)

A bottom trawl consists of a large tapered net with a wide mouth and a small enclosed end. The mouth of a trawl net has two weighted doors that serve not only to keep the net open, but also to keep the net on the ocean floor. These doors weigh several tons. In addition to the heavy doors, the bottom of the net is a thick metal cable (footrope) studded with heavy steel balls . As the net drags along the seafloor, living habitat in its path is collected from the sea bed.

Purse seines are used in the open ocean to target dense schools of single-species pelagic (midwater) fish like tuna and mackerel.A vertical net 'curtain' is used to surround the school of fish, the bottom of which is then drawn together to enclose the fish, rather like tightening the cords of a drawstring purse. Purse-seine fishing in open water is generally considered to be an efficient form of fishing. It has no contact with the seabed and can have low levels of bycatch .To ensure that they leave enough fish in the ocean to reproduce schools of adult fish are targeted using a mesh size large enough to allow smaller fish to swim free.Purse seines can also be used to catch fish congregating around fish aggregating devices (FADs). It is a type of encircling net.

A gillnet is a wall or curtain of netting that hangs in the water. The term covers several forms including stationary gillnets and trammel nets.Gillnets generally have low environmental impacts with minimal seabed interaction. The size of fish caught can be determined by the mesh size, helping to avoid catching juvenile fish.While particular species of fish can be targeted by area, gillnets have the risk of bycatch. Gear modifications have also been made and some fisheries use acoustic alarms attached to nets which deter marine mammals.

A fishing float is an item of angling equipment. Usually attached to a fishing line, it can serve several purposes. Firstly, it can suspend the bait at a predetermined depth; secondly, due to its buoyancy, it can carry the baited hook to otherwise inaccessible areas of water by allowing the float to drift in the prevailing current; and thirdly, a float also serves as a visual bite indicator. Fishing with a float is sometimes called float fishing (Fig 5).

The specimens observed in detail at the landing centre. The body colouration was noted in fresh condition and photographed in digital camera. For identification of fishes FAO sheets and Fishbase were used. The statistical analysis was carried out by using Microsoft Office Excel Software

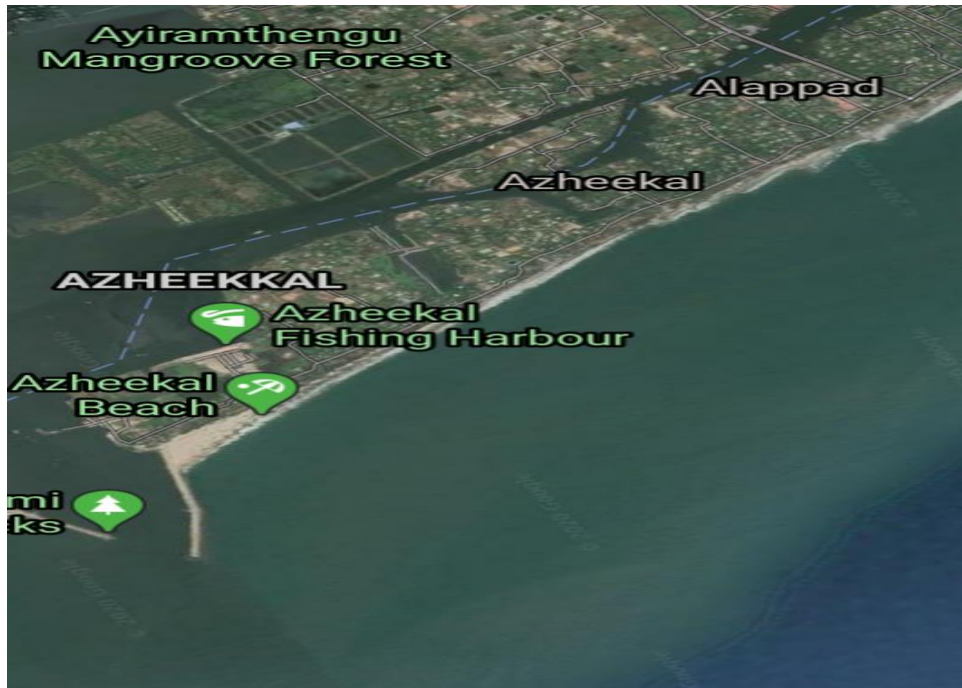


Fig 1: Map showing Study Area



Fig 2: Motorised boats used for fish landings



Fig 3: Fish landings at Azheekal



Fig 4: Fishing nets used at Azheekal



Fig 5: Fishing floats used at Azheekal



Fig 6: Inside view of Azheekal Landing centre



Fig 7: Outside view of Azheekal Landing centre.

RESULTS

Species Description

46 species of fishes belonging to 35 Families and 10 Orders 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 : *Lepturacanthus savala* (Cuvier,1829)

Class: Actinopterygii

Order: Perciformes

Family: Trichiuridae

Common name: Ribbon fish/Cutlass fish



Fig: 8

Description: Its color is steely blue with metallic reflections. The body of the fish turns silvery grey as soon as it dies. The tapering part of the body is white. This colour changes near the margin of the anus which is pale. The margin of the caudal-fin membrane is white, tip of both jaws black, inside of the opercle and the anterior part of the pectoral girdle is pale black. The fins are generally semi-transparent and may have a yellowish colouration. Their tail is pointed and very much different from the tail of other fishes. They have large eyes and the large mouth contains long pointed fang-like teeth.

Distribution: Marine, brackish, benthopelagic fish but may move to the surface during night. It is mostly found in Indo-Pacific ocean.

Biology: Inhabits coastal waters and often comes near surface at night. It feeds on a variety of small fishes and crustaceans. Prawns form the chief part of its diet. Some fishes exhibit migratory behavior. Juveniles perform vertical migration by rising to the surface to feed at night and return to the sea bed during the day. The adults are found to cannibalise juveniles. Spawning occurs year-round in tropical regions, but generally in the spring and summer in colder regions. Each female lays many thousand pelagic eggs that hatch after three to six days. The age of maturity is 1-2 years. The oldest recorded age is 15 years.

Uses: It marketed fresh and iced as well as dried salted. It is an edible fish.

2.Scientific name :*Pampus argenteus*(Euphrasen, 1788)

Class: Actinopterygii

Order: Perciformes

Family: Stromateidae

Common name:Silver pomfret



Fig: 9

Description:They are a species of butterfish. Body is firm, very deep, oval, and compressed. Color is grey above grading to silvery white towards the belly, with small black dots all over the body. The fishes are characterized by their flat bodies, forked tail fins, and long pectoral fins. The body is covered by few small scales. In Malayalam, it is called as “Avoli”. Operculum is absent, gill opening is reduced to a vertical slit on the side of the body. Dorsal and anal fins are preceded by a series of 5 to 10 blade-like spines with anterior and posterior points. Pelvic fins absent. Caudal fin deeply forked, the lower lobe longer than the upper. Fins are faintly yellow; vertical fins with dark edges.

Distribution:Marine and benthopelagic fish. Mostly found in Indo- Pacific region. Oceanodromous, migrating between spawning and different feeding areas. Migrations are cyclical and predictable and cover more than 100 km.

Biology: Inshore species, usually in schools over muddy bottoms. Adults feed on ctenophores, salps, medusae and other zooplanktons. Inshore species, they associate with fish species like *Nemipterus* and *Leiognathus*. They remain in muddy bottoms. The fishes can reach a size of about 4–6 kg. But due to overfishing most specimens exhibit a weight of less than 1 kg.

Uses: It is an edible fish. It is also used in Chinese medicine. Sold fresh in local markets or shipped frozen to urban centers. Its flesh is soft and buttery when cooked. It is known as butter fish due to its tender flesh.

3. *Nemiptreus japonicus* (Bloch, 1791)

Class: Actinopterygii

Order : Perciforms

Family : Nemipteridae

Common name: Japanese threadfin bream



Fig: 10

Description: Eleven to twelve pale golden-yellow stripes are present on the body from behind the head to the base of caudal fin. Prominent red-coloured yellow spots are present below the origin of lateral line. Pectoral fins are very long, reaching to or just beyond level of origin of anal fin. Caudal fin moderately forked, upper lobe slightly longer than lower and produced into a short or moderately long filament. Three transverse scale rows are present on preopercle. Upper part of the body pinkish, silvery below. Top of head behind eye has a golden colour. Dorsal fin whitish, margin of the dorsal fin yellow, a pale lemon stripe is present near base of dorsal fin, this stripe narrow anteriorly and widening on posterior part of fin, anal fin whitish with pale lemon broken lines or scribbles over most of the fin, caudal fin pink, upper tip and filament yellow

Distribution : Indo-Pacific. It is a demersal fish and can be caught at a depth of about 100m

Biology: Very abundant in coastal waters, found on mud or sand bottoms, usually in schools. Feeds mainly on small fishes, crustaceans, molluscs (mainly cephalopods), polychaetes and echinoderms. Females predominate at small sizes and males at larger sizes, due to faster growth rate in males. Females are more abundant than males in the catch. Maximum observed spawning age was 3 years for both sexes with no significant difference between their lengths at age. The catch ratio of *N. japonicus* has been increased within last decade and become as one of the main commercial species. Spawning activity of the thread fin bream populations along the Indian Ocean coast has a major peak during the post monsoon months from September to December.

Uses: Marketed mainly fresh, but also frozen, steamed, dried-salted, dry-smoked, fermented or made into fish balls and fish meal. It is consumed by humans as an ingredient of crab sticks.

4. *Priacanthus hamrur*(Forsskål, 1775)

Class: Actinopterygii

Order: Perciformes

Family: Priacanthidae

Common name: Moontail bullseye



Fig: 11

Description: The body is relatively deep, strongly compressed laterally. The eyes are very large and red. Often it has a row of about fifteen small dark spots along the lateral line. The fins are red to light pink. The pelvic fins are very large. The dorsal fin has 13 to 15 soft rays. The caudal fin has a concave margin which may be lunate. The mouth is oblique with a protruding lower jaw. Soft portion of dorsal fin taller than spinous portion, angular posteriorly; pectoral fins shorter than pelvic spine; pelvic fins long, reaching posterior to spinous portion of anal fin. Number of rows of scales from dorsal-fin origin to anus is 48-57, swimbladder with pair of anterior and posterior protrusions. Colour of body entirely red or capable of quickly changing to silvery with about 6 red bars or large spots on upper side, dusky spots evident on dorsal and anal fin, membranes of caudal and pelvic fins blackish distally. Teeth are small and conical. The male *Priacanthus hamrur* can reach a maximum length of 45 cm

Distribution : Indo-Pacific: Red Sea and southern Africa to French Polynesia, north to southern Japan, south to Australia.

Biology: Uncommon species found in outer reef slopes and deep lagoons from 8 to at least 80 m. Found in small aggregations. Found hovering next to coral heads during day. Feeds on small fish, crustaceans, and other small invertebrates such as small cephalopods, shrimp, crabs, polychaete worms, etc. These fishes can be found throughout the year, with a peak in the month of August. Eggs, larvae and very young juveniles are pelagic. These fishes usually live solitary, but they may also form small aggregations and sometimes large schools in the open waters.

Uses: Generally marketed fresh, may be salted or dried.

5. *Scomberomorus guttatus* (Bloch & Schneider, 1801)

Class: Actinopterygii

Order: Perciformes

Family: Scombridae

Common name: Indo-Pacific king mackerel



Fig: 12

Description: Sides silvery white with several longitudinal rows of round dark brownish spots which are smaller than eye diameter and scattered in about 3 irregular rows along lateral line. First dorsal fin membrane black. The part up to the 8th spine white posteriorly, with the distal margin black, pectoral, second dorsal and caudal fins dark brown; pelvic and anal fins silvery white. It is a popular game fish, growing up to 45 kg, it leaps out of the water when hooked. Swim bladder absent. Body entirely covered with small scales. Lateral line with many auxiliary branches extending dorsally and ventrally and curving down toward caudal peduncle. Intestine with 2 folds and 3 limbs.

Distribution : Found along the shores of continental slopes of the Indo-West Pacific.

Biology: It is a pelagic migratory fish inhabiting coastal waters at depths between 15-200 m; sometimes entering turbid estuarine waters, usually found in small schools. Fishing peaks in the months of November and December. Caught with midwater trawls, purse seines, bamboo stake traps, and by trolling. Based on occurrence of ripe females and size of maturing eggs, spawning probably occurs from April to July. The food consists primarily of fishes. Juveniles feed mainly on teleosts, particularly clupeoids such as *Anchoviella* and *Sardines*. Adults also prey mainly on schooling fishes with small quantities of crustaceans and squids.

Uses: Marketed mainly fresh; also dried-salted, smoked and frozen. Small quantities of frozen product are exported to Europe and North America. It is also used to make fish pickle.

6. *Sardinella longiceps* (Valenciennes, 1847)

Class: Actinopterygii

Order : Clupeiformes

Family: Clupeidae

Common name: Indian oil sardine



Fig: 13

Description: It is an important commercial fish of India. The body of *Sardinella* is elongated and subcylindrical. They have a slightly rounded belly and have eight rays on their pelvic fins. They have a very large number of gill rakers and a faint golden spot behind the gill opening. They also have a faint golden midlateral line, as well as a black spot on the hind border of their gill covers. No prominent keel. Belly is rounded. They have 7 to 14 striped markings along the scales on the top of the head. The paddle-shaped supramaxilla bones are characteristic. They have paired predorsal scales and enlarged fin rays

Distribution : Gulf of Aden, Gulf of Oman, Eastward to southern part of India, on Eastern coast of India to Andhra upto the Andaman Islands.

Biology: Coastal pelagic. Forms schools in coastal waters and is strongly migratory. Feeds mainly on phytoplankton (especially diatoms) and small crustaceans . Breeds once a year off western coasts of India when temperatures and salinity are low during the southwest monsoon months. Spawning period is between June and December. Spawning peaks in August-September. Spawning usually takes place at night. Attains sexual maturity around 15 cm and 1 year of age. The lifespan of this fish is about 2.5 years. These fish only spawn once during the spawning season. The peak period for commercial catch is June and July. Fishes can produce around 75,000 eggs. The development of the egg requires only 24 hours. These eggs are spherical and range from 1 to 4 mm in diameter. These fish are called oil sardines because an oil globule makes up a major part of the egg yolk. The first day of development includes minimal movement and the larva travels by serpentine swimming. By the end of this first day, the oil globule in the yolk disappears or is used up. On the second day of development, the pigmentation of the larva is stable and the eye coloration stabilizes to a silvery white sheen. During the third day, the yolk is completely used up.

Uses: Marketed fresh, dried and dried-salted. Also sold smoked and canned . made into fish meal and fish balls.

7. *Mene maculata* (Bloch & Schneider, 1801)

Class: Actinopterygii

Order : Perciforms

Family : Menidae

Common name: Moon fish



Fig: 14

Description: Dark blue above, silvery white below; 2-3 rows of dark spots above and below lateral line. Pelvic fins with a trace of blue, other fins hyaline or slightly dusky. This species is distinguished by a very deep body which is almost triangular, and extremely compressed the breast is sharp edged, greatest body depth is below the lateral line, anal fin very long and commences at point of insertion of pelvic fins, dorsal spines reducing in number with increasing age. The body is highly compressed laterally and very deep vertically. The ventral profile is steep, with a sharp ventral edge. Lateral line tracking upwards towards base of last ray of dorsal fin, often terminating there well above midline of caudal peduncle but sometimes continuing onto base of upper lobe of caudal fin. The caudal fin is deeply forked. Pectoral fins shorter than head length. Pelvic fins inserted slightly in front of pectoral fins. The mouth is small and protrusible. The first two rays of the pelvic fin are greatly elongated, forming a prominent backward-pointing process on the underside of the fish. This species can reach a length of 30 centimetres. Body covered with minute scales invisible to the naked eye which can easily be brushed off.

Distribution : Indo-West Pacific. The Moonfish is native to the Indian Ocean, including the Red Sea and Persian Gulf, and in the western Pacific where they can be found near the bottom in brackish and marine waters in the vicinity of reefs. They occur at depths of from 50 to 200 metres. Inhabits coastal waters near the bottom on both continental shelves and around major island groups

Biology: Feeds on benthic invertebrates. Exhibits schooling. Caught in trawls and by beach seine, but mainly by trawling

Uses: Edible fish, commercial use, marketed fresh and dried. Readily dries in air without salting. Flesh excellent in quality but available only in small quantity

8. *Leiognathus equulus* (Forsskal, 1775)

Class: Actinopterygii

Order: Perciformes

Family: Leiognathidae

Common name: Pony fish



Fig: 15

Description: Colour of adults greyish black, belly is silvery and many parallel close-set faint bars on are present on the back, a dark brown saddle is visible on caudal peduncle, pectoral fins grey to black, margin of soft dorsal fin black, both caudal-fin lobes with broad dusky margins, pectoral, pelvic, and anal fins colourless to yellowish. In juveniles thin, closely arranged, grey vertical lines descending from back to about midheight are present, membrane between anal-fin spines are yellow, posterior margin of caudal-fin lobes pale yellow and dusky, other fins are hyaline, snout is black. The fish is deep bodied and laterally compressed, with a strongly humped back. Mouth points downward when protracted, gill rakers are short and fleshy, less than 1/2 length of corresponding gill lamellae, total gill rakers on first gill arch 18-22. Head and breast are scaleless, scales on lateral line are 61-66.

Distribution : Indo-West Pacific. Found in river mouths and muddy inshores often in mangrove areas. Adults are coastal inhabitants found on soft bottoms, usually between depths of 10-70 meters. Juveniles are commonly found in mangrove estuaries and tidal creeks, sometimes entering the lower reaches of freshwater streams. Adults move in schools. Frequently ascend into freshwater reaches of rivers.

Biology: They are active by day. Feeds on polychaetes, small crustaceans, small fishes and worms. Caught near the bottom with bottom trawls, push nets, dip nets, and beach seines. Schools near the surface during April-May when caught with drift gill nets.

Uses: It is an important food fish in the tropics. Larger specimens are sorted for human consumption and marketed fresh or dried-salted, but surplus fish used to feed ducks, converted to fishmeal, or discarded

9. *Lactarius lactarius* (Valenciennes, 1883)

Class: Actinopterygii

Order: Perciformes

Family: Lactariidae

Common name: False trevally



Fig: 16

Description: This fish is colored silvery-grey on the upper parts with blue iridescence dorsally and a dusky black spot on the upper gill cover. The underparts are colored silvery-white. The fins are pale yellow. This species can reach a length of 40 cm, though most do not exceed 30 cm. Mouth is large and oblique. Body moderately deep and strongly compressed, with two separate dorsal fins and a wide caudal peduncle. Head, eyes and mouth are large, oblique upper jaw reaching beyond the middle of the eye, lower jaw protrudes beyond upper; front of each jaw with a pair of small sharp canine teeth. Two dorsal fins are present, the first one is spinous, the second relatively long, anal fin longer than second dorsal fin and not preceded by detached spines; pectoral fins long and pointed, pelvic fins inserted below pectoral fins, pelvic fins are half the length of pectoral-fin. Caudal fin forked. Body covered in moderately-sized easily shed cycloid scales, scutes are absent, lateral line is gently curved. The bases of the soft-rayed dorsal and anal fins are covered in deciduous scales. It is an important species to local commercial fisheries.

Distribution : It is native to the Indian Ocean. It is a coastal species, occurring in marine and brackish waters at depths of from 15 to 100 m

Biology: Carnivore, feeds on sand-dwelling animals, benthic invertebrates and fishes. The larvae have spines on their head, large swim bladder and unusual pigmentation. They resemble Carangidae Larvae. The fish is caught by hook-and-line, gill net, seine and trawl in coastal fisheries throughout its range.

Uses: Marketed fresh and dried salted.

10. *Sphyraena jello* (Cuvier, 1829)

Class: Actinopterygii

Order: Perciformes

Family: Sphyraenidae

Common name: Pickhandle Barracuda



Fig: 17

Description: The fish called pick-handle because the dark marks along its sides look like the thick ends of pickaxe handles. These dark markings fade with the preservation. It is a large species. Barracuda are snake-like in appearance, with prominent, sharp-edged, fang-like teeth, all of different sizes, set in sockets of their large jaws. They have large, pointed heads. Their gill covers have no spines and are covered with small scales. Their two dorsal fins are widely separated, with the anterior fin having five spines, and the posterior fin having one spine and 9 soft rays. The posterior dorsal fin is similar in size to the anal fin and is situated above it. The spinous dorsal fin is placed above the pelvic fins and is normally retracted in a groove. The lateral line is prominent and extends straight from head to tail. Caudal fin typically forked in all stages, without a pair of lobes at posterior margin. Origin of pelvic fins before first dorsal-fin origin. Lateral-line scales 130 to 140. The pectoral fins are placed low on the sides. Its swim bladder is large. They are speedy and dynamic and slim.

Distribution : Distributed in the tropical and subtropical Indo-West Pacific. Inhabits bays, estuaries, and turbid inner lagoon. Diurnal, solitary or in small schools. Inhabits inshore tropical and sub-tropical reefs.

Biology: Feeding takes place after releasing its gonads to spawn. This release creates space for the stomach to magnify its capacity for appropriate feeding. This takes place in October and November. Caught by trawls, set nets, gill nets, and other fishing gear.

Uses: Sold fresh, frozen or dried salted. Reports of ciguatera poisoning have been reported.

11. *Nibea soldado* (Lacepede, 1802)

Class: Actinopterygii

Order: Perciformes

Family: Sciaenidae

Common name: Jewfish



Fig: 18

Description: Silver colour with faint series of oblique stripes along scale rows, margin of soft part of dorsal fin dark, pectoral and pelvic fins with yellow tinge. A fairly large species with an arched back and deep body. Snout rounded, but not swollen or projecting; mouth large, terminal, upper jaw extending backward below hind margin of eye. Second anal spine long and stiff. Teeth differentiated into large and small in both jaws. The large ones widely spaced, not canine-like, forming outer series in upper jaw, inner series in lower jaw. 8 to 13 scale rows above lateral line to origin of dorsal fin, 12-17 scale rows below lateral line to origin of anal fin (total 21-29 scale rows). Swim bladder carrot-shaped, with 18-22 pairs of arborescent appendages along its sides, the first pair entering head. No barbel on chin. Gill rakers slender, equal to or slightly shorter than gill filaments, 7 to 12 on lower limb of first gill arch. Scales on head cycloid (smooth), those on body ctenoid (rough to touch), small scales present on soft parts of dorsal and anal fins, lateral-line scales reaching to tip of caudal fin.

Distribution : Found along the Indo West-Pacific. Inhabits shallow coastal waters and estuaries. Juveniles occur in brackish estuaries and often ascend the lower reaches of large, turbid rivers.

Biology: Feeds on small fishes and invertebrates. Amphidromous. Reproduces in fresh water, and newly hatched larvae pass to the sea, a period of feeding and growing occurs at the sea for a few months and well grown juveniles return to fresh water period of feeding and growing in fresh water, followed by reproduction there.

Uses: Marketed fresh as well as dried salted.

12. *Thryssa malabaricus* (Bloch, 1795)

Class: Actinopterygii

Order: Clupeiformes

Family: Engraulidae

Common name: Malabar thryssa



Fig: 19

Description: They are small silvery, herring-like fishes with a conical snout extending beyond the lower jaw, a large mouth reaching well beyond the eye, a single short-based dorsal fin at about mid-body, pectoral fins low on the sides, pelvic fins abdominal, originating before or below the dorsal-fin base, a forked tail and a wide silvery stripe along the mid-sides. The body is covered in smooth, often weakly attached scales. The characteristic feature to identify the fish is the presence of a dark blotch behind upper part of gill opening, and spots on cheeks and paired fins. Tip of snout about level of upper rim of eye. Teeth small. A dark blotch behind upper part of gill opening; small spots on cheek, gill cover, maxilla and paired fins; gill arches pinky orange, inside of gill cover yellow and gold, inner part of anal fin deep yellow, margin whitish. The fish inhabits a depth of 20-50m. Maximum length do not exceed 17.5 cm. The fish lack dorsal soft rays and 34 to 38 anal soft rays are present.

Distribution : Widely distributed along the Indian Ocean along the shores of the Western Indian Ocean and reaches upto Pakistan. It is a schooling fish found mostly inshore and enters estuaries. Pelagic and also found along beaches and entering river mouths; some temporary or even permanent residents in rivers.

Biology: They are filter-feeders that open their mouths as they swim. They produce pelagic eggs and the larvae are pelagic

Uses: A traditional method of processing and preserving is to gut and salt them in brine, allow them to cure, and then pack them in oil or salt. They are used in small quantities to flavor many dishes. Fishermen also use them as bait for larger fish, such as tuna and sea bass.

13. *Decapterus russelli* (Rüppell, 1830)

Class: Actinopterygii

Order: Carangiformes

Family: Carangidae

Common name: Indian scad



Fig:20

Description: Bluish-green above and silvery below with a small black blotch on the margin of operculum near its upper edge. Caudal fin varies from translucent to dark brown, the second dorsal fin is translucent at its base but light blackish-brown towards the margin; the other fins are mostly translucent, other than the pelvic fins of adult males which are slightly darker. The spines and rays on the dorsal and anal fin are grey, those on the other fins are white. It has an elongate, somewhat slender and slightly compressed body. The eyes are of moderate size and have a well developed adipose eyelid which completely covers eye. The scales on top of head do not reach a line running through the centre of pupil. The lateral line has a low regular arch towards the head. There is a dusky or transparent membrane at the joining of the upper jaw, the posterior end of the upper jaw is straight above and a little concave and not horizontal antero-ventrally. Both jaws bear an anterior row of minute teeth which is quite irregular with a single series of posterior teeth. There are two widely separate dorsal fins. The terminal dorsal and anal soft rays consist of a widely detached finlet. Its length is up to 45 cm total length, and the maximum weight is 110g.

Distribution : Occurs throughout the Indian Ocean. Adult are benthic and form large schools in deeper water, although they may occasionally be found inshore in smaller groups where there are sheltered bays.

Biology: Their main prey is smaller planktonic invertebrates. It is host to the ectoparasitic copepod *Lernanthropus decapteri*. It reaches sexual maturity at around 1 year and about 12 cm in length.

Uses: It is generally marketed fresh, may be dried or salted, as well as sold frozen and canned

14. *Anguilla bengalensis*(Gray,1831)

Class: Actinopterygii

Order: Anguilliformes

Family: Anguillidae

Common name: Indian mottled eel



Fig: 21

Description:An eel fish with long round body with dull white underparts and pale bluish spots on the body. Body elongate, head conical, flattened dorsally. Distinct pectoral fin not starting from the right, above of the anal fin. Pale bluish spots on the body. Underside of the body is dull white. Dorsal fin begins back, more or less over anus. Mouth terminal, lips prominent, narrow bands of teeth on jaws, broad band on vomer. They possess no pelvic fins, and many species also lack pectoral fins. The dorsal and anal fins are fused with the caudal fin, forming a single ribbon running along much of the length of the animal. Eels swim by generating body waves which travel the length of their bodies. They can swim backwards by reversing the direction of the wave.

Distribution :Asia: Pakistan, India, Sri Lanka, Burma, and the East Indies. Catadromous. Lives in freshwaters, but also occurs in estuaries and in the sea during early life and near maturity. The eels spend most of their lives in freshwater at a depth range of 3–10 metres, but migrate to the Ocean to breed.

Biology:The eels feed primarily on of benthic crustaceans, molluscs, finfish and worms. Eels begin life as flat and transparent larvae, called leptocephali. Eel larvae drift in the surface waters of the sea, feeding on marine snow, small particles that float in the water. Eel larvae then metamorphose into glass eels and then become elvers before finally seeking out their juvenile and adult habitats.

Uses:There exists a good export market for both live elvers and eels. Highly prized as food fish because of its nutritional value. Fish mucous from live fish mixed with rice or wheat flour is used as medicine for arthritis.

15. *Scoliodon laticaudus* (Muller and Henle, 1838)

Class: Chondrichthyes

Order: Carcharhiniformes

Family: Carcharinidae

Common name: Spadenose shark



Fig: 22

Description: Bronze grey above, white below, fins sometimes darker than body, no conspicuous markings. It has a broad head with a distinctive, highly flattened, trowel-shaped snout. The eyes and nares are small. The corners of the mouth are well behind the eyes and have poorly developed furrows at the corners. About 25–33 tooth rows are in the upper jaw and 24–34 tooth rows are in the lower jaw, each tooth has a single slender, blade-like, oblique cusp without serrations. The first dorsal fin is positioned closer to the pelvic than the pectoral fins, which are very short and broad. The second dorsal fin is much smaller than the anal fin. No ridge occurs between the dorsal fins. Maximum sizes up to 120 cm.

Distribution : Found on rocky substrates of coastal waters and lower reaches of tropical rivers.

Biology: Forms large schools. Feeds on small bony fishes, shrimps and cuttlefish . Common by catch of the inshore demersal gillnet fisheries. Viviparous, with an unusual columnar placenta . The placental stalk, formed from the yolk sac, has an unusual columnar structure and is covered by numerous long appendiculae that support a massive capillary network, providing a large surface area for gas exchange. The placental tissue contacts the uterine wall in a unique structure called the "trophonematal cup", where nutrients are transferred from the mother's bloodstream into the placenta. Litter size varies from 1 to 14 . Size at birth about 13 to 15 cm TL.

Uses: Utilized fresh for human consumption and used as bait for other sharks and bony fishes. The spadenose shark is harmless to humans. The fins are valued for shark fin soup, and the carcasses are processed into fishmeal. The meat can also be processed with glacial acetic acid to obtain a gel powder that can be used as a protein supplement in cereal foods, a biodegradable film for wrapping seafood, or a binder in sausages and other foods.

16. *Odones niger* (Ruppell, 1836)

Class: Actinopterygii

Order: Tetradontiformes

Family: Balistidae

Common name: Red-toothed Trigger fish



Fig: 23

Description:The body is flat, protected as is the case of all triggerfishes, by a solid coating of bony scales, and the eyes, placed up on the head, are independent from each other in the movements granting an all over vision. On the back there is a typical erectile trigger formed by three spines. It is often folded in an appropriate casing, but the fish may snap and lock it, for menace or for defence, in an erect position. The pectoral fins have 15-16 unarmed rays, the ventral ones are reduced to a small spike and the caudal is shaped like a crescent with very elongated margins in the adults. Their pectoral fins are quite small, as a result they steer mostly with their dorsal and anal fins. The mouth is robust, armed by solid incisors which grow up again in the event of breakage. At the beginning they are white, but then they get a reddish tint. They are useful for nibbling the sponges as well as for defence with deep bites. They are one of the more peaceful triggers in the family but can become threatening with age and can perform a grunting-type sound. They have the ability to change their colour depending on their mood, food, feeding and water quality from purple to blue and to bluish-green. The red-toothed triggerfish may reach the 50 cm.

Distribution :It is found in the tropical waters of the Indian and Pacific Oceans. Inhabits reef channels or along slopes that are subject to strong currents. Juveniles associated with isolated patches of rubble or crevices with proper-sized shelter holes. It lives in the madreporic formations between the 4 and the 40 m of depth.

Biology: Oviparous . Form large schools to feed on zooplankton and sponges. Taken by drive-in nets. The eggs are spawned in a nest, dug in the sand. The young, after the larval stages, grow up in the crevices of the madrepores. Can be quite aggressive when guarding their eggs.

Uses: Popular aquarium fish it may be marketed fresh or dried-salted.

17. *Saurida tumbil* (Bloch, 1795)

Class: Actinopterygii

Order: Aulopiformes

Family: Synodontidae

Common name: Greater lizard fish



Fig: 24

Description: Color is generally brown above and silver below. Eight to 10 faint bars occasionally visible along lateral line. The tips of the dorsal and pectorals and the lower caudal lobe are blackish, no markings on fins. Its average length at maturation is 30 cm. They have neither dorsal spines nor anal spines. Body is cigar-shaped, rounded or slightly compressed. The head is pointed and depressed. The snout is broader than long. Body elongate and tubular. Lateral line scales about 50 to 56, 4 to 5 scale rows above lateral line. Head and caudal peduncle somewhat depressed. Several rows of teeth visible in both jaws even when mouth is closed, 2 series of teeth on palate, outer series in 3 or 4 rows anteriorly, a small patch of teeth present on vomer. Pelvic rays subequal in length. They have black eyes and the lining of their mouths and gill areas are black as well.

Distribution : They live in the Indo-West Pacific, their geographic range spans from Red Sea and east coast of Africa. Commonly found on muddy bottoms between 20 and 60 m depth, but may enter shallower waters.

Biology: Mainly piscivorous, but also feeds on crustaceans and squids. Caught primarily with bottom trawls. They are important food for larger fishes such as Tuna and Swordfish. The larvae of lizardfishes are free-swimming. They are distinguished by the presence of black blotches in their guts, clearly visible through their transparent, scaleless skin.

Uses: Marketed fresh

18. *Acreichthys tomentosus* (Linnaeus, 1758)

Class: Actinopterygii

Order: Tetradontiformes

Family: Monacanthidae

Common name: Bristle-tailed file fish



Fig: 25

Description: Filefish are rhomboid-shaped fish. Deeply keeled bodies give a false impression of size when these fish are viewed facing the flanks. Filefish have soft, simple fins with comparatively small pectoral fins and truncated, fan-shaped tail fins, a slender, retractable spine crowns the head. Although there are usually two of these spines, the second spine is greatly reduced, being used only to lock the first spine in the erect position. The small terminal mouths of filefish have specialized incisor teeth on the upper and lower jaw; in the upper jaw there are four teeth in the inner series and six in the outer series; in the lower jaw, there are 4-6 in an outer series only. The snout is tapered and projecting; eyes are located high on the head. Filefish have rough non-overlapping scales with small spikes, which is why they are called filefish. Filefish have small gill openings and greatly elongated pelvic bones creating a "dewlap" of skin running between the bone's sharply keeled termination and the belly.

Distribution : Indo-West Pacific. Adult filefish are generally shallow water fish, inhabiting depths of no more than about 30 metres. They may be found in lagoons or associated with seaward reefs and seagrass beds.

Biology: Adults inhabit reef, weed, and rubble areas on shallow coral reefs commonly found in seagrasses. They are Solitary. Major food items include amphipods, polychaetes and molluscs. Filefish spawn at bottom sites prepared and guarded by the males; both male and the female may guard the brood, The young filefish are pelagic. Sargassum provides a safe retreat for the larvae.

Uses: Popular snack food in some countries. It is typically dried and made into a sweet and salty material, which is then roasted before eating.

19. *Stolephorus indicus*(vanHasselt, 1823)

Class: Actinopterygii

Order: Clupeiformes

Family: Engraulidae

Common name: Indian Anchovy



Fig: 26

Description: Fusiform, sub-cylindrical body but sometimes quite strongly compressed; body tapers to very slender tail. Body light transparent fleshy brown, with silver stripe down flank; no dark pigment lines on back between head and dorsal fin. Belly with 2 to 6 small needle-like pre-pelvic scutes. Maxilla tip pointed, reaching to only just beyond front border of pre-operculum, hind border of pre-operculum convex, rounded. The snout is blunt with tiny, sharp teeth in both jaws. The snout contains a unique rostral organ. No spiny rays in fins, a single dorsal fin, usually short and at midpoint of body, pectoral fins set low on body, pelvic fins usually about midway between pectoral fin base and anal fin origin, anal fin short, caudal fin forked. Scales always cycloid but often shed rather easily, no lateral line. Maximum length do not exceed 15.5

Distribution : Indo-Pacific. Found in depth of 20-50m in most of the tropical areas of the Indo-pacific oceans. Occurring in coastal waters and which enters estuarine parts of rivers, can tolerate brackish water. Pelagic

Biology: Feeds most likely on zooplankton. Migrates out into deeper and more saline water to breed, and returns immediately after that.

Uses: Processed into fish pickle in Indo-China. Used as bait in the tuna fishery in the South Pacific. It can be crisp-fried, used to make fish-based culinary products like fish sauce or in curries.

20. *Aluterus monoceros* (Linnaeus, 1758)

Class: Actinopterygii

Order: Tetradontiformes

Family: Balistidae

Common name: Unicorn leather jacket



Fig: 27

Description: Covered by thin but rough or shagreen-like skin with innumerable minute scales not easily discernible to the unaided eye. Mouth small and usually more or less terminal or slightly supraterminal, teeth only moderately heavy, 6 in an outer series in upper jaw and 6 or fewer in the lower. Body highly compressed, elongate; eyes positioned far back on head above pectoral-fin base; first dorsal-fin spine slender, rudimentary pelvic spine disappears in large specimens. Pale grey with faint spotting in adults and a reticulate pattern of pale lines and greyish blotches in juveniles. Snout convex in adults. Soft dorsal and anal fins pale yellowish to brownish; caudal membrane blackish brown. Gill opening a relatively short, vertical to oblique slit in front of pectoral-fin base, branchiostegal rays hidden beneath the skin. Scales above pectoral-fin base unmodified. Lateral line inconspicuous.

Distribution : Occasionally present in shallow water by steep drop-offs. Solitary or in pairs, occasionally in groups of five or six, at less than 10 m depth. Juveniles are pelagic, seen under floating objects. Benthopelagic. Adults and juveniles are rarely seen near reefs.

Biology: Feed on benthic organisms. This species exhibits distinct pairing. Adults may nest on sandflats adjacent to reefs in deep water. At other times, the adults may form large schools under weed-rafts that usually formed during the wet season .

Uses: Taken as bycatch in commercial fisheries in parts of its range. Only large individuals are eaten, but many are collected as trashfish in commercial bottom trawls. Gelatin can be obtained from the skin of this fish.

21. *Zebrias synapturoides* (Jenkins, 1910)

Class: Actinopterygii

Order: Pleuronectiformes

Family: Soleidae

Common name: Indian zebra sole



Fig: 28

Description: All species in the genus have clear dark and pale stripes giving it a name derived from the word 'Zebra' due to the shared characteristic stripes. Light brown with 10 or 11 darker simple or double crossbands wider than pale interspaces, continued in oblique slant on dorsal and anal fins. Caudal fin darker, brown, with a long, whitish median blotch. Eyes on right side, their diameter slightly longer than snout, close together, usually with a short tentacle each, mouth small, curved, cleft reaching third of the lower eye. Dorsal and anal fins more or less completely joined to caudal fin, pectoral fins well developed, asymmetrical, that on eyed side smaller, pelvic fins short. Scales on both sides ctenoid .

Distribution : Indo-West Pacific, Persian Gulf to Papua New Guinea. Marine, demersal, depth range 43 - 125 m

Biology: They are bottom-dwelling fishes feeding on small crustaceans and other invertebrates. Caught in shallow sand and mud bottoms of the continental shelf and creeks. They begin life as bilaterally symmetric larvae, with an eye on each side of the head, but during development, the left eye moves around onto the right side of the head. Adult soles lie on their left (blind) sides on the sea floor, often covered in mud, which in combination with their dark colours, makes them hard to spot. Moreover, they are growing less quickly now and are rarely older than six years, although they can reach forty. The fish is outside safe biological limits.

Uses: Commercial. Caught mainly with bottom trawls and shore seines. Marketed fresh.

22. *Lagocephalus inermis* (Temminck & Schlegel, 1850)

Class: Actinopterygii

Order: Tetradontiformes

Family: Tetradontidae

Common name: Smooth-backed Blowfish



Fig: 29

Description: Greenish or dark grey above, silvery white below. Dorsal part of body without prickles, belly covered with prickles. Moderate-sized fishes, less than 300 mm, with a heavy blunt body capable of rapid inflation by intake of water or air. Head large and blunt, jaws modified to form a beak of 4 heavy powerful teeth, 2 above and 2 below; gill openings without distinct opercular cover, appearing as simple slits anterior to the pectoral fin, eyes located high on head. Dorsal and anal fins located far posteriorly bearing no spines, caudal fin usually truncate to slightly rounded, pelvic fins absent. Typical scales absent.

Distribution : Marine, demersal, distributed along the Indo-West Pacific. Inhabits tropical and temperate seas, most frequently in shallow nearshore waters, sometimes entering more brackish or fresh water habitats.

Biology: Usually alone or in small, disorganized groups. Their capacity to inflate themselves like balloons probably prevents them from being swallowed by most potential predators. Able to bury in the bottom. They propel themselves through the water by a fan-like flapping of their dorsal and anal fins. They are carnivorous. This fish was considered as a menace by fishermen as it caused damage to other species landed and the net.

Uses: Used moderately for human consumption. Pufferfishes are sold at the harbour. The fish is beheaded, viscera removed, the skin peeled off and then cured in salt (ratio 3:1) for one week. It is then dried in the sun for a day and is transported as cured and dried product. The flesh is reportedly of excellent flavour and is consumed locally in many areas, especially Japan. However, they may be toxic and their consumption has caused serious (sometimes lethal) poisoning. The toxin is concentrated in the internal organs, especially liver and gonads, and can contaminate the flesh during careless cleaning of the fish. Lesser amount of toxin could also be found in skin, muscle and blood.

23. *Secutor insidiator* (Bloch,1787)

Class: Actinopterygii

Order: Perciformes

Family: Leiognathidae

Common name: Pugnose ponyfish



Fig: 30

Description: Belly silvery; back greenish to brownish, with about 10 broken, dark, vertical bars and spots extending to little below lateral line; a black, curved band from lower margin of eye to posterior angle of lower jaw. Dorsal fin membrane between 2nd and 6th spines black, soft part of dorsal fin, pectorals, pelvics and anal fin colourless, caudal fin partly yellow, underside of pectoral fin base dotted black. Naked head. Mouth strongly oblique; nostrils situated above eyes. Tip of maxilla reaching well below level of lower margin of eye. Body depth twice or slightly more than standard length. Body compressed and rather elongate, the dorsal and ventral profiles about equally convex, but a more or less distinct notch present at nape; body depth 2.32 to 2.82 times in standard length. Snout pointed. Scales present on breast. Body oval, deep and compressed. Head strongly concave above eye, snout pointed, mouth pointing upward when protracted. Lateral line reaching backward nearly to below end of dorsal fin. Cheek scaleless.

Distribution : Schooling species .Occasionally enters brackish waters. Along the Indian coasts and off Sri Lanka, in the Eastern Indian Ocean and the South China Sea. Inhabits shallow waters down to depths of 40 m, predominantly near the bottom. It can be fished from inshore waters throughout the year.

Biology : Swims in loose groups. Feeds on zooplankton including copepods, mysids, and larval fishes and crustaceans . Caught mainly with bottom trawls also with inshore seines.

Uses: Sold fresh and dried salted; also used for fishmeal.

24. *Chirocentrus nudus* (Swainson, 1839)

Class: Actinopterygii

Order: Clupeiformes

Family: Chirocentridae

Common name: Whitefin wolf herring



Fig: 31

Description: Silvery, back bright blue (fading to grey), flanks bright silver. Dorsal fin clear (but frequently damaged); inner face of pectoral fin black at base; no black colour on anterior part of anal fin. Scales numerous, small, usually lost. Body very elongate, strongly compressed, belly sharp but without scutes. Head strongly compressed, 2 fanglike canines pointing forward in upper jaw, a series of canine teeth in lower jaw. Dorsal fin set far back on body; pectoral fin long, its length greater than distance between eye centre and hind border of gill cover; anal fin origin usually a little behind dorsal fin origin. Maximum length is 100 cm, commonly found at to 60cm.

Distribution : Indo-West Pacific. Pelagic in coastal waters, from the shore to about 150 m depth. Caught throughout its range, but no special fishery. Common, but not everywhere abundant. Caught with fish traps, gillnets, seines and shallow trawls.

Biology : Feeds mainly on small fishes and crabs. They swim along with their mouths open, filtering the plankton from the water as it passes through their gills. Young herring mostly hunt copepods individually, by means of "particulate feeding" or "raptorial feeding". It is a predatory fish. Eggs are laid on the sea bed, on rock, stones, gravel, sand or beds of algae. Females may deposit from 20,000 to 40,000 eggs. In sexually mature herring, the genital organs grow before spawning, reaching about one-fifth of its total weight. Survival is highest in crevices and behind solid structures, because predators feast on openly exposed eggs. The larvae are 5 to 6 mm long at hatching, with a small yolk sac that is absorbed by the time the larvae reach 10 mm. Only the eyes are well pigmented. The rest of the body is nearly transparent, virtually invisible under water and in natural lighting conditions.

Uses: They are harvested for their flesh and eggs, and they are often used as baitfish. Marketed fresh or frozen. The fish is eaten raw, fermented, pickled, or cured by other techniques, such as being smoked. They are very high in the long-chain omega-3 fatty acids EPA and DHA. They are a source of vitamin D.

25. *Uranoscopus marmoratus* (Cuvier, 1829)

Class: Actinopterygii

Order: Perciformes

Family: Uranoscopidae

Common name: Stargazer fish



Fig: 32

Description: Characterised by having dorsally or dorsolaterally directed eyes placed on or near the top of their large, flattened, cuboid head. They are commonly called stargazers because these small eyes turn upwards 'looking at the stars'. Dorsal parts of head and body dark brown, back with irregular large whitish blotches. Eye dorsally dark brown. First dorsal fin black. Caudal fin rays dark brown. Dorsolaterally directed eyes placed on or near the top of a large, flattened, cuboid head. Mouth oblique, lips lined with cutaneous cirri, and body elongate and subcompressed. Head flattened dorsolaterally, dorsal and lateral surfaces almost entirely encased in minutely sculptured bones. Two occipital lobes developed. Nasal bone weakly ossified, not exposed, covered by skin of snout. Both nostrils with short tubiform valve. No chin barbel or cirri on branchiostegal membrane. Lower edge of preopercle with 4-7 spines. Respiratory valve rudimentary. Teeth in jaws small, conical, in two series. Stargazers are venomous; they have two large venomous spines situated behind their opercles and above their pectoral fins. *Uranoscopus* can also cause electric shocks.

Distribution : Distributed in the Indo-West Pacific, in the eastern Atlantic and the Mediterranean and Black Sea. Benthic fishes distributed worldwide in tropical and temperate oceans, with a few species occasionally entering brackish water or even fresh water habitats.

Biology : The stargazer lays small, transparent eggs on the bottom of the bay. These eggs float to the surface after they are released. They hatch into larvae and grow up to 6–7 mm. They slowly become dark in color and develop the electrical organs when they are 12–15 mm. After this they swim to the bottom and grow into adults. They bury themselves in sand or mud, leaving only the eyes and anterior part of the head exposed.

Uses: Stargazers are a delicacy in some cultures (the venom is not poisonous when eaten), and they can be found for sale in some fish markets with the electric organ removed.

26. *Lutjanus argentimaculatus* (Forsakki,1775)

Class: Actinopterygii

Order: Perciformes

Family: Lutjanidae

Common name: Mangrove red Snapper



Fig: 33

Description: Body moderately deep, preopercular notch poorly developed, vomerine tooth patch crescentic, gill rakers of first gill arch 16-20, scale rows on back more or less parallel to lateral line. Colour of the body generally reddish, belly silvery or whitish, juveniles with a series of about 8 white streaks 2 blue across cheeks. They have prominent canine teeth in their jaws that are used for seizing and holding prey. These teeth can cause injuries.

Distribution : Indo-Pacific region, but never found in large quantities. Euryhaline species . Juveniles and young adults occur in mangrove estuaries, the lower reaches of freshwater streams and tidal creeks .Adults are often found in groups around coral reefs. Eventually migrate offshore to deeper reef areas, sometimes penetrating to depths in excess of 100 m.

Biology :Caught mainly with handlines, bottom longlines, and trawls. Maximum length is 104 cm, max weight 14.5 kg and max age 39 years .The species is carnivorous, they are predators, feeding mainly at night on fishes, crustaceans, gastropods, and cephalopod molluscs. As ambush predators, they often dwell around mangrove roots, fallen trees and rock walls where smaller prey reside for protection.

Uses: Excellent food fish. A good aquaculture species because it doesn't get rancid easily when frozen . It commands a good export market price with no limit on body size. No reported damaging diseases. Marketed mostly fresh and dried-salted. The mangrove red snapper is a highly regarded table fish with firm, sweet-tasting, white flesh. Recreational fishing has been popular for a long time, restricted mostly by fishing limits intended to ensure a sustainable population.

27. *Terapon theraps* (Cuvier, 1829)

Class: Actinopterygii

Order: Perciformes

Family: Terapontidae

Common name: Large scale therapon



Fig: 34

Description: Body oval, compressed, robust. Lower opercular spine extending well beyond the opercular flap. Post-temporal bone exposed posteriorly and serrate. Body dusky dorsally, silvery-white ventrally, 4 dark brown horizontal stripes on body; juveniles also have 6 or 7 vertical bars. Spinous part of dorsal fin with a black blotch on fin membranes between 3rd and 7th spines, soft part of dorsal fin with a dark band along upper portions of anterior rays and a horizontal band on posterior rays, soft part of anal fin with a horizontal black band, each caudal lobe with one transverse stripe, upper lobe with black tip. Jaws equal, gape slightly oblique, rear of upper jaw reaching to vertical through anterior margin of eye in juveniles, falling short with age, teeth conical, in villiform bands, the outer row much enlarged, vomer and palatines (on roof of mouth) toothless, preopercle serrate, the serrations largest at angle, particularly in adults, lower opercular spine very long and strong, extending distinctly beyond edge of opercular bone, post-temporal bone expanded, exposed and serrate posteriorly, spinous part of fin strongly arched and deeply notched; the 3rd to 6th dorsal spines longest, and the penultimate spine about one-half the length of the ultimate. Caudal fin emarginate with rounded lobes. Lateral line scales 46 to 56, 6 to 8 rows of scales above lateral line and 14 to 16 rows below it.

Distribution : Adults inhabit coastal waters. Often found in brackish waters. Juveniles with floating weeds, often far offshore. Wide-spread in the Eastern Indian Ocean and the Western Pacific.

Biology : Eggs are guarded and fanned by the male parent. Feeds on insects, plant matter, small fish, fish scales and crustaceans. Caught with all types of inshore fishing gear, including gillnets, traps, handlines and bottom trawls

Uses: Marketed fresh and dried salted. It occasionally makes its way into the aquarium trade

28. *Cynoglossus macrostomus* (Norman, 1928)

Class: Actinopterygii

Order: Pleuronectiformes

Family: Cynoglossidae

Common name: Malabar tongue sole



Fig: 35

Description:Light brown on eyed side with dark brown forming diffuse, irregular crossbands, dorsal and anal fins grey/black. Body flat and elongate, with dorsal and anal fins joined to caudal fin. Eyes on left side of body, with no space between them, snout short and obtusely pointed, rostral hook short, corner of mouth reaching well beyond lower eye, nearer to tip of snout than to gill opening. Two lateral lines on eyed side but none on blind side. Scales ctenoid on both sides of body, moderately sized, 14 to 16 scale rows between lateral lines on eyed side. They are distinguished by the presence of a long hook on the snout overhanging the mouth, and the absence of pectoral fins. Their eyes are both on the left side of their bodies, which also lack a pelvic fin.

Distribution :Found along the west coast of India where it forms the object of an important fishery. Elsewhere, it is restricted to the east coast of India. Inhabits shallow muddy and sandy bottoms of the continental shelf, down to 25 m, also found in midwaters in certain seasons of the year.

Biology:Feeds mostly on bottom living invertebrates, especially worms. Caught mainly with bottom trawls

Uses:Marketed mostly fresh or frozen, also dried salted.

29. *Sardinella gibbosa* (Bleeker, 1849)

Class: Actinopterygii

Order: Clupeiformes

Family: Clupidae

Common name: Gold striped sardine



Fig: 36

Description: *Sardinella gibbosa* have a relatively slender body, and a below average number of gill rakers. They have unique, small perforations on the hind part of their scales along with a dark spot on the dorsal fin.. Vertical striae on scales not meeting at center, numerous small perforations on hind part of scale. A golden mid-lateral line down flank; dorsal and caudal fin margins dusky. 46–61 gill rakers on the lower arm of the first arch, increasing with size of fish; and interrupted longitudinal striae formation in lateral scales. Mouth terminal with minute teeth on lower jaw and tongue. Two triangular formations are present on top of head. Dorsal fin rays average count 18; pectoral fin with 14–16 rays, tightly embedded in a triangular groove. Pelvic fin with eight rays. Anal fin with 18–20 rays, last two anal rays enlarged, thickened and branched. Lateral scales deciduous, scales with one continuous vertical striae followed by 5–9 discontinuous striae.

Distribution : The distribution of *S. gibbosa* includes the Indo-West Pacific, East African coast, and a range from Madagascar to Indonesia. *S. gibbosa* are one of the most abundant *Sardinella* species in Indo -West Pacific

Biology : *S. gibbosa* have unique eggs because they do not possess a wide perivitelline space .The spawning season for these fish ranges from April to October. In this species there is a trend of smaller fish spawning earlier in the spawning season. Peak spawning occurs in June and July Forms schools in coastal waters. Adults feed on phytoplankton and zooplankton (such as crustacean and molluscan larvae. Juveniles predominantly prefer crustaceans expanding to include phytoplankton in the diet as their length increases.

Uses: Fisheries are most prominent in southern parts of India. Washed, steamed, sun dried, packed and preserved. Marketed fresh, dried-salted, boiled or made into fish balls

30. *Bothus myriaster* (Temminck & Schlegel, 1846)

Class: Actinopterygii

Order: Pleuronectiformes

Family: Bothidae

Common name: Indo-Pacific Oval Flounder

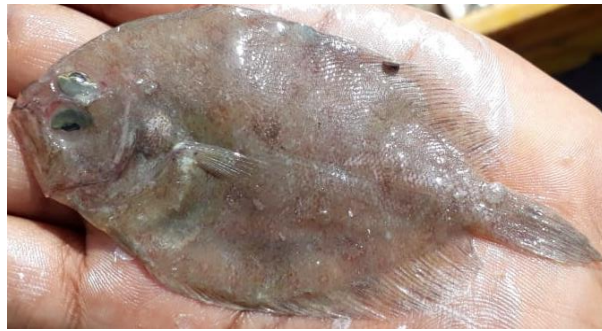


Fig: 37

Description: Colour is brownish on the eyed side, with numerous spots ringed with yellowish smaller spots, 2 or 3 diffuse dark blotches along lateral line. Short lower jaw. Body almost circular in shape in young, becoming ovate and flat with growth. Head profile concave above snout; both eyes on left side, separated by a wide space (larger than eye diameter in males), upper jaw about 3 or 4 times in head length; lower limb of anterior gill arch with 6 to 8 short rakers. Pelvic fin base of blind side much shorter than that of eyed side. Scales on eyed side cycloid (smooth), except at extreme upper and lower edges of body, where they are ctenoid (rough), scales on blind side cycloid, lateral line scales 72 to 108.

Distribution : Indo-West Pacific, demersal, found in continental shelves throughout the area, eastward to Japan. Observed on the Muddy and sandy trawling grounds of the continental shelf.

Biology : Rare species. Feeds on benthic animals. Flounders ambush their prey, feeding at soft muddy areas of the sea bottom, near bridge piles, docks and coral reefs. A flounder's diet consists mainly of fish spawn, crustaceans, polychaetes and small fish. Most sexually dimorphic characters develop at about 8 cm SL. The larva prefers darkness. In its life cycle, an adult flounder has two eyes on one side of its head, and at hatching one eye is on each side of its head. One eye migrates to the other side of the body through a metamorphosis as it grows from larval to juvenile stage. As an adult, a flounder changes its habits and camouflages itself by lying on the bottom of the ocean floor as protection against predators. As a result, the eyes are then on the side which faces up.

Uses: Marketed fresh or used in making fish meal

31. *Parupeneus heptacanthus* (Lacepède, 1802)

Class: Actinopterygii

Order: Perciformes

Family: Mullidae

Common name: Cinnabar goat fish



Fig: 38

Description: Body red shading to silvery white ventrally. Scale margins darker with a blue to pearly spot centrally on the back. Scales on back and sides with light circular central spots, forming about 5 horizontal lines to caudal peduncle, more clear in the mid body specially bellow dorsal fins. 2nd dorsal fin with horizontal pink or violet stripes, but no stripes on 1st dorsal; anal fin with yellow stripes. Caudal fin with vertical pink stripes. A small reddish spot on the 7th and 8th lateral line scales in adults. Cheek, snout and interorbital space with a few inconspicuous iridescent blue lines-diagonally placed. Faint narrow pale blue bands on second dorsal and anal fins. Body rather deep, upper profile forming a characteristic regular arch; interorbital space convex. Mouth ventral and small. Teeth in both jaws in a single row, none on vomer and palatines. Three vertical rows of scales along the space between dorsal fin. Pelvic fin short not reaching to anal fin, anal-fin origin at about one eye diameter behind of second dorsal-fin origin, caudal fin forked.

Distribution: Indo-West Pacific from the eastern coast of Africa. Occurs singly or in small groups over muddy, sandy, rubble, or seagrass bottoms of lagoon and seaward reefs, usually below 20 m.

Biology : Goatfishes are tireless benthic feeders, using a pair of long chemosensory barbels protruding from their chins to rifle through the sediments in search of prey. They feed on worms, crustaceans, molluscs and other small invertebrates. Goatfishes are pelagic spawners; they release many buoyant eggs into the water which become part of the plankton. The eggs float freely with the currents until hatching. The larvae drift in ocean waters or in the outer shelf for a period of 4–8 weeks until they metamorphose and develop barbels. Soon thereafter most species take of bottom-feeding life-style, although other species remain in the open water as juveniles or feed on plankton. Juvenile goatfishes often prefer soft bottoms, in seagrass beds to mangroves.

Uses: Flesh is fairly good for human consumption.

32. *Rastrelligal kanagurta*(Cuvier,1816)

Class: Actinopterygii

Order: Perciformes

Family: Scombridae

Common name: Mackerel



Fig: 39

Description:Narrow dark longitudinal bands on upper part of body (golden in fresh specimens) and a black spot on body near lower margin of pectoral fin; dorsal fins yellowish with black tips, caudal and pectoral fins yellowish; other fins dusky. Body moderately deep, its depth at margin of gill cover 4.3 to 5.2 times in fork length, head longer than body depth. Maxilla partly concealed, covered by the lacrimal bone, but extending to about hind margin of eye, gillrakers very long, visible when mouth is opened, 30 to 46 on lower limb of first arch, a moderate number of bristles on longest gillraker.

Distribution:An epipelagic,neritic species occurring in areas where surface water temperatures are at least 17° C. Widespread in the Indo-West Pacific from South Africa.

Biology :Schooling is by size.The spawning season around India seems to extend from March through September. Spawning is in several batches. Juveniles feed on phytoplankton (i.e. diatoms) and small zooplankton such as cladocerans, ostracods, larval polychaetes, etc. With growth they gradually change their dietary habits, a process that is reflected in the relative shortening of their intestine. Hence, adult Indian mackerel prey primarily on macroplankton such as larval shrimps and fish.Longevity is believed to be at least 4 years.Indian mackerel is caught with purse seines , encircling gillnets, high-opening bottom trawl, lift nets, and bamboo stake traps. The Indian mackerel do not guard their eggs, which are left to develop on their own.

Uses: Marketed fresh, frozen, canned, dried salted, and smoked.Mackerel flesh is high in omega-3 oils.The flesh of mackerel spoils quickly, especially in the tropics, and can cause scombroid food poisoning. Accordingly, it should be eaten on the day of capture, unless properly refrigerated or cured.

33. *Ambassis ambasis* (Lacepede, 1802)

Class: Actinopterygii

Order: Perciformes

Family: Ambassidae

Common name: Glassy Perchlet



Fig: 40

Description: Semitransparent, usually with dark scale outlines and silvery sheen on side of head and belly. Small percoid fishes; body oblong. Eyes large, much greater than snout length. Margins and ridges of preorbital, suborbital, supraorbital, preopercle, and interopercle frequently serrate. Mouth moderately large, only slightly protractile, jaws equal or lower one slightly protruding; angle of jaw oblique, about 40° to horizontal. Bands of villiform teeth on jaws, vomer, and palatines. Caudal fin forked. Branchiostegal rays 6. Scales large and cycloid, extending onto head and base of median fins; cheeks and operculum scaly; lateral line continuous or interrupted in middle portion.

Distribution: India, found in mangrove shores, brackish estuaries, and fresh waters, always in shallow depths. Forms resting aggregations during the day among the roots of mangrove trees and aquatic plants.

Biology: They disperse at night to feed on micro-crustaceans (cladocerans, ostracods, and copepods), aquatic and terrestrial insects, and occasional fishes.

Uses: Too small to be commercially important, although they are sometimes dried and salted; also used as bait fishes.

34. *Scomberoides commersonianus* (Lacepede, 1801)

Class: Actinopterygii

Order: Perciformes

Family: Scomberoidinae

Common name: Double spotted queen fish



Fig: 41

Description: *Scomberoides commersonianus* has a single row of 5-6 large dark silvery spots or blotches running along the flanks over the lateral line. It does not have a dark tip on the dorsal fin lobe. The snout is rather blunt and the large mouth has several rows of very sharp teeth. The anal fin and the dorsal fin are truncated with the posterior part of each fin reduced to spines. The caudal fin is strongly forked. The head and back is bluish grey while the ventral side of the body is silvery. It grows to a maximum total Length of 120 centimetres and the maximum weight is 16 kilograms. Upper jaw extends well beyond posterior margin of eye, especially in large adults; adults with inner and outer row teeth in lower jaw subequal in height.

Distribution: Wide distribution in the Indian Ocean and western Pacific Ocean. The adults of *Scomberoides commersonianus* are found in coastal waters, and frequently occur in the vicinity of reefs and offshore islands. They occasionally enter into estuarine waters.

Biology: It is normally found in small schools. The adults are predatory, feeding on fishes, cephalopods, small invertebrates and other pelagic prey. The juveniles use their rasping teeth to feed on the scales and epidermis of other fishes. The females attain sexual maturity when they reach a fork length of 63 centimetres at around 4–5 years old. Spawning occurs between March and June. The fecundity of females when mature was estimated at 259,488–2,859,935 eggs in each spawning.

Uses: The queenfish is an important commercial and recreational species.

35. *Alepes djedaba*(Forskkaal, 1775)

Class: Actinopterygii

Order: Perciformes

Family: Carangidae

Common name: Shrimp scad



Fig: 42

Description:The colour of the body is an overall silver colour, with a green-blue tone on the upper body, while the underside fades to a more white 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. The posterior scutes may also be a yellow to rusty colour, especially after removal from the water. It reaches a maximum known length of 40 cm. Oblong, compressed body and dorsal and ventral profiles which are almost evenly convex. 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. There are two moderately high, separate dorsal fins. The anal fin has two detached spines followed by one spine connected to 18 to 20 soft rays. The anterior section of the lateral line is strongly curved.

Distribution: The shrimp scad is distributed throughout the Indo-Pacific region .

Biology:The shrimp scad is known to be a migratory species, with records from India indicating the fish resides and feeds in the waters of Madras from September to May, before migrating elsewhere to spawn. The shrimp scad feeds on a variety of prey, with at least two shifts in diet occurring as the fish mature. Older individuals feed mainly on young fishes, crustaceans like decapods, ostracods, amphipods and cladocerans with minor amounts of nematodes, insect body parts and insect larvae taken.

Uses:Considered a good for eating fish.

36. *Sphyraena forsteri* (Cuvier, 1829)

Class: Actinopterygii

Order: Perciformes

Family: Sphyraenidae

Common name: Big-eye barracuda



Fig:43

Description: Silvery body. Body without bars and stripes, a dusky blotch present behind axil of pectoral fins; caudal fin darkish. A medium-sized species. Maxilla either not reaching anterior margin of eye, or to just below anterior margin. Caudal fin typically forked in all stages, without a pair of lobes at posterior margin. Origin of pelvic fins before first dorsal-fin origin. Lateral-line scales 112 to 133. Body elongate, subcylindrical or slightly to compressed covered with small, cycloid scales. Head long, pointed, scaly on sides and posteriorly on top. Mouth nearly horizontal, large. Jaws elongate, the lower one considerably projecting; large, sharp, flattened or conical teeth of unequal size on jaws and palatines; usually 1 or 2 strong, sharp canines near tip of lower jaw. Pectoral fins short, placed on or below axis of body; pelvic fins placed abdominal, Branchiostegal rays 7. Lateral line well developed.

Distribution: Widespread in the tropical and subtropical Indo-Pacific. Occurring in all tropical and temperate seas. Most of them inhabit shallow coastal waters such as bays, estuaries, or the vicinity of coral reefs, but also in the surface of open oceans or down to depths of 100 m or more. Juveniles usually found in mangrove swamps or estuaries of rivers

Biology: Carnivorous. Barracudas frequently occur in small to large schools, but adults are solitary. They are caught by handlines, gill nets, set nets, or trawls. Also a good target of anglers, and many are caught by trolling artificial lures. Attacks on humans have been documented but these are frequently the result of incorrect identification or a result of provocation (e.g. after spearing), it is frequently reported that barracudas are attracted by metal objects flashing in the sun, particularly in murky water.

Uses: Barracudas are marketed fresh, frozen, dried, salted, or smoked.

37. *Thryssa mystax* (Bloch & Schneider, 1801)

Class: Actinopterygii

Order: Clupeiformes

Family: Engraulidae

Common name: Moustached thryssa



Fig: 44

Description: Back blue/green, flanks silvery, a black venulose area behind gill opening, with a golden area before it. Dorsal fin lemon yellow with a dusky tip, caudal fin lemon yellow with upper, lower and hind edges black, anal fin clear. Body fusiform, compressed; belly with a sharp keel of scutes from isthmus (between gill openings on underside of head) to anus. Maxilla produced reaching to the base of first pectoral fin ray; gillrakers usually 13 to 16 on lower limb of first arch, their serrae uneven but not clumped. Anal fin long, usually with 31 to 36 branched rays.

Distribution: Coasts of Pakistan, India and Sri Lanka, eastward to Indonesia. Pelagic in coastal waters, also in estuaries. Found in coastal pelagic waters and often observed as entering mangroves and adjacent brackish waters. Juveniles and adults may penetrate the upper reaches where mixohaline-mesohaline conditions prevail.

Biology: Eggs and larvae are found in the lower reaches of the mangroves. It is a schooling species found mostly inshore. Feed on planktonic organisms in coastal waters. Juveniles in mangroves feed on larvae of shrimps and fish.

Uses: A traditional method of processing and preserving is to gut and salt them in brine, allow them to cure, and then pack them in oil or salt. They are used in small quantities to flavor many dishes. Fishermen also use them as bait for larger fish, such as tuna and sea bass.

38. *Abalistes stellanus*(Anonymous,1798)

Class:Actinopterygii

Order:Tetradontiformes

Family: Ballistidae

Common name: Starry trigger fish.



Fig: 45

Description:Body grey brown dorsally with very small pale spots, becoming whitish ventrally with brownish yellow spots many of which anastomose into a reticulum; 3 large oval white spots along the back and a small one dorsally on caudal peduncle; a broad white streak often on side of body posterior to upper end of gill opening. An oblique groove before the eye. Behind the gill opening are large osseous scales. Front of soft dorsal and anal fins not elevated; caudal fin double emarginate, lobes longer with growth. Depressed caudal peduncle, width greater than least depth, very slender and tapering, much longer than deep. As a protection against predators, triggerfish can erect the first two dorsal spines: The first (anterior) spine is locked in place by erection of the short second spine, and can be unlocked only by depressing the second, “trigger” spine, hence the family name “triggerfish”. Triggerfish have an oval-shaped, highly compressed body. The head is large, terminating in a small but strong-jawed mouth with teeth adapted for crushing shells. The eyes are small, set far back from the mouth, at the top of the head. The anal and posterior dorsal fins are capable of undulating from side to side to provide slow movement and comprise their primary mode of propulsion. The sickle-shaped caudal fin is used only to escape predators. Gill plates (opercula), although present, are also not visible, overlaid by the tough skin, covered with rough, rhomboid scales that form a stout armor on their bodies.

Distribution:Inhabits mud and silt sand bottoms. Adults on deep coastal slopes and usually seen swimming high above the bottom, sometimes found in estuaries. Juveniles in sheltered coastal bays and estuaries with outcrops of rubble or debris on open substrates

Biology:They feed on slow-moving, bottom dwelling crustaceans, molluscs, sea urchins and other echinoderms, generally creatures with protective shells and spines. Many will also take small fishes as food.

Uses:Aquarium fish

39. *Gymnothorax reticularis* (Bloch, 1795)

Class: Actinopterygii

Order: Anguilliformes

Family: Muraenidae

Common name: Dusky-banded moray



Fig: 46

Description: Greyish with brownish bands, colour patterns may change considerably with age. Robust, powerful eels, their body firm, muscular and somewhat compressed along the tail. Typically, the dorsal profile above and behind the eye is steep due to the development of strong head muscles; anterior nostrils tubular at front of snout, posterior nostrils above anterior portion of eye, teeth in jaws usually strong, ranging from sharply pointed and depressible canines to blunt molars; teeth on vomer, each gill opening restricted to a small, roundish, lateral hole or slit. No spines in fins; vertical fins developed, dorsal fin originating on head and anal fin immediately behind anus, both fins restricted to tail tip; pectoral and pelvic fins absent. No scales. No lateral line pores on body, but a reduced complement of lateral line pores on head.

Distribution: Found along western Pacific and Indian Oceans. Inhabiting essentially shallow waters in tropical areas. Morays are most abundant on reefs or in rocky areas where they find protection in holes and crevices.

Biology: They are scavengers and predators which become active mainly at night. They are prone to cause deep wounds with their powerful jaws and teeth if provoked, but usually they do not leave their hiding places to attack swimmers. Their remarkable vitality outside the water, and their slippery bodies contribute to increase the rate of accidents among fishermen, especially in small boats. Morays are most often speared or caught on longlines and in traps.

Uses: They are eaten in many parts of the world. Cannot be considered to be of significant commercial importance at present. Consumption of large individuals of morays may cause fatal poisoning (ciguatera) in coral reef areas. Used also in ornamental purposes.

40. *Lactoria cornuta* (Linnaeus, 1758)

Class: Actinopterygii

Order: Tetradontiformes

Family: Ostracidae

Common name: Cow fish



Fig: 47

Description: The longhorn cowfish, also called the horned boxfish, is recognizable by its long horns that protrude from the front of its head, rather like those of a cow or bull. There is no known sexual dimorphism, so both male and female display a olive base color, which is decorated with white spots. One distinction from other fish is the lack of a gill cover, which is replaced by a small slit or hole. The hexagonal plate-like scales of these fish are fused together into a solid, triangular, box-like carapace, from which the fins and tail protrude. Their unique method of swimming, called ostraciiform swimming, causes them to look as if they are hovering. They have no pelvic skeleton, so they lack pelvic fins.

Distribution: They are a resident of the Indo-Pacific region.

Biology: They are omnivorous, feeding upon benthic algae, various microorganisms, and foraminiferans that it strains from sediments, sponges, polychaete worms from sand flats, also on molluscs, small crustaceans, and small fish. They are able to feed on benthic invertebrates by blowing jets of water into the sandy substrate. Paired courtship just before or after sunset. Developmental stage are pelagic. They are such slow swimmers so cowfish are easily caught by hand, they make a grunting noise when captured. If severely stressed, this species may be able to exude deadly toxin, hemolytic, heat-stable, non-dialyzable, non-protein poison in the mucous secretions of their skin. It is apparently unique among known fish poisons, it is toxic to the boxfish and mimics sea cucumber toxins in general properties. The horns of the Longhorn cowfish may have evolved to make it more difficult to swallow for predators. When damaged, these horns can grow back within a few months. These horns are mostly hollow and composed of mineralized collagen fibers.

Uses: This is the most well-known cowfish species in the aquarium trade.

41. *Thryssa setirostris* (Broussonet, 1782)

Class: Actinopterygii

Order: Clupeiformes

Family: Engraulidae

Common name: Longjaw thryssa



Fig: 48

Description: Head with gold tints; anal and caudal fins light yellow, a black area behind upper part of gill opening. Body fairly compressed, very long maxilla, reaching at least to tip of pectoral fin, usually to pelvic fin base or even to anal fin origin. The jaw rising steeply in the mouth. Lower gillrakers 10 to 12. They are small silvery, herring-like fishes with a conical snout extending beyond the lower jaw, a large mouth reaching well beyond the eye, a single short-based dorsal fin at about mid-body, pectoral fins low on the sides, pelvic fins abdominal, originating before or below the dorsal-fin base, a forked tail and a wide silvery stripe along the mid-sides. The body is covered in smooth, often weakly attached scales. Tip of snout about level of upper rim of eye. Maxilla moderate first supra-maxilla small, oval, jaw teeth small. A dark blotch behind upper part of gill opening; small spots on cheek, gill cover, maxilla and paired fins; gill arches pinky orange, inside of gill cover yellow and gold, inner part of anal fin deep yellow, margin whitish.

Distribution: Indo-Pacific. Presumably schooling occurring mostly close inshore and entering bays and estuaries

Biology: Feeds mainly on crustaceans (zoea larvae, amphipods, *Acetes*). May be caught using ringnets. They are filter-feeders that open their mouths as they swim. They produce pelagic eggs and the larvae are pelagic.

Uses: A traditional method of processing and preserving is to gut and salt them in brine, allow them to cure, and then pack them in oil or salt. They are used in small quantities to flavor many dishes. Used as bait in the tuna fishery in the South Pacific.

42 *Atule mate* (Cuvier, 1833)

Class: Actinopterygii

Order: Carangiformes

Family: Carangidae

Common name: Yellow tailed scad



Fig: 49

Description: The yellowtail scad is a bright olive green above, transitioning to a more golden green ventrally, before becoming silvery white on the underside of the fish. 9 to 16 faint grey bars run vertically on the sides of the fish, as well as a black spot slightly smaller than the eye on the upper margin of operculum and adjacent shoulder region. The caudal and dorsal fins are a characteristic greenish yellow colour, the pelvic fins are white, while the rest of the fins are hyaline. Adipose eyelid well developed and completely covering eye except for a vertical slit centred on pupil; shoulder girdle margin smooth, without papilla, terminal dorsal and anal rays finlet-like in adults, about twice length of adjacent rays and a little more separated but joined by interradiation membrane; lateral line gently arched anteriorly, with junction of curved and straight parts below vertical from sixth to eighth soft rays of second dorsal fin.

Distribution: Indo-Pacific, Adults inhabit mangroves and coastal bays in pelagic waters

Biology: They form schools to about 50m in inshore waters. Are mainly diurnal. They feed mainly on crustaceans and planktonic invertebrates such as copepods, including cephalopods. They swim fast in midwater in pursuit of zooplankton. The size at sexual maturity is between 150 and 160 mm. The species has been observed to spawn in open areas of bays at least 10 m deep mostly between March and October, but there is significant yearly differences in the length of the season. Spawning occurs in the morning. Females release 63,000 to 161,000 eggs per batch. The species is taken by a variety of fishing methods including beach seines. It is caught gill netting, as well as hook and line methods involving jigging with lures.

Uses: The yellowtail scad is a highly valued seafood prepared by boiling, steaming and frying. It may also be dried and salted to preserve the flesh.

43. *Sillago sihama* (Forsk., 1775)

Class: Actinopterygii

Order: Perciformes

Family: Sillaginidae

Common name: Silver silago



Fig: 50

Description: Back light brown, lower ventral flanks and belly whitish or silvery, without dark blotches. Both dorsal fins and caudal fin dusky, other fins pale. Body elongate. Snout pointed; upper head profile slightly convex; mouth small, terminal, villiform teeth present in jaws and on vomer (roof of mouth), 2 or 3 (usually 2), series of scales on cheeks; a small, sharp spine on opercle; gillrakers on lower limb of first arch 7 to 9. First dorsal fin higher than second and with 11 weak spines; second dorsal fin with 1 spine and 20 to 23 soft rays; anal fin with 2 spines and 21 to 24 soft rays. Lateral line with 66 to 73 scales; 5 to 6 scale rows above lateral line. They have a swim bladder characterised by a single, long posterior extension which tapers to a slender point. The anterior end of the organ has three long median projections, with the central extension the longest.

Distribution: Eastern Indian Ocean and Western Central Pacific, southward to the northern coasts of Australia. They are found in shallow sandy flats, bays, surf zones of beaches, protected eelgrass seabeds and occasionally estuaries. They are a shallow water species, operating in depths between 0 and 30 m.

Biology: Benthic in nature. Schooling species like most other sillaginids, and similarly are able to burrow into the sand to escape predators or forage for prey. Fish are taken by a variety of methods including seine, gill and cast nets as well as by line. Amphipods, bivalves, caridean shrimps, crabs and small fish also contribute to the diet. There is a shift in diet as size increases, to avoid intraspecific competition. It produces between 13,600 and 68,900 egg in a spawning period, which occurs between June and October. Juveniles tend to use eelgrass beds as a nursery area, gaining both food and protection from these habitats while adults move to more exposed areas.

Uses: Recreational fishing for them is common, they are used as food fish or for live bait for larger species. Used in estuarine aquaculture in India. They can be very delicious when deep fried.

44. *Pseudorhombus arsius* (F. Hamilton, 1822)

Class: Actinopterygi

Order: Pleuronectiformes

Family: Bothidae

Common name: Largetooth flounder



Fig: 51

Description: Two dark spots are situated on the central part of its dorsal surface, one just to the posterior of the pectoral fin and the second is midway between the forward spot and the tail. Pale brownish in colour. It can vary the colour of the body so that it closely matches the surface the fish rests on. *Pseudorhombus arsius* has an oval-shaped body. The head has a slight notch in front of upper eye. The eyes are on the left side, the snout has a length equal to or slightly greater than the diameter of the eye. The dorsal fin starts in front of its upper eye and of the nostrils on blind side. The mouth forms a deep cleft with the maxilla normally almost half the length of the head. The jaws and teeth are nearly equally developed on both jaws. The upper jaw reaches to below the posterior edge of the lower eye. There are several pairs of moderately large teeth in the anterior parts of both jaws, which are of unequal size and arranged in a single row. They grow to 50 cm.

Distribution: Indo-West Pacific: Persian Gulf and east coast of Africa. *Pseudorhombus arsius* occurs in shallow waters and in estuaries where the substrate consists of mud and sand bottoms, to depths of 200 m. The juveniles are common in brackish water. When they are spawning they are found in shallow water on sandbanks and close to shore. They move to deeper waters in the winter.

Biology: They are predators which prey mainly on benthic animals. The spawning season runs for 3 to 4 months, from April to July and peaks in April and May, during which they move into the sandy shallows close to the shore. The spawn is laid in a single batch. They mature when they attain a total length of between 16 and 17 cm in total length. The sex ratio is always biased towards females and the fecundity of the fish is dependent on its total length and body weight.

Uses: Useful in minor commercial fishery in West Bengal in the estuary of the Hooghly River. Otherwise it is used for recreational angling.

45. *Fistularia petimba*(Lacepede,1803)

Class: Actinopterygii

Order: Sygnathiformes

Family: Fistularidae

Common name: Red cornet Fish



Fig: 52

Description:In life red to orange-brown above, silvery below, dorsal fin and vertical fins also have an orange cast. Body elongate and depressed. Mouth at end of a long, tubular snout, hexagonal in cross section; teeth in jaws small; ridges on snout with forward-pointing serrations, the upper ridges parallel; interorbital space narrow and nearly flat. Dorsal and anal fins short-based and opposite. Lateral line arched, running anteriorly almost along middle of back, then bending down to middle of sides and continuing posteriorly onto an elongate filament produced by the middle 2 caudal fin rays; posterior lateral-line ossifications bearing sharp, retrorse (backward-pointing) spines. A row of elongate bony plates present on midlines of body just anterior to dorsal or anal fin; spinules in skin well developed at all sizes. Vertebrae 76, the first 4 elongate and fused. Maximum length reported is 200 cm

Distribution:It is widespread in the tropical and subtropical waters of the Indo-Pacific. Found in the sublittoral zone, inhabits coastal areas over soft bottoms, usually at depths greater than 10 m .
Benthopelagic

Biology:Solitary predator, stalking and feeding on small fishes, crustaceans, and squid. Sometimes, they feed in small groups along the bottom on small fish which their long snouts are very efficient at sucking up. Reproduction is oviparous. The large eggs hatch and develop outside of the body. Larvae hatch at 6–7 millimetres

Uses: The fish is of minor importance commercially, mostly being sold as fish meal but also fresh and preserved. It is also sold as an aquarium fish.

46. *Arius jella* (Day, 1877)

Class: Actinopterygii

Order: Siluriformes

Family: Ariinae

Common name: Cat fish.



Fig: 53

Description: Distinguished by accessory tooth plates, which are either very elongated and bearing molar-like teeth. *Arius* species have three pairs of barbels, including the fleshy and cylindrical maxillary barbels and two pairs of mental barbels. The base of the adipose fin is moderately long, about half the length of the base of the anal fin.

Distribution: Indian Ocean. Widely distributed in the coastal areas and estuarine habitats.

Biology: In estuaries, it appears to have adapted an opportunistic feeding habit depending on the food source available, which includes fish eggs, shrimp larvae, and waste food from sewage. Feeds mainly on invertebrates. Caught with stake traps, shore seines, set bagnets and on hook and line. It is a mouth brooding fish. The ova are large and yolky non-functional ova are also extruded at the time of spawning. After retaining the large functional ova in the mouth, the non-functional ova are probably eaten by the male parent to maintain basal metabolism. They can locate their prey efficiently in the muddy waters through their well-developed sense of smell and vision. The presence of maxillary barbels serves as an important sensory organ in search for embedded prey in the muddy sediment. Efficiency in fertilisation and transfer of eggs was brought about by enlarged pelvic fins of the female. The oral cavity of the incubating male gets enlarged to receive a large number of eggs and the oral epithelium secretes large quantity of mucus for the safe carrying of eggs or embryos in the mouth. Early hatching embryos commence feeding on inhaled particles when still in possession of large yolk. The hatchlings develop into fingerlings which normally swim in the shallow coastal waters and mangrove creeks.

Uses: Being an important food fish, it supports subsistence fisheries in both lagoons and estuaries. Sold mostly fresh in markets.

Table 1: List of marine fishes landed at Azheekal landing Centre, Kollam.

Sl No	Species	Order	Family
1	<i>Lepturacanthus savala</i>	Perciformes	Trichiuridae
2	<i>Pampus argenteus</i>	Perciformes	Stromatridae
3	<i>Nemiptreus japonicus</i>	Perciformes	Nemipteridae
4	<i>Priacanthus hamrur</i>	Perciformes	Priacanthidae
5	<i>Scomberomorus guttatus</i>	Perciformes	Scombridae
6	<i>Sardinella longiceps</i>	Clupeiformes	Clupeidae
7	<i>Mene maculata</i>	Perciformes	Menidae
8	<i>Leiognathus equulus</i>	Perciformes	Leiognathidae
9	<i>Lactarius lactarius</i>	Perciformes	Lactariidae
10	<i>Sphyraena jello</i>	Perciformes	Sphyraenidae
11	<i>Nibeas soldado</i>	Perciformes	Sciaenidae
12	<i>Thryssa malabaricus</i>	Clupeiformes	Engraulidae
13	<i>Decapterus russelli</i>	Carangiformes	Carangidae
14	<i>Anguilla bengalensis</i>	Anguilliformes	Anguillidae
15	<i>Scoliodon laticaudus</i>	Carcharhiniformes	Carcharinidae
16	<i>Odonas niger</i>	Tetradontiformes	Balistidae
17	<i>Saurida tumbil</i>	Aulopiformes	Synodontidae
18	<i>Acreichthys tomentosus</i>	Tetradontiformes	Monacanthidae
19	<i>Stolephorus indicus</i>	Clupeiformes	Engraulidae
20	<i>Aluterus monoceros</i>	Tetradontiformes	Balistidae
21	<i>Zebrias synapturoides</i>	Pleuronectiformes	Soleidae
22	<i>Lagocephalus inermis</i>	Tetradontiformes	Tetradontidae
23	<i>Secutor insidiator</i>	Perciformes	Leiognathidae
24	<i>Chirocentrus nudus</i>	Clupeiformes	Chirocentridae
25	<i>Uranoscopus marmoratus</i>	Perciformes	Uranoscopidae
26	<i>Lutjanus argentimaculatus</i>	Perciformes	Lutjanidae

27	<i>Terapon theraps</i>	Perciformes	Terapontidae
28	<i>Cynoglossus macrostomus</i>	Pleuronectiformes	Cynoglossidae
29	<i>Sardinella gibbosa</i>	Clupeiformes	Clupeidae
30	<i>Bothus myriaster</i>	Pleuronectiformes	Bothidae
31	<i>Parupeneus heptacanthus</i>	Perciformes	Mullidae
32	<i>Rastrelligar kanagurta</i>	Perciformes	Scombridae
33	<i>Ambassis ambasis</i>	Perciformes	Ambassidae
34	<i>Scomberoides commersonianus</i>	Perciformes	Scomberoidinae
35	<i>Alepes djedaba</i>	Perciformes	Carangidae
36	<i>Sphyraena forsteri</i>	Perciformes	Sphyraenidae
37	<i>Thryssa mystax</i>	Clupeiformes	Engraulidae
38	<i>Abalistes stellanus</i>	Tetradontiformes	Ballistidae
39	<i>Gymnothorax reticularis</i>	Anguilliformes	Muraenidae
40	<i>Lactoria cornuta</i>	Tetradontiformes	Ostracidae
41	<i>Thryssa setirostris</i>	Clupeiformes	Engraulidae
42	<i>Atule mate</i>	Carangiformes	Carangidae
43	<i>Sillago sihama</i>	Perciformes	Sillaginidae
44	<i>Pseudorhombus arsius</i>	Pleuronectiformes	Bothidae
45	<i>Fistularia petimba</i>	Sygnathiformes	Fistularidae
46	<i>Arius jella</i>	Siluriformes	Ariinae

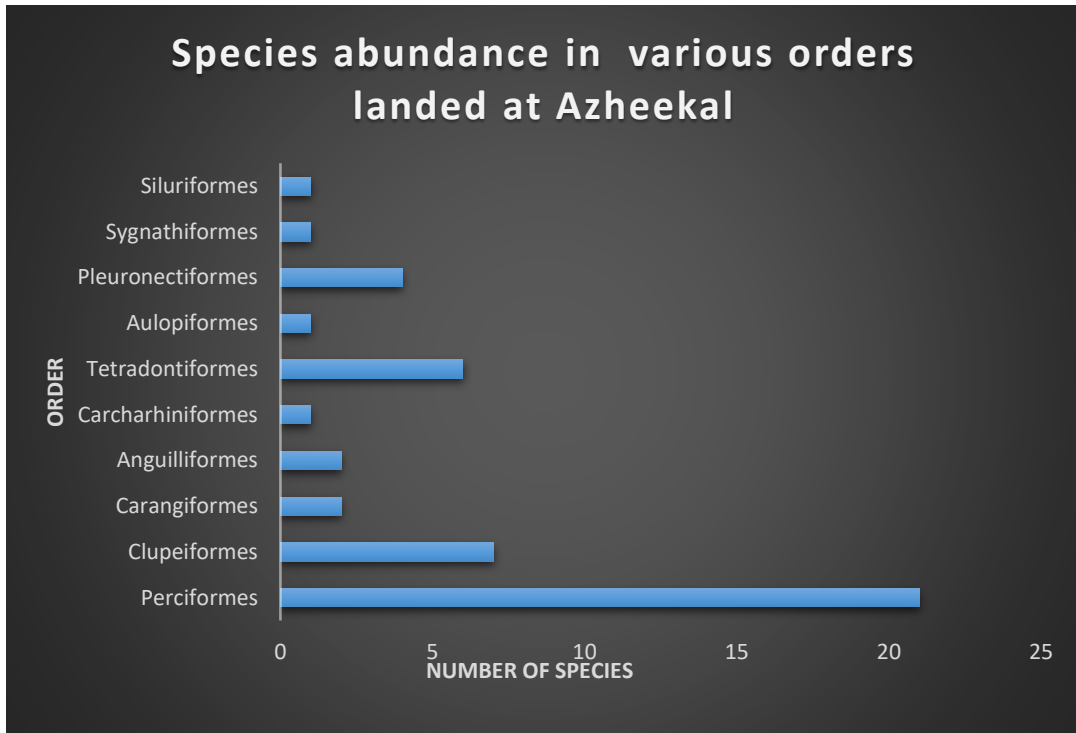


Fig 54 : Species abundance in various orders landed at Azheekkal landing centre.

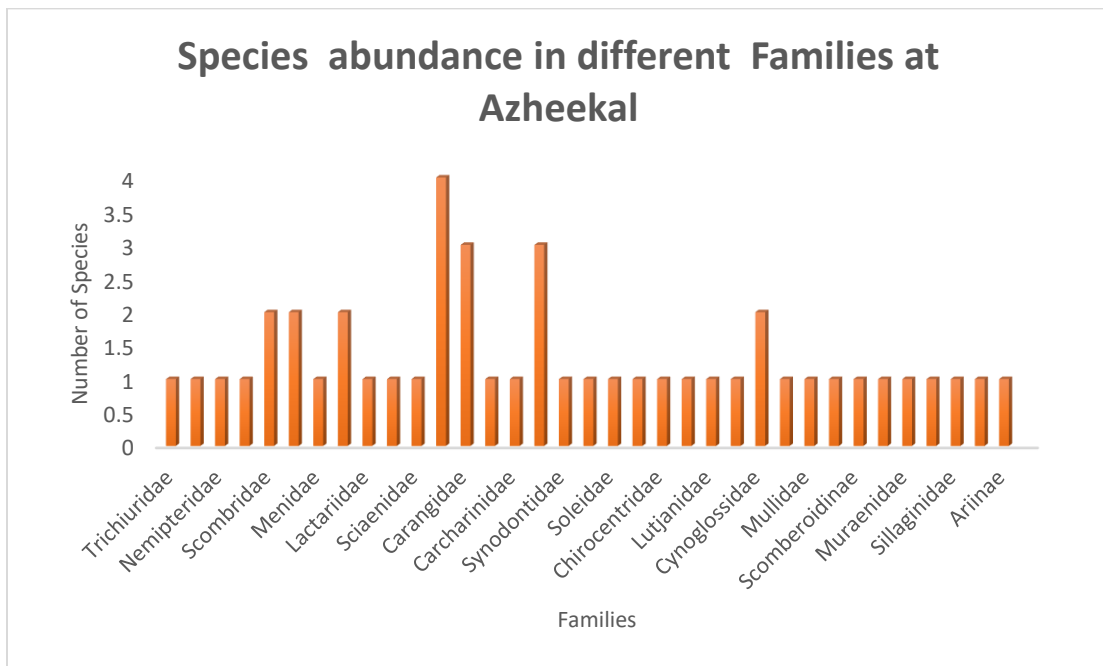


Fig 55:Species abundance in various Families landed at Azheekkal Landing centre

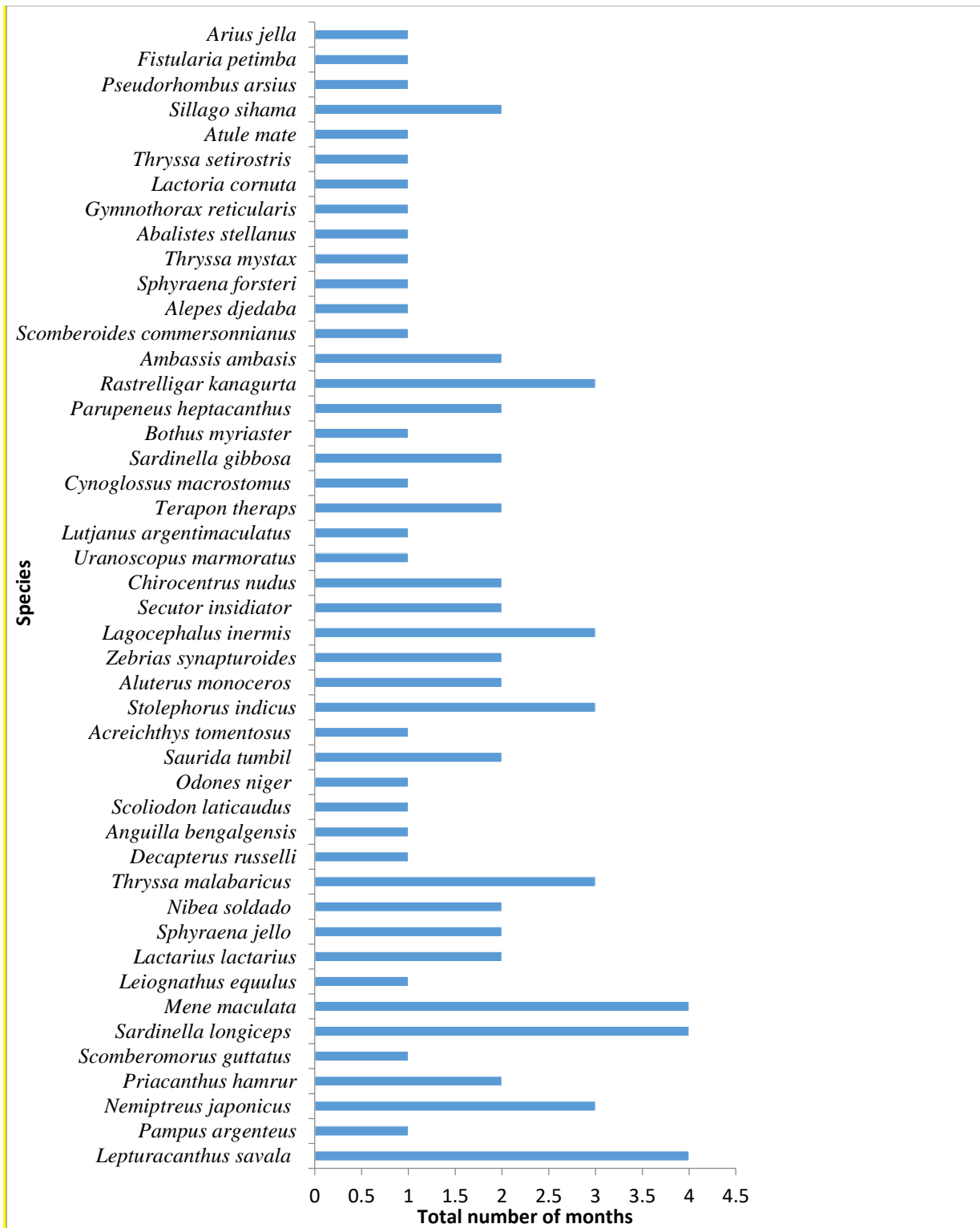


Fig : 56 Monthly availability of fish species at Azheekal landing centre.

DISCUSSION

Taxonomic studies on marine fish landings at Azkeekal landing centre, Kollam revealed the presence of 46 species classified under 10 order and 35 families (Table 1). The Order Perciformes represented the most diverse fish marine fish order with a species diversity of 21 species followed by Clupeiformes (7 species each), Tetradontiformes (6 species each), Pleuronectiformes (4 species each), Carangiformes (2 species each), Anguilliformes (2 species each), Carcharhiniformes (1 species each), Aulopiformes (1 species each), Sygnathiformes (1 species each) and Siluriformes (1 species each)(Fig 54). The species rich family was Engraulidae with a species diversity of 4 species followed by Carangidae and Balistidae (3 species each)(Fig 55).

Lepturacanthus savala, *Pampus argenteus*, *Nemipterus japonicus*, *Priacanthus hamrur*, *Scomberomorus guttatus*, *Sardinella longiceps*, *Mene maculate*, *Leiognathus equulus*, *Lactarius lactarius*, *Sphyraena jello*, *Nibea soldado*, *Thryssa malabaricus*, *Decapterus russelli*, *Saurida tumbil*, *Stolephorus indicus*, *Secutor insidiator*, *Chirocentrus nudus*, *Sardinella gibbosa*, *Parupeneus heptacanthus*, *Rastrelligara kanagurta*, *Scomberoides commersonianus*, *Alepes djedaba*, *Sphyraena forsteri*, *Thryssa mystax*, *Thryssa setirostris* and *Atule mate* were the commercially important food fishes obtained during the study.

Anguilla bengalensis and *Gymnothorax reticularis* were the two eel species observed during the study. *Anguilla bengalensis* can be found in the the rivers too. *Gymnothorax reticularis* is mostly used for ornamental purposes. *Scoliodon laticaudus* was the only species of Shark observed in the study. Ornamental fishes were obtained during the study this include fishes which were used solely for ornamental purposes such as *Odonas niger*, *Abalistes stellanus*, *Lactoria cornuta* and fishes such as *Fistularia petimba* which is used as an ornamental fish and also for limited consumption. *Acreichthys tomentosus*, *Aluterus monocerous* and *Lagocephalus inermis* is not useful for human consumption and usually discarded as trash fishes or bycatch fishes.

The extend at which trawling influences the fish landing is evident by the presence of deep sea fishes is the fish landings and most of these fishes are not suitable for human consumption such as *Zebrias synapturoides*, *Uranoscopus marmoratus*, *Cynoglossus macrostomus*, *Bothus myriaster*. and *Pseudorhombus arsius*. Fishes like, *Terapon theraps*, *Ambassis ambasis*, *Sillago sihama* and *Arius jella* show distribution in the sea and estuaries too.

The results of current study gives us information on the taxonomy and relative adundance of different species of marine fishes landed at Azkheekal landing centre. Similar studies have been conducted in different landing centres along Kerala coast.

184 species from 41 families were recorded by Sluka (2013) along the western coast of India. The most diverse fish family was *Serranidae* with 20 species. In the present study the most diverse Family is Engraulidae with 4 species. Priacanthidae, Balistidae, Lutjanidae and Fistularidae were also recorded during both studies. The Vulnerable species of shark *Nebrius ferrugineus* was recorded during the previous study. *Scoliodon laticaudus* recorded during the present study is in Near threatened status due to overfishing.

Decapterus russelli, *Nemipterus japonicus*, *Sardinella longiceps*, *Stolephorus* sps, *Priacanthus hamrur*, *Rastrelliger kanagurta*, and *Thryssa mystax* observed during the present study were recorded by Naomi (2011) from Neendakara. *Stolephorus indicus*, *Sardinella longiceps*, *Priacanthus hamrur*, *Decapterus russelli*, *Mene maculata*, *Nemipterus japonicus*, *Therapon theraps*, *Rastrelliger kanagurta*, *Zebrias synapturoides*, *Thryssa mystax* was recorded in the present study and those conducted by Bijukumar and Deepthi (2006) to survey the fishes along the Kerala coast. *Sardinella longiceps*, *Stolephorus commersonii*, *Thryssa mystax*, *Therapon theraps*, *Priacanthus hamrur*, *Decapterus russelli*, *Mene maculata*, *Nemipterus japonicus* was recorded during this study and the study conducted by Bijukumar and Rajeev (2010).

The species which were observed during the entire study period was *Lepturacanthus savala*, *Sardinella longiceps* and *Mene maculate*. *Rastrelliger kanagurta*, *Stolephorus indicus*, *Thryssa mystax*, *Nemipterus japonicus* and *Lagocephalus inermis* were the second most abundant species. The month during which most number of fish landings were obtained was November with 23 species and the landings with least species diversity was observed in December with 12 species. (Fig 56).

Ornamental fishes such as *Odonos niger*, *Abalistes stellanus*, *Lactoria cornuta*, *Fistularia petimba* were obtained during the study period. The major cause of mortality in these fishes was damages to body and fins as this fishes were obtained from trolling. If proper care is taken the fishes can be transported in live condition from sea to harbour and reared under captivity until they are marketed (Ranjeet *et al.*, 2015). It also gives the possibility for developing effective marketing channels based on consumer preference for these fishes ensuring better returns to the fishermen as well as conserving the valuable marine resource.

Ribbonfish, sardines and mackerels took a sudden leap from fishmeal to fresh-grade, where as for others, like silverbellies, the shift is more gradual. As more varieties are exported or sent to distant markets, their place in the local markets is filled by fish which were considered as trash until recently. So the fishes like *Acreichthys tomentosus*, *Aluterus monoceros* and *Lagocephalus inermis* are currently considered to be trash fish or bycatch fish may be used for human consumption as the more readily available fish species dwindle.

Zebrias synapturoides, *Uranoscopus marmoratus*, *Cynoglossus macrostomus*, *Bothus myriaster* and *Pseudorhombus arsius* are deep sea fishes and are not used for human consumption. Deep sea species that exhibit life-history characteristics that make them vulnerable to high levels of exploitation. Deep sea fisheries are unsustainable as deep sea fishing may lead to a decline in the abundance of commercial fish species. Legislation to manage deep-sea fisheries, including the introduction of a depth limit to bottom trawling may help to prevent this. Limiting bottom trawling to a maximum depth of 600 m could be an effective management strategy.

Many species observed during the study are common in all marine fish landings. Some species found during the study were rare. This indicate the presence of some unexploited and unexplored marine finfish resources along the southern Kerala coast. Perhaps the mechanization of the fishing crafts, with the use of modern equipments, high enduring capacity as well as catching

efficiency achieved by the gears have made observance of such fishes in the bycatch. For protection of Near threatened species like *Scoliodon laticaudus* fishery regulations and implementation of conservation measures, including marine protected areas should be implemented.

Conclusion

Taxonomic survey was conducted to study the taxonomy and diversity of marine fish landing at Azheekal landing centre, Kollam during October 2019 to February 2020. A total of 46 species classified under 10 orders and 35 families were recorded from the landing centre. The order Perciformes represented the most diverse fish marine fish order followed by Clupeiformes, Tetradontiformes, Pleuronectiformes, Carangiformes, Anguilliformes, Carcharhiniformes, Aulopiformes, Sygnathiformes, Siluriformes. The species rich Family was Engraulidae with a species diversity of 4 species followed by Carangidae and Balistidae .

Major fishing crafts were motorized fiber boats operating on a single day basis. The different gear types used include bottom trawling and purse seine. Catches were also caught by gillnets and encircling nets. Due to paucity of time the species diversity could only be recorded for a short duration of four months. So a detailed study should be conducted in the area in order to get more information on the fish diversity and taxonomy and to take actions for conservation and sustainable utilization. There were species belonging to higher trophic levels in the bycatch, this could have far reaching consequences, considering high level of carnivores and top level predators sustaining the fisheries in this region.

As predatory fishes are selectively removed from the oceans, the trawl must increasingly rely on species in the lower trophic level. This is found true in the case of species in the trawl bycatch of Kerala coast, as the bycatch is dominated by mid level carnivores, particularly the demersal species. However, studies extending over longer time-scale are required to unequivocally establish the decline of predatory fishes in trawl landings. The catches in all the months showed great species diversity. The multispecies nature of trawl fishing and multiday fishing could also have contributed to the greater biodiversity of the catch. The current features of trophic levels of trawl bycatch warrants policy interventions to reduce fishing pressure and to implement bycatch reduction devices along the southwest coast of India.

Another alarming finding is the presence of *Scoliodon laticaudus* which is near threatened. The extinction risk of sharks, rays and chimaeras is higher than that for most other vertebrates due to low intrinsic population growth rates of many species and the fishing intensity they face. The Arabian Sea and adjacent waters border some of the most important chondrichthyan fishing and trading nations globally, yet there has been no previous attempt to assess the conservation status of species occurring here. Results indicate that the Arabian region is home to 15% of described Chondrichthyans including 30 endemic species and has some of the most threatened Chondrichthyan populations in the world. Chondrichthyan populations have significantly declined due to largely uncontrolled and unregulated fisheries combined with habitat degradation. Further, there is limited political will and national and regional capacities to assess, manage, conserve or rebuild stocks. Outside the few deep sea locations that are lightly exploited, the prognosis for the recovery of most species is poor in the near-absence of management. Concerted national and regional management measures are urgently needed to ensure extinctions are avoided, the sustainability of more productive species is secured, and to avoid the continued thinning of the regional food security portfolio.

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