COMMERCIALLY IMPORTANT FOOD FISH SPECIES FROM KOLLAM, KERALA

DISSERTATION
Submitted to the University of Kerala
in the partial fulfilment of the requirement for the
BACHELOR OF SCIENCE IN
ZOOLOGY

Department of Zoology

TKM COLLEGE OF ARTS AND SCIENCE, KOLLAM – 5

2022-2025

COMMERCIALLY IMPORTANT FOOD FISH SPECIES FROM KOLLAM, KERALA

Dissertation Submitted to the University of Kerala in the partial fulfilment of the requirement for the Bachelor of Science in Zoology

BY

25022142001	Abhirag AR
25022142004	Azmi. S
25022142017	Abhin R
25022142010	Gowri J
25022142027	Shahana S
25022142035	Yadhukrishnan S

Department of Zoology

TKM COLLEGE OF ARTS AND SCIENCE, KOLLAM – 5

2022-2025

DECLARATION

I hereby declare that this dissertation entitled **"COMMERCIALLY IMPORTANT FOOD FISH SPECIES FROM KOLLAM, KERALA"** is a bonafide record of research work done by me under the supervision and guidance of Dr. Rohini Krishna MV, Assistant Professor and HOD, Department of Zoology in partial fulfilment of the requirements for the Bachelor of Science of the University of Kerala and that no part of this has been presented earlier for any other degree, diploma or similar title of this University or any other University.

Name :

Signature :

Candidate Code :

Kollam

../../2025

CERTIFICATE

This is to certify that the work embodied in the thesis entitled **"COMMERCIALLY IMPORTANT FOOD FISH SPECIES FROM KOLLAM, KERALA"** has been carried out by……..…, T.K.M College of Arts and Science, Karicode, Kollam under my supervision and guidance as partial fulfilment of the requirements for the Degree of Bachelor of Science in Zoology and that no part thereof has been presented for any other degree, diploma or associateship.

Dr. Rohini Krishna M.V.
Assistant Professor and HOD
Dept. of Zoology

Certified Bonafide:

Dr. Rohini Krishna M.V.
Assistant Professor and HOD
Dept. of Zoology

Examiners: 1.

2.

ACKNOWLEDGEMENTS

I am extremely grateful to my respectful guide and HOD, Dept. of Zoology, Dr. Rohini Krishna M V, for her constant encouragement, guidance and meticulous support for the successful completion of my project.

I would like to express my deep sense of gratitude to all my teachers, Dr. Jasin Rahman V.K., Dr. Mumthas Y and Dr. Munisha Murali S, Dept. of Zoology, TKM College of Arts and Science, Karicode, Kollam.

I am also thankful to my classmates and all my friends in this department for supporting me directly or indirectly in the successful completion of my project work.

Last but not least, I could not appraise the unconditional love, blessings, understanding and encouragement given by my parents, which helped me to pursue this project work. Above all, I thank the Almighty for the blessing in completing this thesis.

CONTENTS

INTRODUCTION

Kollam, formerly known as Quilon, is one of Kerala's most significant coastal districts, rich in natural aquatic resources and a long-standing tradition of marine trade and fisheries. Strategically located on the Malabar Coast, Kollam is bordered by the Arabian Sea and is home to the ecologically significant Ashtamudi Lake—a Ramsar wetland and a vital estuarine ecosystem. These natural features have made Kollam a hotspot for marine and freshwater fish biodiversity, supporting a diverse range of commercially important fish species.

The fishing industry in Kollam plays a crucial role in the district's economy, employing thousands of people, especially from traditional fishing communities. The district's fishing sector includes both marine and inland fisheries, with activities ranging from capture fisheries, aquaculture, fish processing, and export. Kollam's fishing harbors, particularly **Neendakara**, **Sakthikulangara**, and **Thankassery**, are among the busiest in Kerala, serving as major centers for fish landing, auction, and trade.

In Kollam, a wide range of fish species are caught, processed, and marketed both locally and internationally. These species contribute significantly to both domestic food security and the export economy. For instance, sardines and mackerel are staple seafood in Kerala households, while high-value species like tuna, seerfish, and shrimp are major export items.Kollam also has a well-developed fish processing and export industry. Frozen fish, dried fish, and value-added products like fish fillets and ready-to-cook items are exported from Kollam to markets in the Middle East, Europe, and Southeast Asia. The fisheries sector also supports related industries such as boat building, ice plants, net making, and seafood packaging.

Fishing is more than just an economic activity in Kollam—it is a way of life. Traditional fishermen, known as "fisherfolk," have practiced artisanal and small-scale fishing for generations. The sector provides livelihood opportunities to men and women alike, with women often engaged in fish drying, marketing, and processing.

According to statistics from the Department of Fisheries, Kerala, the marine catch from Kollam contributes significantly to the state's total fish production. Seasonal variations, monsoonal cycles, and climatic factors influence fish availability and market prices, affecting the livelihoods of fishing

communities. Market fluctuations, fuel costs, and sustainability challenges such as overfishing and bycatch further complicate the situation.

The commercial fishery of Kollam is characterized by the harvest of a wide variety of species, broadly categorized into pelagic, demersal, and shellfish groups. Among these, several species have emerged as commercially significant due to their abundance, nutritional value, market demand, and export potential. The pelagic fisheries, which include species inhabiting the surface and mid-water column, are dominated by Indian oil sardines (*Sardinella longiceps*), mackerels (*Rastrelliger kanagurta*), and anchovies. These species are harvested in large quantities using purse seines, ring seines, and gill nets. Their high fat content and suitability for processing and preservation make them essential not only for domestic consumption but also for export industries, particularly in dried and canned forms.

In addition to pelagic species, the demersal fishery resources—comprising bottom-dwelling fish—are also of considerable importance. These include seer fish (*Scomberomorus commerson*), threadfin breams (*Nemipterus spp.*), groupers (*Epinephelus spp.*), red snappers (*Lutjanus spp.*), and various species of catfish. These species fetch higher market prices and are often preferred in export-oriented seafood industries due to their meat quality and size. The fishery for seer fish, in particular, holds a premium status in local markets due to its demand in hotels and restaurants, as well as its high nutritional value. Demersal fish are primarily harvested using trawlers operating in deeper offshore waters, contributing significantly to the economic well-being of mechanized fishing sectors.

Shellfish resources also form an integral part of Kollam's fisheries. Species such as prawns, crabs, and squids are regularly landed at major fish landing centers. Among these, the Indian white prawn (*Fenneropenaeus indicus*), tiger prawn (*Penaeus monodon*), and mud crab (*Scylla serrata*) stand out for their high market value and strong export demand, particularly to countries in Southeast Asia, the Middle East, and Europe. Kollam has also gained recognition for its cephalopod landings, particularly squids (*Loligo spp.*) and cuttlefish (*Sepia spp.*), which are exported frozen and in processed forms. The aquaculture of prawns in brackish water farms surrounding Ashtamudi Lake has further boosted the commercial importance of shellfish species in the region.

Beyond the direct commercial benefits, these fish species play a vital role in ensuring food security, providing employment, and supporting ancillary industries such as boat-building, net-making, ice production, transportation, and fish processing. Several women-led self-help groups (SHGs) in Kollam are engaged in value addition, including the preparation of dried fish, pickles, and fish-based snacks, enhancing the economic impact of these species at the community level.

However, the increasing pressure on marine resources due to overfishing, climate variability, pollution, and habitat degradation poses serious challenges to the sustainability of commercially important fish species. The seasonal variations in fish catch and the migration patterns of key species demand the adoption of scientifically guided fishery management practices. Institutions such as the Central Marine Fisheries Research Institute (CMFRI) and Kerala University of Fisheries and Ocean Studies (KUFOS) have conducted extensive studies on the stock dynamics, reproductive biology, and conservation strategies for these species. Their findings underscore the need for ecosystem-based fishery management, improved fishing technologies, and the promotion of responsible fishing practices among coastal communities.

Kollam's marine and estuarine ecosystems host a wide range of commercially important fish species that form the backbone of its coastal economy. The richness of fish diversity, coupled with traditional knowledge and modern fishing practices, has positioned Kollam as a key player in India's fishery sector. Going forward, sustainable utilization, scientific management, and value addition to these resources will be crucial in ensuring the long-term prosperity of the fishing communities and the health of the marine ecosystem.

Fish have been adapting to changes in their living environments throughout evolutionary history. Those that are unable to adapt eventually die out (Vostradovsky, 1973). Over the years, humans have contributed to the extinction of many species. On a smaller scale, we have continually tested the adaptability of species by disturbing their living environments (Gulland, 1977). Therefore, documenting the fish fauna is crucial.

Fish is one of the most important sources of protein in the human diet. It contains lysine and sulphur-containing amino acids. Most fishes contain 15-25% protein and 1-5% fat. Fish is a good source of vitamins A, D, and B. Fish proteins are characterised by high digestibility, biological value and growth-promoting value. The richness of fishes in the water bodies represented the only frequency of appearance. The Fish richness may change due to seasonal variations (Pires et al. 1999, Horpilla et al. 2000, Tripathi et al.2017a). The relative abundance and distribution ultimately manifest the specialization of individuals within habitats and of populations among habitats. The local abundance of a species reflects how individuals utilize local resources like habitat, food and environmental conditions. A very common species obtains a bigger share than do rare ones because they either utilize a broader variety of resources, are specialized on resources that are more abundant or compete more effectively for shared resources (Mishra & Dwivedi 2020). The distribution of species across habitats also reflects how individuals utilize resources (Dwivedi et al. 2016).

Compared to narrowly distributed species, more widespread ones either specialise on widespread resources or are ecologically flexible enough to utilize different resources in different areas (Ricklefs 1990). Lakrin (1956) suggested that in some fish communities, climate control outweighs biological factors (i.e.completion predation) in controlling abundance. Grossman et al. (1982) reviewed this subject and provided evidence that in an Indian stream, stochastic processes largely determine fish population densities (example abundance) and that competition is insignificant in this community. Distribution patterns of organisms are controlled by the dispersal mechanism, historical factors (connecting pathways, dispersal barriers) and tolerance to the environmental stressors or factors (Dwivedi & Nautiyal 2010, Kumar et al.2013, Tiwari et al. 2016, Mishra & Dwivedi 2020).

OBJECTIVES

1. To identify and document the major commercially important food fish species found in Kollam, Kerala.
2. To analyze the economic significance of these species to local fishermen and the seafood industry.
3. Highlight their role in livelihood generation and market value.
4. To study the ecological characteristics and habitat preferences of the identified species.
5. Provide insights into their biology, habitat, and behavior relevant to sustainable management.

REVIEW OF LITERATURE

The fish diversity of the Adyar estuary was described by Evangeline (1967). According to Kurup et al., (2004), the coastal and estuarine waters of Kerala support over 300 species of finfish and shellfish, many of which are of commercial importance. Kollam district, with its unique combination of marine and brackish water environments, particularly around Ashtamudi Lake and the Arabian Sea, serves as a hotspot for pelagic and demersal fish species (CMFRI, 2018). The dominant pelagic species reported include Indian oil sardine (*Sardinella longiceps*), Indian mackerel (*Rastrelliger kanagurta*), and various anchovies. Demersal groups such as threadfin breams, groupers, snappers, and seer fish are also frequently landed in large quantities (Gopakumar et al., 2011). The Central Marine Fisheries Research Institute (CMFRI) has consistently documented the economic importance of various fish species from Kerala, emphasizing their contribution to both local markets and export industries. Studies by Mohamed et al. (2015) indicated that Kollam is one of the leading contributors to Kerala's marine fish landings, with species like oil sardine and seer fish accounting for a major share of the value. The high demand for species such as cephalopods (squid and cuttlefish), prawns, and crabs in international markets has also fueled the growth of seafood processing units and exports from the region (MPEDA, 2019). Several ethnographic studies, such as those by Salagrama (2006), have highlighted the role of traditional fishing communities in managing and harvesting marine resources. The use of indigenous fishing crafts, gear types (like ring seines and gill nets), and community-based seasonal fishing calendars has played a crucial role in sustaining fish stocks. In Kollam, the integration of mechanized boats with traditional practices has evolved, reflecting the adaptive nature of the fishing sector in response to ecological and market changes. Studies have shown that the abundance and composition of commercially important fish species vary seasonally. Nair et al. (2010) found that pelagic species show peak landings during the southwest monsoon retreat, while demersal species are more consistently available throughout the year. Seasonal upwelling along the Kerala coast, particularly off Kollam, significantly enhances nutrient availability and plankton productivity, indirectly influencing fish abundance and diversity (Smitha et al., 2008).

While the fisheries sector in Kollam has shown consistent growth, concerns regarding overfishing, habitat degradation, and climate change impacts have also been documented. Rajesh et al., (2020) reported declining trends in the population of some key species due to overexploitation and unsustainable fishing practices. The need for effective fisheries management, marine spatial planning,

and community involvement in conservation efforts has been emphasized in multiple studies (CMFRI, 2021; KUFOS, 2022).

In response to these challenges, several government and institutional interventions have been implemented. The Kerala Marine Fisheries Regulation Act (1980) and seasonal fishing bans are examples of policy mechanisms aimed at ensuring sustainable exploitation. Research and extension programs by institutions such as CMFRI and the Kerala State Fisheries Department have played a pivotal role in training fishers, introducing modern technologies, and promoting value-added products (Thomas et al., 2017).

MATERIALS AND METHODS

The study areas selected were different market areas in Kollam. The fish were caught with the help of nets; mainly two types of nets were employed for the collection. They are cast net and gill net. The method of operation is described below.

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

Gill net- Gill nets are wall-like with a mesh opening of varying sizes ranging from 20 to 50 mm. It has a head rope with floats and foot rope with sinkers, which will help to keep the net stretched like a wall in the water column. Fishes get trapped in the net depending upon the size of the mesh employed. Gill nets are prepared from synthetic fibres and are translucent, so the fish can't see the nets. These nets are operated mostly during night time, and catches are more during the dark phase of the moon, during which net will not be visible to fishes. As the fish try to swim through a net wall, they get entangled by the operculum, or the whole body gets entangled, and they are caught.

The fish were collected with the help of local fishermen, and the collection was carried out during the morning from 6.00 to 10.30 AM. The fishermen operate the gill net at night and collect the entangled fish in the early morning hours from 6.0 to 6.30 AM. The collections were carried out during the time period of January 2024 to March 2025 (Fig. 8). Monthly visits were conducted to the site during the time span of 3 months. The specimens collected were preserved in 10% formalin for systematic studies. The body colouration was noted in fresh condition and photographed with a digital camera. For identification of fishes, the important taxonomic treatise of Day (1967), Jayaram (1999), and Talwar and Jhingran (1991) were consulted in addition to FAO sheet and Fishbase.

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

RESULTS

23 species of fishes belonging to …. Families were recorded during the study period. The identity of the species, salient morphological and biological characters and economic importance of each species are described below.

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

Order: Perciformes

Family : Gerreidae

They inhabit marine or brackish habitats. Depth 1.9 to 2.3 times in standard length. The base of first dorsal-fin spine, ascending at an angle of about 45° to the horizontal. Dorsal- and anal-fin spines strong, particularly second anal-fin spine; second dorsal-fin spine longer than head minus snout, fewer than 38 lateral-line scales to base of caudal fin. Body silvery, indistinct, fine, dark stripes following scale rows in older fish, caudal fin dusky, anal and pelvic fins yellowish. They may reach a maximum total length of about 30 cm, commonly to 20 cm. They live in small schools on sandy bottoms, juveniles in the littoral zone, and larger fish down to 40 m. Small juveniles feed on zooplankton, larger fish on small polychaetes, bivalves, crustaceans, and fish. One of the more common gerreids in markets. Caught in set traps, seines and gill nets. Usually marketed fresh, but the flesh deteriorates rapidly (Figure : 1)

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

Order: Perciforms

Family : Carangidae

They occur in marine and brackish water. They are pelagic in nature and silvery in colour. The head has a steep sloping profile. The fins are usually grey to black. There is no dark spot around the gill covers. It has an ovate, moderately compressed body with the dorsal profile more convex than the ventral profile, particularly anteriorly. The dorsal fin is in two parts. The caudal fin is strongly forked, and the pectoral fins are falcate, being longer than the length of the head. The lateral line has a

pronounced and moderately long anterior arch, with the curved section intersecting the straight section below the lobe of the second dorsal fin. The curved section of the lateral line contains 58-64 scales, while the straight section contains none to four scales and 26 to 38 very strong scutes. The chest is devoid of scales except for a small patch of scales in front of the pelvic fins. The eye has a horizontal streak in which ganglion and photoreceptor cell densities are markedly greater than the rest of the eye. Juveniles are found in estuaries. Sold mostly fresh and dried salted (Figure : 2).

3 Scientific name: ***Lutjanus argentimaculatus*** (Forsskal, 1775)

Common name- Mangrove red snapper

Order : Acanthuriformes

Family: Lutjanidae

Coloration of the mangrove red snapper ranges from burnt orange to copper, to bronze and dark reddish-brown, depending on its age and environment. Younger fish caught in estuarine areas are often darker than older fish taken from offshore reef areas and exhibit lighter vertical bands down their flanks. The maximum recorded length is 150 centimetres (4.9 ft), but 80 centimetres (2.6 ft) is most common. Like other tropical snappers (family Lutjanidae), mangrove jacks have prominent fangs in their jaws that are used for seizing and holding prey, akin to the canine teeth of a mammal. These teeth can cause a nasty injury to unwary fishers.

As its name implies, the mangrove red snapper is commonly found in mangrove-lined estuarine systems, however, some make their way into complete freshwater systems, particularly at a juvenile age. They migrate to offshore reefs to spawn. As they mature, mangrove red snappers move into open waters, sometimes hundreds of kilometers from the coast, to breed. These larger fish are sometimes caught by bottom-fishers with heavy tackle, though they remain difficult to land due to their speed and proximity to sharp reef bottoms. The species is carnivorous; they are predators, feeding mainly at night on fish, crustaceans, gastropods, and cephalopods. As ambush predators, they often dwell around mangrove roots, fallen trees, rock walls, and any other snag areas where smaller prey reside for protection.Mangrove red snapper is a popular and important commercial and recreational fish throughout its range and is considered to be an excellent food fish, which allows it to command a relatively high market price (Figure : 3).

4. Scientific name: ***Sardinella longiceps*** (Valenciennes, 1847)

Common name- Mangrove red snapper

Order : Clupeiformes

Family : Dorosomatidae

The Indian oil sardine (*Sardinella longiceps*) is a species of ray-finned fish in the genus Sardinella. It is one of the two most important commercial fish in India (with the mackerel). The Indian oil sardine is one of the more regionally limited species of Sardinella and can be found in the northern regions of the Indian Ocean. These fish feed on phytoplankton (diatoms) and zooplankton (copepods).

The body of these *Sardinella* is particularly elongated, even to the point of being 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. *S. longiceps* attains sexual maturity around 15 cm and 1 year of age. The lifespan of this fish is about 2.5 years, but it is difficult to determine because the annual rings in their scales may be formed for several reasons other than yearly changes in their environment. Only after the first year are the rings a reliable indicator of age because they may be formed due to the reduced feeding activity associated with planktonic scarcity during the rise in temperature of the environment in summer. An experiment was done by measuring scales from a selected body area and then determining the relationship between the fish length and scale length. The movement of the fish was determined to be less seasonal than dependent on water conditions directly before and after the monsoon season. This affects the spawning season and means that it may vary from any period between June and December (Figure : 4).

5. Scientific name: ***Tenualosa ilisha*** (F. Hamilton, 1822)

Common name- Mangrove red snapper

Order : Clupeiformes

Family : Dorosomatidae

The ilish (*Tenualosa ilisha*), also known as the ilishi, hilsa, hilsa herring or hilsa shad, is a species of fish related to the herring in the family Clupeidae. Females of the species grow larger than males, with male individuals not reaching over 46 cm. Females can reach lengths of up to 55 cm. Maturity is

generally attained by the end of the first year or the beginning of the second, with males reaching sizes of 26–29 cm and females at 31–33 cm. It has no dorsal spines but 18 – 21 dorsal soft rays and anal soft rays. The belly has 30 to 33 scutes. There is a distinct median notch in the upper jaw. Gill rakers are fine and numerous, about 100 to 250 on the lower part of the arch, and the fins are hyaline. The fish shows a dark blotch behind the gill opening, followed by a series of small spots along the flank in juveniles. While alive, the fish is silver shot with gold and purple.

The migratory shad Hilsa (*Tenualosa ilisha*) is the national fish of Bangladesh and very famous for its unique taste and texture. It is an anadromous fish and spends most of its life cycle in the marine environment, but mature individuals migrate to the upstream freshwater river systems for spawning. Post spawning, larvae grow up to the juvenile stage (locally known as *Jatka*) that performs downstream migration to the sea for further growth and maturation. This indicates that Hilsa regularly experiences broad-spectrum salinity fluctuation throughout its life cycle. Therefore, this species possesses the capability to rapidly adapt to large scale salinity change including full strength seawater (salinity level 35.0%) to absolute freshwater (salinity level 0%) and vice versa Due to this sharp salinity fluctuation, Hilsa faces severe challenges including osmotic stress, differences in nutrient availability, changing immunity and disease susceptibility, hormonal imbalance, etc (Figure: 5).

6. Scientific name: ***Rastrelliger kanagurta*** (Cuvier, 1816)
Common name- Indian mackerel

Order : Scombriformes
Family : Scombridae

Streamlined, fusiform body, Metallic blue-green upper body and silvery lower side. Prominent eye and short pectoral fins. Size in the image is about 15 cm (typical for juvenile or small adult Indian mackerel). Indian mackerel is a commercially important pelagic fish species that is widely consumed and exported. It is often used fresh, dried, or in value-added products like canned mackerel or fish pickles. Typically found in coastal waters up to 100 meters deep. Prefers warm, tropical waters. Found near the surface and midwater levels. Planktivorous: Feeds mainly on zooplankton, phytoplankton, and small fish. Uses gill rakers to filter plankton from water. One of the most economically valuable marine fish in India. Landed in large quantities, especially in Kerala, Maharashtra, and Karnataka. Used fresh, dried, smoked, frozen, or in value-added products (e.g., fish curry, pickles, canned items).

Caught mainly using purse seines, gill nets, and shore seines. Subject to seasonal fishery management to prevent overfishing. High in protein and omega-3 fatty acids. Rich in vitamins like B12 and D. The spawning season around India, which is in the northern hemisphere, is between March and September. Around Seychelles in the southern hemisphere, it is between September and the following March. Spawning occurs in batches. The eggs are laid in the water and are externally fertilised. The Indian mackerel does not guard their eggs, which are left to develop on their own(Figure : 6).

7. Scientific name: ***Glossogobius giuris*** (F. Hamilton, 1822)
Common name- Tank goby

Order : Gobiiformes
Family : Gobiidae

Glossogobius giuris, the tank goby, is a species of goby native to fresh, marine and brackish waters. This species can also be found in the aquarium trade. It is also known as the bar-eyed goby, flat-headed goby and the Gangetic tank goby. The head is depressed with a protruding lower jaw, while the body takes on a compressed appearance towards the caudal fin. Normally brown or light brown with various darker brown spots and flecks along the sides. Ranges in size from 40 to 50 cm maximum. This species is a benthopelagic and amphidromous goby which is found in clear to turbid streams with rock, gravel, or sandy substrates.

Lays eggs amongst submerged vegetation, where the eggs are guarded by both the male and the female. They will spawn in freshwater, the eggs being taken to the sea by the current, although it can complete its whole life cycle in freshwater. Unusually for a goby, this species is commercially exploited, possibly due to its large size, and sold fresh or frozen. It also appears in the aquarium trade.The fish is found in estuaries, brackish backwaters, and shallow freshwater streams. It’s a bottom dweller; it prefers muddy or sandy substrate. It's carnivorous and feeds on small crustaceans, insect larvae, worms, and detritus. It's consumed locally, often fried or curried. Some species are dried and sold in local markets. Caught in small-scale artisanal fisheries using hand nets or traps. Important part of the estuarine food web. Serve as prey for larger carnivorous fish and birds (Figure : 7)

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

Common name: Shortnose ponyfish

Order: Perciformes

Family: Leiognathidae

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

Lives in shallow waters down to depths of about 40 m, predominantly near the bottom, and found in schools. Feeds mainly on diatoms, copepods, *Lucifer*, nematodes and polychaetes. Striking features. Body shape lateral, compressed cross-section, dorsal head profile is more or less straight. Eyes are more or less normal. The type of mouth/snout is more or less normal. Position of the mouth is terminal. With cycloid scales (Figure : 8).

9. Scientific name: ***Nemipterus japonicus*** (Bloch, 1791)

Common name: Japanese threadfin bream

Order : Acanthuriformes

Family : Nemipteridae

Nemipterus species are small to medium-sized benthic fishes with an elongated, laterally compressed body, prominent eyes, and a small, terminal mouth. They usually exhibit pinkish to reddish colouration, often with yellowish stripes or spots, especially along the lateral line. This specimen, approximately 11 cm in length, shows the classic body shape and pink colouration typical of the genus. Threadfin breams are demersal fish, typically found on sandy or muddy bottoms at depths of 20–100 meters. They are common in the Arabian Sea, especially off the Kollam coast, and are frequently caught in trawl nets. These fish are a significant part of Kerala's seafood economy. They are sold fresh

or processed into dried or frozen products. Owing to their mild flavour and firm texture, they are popular in both domestic markets and export industries.

Nemipterus japonicus has its dorsal fin supported by 10 spines and 9 soft rays while the anal fin contains 3 spines and 7 soft rays. Its body has a standard length that is 2.7 to 3.5 times its depth, and it has a snout that is equal to in length or longer than the diameter of the eye. There are 4 or 5 pairs of canine-like teeth in the front of the upper jaw. The pectoral fins are very long and extend beyond the origin of the anal fin and the pelvic fins are of moderate length extending to or just beyond the anus. The caudal fin has a moderately deep forked shape, with the upper lobe slightly longer than the lower and extending into an elongated filament. The colour of the upper body is pinkish, changing to silvery on the flanks and ventral surface (Figure : 9).

10. Scientific name: ***Ambassis ambassis*** (Linnaeus, 1758)
Common name: Indian Glassy Perchlet
Order: Mugiliformes
Family: Ambassidae

Typical habitats are Estuaries, brackish waters, and slow-moving freshwater bodies. The size of juveniles typically ranges from 3–6 cm; adults can grow up to 10–12 cm, depending on the species. Commonly found in the backwaters and coastal regions of Kerala, including Kollam. Semi-transparent or silvery body. Deep body with a compressed shape. Prominent eyes with dorsal and anal fins often have spines. Some species exhibit iridescence or a bluish tint near the head or flanks. It's part of the estuarine food web. Prey for larger commercial fish and birds. While not heavily targeted in large-scale fisheries, glassfish are often part of bycatch. Used in the ornamental fish trade and traditional medicine in some regions. It can be used in the preparation of fish meal or dried fish products.

The Indian glassy fish has an extraordinarily transparent body, revealing its bones and internal organs; the male develops a dark edge to the dorsal fin. The fish grows to a maximum overall length of 80 mm (3.1 in). It occurs in standing water, especially in impoundments, and it breeds prolifically during the rainy season. The species feeds on crustaceans, annelid worms, and other invertebrates. It is, in turn, prey for larger fish, including snakeheads (family Channidae). These fish swim at the middle and lower levels of the tank and will take most small live and frozen foods. In general, they tend not to eat dried foods (such as flakes). The fish reproduce by laying the eggs (females), and then the males fertilize the eggs. With a single supraorbital spine. Rostral spine absent. Preopercle ridge and rear

margin serrate. Interopercle edge smooth except for few small serrae at angle. Cheek scales, 2-3 rows. Lateral line continuous. Carnivorous, nocturnal or crepuscular (Figure : 10).

11. Scientific name: ***Gudusia chapra*** (Hamilton, 1822)
Common name: Indian River Shad

Order: Clupeiformes
Family: Dorosomatidae

Deep, laterally compressed body with a slightly arched back, Silvery flanks, bluish or greenish back Cycloid, deciduous (falls off easily). Strongly serrated keel with scutes (sharp belly scales). Dorsal fin located mid-body; forked caudal (tail) fin. Size is usually 6–12 cm, occasionally up to 15 cm. It is found in freshwater, estuarine, and low-salinity coastal zones. Common in Ashtamudi Lake, Kallada River, and the connected backwaters in Kollam. Pelagic species—often swim in schools in open water Planktivore — Feeds on zooplankton and phytoplankton. Plays an important role in the estuarine food web. Small-scale fisheries target it using cast nets, gill nets, and shore seines. Sold fresh in local markets or dried to make "Unakka Meen". Used in fishmeal production. Popular among coastal and inland fishing communities. Acts as a bioindicator of estuarine health due to its plankton-feeding habit. Supports biodiversity and predator fish species as a prey item (Figure : 11).

12.Scientific name: ***Escualosa thoracata*** (Valenciennes, 1847)
Common name: White Sardine

Order: Clupeiformes
Family: Dorosomatidae

Distinct silvery-white body, somewhat deeper than anchovies, with translucent or lighter belly. This species is amphidromous. It is known to swim at a maximum depth of 50 meters. The largest known standard length for the species is 10 cm. It is distinguished from its sister species, *Escualosa elongata*, the slender white sardine, by its deeper body and broader silver band. The white sardine feeds on zooplankton and phytoplankton. It is a commercially important fish, used fresh and dried.
Body fusiform, moderately deep and compressed with strongly keeled belly, mouth superior, dorsal profile of head more or less straight, second supra-maxilla almost rectangular. Broad, bright silver stripes are present along the flank. Distinguished from *Escualosa elongata* by its deeper body and

presence of a broad silver stripe along the flank. Fin formulae: Dorsal spines (total): 0; Dorsal soft rays (total): 13 - 21; Anal spines: 0; Anal soft rays: 14-19.

The white sardine fishery is supported by a single species, *E. thoracata*, along the coast. They generally form shoals in shallow waters of 5 to 30 m depth zone, preferably close to shore and are caught with encircling nets, particularly ring seines. Small quantities are also caught by gill nets, dolnets and trawls. Motorised and non-mechanised crafts are engaged in the fishery. Shoals of juveniles often enter backwaters and form a minor fishery in drag nets, stake nets and cast nets. Gillnet contribution was 21%, trawl 4.4%, and other traditional gears contributed 7.5%. Fishing operation is done by small outboard units in shallow waters (Figure: 12).

13. Scientific name: ***Salmostoma bacaila*** (F. Hamilton, 1822)
Common name: Large Razorbelly Minnow

Order: Cypriniformes
Family: Danionidae

Salmostoma bacaila (Ham.) is an important freshwater, fast-swimming teleostean fish that lives in shoals of 10-15 individuals. It is in high demand among the people due to its high nutritive value and its delicacy. The food and feeding habits of fish provide an important and scientific tool for successful intensive fish farming. Fishes, like other organisms, require energy for proper growth, development, reproduction and their various physiological activities. The qualitative and quantitative dietary analysis of fish in their natural habitat enhances the understanding of the growth, abundance, and productivity of water bodies.

The group is very rapidly declining in its native habitat due to anthropogenic activities like habitat destruction, indiscriminate application of agrochemicals, overfishing and climatic stress in its natural habitats. These fishes are basically used as food fish in India, and very recently, some researchers are trying to designate some of the fishes of this group as aquarium fish (Paul and Chanda, 2014) for their shining silvery colour and moderate body size. But the vitality of the fish species group is very poor and become easily dead when transfered from its natural habitat to aquarium. Although almost all fishes of this group are either least concern or not evaluated category as per IUCN status except *S. belachi* and *S. horai* are vulnerable. Locally, the population size is very alarming in the present study area (Figure: 13).

14. Scientific name: ***Amblypharyngodon mola*** (Hamilton, 1822)

Common name: Indian carplet

Order: Cypriniformes

Family: Danionidae

Deep-bodied and laterally compressed with a blunt snout, it's around 6–7 cm long. Small and shiny—silvery body with a slightly golden sheen (common in *A. mola*). The caudal fin is slightly forked. Eyes are large relative to head size. Dorsal and anal fins are set far back, a feature typical of this species. It is widespread in Kerala's freshwater bodies, including ponds, canals, and rice fields. Edible small fish, consumed locally. Rich in micronutrients and omega-3 fatty acids. Plays an important role in small-scale inland fisheries. Often found in low-oxygen environments, making it ecologically hardy.

A. mola is highly popular as a food fish due to its high nutritional content and taste, and it is also consumed in smoked and dried forms. Additionally, it is gaining popularity in international markets as an ornamental fish. It is often regarded as a balanced food due to its rich source of protein, vitamins, and minerals. Furthermore, *A. mola* has been identified as a potent species for preventing childhood malnutrition. This species is categorised as lower risk least concern (LRlc) in India (CAMP, 1998) and Least Concern (LC) according to the IUCN (Chaudhry, 2010)(Figure 14).

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

Common name: Streaked spine foot.

Order : Perciformes

Family: Siganidae

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

can be quite painful to humans, but is generally not fatal. The fish use their spines in self-defence and not for hunting prey. The fish is marketed fresh in some places as food(Figure: 15).

16.Scientific name**:** ***Scathophagus argus*** (Linnaeus, 1766)

Common name: Spotted scat

Order : Perciforms

Family: Scathophagidae

Found in marine, brackish estuaries and lower reaches of fresh water streams, mangroves, tiny juveniles are seen floating on the surface, it is a schooling species. Individuals typically grow to a length of 20–30 cm, greenish brown. Juveniles with a few large, roundish blotches, about the size of an eye, or with about 5 or 6 broad, dark, vertical bars. In large adults, spots may be faint and restricted to the dorsal part of the flanks. Body quadrangular, strongly compressed. Eye moderately large, its diameter somewhat smaller than snout length. Snout rounded. Mouth small, horizontal, not protractile. Teeth villiform, in several rows on the jaws.

Feeds on worms, crustaceans, insects and plant matter. The dorsal, anal and pelvic spines are believed to be venomous and capable of inflicting wounds. They are of limited commercial value but are sometimes used both as an aquarium fish and is also for consumption. It is used in Chinese medicine and marketed in both fresh and dried form(Figure: 16).

17. Scientific name**:** ***Lutjanus fulviflamma*** (Forsskål, 1775)

Common name: Blackspot snapper

Order : Acanthuriformes

Family: Lutjanidae

It is found in shallow coastal waters, coral reefs, lagoons, and mangroves, commonly between 5 and 60 meters in depth. Widely distributed across the Indo-Pacific region. It has a silvery body with a golden hue and a single dark black spot below the rear end of the dorsal fin. Yellowish caudal and anal fins. It can grow up to 35 cm, but is commonly found around 15–25 cm in local catches. Oval body with slightly forked tail, relatively large eyes. It is carnivorous – feeds on small fishes, crustaceans, and molluscs. Usually active during dusk and night. Targeted in small-scale artisanal fisheries using handlines, gill nets, and traps. Sold fresh in local markets and sometimes dried or salted. Occasionally

cultured in marine cages in some countries. It is high in protein, low in fat – a valuable food fish. Populations may be locally affected by overfishing and habitat degradation, especially of coral reefs and mangroves. It's better to promote sustainable fishing methods and protect juvenile habitats.

Lutjanus fulviflamma has a body which varies in shape from moderately deep to relatively slender, with a standard length which is 2.5 to 2.9 times its depth, with a head which is not very steeply sloped. The incision and the knob on the preoperculum are not well developed. They occur at depths between 0.5 and 35 m and in several different habitats, with the juveniles occasionally frequenting brackish lagoons and estuaries while the adults normally form schools over coral reefs and in deeper lagoons. They are predators which feed on fish and crustaceans. Spawning takes place in the Spring and Summer from August to March. In the western Indian Ocean, there is an extended spawning period from November and December to April and May. They are discontinuous spawners in which the females lay between 51,000 and 460,000 eggs in batches during a season, although batch sizes have yet to be ascertained (Figure: 17).

18. Scientific name**:** ***Mugil cephalus*** (Linnaeus, 1758)
Common name: Flathead Grey Mullet

Order : Mugiliformes

Family: Mugilidae

The body is elongated and cylindrical with a flat head. Its colour is Silvery-grey with darker shading on the dorsal side. Scales are large, easily visible, and give a slightly rough texture. The mouth is small and terminal. Two separate dorsal fins (not visible here but typical of mullets) and a slightly forked caudal fin. It's found along Indian coasts, especially Kerala, in both marine and brackish waters, including estuaries and backwaters. Highly tolerant of salinity changes, often found in coastal lagoons, estuaries, and rivers. Year-round, but especially abundant during post-monsoon (August to November) and pre-monsoon (February to May). It’s captured using Cast nets, Gill nets, and Seine nets. A commercially valuable species in Kerala. Consumed fresh, and also used for drying and fermentation. It is high in protein and omega-3 fatty acids. Also important in brackish water aquaculture. Juveniles are called "kanni" in some local dialects. Known for their fast swimming, and are often farmed in poly-aquaculture systems with prawns.
The flathead grey mullet is a mainly diurnal coastal species that often enters estuaries and rivers. It usually schools over sand or mud bottoms, feeding on zooplankton, dead plant matter, microalgae and

detritus. The adult fish normally feed on algae in freshwater. The species is euryhaline, meaning that the fish can acclimate to different levels of salinity (Figure: 18).

19. Scientific name**:** ***Saurida tumbil*** (Bloch, 1795)

Common name: Greater lizardfish

Order : Aulopiformes

Family: Synodontidae

The body is elongated, cylindrical, and torpedo-shaped. The head is conical, with a large mouth extending backwards past the eyes, and is equipped with sharp teeth. The colour is brownish to olive dorsally and lighter ventrally, with dark patches or stripes along the lateral line. Dorsal and pectoral fins are relatively small. It's widely distributed in the Indo-West Pacific region. Commonly found along India's west coast, including Kerala. Lives in sandy or muddy bottoms at depths of 20 to 100 meters, sometimes even shallower near estuaries. Available almost year-round. Landings peak during pre-monsoon (Feb–May) and post-monsoon (Sep–Nov) periods. It's caught using Bottom trawls, Shore seines, and Gill nets. It has moderate commercial importance. Usually sold fresh, sometimes sun-dried. Exported in small quantities as part of mixed fish catches. Low-fat, lean white meat, often used in fish mince or surimi production. Known for rapid spoilage, hence must be iced or processed quickly after catch. Juveniles are often caught unintentionally in mixed trawl landings (Figure: 19).

20. Scientific name**:** ***Plotosus lineatus*** (Thunberg, 1787)

Common name: Striped Eel Catfish

Order: Siluriformes

Family: Plotosidae

Elongated, eel-like body with distinct black or dark brown lateral stripes running from head to tail. Barbels around the mouth (not visible here due to the angle, but characteristic of catfishes). Uniform colouration with a pale belly. Appears to be around 18–20 cm. Commonly found in tropical Indo-Pacific waters, including the coastal and estuarine waters of Kerala. Often seen in schools, especially as juveniles. Prefers sandy or muddy bottoms, mangroves, and reef areas. Venomous spines on the dorsal and pectoral fins. It can inflict painful wounds if handled improperly. Though not a major commercial species, it's of interest in marine biology, especially due to its social behaviour and venomous defence. Juveniles form dense swarms and are often seen in shallow waters.

Plotosus lineatus can reach a maximum length of 32 cm. The body is brown with cream-colored or white longitudinal bands. The most striking feature of this species is in the fins, in fact the second dorsal, caudal and anal are fused as in eels. The rest of the body is quite similar to a freshwater catfish: the mouth is surrounded by four pairs of barbels, four on the upper jaw and four on the lower jaw. The first dorsal and each of the pectoral fins have a highly venomous spine. Juveniles of *Plotosus lineatus* form dense ball-shaped schools of about 100 fish, while adults are solitary or occur in smaller groups of around 20 and are known to hide under ledges during the day. Adult *P. lineatus* search and stir the sand incessantly for crustaceans, molluscs, worms, and sometimes fish. *P. lineatus* is an oviparous fish; this species has demersal eggs and planktonic larvae. It has evolved long ampullary canals in its electrosensory organs (originally termed "ampullae of Lorenzini")(Figure: 20).

21. Scientific name**: *Decapterus macarellus,*** (G. Cuvier, 1833)
    Common name: Mackerel scad

Order: Carangiformes

Family: Carangidae

It has a slender, elongated body with a rounded belly, with silvery colouration with a bluish-greenish dorsal side. A prominent dark spot near the upper edge of the gill cover. A forked tail is typical of fast-swimming pelagic fish. Around 12 cm (juvenile or sub-adult stage). Found in coastal waters, estuaries, and offshore regions. Common in the Arabian Sea, especially along the Kerala coast. A commercially valuable species in Kerala. Often used for fresh consumption, dried fish, and bait fish. The largest mackerel scad recorded was 46 cm long. Their elongated bodies look somewhat circular when viewed head-on. They are distinguishable by a small, detached fin located between the dorsal and caudal fins. Mackerel scad has 9 spines and 31–36 rays on their dorsal fins, while there are seven spines and 27–30 rays on their anal fins.

The mackerel scad's fins are black, metallic to blue-green, and its belly is white. The edge of the operculum has a small, black spot with no spots on the lateral line. Mackerel scad's caudal fins have been described as reddish to yellow-green. Mackerel scad usually lives in subtropical seas at depths up to 400 m. They prefer clear water and are frequently found around islands. Although mackerel scad has been found at the surface, they are usually caught at depths between 40 and 200 meters. They feed mainly on zooplankton. Mackerel scad is fairly important both to fisheries and to sportfishing. They are a somewhat popular fish for human consumption, normally eaten split and fried, but are more often

used as bait, since large gamefish such as the blue-spotted grouper, giant trevally, and the one-spot snapper are all known to feed on them (Figure: 21).

22. Scientific name**:** ***Upeneus sulphureus*** (Cuvier, 1829)

Common name: Sulphur goatfish

Order: Syngnathiformes

Family: Mullidae

Body colour is Pinkish to reddish with silver on the lower side. Distinct reddish lateral stripe. Barbels (chin whiskers) are usually present under the mouth – a key feature of goatfish. Blunt head and rounded snout. Body length is 10–11 cm. Common along the Kerala coast, including Kollam. Found on sandy or muddy seabeds, nearshore and offshore. Edible, often consumed fresh or dried. Sometimes caught as bycatch in trawl fisheries. Body color grayish-bronze; head reddish; lower sides and belly pale with two yellowish horizontal stripes on sides; tip of first dorsal fin black; no bars on caudal and anal fins. Body elongates and slightly compressed; dorsal profile of head convex. One pair of short and thin barbels. Scales ctenoid; pre-orbital scales absent.

Goatfish are characterised by two chin barbels (or goatees), which contain chemosensory organs and are used to probe the sand or holes in the reef for food. Their bodies are deep and elongated, with forked tails and widely separated dorsal fins. They have 24 vertebrae. Many goatfish are brightly colored. The largest species, the dash-and-dot goatfish (*Parupeneus barberinus*), grows to 60 cm (Figure: 22).

23. ***Saurida undosquamis*** (Richardson, 1848)

Common name: Brushtooth lizardfish

Order: Syngnathiformes

Family: Mullidae

The lizardfishes are benthic (bottom-dwelling) marine and estuarine bony fishes that belong to the aulopiform fish order, a diverse group of marine ray-finned fish consisting of some 15 extant and several prehistoric families. They are found in tropical and subtropical marine waters throughout the world. Lizardfishes are generally small, although the largest species measures about 60 cm (24 in) in length. They have slender, somewhat cylindrical bodies and heads that superficially resemble those of lizards. The dorsal fin is located in the middle of the back and is accompanied by a small adipose fin

placed closer to the tail. They have mouths full of sharp teeth, even on the tongue. Lizardfishes are benthic animals that live in shallow coastal waters; even the deepest-dwelling species of lizardfish live in waters no more than 400 m (1,300 ft) deep. Some species in the subfamily Harpadontinae live in brackish estuaries. They prefer sandy environments, and typically have body colours that help to camouflage them in such environments.

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. Adult lizardfish have body lengths sizes ranging from 19 cm to 35 cm. The dorsal part of the body is brown. The ventral part is silver in colour with black, faint crossbands. These by-products are usually turned into low-value goods, such as fertiliser, fish meal, animal feed, and biodiesel. Sometimes the by-products are discarded as waste and pollute the environment. This could lead to a significant loss of potential revenue and additional costs for the disposal of the by-products. A high-value product needs to be generated from these valuable by-products that could result in financial gain and produce zero waste (Figure: 23).

24. ***Sillago sihama*** (Fabricius, 1775)

Common name: Silver Whiting

Order: Acanthuriformes

Family: Sillaginidae

Long, slender, cylindrical body. Pale silvery body with a slightly darker back. Pointed snout and terminal mouth. Small scales with a faint lateral line. Dorsal fins are separated into spiny and soft-rayed portions. Size is 10–20 cm. Found in coastal waters, estuaries, mudflats, and sand-bottom regions. Common in the Arabian Sea along the Kerala coast, especially Kollam. It is popular in local markets. Consumed fresh, fried, or dried. Supports small-scale fisheries in Kerala.

The colour of the body is variable, often being light tan, silvery yellow-brown, sandy brown, or honey coloured. The underside of the fish is usually paler, ranging from brown to white. A silver midlateral, longitudinal stripe is normally present. The dorsal fins are dusky on each end, with or without rows of dark brown spots on the second dorsal fin membranes. The caudal fin is dusky terminally, and there is no dark blotch at the base of the pectoral fin as in other sillaginids. All other fins are hyaline, but the anal fin occasionally has a whitish margin.

It commonly inhabits both high-energy beaches and sandbars as well as more protected bays along mangrove creeks and tidal flats. The species commonly enters estuaries, and has even been recorded in freshwater, despite the fact it has no anatomical adaptations to cope with this change (Figure 24).

Figure: 1: *Gerres abbrevatius*

Figure: 2: *Caranx ignobilis*

Figure. 3: *Lutjanus argentimaculatus*

Figure. 4: *Sardinella longiceps*

Figure. 5: *Tenualosa ilisha*

Figure. 6: *Rastrelliger kanagurta*

Figure. 7: *Glossogobius giuris*

Figure. 8: *Leiognathus brevirostris*

Figure. 9: *Nemipterus japonicus*

Figure.10: *Ambassis ambassis*

Figure.11: *Gudusia chapra*

Figure.12: *Escualosa thoracata*

Figure.13: *Salmostoma bacaila*

Figure 14: *Amblypharyngodon mola*

Figure.15: *Siganus javus*

Figure.16: *Scathophagus argus*

Figure.17: *Lutjanus fulviflamma*

Figure.18: *Mugil cephalus*

Figure.19: *Saurida tumbil*

Figure 20: *Plotosus lineatus*

Figure 21: *Decapterus macarellus*

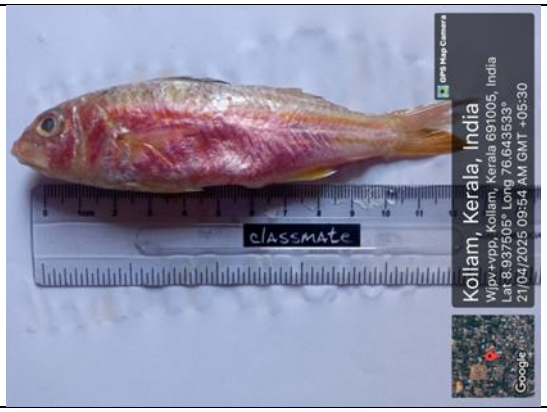

Figure 22: *Upeneus sulphureus*

Figure 23: *Saurida undosquamis*

Figure 24: *Sillago sihama*

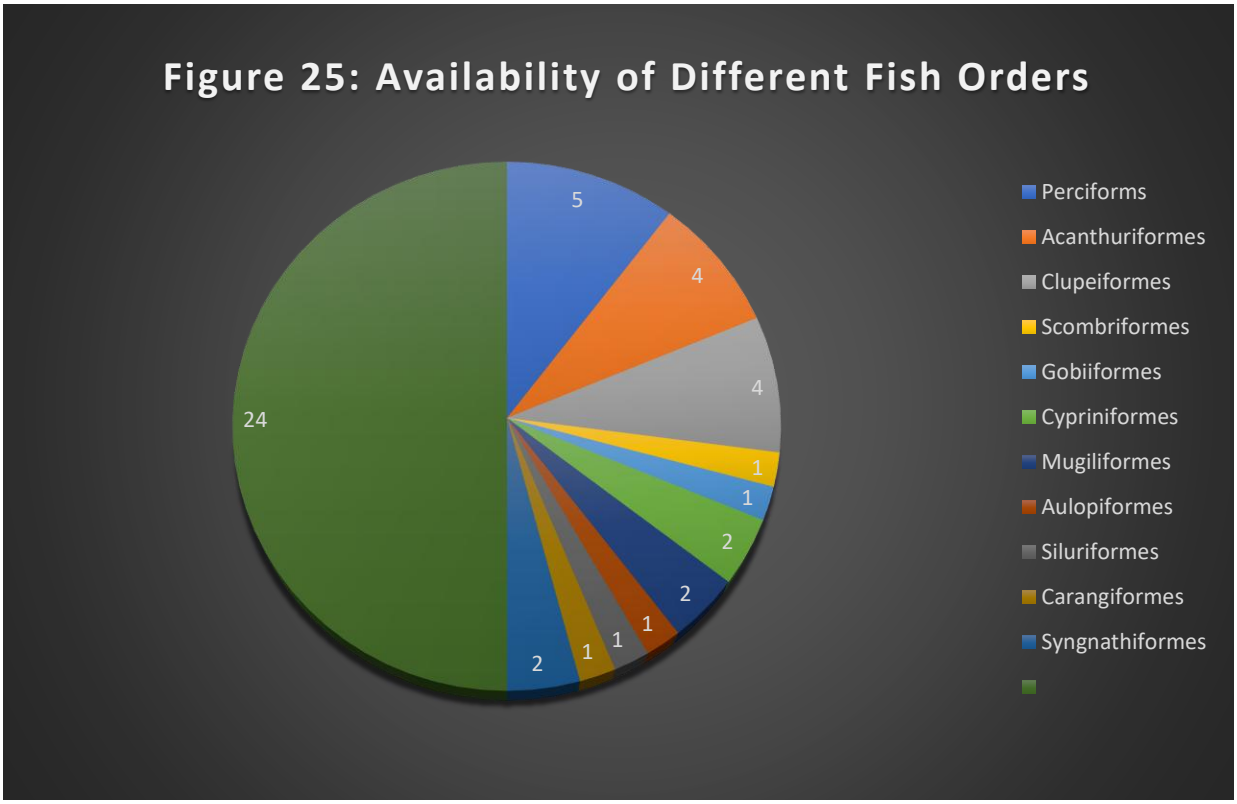
Figure 25: Availability of Different Fish Orders
5
4
4
24
1
1
2
2
1
1
2
Perciforms
Acanthuriformes
Clupeiformes
Scombriformes
Gobiiformes
Cypriniformes
Mugiliformes
Aulopiformes
Siluriformes
Carangiformes
Syngnathiformes

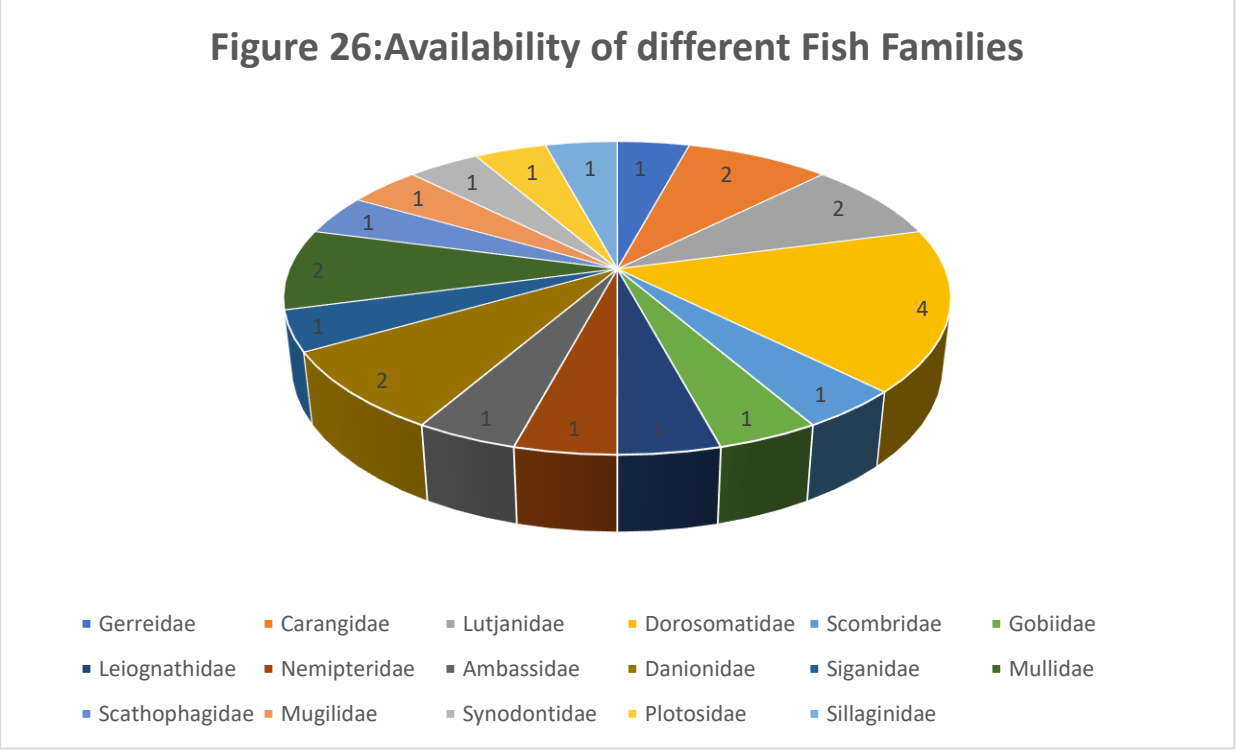
Figure 26:Availability of different Fish Families
1
2
2
4
1
1
1
2
1
1
1
1
2
1
1
1
1
1
Gerreidae
Carangidae
Lutjanidae
Dorosomatidae
Scombridae
Gobiidae
Leiognathidae
Nemipteridae
Ambassidae
Danionidae
Siganidae
Mullidae
Scathophagidae
Mugilidae
Synodontidae
Plotosidae
Sillaginidae

DISCUSSION

While it is commonly accepted that invasive species or non-native organisms that cause ecological, economic and social impacts in new are as to which they are being introduced, the problem of' native invaders' is also frequently encountered by applied and basic ecologists (Shackelford et al. 2013, Bajer et al. 2018, Dwivedi et al. 2017, Tripathi et al. 20l7b, Mayank & Dwivedi 2016). According to Rodrigues et al. (2018), richness data showed that the population of non-native species had a fast increase in the early years, followed by a decrease in the population of the native species. Moyle & Light (1996) state that long-term success of invasions is more probable in aquatic systems that were highly altered by human activities, which can reduce native species' abundance (especially top predators) as well as the intensity of biotic interactions such as predation (Havel et al.2005, Mishra et al. 2021, Mayank et al. 2021), heavy metal concentration (Tiwari & Dwivedi 2014, Tiwari et al. 2015, Dwivedi et al. 2014, 2015) consequently decreasing the biotic resistance of the community and facilitating the dispersion and establishment of non-native species (Tripathi et al. 2013, Dwivedi et al.2017, Mayank et al. 2018).

The coastal and estuarine ecosystems of Kollam, a coastal district in Kerala, are known for their rich aquatic biodiversity and fisheries productivity. Kollam's strategic location along the Arabian Sea and the presence of interconnected backwaters, estuaries, and rivers make it a hotspot for both marine and estuarine fish species. The present documentation highlights the presence of a wide range of commercially important food fish species in Kollam waters, emphasising their ecological roles, economic significance, and contribution to local livelihoods.

Among the pelagic species, *Sardinella longiceps* (Indian oil sardine) and *Rastrelliger kanagurta* (Indian mackerel) are of immense commercial value. These species constitute a large portion of the total marine fish landings in Kollam and are integral to the traditional and mechanised fishing sectors. They are primarily targeted using ring seines and are highly demanded in both domestic and international seafood markets. The cyclical abundance of oil sardines, often linked to oceanographic conditions, directly impacts the socio-economic stability of coastal communities. Similarly, mackerel is a key species in marine food chains, playing an essential role in nutrient cycling and energy transfer in the pelagic ecosystem.

Demersal species such as *Nemipterus japonicus* (Japanese threadfin bream), *Saurida tumbil* (Greater lizardfish), and *Saurida undosquamis* (Brushtooth lizardfish) are commonly caught in bottom trawl operations. These species are prized for their firm white flesh and are processed into frozen fillets, dried products, or consumed fresh. Their presence indicates healthy benthic habitats that support diverse macrofaunal communities. Additionally, the occurrence of *Upeneus sulphureus* (goatfish) and *Leiognathus brevirostris* (ponyfish) further reflects the productivity of nearshore benthic environments, which act as feeding grounds for a variety of carnivorous fishes (Figure 25 and 26)

Estuarine and brackish water habitats in Kollam support a different assemblage of fish species. *Glossogobius giuris* (tank goby), *Mugil cephalus* (flathead grey mullet), and *Plotosus lineatus* (striped eel catfish) are key representatives of these ecosystems. These species exhibit tolerance to fluctuating salinity levels and often migrate between freshwater and marine environments for breeding and feeding. *Mugil cephalus*, in particular, is economically important due to its use in aquaculture and capture fisheries. Its ability to feed on detritus and organic matter contributes to nutrient recycling in estuarine habitats. *Plotosus lineatus*, although not a major commercial species, is ecologically significant due to its role as a scavenger.

Freshwater and migratory species such as *Tenualosa ilisha* (hilsa shad), *Gudusia chapra, Salmostoma bacaila,* and *Amblypharyngodon mola* are frequently found in the inland and estuarine zones of Kollam. These species are seasonally available and are often captured using traditional gear like cast nets and gill nets. *Hilsa*, in particular, has cultural and economic importance in Kerala, with high consumer demand during its seasonal runs. *Amblypharyngodon mola*, a small indigenous species (SIS), is noted for its high micronutrient content and is gaining recognition for its role in addressing nutritional deficiencies.

Predatory and reef-associated species such as *Caranx ignobilis* (giant trevally), *Lutjanus argentimaculatus* (mangrove red snapper), *Lutjanus fulviflamma, Siganus javus* (rabbitfish), and *Scatophagus argus* (spotted scat) contribute to the ecological balance in coral and rocky reef environments. These species are targeted using gill nets and handlines and fetch higher market prices due to their taste and meat quality. Their presence in Kollam highlights the importance of reef habitats as breeding and nursery grounds. *Ambassis ambassis* is another estuarine species that, while small in size, plays a key role in food webs by serving as prey for larger predatory fishes.

The inclusion of *Sillago sihama* (silver whiting) in this list underlines the diversity of inshore fishery resources in Kollam. This species is commonly found in sandy bottom habitats along the coast and is valued for its soft, palatable meat. It is targeted mainly by artisanal fishers using shore seines and small

trawl nets. Other notable species include *Gerres abbrevatius, Decapterus macarellus*, and *Escualosa thoracata*, each of which has specific ecological roles and varying degrees of commercial exploitation. *Gerres abbrevatius* is often found in estuarine mudflats and plays a role in sediment turnover. *Decapterus macarellus* is a midwater schooling species contributing to pelagic fisheries, while *Escualosa thoracata* is known for forming large shoals and is often caught in mixed fishery operations.

Fisheries provide jobs to millions of people including fishers, boat operators, processors, vendors, and exporters. Many more are involved in allied sectors like net making, boat building, ice production, transportation, and retailing. In coastal Kerala, entire communities depend on fishing for their day-to-day income. The fisheries sector contributes significantly to the Gross Domestic Product (GDP), especially in coastal states. In India, it contributes around 1% to the national GDP, and over 5% to the agricultural GDP.Kerala ranks high among Indian states in terms of marine fish production, with Kollam being a major contributor.Fish and seafood are major export commodities. India exports fish products to countries like the USA, China, Japan, and countries in the EU. Popular export items include shrimp, cuttlefish, squid, and frozen fish fillets.

The earnings from seafood exports help improve the foreign exchange reserves of the country.Fish is a cheap and rich source of animal protein, omega-3 fatty acids, vitamins, and minerals. It plays a vital role in food and nutritional security, particularly for low-income groups in coastal and inland regions. Fish and by-products like fish oil, fishmeal, and fish waste are used in industries such as Poultry feed, Fertiliser, Pharmaceuticals and nutraceuticals and Cosmetic products. Fishing villages often have their own micro-economies where trading, processing, and transportation create additional economic activities. Weekly fish markets in regions like Kollam generate significant cash flow and support local businesses like ice factories, food stalls, and fuel stations. The fisheries sector supports small-scale enterprises such as Ice plants and cold storage, Dry fish production units, Aquaculture farms and Ornamental fish farming.

The diversity of commercially important food fish species in Kollam reflects the ecological richness and fishery potential of the region. These species occupy various ecological niches—from pelagic to benthic and estuarine to reef-associated zones—illustrating the multidimensional nature of Kollam's aquatic ecosystems. Sustainable fishing practices, habitat conservation, and continuous monitoring of species composition and catch trends are essential to ensure the long-term viability of fisheries in the region. The inclusion of both high-value and small indigenous species in the local fishery underscores the need for a holistic approach to fisheries management that balances economic gain with ecological sustainability.

CONCLUSION

The fisheries sector in Kollam, Kerala, is enriched by a wide diversity of commercially important food fish species that occupy various ecological niches, ranging from marine pelagic and demersal zones to estuarine and freshwater habitats. This diversity supports not only the ecological stability of aquatic systems but also the economic well-being of thousands of coastal families who rely on fishing as their primary livelihood.

Pelagic species such as *Sardinella longiceps* (Indian oil sardine) and *Rastrelliger kanagurta* (Indian mackerel) are among the most heavily landed species in Kollam and are vital to the region's economy. Their seasonal abundance directly impacts fishery-based incomes and provides affordable, protein-rich food to the local population. Species like *Tenualosa ilisha* (hilsa shad) are culturally significant and highly valued in regional fish markets, while *Decapterus macarellus* and *Escualosa thoracata* contribute to mixed shoal fisheries and bulk landings.

Demersal and benthic species such as *Nemipterus japonicus*, *Saurida tumbil*, *Saurida undosquamis*, and *Upeneus sulphureus* are important in trawl fisheries, contributing to both domestic consumption and export markets. Their firm texture and flavor make them popular in fresh and processed forms. Estuarine and nearshore species like *Glossogobius giuris*, *Leiognathus brevirostris*, and *Ambassis ambassis* indicate the productivity and ecological health of Kollam's backwaters and contribute to the sustenance of small-scale artisanal fishers.

The region also supports a number of reef-associated and predatory species, including *Caranx ignobilis*, *Lutjanus argentimaculatus*, *Lutjanus fulviflamma*, *Siganus javus*, and *Scatophagus argus*. These species are often found in rocky or coral-rich zones and fetch high market prices due to their taste, size, and demand in restaurants and export markets. Their conservation is crucial as they are vulnerable to overfishing due to slower growth and reproductive rates.

Freshwater and small indigenous species such as *Gudusia chapra*, *Salmostoma bacaila*, and *Amblypharyngodon mola* may be small in size but play a vital role in nutritional security and local subsistence fisheries. Their inclusion in the diet contributes to essential micronutrient intake, especially among rural populations.

Overall, this rich assemblage of species—from *Gerres abbrevatius* to *Sillago sihama*—illustrates the ecological wealth and economic relevance of Kollam's fisheries. For undergraduate students studying

fisheries science, marine biology, or environmental studies, understanding the importance of these species is key to promoting sustainable fishery practices. Conservation efforts, scientific research, and community awareness must go hand in hand to protect this biodiversity and ensure that Kollam's fisheries continue to thrive for future generations.

In conclusion, the presence of species like *Nemipterus japonicus*, *Decapterus macarellus*, *Saurida undosquamis*, and *Sillago sihama* underscores the broad ecological spectrum covered by Kollam's fishery resources. Protecting this diversity through sustainable fishing practices and habitat conservation is essential not only for ecological balance but also for supporting future generations of fishers and consumers. For undergraduate students studying marine biology, fisheries, or environmental science, this understanding lays a strong foundation for further exploration into aquatic biodiversity, resource management, and the socio-economic value of fisheries in coastal India.

REFERENCES

1. Bajer, P.G., M. W. Beck & P. J. Hundt (2018). Effect of non-native versus native invaders on macrophyte richness: are carp and bullheads ecological proxies? Hydrobiologia, doi.org/10.1007/s10750-018-3592-1.
2. CAMP. 1998. Report of the workshop on Conservation, Assessment and Management Plan (CAMP) for freshwater fishes of India. Zoo outreach organization and NBFGR, Lucknow, India.
3. Chaudhry, S. 2010. Amblypharyngodon mola. In: IUCN Red List of Threatened Species. www.iucnredlist.org, accessed June 2017.
4. CMFRI. (2018). Annual Report 2017–2018. Central Marine Fisheries Research Institute, Kochi.
5. CMFRI. (2021). Status of Marine Fisheries in Kerala. Central Marine Fisheries Research Institute, Kochi.
6. Dwivedi, A. C. & P Nautiyal (2010). Population dynamics of important fishes in the Vindhyan region, India. LAP Lambert Academic Publishing, Germany.
7. Dwivedi, A. C., S. Khan & P. Mayank (2017). Stressors altering the size and age of Cirrhinus mrigala (Hamilton, 1822) from the Ghaghara River, India. Oceanography Fish Open Access Journal 4(4): 555642. DOI:10.19080/OFOAJ.2017.04.555642.
8. Dwivedi, A.C., A. S. Mishra, P. Mayank & A. Tiwari (2016). Persistence and structure of the fish assemblage from the Ganga River (Kanpur to Varanasi section), India. Journal of Geography and Natural Disasters, 6: 159. Doi:10.4172/2167- 0587.1000159.
9. Dwivedi, A.C., P. Mayank, S. Tripathi & A. Tiwari (2017). Biodiversity: the non-natives species versus the natives species and ecosystem functioning. Journal of Biodiversity, Bioprospecting and Development, 4(1): DOI: 10.4172/2376-0214.1000164.
10. Evangeline, G. (1967). Studies on the fish and fisheries of the Adyar estuary. Journal of the Madras University, 37(2), 1–15.
11. Evangeline, G. (1967). Trend in the fisheries of the Adyar Estuary from April 1963 to March 1965. *Madras Journal of Fisheries* 4: 1–20.
12. Gopakumar, G., et al. (2011). Marine fishery resources of India: Exploited and unexploited potential. Central Marine Fisheries Research Institute, Kochi.
13. Grossman, G.D., P.B. Moyle & J. O. Whitaker (1982). Stochasticity in structural and functional characteristics of an India stream fish assemblage: a test of community theory. An. Nat., 120: 423-455.

14. Gulland, J.A. (1977) *Fish Population Dynamics.* John Wiley & Sons, Ltd., New York.
15. Havel, J. E., C. E. Lee & M. J. V. Zanden (2005). Do reservoirs facilitate invasions into landscapes? BioScience, 55: 518525.
16. Horpilla, J., J. Ruuhijarvi, M. Rask, C. Karppinen, K. Nyberf & M. Olin (2000). Seasonal changes in the diets and relative abundances of perch and roach in the littoral and pelagic zones of large lake. J. Fish Biol., 56: 51- 72.https://doi.org/10.1111/j.1095-8649.2000.tb02086.x.
17. KUFOS. (2022). Fisheries Resource Management Strategies in Kerala. Kerala University of Fisheries and Ocean Studies, Kochi.
18. Kumar, J., A. K. Pandey, A. C. Dwivedi, A. S. Kumar Naik, V. Mahesh and S. Benakappa (2013). Ichthyofaunal diversity of Faizabad district (Uttar Pradesh), India. Journal of Experimental Zoology, India, 16(1): 149-154.
19. Kurup, B. M., Radhakrishnan, K. V., & Velayudhan, T. S. (2004). Biodiversity of fishes and shellfishes in the coastal and estuarine waters of Kerala. Journal of the Marine Biological Association of India, 46(1), 12–18.
20. Lakrin, P. (1956). Interspecific competition and population control: freshwater fish. J. Fish. Res. Board Can., 13: 327-342.
21. Mayank, M., N. Mishra & A. C. Dwivedi (2021). Invasive potential of Nile Tilapia, Oreochromis niloticus (Linnaeus, 1758) from the tributary of the Ganga River, Central India. Journal of Earth and Environmental Science Research, SRC/JEESR-175. DOI: https://doi.org/10.47363/JEESR/2021 (3)152.
22. Mayank, P. & A. C. Dwivedi (2015). Biology of Cirrhinus mrigala and Oreochromis niloticus. LAPLAMBERT Academic Publishing GmbH and Co. KG, Dudweiler Landstr.99,66123 Saarbrucken, Germany,188.
23. Mayank, P. A. C. Dwivedi & R. K. Pathak (2018). Age, growth and age pyramid of exotic fish species Oreochromis niloticus (Linnaeus 1758) from the lower stretch of the Yamuna river, India. National Academy Science Letter, 41(6): 345-348. doi.org/10.1007/s-40009-018-0673-7.
24. Mishra, N. & A. C. Dwivedi (2020). Environmental derivers supports to distribution, composition and biology of *Cyprinus carpio* (Linnaeus, 1758) in respect of time scale: A review. Journal of the Kalash Science, 8(2): 91-102.
25. Mishra, N. & A. C. Dwivedi (2020). Environmental derivers supports to distribution, composition and biology of Cyprinus carpio (Linnaeus, 1758) in respect of time scale: A review. Journal of the Kalash Science, 8(2): 91-102.

26. Mishra, N., A. C. Dwivedi & P. Mayank (2021). Study on stock health of non-native fish species, Cyprinus carpio (Linnaeus,1758) through age pyramid from the tributary of the Ganga River, India. Journal of Aquaculture and Technical Development, 4(1): 011.
27. Mohamed, K. S., et al. (2015). Marine fish landings in Kerala: Trends and sustainability. Central Marine Fisheries Research Institute, Kochi.
28. Moyle, P. B. & T. Light (1996). Biological invasions of freshwater: Empirical rules and assembly theory. Biological Conservation, 78: 149-161.
29. MPEDA. (2019). Annual Report 2018–2019. Marine Products Export Development Authority, Kochi.
30. Nair, P. G., et al. (2010). Seasonal distribution of commercially important marine fish species off the Kerala coast. Indian Journal of Fisheries, 57(3), 9–15.
31. Paul, B. and Chanda, A. 2014. Indigenous Ornamental Fish Faunal Diversity in Paschim Medinipur, West Bengal, India. Int. Res. J. Biological Sci. 3(6): 94-100.
32. Pires, A.M., L. G. Cowx & M. M. Coelho (1999). Seasonal changes in fish community structure of intermittent streams in the middle reaches of the Guadiana basin, Portugal. J. Fish Biol., 54: 235-249.
33. Rajesh, R., Joseph, R., & Harikrishnan, M. (2020). Impact of overfishing and climate change on marine biodiversity along Kerala coast. Environmental Conservation Journal, 21(1-2), 33–40.
34. Ricklefs, R.E. (1990). Ecology.3n1Ed. WH. Freeman and Company. University, 1-896.
35. Rodrigues, A. C., H. S. de Santana, M. T. Rio Baumgartner & L. C. Gomes (2018). Coexistence between native and nonnative species: the invasion process and adjustments in distribution through time for congeneric piranhas in a Neotropical floodplain. Hydrobiologia, https://doi.org/10. 1007/sl0750-018-3541-z.
36. Salagrama, V. (2006). Trends in poverty and livelihoods in coastal fishing communities of India. FAO Fisheries Technical Paper No. 490, FAO, Rome.
37. Shackelford, N., M. Renton, M. P. Perring & R. J. Hobbs (2013). Modeling disturbance-based native invasive species control and its implications for management. Ecological Applications, 23: 1331-1344.
38. Smitha, P. G., Sanjeevan, V. N., & Nair, K. K. C. (2008). Upwelling along the southwest coast of India – A review. Indian Journal of Marine Sciences, 37(4), 479–493.
39. Thomas, S., Kumar, C. R., & Rajan, A. (2017). Innovative technologies and training in fisheries: Role of extension in sustainable development. Kerala State Fisheries Department, Thiruvananthapuram.

40. Tiwari A. & A. C. Dwivedi (2014). Assessment of heavy metals bioaccumulation in alien fish species Cyprinus carpio from the Gomti River, India. European Journal of Experimental Biology, 4(6): 112-117.
41. Tiwari, A., A. C. Dwivedi & P. Mayank (2016). Time scale changes in the water quality of the Ganga River, India and estimation of suitability for exotic and hardy fishes. Hydrology Current Research, 7(3): 254. doi: 10.4172/2157 7587.1000254.
42. Tiwari, A., A. S. Kushwaha & A. C. Dwivedi (2015). Accumulation of heavy metals in liver, muscle and gill of *Cyprinus carpio* from the Ganga River at Varanasi, Uttar Pradesh. Journal of the Kalash Science, 3(1): 47-51.
43. Tripathi, S. A. Gopesh & A. C. Dwivedi (2017a). Framework and sustainable audit for the assessing of the Ganga river ecosystem health at Allahabad, India. Asian Journal of Environmental Science, 12(1): 37-42. DOI:10.15740/HAS/AJES/12.l/3742.
44. Tripathi, S. A. Gopesh & A. C. Dwivedi (2017a). Framework and sustainable audit for the assessing of the Ganga River ecosystem health at Allahabad, India. Asian Journal of Environmental Science, 12(1): 37-42. DOI:10.15740/HAS/AJES/12.l/3742.
45. Vostradovsky, J. (1973). *Freshwater Fishes: A Concise Guide in Colour*. Hamlyn Publishing Group Limited, New York: 33333333